

ANNEX

GUIDELINES IN THE REGULATION OF SUBMERSIBLE PASSENGER CRAFTS

I GENERAL

The Guidelines developed by the IMO (MSC/Circ981 - Guidelines for the design, construction and operation of submersible passenger crafts) is the main reference to the Guidelines attached to this Circular as ANNEX and APPENDIX 1 and 2.

1 OBJECTIVE

To provide policy guidelines in the regulation of submersible crafts designed to carry passengers intended for underwater voyages inside a passenger compartment at or near the pressure of one (1) atmosphere. Such crafts shall be limited to defined areas of operation and shall cater primarily to the leisure and tourism industry.

2 COVERAGE

This Circular shall apply to all persons, corporations, firms and entities engaged in the operation of Submersible Passenger Crafts (SPCraft) in the domestic shipping, involving the carriage of passengers, for leisure and tourism purposes.

3 DEFINITION OF TERMS

For the purpose of this Annex the following definitions are adopted:

- .1 *Autonomous craft* refers to a passenger submersible craft which, although requiring surface support, is not physically connected to support facilities during operation.
- .2 *Ballast tank* refers to a compartment/tank used to control the buoyancy of a passenger submersible craft.
- .3 *Company* refers to the owner of the SPCraft or any organization of person such as the manager, or the bareboat charterer, who has assumed responsibility for operation of the ship from the shipowner and who on assuming such responsibility, has agreed to take over all the duties and responsibilities related to the safe operation of the SPCraft.
- .4 *Design depth* refers to the maximum depth to which the SPCraft is designed to operate.
- .5 *Exostructure* refers to the structure appendages, fairings and fendering outside of the pressure hull, including propeller guards.
- .6 *Gas container* refers to a pressure container for the storage and transport of gases under pressure.

- .7 *IACS* refers to the International Association of Classification Societies.
- .8 *IMO* or Organization refers to the International Maritime Organization
- .9 *Life-support system* refers to the equipment and systems required to maintain the SPCraft in a habitable condition in all anticipated operating conditions.
- .10 *Master* refers to a person appointed and duly qualified to command the submersible passenger craft (SPCraft).
- .11 *Operating Depth* refers to the depth at which the vessel is authorized to operate as specified in the issued Certificate of Public Convenience (CPC). The operating depth shall not exceed the rated depth of the vessel.
- .12 *Payload* refers to the weight the SPCraft is capable of carrying in addition to its permanently fitted equipment.
- .13 *Passenger* refers to every person other than the SPCraft Master and the members of the crew or other persons employed or engaged in any capacity on board a SPCraft on the business of the craft.
- .14 *Passenger compartment* refers to a space intended to accommodate passengers.
- .15 *Pressure container* refers to a pressure vessel for the storage of fluids under pressure.
- .16 *Recognized organization* refers to an organization authorized by a flag State to perform statutory services on its behalf under certain conditions determined by the flag State.¹
- .17 *Rated depth* refers to the maximum depth to which the SPCraft is certified to operate.
- .18 *Submersible Passenger Craft (SPCraft)* refers to a passenger-carrying vessel used solely for leisure and tourism purposes, which primarily operates underwater and relies on surface support, e.g. a surface ship or shore-based facilities, for monitoring and for one or more of the following:
 - .1 recharging of power supply;
 - .2 recharging high pressure air; and,
 - .3 recharging life-support.
- .19 *Support facility* refers to surface craft or shore-based facility providing support to SPCraft.

¹ Refer to the Guidelines for the authorization of organizations acting on behalf of the Administration, adopted by the Organization by resolution A.739(18), and to the Specifications on the survey and certification functions of recognized organizations acting on behalf of the Administration, adopted by the Organization by resolution A.789(19)

- .20 *Viewport* refers to penetration in the pressure boundary including the window, flange, retaining ring and seals.
- .21 *Window* refers to a transparent, impermeable and pressure resistant insert in the viewport.

The meaning of other terms/phrases used herein are as defined in relevant MARINA Memorandum Circulars or as generally understood in maritime industry practice.

4 SURVEYS

- 1 Each SPCraft should be subject to the surveys specified below:
 - .1 An initial survey before the Certificate required in section I/5.2 is issued for the first time. This survey should include a complete and thorough examination of the SPCraft, equipment, fittings, arrangements and materials and should be such as to ensure full compliance with the applicable provisions of the Guidelines.
 - .2 An annual survey to ensure that the SPCraft, fittings, arrangements and equipment remain in compliance with the applicable provisions of the Guidelines and are in good working order. Such survey should be endorsed on the Certificate issued under the provisions of section I/5.2. An annual survey should include a test dive to the rated depth.
 - .3 A dry-docking survey at intervals specified by the Administration, but not exceeding one (1) year, which should be a complete and thorough examination of the SPCraft, equipment, fittings, arrangements and materials and should ensure full compliance with the applicable provisions of the Guidelines. Additional dry-docking(s) may be required at the discretion of the Administration subject to accessibility of underwater components during annual surveys.
 - .4 Annual surveys are to be performed within three months either way of the anniversary date of the previous dry-docking survey or the original certificate date if dry-docking surveys have not yet been performed.
- 2 An inspection, either general or partial, according to the circumstances, should be made whenever an incident / accident occur which affects the safety and certification of the SPCraft, or at the discretion of the Administration whenever reports or complaints are received. The inspection should ensure that the repairs or alterations carried out have been done effectively and are in all respects in full compliance with the applicable provisions of the Guidelines.
- 3 Surveys and inspections should be carried out by officers of the Administration. The Administration may, however, entrust the

surveys to an IACS member Class Society. In every case the Administration concerned should fully guarantee the completeness and efficiency of the surveys.

- 4 After any survey or inspection under this section has been completed no change that affects its safety and certification should be made to the SPCraft without the approval of the Administration except for the purpose of repair or maintenance. The management of submersible passenger craft operations should comply with the International Safety Management (ISM) Code.

5 CERTIFICATES AND DOCUMENTATION

1 Design and Construction Document

- .1 A Design and Construction Document should be issued by the Administration after construction of the SPCraft. The document should list the standards used in the design and construction of the main components, viewports, piping, electrical systems and life support. This document should be attached to the Ship Construction Compliance Certificate.

2 Submersible Passenger Craft Safety Certificate (SPCSC)

The Administration may issue a (SPCSC) after the initial survey of a SPCraft. This certificate may be re-issued after a survey which complies with the requirements of paragraph I/4. In every case, the Administration should assume full responsibility for the Certificate.

- .1 The Certificate should be drawn up in English, in a form corresponding to the model given in appendix 1 of the Guidelines.
- .2 The Certificate would cease to be valid if modifications which affect the safety of the craft have been made without the approval of the Administration, except for the purpose of repair or maintenance, or if surveys and inspections as specified by the Administration under the provisions of paragraph I/4.1 have not been carried out.
- .3 The (SPCSC) should be issued for a period not exceeding one year. An extension of the validity of the Certificate may be granted for a maximum period of three months at the discretion of the Administration.

II DESIGN AND CONSTRUCTION

1 GENERAL

- .1 SPCraft should be designed, constructed and maintained in compliance with the requirements of an IACS member Class Society or with applicable standards recognized by the flag State Administration.

- .2 The basic requirement for the SPCraft design is that, as far as practicable, in the event of any single failure the craft can return to the surface without external assistance. Appropriate backup systems and equipment should be incorporated to meet this general design requirement. The craft should be able to attain positive buoyancy at any time.
- .3 SPCraft should operate only in waters with a sea-bed depth not greater than the craft's rated depth. The Administration, however, may consider operation in areas with a greater sea-bed depth on the basis of safety evaluations demonstrating the adequacy of provisions and/or procedures.
- .4 Adequate measures should be taken to prevent passengers from interfering with the operation of the SPCraft.
- .5 The SPCraft should be designed for and be capable of operating in the environmental conditions and temperature ranges envisaged both while on the surface and under water.
- .6 The arrangement of occupied spaces should provide for easy evacuation.

2 PRESSURE BOUNDARY

- .1 Pressure hull structural requirements

All materials used in the pressure hull, all welding materials and procedures, the design criteria, permissible stresses and all test procedures should comply with the requirements of a recognized organization to the satisfaction of the Administration.
- .2 Hatches
 - .1 The number and location of access hatches should be subject to special consideration of the Administration, bearing in mind the length of the SPCraft, the length of the pressure hull, the number of passengers, the conditions of operation and rescue facilities.
 - .2 The following should be taken into account when determining the number, size and location of access hatches:
 - .1 access hatches have an essentially important function when passengers and crew must be evacuated in an emergency situation;
 - .2 hatches should be arranged with consideration given to all relevant risks such as fire, smoke, hydrostatic stability of the craft after passenger movement, possible down flooding due to adverse sea state, etc.; and,
 - .3 the number of hatches should not be unnecessarily increased beyond the safe minimum.

- .3 Two means, one of which should be visual, should be available to ensure that hatches are closed and secured prior to diving.
 - .4 Means should be available to ensure that hatches are clear of water before opening, and that pressures on either side of the hatch are equalized. Hatches should be outward opening.
 - .5 The means for opening and closing of hatches should permit operation by a single person in all anticipated conditions.
 - .6 Provisions should be made for opening/closing hatches from both sides.
 - .7 Hatches should have means for securing them in the open and closed position.
- .3 Viewports
- Viewports should be of acrylic material and in accordance with the requirements of an IACS member Class Society recognized organization to the satisfaction of the Administration. Viewports may be of other material, as appropriate, provided viewports of such material are at least as effective and in accordance with the requirements of an IACS member Class Society to the satisfaction of the Administration.
- .4 Pressure containers
- .1 The material of pressure containers should comply with the standards of an IACS member Class Society to the satisfaction of the Administration
 - .2 Gas containers should have reliable protection against mechanical damage. They should be securely stowed. The volume of a single internal source should be limited in such a way that complete release of its contents will not increase the pressure beyond the safe limit for the craft and its occupants.
 - .3 Cylinders and pressure vessels mounted externally which may be depleted while at depth should be designed to withstand external pressures equal to the design depth of the passenger submersible craft.

3 EXTERNAL STRUCTURE

- .1 Exostructure
 - .1 The craft should be provided with an exostructure to prevent damage to the pressure hull and other vital components such as ballast systems. Externally mounted equipment such as thrusters, manipulators, etc. should be designed to minimize risk of entanglement or fouling.

- .2 All parts of the exostructure which are designed for free flooding should be provided with openings in such a way that void spaces are fully flooded and vented.
- .2 Access areas
 - .1 Adequate means, such as guardrails and anti-slip surfaces, should be provided to protect passengers and crew, taking into account all operational conditions likely to be encountered.
 - .2 Safe means of boarding passengers should be provided, taking into account the relative heights of the SPCraft and the boarding area, wave effects, protection of the craft appurtenances and the hull of the transfer vessel, where applicable.

4 SYSTEMS

Systems should be designed, installed and tested in accordance with the requirements of an IACS member Class Society to the satisfaction of the Administration.

- .1 Penetrations
 - .1 Piping

Any piping system penetrating the pressure hull should be equipped with a manual shut-off valve mounted directly on the inner side of the hull. Where this is not practicable, short and strong stub pieces capable of withstanding anticipated mechanical and pressure loads may be fitted between the valve and hull.
 - .2 Electrical penetrations through pressure boundaries
 - .1 Penetrating devices conveying electricity through pressure boundaries should be designed, manufactured and tested to standards acceptable to the Administration. The penetrating devices should be capable of maintaining the watertight integrity of the hull if the cable is cut.
 - .2 Electrical conductors within the penetrating device should be of solid material.
 - .3 The positive and negative conductors from a power source are not to pass through the same penetrating device unless:
 - .1 it can be shown that there is little risk of short circuiting or 'tracking' between conductors; and,
 - .2 the voltages and currents are of such an order that, in the event of failure in any way of the conductor insulation, the integrity of the penetrating device's water block is maintained.

- .4 Electrical penetrating devices should not have any pipes or other system passing through them. This would not preclude having different types of penetrating devices passing through a common plate.
- .2 Mechanical systems
- .1 Piping
 - .1 Systems, fittings and equipment subject to internal or external pressures or a combination of both should be suitable for this purpose. All piping which may be exposed to the sea pressure should be able to withstand the design depth of the hull.
 - .2 Means should be provided for valves or cocks to indicate open and closed positions. When such an arrangement is not practicable an equivalent method/procedure may be accepted.
 - .3 Piping passing through spaces inaccessible for maintenance should consist of continuous length pipe.
 - .4 Piping which may be susceptible to mechanical damage should be adequately protected.
 - .5 For piping systems penetrating the occupied pressure hull and open to the sea pressure a non-return valve or shut-off valve should be provided in addition to that provided in accordance with above paragraphs.
 - .6 Taper cocks should not be used.
 - .2 Hydraulic systems

To protect the hydraulic system from over pressurization, a closed circuit safety valve should be fitted to the pressure line. The liquid discharged through safety valves should be returned into the system.
 - .3 Electrical systems

All power sources and electrical equipment should be designed for the environment in which they will operate to minimize the risk of fire, explosion, electrical shock and emission of toxic gases to personnel and passengers, and galvanic action of the SPCraft.

 - .1 Power
 - .1 Each SPCraft should have a separate main and an onboard emergency source of electrical power.
 - .2 If the main source of electrical power is from an external support facility, the capacity of that source is to be adequate for its intended usage
 - .3 The main source of electrical power should have a reserve capacity beyond the normal mission time

to supply, where and as appropriate, the following systems for a period of time consistent with the emergency rescue plan but in no case less than 24 hrs:

- .1 emergency lighting;
 - .2 communication equipment;
 - .3 life-support systems;
 - .4 environmental monitoring equipment;
 - .5 essential control systems; and,
 - .6 other equipment necessary to sustain life.
- .4 The onboard emergency source of electrical power should have the capacity to supply the systems listed in the above paragraph (.1, .2, .4, .5 and .6) plus the emergency life support system, if electrically supplied, for 1.5 times the time required for emergency ascent or 1 h, whichever is greater, unless approved otherwise by the Administration on the basis of special operating conditions.
- .5 The SPCraft should be fitted with emergency lighting which is switched on automatically in the event of failure of the main power supply.
- .6 The emergency source of electrical power should be located so as to ensure its functioning in the event of fire or other casualty causing failure to the main electrical power source.

.2 Electrical arrangements

- .1 Power cables should be provided with short circuit and overload protection. The device fitted to power cables passing through a pressure boundary should have response characteristics which will ensure watertight integrity of the electrical penetrators. Protection devices located in the battery compartment should not, under any circumstances, provide an ignition source for the hydrogen gas.
- .2 Adequate precautions should be taken to eliminate all potential sources of ignition within battery compartments. The use of a rigid interconnecting links between batteries should be avoided.
- .3 Electrical equipment should be suitable and safe for its intended use. Consideration should be given to pressure and pressure cycling, humidity, moisture, temperature, oxygen concentration,

cable combustibility and water absorption characteristics.

- .4 Arrangements and procedures should be in place to avoid the potential hazards arising from hydrogen accumulation. Hydrogen gas concentrations within the pressure boundary should be monitored and maintained at a level below the lower explosive limit in order to allow the craft time to take corrective action.

.4 Life support

- .1 The SPCraft should be provided with systems and equipment necessary to ensure adequate life support during normal and emergency conditions.
- .2 A separate main and an on-board emergency life-support system should be provided for maintaining the oxygen content of the breathing gas between 18% and 23% percent by volume and the concentration of CO₂ below 0.5% by volume under normal conditions and 1% percent under emergency conditions.
- .3 The capacity of the main life-support system should be sufficient for the design mission time plus a period of time consistent with the emergency rescue plan, but in no case less than 24 hrs. The capacity of the onboard emergency life support system is to be sufficient for 150% of the time normally required to reach the surface or 1 hr, whichever is greater.

The duration for the emergency system may be reduced based on special operating conditions.
- .4 For the purpose of calculating the required capacities of main and emergency life-support systems, the consumption of oxygen should be assumed to be 28.3 liters per hour per person and a CO₂ production rate of 0.0523 kg per hour per person. Additional medical O₂ of at least 5 lbs or suitable for 2-3 hrs continuous use per portable container shall be available on board.
- .5 Where oxygen containers are located inside the pressure hull, the volume of a single container should be limited such that the complete release of its contents will not increase the pressure by more than 1atmosphere nor raise the oxygen level above 25% by volume. The allowable pressure increase may be further limited by design and safety considerations.
- .6 When the pressure containers for oxygen are stored outside the pressure hull, they are to be arranged in at least two banks with separate penetrations entering the craft. The pressure containers are to be designed for an

external pressure differential not less than the rated pressure of the passenger submersible craft.

- .7 In view of the hazards associated with oxygen systems, special consideration should be given to the selection of materials, equipment, installation, cleaning and testing procedures. Ball valves should not be used in oxygen systems.
 - .8 The Master or a crew member should be able to monitor O₂ and CO₂ concentrations, humidity, temperature and pressure of occupied spaces.
 - .9 Means should be provided and/or operational procedures implemented to notify of a malfunction of the life-support systems.
 - .10 Consideration should be given to the possible need for thermal protection, sanitary facilities, food and water, consistent with the mission time and the emergency rescue plan.
- .5 Fire protection
- .1 The general construction of the SPCraft should be such as to minimize hazards of smoke and fire. All materials and equipment within the craft should be non-combustible within the range of O₂ levels envisaged. Toxicity of burning materials and low flame-spread characteristics should be taken into account.
 - .2 The SPCraft may be fitted with fire/smoke detectors to alert the crew as may be required by the Administration. Consideration should be given to the size of the SPCraft, usage of unoccupied spaces and the ability of occupants to detect fire/smoke in advance of an on-board detector.
 - .3 The SPCraft should be fitted with a suitable means of fire extinguishing. This may consist of a permanently installed system and/or portable extinguishers. The design of the system and selection of the extinguishing medium should consider type and location of fire anticipated, hazards to human health and the effects of increased pressure. Carbon dioxide and seawater are generally considered to be unsuitable.
- .6 Navigation
- .1 The SPCraft, when engaged in surface navigation, should be provided with means and/or procedures to enable the craft to be navigated safely. Autonomous craft should be provided with such visibility on the surface as will enable the craft to be navigated safely.

- .2 Provisions are to be made for the Captain to assess the situation in the area in which the craft is intended to surface.
 - .3 Means are to be provided to render the SPCraft, while on the surface, readily visible to other vessels.
 - .4 SPCraft should be provided with navigational equipment to enable safe operations under all design conditions. Equipment may include, but not be limited to, directional indicator, depth indicator, depth sounder, clock, trim and heel indicator, underwater location device, speed and distance device and Sonar. Navigational equipment should be located in the Master's work area.
 - .5 SPCraft equipped with propulsion systems should be provided with adequate controls and indicators to enable safe operation under all design conditions.
 - .6 Where a releasable location system is used, the release arrangement may be manual or hand-hydraulic. It should not depend on electrical power for its operation and should be able to operate at all anticipated angles of heel and trim. The size of the float and length of line should be such that expected currents acting on the line do not prevent the float from coming to the surface.
 - .7 SPCraft should have two independent instruments for registration of its depth. At least one of these instruments is to be a pressure gauge capable of functioning also in an emergency situation. If both are pressure gauges, they should not have a common inlet. SPCraft operating in areas where the sea-bed depth is greater than the rated depth should have a depth alarm set at no greater than the rated depth of the craft.
- .7 Communications
- .1 SPCraft should be provided with such equipment as is necessary for the craft to communicate with the support facility when on the surface and when submerged.
 - .2 Surface communications

SPCraft should be equipped with at least one two-channel transmitter / receiver, one of the channels of which must operate on safety channel 16-VHF, while the other is used as a "working channel" for communication between the SPCraft and its support facility.
 - .3 Underwater communications

SPCraft should be equipped with at least one single channel side-band under water telephone system. Such system should as a minimum requirement enables communication to be maintained with the support facility

when it is at a distance equivalent to twice the nominal depth of the SPCraft.

- .4 Provisions should be made for easy and reliable communication between the crew members and to passengers.
- .5 Where SPCraft have more than one compartment, intercommunication should be provided.
- .6 SPCraft should be fitted with a radar transponder if they are not clearly visible on a radar screen.
- .7 SPCraft should be fitted with an emergency acoustic pinger compatible with surface support facilities or with sonar reflector. Buoys may be additionally provided. These means should remain operational in the event of loss of main power.
- .8 Control and instrumentation
 - .1 The arrangements for blowing ballast tanks should be such that damage to the tanks due to over pressurization is not possible.
 - .2 Adequate indications should be available to the Master to enable effective monitoring of conditions affecting the safety of the SPCraft and its occupants. The equipment provided should be consistent with the design operating and emergency conditions and procedures. Indications should be provided for at least the following:
 - .1 water leakage into the main pressure hull, battery pods and other compartments as may be deemed necessary;
 - .2 indications of available power (fuel, electrical, etc.);
 - .3 amount of ballast water;
 - .4 ground/earth fault monitoring; and
 - .5 voltage of, and current from, each electrical source of power.

5 LIFE-SAVING APPLIANCES

- .1 Lifejackets should be provided for, and accessible to, each person on the SPCraft. Inflatable type lifejackets should be considered to facilitate disembarkation.
- .2 Lifebuoys or equivalent should be available during embarkation and disembarkation of passengers or whenever personnel are on deck.
- .3 SPCraft should be provided with a first aid kit.

6 BUOYANCY, STABILITY AND EMERGENCY ASCENT

- .1 SPCraft should be able to ascend/descend in a safe and controlled manner throughout the craft's rated depth of operations to the satisfaction of the Administration.
- .2 SPCraft should be able to maintain an acceptable stability and trim during ascent, descent, while submerged and on the surface.
- .3 SPCraft should be capable of remaining on the surface with the hatches open during all normal design environmental and operating conditions without downflooding.
- .4 Two independent means, one of which is to be operated with no electric power, should be provided to bring the unit to the surface in a stable and upright condition.
- .5 In addition to the means provided in accordance with the above paragraph, SPCraft should be provided for emergency surfacing with means to jettison sufficient mass so that if the largest single floodable volume, other than personnel compartments, is flooded, the ascent rate will be equal to the normal ascent rate.

The jettisoned mass may consist of a drop weight, appendages subject to entanglement or a combination of both.

Alternatively, the passenger compartment may be provided with a means of separating it from all other parts of the system, including appendages, provided the personnel compartment is positively buoyant when released.
- .6 The possibility of entanglement should be considered in the design of the SPCraft. Design features, operational and emergency procedures and/or means of jettisoning may be necessary.
- .7 In accordance with the emergency procedures, it may be necessary to provide means to jettison lifting cables and umbilicals.
- .8 Jettisoning systems, where provided, should require at least two positive manual actions and should be independent of electric power.
- .9 SPCraft should have adequate stability under any possible combination of dropped jettisoned masses to provide for the safe recovery of passengers in accordance with the **emergency response plan**.
- .10 SPCraft should be provided with means of externally bringing the craft to the surface.

III SUBMERSIBLE PASSENGER CRAFT OPERATION

1 GENERAL

- .1 Apart from safety issues associated with system design and operation, there is also a variety of issues dealing with the qualification of personnel, the management of passengers and contingency planning for dealing with emergencies.
- .2 The selection of unreliable or unqualified personnel, inadequate training or inadequate licensing procedures could adversely affect the safe operation of the SPCraft. The safety of passengers and crew as well as the protection of property involved in SPCraft operations requires careful attention to personnel selection, training program and licensing procedures.
- .3 Individuals serving as Master and assistant Master of the SPCraft will be required to possess the appropriate license.
 - .1 The license must be adequate for a passenger-carrying vessel of similar gross tonnage and trading area pursuant to the requirements of MARINA Circular No. 2012 – 04 and its subsequent amendments.
 - .2 The license must contain an endorsement for the particular submersible or class of submersibles to be operated.
 - .3 To obtain endorsement, an individual will be required to successfully complete a company training program as specified under Sec. III/6 of this ANNEX.
 - .4 Such a program would include, but not be limited to: vessel systems, vessel operations, emergency procedures, embarkation and debarkation of passengers, passenger management, and "hands on" qualification dives.
 - .5 Applicants will be required to pass a specially prepared submersible operations examination module. The submersible operations module is vessel specific, and is prepared by the SPCraft manufacturer and approved by the Administration after review of the vessel's operations and technical manuals.
- .4 At least two licensed individuals should be onboard to ensure the vessel can be safely operated under all conditions. This ensures that at least one other person is capable of taking control of the vessel's navigation should the Master become incapacitated, and also provides another individual for assisting and directing the passengers and required crew in the event of an emergency.

2 CHAIN OF COMMAND

A documented chain of command shall be available and should be well defined for each operation such that each person involved knows the person in-charge, their individual responsibilities and inter-relationships, including the responsibilities of support crew members and other personnel external to the submersible passenger craft. A list of contact numbers in the event of an emergency shall also be made available.

3 OPERATION PREPARATION AND PLANNING

- .1 An **operating manual**, describing normal and emergency operational procedures, should be prepared and be available on board and to others as deemed necessary. This manual should include the following, as applicable:
 - .1 operation check-off lists, including pre and post dive check-off lists;
 - .2 emergency procedures for situations such as power failure, break in umbilical cord, deballasting / jettisoning, loss of communications, life support system malfunction, fire, entanglement, high hydrogen level, high oxygen level, internal and external oxygen leaks, stranded on bottom, minor flooding and specific emergency conditions characteristics of special types of systems;
 - .3 operational mission/ time and depth capabilities;
 - .4 sea state capabilities;
 - .5 geographical dive site limitations;
 - .6 launch and recovery operation procedures;
 - .7 liaison with support vessels;
 - .8 special restrictions based on uniqueness of design and operating conditions; and,
 - .9 manning levels.
- .2 A written **emergency response plan** for each operating SPCraft should be prepared and be available on board and to others as deemed necessary.
- .3 Emergency drills should be performed on a regular basis. These drills should clearly demonstrate the effectiveness of the procedures. Each drill shall be recorded in an Emergency drill logbook.
- .4 A **maintenance manual** containing procedures for periodic inspections and preventative maintenance techniques should be readily available for inspection. The manual is to include the expected service life of the pressure hull and of other vital components/equipment (e.g. viewports, batteries, etc.) along with particular instructions for the maintenance of items requiring

special attention. The manual, together with operational and maintenance records should be readily available at the operation site.

- .5 Procedures for normal and emergency operations and essential drawings should be carried on board the unit.

4 SUBMERSIBLE PASSENGER CRAFT MASTER

The Master and Assistant Master should be certificated for the SPCraft he is to operate. The certificate should be obtained by successful completion of a training course, completion of a given number of dives while at the controls of the SPCraft and passing of a test.

5 TRAINING

- .1 The Company is responsible for ensuring that personnel (including the Master, Assistant Master, crew and maintenance staff) are at all times adequately trained. Such training should include theoretical, practical and operational aspects of SPCraft and procedures to be adopted in emergency situations. The training should, where applicable, include the following subjects as deemed necessary to suit the particular type of craft.

- .1 Life support

- The properties and effects of carbon dioxide, high and low levels of oxygen, carbon monoxide and other gases which could be present in the craft, gas concentrations, oxygen systems, color coding of gas bottles, methods of carbon dioxide removal and effects of humidity and shelf life on the efficiency of the CO₂ absorbent.

- .2 Buoyancy and stability

- Conditions relating to buoyancy, payload, basic stability and factors affecting stability in both normal and emergency situations.

- .3 Navigation

- The use of surface and sub-surface navigational equipment, effects of currents and tides, seamanship and Collision Regulations.

- .4 Communications

- Surface and sub-surface communication systems, effects of thermal layering on sub-surface communications and the use of standard communication vocabulary.

- .5 Power sources and electrical arrangements

- Batteries and battery charging, explosive hazards and ignition sources, particularly in battery compartments, circuit protection devices, emergency power sources, ground/earth fault detection, fault currents from batteries

and pressure compensating arrangements for batteries exposed to sea pressure.

.6 Emergency planning

Fires and their causes, fire extinguishing systems and their environmental effects, flooding, entanglement, available life support, toxic hazards, loss of communication, loss of power, physical and physiological effects on passengers and crew subject to prolonged periods underwater when subject to sensory, perceptive or thermal deprivation, control of passengers and means to avoid panic, claustrophobia and hypothermia.

.7 Personnel responsibilities

Determination of the allocation of duties, chain of command in normal and emergency situations, familiarization with local, national and international requirements.

.8 Practical and operational training

The operational training of crew members should be under direct supervision of an experienced SPCraft Captain and culminate in practical and operational tests including simulated emergency situations.

.2 The Administration shall review and ensure that the training course's level of proficiency is appropriate; Administration inspector/s may be assigned to participate in or monitor such a course to evaluate its effectiveness. The following instruction schedule may be accepted, however, the Administration's discretion in this regard is not limited:

.1 Classroom Instruction. 40 hours;

.2 Supervised Vessel Operation. 15 hours;

.3 Unsupervised Vessel Operation. 5 hours; and

.4 Route Training. 5 hours.

6 CERTIFICATE OF COMPETENCE

Each SPCraft Master and Assistant Master should be trained to be able to command a submersible in accordance with the Administration approved training program developed by the Craft Manufacturer or an organization duly recognized by a competent authority. The Administration may also develop a suitable training program for this purpose. The training program should enable the Master and Assistant Master to safely operate the SPCraft in all aspects under normal and emergency situations.

The Company, with the approval of the Administration, may opt to use qualified and duly certificated Master of a submersible craft to conduct the required training.

After having passed all the requirements of the Company, each SPCraft Master and Assistant Master should be recommended for the issuance of a Certificate of Competence according to the model given in appendix 2. The Administration may, upon evaluation, issue the Certificate of Competence based on the recommendation of the Company.

7 REPORTING

Information on incidents threatening injury, casualties, damage to the craft or equipment failure should be collected and analyzed by the Company. Measures should be taken to prevent recurrence. Incidents affecting the safety of passengers and/or the passenger submersible craft should be reported to the Administration at the soonest possible time, copy furnished the nearest Philippine Coast Guard (PCG) Unit.