

GUIDELINES

ON SURVEY OF MANNED SUBMERSIBLES AND SHIP'S DIVING SYSTEMS UNDER CONSTRUCTION AND IN SERVICE

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GUIDELINES ON SURVEY OF MANNED SUBMERSIBLES AND SHIP'S DIVING SYSTEMS UNDER CONSTRUCTION AND IN SERVICE

Guidelines on Survey of Manned Submersibles and Ship's Diving Systems under Construction and in Service supplement the Rules for the Classification and Construction of Manned Submersibles and Ship's Diving Systems and replace the Guidelines on Survey of Manned Submersibles and Ship's Diving Systems in Service and the Guidelines on Survey of Manned Submersibles and Ship's Diving Systems during Construction and Manufacture of Products.

These Guidelines have been approved in accordance with the established approval procedure and come into force on 1 July 2022.

Unless otherwise specified in these Guidelines, all applicable requirements of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships are applied to manned submersibles and ship's diving systems as well as supervision procedures and methods provided in the Guidelines on Technical Supervision of Ships in Service during survey of their structures, arrangements, machinery, devices and equipment.

Technical supervision during manufacture of products for manned submersibles and ship's diving systems shall be carried out in accordance with the requirements of Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships except for specific products for the manned submersibles and ship's diving systems, the requirements for which are specified in the relevant chapters of [Section 2](#) of these Guidelines.

From the date of entering into force of these Guidelines, the Guidelines on Survey of Manned Submersibles and Ship's Diving Systems under Construction and in Service, 2018 become null and void.

In case of discrepancies between the Russian and English versions, the Russian version shall prevail.

REVISION HISTORY

(purely editorial amendments are not included in the Revision History)

For this version, there are no amendments to be included in the Revision History.

1 GENERAL

1.1 APPLICATION

Guidelines on Survey of Manned Submersibles and Ship's Diving Systems under Construction and in Operation¹ establish the forms, procedure, methods and scope of technical supervision of Russian Maritime Register of Shipping² during construction and operation of manned submersibles and ship's diving systems with the purpose of their classification and monitoring for compliance with the Rules for the Classification and Construction of Manned Submersibles and Ship's Diving Systems³, as well as providing operational safety based on specific features of these items.

The Register also performs technical supervision during manufacture, installation, testing of materials and products and during construction and operation of the manned submersibles and ship's diving systems in accordance with the nomenclature and in the scope of measures as specified in Appendices 1 and 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

These Guidelines establish the procedure for technical supervision during reconstruction, repair and conversion of the manned submersibles and ship's diving systems in operation.

Technical supervision of structural members and outfit of the manned submersibles and ship's diving systems not covered by these Appendices shall be supervised by the relevant competent authorities.

¹ Hereinafter referred to as "the Guidelines".

² Hereinafter referred to as "the Register, RS".

³ Hereinafter referred to as "the Rules for Manned Submersibles and Ship's Diving Systems".

1.2 TERMS AND DEFINITIONS

1.2.1 The terms, definitions and explanations provided in the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships¹ and the Guidelines on Technical Supervision of Ships under Construction² have been adopted in these Guidelines. Definitions and explanations related to the specific features of the manned submersibles and ship's diving systems are specified in [Section 1](#) "Terms and Definitions" of the General Regulations for the Classification and Other Activity Relating to Manned Submersibles and Ship's Diving Systems of the Rules for Manned Submersibles and Ship's Diving Systems. Definitions and explanations related to the procedure for technical supervision during construction of the manned submersibles and ship's diving systems and manufacture of products for them are specified in Section 1, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision.

1.2.2 Where the definitions and explanations of the Rules for Technical Supervision are applied to the manned submersibles and ship's diving systems, the term "ship" shall also mean the manned submersible and ship's diving system.

1.2.3 The firm (manufacturer) is meant the firm (manufacturer) of the manned submersibles and ship's diving systems, and products for them.

¹ Hereinafter referred to as "the Rules for Technical Supervision".

² Hereinafter referred to as "the Guidelines on Technical Supervision".

2 SURVEY OF THE MANNED SUBMERSIBLES AND SHIP'S DIVING SYSTEMS UNDER CONSTRUCTION AND PRODUCTS DURING MANUFACTURE

2.1 GENERAL

2.1.1 The requirements of this Section are additional to the requirements of Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision and applicable for survey of the manned submersibles and ship's diving systems under construction and during manufacture of products and materials for them.

2.1.2 Requirements of this Section are applied for technical supervision during manufacture of products, installation and testing of specific hull structures, arrangements, machinery, equipment and outfit for manned submersibles and ship's diving systems.

2.1.3 Technical supervision during manufacture of products for manned submersibles and ship's diving systems shall be performed in accordance with the requirements of Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision except for specific products for the manned submersibles and ship's diving systems, the requirements for which are specified in the relevant chapters of the Rules for Manned Submersibles and Ship's Diving Systems and these Guidelines.

2.1.4 Prior to technical supervision, the firm (manufacturer) submits RS-approved technical documentation to the RS Branch Office in a scope as required by the Rules for Manned Submersibles and Ship's Diving Systems.

Simultaneously, the list of items of technical supervision drawn up by the firm (manufacturer) in accordance with the requirements of Section 13, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision shall be submitted to the RS Branch Office for approval. When manufacture of manned submersibles and ship's diving systems is completed, they shall be tested in accordance with the RS-approved program.

2.1.5 Due to specific nature of manned submersibles and ship's diving systems, separate products of which may be operationally tested only when manned submersible and ship's diving system are under water, some tests are performed by test team without presence of the RS surveyor.

2.1.6 Test team shall be appointed by the order of the master of the manned submersible and ship's diving system support ship and may include specialists both of the shipowner and other organizations and firms.

A copy of this order shall be submitted to the RS Branch Office responsible for technical supervision during construction of manned submersibles and ship's diving systems.

2.1.7 The RS-approved test program shall include a specific list of items of manned submersibles (ship's diving systems) that shall be operationally tested by test team.

2.1.8 The results of operational testing of items of the manned submersibles (ship's diving systems) performed by test team shall be documented by test reports. Copies of these reports shall be submitted to the RS surveyor performing technical supervision and attached to the survey reports drawn up by the Register.

2.1.9 The list of items of the manned submersibles and ship's diving systems operationally tested by test team is specified in [Appendix](#) to this Part.

**2.2 TECHNICAL SUPERVISION DURING MANUFACTURE OF MATERIALS
AND PRODUCTS AND DURING CONSTRUCTION OF MANNED SUBMERSIBLES
AND SHIP'S DIVING SYSTEMS**

2.2.1 Hull.

2.2.1.1 General

The requirements of this Section are additional to the requirements of Section 2, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 2 of the Guidelines on Technical Supervision with respect to procedure and methods of the RS technical supervision during manufacture of the hull structures specific for manned submersibles and ship's diving systems and construction of their hulls.

2.2.1.2 Materials

Materials used for manufacture of hull structures for the manned submersibles and ship's diving systems shall comply with the requirements of Part II "Hull" of the Rules for Manned Submersibles and Ship's Diving Systems and applicable provisions of Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships.

2.2.1.3 Surveys.

2.2.1.3.1 Types of checks, tests and inspections during the RS technical supervision during manufacture of specific hull structures for manned submersibles and ship's diving systems and during manufacture of hulls are specified in [Table 2.2.1.2](#).

Table 2.2.1.2

Item of technical supervision	Types of checks, tests and inspections																						
	During manufacture of structures								During manufacture of hulls for the manned submersibles and ship's diving systems														
	Verification of technical documentation	Control of material		Visual examination	Measurements control	Flaw detection for welds	Strength test	Branding	Verification of technical documentation	Material test		Visual examination	Measurements control	Flaw detection for welds	Strength test	Tightness test	Mooring trials of manned submersibles	Bench test of ship's diving systems	Sea trials of manned submersibles	Testing of ship's diving systems under operating conditions	Branding ¹		
		Markings branding	RS Certificates							Marking, branding	RS Certificates										Manned submersibles	Diving bells	Compression chambers
Pressure hull (spherical, conical and cylindrical shells, framing members, end bulkheads, heads)	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Pressure tanks	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	-	+	-	-	-	-	-
Tight enclosures of exterior electrical equipment of diving bells and manned submersibles:	+	+	+	+	+	+	+	-	+	+	+	+	+	-	+	+	+	+	+	-	-	-	-
Power sources, switchboards, etc.	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-
Parts fitted on the pressure hull (welded-in pieces and flanges of hatches, view ports, tight penetrators)	+	+	+	+	+	+	-	-	+	+	+	+	+	-	-	+	+	+	+	-	-	-	-
Foundations for main equipment	+	+	+	+	+	+	-	-	+	+	+	+	+	-	-	+	+	+	+	-	-	-	-
External hull	-	-	-	-	-	-	-	-	+	+	+	+	+	-	-	+	-	+	-	-	-	-	-
Ballast tanks	+	+	+	+	+	+	-	-	+	+	+	+	+	-	+	+	-	+	-	-	-	-	-
Buoyancy units	+	+	-	+	+	+	-	-	+	+	-	+	+	-	-	+	-	+	-	-	-	-	-

¹ It is branding of hulls of manned submersibles, diving bells, hyperbaric evacuation systems and compression chambers is meant.

2.2.1.3.2 Types of technical supervision for structures specified in [Table 2.2.1.2](#) are provided in Nomenclature of Manned Submersibles and Ship's Diving Systems (refer to Appendix 1, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems).

2.2.1.3.3 When surveying the items of technical supervision specified in [Table 2.2.1.2](#), the surveyor shall follow the applicable provisions of Section 2 of the Guidelines on Technical Supervision with regard to the following:

.1 set of the RS-approved technical documentation according to Section 5, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems related to the item of technical supervision surveyed shall be submitted to the RS surveyor;

.2 scope and quality assessment criteria of welds in pressure hulls, tight external hull structures, external hull, ballast tanks, etc. for the manned submersibles and ship's diving systems structures during non-destructive testing (NDT) shall comply with the RS-approved design and normative documents.

2.2.1.4 Documentation.

When carrying out technical supervision of items specified in [Table 2.2.1.2](#), the surveyor shall follow technical documentation according to Section 5, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems with regard to applicable provisions of Part II "Technical Documentation" of the Rules for Technical Supervision and in Section 2 of the Guidelines on Technical Supervision.

2.2.1.5 Manufacture of hull structures and hulls of the manned submersibles and ship's diving systems.

2.2.1.5.1 Manufacture of separate structural elements and units, flat plate panels, framing girders, shell plates and heads forming the hull structures of the items specified in [Table 2.2.1.2](#) shall be subject to technical supervision by the Register;

2.2.1.5.2 When carrying out technical supervision during manufacture of elements of welded structures and assemblies of the manned submersibles, diving bells and compression chamber, the RS surveyor shall follow the provisions specified Section 2 of the Guidelines on Technical Supervision, as far as practically applicable to the specified items of the manned submersibles and ship's diving systems, with regard to the following:

.1 manufacture accuracy of pressure hull shell shapes shall comply with the requirements specified in 3.8, Part II "Hull" of the Rules for Manned Submersibles and Ship's Diving Systems;

.2 deviations in the places of opening reinforcements location shall be measured in accordance with 3.8.3, Part II "Hull" of the Rules for Manned Submersibles and Ship's Diving Systems;

.3 flanging of heads depending on the flange wall thickness shall be at least as follows:

Wall thickness of flanged element S , in mm	Flanging, in mm
<5.....	15
5 to 10.....	$2S+5$
10 to 20.....	$S+15$
>20	$S/2+25$

2.2.1.5.3 Where hulls of the manned submersibles, ship's diving systems and compression chambers are assembled from manually welded shells and heads, longitudinal welds of the shells shall not coincide with the chord welds of the heads. In such case, the welds shall be displaced in relation to each other equal to the double thickness of the thicker element but at least 100 mm.

2.2.1.5.4 Spherical heads formed by flaring and affected weld zones of pressure hulls shall be subject to 100 % non-destructive testing (NDT) for microcracks or other surface defects (rolled-in scale, delaminations).

2.2.1.6 Strength and tightness tests.

2.2.1.6.1 The procedure for strength testing of hull structures of the manned submersibles and ship's diving systems and test pressures shall comply with the requirements of Section 4, Part II "Hull" of the Rules for Manned Submersibles and Ship's Diving Systems.

2.2.1.6.2 The item subject to strength testing shall be fully manufactured, with fitted weld-in and welded-on outfitting components, but prior to insulating, painting and installation of internal equipment.

Where the tested item is provided with viewports, hatches, seals, cable penetrators and other similar arrangements, these arrangements shall be tested together with the item shell.

2.2.1.6.3 Technical supervision of strength tests conducted by the surveyor shall be carried out in accordance with provisions of 9.7.1, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision.

2.2.1.6.4 The items subject to tightness tests shall be fully manufactured and equipped.

2.2.1.6.5 Tubular rails for the manned submersibles and ship's diving systems shall be subject to tightness tests when the volumes of these structures are taken into account in buoyancy calculation.

2.2.1.6.6 Technical supervision of tightness tests conducted by the surveyor shall be carried out in accordance with provisions of Appendix 1, Part II "Hull" of the Rules for the Classification and Construction of Sea-Going Ships.

2.2.1.7 Buoyancy, stability and unsinkability.

2.2.1.7.1 When carrying out buoyancy survey, the surveyor shall make sure that the fully equipped manned submersible and ship's diving system are weighed in air and in submerged position according to Instructions for reballasting (refer to Appendix 1, Part IV "Buoyancy, Stability and Unsinkability" of the Rules for Manned Submersibles and Ship's Diving Systems) and the emergency buoyancy reserve is determined according to the RS-approved technical documentation.

2.2.1.7.2 The stability shall be experimentally determined in the presence of the surveyor according to Instructions for experimental determination of manned submersible stability (refer to Appendix 2, Part IV "Buoyancy, Stability and Unsinkability" of the Rules for Manned Submersibles and Ship's Diving Systems). Stability Booklet of the manned submersible shall be submitted to the surveyor for review and approval.

2.2.2 **Equipment, arrangements and outfit.**

2.2.2.1 General.

The requirements of this Chapter are additional to the requirements of Section 3, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 3 of the Guidelines on Technical Supervision with regard to the procedure and methods of the RS technical supervision during manufacture, installation and testing of specific arrangements for the manned submersibles and ship's diving systems.

2.2.2.2 Materials.

Materials used for manufacture of products shall comply with the requirements of Part III "Equipment, Arrangements and Outfit" of the Rules for Manned Submersibles and Ship's Diving Systems and Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships.

2.2.2.3 Survey.

2.2.2.3.1 Types of checks, tests and inspections during the RS technical supervision during manufacture, installation and testing of specific arrangements for the manned submersibles and ship's diving systems are specified in [Table 2.2.2.2](#).

Types of technical supervision for arrangements and their components specified in [Table 2.2.2.2](#) are provided in Nomenclature of Manned Submersibles and Ship's Diving Systems (refer to Appendix 1, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems).

2.2.2.3.2 When carrying out survey of the items of technical supervision specified in [Table 2.2.2.2](#), the surveyor shall follow the applicable provisions of Section 3, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 3 of the Guidelines on Technical Supervision with regard to the following:

.1 set of the RS-approved technical documentation according to Section 5, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems related to the item of technical supervision surveyed shall be submitted to the surveyor;

.2 scope and assessment criteria during non-destructive testing (NDT) of arrangements and components welds of the manned submersibles and ship's diving systems shall comply with the RS-approved design and normative documents;

.3 strength and tightness tests of closing devices shall be performed together with hull tests for the manned submersibles and ship's diving systems ([refer to 2.2.1.6](#));

.4 tightness tests of pressure hull penetrators for pivots of emergency release devices for jettisonable ballast, penetrators for rods of emergency quick-release gears, and penetrators for steering tie-rods, shall be performed during the similar hull test of the manned submersibles and ship's diving systems ([refer to 2.2.1.6.4](#)).

2.2.2.4 Documentation.

When carrying out technical supervision of items specified in [Table 2.2.2.2](#), the surveyor shall follow technical documentation according to Section 5, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems with regard to applicable provisions of Part II "Technical Documentation" of the Rules for Technical Supervision and in 3.3, Part IV "Technical Supervision during Manufacture of Products" and Section 3 of the Guidelines on Technical Supervision.

2.2.2.5 Special features of surveying arrangements specific for the manned submersibles and ship's diving systems.

When carrying out technical supervision during manufacture, installation of arrangements specific for the manned submersibles and ship's diving systems, the following shall be checked:

2.2.2.5.1 Arrangements and closing devices in the pressure hull:

.1 devices on hatch covers of compression chambers, diving bells, compartments of lock-out submersibles, which provide for easy and smooth opening and closing by an effort not exceeding 118 N if there is no pressure difference between the inner and outer sides of the cover (operational test). For external covers of the manned submersibles, the opening and closing effort shall not exceed 245 N;

.2 securing devices on access hatch covers of the manned submersibles and ship's diving systems, which make it possible to operate the covers from both sides (operational test);

.3 cover clamping devices for initial sealing (operational test) and possibility to release them from the adjacent compartment;

.4 safety devices preventing hatch covers from opening until the pressures from both sides of the cover are equalized (operational test);

.5 air lock safety device, which prevents simultaneous opening of the inner and outer covers and opening of the outer cover until the pressure in the air lock becomes equal to the atmospheric one (operational test);

.6 arrangements for efficient holding of hatch covers in the end open position to pressure bulkheads of the manned submersibles and ship's diving systems (operational test);

.7 absence of internal or external one-side locking means on hatch covers having an arrangement for opening from both sides;

.8 marking indicating the direction of covers actuator rotation when opening and closing the covers;

.9 efficient protection of seals of hatch covers, air locks, and support flanges against cutting or pressing out at maximum pressure at the test diving depth or swelling out under high temperature (when exposed to sunlight);

.10 efficient sealing of viewport glasses in the viewport frames, rigidity of the glasses, and no possibility of glass skewing at the test diving depth;

.11 proper attachment of metallic equipment to the hulls of the manned submersibles and ship's diving systems or a specific protection to prevent sparking, as well as compliance of materials used in hinges of hatch covers, doors and air locks to prevent sparking;

.12 absence of defects in viewport glasses exceeding the permissible limits specified in the appropriate glass manufacturer's operating instructions;

.13 viewport glass external protection against mechanical damages;

.14 strong and tight protective covers of diving bell view ports to be closed from the inside in case of the viewport damage (tightness between the covers and coamings is checked by chalk testing).

2.2.2.5.2 Emergency release devices for jettisonable ballast and other equipment external to the pressure hull of the manned submersibles and ship's diving systems:

.1 stoppers to prevent spontaneous or accidental operation of the release device actuators;

.2 marking to indicate the direction of rotation or movement of the release device actuator;

.3 manual actuator (operational test) at effort not exceeding 118 N;

.4 specific protection to prevent ingress of helium inside the actuator when hydraulic or pneumatic control system is used;

.5 required amount and correct positioning of emergency ballast;

.6 actuation of gears to detach the emergency ballast from pivots (operational test);

.7 actuation of gate valve for jettisoning the loose ballast of manned submersibles (operational test);

.8 arrangements preventing accidental loss of ballast (operational test);

.9 sealed covers (or other safety arrangements) provided on controls of electromagnetic or pyrotechnic actuators.

2.2.2.5.3 Emergency release devices of the support wire rope and umbilical on the diving bell:

.1 actuation of the emergency release device of the support wire rope and umbilical (operational test);

.2 actuation of blades of cutting devices (operational test);

.3 pressure in the hydraulic system to cut the umbilical;

.4 compliance with the requirements of [2.2.2.5.2](#).

2.2.2.5.4 Emergency quick-release gears:

.1 actuation of the device to rotate the pivot and disconnect the base of the support wire rope (operational test);

.2 compliance with the requirements of [2.2.2.5.2](#).

2.2.2.5.5 Mating devices for connection of lock-out submersibles (ship's diving systems) with compression chambers and compression chambers to one another:

.1 mating devices of the compression chambers (operational test);

In such case, uniform compression of the sealing arrangements around the entire flange circumference when connected to the lock-out submersible (ship's diving system), tight and efficient connection of the lock-out submersible (ship's diving system) to the compression chambers and the compression chambers to one another, actuation of interlocking devices at connection and disconnection shall be checked;

.2 pressure to fully seal the connection;

.3 power mating device and spare power mating device (operational test).

2.2.2.5.6 Emergency signal means:

- .1 proper attachment of the emergency signal means to the hulls of manned submersibles and ship's diving systems;
- .2 actuation of the release arrangement for the emergency signal means and its ascending to the surface (operational test) both under normal conditions and at the limiting heel and trim angles, which are likely to occur in operation of manned submersibles, passenger submersibles and diving bells. The extent of tests is determined as agreed upon with the Register;
- .3 length and correct winding of the wire rope on the drum and attachment of the arrangement to the wire rope;
- .4 compliance with the requirements of [2.2.2.5.2](#).

2.2.2.5.7 Lifting lugs and lifting gear of manned submersibles, passenger submersibles and ship's diving systems:

efficient attachment of the lugs to the hulls of manned submersibles, passenger submersibles and ship's diving systems.

2.2.2.5.8 Thrusters:

- .1 tightness of compensating diaphragms in assembly;
- .2 complete filling of external submersible motors with sealing fluid;
- .3 alignment between propellers and steering nozzles;
- .4 alignment and synchronous operation of horizontal rudders, stabilizers and diving planes;
- .5 easy shifting of horizontal rudders and diving planes.

2.2.3 **Fire protection.**

2.2.3.1 General

The requirements of this Chapter are additional to the requirements of Section 4, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 4 of the Guidelines on Technical Supervision with respect to procedure and methods of the RS technical supervision during manufacture of products, structures and systems providing fire protection of the manned submersibles and ship's diving systems.

2.2.3.2 Materials.

Materials used for manufacture of structural elements and equipment shall comply with the requirements of Part V "Fire Protection" of the Rules for Manned Submersibles and Ship's Diving Systems and applicable requirements of Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships.

2.2.3.3 Surveys.

2.2.3.3.1 The scope and types of technical supervision of fire protection products and equipment are specified in Section "Fire Protection", Appendix 1 of Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision.

2.2.3.3.2 When carrying out technical supervision of items specified in Table 4.1.2, Section 4 of the Guidelines on Technical Supervision, the surveyor shall additionally check the following:

- .1 proper attachment and protection of all internal metallic equipment of the diving bells, diving compartment of lock-out submersibles and compression chambers against spark formation;
- .2 actuation time of the pressure water-spraying system and its capability of being actuated from both the inside and outside of the compression chamber;
- .3 possibility of removal of combustion products from compression chamber atmosphere and reduction of harmful impurities content to the permissible level;
- .4 availability of self-contained breathing apparatuses capable of functioning for a period of time required for emergency surfacing from the operating diving depth and recovery aboard in compartments of the manned submersibles except for diving compartment (if there is no emergency fixed breathing system); the number of these apparatuses shall correspond to that of crew members of the manned submersible plus spare apparatus;

.5 availability of portable fire extinguishers with extinguishing medium causing no harmful effect in an enclosed space on human health in the diving bell, compartments of compression chambers and manned submersibles;

.6 possibility of operation of fire extinguishers installed in the high pressure compartments under high pressure;

.7 availability of self-contained breathing apparatus capable of functioning not less than 30 min in spaces intended for control, communication and sitting of manned submersibles and ship's diving systems on board the support ship; the number of such self-contained breathing apparatuses shall correspond to the number of operating personnel in the space;

.8 availability of portable fire extinguishers with type and number complying with the requirements specified in item 4.1 "Control Stations", Table 5.1.2, Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships in spaces on board the support ship intended for control, communication and siting of manned submersibles and ship's diving systems, as well as for placement of the manned submersible ancillary gear.

2.2.4 Machinery installations, heat exchangers, pressure vessels, mechanical equipment and systems.

2.2.4.1 General.

2.2.4.1.1 The requirements of the this Chapter apply to machinery installations, engines, propellers, machinery, heat exchangers and pressure vessels, systems, piping and other mechanical equipment of the manned submersibles and ship's diving systems and are additional to the requirements of Sections 5, 6, 7, 8, 9, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 5 of the Guidelines on Technical Supervision with respect to procedure, methods and scope of technical supervision during construction and manufacture of materials and products for manned submersibles and ship's diving systems.

2.2.4.1.2 Types of checks, tests and inspections required during technical supervision during manufacture, installation and testing of specific items of machinery installation, machinery, their systems and pipelines for manned submersibles and ship's diving systems are specified in [Table 2.2.4.1](#).

2.2.4.2 Materials.

Materials used for mechanical equipment shall comply with the requirements of Part VI "Machinery Installations, Mechanical Equipment and Systems" of the Rules for Manned Submersibles and Ship's Diving Systems, as well as with the requirements of Parts VII "Machinery Installations" and IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ships.

2.2.4.3 Surveys.

2.2.4.3.1 Prior to manufacture of products of machinery installations, machinery, their systems and pipelines, their installation on manned submersibles and ship's diving system and testing, the firm (manufacturer) shall submit the approved technical documentation in accordance with Section 5, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems to the RS Branch Office.

2.2.4.3.2 During survey of machinery installation, machinery, systems and pipelines, the following shall be checked in addition to checks for compliance with the relevant parts of the Rules for Technical Supervision and Section 5 of the Guidelines on Technical Supervision:

.1 handling system machinery:

availability of helical grooves at least rope half diameter deep on the winch drum when the rope is wound in one layer, and a rope-coiling trolley on the smooth drum when the rope is wound in several layers;

synchronous operation of handling system machinery;

Table 2.2.4.1

Nos.	Item of technical supervision	Types of checks, tests and inspections										
		At the firm (manufacturer)				During installation on the manned submersibles (ship's diving systems)						
		Visual examination (verification of technical documentation, material checks)	Flaw detection	Hydraulic tests	Bench tests	Verification!				Testing		
						Technical documentation	Documents for products	Marking, branding	Installation	Tightness test	Mooring trials of manned submersibles Bench tests of ship's diving systems at the manufacturer's premises	Sea trials of manned submersibles Testing of ship's diving systems under operating conditions on board the support ship
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Motors and reduction gears	+	-	-	+	+	+	+	+	+	+	+
1.1	Exposed motors	+	-	+	+	+	+	+	+	-	-	-
1.1.1	Motor case	+	+	+	-	-	-	-	-	-	-	-
1.1.2	Compensating diaphragms	+	-	+	-	-	-	-	-	-	-	-
1.1.3	Seals and glands	+	-	+	-	-	-	-	-	-	-	-
2	Exposed reduction gear	+	-	+	+	+	+	+	+	-	-	-
2.1	Reduction gear case	+	+	+	-	-	-	-	-	-	-	-
2.2	Compensating diaphragm	+	-	+	-	-	-	-	-	-	-	-
2.3	Seals and glands	+	-	+	-	-	-	-	-	-	-	-
3	Steering gears	+	-	-	+	+	+	+	+	+	+	+
3.1	Motors of external active means of steering of the manned submersibles	+	-	+	+	+	+	+	+	-	-	-
3.1.1	Motor case	+	+	+	-	-	-	-	-	-	-	-
3.1.2	Compensating diaphragms	+	-	+	-	-	-	-	-	-	-	-
3.1.3	Seals and glands	+	-	+	-	-	-	-	-	-	-	-
3.1.4	Compensating fluid	+	-	-	-	-	-	-	-	-	-	-
4	Handling system machinery	+	-	-	+	+	+	+	+	+	+	+
4.1	Exposed motor	+	-	+	+	+	+	+	+	-	-	-
4.1.1	Motor case	+	+	+	-	-	-	-	-	-	-	-
4.1.2	Compensating diaphragms	+	-	+	-	-	-	-	-	-	-	-
4.1.3	Seals and glands	+	-	+	-	-	-	-	-	-	-	-
4.1.4	Compensating fluid	+	-	-	-	-	-	-	-	-	-	-
5	Machinery Installation systems	+	-	+	-	+	+	+	+	+	+	+
5.1	Hydraulic system	+	-	+	-	+	+	+	+	+	+	+
5.2	Class I and Class II pipeline valves	+	-	+	+	+	-	-	-	-	-	-

Guidelines on Survey of Manned Submersibles and Ship's Diving Systems under Construction and in Service (Section 2)

Nos.	Item of technical supervision	Types of checks, tests and inspections										
		At the firm (manufacturer)				During installation on the manned submersibles (ship's diving systems)						
		Visual examination (verification of technical documentation, material checks)	Flaw detection	Hydraulic tests	Bench tests	Verification!				Testing		
						Technical documentation	Documents for products	Marking, branding	Installation	Tightness test	Mooring trials of manned submersibles Bench tests of ship's diving systems at the manufacturer's premises	Sea trials of manned submersibles Testing of ship's diving systems under operating conditions on board the support ship
3	4	5	6	7	8	9	10	11	12	13		
1	2											
6	Machinery											
6.1	Compressors (air, gas, refrigerant)	+	+	-	+	+	+	+	+	-	+	+
6.1.1	Delivery membranes	+	+	+	-	-	-	-	-	-	-	-
6.1.2	Suction and delivery valves	+	+	-	-	-	-	-	-	-	-	-
6.1.3	Pressure-relief valve	+	+	-	+	-	-	-	-	-	-	-
6.1.4	Booster pumps	+	+	+	+	+	-	-	-	-	-	-
6.1.5	Exposed booster compressor case	+	+	+	-	-	-	-	+	-	-	-
6.2	Pumps and fans of life support systems	-	-	-	-	+	-	-	+	+	+	+
6.2.1	Seals of gas medium fans	-	-	-	-	-	-	-	+	+	+	+
7	Heat exchangers and pressure vessels											
7.1	Air receivers (bottles)	+	+	+	+	+	+	+	+	+	-	+
7.2	Gas bottles	+	+	+	+	+	+	+	+	+	-	+
7.3	Compressors	+	+	+	-	+	+	+	+	+	+	+
7.4	Heat exchangers	+	+	+	-	+	+	+	+	+	+	+
7.5	Safety valves	+	+	+	-	+	+	+	+	+	+	+
7.6	Shut-off valves	+	-	+	-	+	-	-	-	-	-	-
8	Instruments (pressure gauges, depth gauges, etc.)	+	-	-	-	+	-	+	+	-	+	+

.2 machinery installation pipelines:

pipelines shall be strength tested by hydraulic pressure equal to $1,5P_{op}$ prior to installation; protection of flexible connections and hoses against mechanical damages;

.3 compressors (air, gas, refrigerant):

tightness of the exposed booster compressor case shall be tested during manufacture by pressure equal to 1,25 times the maximum operating depth pressure.

2.2.5 Heat exchangers and pressure vessels specific for manned submersibles and ship's diving systems.

2.2.5.1 General.

The requirements of this Chapter apply to heat exchangers and pressure vessels specific to manned submersibles and ship's diving systems and are additional to the requirements of Section 9, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 5 of the Guidelines on Technical Supervision with respect to procedure and methods of technical supervision during manufacture, installation and testing.

2.2.5.2 Materials.

Materials intended for manufacture of heat exchangers and pressure vessels components shall comply with the requirements of 1.4, Part X "Boilers, Heat Exchangers and Pressure Vessels" of the Rules for the Classification and Construction of Sea-Going Ships.

2.2.5.3 Surveys.

2.2.5.3.1 The scope and types of checks, tests and inspections required for the technical supervision during manufacture of products, installation and testing of specific heat exchangers and pressure vessels for manned Submersibles and ship's diving systems are specified in [Table 2.2.4.1](#).

The documents issued by the Register are provided in Nomenclature of Manned Submersibles and Ship's Diving Systems (refer to Appendix 1, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems).

2.2.5.3.2 During survey of heat exchangers and pressure vessels, the following shall be checked in addition to the requirements specified in Section 9, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 5 of the Guidelines on Technical Supervision:

.1 equipment of compression chamber compartments, diving bells and diving compartment of lock-out submersibles with alarms to be actuated when the operating pressure is exceeded, or with safety valves;

.2 painting and marking of bottles according to Table 3.2.5, Part VI "Machinery Installations, Mechanical Equipment and Systems" of the Rules for Manned Submersibles and Ship's Diving Systems;

.3 pressure vessels subject to hydraulic tests by pressure equal to 1,5 times at maximum operating depth pressure;

.4 position of the shut-off valve for the safety valve installed on the compression chamber, manned submersibles and diving bells to be sealed by the surveyor in the "open" position after check;

.5 drainage valve installed external to the diving bell (operational test);

.6 assembled fittings installed on the compression chamber, manned submersibles and diving bells: closed tightness testing by the pressure equal to $1,25P_{op}$ for liquid media and pressure equal to the design one for gas and gas mixtures.

2.2.6 Instrumentation.

2.2.6.1 General.

This Chapter contains requirements for the technical supervision during installation and testing of instrumentation for manned submersibles and ship's diving systems.

2.2.6.2 Surveys.

2.2.6.2.1 The documents issued by the Register are provided in Nomenclature of Manned Submersibles and Ship's Diving Systems (refer to Appendix 1, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems).

2.2.6.2.2 During installation and operational testing of instrumentation for the manned submersibles and ship's diving systems, the following shall be checked in addition to surveys specified in [Table 2.2.4.1](#):

.1 red line indicating the operating pressure and limiting diving depth on the scales of pressure and depth gauges, respectively;

.2 reserve divisions exceeding the rated values of measured quantities on the scales of instruments.

2.2.7 Systems and piping.

2.2.7.1 General.

The requirements of this Chapter are additional to the requirements of Section 8, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 5 of the Guidelines on Technical Supervision and contain the RS requirements for technical supervision during manufacture, installation and testing of specific components of systems and piping for the manned submersibles and ship's diving systems provided in Nomenclature of Items of Manned Submersibles and Ship's Diving Systems (refer to Appendix 1, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems).

2.2.7.2 Materials.

Materials used for manufacture of systems and piping components shall comply with the requirements of Part VII "Systems and Piping" of the Rules for the Classification and Construction of Sea-Going Ships with regard to the requirements of Section 4, Part VI "Machinery Installations, Mechanical Equipment and Systems" of the Rules for Manned Submersibles and Ship's Diving Systems.

2.2.7.3 Surveys.

2.2.7.3.1 Types of checks, tests and inspections required for the RS technical supervision during manufacture of systems and piping components specific for manned submersibles and ship's diving systems are specified in [Table 2.2.7.3.1](#).

2.2.7.3.2 Checks in the course of technical supervision during manufacture of valves and heaters of steam or water heating system at the firm (manufacturer) shall comply with the applicable checks specified in Section 5 of the Guidelines on Technical Supervision.

Table 2.2.7.3.1

Nos.	Item of technical supervision	Testing of materials used	External examination	Testing by test pressure	Inspection of welds	Operational test
1	Class I and II pipeline valves (bottom, side, remote- controlled, automatic)	+	+	+	-	+
2	Flexible hoses and expansion joints	+	+	+	-	+
3	Hoses for supplying gases and water to the diving bell included in umbilical	-	-	-	-	+
4	Heaters of steam or water heating system	+	+	+	+	+
5	Distribution boards for single-component gases and gas mixtures	+	+	+	+	+

The results of hydraulic tests shall be checked regarding the following:

.1 all fittings shall be tested for strength by pressure equal to $1,5P_{op}$ and checked for leakage by pressure equal to $1,25P_{op}$;

.2 prior to installation, the heaters of steam or water heating system shall be subject to strength tests by a test pressure equal to $1,5P_{op}$;

.3 the greater of two pressures acting on specified components shall be taken as the operating pressure for valves and heaters located inside diving bells, compression chamber

and manned submersibles, and the appropriate operating medium pressure shall be taken as the operating pressure for valves external to the compression chamber.

2.2.7.3.3 Checks in the course of technical supervision during manufacture of flexible hoses, expansion joints and pipelines at the firm (manufacturer) shall comply with provisions of 8.5 and 8.7, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision regarding these flexible hoses, expansion joints and pipelines shall be subject to hydraulic strength tests by test pressure equal to $1,5P_{op}$. The operating pressure for the above components shall be taken similarly as for those specified in [2.2.7.3.3](#).

2.2.7.3.4 Types of checks, tests and inspections during the RS technical supervision during installation and testing of specific systems and pipelines for manned submersibles and ship's diving systems are specified in [Table 2.2.7.3.4](#).

Table 2.2.7.3.4

Nos.	Item of technical supervision	Types of checks, tests and inspections										
		During installation on the manned submersibles and ship's diving systems			Installation on board the support ship for the manned submersibles and ship's diving systems			Mooring trials of manned submersibles	Bench tests of ship's diving systems	Sea trials of manned submersibles	Testing of ship's diving systems under operating conditions	
		Verification of technical documentation	Visual examination including check of system components and test dismantling	Tightness testing	Verification of technical document	Visual examination including check of system components and test dismantling	Tightness testing					
1	2	3	4	5	6	7	8	9	10	11	12	
1	Systems of manned submersibles and ship's diving systems											
1.1	Hydraulic system	+	+	+	-	-	-	+	+	+	+	
1.2	Submergence and surfacing system	+	+	+	-	-	-	-	-	+	+	
1.3	Compensating system	+	+	+	-	-	-	-	-	+	+	
1.4	Trim system	+	+	+	-	-	-	-	-	+	+	
2	Life-support systems:											
2.1	breathing gas mixture supply systems;	+	+	+	+	+	+	+	+	+	+	
2.2	breathing gas mixture recovery system;	+	+	+	+	+	+	+	+	+	+	
2.3	gas medium temperature control system;	+	+	+	+	+	+	+	+	+	+	
2.4	pressure equalization systems;	+	+	+	+	+	+	+	+	+	+	
2.5	air and gas mixture regeneration and purifying system;	+	+	+	+	+	+	+	+	+	+	
2.6	metabolite and waste removal system	+	+	+	+	+	+	+	+	+	+	
2.7	ventilation system;	+	+	+	+	+	+	+	+	+	+	
2.8	air conditioning system	+	+	+	+	+	+	+	+	+	+	
2.9	heating system	+	+	+	+	+	+	+	+	+	+	
2.10	diving bell, compression chamber gas medium and diver heating system	+	+	+	+	+	+	+	+	+	+	
2.11	domestic water supply system	+	+	+	+	+	+	+	+	+	+	
2.12	systems of transfer of single-component gases from one bottle to another,	+	+	+	+	+	+	+	+	+	+	
2.13	emergency life-support systems	+	+	+	-	-	-	+	+	+	+	
3	Hydraulic drive systems for arrangements and machinery (handling system, pumps, etc.)	-	-	-	+	+	+	+	+	+	+	

2.2.7.3.5 When carrying out survey of systems and pipelines, the fulfillment of the applicable requirements of Section 5 of the Guidelines on Technical Supervision shall be monitored as well as the following:

- .1 availability of protection of the gas breathing mixture pipelines running in the support ship in areas where they may be mechanically damaged;
- .2 absence of detachable joints of pipelines located in tunnels, pipes or tight casings;
- .3 availability of position indication for shut-off valve in fittings installed on systems of manned submersibles and ship's diving systems;
- .4 availability of protective devices to prevent sticking of objects and people present in the chamber upon pressure drop on air or gas outlets inside the compression chamber;
- .5 compliance of marking of gas mixture pipelines with the requirements of Table 3.1.6, Part VI "Machinery Installations, Equipment and Systems" of the Rules for Manned Submersibles and Ship's Diving Systems;
- .6 availability and operation of interlocking arrangements in the ballast tank blowout system preventing air supply when the vent valves are open and also when the vent valves and sea valves close/open simultaneously;
- .7 automatic closure of vent valves of ballast tanks in manned submersibles in the event of failure of their actuators;
- .8 availability and operation of a water level gauge in the compensating tank;
- .9 availability of at least two isolating valves on the air supply pipeline for blowing out compensating tanks;
- .10 availability of a shut-off valve and quick-closing automatic device isolating the regenerating system of air and gas medium from the compression chamber in the event of failure and pressure drop.

2.2.7.3.6 The results of tests after installation of systems and pipelines shall be checked with regard to the following:

- .1 pipeline sections subjected to field welding or brazing shall be subject to strength testing by a hydraulic pressure equal to $1,5P_{op}$.
- .2 hydraulic system pipelines in assembly with valves and flexible connections shall be tested by a hydraulic pressure equal to $1,5P_{op}$.
- .3 systems and pipelines shall be subject to tightness tests by internal air pressure equal to the operating pressure with no regard under what pressure (internal or external) they work;
- .4 the greater of two pressures acting on these systems and pipelines shall be taken as the operating pressure for systems and pipelines located inside the manned submersibles, diving bells and compression chamber. For other systems and pipelines, the working medium pressure shall be taken as the operating pressure.

2.2.8 Electrical equipment.

2.2.8.1 General.

The requirements of this Chapter are additional to the requirements of Section 10, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 5 of the Guidelines on Technical Supervision with respect to procedure and methods of the RS technical supervision during manufacture, installation and testing of specific electrical equipment for manned submersibles and ship's diving systems.

2.2.8.2 Survey of electrical equipment during manufacture.

2.2.8.2.1 When carrying out technical supervision during manufacture of electrical equipment, in the course of product tests for resistance to motions and prolonged inclinations, the possibility of reliable operation at any critical operating conditions (heel and trim of up to 45°) under overpressure and composition of the gas mixture corresponding to the operating diving depth of manned submersible and diving bell shall be checked for a period sufficient to test the product and measure parameters, but at least equal to 5 min.

2.2.8.2.2 When testing cables, their longitudinal and radial tightness shall be checked by holding in water under overpressure equal to $1,25P_{op}$ with subsequent dielectric insulation strength tests and measurements of insulation resistance between cable cores and relative to casing.

2.2.8.2.3 During tests, the product shall be kept operable under climatic conditions specified in Part VII "Electrical Equipment" of the Rules for Manned Submersibles and Ship's Diving Systems.

2.2.8.2.4 When carrying out technical supervision during manufacture and installation of the electrical equipment for the ship's diving systems, the compliance of electric power parameters for the equipment and devices of the ship's diving systems with parameters and quality of electric power produced on the support ship shall be checked.

2.2.8.3 Survey of electrical equipment during installation.

When surveying installation works, in addition to the requirements of Section 5 of the Guidelines on Technical Supervision, the following shall be checked:

.1 availability of arrangements preventing cable damage from bends at penetrations as well as plug and socket connections of manned submersibles and diving bells;

.2 possibility to quickly and easily disconnect cable from manned submersibles and diving bells using tight connections;

.3 proper fitting of tight connections as well as cable connections and penetrators. This check shall be carried out simultaneously with strength tests for manned submersibles, diving bells and compression chambers in accordance with the requirements specified in [2.2.1.6](#). The electrical equipment is considered to have passed the test if no pressing out of rubber gaskets, flattening of cables or rubber sealings and damages of lighting fixture glass hoods are detected;

.4 earthing of hulls of diving bells, tethered manned submersibles and compression chambers by connection to the support ship hull;

.5 availability (where necessary) of protection gratings and other protective arrangements providing efficient protection of lighting fixtures located in spaces and compartments of manned submersibles and ship's diving systems and those external to the pressure hull of manned submersibles and ship's diving systems against mechanical damages;

.6 absence of switches of lighting fixtures, control and protective units, sound-powered telephones inside compression chambers;

.7 absence of commutator electrical equipment in the saturation compression chamber where oxygen content is above 5 % at operating pressure in the chamber;

.8 proper laying of cables included in the umbilical and other cables laid external to manned submersibles and ship's diving systems, and their protection against mechanical damages;

.9 corrosion and dielectric properties of the compensating liquid (upon completion of laboratory tests performed by the competent authority).

2.2.8.4 Survey of electrical equipment during mooring and sea trials.

When surveying electrical equipment during mooring and sea trials, in addition to the requirements of Section 10 of the Guidelines on Technical Supervision, the following shall be checked:

.1 adequate power of the emergency power source (generator) and adequate capacity of accumulator batteries to provide the consumers with power for a period specified in Section 2, Part VII "Electrical Equipment" of the Rules for Manned Submersibles and Ship's Diving Systems;

.2 tightness of cable penetrations inside pressure hulls of manned submersibles and diving bells (to be carried out simultaneously with tightness tests of manned submersibles, diving bells and compression chambers according to [2.2.1.6](#));

.3 operation of means for centralized emergency switch-off for electric drives of machinery and equipment of the manned submersibles and ship's diving systems from the control station;

.4 efficient protection against mechanical damages and free passage of umbilical and other cables laid external to the pressure hull of manned submersibles and diving bells during lowering and surfacing. Kinks, cable tensions, etc. are not allowed;

.5 operation of means for monitoring and alarm (for current and limiting values):
when the operating diving depth is reached;
when the breathing mixture parameters (oxygen, carbon dioxide partial pressure, temperature, humidity) change exceeds the permissible limits;

position of remotely controlled valves in submergence, surfacing and trimming system;
ingress of water into the pressure hull of the manned submersibles;

discharge of accumulator batteries;

decrease in insulation resistance of electrical circuits;

fire detection and alarm system;

overpressure in the diving bell;

.6 intended operation of the electric drives of essential mechanisms:

operation of remotely controlled valves in submergence, surfacing and trimming system;

operation of alarm in case of overloading of electric motors installed inside the pressure hull of manned submersibles, diving bells and compression chambers;

operation of the electric drive of sea water pumps and devices for monitoring of its operation;

operation of the electric drive of the hydraulic system;

.7 accumulator batteries and possibility of their charging both on the manned submersibles and diving bells as well as the support ship;

.8 lighting; the following shall be additionally checked:

operation of the protective relay to switch off the voltage in the event of cable break or bulb damage in the circuits of external deep-water lighting fixtures;

operation of arrangement for heating of glasses in the handling system control console spaces (if any);

.9 service telephone communication. In such case, the following shall be additionally checked:

stable operation of the two-way telephone wire communication system between stations specified in 2.9.1 and 2.9.2 of Part VII "Electrical Equipment" of the Rules for Manned Submersibles and Ship's Diving Systems;

operability of speech unscrambler;

quality of recording messages received thorough communication channels to the support ship from manned submersibles and ship's diving systems by voice recorder.

2.2.9 Radio and sonar equipment.

2.2.9.1 General.

The requirements of this Chapter are additional to the requirements of Section 15, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 15 of the Guidelines on Technical Supervision with respect to procedure and methods of the RS technical supervision during manufacture, installation and testing of radio and sonar equipment specific for manned submersibles and ship's diving systems.

2.2.9.2 Survey during installation.

2.2.9.2.1 The list of items of technical supervision, procedure and scope of surveys of the equipment specific for the manned submersibles and ship's diving systems are provided in [Table 2.2.9.2.1](#).

2.2.9.2.2 When surveying installation works, in addition to specified in Section 15 of the Guidelines on Technical Supervision, the following shall be checked:

tightness of the VHF radio station with digital selective calling (DSC) antenna insulator where the cable is connected to the aerial;

presence and quality of water-repellent coating on the aerial and insulator of the VHF radio station with DSC;
provision of aerial devices protection against mechanical damages.

Table 2.2.9.2.1

Nos.	Item of technical supervision	Verification of technical documentation	Survey			
			during installation	during mooring trials of trials of manned submersibles	during sea trials of manned submersibles	during testing on the support ship of the ship's diving systems under operating conditions
1	Communication sonar system	+	+	+	+	+
2	Emergency sonar beacon with a fixed frequency of 37,5 kHz	+	+	+	+	+
3	Emergency receiver of sonar signals at a fixed frequency of 37,5 kHz	+	+	+	+	+
4	VHF radio station with DSC	+	+	+	+	+
6	Radio beacon	+	+	-	+	+
7	Radar search and rescue transponder (SART)	+	+	+	+	+

2.2.9.3 Survey during mooring trials.

When surveying equipment during mooring trials, in addition to specified in Section 15 of the Guidelines on Technical Supervision, the following shall be checked:

- .1 sensitivity of the receiving line and output power of the transmission line of communication sonar systems;
- .2 simultaneous operation of communication sonar systems on manned submersibles and ship's diving systems and on board the support ship;
- .3 efficient operation of speech unscrambler during operation of communication sonar systems;
- .4 operation of the emergency sonar beacon on manned submersibles and ship's diving systems at a fixed frequency of 37,5 kHz with concurrent check of emergency receiver of sonar signals.

The ship's diving systems are allowed to be checked when operators are in air at the atmospheric pressure.

2.2.9.4 Survey during sea trials.

When surveying equipment during sea trials, in addition to specified in Section 15 of the Guidelines on Technical Supervision, the following shall be checked:

- .1 no interference produced by communication sonar systems for operation of telephone wire communication;
- .2 simultaneous operation of communication sonar systems on manned submersibles/ship's diving systems and support ship with the use of helium gas mixture at operating diving depth of the manned submersible;
- .3 efficient operation of speech unscrambler during operation of communication sonar systems;
- .4 operation of emergency sonar beacon on manned submersibles and ship's diving systems at a fixed frequency of 37,5 kHz with concurrent check of emergency receiver of sonar signals.

2.2.10 Navigational equipment

2.2.10.1 General.

The requirements of this Chapter are additional to the requirements of Section 16, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision and Section 16 of the Guidelines on Technical Supervision with respect to procedure and methods of the RS technical supervision during manufacture, installation and testing of equipment specific for manned submersibles and ship's diving systems.

2.2.10.2 Survey of navigational equipment during manufacture.

When carrying out technical supervision during manufacture of navigational equipment, in addition to the requirements specified in 16.3 and 16.4, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision, the following shall be checked:

.1 sonars:

- ability of transmitting of 3D image of seabed objects (for prototypes);
- ability of transceiving system to scan in horizontal and vertical planes;
- operation of protective arrangements;
- operation of means for reduction of transmitted pulse frequency and remote control of transmitted pulse duration;
- automatic and manual operation in all prescribed modes (vertical and horizontal).

.2 logs:

- tightness and insulation resistance of the piezoelectric transducer relative to aerial case;
- possibility of measuring the longitudinal and lateral components of manned submersible's speed in the ranges specified in documentation for manufacture;
- operability of logs at water temperature and salinity variations, at roll of up to $\pm 10^\circ$ and pitch of up to $\pm 5^\circ$ (in surface position of the manned submersible) and at constant list of up to 3° ;
- measurement accuracy at low speeds (above 0,3 knots) up to the maximum design speed of the manned submersible. The speed measurement error shall not exceed 0,1 knots when measured relative to ground, and 2 % of the measured speed when measured relative to water;
- ability of measuring speed and distance run relative to ground and/or water (measurement error of distance run shall not exceed ± 1 % of the value measured);
- possibility to output the data related to speed and distance run to the equipment of automated navigational system via individual channels.

.3 echo sounder:

- good resolution and possibility of adjusting it (to check the bottom configuration while diving and condition of water surface while surfacing);

2.2.10.3 Survey during installation, mooring and sea trials.

2.2.10.3.1 The list of items of technical supervision, procedure and scope of surveys of the navigational equipment specific for manned submersibles and ship's diving systems are specified in [Table 2.2.10.3.1](#).

Table 2.2.10.3.1

Item of technical supervision	Verification of technical documentation	Survey		
		during installation	during mooring trials	during sea trials
Log	+	+	+	+
Depth indicator	+	+	+ ¹	+ ²
Echo sounder	+	+	+	+
Sonar	+	+	+	+
¹ Testing of the diving bells are carried out at the firm's (manufacturer's) bench (mooring trials) and under operating conditions on board the support ship (sea trials).				
² For self-sustained manned submersibles.				

2.2.10.3.2 When carrying out technical supervision during installation and testing of navigational equipment, in addition to the requirements specified in Section 16 of the Guidelines on Technical Supervision, the following shall be checked:

.1 sonars:

- possibility of taking bearing and estimating range to underwater objects at a distance not less than the manned submersible's stopping distance (after the propellers are stopped at the maximum speed), both right ahead and at different angles (at least 100 m in all cases);
- possibility of adjusting the operating range, resolution and beam width depending on size and reflectivity of an object and distance to it;

adjustment of beam sweep rate on the centering vertical line and beam focus, pulse length on horizontal and vertical paths;
operation of echograph (if any) in all measurement ranges;
estimation of the sonar minimum range of detection (blind area);
operation of a rotary-extension arrangement; side, lower and upper limit switches, compliance of the beam relative bearing as indicated by the control unit with the actual one.

.2 logs:

correct arrangement of the receiving aerial. The angular error for aerial initial setting shall not exceed $1 - 2^\circ$;

availability and operation of aerial heating devices;

possibility of measuring the manned submersible speed at very shallow depths under the keel, down to 0,3 – 0,5 m;

possibility of measuring the near-bottom currents (if any) when guide-roped or on the ground;

no interference produced by transceivers and affecting operation of other manned submersible sonars;

operation of the log while measuring speed relative to ground and water;

operation of the indicator of the used speed measurement mode.

.3 echo sounder:

possibility of measuring distance to the ground and to water surface.

.4 depth indicator:

possibility for continuous measurement of submergence depth with accuracy of $\pm 1\%$ of the operating depth;

operation of sound and light alarm of approaching the operating depth 50 and 10 m before and upon reaching it.

2.2.11 Handling systems of manned submersibles and ship's diving systems.

2.2.11.1 General.

2.2.11.1.1 This Chapter contains provisions and requirements related to the procedure and methods of the RS technical supervision during manufacture, installation and testing of handling systems of manned submersibles and ship's diving systems.

2.2.11.1.2 Unless otherwise additionally provided in this Section, handling systems of manned submersibles and ship's diving systems are covered by the applicable provisions and requirements of the Rules for the Cargo Handling Gear of Sea-Going Ships with respect to technical supervision during manufacture, installation and testing of cargo handling gear.

2.2.11.1.3 The materials, wire ropes and chains used in the handling systems shall comply with the relevant requirements specified in Sections 6 and 7, Part X "Shipboard Handling Systems of Manned Submersibles and Ship's Diving Systems" of the Rules for Manned Submersibles and Ship's Diving Systems.

2.2.11.1.4 General regulations for technical supervision are provided in Part I "General Regulations for Technical Supervision" and provisions applicable for approval of technical documentation are specified in Part II "Technical Documentation" of the Rules for Technical Supervision.

2.2.11.2 Surveys.

2.2.11.2.1 Types of checks, tests and inspections for the RS technical supervision during manufacture, installation and testing of items of handling systems for the manned submersibles and ship's diving systems are specified in [Table 2.2.11.2.1](#).

Types of technical supervision for items listed in [Table 2.2.11.2.1](#) are provided in Nomenclature of Items of Manned Submersibles and Ship's Diving Systems (refer to Appendix 1, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems).

2.2.11.2.2 When carrying out survey of the items of technical supervision specified in [Table 2.2.11.2.1](#), the RS surveyor shall be guided by the following:

.1 when verifying technical documentation, a set of the RS-approved technical documentation shall be submitted to the RS surveyor according to the applicable requirements specified in 1.4 of the Rules for the Cargo Handling Gear of Sea-Going Ships related to the item of technical supervision surveyed;

.2 scope and methods of non-destructive testing (NDT) of welds shall comply with the requirements of 7.2, Part X "Shipboard Handling Systems of Manned Submersibles and Ship's Diving Systems" of the Rules for Manned Submersibles and Ship's Diving Systems.

2.2.11.2.3 The strength testing of products means the following:

.1 testing of interchangeable components and loose gear with a proof load in compliance with the requirements of 10.2 of the Rules for the Cargo Handling Gear of Sea-Going Ships;

.2 testing of each wire rope of the handling system to estimate the breaking load of rope as a whole.

2.2.11.3 The scope of survey for the handling system during testing is provided in [Table 2.2.11.3](#).

Table 2.2.11.3

Tests (inspections)	Proof load	Angle of heel (anti heel) of the support ship	Support ship angle of trim	Survey of handling system	
				prototypes	serial
No-load operational test	–	0°	0°	+	+
Strength testing:					
static testing:	1,5 P_{SWL}	10°	5°	+	+
handling system assembled with gripping devices (wedge stoppers)	1,5 P_{SWL}	10°	5°	+	+
dynamic testing:					
handling system in assembly	1,1 P_{SWL}	0	0	+	+
Testing by lowering manned submersibles and diving bells without people to the specified depth:					
handling system in assembly	–	10°	5°	+	+

2.2.11.4 Technical supervision during manufacture of handling system products.

2.2.11.4.1 Manufacture of components, assemblies and structures of the handling system for manned submersibles and ship's diving systems specified in [Table 2.2.11.2.1](#) shall be subject to the RS technical supervision.

2.2.11.4.2 When carrying out technical supervision during manufacture of load-bearing stressed structures of the handling system for manned submersibles and ship's diving systems, the RS surveyor shall be guided by the relevant provisions of Sections 3 and 9 of the Rules for the Cargo Handling Gear of Sea-Going Ships as well as the applicable requirements specified in Section 5 of the Guidelines on Technical Supervision.

2.2.11.5 Technical supervision during installation of the handling system on the support ship.

2.2.11.5.1 When carrying out technical supervision during manufacture of the handling system items for manned submersibles and ship's diving systems specified in [Table 2.2.11.2.1](#), the RS surveyor shall carry out survey with regard to the applicable provisions of Sections 5, 9 and 10 of the Rules for the Cargo Handling Gear of Sea-Going Ships taking into account the following checks:

.1 sufficient view of the work site;

Table 2.2.11.2.1

Item of technical supervision	Types of checks, tests and inspections												
	During manufacture of components and structures							During installation on board the support ship of the manned submersibles and ship's diving systems					
	Verification of technical documentation	Control of material		Visual examination	Measurements control	Flaw detection for welds	Strength test	Verification of technical documentation	Verification of documents for products	Verification of brands	Visual examination	Verification of installation	Check of installation dimensions
Marking, branding		RS Certificates											
Cargo handling gear of handling systems ¹	+	+	+	+	+	+	+ ²	+	+	+	+	+	+
Steel wire ropes	+	+	-	+	+	-	+	+	+	-	+	+	-
Compensators of vertical and horizontal motions	-	-	-	-	-	-	-	+	+	-	+	+	+
Transportation platforms on the support ship for transportation and mating of lock-out submersibles and ship's diving systems	-	-	-	-	-	-	-	+	+	-	+	+	+
Counterbalance platform	-	-	-	-	-	-	-	+	+	-	+	+	+
Anti-sway appliances	-	-	-	-	-	-	-	+	+	-	+	+	+
Devices for gripping and suspending manned submersibles and ship's diving systems	-	-	-	-	-	-	-	+	+	-	+	+	+

¹ Refer to applicable requirements for cargo handling gear specified in Appendix 1, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision.

² Applied to interchangeable components and loose gear.

.2 clearances between guard boards of running wheels of the handling system's retractable trusses and of load trolleys running by rails. These clearances shall not exceed 10 mm to prevent the ingress of foreign objects;

.3 length of wire rope free end after the last clamp on the winch drum (shall be at least twice the wire rope diameter) and no bends of the wire rope free end under and near the hold-down strap;

.4 laying of tracks with the following tolerances, in mm):

track width gauge deviation (parallelism over the track length):

for span < 5 m±3

for span > 5 m±5

difference between track head levels in the same cross-section 5

difference between track head levels between adjacent supports 5

gaps in track joints 4

.5 permissible slope of the track when the support ship is on even keel;

.6 availability of appliances preventing derailment of trolleys for submersibles and retractable trusses of handling systems;

.7 efficient communication between the handling system machinery operator and handling supervisor;

.8 availability of counters of paid-out length of wire ropes, hoses and cables on handling system's winches, reels and control stations.

2.2.11.6 Surveys during testing of the handling system.

2.2.11.6.1 The scope of survey for the handling system during testing is specified in [Table 2.2.11.3](#).

2.2.11.6.2 When carrying out the handling system survey in the course of its no-load operational test, the following shall be checked:

.1 easy passage of wire ropes;

.2 synchronous operation of handling system machinery;

.3 no spontaneous speed change or switchover of claw clutches of the handling system machinery or disconnection of the kinematic diagram;

.4 efficiency and interlocking of handling system winch claw clutches;

.5 operation of limit switches stopping the following handling system machinery:

handling machinery – before the system's connection devices approach then- extreme positions; to the stop as the uppermost position (the handling gear shall stop at least 200 mm before the suspending device of the manned submersible and diving bell approaches the stop) and to the permissible paid-out wire rope length as the lowermost position;

gear for luffing/swinging-out of trusses and girder as they approach the extreme positions (the drive shall stop when the stops are approached);

load trolley shifting mechanism as it approaches extreme positions on the truss/girder (the drive shall stop when the stops are approached);

.6 operation of interlocking arrangements to prevent hoisting when limit switches are off;

.7 operation of phase break off relay to switch off handling system machinery with AC three-phase motors in case of break-off in any of three phases;

.8 operation of the interlocking devices allowing for energization of the handling system machinery only if all electric drive controllers are in zero position;

.9 operation of interlocking devices preventing the following:

start of electric drives according to a control circuit other than the proper one;

start of electric drives by contacts of safety devices (limit switches and interlocking devices);

audible alarms during operation of handling systems controlled from the control cabin or console.

2.2.11.6.3 Strength tests shall be carried out with a proof load. Application of dynamometer instead of a proof load is not allowed. Strength tests may be performed by standard manned submersibles/diving bells by increasing their weight up to the required load using additional proof load.

2.2.11.6.4 During static strength testing of the handling system, the proof load shall be kept in surface position with the system swung outboard the support ship: suspended on handling wire ropes for 10 min and suspended on the hook (gripping device) of the handling system for 10 min. Rope slipping through operating wedge stoppers are not allowed.

After static testing, metal structures, machinery arrangements and handling wire ropes shall be examined. Where residual strains or other damages are not detected, dynamic tests of the handling system shall be carried out.

2.2.11.6.5 Generally, dynamic testing shall be performed by triple launching or lowering a load until fully submerged and lifting back to the upper position. Abrupt braking is performed during each lowering to test operation of brakes and strength of the handling system.

2.2.11.6.6 Where there are load mobile trolleys (to move manned submersibles and diving bells) in the handling system for the manned submersibles and ship's diving system, they shall be subject to strength testing by a static proof load equal to $1,5P_{SWL}$ for 10 min.

2.2.11.6.7 The handling system tests when the manned submersible and diving bell are lowered to the specified length shall be performed only upon satisfactory results of no-load operational test and strength testing of the handling system.

2.2.11.6.8 Testing of the handling system when the manned submersibles and diving bells are lowered to the specified depth according to the RS-approved program clearly indicating the load for the manned submersible and diving bell, diving depth, sea state, etc.

2.2.11.6.9 During testing of the handling system by lowering manned submersibles, diving bells and evacuation compression chambers to the specified depth, the checks specified in [2.2.11.6.2](#) shall be performed. The following shall be additionally checked:

- .1 no twisting of steel support wire ropes or umbilicals of manned submersibles and diving bell;
- .2 easy passage and absence of bends in the handling system cables and hoses;
- .3 smooth motion of manned submersibles and diving bells during operation of load trolley traveling and boom luffing gear;
- .4 correct winding of the support wire ropes and umbilicals on the drums of the winch and reel of the handling system;
- .5 rope capacity of the reel drums, which shall be sufficient for diving of the manned submersibles and diving bells to the specified depth with regard to slack of at least 30 % of the specified diving depth and at least four dead turns of the wire on the drum;
- .6 efficient operation of slip devices or breakdown torque clutches operating at loads not in excess of elastic strain loads in cables and hoses;
- .7 possibility of stopping the diving bell in case of detachment of the support wire rope and subsequent (emergency) recovery of the manned submersible aboard the support ship;
- .8 efficient locking of the handling wire ropes in case of handling winch failure;
- .9 possibility of emergency recovery of the lock-out submersibles and diving bells aboard the support ship by means of handling wire ropes using mooring or other deck machinery;
- .10 possibility of emergency recovery of lock-out submersibles and diving bells aboard the support ship by means of emergency or guide wire ropes where such a recovery is provided in the design;
- .11 possibility of opening the access hatch of the self-sustained or tethered manned submersibles at emergency hoisting of the manned submersibles to the water surface using the handling system.

2.2.11.6.10 During testing by lowering the manned submersibles and diving bells to the specified depth without people, the sea state at which the handling system operation is possible shall be checked.

2.3 TECHNICAL DOCUMENTATION

2.3.1 The requirements of this Section are additional to the requirements of Part II "Technical Documentation" of the Rules for Technical Supervision and apply when reviewing technical documentation for construction, conversion, modification, restoration and repair of items of technical supervision of manned submersibles and ship's diving systems and products for them.

2.3.2 The scope of technical documentation for manned submersibles and ship's diving systems submitted to the Register for review is provided in Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems and in Section 1 "General" of the Rules for the Cargo Handling Gear of Sea-Going Ships.

2.3.3 After construction, testing and commissioning of the manned submersibles and ship's diving systems, the final documentation related to the port of registry of the manned submersible or support ship of the ship's diving system shall be submitted to the RS Branch Office in the order specified in Section 11, Part II "Technical Documentation" of the Rules for Technical Supervision.

2.3.4 The final documentation shall be submitted in a scope as specified in the list of final documentation to be submitted to the RS Branch Office carrying out technical supervision of manned submersibles and ship's diving systems in service (refer to [Appendix 1](#) to these Guidelines). This list may be reduced or extended by the Register in each particular case depending on specific features of the manned submersibles and ship's diving systems structure.

3 SURVEY OF THE MANNED SUBMERSIBLES AND SHIP'S DIVING SYSTEMS IN SERVICE

3.1 GENERAL

3.1.1 The requirements of these Guidelines apply to the items of technical supervision included in the Nomenclature of Items of the Register Technical Supervision and is aimed to determine their technical condition. These Guidelines establish the procedure and methods of surveying the manned submersibles and ship's diving systems and their items for class assignment, confirmation and renewal of the manned submersibles and ship's diving systems in service.

3.1.2 The aim of the initial survey of manned submersibles or ship's diving systems in service is to determine whether it is possible to assign class to a manned submersible/ship's diving system being submitted for the RS classification for the first time as well as to re-assign the RS class to the manned submersible/ship's diving system, the RS class of which was withdrawn. Initial survey is performed during re-classification, assigning class to the manned submersible/ship's diving system constructed without the RS technical supervision, reassigning class for the manned submersible/ship's diving system, the RS class of which was withdrawn, as well as when changing the existing notation of the RS class and assigning new class notation (only for items of technical supervision related to the new distinguishing mark or descriptive notation in the class notation).

3.1.3 Assessment of technical condition of the hull, arrangements, equipment and outfit, machinery installation and refrigerating plant, electrical equipment for the manned submersibles/ship's diving system is a basis for assignment, retainment, confirmation, reinstatement, renewal and reassignment of the class; it is also required for assessment of the necessary scope of repairs.

3.1.4 Surveys shall be carried out by the RS surveyor in a scope required to verify the compliance of technical requirements for items of technical supervision regulated by the Rules for Manned Submersibles and Ship's Diving Systems and to access their technical condition.

3.1.5 The RS documents for the manned submersibles and ship's diving systems are issued provided that the manned submersible, ship's diving system, handling system as well as equipment and arrangements on board the support ship of the manned submersible/ship's diving system ensuring safe operation of the manned submersible and ship's diving system comply with requirements of the Rules for Manned Submersibles and Ship's Diving Systems.

3.1.6 The system of periodical surveys specified in Section 4, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems applies in the course of technical supervision of the manned submersibles and ship's diving systems in service after construction under the RS technical supervision or after initial survey.

3.1.7 In the intervals between the RS periodical surveys of the manned submersibles and ship's diving systems, the responsibility for continuous supervision over their technical condition, maintenance in operational condition in service is within duties of the support ship administration of the manned submersibles and ship's diving systems and relevant shipowner's services who shall ensure performance of required checks and examinations for detection of possible defects and faults. The check results shall be recorded in the operational documentation for the manned submersibles and ship's diving systems.

Submission of the items of technical supervision to compulsory periodical inspections by competent authorities within the stipulated periods and replacement of the items of technical supervision with expired service is the duty of the administration of the support ship of the manned submersibles and ship's diving systems and relevant shipowner's services.

3.1.8 For all types of surveys, the owner of the manned submersible and ship's diving system shall report on modifications made from the date of the previous survey and submit the necessary technical documentation.

3.1.9 Service restrictions caused by deterioration of technical condition, deficiencies in the equipment or incompleteness of the manned submersibles and ship's diving systems outfit are not allowed.

3.1.10 Faulty condition of items being under technical supervision of the competent authorities shall be reported to the Register. The competent authorities shall make appropriate records on technical condition of items of technical supervision of the manned submersibles/ship's diving systems to their technical documentation or issue the appropriate report.

3.1.11 To assess the technical condition of items of technical supervision of the manned submersible and ship's diving systems, inspections, measurements, tests and operational testing shall be performed in a scope established in the relevant sections of these Guidelines.

The manned submersible and diving bell shall be tested in submerged position only in case of satisfactory results of their testing on board the support ship of the manned submersible and ship's diving system and afloat.

3.1.12 For all types of surveys of arrangements, machinery and equipment of the manned submersibles/ship's diving systems, tests in the submerged position shall be carried out by the shipowner's test team according to the RS-approved program; in such case, the manned submersible/diving bell shall be launched and lowered to the depth of 10 – 15 m (except for tests of the handling system, refer to [Section 10](#)). The test results shall be recorded in a special log for the manned submersible/ship's diving system and taken into account by the RS surveyor while issuing the relevant documents.

Approximate list of items of the manned submersibles/ship's diving systems with operational test performed by a test team is provided in [Appendix 2](#) to these Guidelines.

3.1.13 When replacing the standard equipment of the manned submersibles/ship's diving systems, the shipowner or designer shall submit the relevant technical background justifying that the proposed changes are permissible.

All modifications related to materials and structures of the manned submersible/ship's diving system, its machinery and products carried out by the shipowner shall be agreed upon with the designer and approved by the Register before their implementation.

3.1.14 Requirements for technical supervision of the manned submersibles/ship's diving systems are provided in [Sections 4 – 10](#) of these Guidelines.

3.2 INITIAL SURVEY

3.2.1 The aim of the initial survey of the manned submersibles/ship's diving systems in service is to determine whether it is possible to assign class to the manned submersible/ship's diving system being submitted for the RS classification for the first time, as well as to re-assign an RS class to the manned submersible/ship's diving system, the RS class of which was withdrawn. Initial survey is performed during re-classification, assigning class to the manned submersible/ship's diving system constructed without the RS technical supervision, reassigning class for the manned submersible/ship's diving system, the RS class of which was withdrawn, as well as when changing the existing notation of the RS class and assigning new class notation (only for items of technical supervision related to the new distinguishing mark or descriptive notation in the class notation).

3.2.2 The aim of the initial survey is to determine, to which extent the structure, machinery, equipment, arrangements, systems, electrical equipment, communication and navigation means, life-saving appliances and signal means of the manned submersible/ship's diving system submitted to the Register comply with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems.

Initial survey consists in detailed examination, checks, tests and measurements, the scope of which is specified depending on the age of the manned submersible/ship's diving system, its technical condition, availability of technical documentation and documents of the recognized competent supervisory authorities. During surveys with regard to class transfer, drawing up of the RS certificates on the RS items of technical supervision installed on manned submersibles/ship's diving systems and included in the RS Nomenclature, provided they have the certificated issued by ACS – IACS member or the documents/certificates on compliance with the regulations of Council Directive 96/98/EC of 20 December 1996 on Marine Equipment (MarED Directive, if applicable) is not required. With regard to the documents and certificates on compliance of the RS items of technical supervision according to the RS Nomenclature during the flag change surveys, it is necessary to follow the provisions of 4.2.2.1.2, Part III "Survey of Ships in Compliance with International Conventions, Codes, Resolutions and Rules for the Equipment of Sea-Going Ships" of the Guidelines on Technical Supervision of Ships in Service.

3.2.3 At the first stage of the initial survey, the availability of certificates issued by ACS – IACS member confirming supervision by the ACS over essential structures, assemblies and equipment of the manned submersibles/ship's diving systems shall be checked. Where there are no such certificates, the relevant item shall be replaced with the equipment having the ACS or RS certificates, or firm's (manufacturer's) documents shall be reviewed. In this case, the relevant technical documentation for the specified equipment shall be reviewed including the program of tests to be carried out by the owner in the presence of the RS surveyor.

3.2.4 The initial survey of the manned submersibles/ship's diving systems without previously issued ACS – IACS member documents or were constructed without technical supervision of any ACS shall be performed in the scope of special survey ([refer to 3.3.2](#)).

For the manned submersibles/ship's diving systems constructed under supervision of ACS – IACS member and having a valid Classification Certificate, the initial survey consists of the assessment of the technical condition of the manned submersibles/ship's diving systems. For such manned submersibles/ship's diving systems, the scope of the initial survey may be reduced as agreed upon with RHO but shall be at least equal to the scope of the annual survey.

3.2.5 In addition to the scope of surveys specified in [3.2.4](#), buoyancy, stability and unsinkability calculations for the manned submersibles and the diving bell based on experimental assessment of the center of gravity and displacement (inclining experiment) shall be submitted to the Register for review.

3.3 SPECIAL SURVEY

3.3.1 At special survey, the manned submersibles/ship's diving systems, their regulated and technical characteristics, components, structure, arrangement and installation of items of technical supervision shall be examined to ascertain their compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems.

Based on survey results, proper technical condition of the manned submersibles/ship's diving systems required for class renewal and to recognize the manned submersible/ship's diving system fit for navigation shall be also ascertained, or requirements are specified, which shall be complied with for class renewal.

3.3.2 At special survey shall include the external and internal detailed examination of the manned submersible/ship's diving system, inspection of the disassembled machinery, arrangements and equipment with necessary measurements, hydraulic testing of all pipelines, pressure vessels and systems assembled with valves, strength and tightness testing of the pressure hull of the manned submersible/ship's diving system (refer to Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems), strength and tightness testing of hoses.

The operation of the emergency release devices of jettisonable ballast, support wire rope and umbilical shall be checked on board the support ship of the manned submersible/ship's diving system.

Summarized scope of special surveys of the manned submersibles/ship's diving systems is specified in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

3.3.3 At special survey, detailed examination, operational test, static and dynamic tests of the handling system shall be carried out (refer to [Section 10](#)).

3.3.4 Manned submersibles/ship's diving systems shall be submitted for special surveys at 5-year intervals to renew the class in compliance with the requirements of [3.3.4.1 — 3.3.4.10](#).

3.3.4.1 The first special survey shall be completed within 5 years from the date of the initial survey after construction and thereafter in 5-year from the credited date of the previous special survey.

3.3.4.2 Special survey may be commenced at the 4th annual survey and be progressed with a view to completion by the 5th anniversary date. When special survey is commenced prior to the 4th annual survey (more than 15 months before the 5th anniversary date), the entire survey (including dry-docking survey) shall be completed within 15 months before actual date of survey completion if such work shall be credited to special survey.

3.3.4.3 On completion of special survey, the surveys of items of technical supervision, which were carried out in the required scope not more than 15 months before the 5th anniversary date/actual date of survey completion (including dry-docking survey), may be credited, as appropriate, considering [3.3.4.2](#).

3.3.4.4 Intervals between special surveys shall be recorded:

from the date of completion of the initial survey after construction of the manned submersible/ship's diving system;

from the date of completion of initial (in the scope of special) survey for assignment of class to the manned submersible/ship's diving system constructed without the RS technical supervision or recognized classification society;

from the date of completion of special survey carried out by the classification society – IACS member in case of transfer of class transfer of the manned submersible/ship's diving system with the valid class of the recognized classification society (retention of dates of periodical surveys);

from the date of completion of the initial survey carried out by the Register at transfer of class of the manned submersible/ship's diving system with the valid class of the recognized classification society, if initial survey is carried out in the scope of special survey;

from the date of completion of special survey carried out by the Register for renewal of class;

from the date of completion of occasional survey (in the scope of special) at reassignment of class to the manned submersible/ship's diving system, which class was withdrawn.

3.3.4.5 If special survey of the manned submersible/ship's diving system for class renewal is completed within 3 months before the expiry date of special survey, the next period of class is established for 5 years beginning from the expiry date of special survey. In this case, the period of validity of a new Classification Certificate (hereinafter referred to as "the Certificate") begins from the date of completion of the special survey until the date not later than 5 years after the date of expiration of period of the existing Certificate validity.

3.3.4.6 If special survey of the manned submersible/ship's diving system for class renewal is completed after the expiry date of special survey, the next period of class is established for 5 years beginning from the expiry date of special survey. In this case, the period of validity of a new Certificate begins from the date of completion of the special survey until the date not later than 5 years after the date of expiration of period of the existing Certificate validity without extension of the special survey period or of the existing Certificate.

In exceptional circumstances, upon agreement with RHO, the next period of class may be established for 5 years beginning from the date of actual completion of the special survey. In this case, the period of validity of a new Certificate begins from the date of completion of the special survey until the date not later than 5 years after the date of completion of this survey.

3.3.4.7 If special survey of the manned submersible/ship's diving system for class renewal is completed more than 3 months before the expiry date of special survey, the next period of class is established for 5 years beginning from the survey completion date. In this case, the period of validity of a new Certificate begins from the date of completion of the special survey with the date not later than 5 years after the date of completion of this survey.

3.3.4.8 In cases where the manned submersible/ship's diving system has been laid-up or has been out of service for a considerable period of time due to major repair or modification, and the owner of the manned submersible/ship's diving system elects to only carry out the overdue (due to major repair or modification) special survey, the next period of class will start from the expiry date of the overdue special survey. If the manned submersible/ship's diving system owner elects to only carry out the next due (depending on the age of the manned submersible/ship's diving system) special survey, the next period of class will start from the survey completion date.

3.3.4.9 Considering the age of the manned submersible/ship's diving system and changes in its technical condition, reduced intervals between special surveys may be assigned. Such decision, this and further special surveys' scope and schedule shall be reviewed by the Register in each particular case.

3.3.4.10 Extension of special survey.

Under special circumstances, the Register may grant an extension not exceeding 3 months to allow for completion of the special survey provided that the manned submersible/ship's diving system is attended and the attending RS surveyors so recommend after the following has been carried out:

- .1 occasional survey in full scope of annual survey;
- .2 verification of compliance with the requirements or review of the possibility to postpone fulfillment of the requirements and other conditions of class prescribed for the due date of the special survey;
- .3 special survey in the maximum possible scope.

Reviewing issues related to the extension of special survey, assignment of conditions and determination of occasional survey scope (not less than determined in [3.3.4.10.1 – 3.3.4.10.3](#)) shall be within the competence of the RS Branch Office for in-service supervision.

The issue related to the extension of special survey is considered based on the owner's written request. For this purpose, the owner shall apply with a request to the RS Branch Office for in-service supervision, or to any other RS Branch Office that shall forward the owner's request to the RS Branch Office for in-service supervision. The owner in his request shall provide the documentary evidence confirming the occurrence of special circumstances.

Upon receipt of the owner's request for extension of special survey for the manned submersible/ship's diving system, the RS Branch Office for in-service supervision shall notify RHO of its opinion on the possibility of granting such an extension based on the analysis results.

Based on the owner's written request, RHO requests the opinion of the RS Branch Office for in-service supervision.

Taking final decision on granting an extension of special survey is within the competence of Director/Head of the RS Branch Office which performed the occasional survey prescribed by this paragraph. Such a decision is made based on the survey results considering whether the prescribed conditions are complied with.

3.4 ANNUAL SURVEY

3.4.1 At annual survey, the manned submersibles/ship's diving systems shall be examined with respect to changes in their components, structure, arrangement and installation of items of supervision and their technical condition.

3.4.2 Annual surveys of a manned submersible (ship's diving system) consists mainly of an external examination of items and their operational testing (summarized scope of annual surveys of manned submersibles/ship's diving systems is provided in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems and in the relevant sections and chapters of these Guidelines).

3.4.3 The annual survey shall include the internal and external examination, tightness testing of the manned submersible/ship's diving system (in this case, efficient operation of connecting flanges and transfer hatches shall be also checked), tightness testing in way of installation of pipelines and hoses assembled with valves, external examination throughout the length of the handling system wire ropes, actuation check for safety valves of the ship's diving system.

The operation of the emergency release devices of jettisonable ballast, support wire rope and umbilical shall be checked on board the support ship of the manned submersible/ship's diving system.

3.4.4 Annual surveys shall be carried out between special surveys (or between initial and special survey) within 3 months before and after each anniversary date of the Classification Certificate.

If an annual survey is completed before the beginning of a specified survey window (early survey), a new anniversary date shall be stated in the Classification Certificate, and the subsequent annual surveys shall be completed at the intervals prescribed by these Guidelines using the new anniversary date. A new anniversary date shall be fixed not later than 3 months after the survey completion date, and a new survey window shall be prescribed (± 3 months), respectively. Thus, the validity date of the Classification Certificate may be changed accordingly, namely, the completion of annual survey before the beginning of a specified survey window (early survey) may lead to the reduction of existing Classification Certificate validity period.

The expiry date of the Classification Certificate may remain unchanged provided annual survey is carried out so that the maximum intervals between the surveys prescribed by the relevant requirements of these Guidelines are not exceeded.

3.5 OCCASIONAL SURVEY

3.5.1 Occasional survey of the manned submersibles/ship's diving systems shall be performed in the following cases:

- .1** in case of emergency;
- .2** after repair of pressure-resistant structures or handling system;
- .3** after replacement of essential machinery;
- .4** after replacement of wire ropes or parts of the handling system's load-bearing structures;
- .5** after repair or replacement of the life-support system equipment;
- .6** in case of external damages of pressure-resistant structures due to transportation or operating conditions;
- .7** due to verification of compliance of previously imposed requirements;
- .8** upon the initiative of the RS Branch Office (surveyor);
- .9** related to class suspension, reinstatement or withdrawal;
- .10** related to class transfer;
- .11** at the manned submersible/ship's diving system lay-up or reactivation.

3.5.2 The scope of occasional survey for the replaced or repaired assemblies shall correspond to the scope required for construction/installation.

In some cases, with regard to technical condition of the manned submersibles/ship's diving systems, the scope of occasional survey may be changed by the RS Branch Office.

3.5.3 Occasional survey results shall be recorded in the Report drawn up per form 6.3.10.

3.6 TECHNICAL SUPERVISION DURING REPAIR, RECONSTRUCTION AND MODIFICATION

3.6.1 General issues on arrangement and performance of technical supervision during repair, reconstruction or modification of the manned submersibles/ship's diving systems shall be solved in accordance with the provisions of Methodological Recommendations on Technical Supervision during Repair of Sea-Going Ships, the requirements specified in 4.9, Part II "Survey Schedule and Scope" of the Rules for the Classification Surveys of Ships in Service and Chapter 3, Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service.

3.6.2 While approving the scope and methods of repair of items of technical supervision, the RS surveyor shall follow the provisions of appropriate sections of Methodological Recommendations on Technical Supervision during Repair of Sea-Going Ships, the requirements specified in 4.9, Part II "Survey Schedule and Scope" of the Rules for the Classification Surveys of Ships in Service and Chapter 3, Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service with respect to assessment of technical condition, permissible limits of wear, deformations, damages and technological instructions.

3.6.3 Prior to submission of a manned submersible/ship's diving system for repair, conversion or modification, the shipowner shall submit the design documentation related to modifications made to the hull of the manned submersible/ship's diving system, its machinery, arrangements, equipment and handling system to RHO for approval. The scope of design documentation shall comply with the scope of the scheduled modifications.

Design documentation shall include the post-repair testing program for the manned submersible/ship's diving system in a scope corresponding to the scope of tests during special survey.

Work performance without approval of technical documentation is not allowed.

3.6.4 Repair shall be performed in accordance with technological processes approved by the RS Branch Office carrying out the survey.

4 HULL

4.1 Summarized scope of surveys of hull structures for manned submersibles/ship's diving systems during periodical surveys is provided in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

4.2 At initial survey of the manned submersibles/ship's diving systems hull, its compliance with the requirements of Part II "Hull" of the Rules for Manned Submersibles and Ship's Diving Systems shall be verified regarding the following:

- selection of materials for the hull and welds;
- deviation of geometric dimensions of pressure hull from the construction dimensions (in particular, from the regular round shape);
- deviation of profile of the convex parts of heads and covers;
- sufficient strength depending on operating conditions and all operating states as specified in technical documentation for construction and in Operating Instructions for the manned submersible/ship's diving system;
- wear of structural members;
- deviations from technical documentation; damages;
- quality of welded joints.

The strength of structures is assessed by comparing the dimensions of the shell plating and structural members required by as-built documentation with actual dimensions. Where necessary, the comparative strength calculation may be required.

At initial survey, if a manned submersible/ship's diving system was classed by a recognized ACS, the strength assessment may be limited to random check of individual main structural members.

At initial survey, the hull shall be tested for strength and tightness.

These tests may be omitted if a manned submersible/ship's diving system is constructed under technical supervision of a recognized ACS and has the Classification Certificate.

4.3 At special survey of a manned submersible/ship's diving system, the hull structures shall be verified for compliance with as-built technical documentation, and the hull technical condition shall be assessed with respect to strength, tightness as well as wear and damages with assessment of their effects on strength. Hull strength diameter (with deviations from the regular round shape) and profile of convex part of heads and covers shall be also measured.

At survey, particular attention shall be given to detection of wear in intensive corrosion areas and damages in areas of abrupt changes in hull geometry. In case of wear, the surveyor shall require residual thickness measurement of any structure.

At plating survey, particular attention shall be given to plating in way of openings (access hatches, manholes, view ports, system valves, cable penetrator and air hose, etc). Where necessary, the surveyor may require a non-destructive testing for cracks in the base metal and welded joints.

Preparation for the survey shall be performed in accordance with the applicable requirements of these Guidelines.

4.4 At annual survey, in some cases the surveyor may require partial opening-up of insulation, measurements of residual thickness of hull structure, and in case of hull corrosive damages – a non-destructive testing for cracks in the base metal and welded joints as well.

At annual survey, areas of access hatch openings, manholes, view ports, system valves, cable penetrators and outlets, and hoses shall be examined.

At annual survey, the pressure hull and pressure tanks shall be tested as specified in Footnote 1 to Table in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

4.5 The hull technical condition is determined through inspections, measurements of residual thickness, checks of geometric dimensions and strength and tightness tests using

previous survey reports and results of in-service inspections, and repair and replacement data as indicated in the maintenance records.

General provisions for assessment of the technical condition are specified in Section 5, Part I "General Provisions" of the Rules for the Classification Surveys of Ships in Service.

4.6 For assessment of the technical condition of pressure-resistant structures, the applicable provisions of the Methodological Recommendations on Technical Supervision during Repair of Sea-Going Ships shall be applied.

Technical condition of the other hull structures of the manned submersibles and ship's diving systems shall be assessed according to the applicable provisions of Appendix 2 to the Rules for the Classification Surveys of Ships in Service.

4.7 The deviation of geometric dimensions of the pressure hull shall not exceed the permissible limit specified in the technical documentation for the manned submersibles and ship's diving systems.

All hull damages the causes of which are not detected shall be subject to special consideration to determine possible structural deficiencies.

4.8 If any ruptures and cracks are detected in hull structural members, it is necessary to determine their cause, detect the crack limits and develop production process instructions on their elimination.

The defects of pressure-resistant structures shall be eliminated in accordance with the procedure approved by the Register.

4.9 The hull of the manned submersible/ship's diving system with the removed insulation (refer to Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems) shall be examined by dye penetrant, magnetic particle, etc. testing or using a magnifying glass. Prior to examination, the surface of the weld and its adjacent areas shall be cleaned to remove rust, paint and dirt to the metallic blushing for a width of at least 20 mm to each side.

4.10 During strength and tightness testing, the pressure shall be measured using two pressure gauges. The manned submersible hull shall be kept under the strength testing pressure for at least 15 min, and when the hull thickness is 50 mm or more, for at least 30 min; then the pressure shall be reduced down to the operating pressure. The pressure equal to the operating one shall be maintained for a period required for examination of the manned submersible hull.

During hydraulic testing, the ambient temperature shall be positive, and difference between ambient and water temperature shall be not more than 5 °C.

After hydraulic testing, the pressure hull shall be examined, and deviations of its geometric dimensions from the construction ones shall be determined.

Manned submersibles, their compartments and tanks operating under external pressure shall be subject to tightness tests with the internal air pressure specified in design documentation; in such case, welds of the hull, bulkheads, hatch covers, view ports, valves, cable penetrators and outlets, hoses shall be subjected to tightness tests by soap solution bubble test or other method approved by the Register.

4.11 During strength testing, the manned submersible/ship's diving system is considered fit for operation, unless examination reveals the following:

- .1 signs of rupture;
- .2 leakage, single non-leaking drops or sweating on the base metal and welds;
- .3 residual deformations after testing;
- .4 cracks in view ports and valves;
- .5 pressing out of gaskets, flattening of cables or rubber seals.

4.12 During tightness testing, the manned submersible/ship's diving system is considered fit for operation, unless examination reveals the following:

- .1 air leakages on the tested surface;
- .2 pressure drop within 1 h.

5 EQUIPMENT, ARRANGEMENTS AND OUTFIT

5.1 GENERAL

5.1.1 The scope of periodical surveys of arrangements, equipment and outfit of manned submersibles, diving bells of ship's diving systems is provided in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

5.2 ARRANGEMENTS AND CLOSING DEVICES OF OPENINGS IN PRESSURE HULL AND PRESSURE BULKHEADS OF MANNED SUBMERSIBLES, DIVING BELLS AND COMPRESSION CHAMBERS

5.2.1 At initial survey of closing devices, they shall be verified for compliance with Section 2, Part II "Hull" and Part III "Equipment, Arrangements and Outfit" of the Rules for Manned Submersibles and Ship's Diving Systems.

5.2.2 For all types of surveys, hatches and view ports are subject to detailed examination. Particular attention shall be given to condition of sealings and view port glasses. The expiry date of glasses shall be verified. The closing device actuators shall be operationally tested.

5.2.3 At special survey, the closing devices shall be subject to strength and tightness tests that shall be carried out simultaneously with similar tests of hulls of manned submersibles, diving bells and compression chambers.

At the first and second special survey, the tightness testing may be performed only provided that the requirements specified in Footnotes 2 and 3 to Table in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems are complied with.

At special survey of hatch closing devices, their actuators shall be subject to detailed examination with necessary dismantling before operational test.

In case of signs of corrosive wear of hatch covers, the surveyor shall require residual thickness measurement.

5.2.4 At annual survey, closing devices shall be subject to strength testing.

5.2.5 While assessing the technical conditions of closing devices, the applicable wear limits specified in Appendix 5.2-1 of Part in "Additional Surveys of Ships Depending on their Purpose and Hull Material" of the Rules for the Classification Surveys of Ships in Service shall be followed.

5.2.6 The view port glasses shall be replaced upon expiry date or when a wear or defects exceeding the permissible limits specified in the appropriate manufacturer's operating instructions are detected.

While replacing the view port glasses upon expiry date or when non-permissible wear or defects are detected, the surveyor shall ensure that the replacement method and testing procedure comply with as-built documentation and Operating Instructions for the manned submersible and ship's diving system.

After replacement is over, view port glasses shall be subject to strength and tightness testing in the presence of the surveyor in accordance with the manufacturer's instructions agreed with the Register.

5.3 MANOEUVRING AND DIRECTIONAL STABILITY FACILITIES OF MANNED SUBMERSIBLES

5.3.1 At initial and special surveys, manned submersible shall be verified for compliance with as-built documentation and tested in surface and submerged position; in such case, the operating parameters of the manoeuvring and directional stability facilities to ensure the efficient and safe operation of the manned submersible shall be checked.

5.3.2 During testing, the appropriate hollow structures and compensating diaphragms shall be tested for strength and tightness.

5.3.3 While assessing technical condition of these facilities, the applicable provisions of 2.4.8, Part II "Survey Schedule and Scope" of the Rules for the Classification Surveys of Ships in Service shall be followed.

5.4 EMERGENCY RELEASE DEVICE FOR JETTISONABLE BALLAST AND OTHER EQUIPMENT EXTERNAL TO THE PRESSURE HULL

5.4.1 At initial and special surveys, the device shall be verified for compliance with the Rules for Manned Submersibles and Ship's Diving Systems and as-built documentation as well as actuators of this device shall be subject to detailed examination, and this device shall be operationally tested.

5.4.2 At annual survey, the device shall be operationally tested, and where necessary measured and disassembled.

5.4.3 During operational test of the device, the surveyor shall check the efficient operation of the gear and hand drive (at an effort upon the handle not exceeding 118 N) of emergency release for jettisonable ballast or other equipment, and proper operation of means preventing their accidental loss.

5.4.4 While assessing technical condition of load-bearing elements of the structure of the emergency release device for jettisonable ballast and/or other equipment to determine the wear effects on strength and efficiency, the requirements of Part III "Equipment, Arrangements and Outfit" of the Rules for Manned Submersibles and Ship's Diving Systems shall be taken into account.

5.5 EMERGENCY RELEASE DEVICE FOR SUPPORT WIRE ROPE AND UMBILICAL OF THE DIVING BELL

5.5.1 At initial and special surveys, the emergency release device shall be verified for compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems and as-built documentation, and its technical condition shall be assessed by detailed examination and operational test.

At annual survey, the device shall be subject to operational test.

5.5.2 For all types of surveys, the support wire rope fixation into the diving bell base shall be verified for compliance with as-built documentation.

5.5.3 During operational test, the following shall be performed:

check for the efficient actuation of blades of cutting devices;

pressure monitoring in the hydraulic system to cut the umbilical;

operability verification of the hand drive at effort of not more than 245 N.

5.5.4 If the actuation of the umbilical release gear cannot be tested without destruction of the umbilical, this gear may be checked dismantled on the bench or using other simulation method as agreed upon with the Register.

**5.6 MATING SYSTEM FOR CONNECTION OF MANNED SUBMERSIBLES, HYPERBARIC
EVACUATION SYSTEMS AND DIVING BELLS TO COMPRESSION CHAMBERS AND
COMPRESSION CHAMBERS TO ONE ANOTHER**

5.6.1 At initial and special surveys, the mating system shall be subject to detailed examination, pressure testing for strength and tightness as well as operational test.

For these types of surveys, the system shall be verified for compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems and as-built documentation.

5.6.2 At each annual survey, the mating system shall be subject to pressure testing for strength and tightness and operational test.

5.6.3 The strength and tightness testing of the mating system shall be carried out simultaneously with similar tests of hulls of the manned submersibles, diving bells, hyperbaric evacuation systems and compression chambers.

5.6.4 During operational test, the surveyor shall check the following:
evenness of the sealing arrangement compression around the entire perimeter of the coupling flange;
tight and efficient connection of the manned submersibles, hyperbaric evacuation systems and diving bells to the compression chambers and the compression chambers to one another;
efficient actuation of interlocking devices at connection and disconnection;
tight and efficient connection of the manned submersibles, hyperbaric evacuation systems and diving bells to the compression chambers by means of main and spare mating facilities where provided for mating.

**5.7 LIFTING LUGS AND LIFTING GEAR OF THE MANNED SUBMERSIBLES,
DIVING BELLS AND HYPERBARIC EVACUATION SYSTEMS**

5.7.1 During all types of surveys, lifting lugs and lifting gear of manned submersibles, diving bells and hyperbaric evacuation systems shall be subject to external examination.

5.7.2 At initial and special surveys, the surveyor shall verify manned submersibles/diving bells for compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems and as-built documentation as well as carry out wear and defect measurements to assess the technical condition of lifting lugs and parts of the lifting gear.

5.7.3 While assessing technical condition to determine the effects of wear and defect degree of the lifting lugs and parts of the lifting gear on their strength, the requirements of Section 7, Part III "Equipment, Arrangements and Outfit" of the Rules for Manned Submersibles and Ship's Diving Systems shall be taken into account.

5.8 SIGNAL AND EMERGENCY SIGNAL MEANS

5.8.1 During all types of surveys of manned submersibles and ship's diving systems, signal and emergency signal means shall be operationally tested.

At initial and special surveys, the surveyor shall verify these means for compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems and as-built documentation as well as perform their operational test.

Prior to operational test, the means shall be subjected to detailed examination, and emergency signal means shall be tested by pressure for strength and tightness.

The strength and tightness testing shall be carried out simultaneously with similar tests of hulls of manned submersibles, diving bells and hyperbaric evacuation systems.

5.8.2 The emergency surfacing of the emergency signal means when released from the inside of the manned submersible/diving bells shall be operationally tested. At initial survey, this check shall be performed at the limiting heel and trim angles, which are likely to occur in specified operating conditions of the manned submersibles/diving bells.

5.8.3 The emergency signal means shall be tested by pressure for strength and tightness according to standards specified in Part II "Hull" of the Rules for Manned Submersibles and Ship's Diving Systems.

6 FIRE PROTECTION

6.1 GENERAL

6.1.1 The applicable requirements specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service shall fully apply to the scope and procedure of survey of fire protection items for manned submersibles/ship's diving systems.

Machinery and electrical equipment included in fire protection shall be surveyed in accordance with the requirements of Sections [7](#) and [8](#) of these Guidelines.

6.2 SURVEYS

6.2.1 For all types of surveys of items of fire protection for manned submersibles/ship's diving systems, in addition to applicable provisions specified in 2.2.4 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service, the surveyor shall check the following:

.1 materials used for equipment of spaces as well as for internal and external fire extinguishing systems and warning alarms systems;

.2 actuation of pressure water-spraying system from both the inside and outside of the compression chamber, hyperbaric evacuation system (air supply shall be effected during annual surveys);

.3 availability of hyperbaric portable fire extinguishers suitable for high pressure conditions with extinguishing medium having no harmful effect in an enclosed space on the human health in the diving bell, compression chambers, manned submersibles and hyperbaric evacuation systems;

.4 availability of self-contained breathing apparatuses capable of functioning not less than 30 min in rooms intended for communication and control of the manned submersible/ship's diving system on board the support ship, with number corresponding to the number of operating personnel in the room;

.5 availability of portable fire extinguishers complying with requirements specified in 5.4, Part V "Fire Protection" of the Rules for Manned Submersibles and Ship's Diving Systems in spaces on board the support ship intended for control, communication and siting of the manned submersibles (ship's diving systems), as well as for placement of the manned submersible ancillary gear;

.6 availability of self-contained breathing apparatuses capable of functioning for a period of time required for emergency surfacing from the operating diving depth and recovery aboard in each pressure-resistant compartment of the manned submersible except for the lock-out submersible (if there is no emergency stationary breathing system), the number of these apparatuses shall correspond to that of crew members of the manned submersible plus spare apparatus.

6.2.2 At initial and special surveys of fire protection items of manned submersibles/ship's diving systems, their compliance with the Rules for Manned Submersibles and Ship's Diving Systems shall be verified by the surveyor in addition to the applicable requirements of Part II "Survey of the Manned Submersibles and Ship's Diving Systems under Construction and Products during Manufacture".

7 MACHINERY INSTALLATIONS, MECHANICAL EQUIPMENT AND SYSTEMS

7.1 GENERAL

7.1.1 These requirements are additional to the requirements specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service in terms of scope, sequence and procedure of technical supervision of the Register for items of machinery installations, mechanical equipment, systems and piping specific for manned submersibles/ship's diving systems.

7.1.2 Summarized scope of items of machinery installations, mechanical equipment, systems and piping of manned submersibles and ship's diving systems to be surveyed is specified in Appendix 2, to Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

7.1.3 For all types of surveys, all items of machinery installation, mechanical equipment, systems and piping shall be tested for the intended purpose.

7.1.4 At initial survey, items of machinery installation, mechanical equipment, systems and piping shall be verified for compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems.

7.1.5 Periodical surveys of machinery installations, pressure vessels, systems and piping of manned submersible and ship's diving system support ships shall be carried out simultaneously with surveys of manned submersibles and ship's diving systems. Results of surveys shall be recorded in manned submersible or ship's diving system documents.

7.1.6 For operational test and trials of machinery, systems and piping of manned submersibles and ship's diving systems, the provisions specified in [3.1.12](#) of these Guidelines shall be considered.

7.2 ENGINES

7.2.1 Engines shall be subject to operational testing both in surface and submerged positions during all types of surveys.

7.2.2 Compensating diaphragms of exposed engines shall be subject to external examination and strength and tightness testing during all types of surveys according to the requirements of the Rules for Manned Submersibles and Ship's Diving Systems.

7.2.3 Engine sealing glands shall be subject to external examination and tightness testing at the operating pressure during all types of surveys.

7.3 AUXILIARY MACHINERY

7.3.1 Auxiliary machinery include pumps (differential pumps, vacuum pumps, hydraulic system pumps, and life support system pumps), compressors (air compressors, gas compressors, air conditioning coolant compressors, and compressors of breathing gas mixtures of compression chambers), steering engines, guide rope anchor gear, hydraulic motors and fans (breathing gas mixture fans, hot air fans, etc.).

7.3.2 At special survey, auxiliary machinery shall be submitted to detailed examination according to the requirements specified in 2.4.5.7 Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service.

7.3.3 During survey of compressors, pressure membranes shall be examined.

7.4 PRESSURE VESSELS AND APPARATUSES

7.4.1 The requirements of this Chapter apply to the pressure vessels and apparatuses with valves and instruments of the following systems:

- .1** life support system;
- .2** fire extinguishing system, waste water system, and drinking and domestic water supply systems.

7.4.2 For pressure vessels designed for storage of breathing gas mixtures, the scope of special surveys shall include the following:

- .1** external and internal examination according to the requirements specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service;
- .2** hydraulic tests by pressure equal to $1,25P$ according to requirements specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service.

7.4.3 Pressure vessels and apparatuses shall be surveyed according to the requirements specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service.

7.4.4 Arrangement, fastening and colour of bottles for gases and gas mixture storage shall be checked during each survey.

7.4.5 Bottles for storage of gases and gas mixtures shall be hydraulically tested with fresh water. When hydraulic tests are over, inner surfaces of the bottles shall be thoroughly dried.

7.5 SYSTEMS AND PIPING

7.5.1 General.

7.5.1.1 The requirements of this Chapter apply to systems and piping specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service and to the following systems:

- .1 submergence and surfacing system;
- .2 compensating system;
- .3 trim system;
- .4 hydraulic system;
- .5 life support system.

7.5.1.2 When surveying systems and piping, the surveyor shall follow the requirements specified in 2.2.6 and 2.4.6 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service with regard to the provisions of this Chapter.

7.5.1.3 Assembled systems and piping during each special survey of manned submersibles/ship's diving systems shall be subject to hydraulic test with pressure according to the requirements of Part Vin "Systems and Piping" of the Rules for the Classification and Construction of Sea-Going Ships.

7.5.1.4 Systems and piping installed in diving bell, inside ship's diving system compression chambers and in diving compartment of submersible during annual survey are subject to tightness test with pressure equal to operating pressure irrespective of pressure they work under on a diving submersible and ship's diving system.

7.5.1.5 Hydraulic tests of piping and systems of manned submersibles/ship's diving systems shall be carried out after repair and complete or partial replacement of pipes or valves.

After final treatment and before installation on manned submersibles/ship's diving systems, all newly installed pipes and valves shall be hydraulically tested with pressure according to the requirements of the Rules for the Classification and Construction of Sea-Going Ships.

7.5.1.6 Summarized scope of periodical surveys of systems and piping is provided in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

7.5.2 Detailed examination and operational testing during special surveys.

7.5.2.1 During survey of the compressed air system, the surveyor shall examine valves and manual, automatic and remote controls of valves. When carrying out tightness testing of this system, the surveyor shall separately test non-return shut-off valves at outlet to ballast tanks, which prevent water ingress into air pipeline.

7.5.2.2 During survey of the submergence and surfacing system, the surveyor shall examine flooding valve, vent valves of ballast tanks, blow-off pipeline, flooding pipeline, ballast tank valves and drives of remote-control valves.

When the system is tested in operation, test flooding valves and vent valves shall be subject to tightness tests while blowing off the ballast.

7.5.2.3 When surveying the compensating system, the surveyor shall examine the compensating tanks, remotely operated distributor, valves and pipeline.

When testing the system in operation, pump operation, operability of valve remote control systems, high-pressure air valve interlocks, limit switches and fluid level indicators in tanks shall be checked.

7.5.2.4 When surveying the trim system, the surveyor shall examine tanks, pipeline and valves.

7.5.3 Life-support systems.

7.5.3.1 The requirements of this Chapter apply to the following life support systems:

- .1 gas supply systems of compressed air, single-component gases and breathing gas mixtures to compartments of manned submersibles, diving bells and divers;

- .2 breathing gas mixture disposal and helium regeneration systems;
- .3 system of gas mixture preparation and supply to diving bell and compression chambers;
- .4 gas analysis system;
- .5 heating system of manned submersible/ship's diving system compartments;
- .6 regeneration and conditioning system for gas atmosphere in the manned submersible, compression chamber, diving bells compartments and supplied for breathing of divers;
- .7 water heating systems for divers in diving bells and in diving outfit;
- .8 sanitary systems (system for water supply to compression chamber compartments and sewage systems);
- .9 emergency systems and associated hoses as a part of umbilical and detachable flexible piping applied in these systems.

7.5.3.2 For all types of surveys of life support systems, the surveyor shall pay attention that installation of safety membranes is not allowed.

7.5.3.3 For all types of surveys of detachable flexible piping, the surveyor shall pay attention to the piping connection fittings. Each breathing mixture and each gas shall have detachable flexible pipeline (if any) with individual connection sizes. Connections of detachable flexible piping shall be tested for leakage with a pressure set depending on the applied test method.

7.5.3.4 At special survey of diving hoses, the surveyor shall carry out tightness with gas pressure equal to at least $1,25P_{op}$ and for longitudinal strength with load equal to permissible axial load specified in the performance specification for delivery of hoses. In such case, deformation of outer diameter shall not exceed 15 % of initial diameter, and residual elongation is not allowed.

7.5.3.5 For all types of surveys of manned submersible/ship's diving system oxygen and breathing gas mixture supply systems, the surveyor shall examine non-return valves, non-return shut-off valves, reducing, throttle and safety valves.

When the systems are tested in operation, operation of reducing, throttle and non-return valves shall be tested.

7.5.3.6 Safety valves on pressure vessels, systems and piping shall be tested for operation during each periodical survey.

Valves shall be set to pressure of $P_{open} < 1,05P_{op}$ (for $P_{op} < 0,1$ MPa) or $P_{open} < 1,03P_{op}$ (for $P_{op} > 0,1$ MPa), where P_{open} is valve opening pressure. Maximum permissible safety valve operation pressure is $P_{max} < 1,1P_{op}$.

Operated safety valves shall completely stop air (gas) outflow from systems when operating pressure decreases by not more than $0,15P_{op}$. After their adjustment, safety valves shall be sealed.

7.5.3.7 For all periodical surveys, the surveyor shall check for availability of documents and/or brands and seals on pressure gauges and depth gauges, which confirm completion of metrological control.

7.6 PROPELLERS AND SHAFTING

7.6.1 During survey of propellers, the surveyor shall follow the requirements specified in Section 2 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service and consider the requirements of this Chapter.

7.6.2 For all types of surveys, sealing glands of propeller shafts shall be subject to external examination and tightness testing with pressure equal to test diving depth pressure.

7.6.3 For all types of surveys, manned submersible/diving bell propellers shall be subject to operational test.

7.6.4 At annual surveys, operational test shall apply to manned submersibles/diving bells in surface position.

7.6.5 At initial and special surveys, manned submersibles/diving bells shall be tested in surface and submerged positions. While testing, specific performance parameters of propellers that ensure reliable and safe operation of manned submersibles/diving bells shall be checked.

At initial survey, compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems shall be additionally verified.

8 ELECTRICAL EQUIPMENT

8.1 GENERAL

8.1.1 At survey of electrical equipment, the requirements of Part II "Survey Schedule and Scope" of the Rules for the Classification Surveys of Ships in Service and Section 2, Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service, as well as Sections [3](#) and [8](#) of these Guidelines shall be applied.

8.1.2 Summarized scope of survey of electrical equipment during periodical surveys of manned submersibles and ship's diving systems is specified in Table in Appendix 2 to Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

8.2 INITIAL SURVEY

At initial survey of items of electrical equipment of manned submersibles and ship's diving systems, the survey scope and conditions shall be set according to the requirements specified in 2.1 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service based on the scope of special survey ([refer to 8.3](#)).

8.3 SPECIAL SURVEY

8.3.1 At special survey, compliance with the requirements of the Rules for the Classification and Construction of Sea-Going Ships and Rules for Manned Submersibles and Ship's Diving Systems in relation to the composition of electrical equipment, its design, location, installation and specifications shall be verified, and technical condition of equipment shall be estimated.

8.3.2 At special survey of electrical equipment of manned submersibles and ship's diving systems, its scope and conditions shall be specified according to the applicable requirements specified in 2.4.7 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service.

8.3.3 In addition to the requirements specified in 2.4.7 of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service, the following shall be checked during special survey:

.1 condition of all electrical equipment installed outside the pressure hull, design of its enclosures, guards, coatings etc.;

.2 quality of compensating liquid of exposed electrical equipment (according to the ship inspection reports);

.3 tightness of electrical equipment installed outside of the pressure hull, pressure hull cable penetrations (including umbilical penetrations for tethered manned submersibles and ship's diving systems);

.4 condition of umbilical cables (for tethered manned submersibles and diving bells);

.5 condition of receivers, sensors, sound and light sources, and other elements included in systems for monitoring and alarm (current and limit values) of diving depth, concentration and other parameters of breathing gas mixture, position of remotely operated valves of submerging, surfacing and trimming system, liquid level, etc.;

.6 condition of elements in monitoring and alarm system of propulsion plants and life support systems;

.7 condition of accumulator batteries of propulsion plant and emergency power source, their fastenings and charging facilities.

8.3.4 At special survey, insulation resistance of all electrical equipment and cabling, including umbilical cables shall be measured.

8.3.5 At special survey, operational testing of electrical equipment for the intended purpose shall be carried out in submerged and surface positions of manned submersibles/diving bells. Testing in the surface position shall be carried out directly by the surveyor, and that in the submerged position, by the test team.

8.3.6 When carrying out testing electrical equipment in operation, the following shall be tested in addition to the specified in Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service:

.1 when testing electric drives of manned submersible/diving bell mechanisms and devices, operation of means for centralized emergency switch-off of drives from continuously manned control station; operation of phase break off relay, which switch off handling system mechanisms with alternating-current motors in case of failure of any of three phases (for group of synchronously operating mechanisms); operation of remotely operated valves of submerging, surfacing and trimming system; operation of overload alarm of electric motors installed in pressure hull of manned submersible/diving bell;

.2 when testing electrical systems for monitoring and alarm (current and limit values) of diving depth, concentration and other parameters of breathing gas mixture; position of remotely operated valves of submerging, surfacing and trimming systems; ingress of water into manned submersible pressure hull; discharge of accumulator batteries and insulation resistance of electrical circuits, check for correct indication of current value indicators (using

verified reference instruments), operability of alarm for each parameter to be checked by simulating device actuation conditions;

.3 when testing monitoring and alarm system of propulsion plants and life support mechanisms and devices, refer to the provisions of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service;

.4 when testing service telephone communication, operability and efficiency of independent telephone communication between the support ship diving control station and the diver in water, as well as tethered manned submersible/diving bell, compression chamber spaces and control stations of handling system and control stations of handling system, life support systems and support ship; operability and efficiency of independent telephone communication between main control station of self-sustained manned submersible and diving compartment and other manned spaces of manned submersible; operability and efficiency of speech unscrambler (in diving bell, manned submersible compartments and compression chambers using helium gas mixture).

8.4 ANNUAL SURVEY

8.4.1 At annual survey of manned submersibles and ship's diving systems, modifications in composition of electrical equipment, its design, location, installation and technical condition shall be revealed.

8.4.2 At annual survey, electrical equipment shall be tested and subjected to examination according to the requirements of [8.3.3](#) ([except for 8.3.3.3](#)). Besides, devices and items for cable laying (including those of umbilical) and cable penetration through pressure hull shall be subject to external examination.

8.4.3 At annual survey, external examinations shall be carried out with a limited, as compared with special survey, scope of opening-ups, disassembling and dismantling.

8.4.4 At annual survey, only electrical equipment located in dangerous spaces and outside the pressure hull of manned submersible/diving bell shall be subject to detailed examination.

8.4.5 During annual survey, all power and illumination equipment (including emergency one), electrical control and alarm systems, and underwater telephone communication means shall be subject to operational testing.

8.4.6 Operational test of electric propulsion plant shall be carried out in surface position and, if necessary, in the submerged (at depth of 10 – 15 m) position of the manned submersible. In such case, in all cases, start and reverse of propulsion motor at minimum speed of rotation and operation of interlocking and signalling provided by the electric movement diagram shall be tested.

9 RADIO, SONAR AND NAVIGATIONAL EQUIPMENT

9.1 GENERAL

9.1.1 During survey of radio, sonar and navigational equipment, the applicable provisions specified in 2.1.3 of Part III "Survey of Ships in Compliance with International Conventions, Codes, Resolutions and Rules for the Equipment of Sea-Going Ships" of the Guidelines on Technical Supervision of Ships in Service, Annex 15 to the Guidelines on Technical Supervision of Ships in Service, and the provisions of Sections [3](#) and [9](#) of these Guidelines shall be applied.

9.1.2 At periodical surveys, scope of survey of radio, sonar and navigational equipment of manned submersibles and ship's diving systems is provided in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

9.1.3 For all types of survey, depth indicators, COSPAS-SARSAT satellite emergency position-indicating radio beacons and emergency sonar beacons with a fixed frequency of 37,5 kHz are subject to mandatory periodic checks carried out by a firm recognized by the Register. The test report shall be attached to the RS report on manned submersible and ship's diving system survey.

9.1.4 Instruments and arrangements as parts of radio, sonar and navigational equipment of manned submersibles and ship's diving systems shall be approved by the Register.

9.1.5 Radio, sonar and navigational equipment of manned submersibles and ship's diving systems, installed at the discretion of the shipowner in addition to the mandatory equipment required by the Rules for Manned Submersibles and Ship's Diving Systems, with the purpose of enhancing safety of life and navigation at sea, is subject to the full scope technical supervision carried out by the Register only in case where it fully duplicates the mandatory equipment in respect to its use and commutation with aerials and sources of power as parts of the mandatory equipment.

In cases where the routine operation of the equipment required by the Rules for Manned Submersibles and Ship's Diving Systems is affected by operation or arrangement of the additional equipment, the RS surveyor shall require elimination of such negative influence causes.

9.2 INITIAL SURVEY

9.2.1 During initial survey of radio, sonar and navigational equipment of manned submersibles and ship's diving systems, the survey scope and conditions shall be specified according to the requirements of [9.3](#) and according to the applicable requirements of Part II "Carrying Out Classification Surveys of Ships" of the Guidelines on Technical Supervision of Ships in Service within the scope of special survey.

9.3 RENEWAL SURVEY

9.3.1 At renewal survey of radio, sonar and navigational equipment of manned submersibles and ship's diving systems, the survey scope and conditions shall be specified according to the requirements of [9.4](#) and according to the requirements specified in 2.1.3 of Part in "Survey of Ships in Compliance with International Conventions, Codes, Resolutions and Rules for the Equipment of Sea-Going Ships" of the Guidelines on Technical Supervision of Ships in Service within the scope of renewal survey.

9.3.2 At renewal survey of radio, sonar and navigational equipment of manned submersibles and ship's diving systems, the equipment shall be subject to detailed examination and operational testing by the RS surveyor in surface position of manned submersible/diving bell and by the test team in submerged position.

Operational testing of equipment in surface position is carried out, as a rule, without bringing it to the working condition but with checking start, availability of indications and operation of controls, remote indications and alarm systems.

Operational testing of the equipment in submerged position shall be carried out at operating depth of a manned submersible/diving bell according to the special program approved by the Register, including functional test of sonar communication in radiotelegraphy mode, voice messages and code communication.

9.3.3 In addition to the above mentioned and to the requirements specified in [9.4](#), the following shall be examined:

.1 thoroughly – condition of all radio, sonar and navigational equipment of manned submersibles and ship's diving systems and of its component units installed outside the pressure hull, ingress protection of cases and aerials, pressure hull cable penetrations, quality of coatings, etc.;

.2 residual capacity of standby power source, which shall not be lower than the calculated minimum permissible value.

9.4 ANNUAL SURVEY

9.4.1 At annual survey of radio, sonar and navigational equipment of manned submersibles and ship's diving systems, the equipment shall be examined and tested in operation by the RS surveyor in surface position of manned submersible/diving bell. Where necessary, the RS surveyor may require to carry out test of some units or equipment in submerged position of manned submersible/diving bell.

9.4.2 The survey scope and its conditions shall be specified according to the applicable requirements specified in 2.1.3 of Part III "Survey of Ships in Compliance with International Conventions, Codes, Resolutions and Rules for the Equipment of Sea-Going Ships" of the Guidelines on Technical Supervision of Ships in Service.

9.4.3 In addition to the above-mentioned requirements, the following shall be checked:

.1 compliance of composition of installed radio, sonar and navigational equipment of manned submersibles and ship's diving systems with composition specified in the previous annual survey report or in the ship design approved by the Register;

.2 insulation resistance (not less than 1 M Ω) of sonar aerials. Where the results of insulation resistance measurements are unsatisfactory, it is necessary to carry out detailed check of condition of radio, sonar or navigational equipment of manned submersibles and ship's diving systems whose aerials have shown unsatisfactory results of measurements, in particular, units of equipment installed outside the pressure hull. In such case, ingress protection of cases and aerials, pressure hull cable penetrations, quality of coatings, etc. shall be checked;

.3 quality of radiotelephone communication and DSC mode communication within the VHF frequency band between self-sustained manned submersible and support ship or shore base;

.4 capacity of sonar aerials (according to the requirements of the datasheet or specification for a particular sonar equipment);

.5 operation of built-in operational and alarm systems;

.6 compensating liquid quality of submerged or float-free equipment (according to the ship test reports);

.7 expiry dates of power sources integrated in satellite emergency position-indicating radio beacons, radar search and rescue transponders, emergency sonar beacons, etc., and integrity of seals (if any), which prevent unauthorized switching of the specified equipment. In such case, power sources that expire in less than one year from the moment of survey shall be replaced.

10 HANDLING SYSTEM

10.1 GENERAL

10.1.1 During survey of handling systems of manned submersibles and ship's diving systems installed on manned submersible and ship's diving system support ships, the general provisions for technical supervision and the main requirements of the Rules for the Cargo Handling Gear of Sea-Going Ships and of the Rules for Manned Submersibles and Ship's Diving Systems shall be applied.

10.1.2 Summarized scope of surveys of handling system structures and items during periodical surveys of manned submersibles and ship's diving systems is provided in Appendix 2, Part I "Classification" of the Rules for Manned Submersibles and Ship's Diving Systems.

10.1.3 Electrical equipment of handling systems shall be surveyed according to the requirements of [Section 8](#) of these Guidelines.

10.1.4 The scope of initial survey of handling system items shall be based on the scope of special survey considering possible survey scope reduction if Classification Certificate issued by a recognized ACS is available.

At survey, handling systems shall be verified for compliance with the requirements of the Rules for Manned Submersibles and Ship's Diving Systems and the detailed (design) documentation as well as tested for strength according to the requirements specified in [10.2.1](#).

10.1.5 At special survey of handling systems, structures, interchangeable components and loose gear, mechanisms, lead screws, rollers, racks, locking devices, safety devices, vertical and horizontal motion compensators of manned submersibles/diving bells, transportation platforms and control consoles of handling system shall be subject to thorough examination and operational testing. Steel wire ropes of handling systems shall be replaced.

10.1.6 At annual survey, the handling system items are subject to the following types of survey:

.1 structures with permanently fitted fixed gear (masts, posts, ties of counterweights, foundations, etc.), interchangeable components and loose gear (blocks, axles, eyes, catches, etc.) shall be subject to external examination;

.2 steel wire ropes of handling systems shall be subject to external examination (with wear measurement, if necessary);

.3 mechanisms, lead screws, rollers, racks, locking devices, safety devices, vertical and horizontal motion compensators of manned submersibles/diving bells, transportation platforms and control consoles shall subject to external examination and operational testing.

10.2 HANDLING SYSTEM TESTING AND SURVEYS

10.2.1 During initial, special and occasional surveys, handling systems shall undergo static and dynamic tests.

Strength tests shall be carried out with a proof load equal to 1,5 of the handling system load capacity for static testing and 1,1 of the handling system load capacity for dynamic testing.

Strength tests shall be carried out with a proof load. Application of dynamometer instead of a proof load is not allowed

Strength tests may be carried out using the standard manned submersible (diving bell) with increase of its weight to the required value with an additional weight.

Strength tests may be performed by standard manned submersibles/diving bells by increasing their weight up to the required load using additional proof load.

10.2.2 During static tests, the proof load shall be kept in surface position with the system swung outboard for 10 min, and then the metal structures, mechanisms and devices are subject to visual examination.

Where residual strains or other damages are not detected, dynamic tests of the handling system shall be carried out.

10.2.3 Generally, dynamic testing shall be performed by triple launching or lowering a load equal to 1,1 of the handling system load capacity into water until fully submerged (depending on type of the manned submersible and diving bell) and lifting back to the upper position. Abrupt braking is performed during each lowering to test operation of brakes and strength of the handling system.

10.2.4 Catches (wedge stoppers) shall be tested during static tests of handling system with a load equal to 1,5 of the handling system load capacity. Rope slipping through operating wedge stoppers are not allowed.

10.2.5 Where static and dynamic test results are satisfactory, operational testing of the handling system shall be carried out by lowering and lifting the manned submersible/diving bell without people.

10.2.6 The operational testing of handling system of manned submersible/diving bell with negative buoyancy shall be carried out by triple lowering the manned submersible/diving bell to the operating depth.

At initial survey, the handling system shall be tested in the sea state close to the limit value specified in the handling system certificate. In other cases, the handling system may be tested in the sea state less than the limit value. During each lowering operation, two-fold abrupt stopping of the handling system shall be carried out at its maximum speed by stopping the lowering winch drive to simulate jerking on waves.

10.2.7 When carrying out survey of ropes, the following shall be taken into account:

.1 ropes without certificates or data of laboratory tests shall not be used. Where a rope certificate specifies the total breaking strength of wires, the breaking strength of the rope as a whole shall be determined by multiplying the total breaking strength by coefficient of 0,83;

.2 when the ropes are replaced, the RS surveyor shall ensure that the safety factor of steel wire ropes relative to the breaking load of the rope as a whole shall not be less than:

6 – for manned submersible/diving bell with negative buoyancy and emergency surfacing device available and for self-sustained manned submersibles;

3 – for emergency lifting of manned submersible/diving bell;

2,5 – for all manned submersibles/diving bells when ropes are tested for dynamic loads which occur in the permissible sea state (with shock-absorbing taken into account).

.3 where within any length-wise section equal to 8 diameters of a steel wire rope the number of broken wires is equal to or exceeding 10 % of the total number of wires or where a broken strand or excessive rope deformation is detected, such a steel rope shall not be applied.

After 5 years, the ropes installed on the handling system shall be replaced irrespective of their condition and total operation time.

10.2.8 For all types of surveys of handling system, the following shall be checked:

.1 absence of spontaneous movement of trolleys, retractable telescopic trusses or other retractable (luffing) structures at maximum permissible heel and trim of manned submersible/ship's diving system support ship and stop of these structures in any position when the drive is stopped;

.2 condition of handling system sea-securing devices and arresting devices in "stowed for sea" position for fixing the handling system trusses (girders) and bridges in extreme positions;

.3 condition of railways, their dampers and fixtures preventing derailment of trolleys and trusses;

.4 condition of trolley wheels (irregular wear in diameter shall not exceed 0,05 diameter, and wear of drum flanges shall not exceed 40 % of the initial dimension);

.5 synchronous operation of mechanisms, which ensure jointly appropriate positions of the manned submersible/diving bell during lowering, lifting or truss (girder) luffing;

.6 smooth movement of manned submersible/diving bell when the load trolleys traveling gear operates and the trusses (girders) are luffed;

.7 operation of limit switches, which stop the handling system mechanisms when they approach the extreme positions during lowering and lifting, luffing of trusses (girders) and movement of trusses or load trolley;

.8 operation of interlocking device, which prevents lifting (lowering) of manned submersible/diving bell when the limit switches are deactivated;

.9 operation of electric brakes of handling system mechanisms by hard braking during lowering.

10.2.9 For all types of survey of mechanically driven reels used for laying cables and hoses connected to current sources and gas medium and located on the manned submersible/ship's diving system support ship, the following shall be checked:

.1 proper connection;

.2 absence of damages or attritions of cable sheaths and hoses;

.3 efficient operation of slip devices or breakdown torque clutches operating at loads not in excess of elastic strain loads in cables and hoses;

.4 rope capacity of reel drums, which shall be sufficient to enable the manned submersible/diving bell diving to the operating depth, considering the slack equal to at least 30 % of the operating depth and availability of at least 4 turns on the drum. Where a new cable or hose is laid, it is necessary to ensure that their bending radius complies with the reel drum diameter. The least permissible drum diameter shall not be less than 20 rope diameters;

.5 proper operation of clutches, brakes and interlocking device which provide impossibility of disconnection when the brake (stopper) is released;

.6 absence of support wire ropes twisting between each other or with the umbilical;

.7 correct coiling of support wire ropes and umbilical on the reel drum;

.8 operation of counters of paid-out length of wire ropes and umbilical.

11 REGISTER DOCUMENTS

11.1 Based on the results of technical supervision of manned submersibles and ship's diving systems, the Register issues the applicable documents specified in Section 4 of the General Regulations for the Classification and Other Activity Relating to Manned Submersibles and Ship's Diving Systems of the Rules for Manned Submersibles and Ship's Diving Systems.

11.2 The Classification Certificate for a manned submersible/ship's diving system shall specify the following:

.1 main particulars of manned submersible/ship's diving system:
type and purpose of manned submersible/ship's diving system;
registered number of manned submersible/ship's diving system;
owner of manned submersible/ship's diving system;
year and place of build of manned submersible/ship's diving system;
diving depth of manned submersible/operating pressure of ship's diving system/diving depth of diving bell when used as an observation chamber (if any);
crew number of manned submersible/ship's diving system; in such case, the number of divers in diving compartment for a diving submersible, the number of passengers for a passenger submersibles and the number of divers in diving bell for a ship's diving system shall be specified in brackets;

self-sustainment of manned submersible in submerged position/number of compression chambers and number of compartments in ship's diving system compression chambers;

.2 permissible wind and wave characteristics shall be specified.

11.3 Information about testing and survey of a manned submersible/ship's diving system handling machinery shall be recorded in the Register of Ship's Cargo Handling Machinery and Gear of the Support Ship of the Manned Submersible and Ship's Diving System. In such case, an entry confirming that the handling machinery is tested in compliance with Section [10.2](#) of these Guidelines shall be made in the handling machinery description

11.4 The basis for issue (renewal) of the Classification Certificate to manned submersible/ship's diving system are the following documents:

Ship Survey Statement (form 6.1.03) based on Checklist (form 6.1.01) generated in the program STORM;

Report on Survey of the Ship (form 6.3.10) in case of occasional survey.

11.5 The documents listed in [11.4](#) shall be filled in upon the results of technical supervision during construction (or upon the initial survey results), as well as the results of special, annual and occasional surveys of manned submersibles/ship's diving systems. The documents shall specify technical condition of the equipment surveyed in accordance with the Nomenclature of Items of the Register Technical Supervision. Besides, the information about what equipment was subjected to operational testing by the test team with the manned submersible/diving bell in submerged position, with due reference to the attached records of tests carried out by the test team.

11.6 The basis for confirmation of the Classification Certificate for Manned Submersible/Ship's Diving System is the Survey Checklist (form 6.1.01) in the program STORM.

11.7 The RS documents issued for manned submersibles/ship's diving systems shall be kept on board of the manned submersible/ship's diving system support ship (if any or kept by the owner of the manned submersible).

11.8 The Classification Certificate of manned submersible/ship's diving system becomes invalid in following cases:

.1 upon expiry of validity period;

.2 where the manned submersible or ship's diving system has not been submitted to the prescribed survey in due date;

- .3 after an emergency;
 - .4 after repair, conversion or modification carried out without the RS technical supervision of those parts of manned submersible/ship's diving system, which the Rules requirements apply to;
 - .5 where the manned submersible/ship's diving system is not maintained in proper technical condition ensuring its safety;
 - .6 where the operating conditions stated in the Classification Certificate have been violated;
 - .7 where terms or instructions of the Register have not been followed.
- 11.9** Besides, the Diving System Safety Certificate (form 2.4.28) provided for by the IMO Code of Safety for Diving Systems may be issued for the ship's diving systems that comply with the requirements of this Code.
- 11.10** The Passenger Submersible Craft Safety Certificate (form 2.1.44) shall be issued for the passenger submersibles complying with the requirements of the Guidelines for the Design, Construction and Operation of Passenger Submersible Craft (refer to IMO MSC/Circ.981).
- 11.11** After testing at the firm (manufacturer), the Certificate filled-in and signed by the Register (form 6.5.30) specifying the performance characteristics may be issued to the ship's diving system.

LIST OF COMMISSIONING TECHNICAL DOCUMENTATION OF MANNED SUBMERSIBLE AND SHIP'S DIVING SYSTEM TO BE SUBMITTED TO THE REGISTER

- 1 General**
 - 1.1** General specification on manned submersible and ship's diving system (may be submitted in separate parts).
 - 1.2** Operating Manual of manned submersible and ship's diving system.
 - 1.3** General arrangement plan of manned submersible and ship's diving system plan.
 - 1.4** List of mechanisms and equipment installed on manned submersible and ship's diving system with technical characteristics (and information on approval).
 - 1.5** Conditions of strength and tightness testing of compartments and systems.
 - 1.6** Diagram of watertight compartments with indication of types of closing devices and their drives.
 - 1.7** Inclining Test Record.
 - 1.8** Reballasting Record.
 - 1.9** Maintenance Manual for passenger submersibles.
- 2 Hull**
 - 2.1** Hull specification (may be submitted as part of the general specification – [refer to 1.1](#)).
 - 2.2** Structural drawings (longitudinal section, transverse sections and pressure bulkheads).
 - 2.3** Drawings of reinforcements for cutouts for hatches, view ports and cable penetrators.
 - 2.4** Description and diagrams of corrosion protection means.
 - 2.5** Structural drawings of supports and/or suspensions of a manned submersible, diving bell and compression chambers.
 - 2.6** Drawings of foundations for the main equipment (irrespective of installation site).
 - 2.7** Specifications for the base and welding materials applied.
 - 2.8** Solid ballast arrangement and securing plan.
 - 2.9** Weld inspection plan for structures of manned submersible and ship's diving system pressure hulls.
- 3 Arrangements, equipment and outfit**
 - 3.1** Specification for arrangements, equipment and outfit (may be submitted as part of the general specification – [refer to 1.1](#)).
 - 3.2** Arrangement plans of openings in pressure hull and pressure bulkheads of manned submersibles and ship's diving systems, with indication of type of closing device.
 - 3.3** General arrangement plans for manoeuvring and directional stability facilities of manned submersibles, with indication of main elements, dimensions (parameters), structure and material.
 - 3.4** General arrangement plans for emergency release devices for jettisonable ballast and other equipment external to the pressure hull; mating devices for connection of diving bells with compression chambers and compression chambers to each other; emergency release arrangements for wire rope and umbilical of diving bell; signal and emergency signal means; emergency quick-release gear, with indication of types and main dimensions (parameters).
 - 3.5** General arrangement plan for lifting lugs of manned submersible and ship's diving system, with indication of main dimensions and material.

- 3.6** List of emergency outfit and its arrangement plan.
- 3.7** General arrangement plan for handling system of ship's diving system (for the manned submersible, the documentation on the handling system's parts located on the manned submersible ([refer to 3.5](#)) shall be submitted, and the other documentation on the handling system may be submitted as part of the support ship's report documentation), with indication of lifting capacity and characteristics of the main elements.
- 3.8** Drawing of device for emergency lifting of manned submersible and ship's diving system aboard support ship after emergency surfacing of manned submersible and ship's diving system.
- 4 Buoyancy, stability and unsinkability of manned submersible and diving bell**
 - 4.1** Lines drawing.
 - 4.2** Weight load.
 - 4.3** Summary table of permanent buoyancy volume.
 - 4.4** Calculation of buoyancy and initial stability, buoyancy and initial stability curves in different positions.
 - 4.5** Summary table of buoyancy and initial stability in different positions (including emergency surfacing).
 - 4.6** Table of the Bonjean curves and the displacement curve.
 - 4.7** Summary table of tank elements and tank element curves.
 - 4.8** Justification of permissible wind and wave characteristics providing safe operation of manned submersible and ship's diving system.
 - 4.9** Stability Booklet.
 - 4.10** Calculations of unsinkability in surface and submerged positions.
- 5 Fire protection**
 - 5.1** Detailed description of fire protection of the spaces with indication of insulating and finishing materials applied, their location and combustibility rate. Description of fire-extinguishing systems and fire alarm diagrams (may be submitted as part of the general specification – [refer to 1.1](#)).
 - 5.2** Circuit diagrams of fire-extinguishing systems.
 - 5.3** Circuit diagram of fire alarm system.
 - 5.4** List of fire-fighting outfit and its arrangement plan.
- 6 Machinery installations, mechanical equipment and systems**
 - 6.1** Machinery installation specification (may be submitted as part of the general specification – [refer to 1.1](#)).
 - 6.2** General arrangement plan for mechanisms and equipment.
 - 6.3** General arrangement plans of shafting.
 - 6.4** Drawings of shafts, engine, their protection and seals.
 - 6.5** Diagram of controllable pitch propeller (CPP) and/or other applied propeller control system.
 - 6.6** Diagram and description of remote control systems for the main machinery, indicating instruments and alarm devices as well as means of communication.
 - 6.7** Diagrams of ship's diving system handling system mechanisms (for the manned submersible handling system may be submitted as a part of the support ship's documentation).
 - 6.8** Diagrams of mechanical installation piping.
 - 6.9** Diagrams and drawings of hydraulic system.
 - 6.10** Diagrams and drawings of submerging and surfacing, compensating and trimming systems.
 - 6.11** Diagrams of other systems not specified in [6.5 – 6.10](#).
 - 6.12** List of hoses (for umbilical) and their characteristics.

7 Electrical equipment

7.1 Electrical equipment specification (may be submitted as part of the general specification – [refer to 1.1](#)).

7.2 Circuit diagrams of power distribution from main and emergency sources of electrical sources of electrical power: power networks and lighting systems (to section switchboards).

7.3 Circuit diagrams and general arrangement plans of main and emergency switchboards, control panels and other distribution switchboards of non-standard design.

7.4 Detailed diagrams of the main current, excitation, control, pilot, signaling, protection and interlocking of electric propulsion plant.

7.5 Drawings of layout and installation of essential electrical equipment.

7.6 Diagrams of cable runs, fastening and penetrators.

7.7 Circuit diagrams of electric drive of machinery used during submergence, surfacing, compensating, trim and handling systems of ship's diving system (for the manned submersible handling system may be submitted as a part of the support ship documentation), pumps, compressors and blowers of life support systems.

7.8 Diagrams of telephone communication and signaling systems (signaling of diving depth, breathing gas mixture parameters, position of remotely operated valves of submergence, surfacing and trim systems, ingress of water into pressure hull of manned submersible, discharge of accumulator batteries and insulation resistance of electric circuits).

7.9 Diagrams of lighting circuits supplied from section switchboards.

Note : Documentation shall contain information on sectional area of cables, their types, currents and protection, including those for the umbilical.

7.10 Results of calculations of the required output of electrical power plant for all operating conditions of the manned submersible and ship's diving system and substantiation for selection of number and power of electric main and emergency power sources.

8 Radio and sonar equipment

8.1 Radio and sonar equipment specification (may be submitted as part of the general specification – [refer to 1.1](#)).

8.2 Connection diagram of means for external communication and commutation of aerials (with indication of brands and sectional areas of cable cores and protective equipment against radio interference).

8.3 Connection diagram for sonar communication means.

8.4 Diagram of wire communications with diving bell and divers.

9 Navigational equipment

9.1 Navigational equipment specification (may be submitted as part of the general specification – [refer to 1.1](#)).

9.2 List, arrangement plans and performance characteristics of navigational equipment for determination and measurement of the manned submersible motion parameters.

**LIST OF MANNED SUBMERSIBLE AND SHIP'S DIVING SYSTEM ITEMS
SUBJECT TO OPERATIONAL TESTING BY THE TEST TEAM**

1. Propellers and steering gear: sustained, sidewise and vertical propellers, horizontal and vertical rudders, propeller in steerable nozzle (check of speed and speed variation limits, dynamic motion stability, directional stability in horizontal and vertical planes, depth and course stabilization, deep manoeuvring, spatial and special manoeuvring, turning motion within operating diving depth).
2. Machinery installation and mechanisms: engines, machinery and reducers (check of reliability and absence of excessive vibration in different underwater movement modes).
3. Systems and piping: submergence and surfacing, hydraulic, compensating, trim, compressed air and fuel systems (check of operation reliability in the intended purpose and as-built characteristics).
4. Electrical equipment and power sources: outboard electrical equipment and electrical equipment operating in gas medium under pressure, electrical equipment monitoring instruments and safety devices (check of operation reliability in different modes within operating diving depth).
5. Automation systems: solid ballast jettisoning when reaching the specified depth that exceeds the operating depth; monitoring, alarm, control and protection of electrical power plant.
6. Communication and navigational means: means of sonar communication with manned submersible support ship and divers and ship's diving system; voice communicating devices inside manned submersibles and ship's diving systems, wire means of communication with divers; sonar, magnetic, mechanical, gyroscopic and electromechanical navigational devices; sonar beacons and receivers at a fixed frequency of 37,5 kHz (operational testing with bringing to the working condition when manoeuvring in all ranges of permissible depths).

Russian Maritime Register of Shipping

**Guidelines on Survey of Manned Submersibles and Ship's Diving Systems
under Construction and In Service**

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