GUIDANCE NOTES

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GUIDELINES FOR APPLICATION OF SHIP DIGITAL SURVEY

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CONTENTS

CHAPTER 1 GENERAL

Section 1 General Provisions

1.1.1 Scope of application

1.1.1.1 This Guideline specifies the implementation conditions, methods, steps, application principles, plan approval and survey requirements to carry out the ship digital survey. It is applicable to ships applying for digital survey class notation of IS Class (hereinafter referred to as "ISC").

1.1.1.2 The degree of digitization and the scope of application of digital survey for inspected objects do not affect the application of digital survey class notation.

1.1.1.3 Data collection methods include but are not limited to one or more of the following methods:

(1) Continuous monitoring;

(2) Offline measurement;

(3) System generation;

(4) Knowledge-based inputs;

(5) Manual inputs, such as certificate, report, record and other textual data.

1.1.1.4 The applicable data types include the followings:

(1) Structured data, such as structured query language (abbreviated as SQL) database;

(2) Unstructured data, such as text documents, pictures, audio and video;

(3) Semi-structured data, such as computer running logs, extensible markup language (abbreviated as XML) documents.

1.1.2 General requirements

1.1.2.1 Ships applying for ISC digital survey class notation are to prepare an implementation plan for acquiring survey data according to this Guidelines and subject to relevant surveys.

1.1.2.2 The test/diagnosis output data of inspected objects tested and diagnosed by those equipment (including the built-in self-test functions) verified by ISC to the may be directly used as the data source. For example, after the self-test function of the fixed fire detection and alarm system is surveyed by ISC, its self-test results may be directly used as the digital survey data.

1.1.2.3 The collected and/or diagnosed data of shipborne system surveyed by ISC may be directly used as the data source.

1.1.2.4 Where the inspected object involves the survey data submitted by a third-party service agency, such as condition monitoring and evaluation data, ISC supplier approval is to be carried out for such agency before it provides the service.

1.1.2.5 The shipowners or the ship management companies are to ensure that the survey data are authentic and effective.

1.1.2.6 If the verification results of survey data show that the inspected object has defects, damages or deterioration that need attention, or defects that affect the validity of survey data are found, the surveyor may require further inspection of relevant items, including the survey carried out by conventional inspection methods.

1.1.2.7 When digital survey is carried out for ships, it is also to meet the relevant statutory requirements of international conventions, flag State Administrations, port State Authorities, regional organizations and other relevant ISC rules. In case of any inconsistency between this Guidelines and the above-mentioned statutory regulations and rules, the international conventions, flag State Administration, Port State Control authorities, regional organizations and ISC rules are to prevail.

1.1.3 Definitions

1.1.3.1 Unless otherwise specified, the relevant definitions in this Guidelines are as follows:

(1) Surveyed object: means all objects subject to ship survey, such as ship documents/information, hull structure, machinery equipment (system), etc.

(2) Digitization: means the use of information system, various sensors, machine vision and other technologies to collect raw data, various information and related knowledge of the inspected object to form identifiable, storable and computable data, so as to establish relevant data models for processing, analysis and application.

(3) Survey data: means the data used to evaluate the performance, condition and other important monitoring and control or quality assurance of the inspected object.

(4) Digital survey: means the verification of survey data to evaluate the acceptability of inspection elements such as the condition, integrity and compliance of the ship's inspected objects, and it is a data-driven ship survey technology.

(5) Digital system: means a system that uses data to digitally present specific physical entities and reflects the specific life cycle process of physical entities.

1.1.4 Normative references

1.1.4.1 The clauses in relevant documents are to be quoted as a part of this Guidelines. For the quoted documents marked with date, only the versions with the marked date are applicable to this Guidelines. For those not marked with date, the latest versions (including all modifications and notices of change) are applicable to this Guidelines.

Section 2 Class Notation

1.2.1 Class notation

1.2.1.1 The following digital survey class notation may be assigned to a ship upon application and the satisfactory plan approval and survey by ISC:

DDV

Where:

DDV — Data-Driven Verification, indicating that the ship has the conditions to carry out survey by means of digital survey.

1.2.1.2 The scope of application for the inspected objects is not restricted when applying for the digital survey class notation of a ship.

1.2.1.3 The assignment, maintenance, suspension, cancellation and reinstatement of the ship's digital survey class notation are to meet the requirements of PART ONE of ISC Rules for Classification of Sea-going Steel Ships or other applicable rules.

CHAPTER 2 IMPLEMENTATION PLAN

Section 1 General Provisions

2.1.1 General requirements

2.1.1.1 This Chapter provides the preparation of the implementation plan and implementation requirements .

Section 2 Preparation Requirements

2.2.1 General requirements

2.2.1.1 The shipowner or ship management company is to prepare an implementation plan for acquiring survey data according to the implementation conditions, scope of application, methods and steps, digitization degree of inspected objects, and operating instructions (if applicable) for ship digital survey, and submit it to ISC for approval.

2.2.2 Main contents

2.2.2.1 The configuration modes and methods, system principles and performance parameters and/or test reports, etc. of main components for relevant equipment/systems for acquiring survey data (including shipboard and shore-based devices and equipment, such as computer systems, sensors, cameras, data relay components, shipboard data servers, remote data servers, etc.) .

2.2.2.2 The scope of application of digital survey carried out for ships, including inspected objects and survey items.

2.2.2.3 The identification, collection, integration, model, scope of application and methods (if applicable) of survey data are at least to include:

(1) The principle, coding method and coding management of data identification, as well as survey data identification list;

(2) Data collection modes, methods, conditions and plans, data scope (such as the data collection cycle and frequency, etc.) and/or types (such as operating parameters and maintenance records), and necessary technical instructions (such as technical methods, application standards, etc.) are to be provided. For the acquisition modes and methods for survey data, refer to Appendix 1 of this Guidelines;

(3) Data storage/backup mechanisms;

(4) Data integration methods, including calibration, sharing, combination, distribution and other processing processes;

(5) Functions and methods of data model and application.

2.2.2.4 Division of responsibilities of management personnel and operators.

2.2.2.5 Defining the scope, form and method of survey data distributed or authorized access rights, as well as the timeliness of data.

2.2.2.6 Other contents deemed necessary by ISC according to the conditions of full-scale ships.

Section 3 Implementation Requirements

2.3.1 General requirements

2.3.1.1 The management personnel and operators of the ships involved are to be familiar with and comply with the approved implementation plan.

2.3.1.2 Any changes of the implementation plan are to comply with the requirements of 6.2.6 in Chapter 6 of this Guidelines.

2.3.2 Process control

2.3.2.1 The management personnel and operators of the ships involved are to carry out update and maintenance for survey data in a timely manner.

2.3.2.2 Data quality assessment is to be carried out regularly so as to continuously improve the quality of survey data by reference to the requirements of Section 5, Chapter 1 in ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

CHAPTER 3 SHIPBOARD SURVEY DATA

Section 1 General Provisions

3.1.1 General requirements

3.1.1.1 This Chapter provides the data requirements for digital survey.

3.1.1.2 The reliability, integrity, cyber security and data quality of relevant equipment/systems for acquiring survey data (including shipboard and shore-based devices and equipment, if applicable) are to meet the applicable requirements of Sections 2, 3, 4 and 5 of Chapter 1 of ISC Guidelines for the Verification of Digital Systems of Ships and Offshore Installations.

3.1.1.3 The relevant equipment/system for acquiring survey data are to be so designed as a whole from data identification to application, or may be combined by multiple subsystems to establish data storage and effective transfer relationship, so as to realize the identification, collection, integration, application (if applicable) and management of survey data.

3.1.1.4 The relevant equipment/system for acquiring survey data are to be installed and arranged according to the requirements of Section 4, Chapter 7 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations so as to realize integrated operation.

3.1.1.5 When carrying out digital survey based on the existing conditions of a ship, the capabilities of survey data acquisition are to be evaluated according to the requirements of this Chapter, and relevant tests are to be conducted if necessary.

3.1.2 Functions and composition

3.1.2.1 The relevant equipment/systems for acquiring survey data are to be capable of data identification, collection, integration and application (if any), as well as having the management functions, such as data management, data maintenance, user management, access permission setting, query, early warning, report production, etc.

3.1.2.2 The relevant equipment/systems for acquiring survey data are to be able to identify and record critical condition parameters and fault alarms, as well as modification records of alarm and warning limit parameters during the operation.

3.1.2.3 Necessary measures are to be taken for the relevant equipment/systems for acquiring survey data so as to prevent data tampering, and time stamps, electronic signatures, etc. may be set if necessary.

3.1.2.4 The relevant equipment/systems for acquiring survey data are to be capable of automatically switching to the standby power supply when the normal power supply is lost. The rechargeable storage battery may be used as standby power supply and its capacity is to maintain power supply for at least 30min. An uninterrupted method is to be used for switching to the standby power supply if it may be adversely affected by power interruption.

3.1.2.5 The computer systems are to meet the requirements of Category I computer system in Section 6, Chapter 2, PART SEVEN of ISC Rules for Classification of Sea-going Steel Ships.

3.1.2.6 The sensors are to meet the requirements of Section 7, Chapter 2, PART SEVEN of ISC Rules for Classification of Sea-going Steel Ships.

3.1.2.7 The shipboard data servers, data relay components (including data transport device, cyber security equipment, etc.), remote data server and other data collection infrastructures are to

meet the requirements of 3.2.2, Section 2, Chapter 3 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

Section 2 Data Identification

3.2.1 General requirements

3.2.1.1 Identification coding is the process of assigning specific codes to identified objects.

3.2.2 Data identification

3.2.2.1 The principle, coding method and coding management of data identification are to meet the requirements of Section 2, Chapter 2 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

3.2.2.2 The coding standards are at least to include the scope of application, coding method, coding structure and coding rules, and the common data standards (such as ISO 19848 — Standard Data for Shipboard Machinery and Equipment issued by the International Organization for Standardization) or other applicable proprietary standards accepted by ISC are generally to be selected.

3.2.3 Verification requirements

3.2.3.1 Verification is to be generally carried out by reference to the requirements of Section 3, Chapter 2 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations. Other measures, if any are to be approved by ISC.

Section 3 Data Collection

3.3.1 General requirements

3.3.1.1 Data collection means the process of acquiring, transmitting and storing data in the shipboard data server and/or remote data server by means of one method or more combined methods, such as continuous monitoring, offline measurement, system generation, knowledge input, manual input, etc.

3.3.1.2 Data collection is to meet the requirements of Section 1, Chapter 3 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

3.3.2 Data collection

3.3.2.1 In general, the data collection framework is to be determined according to the requirements of 3.2.1, Section 2, Chapter 3 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

3.3.2.2 The data interface protocol, transport protocol, exchange format and communication requirements are to meet the requirements of 3.2.3, 3.2.4, 3.2.5 and 3.2.6 in Section 2, Chapter 3 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations, respectively.

3.3.2.3 The data collection modes, methods and scope are to be determined according to the

requirements of survey types, survey items and data application and/or verification. One type of data may be used to correspond to multiple survey items, or use multiple types of data to correspond to the requirements of one survey item.

3.3.2.4 The survey data may be collected by reference to the following modes so as to construct the subsystems (or function modules):

(1) For electronic files management system: establishing electronic files and information database for ship documents, including manuals, drawings, certificates, reports, technical archives, record books, nautical publications/materials, operating instructions, personnel qualifications and skill certificates, and realizing digital application and management of ship documents and information;

(2) For hull structure inspection system: establishing hull structure inspection management and implementation procedures, collecting coating condition images of tanks, structural component damage and thickness measurement data, and establishing data model library to realize digital application, such as overall evaluation on hull structural conditions;

(3) For patrol management system: making use of regular patrol system to collect, present or identify the appearance and functional effectiveness data of deck equipment and machinery equipment, life-saving and fire-fighting equipment, lifting equipment and other inspected objects, including pictures, audio and video, measurement data, text description and other forms, and establishing a data model library.

(4) For data monitoring system: building a monitoring system to collect the operating parameters and/or signals of the equipment onboard ships for the inspected object, or integrate the information resources of other relevant digital systems onboard ships so as to realize data collection and establishing a data model library.

3.3.3 Data storage

3.3.3.1 The data storage system is to meet the requirements of Section 3, Chapter 3 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations. If necessary, redundant design is to be made so as to ensure the integrity of data storage.

3.3.3.2 The data server is to be capable of having warehousing identification and security verification, which is at least to include data filtering and calibration.

3.3.3.3 The data server is to meet the storage requirements of structured data, semi-structured data and unstructured data.

3.3.3.4 The storage period of survey data is to be determined according to the application modes and objectives of survey data, and the data backup mechanism is to be used to ensure that the historical data within the life cycle of the ship may be retrieved and traced.

3.3.3.5 The shipboard data server is generally to be able to store all data within the survey cycle defined in the implementation plan. The remote data server may only store the data to be distributed, or more remote servers may be provided according to the data storage requirements, capabilities and purposes.

3.3.3.6 Where a remote server is used, a data combination and conflict mechanism is to be established between the shipboard terminal data and the remote server. In addition, it is to be capable of continuously operating onboard when the communication function is lost, so as to ensure the integrity of survey data, and have the function of breakpoint resume transmission.

3.3.4 Verification requirements

3.3.4.1 Verification is to be generally carried out by reference to the requirements of Section 4, Chapter 3 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations. Other methods, if any are to be approved by ISC.

Section 4 Data Integration

3.4.1 General requirements

3.4.1.1 Data integration is to meet the requirements of 4.1.2, Section 1, Chapter 4 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

3.4.1.2 The technical requirements for data integration, including calibration, sharing, combination, distribution and other processing processes, are generally to refer to the requirements of Section 2, Chapter 4 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

3.4.1.3 After the data are combined, a standard data model base is to be established according to the survey data verification requirements.

3.4.2 Verification requirements

3.4.2.1 Verification is to be generally carried out by reference to the requirements of Section 3, Chapter 4 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations. Other methods, if any are to be approved by ISC.

Section 5 Data Application

3.5.1 General requirements

3.5.1.1 Where the survey data is used for monitoring, diagnosis, prediction and other purposes, it is to meet the requirements of relevant application categories in Chapter 6 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations, and subject to the data application capability verification carried out by ISC.

CHAPTER 4 DATA DISTRIBUTION AND VERIFICATION

Section 1 General Provisions

4.1.1 General requirements

4.1.1.1 This Chapter provides the scope, forms and methods of survey data distribution, and defines the requirements for the transmission, expression and use of the results of survey data verified by ISC.

4.1.1.2 The timeliness of survey data is to meet the requirements of survey types, survey items, data application and/or verification. In general, other period of time, if used within the survey window period or annual survey cycle, is to be approved by ISC.

Section 2 Data Distribution

4.2.1 Survey data distribution

4.2.1.1 Before the distribution or access authorization of survey data, it is to ensure that the identification, format, scope and timeliness of data meet the requirements of this Guidelines and ISC digital application data standards and data exchange, and form a data model library.

4.2.1.2 The shipowners or ship management companies are to be responsible for distributing the survey data to ISC, or authorizing ISC to access the data servers. Other forms used to provide data to ISC, if any are to be approved by ISC.

4.2.1.3 Where the data submitted by the supplier service agency is involved, the submitted data are to meet the requirements of this Guidelines. In general, the third-party supplier service agency is to distribute the survey data to ISC as required, or authorize ISC to access the data server.

4.2.1.4 The shipowners or ship management companies are to take necessary measures to ensure the security of data distribution or access authorization.

Section 3 Data Verification

4.3.1 Verification of survey data

4.3.1.1 ISC is to carry out the verification for survey data according to the application scope and survey requirements of ship digital survey, and feed back the verification report to the shipowners or ship management companies (the applicants).

4.3.1.2 In addition to the survey data distributed to ISC or authorized to be accessed by ISC, ISC may use relevant survey data and other knowledge, i.e.: product inspection, survey during construction, and survey after construction as supplementary data to the ship digital survey.

4.3.1.3 The verification report is generally to include the followings:

(1) Ship name, port of registry, IMO No. and other particulars of ship;

(2) Conclusion and/or description of survey items;

(3) ISC verification system name, version number and other information;

(4) General information such as data verification date and report output date;

(5) Other necessary information to be determined according to the conditions of full-scale ship.

4.3.2 Use of verification results

4.3.2.1 When ship digital survey is conducted and the data verification results are used as auxiliary information for ship survey, the surveyor may determine the acceptance of the data verification results according to the conditions of full-scale ship.

4.3.2.2 When ship digital survey is conducted and the data verification results are used as the basis for ship survey, it is to meet the requirements of 1.1.2.6 and 1.1.2.7 of this Guidelines.

4.3.2.3 In case of any inconsistent between the attended survey results and the verification results, the evaluation results of site surveyor are to prevail, and the surveyor may require to carry out further inspection according to the requirements of 1.1.2.6 of this Guidelines.

CHAPTER 5 REQUIREMENTS FOR APPROVAL OF PLANS AND DOCUMENTS

Section 1 General Provisions

5.1.1 Scope of application

5.1.1.1 This Chapter provides the requirements for approval of ship plans and documents.， and ship survey documents.

Section 2 Approval Basis

5.2.1 Approval basis

5.2.1.1 In addition to the requirements of this Guideline, it is to include the followings:

(1) The applicable requirements of Chapter 1, PART FOUR and PART SEVEN of ISC Rules for Classification of Sea-going Steel Ships;

(2) ISC Chapters 1 ~ 4, Chapter 7 and Chapter 9 of ISC Guidelines for Verification of Digital Systems of Ships and Offshore Installations.

Section 3 Plans and documents

5.3.1 Plans and documents

5.3.1.1 For ships applying for digital survey class notation, the following applicable plans and documents are to be submitted to ISC as a minimum. See Table 5.3.1.1 (1) and Table 5.3.1.1 (2) for details.

List of Plans and Documents and Requirements **Table 5.3.1.1(1)**

No.	Title of document	Main contents and requirements	Mode of approval
1	Technical description of relevant equipment/ systems for acquiring survey data	(1) System principle, function and instructions, including system structure, communication, database design, etc; (2) Hardware description, such as sensors data collection devices, data storage/backup devices, etc.; (3) Software description, such as data identification, integration, application methods, etc.; (4) The modes, contents, data categories and requirements, etc. of output/output information.	N
2	Arrangement of relevant equipment/systems for acquiring inspection data	Installation and arrangement of data collection devices, network equipment, data server and other critical equipment onboard ships.	N
3	System single-line	Including system power supply arrangement, input and	A

	Schematic diagram	output signal lines, etc.	
4	Network Topology Diagram of computer-based system	Describing the network configuration and mutual physical connection of various transmission media interconnection devices such as network server and workstation.	A
5	List of components	Model specification and quantity of critical equipment such as data collection device, network equipment, data server, etc.	N

Note: A — approval and N — for information.

List of Ship Survey Documents and Requirements **Table 5.3.1.1(2)**

No.	Title of document	Main contents and requirements
1	Implementation plan	Chapters 2, 3 and 4 of this Guidelines
2	Test program	Chapter 6 of this Guidelines

5.3.1.2 When conducting ship digital survey based on the existing conditions of a ship, ISC may accept the exemption of relevant plans and documents submitted for approval according to the conditions of full-scale ship.

CHAPTER 6 CLASS NOTATION SURVEY

Section 1 General Provisions

6.1.1 General requirements

6.1.1.1 This Chapter provides that the ships applying for assignment of digital survey class notation are to be verified the scope of survey specially required so as to obtain and maintain the class notation.

6.1.1.2 The special provisions specified in this Chapter are supplementary to the survey requirements for ISC classed ships. The survey may be carried out simultaneously with the same type of surveys specified in ISC rules, i.e.: the Initial Class Survey, annual survey and special survey.

6.1.1.3 When the survey data have been generated from relevant records and reports of the class notation survey, the digital survey method may be used for verification.

6.1.2 Documents onboard

6.1.2.1 The Plans and documents are to be available onboard ships, at least including the followings:

(1) Plans and documents specified in 5.3.1, Chapter 5 of this Guidelines;

(2) Certificates or quality certificates of relevant equipment/systems for acquiring survey data;

(3) Operating instructions, operation manuals, etc. of relevant equipment/systems for acquiring survey data;

(4) Operation and maintenance records of relevant equipment/systems for acquiring survey data and inspected objects, including repair or replacement records, etc.;

(5) Calibration records/certificates of monitoring equipment/sensors (if applicable);

(6) Reports provided by the third-party supplier agencies (if applicable);

(7) Regular operation report and survey data verification report (if applicable).

6.1.2.2 The information may be retained in paper or electronic form.

6.1.2.3 The plans and documents retained onboard ships and the retention methods are also to be in compliance with the relevant requirements of conventions, codes and rules for inspection.

Section 2 Survey Requirements

6.2.1 Initial survey

6.2.1.1 The initial survey is at least to include:

(1) Confirming the integrity of installation for relevant equipment/systems for acquiring survey data and compliance of the approved drawings and documents;

(2) Conducting the test according to the approved test program, and the test items are at least to include the contents specified in Table 6.2.1.2;

(3) Confirming that relevant management personnel and operators are familiar with and competent for the relevant work of the implementation plan;

(4) Checking the consistency between the contents of the implementation plan and the conditions

of full-scale ships;

(5) Confirming that the information onboard is complete.

6.2.1.2 The test items of initial survey are shown in Table 6.2.1.2.

Test Items of Initial Survey **Table 6.2.1.2**

No.	Test items	Acceptance requirements	Remarks
1	Appearance and integrity	The appearance of relevant equipment (system) are to be free of damage, with clear identification, parts and components are to be installed completely, and in compliance with the approved drawings and documents.	
2	Data Tamper-Resistance function	Preventing the operators from modifying the program unintentionally or without authorization.	
3	Power switching function	Automatically switching to the standby power supply when the normal power supply is lost.	
4	Power failure alarm	Visual and audible alarm is to be given in case of power failure.	
5	Document collection and retrieval function	Accuracy of document collection and retrieval.	If applicable
6	Picture and video collection function	Confirming that the quality and format of pictures and videos collection are consistent with the implementation plan.	If applicable
7	Image recognition function	The accuracy of hull defect image recognition function are to meet the design requirements.	If applicable
8	Inspection of monitoring data collection function	Connecting the corresponding standard signals (such as current signal, voltage signal, serial port signal, etc.) to various data collection interfaces, and observing the data display of the system. If more data collection interfaces of the same type are provided, sampling method may be used for verification.	If applicable
9	Check of monitoring parameter format	The record of monitoring parameters are at least to include the following information: (1) Description of the basic data for equipment and system; (2) Measuring position; (3) Processing methods of measurement data; (4) Date and time information.	If applicable
10	Recording function of reference data	Recording the reference data of condition monitoring measured or obtained under the initial condition of equipment/systems.	If applicable
11	Data communication fault alarm function	self-test is to be conducted continuously for communication lines and an alarm is to be given in case of abnormal conditions.	If applicable

12	Signal loss alarm function	The system is to be capable of giving an alarm if the signal to be collected is lost.	If applicable
13	Inspection of ship-shore communication function	Confirming the effectiveness of ship-shore data communication (including checking the data combination and conflict mechanism between shipboard terminal data and remote server, the ability to continue to operate onboard when the communication function is lost, and the Breakpoint Resume Transmission function).	If applicable
14	Expiration reminder and alarm function	Confirming the expiration reminder and alarm functions according to the implementation plan.	If applicable
15	Record generation function	Two records: (1) Operating records for the relevant equipment/ systems for acquiring survey data; (2) Operating & maintenance and repair records for the inspected objects.	If applicable
16	Checking of data storage function	The collected data are to be recorded in a standard format and stored regularly; Historical data can be queried from the stored data, and the data content is to be consistent with the original input data.	
17	Checking of data backup capability	The system is to be equipped with the facilities required for database backup and verified to be effective.	
18	Historical data query function	Historical data are to be able to query.	
19	File/report output function	Confirming the format and contents.	
20	Data distribution and access authorization functions	Effectiveness of distribution and access authorization functions.	If applicable

6.2.1.3 ISC may accept the exemption of relevant test items when conducting digital survey based on the existing conditions of ships.

6.2.2 Surveys to be implemented

6.2.2.1 For a ship assigned with the digital survey class notation for the first time, a classification memorandum is to be given. ISC surveyors are to implement the digital survey for the class notation not earlier than 6 months from the date of completion of initial survey, and not later than 6 months after the first annual/intermediate/special survey is carried out for the ship.

6.2.2.2 In general, the survey is to be implemented by routine onboard survey, mainly including:

(1) Checking and verifying that the relevant equipment/systems for acquiring survey data has been effectively operated according to the approved implementation plan, can realize the expected functions, and timely verifying the effectiveness of its functions;

(2) Reviewing the implementation report provided by the shipowner or ship management company,

which may refer to the preparation of annual operation report, see 6.2.3.2 (1) of this Guidelines;
(3) Confirming that the relevant management personnel and operators are familiar with the operation of implementation plan;
(4) Checking the detailed records of relevant equipment/systems for acquiring survey data, and their failure and repair records (if applicable).

6.2.3 Annual survey

6.2.3.1 The annual survey may be carried out in combination of data verification (if applicable) and routine onboard survey.

6.2.3.2 The inspection of relevant equipments/systems for acquiring survey data is to mainly include:

(1) The shipowners or the ship management companies are to submit annual operation reports to the ISC survey implementing unit, which are at least to include:

① Abnormal and fault records of operation and maintenance records (including components);

② Records of operation effectiveness.

(2) At the meanwhile, the following items are to be inspected:

① Appearance and integrity;

② Confirming the operation conditions (such as sensor input conditions, model constraints, etc.);

③ Confirming the self-test report (if applicable);

④ Confirming the working conditions, checking whether the function is complete and the operation is in a normal order, and checking the fault record and maintenance record of the inspected objects, if necessary;

⑤ Periodic calibration or verification of measuring equipment/sensors for acquiring data (if applicable).

6.2.4 Special survey

6.2.4.1 In addition to the annual survey items, the implementation effects of ship digital survey are also to be inspected.

6.2.4.2 The inspection of implementation effects for ship digital survey mainly includes:

(1) Checking the following records:

① Operation and maintenance records of inspected objects so as to verify that the inspected objects are maintained in a normal order and meet the rules and intended purposes after survey;

② Abnormal and fault records of inspected objects (including components) (if applicable);

③ Repair records of inspected objects (if applicable), including mechanical parts and components replaced by the spare parts due to damage, relevant photos, and product certificates (if applicable);

④ When checking the maintenance records of inspected objects, further survey may be required if the measurement data is inaccurate, or the measurement data has exceeded the allowable limit but the inspected object has not been replaced, or if it is considered that the handling of mechanical faults is incorrect;

(2) At the meanwhile, the following items are to be inspected:

① Inspection of relevant equipment/systems for acquiring survey data, including items 1~8 and

11~20 in Table 6.2.1.2;

② Further inspection, if necessary, according to the verification results of ship data.

6.2.5 Damage and repair

6.2.5.1 If the failure of relevant equipment/systems for acquiring survey data or the damage and repair of inspected object affects the operation effectiveness of implementation plan and/or the survey data, an application for occasional survey is to be provided to ISC. The repair of such damaged parts/machinery equipment is to be to the satisfaction of the surveyor.

6.2.5.2 Any repair and corrective measures taken to the inspected objects are to be recorded and submitted to the surveyor for review when the class notation survey is carried out.

6.2.5.3 Overdue class conditions or unrepaired damage records will affect the implementation of ship digital survey.

6.2.6 Management of change

6.2.6.1 For the relevant equipment/systems onboard ship for acquiring survey data after an initial survey carried out by ISC, an application for temporary survey is to be provided to ISC according to the specific situations if the relevant equipment/systems have been substantially changed or repaired, such as the data collection method, integration method, application model and other changes that affect the accuracy of the data.

6.2.6.2 The shipowners or ship management companies may adjust the implementation plan appropriately according to the health monitoring of equipment, ship operation, etc. The adjusted implementation plan is to be approved by the surveyor.

6.2.6.3 When the shipowner or management company changes, it is to confirm that management personnel and operators are in compliance with the requirements of Chapter 2 of this Guidelines, reapprove the implementation plan in combination with the temporary survey, and carry out the corresponding survey and/or test, if necessary.

6.2.7 Withdrawal and cancellation

6.2.7.1 The shipowners or the ship management companies may apply for the withdrawal of the ship digital survey class notation.

6.2.7.2 If it is found that the ship has not seriously conducted the implementation plan of digital survey, the ISC survey implementing unit is to report it to the Headquarters. The Headquarters is to give a written reminder to the shipowner or the ship management company as the case may be, and require the shipowner or the ship management company to correct within a time limit, otherwise the relevant class notation will be canceled.

6.2.7.3 After the class notation is withdrawn or canceled, digital survey method cannot be used for ship inspection.

APPENDIX 1 ACQUISITION MODES AND METHODS FOR SURVEY DATA

Section 1 General Provisions

1.1.1 Purpose

1.1.1.1 This Appendix provides modes and methods for acquiring survey data of general survey subjects of ships for the reference during preparation of implementation plans of ship digital survey.

1.1.2 General requirements

1.1.2.1 Acquisition of survey data is intended to archive the survey requirements and data verification. Based on this principle and the features of survey subjects, the types of survey data are determined in accordance with 1.1.1.4 of Chapter 1 of this Guidelines.

1.1.2.2 Based on the contents, requirements and features of ship survey and methods for implementation of digital survey, the ship survey subjects are divided into document, hull structure, deck equipment, main propulsion system, steering system, boiler system, anti-pollution equipment, electrical power system, navigational equipment and system, radio installations and system, life-saving and fire protection system, dynamic positioning system, lifting equipment, energy efficiency management system, etc.. See Table 1.1.2.2 for details.

Classification of Survey Subjects **Table 1.1.2.2**

Serial No.	Category of survey subjects	Examples of survey subjects
1	Documents	Manuals, plans, certificates, reports, technical files, record book, nautical publications and navigational reference materials operating instructions, personnel qualification and skill certificates, etc.
2	Hull structure	Coating condition of tanks, structural members, hull strength, etc.
3	Deck equipment	Stability equipment: collision bulkhead valve, drainage system of enclosed cargo space on freeboard deck, bilge drainage system of watertight tanks, alarm device of cargo hold and tunnel bilge well, water level detector and audible and visual alarm, pumping system, etc.; Tightness equipment: weather tight doors, watertight doors, ventilators, stem/stern/gangway, hawsepipe, drainage opening, freeing ports, hatchway, porthole/window/skylight, air pipe, opening of shell plating, watertight cable penetrations, cargo hatchcover, etc.; Outfitting equipment: anchoring equipment, mooring equipment, towing installation, loading computer, stem and stern unloading appliance, hull mark (draught/loadline/in-water survey/cargo hold marks), crew protection facilities, etc.
4	Main propulsion system	Main engine: engine (including gas fueled engine, methanol/ethanol fuel engine), steam turbine or gas turbine;

		Shafting: conventional shafting or Z-type propulsion installations, electric propulsion installations, water spray propeller, gear case, etc. Associated equipment serving main propulsion system: pump, air compressor, heat exchanger, etc.
5	Steering system	Main steering gear, auxiliary steering gear, rudder and steering gear, etc.
6	Boiler system	Steam boiler, Thermal oil boiler,, feed pump, heat conduction oil pump, etc.
7	Anti-pollution equipment	Oil pollution prevention equipment: oil-filtering equipment and oil content meter, Oil discharge monitoring and control system and oil content meter, incinerator, crude oil washing system, etc.; Toxic liquid pollution prevention equipment: ventilation system, stripping system, washing system, etc.; Sewage pollution prevention equipment: sewage treatment equipment, Sewage comminuting and disinfecting system, discharge pump, etc.; Garbage pollution prevention equipment: incinerator, grinder, compactor, etc.; Air pollution prevention equipment: equipment containing ozone-consuming material, NOx emission control equipment, SOx emission control equipment, incinerator, etc.; Ballast water management system.
8	Electrical power system	Main source of electrical power: generator set, main switchboard, transformer, harmonic filter, etc.; Emergency source of electrical power: emergency generating set, emergency switchboard, emergency transformer, emergency storage battery/temporary emergency storage battery/radio storage battery, charge and discharge board, etc.; Shore power system: shore power connection system (high pressure, low pressure), etc.; Associated equipment serving electrical power system: pump, emergency air compressor and heat exchanger, etc.
9	Navigational equipment and system	Magnetic compass, gyrocompass, Electronic Chart Display and Information System (hereinafter referred to as “ECDIS”), Global Navigation Satellite System (hereinafter referred to as “GNSS”), radar, Automatic Identification System (hereinafter referred to as “AIS”), Voyage Data Recorder (hereinafter referred to as “VDR”), navigational speed and voyage measuring equipment, course or route control system, Bridge Navigation Watch Alarm System (hereinafter referred to as “BNWAS”).
10	Radio installation and system	Very high frequency radio installation (hereinafter referred to as “VHF”), medium frequency radio installation (hereinafter referred to as “MF”), medium/high frequency radio installation (hereinafter referred to as “MF/HF”), satellite ship earth station (hereinafter referred to as “SES”), emergency position-indicating radio beacon (hereinafter referred to as “EPIRB”), device receiving maritime safety information [NAVTEX, enhanced group call system (hereinafter referred to as “EGC”), high frequency direct printed telegraphy maritime safety information system (hereinafter referred to as “HF MSI”)], two-way portable VHF radio telephone equipment, search and rescue

		positioning device (radar transponder, AIS transponder).
11	Life-saving and fire protection system	Life-saving appliances: lifeboat, rescue boat, liferaft, launching and embarkation appliances, lifebuoy, lifejacket, immersion suit, line throwing equipment and distress call, equipments for recovery of persons from the water, maritime evacuation system, etc.; Fire protection equipment: structural fire-protection, fire detection and alarm system, fixed hydrocarbon gas detection system, ventilator, fire extinguisher, emergency escape breathing device (EEBD), fireman's outfit, international shore connection, gaseous fuel for domestic use, water fire-extinguishing system, fixed fire-extinguishing system, inert gas system, etc.
12	Dynamic positioning system	Thruster, measuring system, control system, etc.
13	Lifting equipment	Lifting equipment.
14	Energy efficiency management system	Energy efficiency management system
15	Others	Other survey subjects not belonging to the above 14 categories.

Notes: ① Other survey subjects not listed may be included in the corresponding category after evaluating and confirmed by ISC.

② Documents related to structure and equipment (system), generally as a part of survey subjects of structure and equipment (system), are not listed separately, such as maintenance records of equipment and scantling measuring records.

Section 2 Acquisition Modes and Methods for Survey Data

1.2.1 Documents

1.2.1.1 The manuals, plans, certificates, reports, technical files, record books, nautical books, operating instructions, personnel qualification and skill certificates onboard the ship are to be in digital form with digital functions such as electronic signature, hierarchical plan management, warning of expiration, optical character recognition (OCR).

1.2.1.2 List of Ship Electronic Documents and Digital Application is to be prepared with descriptions of categories of documents and corresponding digital applications in order to carry out digital application of ship documents.

1.2.2 Hull structure

1.2.2.1 The numerical evaluation of the rating system is to be carried out for coating condition of tanks, structural members and hull strength. The overall score for tanks is calculated by certain weighted average value of coating condition of tanks index, structural members index (including deformation and crack) and hull strength index (including thickness measurement of plating/structural member and hull longitudinal strength criterion). Clear pictures about coating condition of tanks index and structural members index and corresponding data about structural members index and hull strength index are to be uploaded for giving scores.

1.2.2.2 The UAV/robot and other equipment may be used to collect structural images and thickness measurement data, evaluate the coating conditions of tanks and identify structural

defects based on image recognition technology, evaluate the corrosion conditions of the hull structure based on the thickness measurement data, automatically match with the three-dimensional model of the hull structure, and establish the mapping between the image/data and the three-dimensional model structure, so as to provide data support for the evaluation, maintenance and structure renewal of the hull structure.

1.2.2.3 ISC Guidelines for Hull Inspection and Maintenance Scheme, ISC Guidelines for Condition Assessment Programme (CAP) for Existing Ships or ISC Rules for Intelligent Ships may be referred to for index selection and scoring methods of hull structure. Other self-defined plans may also be used, but the detailed scoring methods are to be made clear in the implementation plan. The method listed in Table 1.2.2.3 is a self-defined overall scoring method for reference, the smaller score, the better grade.

Score/Grading of Hull **Table 1.2.2.3**

Grade	Score	Coating condition of tanks index	Structural members index	Hull strength index
Good	1-2	The surface coating is sound or only has light rusting without need for maintenance or repair.	No visible deformation or crack.	Only minor corrosions and thickness measurement data of plating/structural member is close to original thickness.
Ordinary	3-4	Obvious breakdown or rusting of coating, but not in a large area.	Slight deformation or crack without need for repair.	Corrosions, but thickness measurement data is higher than substantial corrosion* standard. The hull girder section modulus is obviously higher than 0.9 times that required in the rules.
Bad	5	Large area of breakdown or rusting of coating.	Obvious deformation or crack with urgent need for repair.	Severe corrosion and thickness measurement or strength data is higher than renewal standard. Substantial corrosion or hull girder section modulus is higher than but close to 0.9 times that required in the rules.

Note: Substantial corrosion means that the corrosion volume exceeds 75% of permissible limit after corrosion condition evaluation, but still within the acceptable range.

1.2.2.4 The following are to be clearly defined for preparation of implementation plan of hull structure digital survey:

(1) Descriptions on job responsibilities for the software operating crew;

(2) List of hull maintenance programs and examination plans;

(3) Score and algorithm standards for hull inspection software, image reference standards.

1.2.3 Deck equipment

1.2.3.1 The maintenance and regular test records of stability/tightness/outfitting are to be obtained with appearance photos and function operation videos as a support to verify its operating condition.

1.2.3.2 The normal operating parameters of remote control valves of deck and tank and water level detector and alarm equipment of sewage well are to be obtained to verify its operating condition.

1.2.3.3 The normal operating parameters of remote control operations and switch indications of watertight doors are to be obtained to verify its operating condition.

1.2.4 Main propulsion system

1.2.4.1 Relevant information and data are to be obtained such as function of starting from a dead ship condition for main propulsion system, normal operating capability, operation and control device, bridge room remote control function (if any), central control room remote control function (if any), automatic stopping and security capability, reversing and stopping capacity and operational capacity and override function of the propulsion system in the failure case of any auxiliary machinery.

1.2.4.2 Main engine

(1) Engine (including gas fueled engine): routine operating parameters of engine are to be obtained to verify the operation of equipment serving engine for propulsion, such as supercharger, speed controller, shock absorber, jacking engine, vent valve hydraulic equipment, balancing device, fuel injection pipe protection measures, piston cooling device, air cooler, emergency fan, scavenging arrangement and fuel electronic injection device and oil mist (or gas) concentration detector;

(2) Steam turbine: routine operating parameters of steam turbine are to be obtained to verify the operation of equipment serving steam turbine for propulsion such as pneumatic piping, vibration indication device, turbine alarm device, rotor position indication device, speed controller, servosystem and pedestal expansion gear;

(3) Gas turbine: routine operating parameters of gas turbine are to be obtained to verify the operation of equipment serving gas turbine for propulsion such as pneumatic piping, safety protection device of gas turbine and condition of combustor, air compressor system, free gas turbine device, internal cooling device and heat-exchanging system.

(4) Methanol/ethanol fuel engine: the routine operating parameters of methanol/ethanol fuel engine, including engine r.p.m., torque, maximum combustion pressure per cylinder, average indicated pressure per cylinder, charging air pressure and temperature, exhaust gas temperature, fuel rack position or similar parameters related to engine load, turbocharger speed, engine parameters required for control and detection of predefined purposes (such as propulsion, auxiliary, emergency), methanol/ethanol and oil fuel indices (or equivalent readings), methanol pressure and temperature at the inlet of methanol/ethanol manifold, etc. are to be obtained to verify the operation conditions of shock absorber for main propulsion methanol/ethanol fuel engine, balance device, high-pressure oil pipe protection device, piston cooling device, turning gear, turbocharger, air cooler, scavenging device, emergency blower, speed governor, fuel injection device, exhaust valve hydraulic device, oil mist/gas concentration detector, methanol/ethanol injection valve, etc.

1.2.4.3 Shafting

(1) Conventional shafting: information including thrust bearing lubricating oil inspection report, thrust bearing clearance, intermediate shaft bearing lubricating oil inspection report, intermediate shaft bearing clearance, tail shaft lubricating water inspection report, tail shaft lubricating oil inspection report, bearing temperature and consumption of lubricating water/oil is to be obtained to verify the operation of equipment such as propeller, thrust bearing, intermediate bearing, tail shaft and tail seal device of conventional shafting;

(2) Z-type propulsion installations: information including bearing clearance measurement, bearing temperature and shafting job record is to be obtained to verify the operation of equipment such as seal device, paddle and securing device, gear unit, propeller shaft and steering column in Z-type propulsion installations;

(3) Electric propulsion units: operating parameters of electric propulsion units are to be obtained to verify the operation of equipment such as electromotor, transducer and transformer in electric propulsion installations;

(4) Water jet thruster: information including corrosion condition of stern transom plate, structure of stern water injection nozzle, wearing of shaft seal, shafting operating record, measurement record and consumption of lubricating oil is to be obtained to verify the operation of equipment such as direction control device, fastening bolts and nuts, shaft seal, impeller and impeller casing of water jet thruster;

(5) Gear box: information including lubricating oil temperature, consumption of lubricating oil and lubricating oil inspection report is to be obtained to verify the operation of gear box.

1.2.4.4 Associated equipment serving main propulsion system

(1) Pump: parameters including inlet and outlet pressure and running current of each pump are to be obtained to verify the operation of pumps;

(2) Heat exchanger: inlet and outlet temperature of working medium of each heat exchanger is to be obtained to verify the operation of heat exchangers;

(3) Air compressor: inflation rate of air compressor is to be obtained to verify the operation of air compressors.

1.2.5 Steering system

1.2.5.1 Information including operating record and routine operating parameters is to be obtained to verify the operation of recharging device of steering system, rudder angle stop block and brake device, failure isolation device, control device, power supply failure and recovery capacity related to main steering arrangement, security arrangement for steering gear and communication equipment between rudder room and bridge.

1.2.5.2 Main steering gear

(1) Information including operating record and routine operating parameters is to be obtained to verify the operation of steering gear control, safety and alarm device of main steering gear, rudder angle indication device, operation indication device, steering capacity and lubricating device for main steering gears.

1.2.5.3 Auxiliary steering gear

(1) Information including operating record and routine operating parameters is to be obtained to verify the operation of steering gear control, safety and alarm device of auxiliary steering gear,

rudder angle indication device, operation indication device, steering capacity and lubricating device for auxiliary steering gears.

1.2.5.4 Rudder and steering gear

(1) Routine operating parameters including monitoring of rudder system bearing clearance and operation of sealing device are to be obtained to verify the operation of rudder stock.

1.2.6 Boiler system

1.2.6.1 Routine operating parameters are to be obtained to verify the operation of automation system, safety and alarm device of boiler, water supply system, blowdown system, burner, control unit and oil supply system.

1.2.6.2 Steam boiler

(1) Parameters and leakage conditions of inlet and outlet temperatures and pressure of superheater and economizer and pressure of steam drum and water drum are to be obtained to verify the operation of superheater and economizer of steam boiler and steam drum and water drum devices of large D-type water tube boiler.

1.2.6.3 Thermal oil boiler

(1) Parameters of thermal oil inlet and outlet temperatures of boiler and inlet and outlet pressures of thermal-oil circulating pumps are to be obtained to verify the operation of hot-oil circulating pump of thermal oil boiler, flue condition at combustion side of boiler, thermal oil heater, automation system, safety and alarm device and accessories.

1.2.6.4 Feed pump, conduction oil pump

(1) Parameters of inlet and outlet pressure for each pump and running current are to be obtained to verify the operation of pumps.

1.2.7 Anti-pollution equipment

1.2.7.1 Oil pollution prevention equipment

(1) Oil filtering equipment and oil content meter: Parameters of self-test condition, emission flow and discharge pressure of oil-filtering unit and continuity and integrity of alarming records of oil content meter are to be obtained through monitoring to verify the operation of oil-filtering unit and oil content meter;

(2) Oil discharge monitoring and control system and oil content meter: Parameters of self-test condition, emission flow and discharge pressure of oil discharge monitoring and control system, flow of sampling pump, operation of remote control valve and continuity and integrity of alarming records of oil content meter are to be obtained to verify the operation of oil discharge monitoring system and oil content meter;

(3) Incinerator: Parameters of self-test condition of incinerator, temperature of combustion chamber, fuel pressure, pressure within combustion chamber and continuity and integrity of alarming records of safety device are to be obtained to verify the operation of incinerator;

(4) Crude oil washing system: Parameters of oxygen content of cargo hold, cargo hold pressure, pressure and flow of crude oil washing pump and operating pressure of crude oil washing piping system are to be obtained to verify the operation of crude oil washing system;

1.2.7.2 Toxic liquid pollution prevention equipment

(1) Ventilation system: Parameters of draught fan starting current, running current, draught fan vibration and wind pressure of ventilation system at outlet are to be obtained to verify the

operation of ventilation system;

(2) Stripping system and washing system: Parameters for operation of monitoring of heating system, pressure and flow of stripping/washing pump and operating pressure of stripping/washing piping are to be obtained to verify the operation of stripping system and washing system;

1.2.7.3 Sewage pollution prevention equipment

(1) Sewage treatment equipment: Parameters of discharge pressure of gas pump, inlet and outlet pressure of discharge pump and operation of ultraviolet radiator are to be obtained to verify the operation of sewage treatment unit;

(2) Sewage comminuting and disinfecting system: Parameters of inlet and outlet pressures and running current of disperser are to be obtained to verify the operation of dispersers;

(3) Discharge pump: Parameters of inlet and outlet pressures and running current of discharge pump are to be obtained to verify the operation of discharge pumps;

1.2.7.4 Garbage pollution prevention equipment

(1) Incinerator: Parameters of self-test condition of incinerator, temperature of combustion chamber, fuel pressure, pressure within combustion chamber and continuity and integrity of alarming records of security device are to be obtained to verify the operation of incinerator;

(2) Grinder: Parameters of self-test condition and running current of grinder are to be obtained to verify the operation of grinders;

(3) Compactor: Parameters of self-test condition and running current of compactor are to be obtained to verify the operation of compactors.

1.2.7.5 Air pollution prevention equipment

(1) Equipment containing ozone-consuming material: Parameters of alarming records and charging records of leakage alarming device are to be obtained to verify the operation of equipment containing ozone-consuming material;

(2) NOx emission control equipment and SOx emission control equipment： Operating parameters of control device are to be obtained to verify the operation of NOx emission control equipment and SOx emission control equipment;

(3) Incinerator: Parameters of self-test condition of incinerator, temperature of combustion chamber, fuel pressure, pressure within combustion chamber and continuity and integrity of alarming records of security device are to be obtained to verify the operation of incinerator;

1.2.7.6 Ballast water management system

(1) Operating parameters and self-test condition of ballast water management system are to be obtained to verify the operation of ballast water management system.

1.2.8 Electrical power system

1.2.8.1 General requirements

(1) The display conditions of insulation resistance monitoring and alarming device in electrical power system is to be obtained to verify the operation and self-test function of the related devices;

(2) The conditions of indicator light, indicating instrument and all control components are to be obtained to verify the operation of the related devices;

(3) The alarming records of electrical power system are to be obtained.

1.2.8.2 Main source of electrical power

(1) Main generating set

Data Sources for Main Generator Sets **Table 1.2.8.2**

Critical components	Prime motor	Electric generator
Data source	① For diesel engine, functions of each protective device (such as overspeed shutdown, shutdown due to low lubricating oil pressure) and information of diesel engine operation monitoring system are to be obtained so as to verify the operation of diesel engine for power generation. If the ship's propulsion system is an electric propulsion system, the verification of related additional functions of the diesel engine is to meet relevant requirements of 1.2.4.2 of this Appendix; ② For steam turbine, functions of each protective device and operation monitoring system of steam turbine may refer to relevant requirements of 1.2.4.2 of this Appendix.	① Functions of each protective device and actual load of electric generator and parameters of voltage, current, frequency, power and vibration and temperature rise of generator or converter during operation are to be obtained to verify the operation of electric generator; ② For electric generator required to start automatically and connected to main switchboard after failure of power, parameters of action and starting time of self-starting device are to be obtained to verify the operation of self-starting function.

(2) Main switchboard: Parameters of overcurrent, reverse-power/countercurrent and undervoltage of main switch are to be obtained to verify the operation of main switch protection device. The action states of first-level discharge and second-level discharge of unloading device is to be obtained to verify the valid operation of unloading device;

(3) Transformer: Parameters of current, voltage and temperature of transformer are to be obtained to verify the operation of transformers;

(4) Harmonic filter: Harmonic filter data of voltage is to be obtained to verify the operation of harmonic filters.

1.2.8.3 Emergency source of electrical power

(1) Emergency generator set

① The voltage, current, frequency, power and main parameters of electric generator or converter during operation are to be obtained to verify the steady operation of generator and its converter;

② Information of self-starting time and automatic closing device is to be obtained to verify the self-starting process (if applicable);

③ For electric generator to be started under 0 ℃ , information of shutdown/stop and operating information of heater of generator set or the heater under the environment is to be obtained to verify the operating condition of heaters;

④ Parameters of battery voltage change or air pressure consumption at starting, storage of second starting energy and failure alarming of third starting are to be obtained to verify the operation of self-starting device of emergency generating set;

(2) Emergency switchboard: Parameters of overcurrent, undervoltage and insulation are to be obtained to verify the operation of main switch protective device of emergency switchboard;

(3) Emergency transformer: Parameters of current, voltage and temperature of transformer are to be obtained to verify the operation of transformers;

(4) Emergency storage battery/temporary emergency storage battery/radio storage battery: Parameters of voltage, current and battery temperature of storage battery are to be obtained to verify the operation of storage battery;

(5) Charge and discharge board: Parameters of voltage, current and insulation of charge and discharge board are to be obtained to verify the operation of charge and discharge board;

1.2.8.4 Shore power system

(1) The interlocking protection switch condition of shore power system and marine electric power system is to be obtained to verify the operation of interlocking switch;

(2) The high voltage shore power connection system is also to consider:

① Information of current, voltage, phase sequence, earthing and on-off state of breaker of high voltage shore power connection system is to be obtained to verify the function of protection against short circuit, overcurrent, earthing, overvoltage, undervoltage and reverse power (if applicable) and phase sequence and emergency switching-off function;

② Information of current and voltage of disconnector within high pressure entrance and exit cable cabinet is to be obtained to verify the function of protection against short circuit, overload and overload;

③ Information of control device and alarm system of high voltage cable winch is to be obtained to verify its operation.

1.2.8.5 Associated equipment serving power system:

(1) Pump: Parameters of inlet and outlet pressure and running current of each pump are to be obtained to verify the operation of pumps;

(2) Heat exchanger: The inlet and outlet temperature of each heat exchanger is to be obtained to verify the operation of heat exchangers;

(3) Emergency air compressor: The air inflation rate of emergency air compressor is to be obtained to verify the operation of air compressors.

1.2.9 Navigational equipment and system

1.2.9.1 Information of service voltage and source of each navigational device is to be obtained to verify the operation of power supply of device.

1.2.9.2 Magnetic compass

(1) Photos or videos demonstrating whether compass liquid has bubbles or illumination can be lit are to be obtained to verify the operation of magnetic compass.

1.2.9.3 Gyrocompass

(1) The heading repeater and orientation repeater data of gyrocompass are to be obtained,and compare the data of the main compass to verify the operation of gyrocompass;

(2) The channel information of gyrocompass providing data to other equipment is to be obtained

to verify the operation of its output signal.

1.2.9.4 Electronic Chart Display and Information System (ECDIS)

(1) The version of ECDIS, information such as position, heading and speed, daily,normal operating condition, various alarms or self-test test data of system are to be obtained to verify the operation of equipment; the voyage ranges are to be compared to determine whether the chart covers the ship's routes;

(2) The data connection channel information between ECDIS and other devices is to be obtained to verify the operation of its connection signals;

(3) The simulation test of self-starting of ECDIS after interruption of power supply is carried out to obtain the time and display status of re-starting and verify the operation of self-starting of equipment.

1.2.9.5 Global Navigation Satellite System (GNSS)

(1) The self-test information of device is to be obtained and the alarm signals of equipment after loss of signal or position are to be obtained to verify the operation of equipment.

1.2.9.6 Radar

(1) The indication and display information of radar (including various alarm information such as performance test) are to be obtained to verify the operation of equipment.

1.2.9.7 Automatic Identification System (AIS)

(1) The static and dynamic information of equipment are to be obtained to verify the operation of equipment;

(2) The displaying and sending information of AIS during test is to be obtained by means of test device to verify the operation of receiving function of equipment.

1.2.9.8 Voyage Data Recorder (VDR)

(1) Photos or videos including validity of VDR battery/releaser are to be obtained;

(2) The real-time monitoring data or VDR download records are to be obtained to verify the operation of equipment;

(3) The test information of float-free recording medium and beacon is to be obtained by means of test device to verify the operation of its function.

1.2.9.9 Navigational speed and voyage measuring equipment

(1) The navigational speed and voyage information of equipment is to be obtained to verify the operation of equipment;

(2) The channel information of this equipment providing data to other equipment is to be obtained to verify the operation of its output signal.

1.2.9.10 Course or route control system

(1) The simulation test for monitoring of alarm function (such as yawing, loss of power supply and failure) is carried out to obtain relevant alarm data and verify the operation of equipment.

1.2.9.11 Bridge Navigation Watch Alarm System (BNWAS)

(1) The feedback on each level of alarm (such as glitter of buttons on both wings outside the bridge, alarm sound, button restoration and emergency call function) is to be obtained by means of testing each level of alarm function of test device to verify the operation of equipment.

1.2.10 Radio installation and system

1.2.10.1 General requirements

(1) The supply voltage and source of radio installations are to be obtained to verify the operation

of power supply to equipment;

(2) The voltage and current of automatic charging unit are to be obtained to verify the operation of equipment;

(3) The charging/discharging current and voltage of storage battery are to be obtained to verify the function of storage battery;

(4) The insulation index of antenna are to be obtained to verify the insulation function of antenna.

1.2.10.2 Very high frequency radio installation (VHF)

(1) The operating condition data of equipment is to be obtained including third-party test report.

1.2.10.3 Medium frequency radio installation (MF)

(1) The operating condition data of equipment is to be obtained.

1.2.10.4 Medium/high frequency radio installation (MF/HF)

(1) The operating condition data of equipment is to be obtained;

(2) The sending and receiving message information of automatic repeat request (hereinafter referred to as ARQ) test between MF/HF narrow-band direct-printing telegraphy (hereinafter referred to as NBDP) and shore radio station is to be obtained to verify the operation of NBDP function.

1.2.10.5 Satellite ship earth station (SES)

(1) The message information of SES performance test (hereinafter referred to as PV test) or internal self-sending and self-receiving message is to be obtained to verify the operation of equipment.

1.2.10.6 Emergency position-indicating radio beacon (EPIRB)

(1) The validity information of EPIRB battery and hydrostatic release unit and record data of self-test is to be obtained for self-test of record data to verify whether it is constantly available.

1.2.10.7 Device receiving maritime safety information

(1) NAVTEX

① The sending and receiving message information of NAVTEX and self-test information is to be obtained to verify its operation.

(2) Enhanced group call system (EGC)

① The sending and receiving message information of EGC and self-test information (if applicable) is to be obtained to verify its operation.

(3) HF direct-printing telegraphy maritime safety information system (HF MSI)

① The sending and receiving message information of equipment is to be obtained to verify its operation.

1.2.10.8 Two-way portable VHF radio telephone equipment

① Photos of validity of equipment battery, and communication signals of device communication test are to be obtained to verify the function of equipment.

1.2.10.9 Search and rescue locating device

(1) Radar transponder

① self-test information of equipment is to be obtained.

(2) AIS search and rescue transmitter

① self-test information of equipment is to be obtained.

1.2.11 Life-saving and fire protection equipment

1.2.11.1 The maintenance, regular test and drill records of life-saving and fire protection

equipment are to be obtained with support of photos and/or videos to verify its operation.

1.2.11.2 Routine operation parameters of ventilators, fire detection and alarm system, fire pump, foam pump (if applicable), fixed fire-extinguishing system and machinery-space water mist system (if applicable) or self-test information (if applicable) are to be obtained to verify the operation.

1.2.12 Dynamic positioning system

1.2.12.1 Operation parameters of working records are to be obtained to verify the operation of dynamic positioning system UPS, dynamic positioning software, joint joystick system, stand-by system, override function, alarm device, thruster and signal exchanger of system.

1.2.12.2 Thruster: The control and alarm device of thruster of dynamic positioning system and operation of propulsion unit may be verified according to relevant requirements for Z-type propulsion unit and electric propulsion unit in this Chapter.

1.2.12.3 Measurement system: Operation parameters of working records are to be obtained to verify the operation of measurement system of dynamic positioning system.

1.2.13 Lifting equipment

1.2.13.1 The maintenance records and working parameters of lifting equipment are to be obtained with support of photos and/or videos to verify its working condition.

1.2.14 Energy efficiency management system

1.2.14.1 The ship’s voyage information is to be obtained including navigation distance and navigation time.

1.2.14.2 The voyage fuel consumption information is to be obtained by means of monitoring of flowmeter or fuel oil tank.

1.2.14.3 Relevant information such as deck log book, engine log book, oil record book and bunker delivery note is to be obtained.

1.2.14.4 The data are to be collected and calculated to output the IMO DCS report and CII annual rating report.