RULES FOR CLASSIFICATION

Inland navigation vessels

Edition December 2015

Part 7 Fleet in Service

Chapter 1 Survey requirements
FOREWORD

DNV GL rules for classification contain procedural and technical requirements related to obtaining and retaining a class certificate. The rules represent all requirements adopted by the Society as basis for classification.

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Any comments may be sent by e-mail to rules@dnvgl.com

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In this provision "DNV GL" shall mean DNV GL AS, its direct and indirect owners as well as all its affiliates, subsidiaries, directors, officers, employees, agents and any other acting on behalf of DNV GL.
Changes – Current

This is a new document.
The rules enter into force 1 July 2016.
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SECTION 1 GENERAL

1 Surveys for maintenance of class

1.1
For retention of class, the regular periodical and non-periodical surveys of hull and machinery, including electrical installations as well as special equipment and installations and additional class notations shall be performed as detailed in the following, see also Pt.1 Ch.1 Sec.2 [6.2].

The periodical surveys include:
— the class renewal survey, see Sec.3
— the intermediate survey, see Sec.2
— the bottom survey, see Sec.5
— the propeller shaft survey, see Sec.3 [9]
— the boiler survey, see Sec.6

and surveys for the retention of additional class notations, where applicable. Such surveys are carried out at the intervals and under the conditions laid down in this section.

Where there are no specific survey requirements for additional class notations assigned to a vessel, the equipment and/or arrangements related to these additional class notations shall be examined, as applicable, to the surveyor's satisfaction at each class intermediate or renewal survey.

The surveys shall be carried out in accordance with the relevant requirements in order to confirm that the hull, machinery, including electrical installations, equipment and appliances comply with the applicable rules and will remain in satisfactory condition.

Where the conditions for the maintenance of type and service notations and additional class notations are not complied with, the type and service notation and/or the additional class notations as appropriate will be suspended and/or withdrawn in accordance with the applicable rules given in Pt.1 Ch.1 Sec.3.

It is understood that requirements for surveys apply to those items that are required according to the rules or, even if not required, are fitted on board.

Unless specified otherwise, any survey other than bottom, propeller shaft or boiler survey may be effected by carrying out partial surveys or splitting of surveys, e.g. continuous survey hull and machinery, at different times to be agreed upon with the Society, provided that such a survey procedure is adequately extensive. The splitting of a survey shall be such as not to impair its effectiveness.

1.2
DNV GL reserves the right, after due consideration, to change the periodicity, postpone or advance surveys, taking into account particular circumstances.

Except for intermediate surveys for main class on all vessels and pressure vessels other than boilers on German Flag vessels, the Society may accept to postpone periodical surveys upon special consideration in each separate case.

Extension of class period is detailed in [8].

Postponement of periodical surveys will not affect the surveys next due date.
Postponement of the renewal survey may be granted only upon the owner's written request. Such a request shall be received by the Society well in advance of the expiry date of the classification certificate.

A postponement of the renewal survey shall normally be based on satisfactory result from a sighting survey.

1.3 General procedure of survey

1.3.1 The general procedure of survey consists in:
— an overall examination of the parts of the vessel covered by the rule requirements
— at random checking of selected items covered by the rule requirements
— attending tests and trials where applicable and deemed necessary by the surveyor

1.3.2 When a survey results in the identification of corrosion, structural defects or damage to hull, machinery and/or any piece of its equipment which, in the opinion of the surveyor, affect the vessel’s class, remedial measures shall be implemented before the vessel continues in service.

1.3.3 The Society’s survey requirements cannot be considered as a substitute for specification and acceptance of repairs and maintenance, which remain the responsibility of the Owner.

1.4 Definitions and procedures related to surveys

1.4.1 Overdue surveys
Each periodical survey is assigned a limit date specified by the relevant requirements of the rules (end of survey interval or end date of window) by which it shall be completed.
A survey becomes overdue when it has not been completed by its limit date.

1.5 Preparations and conditions for surveys

1.5.1 Surveys required for retention of class, e.g. in the case of repairs of, or modifications to any parts subject to classification, shall be agreed with the Society’s Head Office or the Society’s local representations in due time, so that the measures envisaged may be assessed and supervised as required.

1.5.2 The surveyors shall be given access at any time to the vessel and/or to the workshops, so that they may perform their duties. The Owner shall provide the necessary facilities for the safe execution of the surveys.
For their internal examination, tanks and spaces shall be safe for access, i.e. cleared, cleaned, gas freed, ventilated, etc.
For survey of the vessel’s internal structure including close up survey, means shall be provided to enable the surveyor to examine the structure in a safe and practical way.
Tanks and spaces shall be sufficiently illuminated, clean and free from water, scale, dirt, oil residues, etc. to reveal corrosion, deformation, fractures, damage or other structural deterioration.
Rescue and safety equipment shall be available.
In this connection all areas to be surveyed shall be cleared, cleaned and shall be made gas-free, as deemed necessary by the surveyor.
The class certificate and other documents related to classification and carried on board shall be made available to the surveyor.

1.5.3 In special cases, e.g. where damages require immediate inspection and decisions, a survey may be conducted while the vessel is not in harbour. The prerequisites, procedure and specific conditions to be met, e.g. weather, will be fixed case by case. The decision as to feasibility of the survey may only be taken in agreement with the surveyor.

1.5.4 The Society will inform the owner about the status of class, indicating the last recognized surveys and the next due dates. However in principle it remains the responsibility of the Owner to comply with the class conditions and to observe the dates for the prescribed surveys, see Pt.1 Ch.1 Sec.2.

1.5.5 Upon request the Society may agree to testing, monitoring and analysis procedures as a supplement to or equivalent substitute for conventional survey methods.
1.5.6 The Society reserves the right to extend the scope of a survey and/or inspection for given reasons, e.g. in case of suspected damage or other negative experience gained, possibly on board of similar vessels or vessels with similar components. Likewise, the Society reserves the right to demand surveys to be held between the due dates of regular periodical surveys.

2 Selection of surveyors

2.1 General
On principle, the acting surveyors will be chosen by the Society. However, the Owner is free to have any findings of surveys and decisions resulting there from, which deem to be doubtful, checked by other the Society’s surveyors upon special request to Head Office.

3 Documentation of surveys, confirmation of class

3.1 General
3.1.1 The records of each survey, as well as any requirements upon which maintenance of class has been made conditional, will be entered into the respective survey statement/certificate. By his signature in the certificate and other documents the surveyor certifies what he himself has seen and checked during the particular survey. The Society reserves the right to modify the endorsements made by the surveyors.

3.1.2 In the Register the dates of the surveys will be indicated.

3.1.3 On request, the class status may be confirmed in writing by the Society.

3.1.4 Where defects are repaired provisionally only, or where the surveyor does not consider immediate repair or replacement necessary, the vessel's class may be confirmed for a limited period. Cancellation of such limitations will shall be indicated in the survey statement/certificate.

4 Surveys in accordance with regulations of the authority

4.1 The Society’s intervention
Where surveys are requested by the Owner on account of international conventions, the Society will carry them out by order or within the framework of official order, acting on behalf of the Authorities concerned, based on the respective provisions. This includes surveys according to e.g. ADN Regulations, Rhine Rules, European Directive, etc.
Where possible, such surveys will be carried out simultaneously with the class surveys.
4.2 Validity of certificates
If for any reason a vessel's class has expired or has been withdrawn by the Society, all certificates issued by the Society will automatically become void. If subsequently the class is renewed or reassigned, the validity of these certificates may be revived within the scope of their original period of validity, provided that all surveys meanwhile having fallen due have been carried out to the satisfaction of the surveyor.

5 External service suppliers

5.1 General
Personnel or firms engaged in services affecting classification and statutory work are subject to approval by the Society.
The inspection, measuring and test equipment used in workshops, Building Yards and on board vessels, which may form the basis for surveyor's decisions affecting classification or statutory work, shall be appropriate for the services to be performed. The firms shall individually identify and calibrate each unit of such equipment to a recognized national or international standard.

6 Periodical surveys

6.1 General

6.1.1 The periodical surveys listed in the following shall be conducted for the hull, machinery including electrical installations as well as special equipment and installations included in the classification of the inland navigation vessel.
If for some obvious reason, e.g. a temporary out-of-service condition of certain equipment, parts included in the classification cannot be surveyed, this will be noted in the survey statement/certificate.

6.1.2 Where Flag State Regulations are applicable which impose inspection intervals deviating from the class related intervals, the intervals will be harmonized in the individual case to reduce the number of single surveys, where possible.

7 Surveys relative to class notations from other of the Society’s rules

7.1 General
The surveys requested for granting of class notations defined in the rules but not in inland navigation rules shall be performed according to corresponding requirements for retention of class.

8 Class extension surveys

8.1 General
On owner’s request and following surveys of hull and machinery afloat, the Society may within two periods of class, extend the class by no more than 12 months in total, provided that the surveys show that hull and machinery are in unobjectionable condition.
In the case where a 12 month extension of the class period has been granted, the last survey in dry-dock shall not date back more than 5 years, counting from the date of the respective class renewal survey.

With ships of over 20 years of age or the hull structural elements of which are riveted, the last survey in dry-dock shall not date back more than 3 years.
SECTION 2 INTERMEDIATE SURVEYS

1 General
The Intermediate survey becomes due 2.5 years after the commencement of the period of class and shall be carried out between six month before to six month after this date.

2 Surveys performance

2.1 General

2.1.1 Intermediate surveys shall include all the inspections and checks required for eventual annual surveys. Additionally, the following requirements shall be observed.

Guidance note:
More extensive Regulations of the country, where the vessel is registered, shall be observed.

---e-n-d---of---g-u-i-d-a-n-c-e---n-o-t-e---

2.1.2 The requirements apply to inland navigation vessels in general. Additional requirements may shall be observed for particular vessel types, due to request of the owner or in connection with manufacturer's recommendations for special equipment.

3 Hull structure

3.1 General

3.1.1 The main structural elements of the hull shall be subjected to a general visual inspection, as far as accessible. If applicable, ballast tank, storage and engine rooms shall be surveyed at random, depending on the vessel type and the age and general condition of the vessel. Where damages or excessive wastage affecting the class are suspected, the surveyor is entitled to carry out further investigations as well as thickness measurements, if required.

3.1.2 The rudder and manoeuvring arrangement and the anchor equipment shall be checked for visible damages. For the related machinery and for operability, see [4.1.1].

3.1.3 The foundations and their substructure of special equipment, particularly on the upper deck, shall be inspected for damages.

3.1.4 Depending on the vessel's age, the surveyor may require opening of ballast tanks for visual inspection, particularly if deterioration of the coating or excessive wastage has already been observed at previous surveys.
If the coating in such ballast tanks is found to be in poor condition (see Sec.7 [2.10]), maintenance of class shall be subject to the tanks in question being examined at periodical surveys, and thickness measurements carried out as considered necessary.
If coating shall be partly or totally renewed, only approved coating is applicable in case of a repair. The whole working procedure including the surface preparation shall be documented.

3.1.5 Compartments and rooms normally not accessible, or accessible only after special preparations, may be required to be opened for inspection, depending on the vessel's age and available information about service conditions.
3.1.6 Hatches and covers, bow, side and stern doors
Hatches and covers, bulkhead and hull doors, ramps and any openings in the outer shell shall be surveyed regarding structural integrity as well as tightness and operability of all closures.

Additionally to the overall survey the following structural members of bow, side and stern doors shall be thoroughly inspected:
— all hinges and the pertinent hydraulic cylinders in way of their securing points
— all securing elements of the locking devices and stoppers.

Where considered necessary by the surveyor, additionally crack tests shall be carried out at structural members of bow, side and stern doors.

Essentially, the crack tests will cover:
— main joining welds and their interfacial areas both on the vessel's hull and on the doors
— highly stressed areas in way of the centres of rotation of the hinges
— highly stressed areas of the locking devices and their stoppers
— repair welding.

For crack detection the dye penetration method or the magnetic particle inspection method shall be employed, and a test protocol shall be prepared.

3.2 Dry dock survey

3.2.1 When the vessel is granted with the range of navigation **IN(1.2)** to **IN(2)**, a dry dock survey shall be carried out. Hull plates before protective application, appendages, discharge valves, river chests, etc shall be examined. In case of doubt, thickness measurements can be requested by the surveyor.

For performance of dry dock surveys, see Sec.5.

4 Machinery

4.1 General

4.1.1 The machinery including electrical installations will be subjected to the following surveys and operational checks:
— general inspection of machinery and boiler rooms, with special regard to the propulsion system, the auxiliary engines, possible fire and explosion sources, and checking of emergency exits as to their free passage
— external inspection of boilers and pressure vessels, with their appliances and safety devices. For details regarding boilers, see Sec.6.
— inspection and checking of the remote control, quick closing/stopping devices of pumps, valves, ventilators, etc.
— random checking of the remote control and automation equipment
— inspection and functional checking of the main and auxiliary steering gear, including their appliances and control systems
— if applicable, checking of all communication systems between bridge and machinery/boiler and steering gear rooms
— inspection of the bilge system, including remote control actuators and bilge filling level monitors
— checking of the main and emergency power supply systems, including the switch gear and other important electrical installations
— survey of explosion-proof installations
— random inspection and checking of essential equipment to the surveyor’s discretion
4.1.2 Fire extinguishing systems
The following items/systems are subject to inspection and/or testing, where applicable:
— fire mains system, including hoses and nozzles
— gas fire extinguishing system
— dry powder fire extinguishing system
— foam fire extinguishing system
— sprinkler system, including water mist sprinkler system
— water and/or foam drenching system
— any other fixed fire extinguishing system provided
— portable fire extinguishers, mobile fire extinguishers, including portable foam application units
— fire detection and alarm systems
— emergency stops for ventilation fans, boiler forced draft fans, fuel transfer pumps, fuel oil purifiers
— quick-closing fuel valves
— fire closures, fire dampers, etc.
— fireman’s outfits, if required

4.1.3 Fire hoses and nozzles
Fire hoses and nozzles provided shall be included in the testing of the fire mains system to the surveyor’s discretion.

4.1.4 Fixed fire extinguishing systems
Fixed fire extinguishing systems, such as gas, foam, dry powder or water mist systems, including gas cylinders are subject to maintenance every 2 years.

On the occasion of these inspections all hose assemblies shall be subjected to a visual check. All hose assemblies made of synthetic rubber shall be replaced according to manufacturer’s instructions.

The installation, maintenance, monitoring and documentation of fixed fire extinguishing systems according to Statutory Regulations, for the engine room, pump room and all spaces containing essential equipment, such as switchboards, compressors, etc., and for the refrigeration equipment, if any, shall only be performed by recognised specialized companies.

4.1.5 Portable and mobile fire extinguishers
Portable and mobile fire extinguishers are subject to inspection by approved or recognized specialized company every 2 years. Maintenance and eventual pressure testing shall be carried out as appropriate in accordance with the manufacturer’s instructions or applicable rules. Each extinguisher shall be provided with a label showing the date of inspection and name and signature of the approved or recognized specialized company.

A protocol of the inspections and maintenance work carried out shall be kept on board.

4.1.6 Foam concentrate
Foam concentrate for fixed foam fire extinguishing systems shall be examined not later than 3 years after filling into the system, and yearly thereafter. The examination shall be performed by the manufacturers or by an independent recognized laboratory. Reports shall be presented to the surveyor. Manufacturer’s certificates stating the properties of the foam concentrate shall be available on board for reference.

The foam concentrate for the portable foam applicators shall be renewed on the occasion of each class renewal.

More extensive regulations of the Owner regarding other inspection intervals/performance of the tests should be observed.

4.1.7 Measurements
The following measurements are generally to be performed unless it can be proved by valid protocols that they have been carried out recently:
— crank web deflection, main engine(s)
— crank web deflection, auxiliary diesel engine(s) (where relevant)
— axial thrust bearing clearance of shafting system(s)
— axial thrust bearing clearance of main and auxiliary gas turbine rotors (where applicable)
— insulation resistance of generators and electrical motors, including cabling and switch gear.

4.1.8 Operational tests
In addition to the requirements under [4.1.1], the following system components shall be subjected to operational tests:

— emergency generating set, including emergency switchboard (where applicable)
— emergency bilge valve(s)
— bilge, ventilation and monitoring systems for the carriage of dangerous substances
— drainage facilities of starting-air and control-air receivers
— general operational test of the machinery and electrical installation to demonstrate unrestricted operability, as indicated by the surveyor.

4.1.9 Monitoring equipment
The monitoring equipment and the automated functions of the machinery installation shall be subjected to operational trials under service conditions. The bridge remote control equipment of the propulsion system will be examined as required by the surveyor.

4.1.10 Machinery installations and safety systems on tankers
On tankers the following installations and equipment shall be checked:

— electrical equipment, in particular electrical installations in areas of explosion hazard, in which ignitable gas mixtures or water vapours may accumulate
— level/overfill alarms
— level indicators
— tank venting systems
— flame arresters
— piping, valves and fittings, pumps
— pump room equipment, including ventilation system
— fire-extinguishing equipment
— pressure/vacuum relief valves.

On gas tankers, the following additional surveys shall be carried out:

— venting system of cargo tanks and holds spaces
— all gastight bulkhead penetrations including gastight shaft sealing, if provided
— cargo handling control and safety systems, if practicable, such as:
  — emergency shut down valves at shore connections and tanks
  — control, alarm and safety systems monitoring the pressure in cargo tanks, cargo piping and hold spaces
  — cargo tanks level gauging including alarm and safety functions
  — cargo temperature monitoring systems
  — control, alarm and safety systems of cargo compressors and cargo pumps
— gas detection equipment including indicators and alarms in operation
— ventilation systems of all spaces in cargo area
— inert gas or dry air installations in operation, including the means for preventing backflow of cargo vapour to gas safe areas
— gastightness of metal
— wheelhouse doors and windows
— sealing arrangement of tank/tank domes, penetrating decks/tank covers, of portable and permanent drip trays or insulation for deck protection in the event of cargo leakage.

### 5 Installations under pressure

#### 5.1 Steam boiler installations

For steam boiler installations, thermal oil plants and pressure vessels, see Sec.6.

#### 5.2 Thermal oil plants

Thermal oil plants shall be subjected to external inspection and functional testing while in operation. At the intermediate surveys, proof of continued usability of the thermal oil, made by a competent testing institution, shall be furnished.

### 6 Inert gas systems

#### 6.1 General

Inert gas installations of the cargo tank area of tankers shall be checked with regard to operability in accordance with DNV GL's survey programme, at intervals of nominally 2.5 years, preferably in conjunction with each intermediate and renewal survey.
SECTION 3 CLASS RENEWAL SURVEYS

1 General

1.1 Scope

1.1.1 Class renewal surveys shall be carried out at the intervals according to Pt.1 Ch.1 Sec.1.

1.1.2 Upon request, in exceptional cases extension of the class period may be granted by the Society, see Sec.1 [8.1].

1.1.3 Class renewals for hull are numbered in the sequence I, II, III, etc. Regarding their scope, see [2].

1.1.4 A class renewal survey may be carried out in several parts. The survey may be commenced at the last year during the class period. Considering [1.1.2], the total survey period of the class renewal survey shall not exceed 12 months, except under special circumstances and by prior agreement from the Society.

1.1.5 The new period of class will commence:
— with the following day, after which the previous class expires, provided that the class renewal survey has been completed within the 3 months preceding that date. In case of extension of validity of class certificate, the period of class will commence the following day after which the extension period expires
— with the date on which the class renewal survey has been completed, if this is the case more than 3 months before expiry of the previous class

1.2 Class renewal survey performance

1.2.1 In addition to the inspections and checks to be carried out on occasion of the intermediate surveys, for class renewal the following requirements shall be observed.

1.2.2 The class renewal survey is in principle to be held when the vessel is in dry dock or on a slipway unless a dry docking survey has already been carried out within the admissible period, see [1.1.4] and Sec.5.

2 Hull and hull equipment

2.1 Class renewal I

2.1.1 Class renewal shall be performed at the end of the first class period.

2.1.2 Conditions for surveys
When examination of associated structure is required, insulation of compartments intended for refrigerated cargoes shall be removed over the necessary extent for examination by the surveyor of the condition of the structure, unless constructional arrangements make such inspections possible without removing the insulation.
If deemed necessary by the surveyor, defective cement and asphalt covering shall be removed. The steel work shall be examined before painting or before the cement or other coverings are renewed.
2.1.3 Equipment for surveys
One or more of the following fracture detection methods may be required if deemed necessary by the surveyor:

— radiography (X or gamma rays)
— ultrasonic test
— magnetic particle test
— dye penetrant test.

2.1.4 Hull, general
At the surveyor’s discretion, the survey on principle covers the whole hull structure, particularly those areas which from experience are known to be exposed to fatigue and corrosion, such as openings in the shell and in the deck including doors and hatch coamings and covers, tanks, engine foundations and ends of superstructures. As a matter of principle, all machinery spaces, dry spaces, store rooms, pipe tunnels, cofferdams and void spaces shall be examined, including the piping systems.

2.1.5 Tank surveys
The ballast tanks shall be inspected at the surveyor’s discretion, the procedure as outlined in [2.3.3] shall be followed.

Fuel oil, lubricating oil and fresh water tanks need not to be emptied, if their tightness can be verified by an external examination while they are completely filled and there is no reason for doubt as to their unobjectionable condition. However, fore and after peak are in any case subject to internal examinations at each class renewal survey.

2.1.6 Tightness and pressure tests
Each compartment of the double bottom, cofferdams and all tanks, the boundary plating of which forms part of the vessel's main structure, shall be subjected to pressure tests. Fuel oil, lubricating oil and fresh water tanks may be tested by filling with the respective liquid.

The test pressure applied shall correspond to a head of water up to the top of the overflow/air pipe or up to the hatch of a tank, where applicable, whichever is higher. For oil, lubricating oil tanks, the test pressure applied shall correspond to a head of liquid up to the top of the tank.

The tightness of pipe tunnels outside the inner bottom, and of void spaces, may be tested by air pressure. Air pressure testing of other spaces shall be agreed with the surveyor from case to case. The overpressure shall not exceed 0.2 bar and not be less than 0.1 bar.

2.1.7 Thickness measurements
If the surveyor has reason to suspect inadmissible corrosion, he may require the rust to be removed from parts of the structure and thickness measurements to be carried out, see Sec.7.

2.1.8 Rudder, equipment, deck openings, etc.
The class renewal survey also covers other parts essential for the operation and safety of the vessel, such as rudder and steering gear, watertight doors, sluice valves, air and sounding pipes, gas-freeing and safety arrangements of cargo tanks, companionways, hatches, scuppers and water drain pipes with their valves, fire protecting arrangements, masts, anchors, anchor chains and hawsers.

The rudder, rudder couplings and bearings, as well as the stock shall be surveyed in mounted condition, the rudder clearance to be measured and documented. The steering gear shall be subjected to an operational trial.

If considered necessary in view of the inspection results, the rudder and/or parts of the steering gear may shall be dismantled.

Bow, side and stern doors, if any, shall be checked.
2.1.9 Engine room structure
Particular attention shall be given to tank tops, shell plating in way of tank tops, brackets connecting side shell frames and tank tops, engine room bulkheads in way of tank top and the bilge wells. Where wastage is evident or suspected, thickness measurements shall be carried out.
For cargo pump rooms the survey consists of the verification of the good condition of:
— access ladders
— sumps
— all bulkheads for signs of leakage or fractures and in particular, the sealing arrangements of the bulkhead penetrations
— piping systems, their pumps and auxiliaries
— pump room ventilation system including ducting, dampers and screens.

2.1.10 Tankers
On tankers which - as can be proved - have exclusively carried cargo not causing corrosion, the cargo tanks shall be inspected at each alternate class renewal only, provided that it may be assumed on the basis of random checks that the component parts are still in satisfactory condition, and provided that no objections will result from the tightness and pressure tests as per [2.1.6].
During each class renewal, the cofferdams of tankers shall be hydrostatically tested to the test pressure as defined in Pt.3 Ch.3 Sec.3 and Pt.2 Ch.5 Sec.4.
At each alternate class renewal only, the cargo tanks of tankers including gas collector if any, shall be tested by water and/or air pressure, to the test pressure stated in the rules. In case of air tightness and pressure test, the test shall be made according to [2.1.6]. Where substances are carried which cause corrosion in connection with water, the kind of testing shall be specified.
At each class renewal, tanks of tankers carrying acids and lye solution will be subjected to an internal examination and, at each alternate class renewal, to a hydrostatic pressure test. The test pressure to be fixed in accordance with Pt.3 Ch.3 Sec.3, depends on the density of the cargo.

2.1.11 Gas tankers
In addition to the requirements given under [2.1.10], the renewal survey of these vessels consists of the following examinations, measurements and testing:

a) Thickness measurements and non-destructive testing of cargo tanks:
— Thickness measurements of cargo tanks may be required. During these examinations, the state of insulation is checked around the considered areas.
— During the internal survey of the tanks, a non destructive testing procedure supplements the examination of cargo tanks, according to a programme and control means approved beforehand by the Society.
— When independent tanks (cylindrical under pressure) are concerned, in principle, 10% of the length of welded seams, in critical areas are tested: tank supports, reinforcement rings, attachment of hollow bulkheads, welding of the fittings (domes, sumps) to the tank-plates, supports of pumps, ladders, pipe connections. It may be necessary to remove partially the tank insulation to perform these examinations.
— For tanks where anti-corrosion coatings are found to be in satisfactory condition, the extent of thickness measurements may be specially considered, at the discretion of the surveyor.

b) Testing of cargo tanks:
— Tanks for the carriage of pressurized liquefied gases shall be tested like pressure vessels. Deviating there from, cargo tanks need to be subjected to an internal inspection on the occasion of each other subsequent class renewal only, if in these tanks only gases or gas mixtures have been carried, which have no corrosive effect upon their walls, and if random checks suggest that the tanks are in satisfactory condition.
— Tightness of cargo tanks and domes shall be verified. However, for a vessel of less than fifteen years of age, a separate tightness test may not be required for each tank, provided the examination of the log book raises no doubts as to their tightness.

— Where the results of tanks examination and testing, or the examination of the log book raise doubts as to the structural integrity or tightness of a cargo tank, or when significant repairs have been carried out, hydraulic or hydro-pneumatic testing shall be carried out.

c) External examination of cargo tanks:

— All independent tanks shall be examined externally wherever practicable. Where the insulation of a cargo tank or of the hull structure is accessible, the surveyor examines the insulation externally including any vapour or protective barrier. If considered necessary by the surveyor, insulation shall be removed in part or entirely so as to check the condition of the tank. Cargo tank supports, chocks and keys and the adjacent hull structure shall be examined.

— Pressure relief valves of cargo tanks shall be opened up for examination, adjusted, sealed and tested to the surveyor's satisfaction.

— Pressure/vacuum relief valves or other pressure relief devices in the tank spaces, shall be examined to the surveyor's satisfaction and, according to their design, opened up, adjusted and tested.

d) Examination of the cargo area:

— The venting system of cargo tanks and hold spaces shall be checked. All gastight bulkheads shall be examined. Gastight bulkhead penetrations, including eventual gastight shaft sealings, shall be examined.

— Gas detection equipment, including indicators and alarms in operation, shall be verified in good working order.

— The inert gas or dry air installation in operation, including the means for preventing backflow of cargo vapour to gas safe areas will be checked.

— Sealing arrangements of tanks/tank domes, penetrating decks/tank covers, of portable and permanent drip trays or insulation for deck protection in the event of cargo leakage shall be verified.

— Hose and spool pieces used for segregation of piping systems for cargo, inert gas and bilge shall be examined.

2.1.12 Tankers, piping systems
Cargo piping, including valves and fittings, pumps as well as gas-freeing and safety equipment shall be surveyed.

At each class renewal, the loading and discharge pipes of tankers shall be tested to 1.25 times the allowable working pressure.

Guidance note:
When components are replaced in the cargo handling installation, it is the responsibility of the Owner to verify their compatibility with the chemical characteristics of the products transported.

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2.2 Class renewal II

2.2.1 The requirements for the second class renewal include those for class renewal I. Additionally the following investigations shall be carried out.

2.2.2 The structural parts behind ceilings, floor coverings and insulation shall be examined, as required by the surveyor and depending on the general condition of the vessel, see also [2.3.2].

2.2.3 In principle, all tanks and cargo tanks shall be examined internally. The fuel oil, lubricating oil and fresh water tanks shall be at least examined at random, as required by the surveyor. If applicable, in vessels aged 2p years and over, during the class renewal survey, all ballast tanks shall be examined for damages to
the hull structural elements and to the coating. If applicable the procedure as outlined in Sec.2 [3.1.4] shall be followed.

Peak tanks see [2.1.5].

2.2.4 The chain cables shall be ranged so that they can be examined for wear and other damages throughout their length. The mean diameter of the anchor chain cables shall be determined on at least 3 links per length.

2.2.5 For thickness measurements, see Sec.7.

2.3 Class renewal III and subsequent ones

2.3.1 The requirements for the third and the subsequent class renewals include those for the class renewal II. Additionally, the following investigations shall be carried out.

2.3.2 Ceilings, linings and insulation of all spaces and cargo holds including steel ceiling adjacent to the shell plating and the inner bottom shall be removed, as indicated by the surveyor, to enable the steel structure to be examined in detail.

For class renewals III and subsequent ones, the inner bottom ceilings may be partially removed at the surveyor’s discretion, to enable their assessment.

For class renewals IV and subsequent ones the inner bottom ceilings shall be completely removed and the tank top shall be carefully cleaned, such as to enable proper assessment of the tank top’s condition.

The wall lining underneath windows in the outer shell shall be lifted as required by the surveyor so that the structure behind may be examined.

2.3.3 All tanks and cargo tanks shall be examined internally. The fuel oil, lubricating oil and fresh water tanks shall be examined internally and tested in accordance with the requirements, at the surveyor’s discretion, see also [2.2.3]. In the case of ballast tanks the procedure as outlined in Sec.2 [3.1.4] shall be followed, if applicable.

Peak tanks see [2.1.5].

2.3.4 The rudder body shall be examined. The connections to the rudder stock and pertinent securing devices shall be inspected. Clearance shall be checked.

The rudder stock shall be surveyed as far as accessible. If deemed necessary in view of findings during this external inspection, the stock shall be dismantled. In way of the bearings, stock and pintle shall be examined for corrosion.

2.3.5 The weight of the anchors shall be checked.

3 Machinery

3.1 General

Except for individual machinery components as indicated in the following, the scope of all class renewal surveys related to the machinery including electrical installations is identical. If the continuous class renewal system is applied, the indications according to the Society shall be observed.
3.2 Surveys requiring dry docking
While the vessel is in dry dock, the river inlet and discharge valves shall be examined as to their condition and to be opened up and overhauled once within the class period.
For propellers and stern-tube shafts, see[9].

3.3 Propulsion system and auxiliaries

3.3.1 General
Inspection of the propulsion system is mainly to cover:
— intermediate shafts and bearings, including thrust bearings
— gearing
— mechanical and flexible couplings
— turning gear
— the main propulsion engines, see [3.3.2].
Spring elements made of rubber ring clutches with or without plies of fabric and under shear load, and other rubber or fibre reinforced plastic couplings shall be renewed, if required on account of negative inspection results.

3.3.2 Main propulsion diesel engines
The following components shall be inspected and checked in the dismantled condition, where deemed necessary by the surveyor:
— cylinders, cylinder covers, pistons, piston rods and bolts, cross heads, crankshaft and all bearings
— camshaft, with drive and bearings
— tie rods, frame, foundation and fastening elements
— injection system, attached pumps and compressors, superchargers, suction and exhaust lines, charging air coolers, filters, monitoring, control, protective and safety devices, starting, reversing and manoeuvring equipment
Class renewal survey of the main engine can be made during the main overhaul subject to the presence of the surveyor.

Guidance note:
In case of medium speed diesel engines, dismantling and replacement of main and crank bearings may be postponed until the service life limits have been reached.

3.3.3 Auxiliary engines
For all auxiliary engines, the survey scope is identical to that applying to the main engines. A reduction in the scope of survey may be agreed to upon examination of the maintenance protocols.

3.4 Auxiliary machinery, equipment and piping, survey performance
The following components shall be inspected and tested in dismantled condition, where deemed necessary by the surveyor:
— all pumps of the essential systems
— air compressors, including safety devices
— separators, filters and valves
— coolers, pre-heaters
— main and auxiliary steering gear
— anchor and other windlasses, including drives
— piping, pipe connections, compensators and hoses
— emergency drain valves and bilge piping systems
— tank filling level indicators
— installations preventing the ingress of water into open spaces
— freshwater distillation plant, where provided
— oil purifier and sewage systems
— additional systems and components, where deemed necessary by the surveyor, as well as special equipment and installations if included in the scope of classification.

3.5 Gas tankers

3.5.1 Cargo handling installation
Cargo piping system including valves, their monitoring devices, etc. shall be opened up for examination and their insulation removed as the surveyor deems necessary. The complete system is tested to 1.25 times the design pressure. If the maximum delivery pressure of pumps is less than the design pressure of the piping system, testing to the pumps maximum delivery pressure may be accepted. In such cases, selected expansion bellows shall be dismantled, examined internally and tested to their design pressure to the surveyor’s satisfaction.

All pressure relief valves shall be opened up for examination, adjusted, sealed and tested to the surveyor’s satisfaction.

Cargo pumps, compressors, heat exchangers and other machinery including their prime movers which are a part of the cargo handling installation shall be examined.

3.5.2 Cargo handling control and safety installations
The cargo handling control and safety installations such as:
— emergency shut down valves at shore connections and tanks
— control, alarm and safety systems monitoring the pressure in cargo tanks, cargo piping and hold spaces
— cargo tanks level indicators including alarm and safety functions
— cargo temperature monitoring systems
— control, alarm and safety systems of cargo compressors and cargo pumps.

shall be verified on good working.

Guidance note:
When components are replaced in the cargo handling installation, it is the responsibility of the Owner to verify their compatibility with the chemical characteristics of the products transported.

4 Electrical installations

4.1 Propulsion machinery
If the vessel is propelled by electrical machinery, the propulsion motors, the propulsion generators and exciters, particularly the windings of these machines, and their ventilating systems shall be examined and tested. Checking of the electric switch gear for operability shall cover also the protective, safety and interlocking devices.

The electric cables and their connections shall be inspected.

The insulation resistance of all electric machinery and equipment shall be tested.
4.2 Dynamic positioning systems
Dynamic positioning systems, if any, including control systems, shall be subjected to operational tests.

4.3 Auxiliary machinery and systems
The electrical machinery and equipment, including the generators, the motors of the essential services, the switch gear including its protective and interlocking devices, as well as the cable network shall be inspected externally. The remote stopping system, navigation lights, alarms, etc. shall be examined for proper operation. For vessels carrying dangerous goods, the condition of safety electrical equipment in relation to explosive atmospheres especially in cargo area shall be checked.
The insulation resistance shall be measured.

4.4 Explosion protection
Electrical installations and equipment located in spaces in which there is a risk of inflammable gas or vapour/air mixtures accumulating, shall be checked as to the explosion protection provided.

5 Pipes in tanks

5.1 General
Where pipes are led through tanks, they shall be examined and, if required by the surveyor, subjected to hydraulic tests, if for the respective tanks an internal examination is required. Depending on the results obtained, thickness measurements may be required.

6 Fire extinguishing and fire alarm systems

6.1 General
Proof shall be furnished to the surveyor that the entire fire extinguishing equipment is ready for operation and in a satisfactory condition.
On the occasion of every class renewal survey, the installation shall be subjected to a visual inspection and test if deemed necessary by the surveyor.
Equipment (cylinders, bottles, fire extinguishers, etc) shall be inspected according to the manufacturer's instructions or applicable codes by an approved or recognised company. Reports of these inspections shall be provided to the surveyor.
Emergency exits/escapes shall be inspected.

7 Spare parts

7.1 General
If needed and in order to be able to restore machinery operation and manoeuvring capability of the vessel in case of damage, DNV GL recommends that spare parts for the main propulsion and the essential equipment are stored on board, documented and maintained in a corresponding list.
8 Trials

8.1 General
Upon completion of the surveys for class renewal, the surveyor shall be satisfied that the entire machinery installation including electrical installations and steering gear, as well as special equipment and installations are operable without any restrictions. In case of doubt, trials and/or operational tests may be necessary.

9 Propeller shafts and tube shafts, propellers and other systems

10 Inert gas systems
Inert gas installations of the cargo tank area of tankers shall be checked as to their operability in accordance with the Society’s survey programme, at intervals of nominally 2.5 years, preferably on the occasion of each class renewal and intermediate survey.

11 Bottom surveys
For bottom surveys, see Sec.5.

12 Installations under pressure
For steam boiler installations, thermal oil plants and pressure vessels, see Sec.6.
SECTION 4 NON-PERIODICAL SURVEYS

1 Damage and repair surveys

Damage and repair surveys fall due whenever the vessel's hull and machinery, including electrical installations, as well as special equipment and installations covered by the classification have suffered a damage which might affect validity of class, or if damage may be assumed to have occurred as a consequence of an average or some other unusual event, see also Pt.1 Ch.1 Sec.2 [6.3.2].

1.1 Damage and repair surveys performance

1.1.1 Where damage has occurred to the vessel's hull, machinery including electrical installations or special equipment and installations, the automatic/remote-control systems, etc., the damaged parts shall not be made accessible for inspection in such a way that the kind and extent of the damage can be thoroughly examined and ascertained, see also Pt.1 Ch.1 Sec.2 [6.3.2].

In the case of grounding, dry docking or, alternatively, an in-water survey is required.

1.1.2 The repair measures shall not be agreed with the surveyor such as to render possible confirmation of the class without reservations upon completion of the repairs. In general, a class confirmation with conditions of class, e.g. in the case of a preliminary repair ("emergency repair"), requires to be approved by the Society’s Head Office or the Society’s representative.

1.1.3 Surveys conducted in the course of repairs shall not be based on the latest experience and instructions by the Society. In exceptional cases advice shall not be obtained from the Society’s Head Office or the Society’s representative, in particular where doubts exist as to the cause of damage.

1.1.4 For older vessels, in the case of repairs and/or replacement of parts subject to classification, as a matter of principle, the construction rules in force during their period of construction continue to be applicable.

This does not apply in the case of modifications required to the structure in the light of new knowledge gained from damage analyses, with a view to avoiding recurrence of similar damages.

1.1.5 Regarding the materials employed and certificates required, the requirements for newbuildings are applicable. See Pt.1 Ch.1 Sec.2 [6.4].

1.1.6 Regarding corrosion damages or excessive wastage beyond allowable limits that affect the vessel's class, see Sec.7.

2 Voyage repairs and maintenance

Where repairs to hull, machinery or equipment, which affect or may affect class shall not be carried out by a riding crew during a voyage, a complete procedure shall not be submitted to and agreed upon with the Society.

Maintenance and overhaul to hull, machinery, as well as special equipment and installations in accordance with the recommended manufacturer's procedures and established practice and which does not require Society approval, are not included. However, any repair as a result of such maintenance and overhauls which affects or may affect class shall not be noted in the vessel's log and submitted to the attending surveyor for use in determining further survey requirements.

3 Conversion surveys

In case of conversion and/or major changes of the vessel's hull, machinery, as well as special equipment and installations with effect to the class designation including notations, the Society’s approval shall not be
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Survey requirements

requested as in the case of newbuildings and surveys shall not be carried out, as described in Pt.1 Ch.1 Sec.2 [6.4].
A new or amended class designation will be assigned, where necessary.

4 Extraordinary surveys
The Society reserves the right to require extraordinary surveys to be held independently of any regular surveys. Such surveys may become necessary for examining the vessel's technical condition and are understood to be a part of the Society’s quality assurance system.

5 Survey for towage or voyage over sea
In compliance with the provisions of the General Terms and Conditions, a certificate of towage or voyage over sea may be issued upon satisfactory survey, the scope of which is fixed in each particular case by the Society according to the towing or voyage over sea.
SECTION 5  MISCELLANEOUS MAIN CLASS SURVEYS

1 Bottom surveys

1.1 General
Inland navigation vessels are generally to be subjected to a bottom survey once during the surveyor period. As a matter of principle, class renewal includes a bottom survey in dry-dock.

1.2 Intermediate survey
Intermediate surveys shall be carried out in dry-dock in the following cases:
— the vessel's shell is riveted, at the surveyor's discretion
— the vessel's age exceeds 20 years, at the surveyor's discretion
— the vessel's age exceeds 20 years and the service notation granted is tanker for transport of dangerous goods
— the vessel is granted with the navigation range \( \text{IN}(x) \), \( 1.2 \leq x \leq 2 \), when it sails regularly in salt or brackish waters

Moreover, for each bottom survey performed in addition to the bottom surveys stipulated by the classification requirements, a the surveyor shall be called to attend.

1.3 Performance of dry dock surveys

1.3.1 General
For the survey, the vessel shall be placed on sufficiently high and secure blocks, so that all necessary examinations can be carried out in a satisfactory manner. It may be necessary to clean the bottom and outer shell and/or remove rust from some areas to the surveyor's satisfaction.

1.3.2 Hull bottom survey
The survey covers an examination of the bottom and side plates of the shell plating, including any attachments, the rudder, the scuppers and water drain pipes, including their closures.

1.3.3 Steering gear
The rudder, rudder couplings and bearings, as well as stocks and pintles, shall be surveyed in place, the rudder clearance shall be measured and documented. The steering gear shall be subjected to an operational trial.

If considered necessary in view of the inspection results, the rudder or parts of the steering gear will shall be dismantled.

Bow thrusters are normally to be inspected in place.

1.3.4 Machinery and propulsion systems
Propellers shall be examined visually.

Damages, such as cracks, deformation, cavitation effects, etc. shall be reported and repaired at the surveyor's discretion.

Controllable pitch propellers shall be checked for oil leakages. The function of the controllable pitch propellers has to be tested. The maintenance according to manufacturer's instructions has to be checked.

Verification of integrity of the stern tube outboard seals to be carried out.

Propeller shaft bearing clearances should be measured/calculated and recorded.
River inlet and discharge valves - including those of special equipment, if any - shall be checked as to their condition during each dry docking survey and to be opened up and overhauled once within a period of surveyor.

2 Propeller shaft surveys

2.1 General

For retention of the Class, periodical surveys and tests of propeller shafts and tube shafts are to be carried out. The scope of surveys and tests unless specifically restricted is defined in 10.

The following surveys are applicable for propeller shafts and tube shafts:

— normal survey
— modified survey
— partial shaft survey.

Where the propeller shafts and tube shafts are:

— fitted with continuous liners, or
— protected against corrosion, or
— mechanically grease-lubricated, or
— fitted with approved oil sealing glands, or
— made of corrosion resistant materials, or
— of increased corrosion allowance to the Society’s satisfaction,

the interval of survey shall be 5 years, normally carried out in conjunction with the dry dock survey.

2.2 Full scope survey

The scope of survey consists the following after the shaft is fully drawn:

— dismantling of propeller and key, where fitted, visual inspection of all parts of the shaft especially the cone, the keyway, the bearing contact areas of the shaft, the bearings, and the thread of the propeller nut, or the fillet of the flange, examination of the propeller fit
— examination of the bearing clearances and/or wear down before dismantling and after reassembly of the shaft with recording of the values measured
— overhaul of the shaft sealing glands according to manufacturer’s instructions (sealing rings, liners, etc.).

Where shafts and fittings are protected from corrosion in mechanically grease lubricated systems, the shaft may be sufficiently drawn to permit examination of the aft bearing contact area of the shaft at every alternate survey.

2.3 Reduced scope survey

For oil lubricated arrangement with approved sealing glands, the shaft need not be drawn at the occasion of the tail shaft survey, provided the following are satisfactorily met:

— examination of all accessible parts of the shaft
— examination of the bearing clearances, respectively wear down of the aft bearing
— overhaul of the shaft sealing glands according to manufacturer’s instructions (sealing rings, liners, etc.)
— examination of the records of all regularly carried out lubricating oil analyses
— examination of the records of the oil consumption
— propeller is free of defects which have an influence on the safe operation of the tail-shaft.
Where doubts exist regarding the findings, the shaft is to be drawn to permit an entire examination.

Lubricating oil analysis shall be carried out regularly at intervals not exceeding 6 months, and the oil consumption shall be recorded and considered to be within permissible limits. The documentation on lubricating oil analysis shall be available on board and be checked. Each analysis should include the minimum parameters:

- water content
- chloride content
- content of bearing metal particles
- oil ageing (resistance to oxidation).

Oil samples should be taken under service conditions.

2.4 Partial scope

For oil lubricated propeller shafts with approved sealing glands DNV GL may extend the tailshaft survey by 2.5 years provided the following items have been examined with satisfactory result:

- verification of the effectiveness of the inboard and outboard seals
- aft bearing clearances measured/calculated and recorded
- level monitoring of lubricating oil system including oil consumption records
- oil analysis and trend results (6 monthly intervals, latest not older than 3 months) in order
- historic records of tail shaft aft bearing temperature
- propeller is free of defects which have an influence on the safe operation of the tail-shaft.

In addition to the above, a propeller connection survey in accordance with Sec. 5 [3.1.1] shall be carried out for propeller shafts with a keyway. Where propeller shaft connection survey in accordance with Sec.1 [1.6.7] for keyless and flanged connections is not due, DNV GL may, on a case by case basis and evaluation, consider exempting measurement and recording of aft bearing clearances.

The partial scope survey method shall not apply in succession and is not subject to further postponement. Lubricating oil analysis is carried out regularly at intervals not exceeding 6 months, and the oil consumption is recorded and considered to be within permissible limits. The documentation on lubricating oil analysis is to be available on board and be checked. Each analysis should include the minimum parameters:

- water content
- chloride content
- content of bearing metal particles
- oil ageing (resistance to oxidation).

Oil samples should be taken under service conditions.

3 Propeller connection survey

In any of the following three cases:

- the propeller is fitted to a keyed shaft taper, or
- the propeller is fitted keyless to the shaft taper, or
- the propeller is fitted to a solid flange coupling at the aft end of the shaft, the design details of which are approved.

A non-destructive examination shall be carried out at each survey by an approved crack-detection method of:

- a non-destructive examination shall be carried out at each survey by an approved crack-detection method of the after end of the cylindrical part of the shaft (from the after end of the liner, if any), and of about one third of the length of the taper from the large end and of the area of keyway for keyed propellers at an interval of 5 years, or
— or of the forward part of the aft shaft taper for keyless propellers at an interval of 15 years, or
— of the aft fillet flange area of the shaft for solid flange coupling propellers at an interval of 15 years.
In all other cases, the nominal interval of survey may be shorter. The scope and extent of survey shall be agreed with the Society.

4 In-water surveys

4.1 General

In particular circumstances, in-water survey, the extent of which is subject to preliminary agreement of the Society, may be performed under the conditions and requirements of this sub-section.

4.2 Approval

The diving firm assisting in in-water surveys shall be approved by the Society for this purpose according the Society's procedures.

4.3 Performance of survey

4.3.1 Unless accessible from outside with the aid of the vessel's trim and/or heel, underwater parts shall be surveyed and/or relevant maintenance work shall be carried out with assistance by a diver whose performance is controlled by a surveyor, using an underwater camera with monitor, communication and recording systems.

4.3.2 Surveys of the underwater body shall be carried out in sufficiently clear and calm waters. The vessel should be in light vessel condition. The shell sides below the waterline and the bottom shall be free from fouling.

4.3.3 The underwater pictures on the surface monitor screen shall offer reliable technical information such as to enable the surveyor to judge the parts and/or the areas surveyed.

4.3.4 Documentation suited for video reproduction including voice shall be made available to the Society.

4.4 Additional examinations

Guidance note:
Where, for instance, grounding is assumed to have taken place, the surveyor may demand individual parts of the underwater body to be additionally inspected from inside.

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If during the in-water survey damages are found which can be assessed reliably only in dry-dock or require immediate repair, the vessel shall be dry docked. If the coating of the underwater body is in a condition which may cause corrosion damages affecting vessel's surveyor to occur before the next dry docking, the vessel shall be dry docked.
5 Thruster survey

5.1 General
The survey intervals for thrusters shall be according to the ship rules SHIP Pt.7 Ch.1 Sec.1 [1.6.8].
The requirements to thruster surveys in the ship rules SHIP Pt.7 Ch.1 Sec.5 [4] and SHIP Pt.7 Ch.1 Sec.5 [5]
shall be applied.
SECTION 6 INSTALLATIONS UNDER PRESSURE

1 Steam boiler installations

1.1 General
Survey of auxiliary steam generators/boilers are to be carried out in conjunction with the intermediate survey and at class renewal survey. The survey consists of external and internal inspections as detailed in [1.2] and [1.3].

1.2 External inspection performance

1.2.1 The operability and general condition of the entire boiler, including its valves and fittings, pumps, piping, insulation, foundation, control and regulating systems and its protective and safety equipment, shall be examined.

Guidance note:
More extensive regulations of the country, where the vessel is registered, shall be observed.

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1.2.2 In detail, the following items shall be examined:
— the entire steam boiler plant for leakages
— the condition of the insulation
— the functioning of the indication, control and safety equipment
— the remote controls for the shut-off and discharge valves
— the leakage monitors for the heaters
— the emergency switch-off devices (oil firing, pumps)
— the safety switch-off devices for the oil burner
— lighting, emergency lighting and labelling.

1.3 Internal inspection performance

1.3.1 Where deemed necessary by the surveyor, the boiler shall be cleaned on the water and flue gas sides and, if required, its outside surfaces shall be uncovered, so that all walls subject to pressure may be examined.

1.3.2 Where the design of the boiler does not permit an adequate internal inspection, hydraulic tests may be required. It is left to the surveyor's discretion to have the internal inspection supplemented by hydraulic tests, if considered necessary on account of the general condition/ appearance of the boiler.

1.3.3 Where there are doubts concerning the thickness of the boiler walls, measurements shall be made using a recognised gauging method. Depending on the results, the allowable working pressure for future operation shall be determined.

The hydraulic pressure test shall be carried out to a test pressure of 1.5 times the allowable working pressure. This is also applicable after repairs of major damages. If the maximum allowable working pressure is less than 2 bar, the test pressure shall be at least 1 bar above the maximum allowable working pressure. In no case the test pressure should exceed the test pressure applied during the first inspection of the boiler after completion.
1.3.4 Steam pipes and heating coils shall be examined according to agreed procedures.

1.4 Non periodical inspection

Beyond the above periodical inspections, the surveyor may require hydraulic tests or extraordinary inspections to be performed on other occasions, e.g. following repairs and maintenance work.

2 Thermal oil plants

2.1 General

2.1.1 Thermal oil plants are subject to periodical surveys. The survey consists of a tightness and pressure test, internal, and external inspection in accordance respectively with Sec.1 [8], [2.3] and [2.4].

In addition, a function test and review of documentation of annual tests performed by a competent testing institution for continued usability of the thermal oil shall be carried out.

2.2 Internal inspection performance

During the internal inspection every p years the heating surfaces and, where appropriate, the combustion chamber, shall be examined for contamination, corrosion, deformations and leakages.

2.3 External inspection performance

For external inspection performance, the following items shall be examined in detail:

— the entire thermal oil plant for leakages
— the condition of the insulation
— the functioning of the indication, control and safety equipment
— the remote controls for the shut-off and discharge valves
— the leakage monitors for the heaters
— the emergency switch-off devices (oil firing, pumps)
— the safety switch-off devices for the oil burner
— lighting, emergency lighting and labelling.

Reference shall be made to the test reports on the annual checks to be performed by an appropriate testing institution for continued usability of the thermal oil. This shall be confirmed in the report.

Guidance note:

More extensive Regulations of the country, where the vessel is registered, shall be observed.

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2.4 Tightness and pressure test

Tightness and pressure test of the whole plant to the admissible working pressure shall be performed at intervals of p years, counting from commencement of initial operation and possibly in connection with a class renewal survey. Following repairs and renewals of plant components exposed to pressure, a pressure test shall be carried out to 1.5 times the admissible working pressure.
3 Pressure vessels

3.1 General

3.1.1 Pressure vessels shall be inspected internally and externally every p years, possibly in connection with class renewal survey.
Pressure vessels for which pressure [bar] times cubic capacity [l] is less than or equal to 200 shall be surveyed on the occasion of checking of the pertinent piping system.

3.1.2 Where pressure vessels cannot be satisfactorily examined internally and where their unobjectionable condition cannot be clearly stated during the internal inspection, approved non-destructive test methods and/or hydraulic pressure tests shall be carried out. The hydraulic pressure test shall be performed at a test pressure of 1.5 times the maximum allowable working pressure. If the maximum allowable working pressure is less than 2 bar, then the test pressure should be at least 1 bar more than the maximum allowable working pressure. Pressure vessels manufactured in accordance with non-class standards shall be tested according to that standards.
The test pressure shall in no case exceed the initial test pressure.

3.1.3 Pressure vessels survey performance
Pressure vessels which are subject to survey by the Society according to the construction rules, shall be examined internally and externally every p years, possibly in connection with a class renewal survey.
CO₂ cylinders and other gas cylinders for fire-extinguishing purposes including vessels for powder extinguishers shall be submitted to periodical survey according manufacturer instructions or applicable Standards. Reports relative to these surveys carried out by recognised company shall be submitted to the surveyor.
Receivers in hydraulic or pneumatic control systems shall be examined during maintenance and repairs at the system; air receivers with a product of pressure by cubic capacity: 
\[ p \times l \geq 1000 \] (p in bar, l in litre)
shall be subjected to an internal inspection at least once during each class renewal.
The intervals between surveys as referred to may be reduced, depending on the findings.
SECTION 7 PERFORMANCE AND SCOPE OF THICKNESS MEASUREMENTS

1 Objectives of thickness measurements

1.1 General

1.1.1 Thickness measurements are a major part of surveys to be carried out for the maintenance of survey, and the analysis of these measurements is a prominent factor in the determination and extent of the repairs and renewals of the vessel’s structure.

1.1.2 The corrosion and wear tolerances stipulate limits of wastage which shall be taken into account for reinforcements, repairs or renewals of steel structure. They are classified and determined by the Society, depending on the local conditions of the structural elements into:

— criteria on longitudinal and buckling strength
— criteria on local strength and pitting.

Each measured structural item shall be checked against these criteria, as far as applicable. When the criteria are not met, reinforcements, repairs and renewals shall be carried out as appropriate.

1.1.3 The thickness of structural elements is checked by measurements, in order to assess whether or not the values stipulated in the construction rules are kept, taking into account the admissible corrosion tolerances. Unless severe corrosion has occurred owing to particular service conditions, thickness measurements will not be required until class renewal II, see Table 1 and Table 2.

1.1.4 Thickness measurements shall be carried out in accordance with recognized methods and by authorized personnel or companies.

Guidance note:
The specific guidelines of the Society give details about the scope of authorization.

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1.1.5 Rust and contamination shall be removed from the components to be examined. The surveyor is entitled to require check measurements or more detailed measurements to be performed in his presence. The thickness measurements shall be witnessed by the surveyor on board to the extent necessary to control the process.

1.1.6 The scope of thickness measurement as well as the reporting shall be fixed in a survey planning meeting between the surveyor, representatives of the vessel’s owners and the approved thickness measurement operator/firm well in advance of measurements and prior to commencing the survey.

1.1.7 Thickness measurements of structures in areas where close-up surveys are required shall be carried out simultaneously with the close-up survey.

2 Definitions

2.1 Ballast tank

A ballast tank is a tank that is being primarily used for water ballast. A tank which is used for both cargo and water ballast will be treated as a ballast tank when substantial corrosion has been found in such tank, see [2.8].
2.2 Spaces
Spaces are separate compartments such as holds and tanks.

2.3 Overall survey
An overall survey is a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

2.4 Close-up survey
A close-up survey is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

2.5 Transverse section
A transverse section includes all longitudinal members contributing to longitudinal hull girder strength, such as plating, longitudinals and girders at the deck, side shell, bottom, inner bottom, longitudinal bulkheads, and plating in side tanks, as well as relevant longitudinals, as applicable for the different vessels. For a transversely framed vessel, a transverse section includes adjacent frames and their end connections in way of transverse sections.

2.6 Representative tanks or spaces
Representative tanks or spaces are those which are expected to reflect the condition of other tanks or spaces of similar type and service and with similar corrosion protection systems. When selecting representative tanks or spaces, account should be taken of the service and repair history on board and identifiable suspect areas.

2.7 Critical structural area
Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject vessel or from similar vessels or sister ships, if applicable, to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the vessel.

2.8 Substantial corrosion
Substantial corrosion is an extent of corrosion such that assessment of the corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits.

2.9 Suspect areas
Suspect areas are locations showing substantial corrosion and/or considered by the surveyor to be prone to rapid wastage.

2.10 Coating condition
Coating condition is defined as follows:
— good: condition with only minor spot rusting
— fair: condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for poor condition
— poor: condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.
2.11 Cargo area for vessels carrying liquid cargo in bulk
The cargo area is that part of the vessel which contains cargo tanks, slop tanks and cargo/ballast pump rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the vessel over the above-mentioned spaces.

2.12 Cargo area for dry cargo vessels
The cargo area is that part of the vessel which includes all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

3 Scope and extent of measurements for class renewal survey

3.1 General
The thickness measurements required by the rules consist of:
— systematic thickness measurements, i.e. measurements of different parts of the structure in order to assess the overall and local strength of the vessel
— measurements of suspect areas as defined in [2.9]
— additional measurements on areas determined as affected by substantial corrosion as defined in [2.8].

3.2 Main hull structural elements
As applicable, in class renewal II and all subsequent ones, the plate thickness of the main and essential longitudinal and transverse structural hull elements shall be checked by thickness measurements. The number of measurements depends on the vessel's maintenance condition and is left to the surveyor's discretion. The minimum requirements for thickness measurements on the occasion of class renewal surveys are stated in Table 1 and Table 2, depending on the vessel's class renewal survey number. Respective thickness measurements to determine the general level of corrosion shall be carried out.

3.3 Reduction of thickness measurement scope
The extent of thickness measurements may be reduced, in comparison with those stated in Table 1 and Table 2, provided during the close-up examination the surveyor satisfies himself that there is no structural diminution and the protective coating, where applied, continues to be effective. When the structure is coated and the coating is found to be in good condition, as defined in [2.10], the surveyor may, at his discretion, accept a reduced program of thickness measurements in the corresponding areas. Other effective protective arrangements may also be considered. The requirements for close-up survey of tank vessels are stated in Table 3.

3.4 Extension of thickness measurement scope
The surveyor may extend the scope of the thickness measurement as deemed necessary. This applies especially to areas with substantial corrosion. When thickness measurements indicate substantial corrosion, as defined in [2.8] the number of thickness measurements shall be increased to determine the extent of substantial corrosion.
### Table 1 Requirements for thickness measurements at class renewal survey - General cargo vessels and other vessels

<table>
<thead>
<tr>
<th>Class renewal survey number</th>
<th>Class renewal I</th>
<th>Class renewal II</th>
<th>Class renewal III</th>
<th>Class renewal IV and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suspect areas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within the cargo length area or 0.5 · L amidships:</td>
<td>Within the cargo length area or 0.5 · L amidships:</td>
<td>Within the cargo length area or 0.5 · L amidships:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected deck plates</td>
<td>— each exposed deck plate</td>
<td>— each deck plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— one transverse section</td>
<td>— two transverse sections</td>
<td>— three transverse sections 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected bottom/ inner bottom plates</td>
<td>— selected tank top plates</td>
<td>— each bottom/inner bottom plates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected side shell plates</td>
<td>— each bottom shell plates</td>
<td>— all side shell plates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected hatch covers and coamings 1)</td>
<td>— selected transverse and longitudinal cargo hold bulkheads 1)</td>
<td>— all hatch covers and coamings 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>— all hatch covers and coamings 1)</td>
<td>— all hatch covers and coamings 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside the cargo length area:</td>
<td>Outside the cargo length area:</td>
<td>Outside the cargo length area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected deck plates</td>
<td>— each deck plate</td>
<td>— each deck plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected side shell plates</td>
<td>— each side shell plate</td>
<td>— each side shell plate</td>
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<tr>
<td>— selected bottom plates</td>
<td>— each bottom plate</td>
<td>— each bottom plate</td>
<td></td>
<td></td>
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<tr>
<td>Collision bulkhead, forward machinery space bulkhead 1), 2)</td>
<td>All transverse and longitudinal bulkheads outside cargo hold area 1), 2)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>In engine room 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— river chests</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>— river water manifold</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>— duct keel or pipe tunnel plating and internals</td>
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</tr>
<tr>
<td>Selected internal structure such as ballast tank, floors and longitudinals, transverse frames, web frames, deck beams, girders, etc. Measurements may be increased if the surveyor deems it necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Including plates and stiffeners.
2) Measurements may be waived or reduced after satisfactory visual examination, when such bulkheads form the boundaries of dry void spaces or river chests, etc. are found in good condition.
3) The number of transverse sections may be reduced at the surveyor’s discretion for vessels of length under 40 m.
### Table 2 Requirements for thickness measurements at class renewal survey - tank vessels

<table>
<thead>
<tr>
<th>Class renewal survey number</th>
<th>Class renewal I</th>
<th>Class renewal II</th>
<th>Class renewal III</th>
<th>Class renewal IV and subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspect areas</td>
<td>Suspect areas</td>
<td>Suspect areas</td>
<td>Suspect areas</td>
<td>Suspect areas</td>
</tr>
<tr>
<td>Measurement for general assessment and recording of corrosion pattern of those structural members subject to close-up survey according to Table 3</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Within the cargo length area:</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>— selected deck plates</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— one transverse section</td>
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<td></td>
<td></td>
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<tr>
<td>— selected bottom/inner bottom plates</td>
<td></td>
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<tr>
<td>— selected side shell plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected hatch covers and coamings ¹)</td>
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<tr>
<td>Within the cargo length area:</td>
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<tr>
<td>— each deck plate</td>
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<td></td>
</tr>
<tr>
<td>— two transverse sections in two different tanks</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>— each bottom/inner bottom plate</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— all side shell plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— selected transverse and longitudinal cargo tank bulkheads ¹)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— all hatch covers and coamings ¹)</td>
<td></td>
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<tr>
<td>Outside the cargo length area:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>— selected deck plates</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>— selected side shell plates</td>
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<td></td>
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<tr>
<td>— selected bottom plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collision bulkhead, forward machinery space bulkhead, aft peak bulkhead ¹), ²)</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>In engine room ²):</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>— river chests</td>
<td></td>
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<tr>
<td>— river water manifold</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>— duct keel or pipe tunnel plating and internals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selected internal structure such as ballast tanks, floors and longitudinals, transverse frames, web frames, deck beams, girders, etc. Measurements may be increased if the surveyor deems it necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹) Including plates and stiffeners.
²) Measurements may be waived or reduced after satisfactory visual examination, when such bulkheads form the boundaries of dry void spaces or river chests, etc. are found in good condition.
³) The number of transverse sections may be reduced at the surveyor’s discretion for vessels of length under 40 m.
Table 3 Requirements for close-up survey at class renewal survey of tank vessels

<table>
<thead>
<tr>
<th>Class renewal survey number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class renewal I</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Within the cargo length area:</td>
</tr>
<tr>
<td>— selected deck plates in one tank for survey from inside of the tank</td>
</tr>
<tr>
<td>— selected deck longitudinals/brackets in one tank 1)</td>
</tr>
<tr>
<td>— one transverse section selected in one representative cargo tank</td>
</tr>
<tr>
<td>Within the cargo length area:</td>
</tr>
<tr>
<td>— selected deck plates in two tanks for survey from inside of the tank</td>
</tr>
<tr>
<td>— selected deck longitudinals/brackets in two tanks 1)</td>
</tr>
<tr>
<td>— selected bulkheads for survey of upper and lower parts 1)</td>
</tr>
<tr>
<td>— two transverse sections selected in two representative cargo tank</td>
</tr>
<tr>
<td>— selected plates and stiffeners in one representative ballast tank</td>
</tr>
<tr>
<td>Within the cargo length area:</td>
</tr>
<tr>
<td>— selected deck plates in four tanks for survey from inside of the tank</td>
</tr>
<tr>
<td>— selected deck longitudinals/brackets in four tanks 1)</td>
</tr>
<tr>
<td>— all bulkheads for survey of upper and lower parts 1)</td>
</tr>
<tr>
<td>— three transverse sections selected in three representative cargo tanks, including all transverse sections in one representative cargo tank 2)</td>
</tr>
<tr>
<td>— selected plates and stiffeners in all ballast tanks</td>
</tr>
</tbody>
</table>

1) Including plates and stiffeners.
2) The number of transverse sections may be reduced at the surveyor’s discretion for vessels of length under 40 m.

3.5 Transverse sections
Transverse sections shall be chosen where largest corrosion rates are suspected to occur or are revealed by deck plating measurements.

3.6 Ballast tanks
If applicable, in the case of major corrosion damages, the structural elements of ballast tanks shall be checked by thickness measurements.

3.7 Substantial corrosion and suspect areas
Where special reasons exist, the surveyor may demand thickness measurements to be carried out already on the occasion of class renewal I, also outside the area of 0.5 L amidships. The same applies in the case of conversion or repair of a vessel.

3.8 Hull equipment
In class renewal II and all subsequent survey renewals the cross sectional areas of the anchor chain cables shall be determined. The mean diameters of the anchor chain cables shall be determined by representative measurements, approximately 3 links per length of 27.5 m, made at the ends of the links where the wear is the greatest. The weights of the anchors shall be checked in class renewal III and all subsequent survey renewals. For permissible tolerances see [4.4].
4 Corrosion and wear tolerances

4.1 General
Where thickness measurements result in corrosion and wear values exceeding those stated in the following, the respective hull structural elements will shall be renewed.

4.2 Longitudinal and buckling strength
In general, the applicable criteria on longitudinal and buckling strength will be decided by the Society, if needed, on a case by case basis.

4.3 Local strength and pitting

4.3.1 Where applicable, the maximum permissible large surface reduction of plate thickness and web thickness of profiles should not exceed the values of corrosion additions as stipulated in Pt.3 Ch.3 Sec.1 [8.1.2] for steel and Pt.3 Ch.3 Sec.1 [8.1.3] for stainless steel or aluminium alloys.

4.3.2 Beyond the calculated corrosion additions tₐ, and at the surveyor's discretion, a maximum permissible locally limited reduction of thickness for isolated pits of 0.35, respectively of 0.2 times the as-built thickness for 50% scattered pits, may be accepted.

4.4 Anchor equipment
Maximum permissible reduction of the mean diameter of chain links: 12 %.
Maximum permissible reduction in weight of anchors: 10 %.

5 Reporting

5.1 General
Appropriate reporting forms recommended by the Society shall be used for recording thickness measurements.
The report shall provide the name of the vessel, the location of measurement, the thickness measured and the corresponding original thickness. Furthermore, the report shall include the date when the measurements were carried out, the type of measuring equipment, the names and the qualification of the operator and his signature.
The single measurement recorded shall represent the average of multiple measurements.
The report shall be verified and validated by the surveyor.
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