RULES FOR HIGH SPEED CRAFT

GUIDANCE FOR HIGH SPEED CRAFT

Rules for High Speed Craft **2019 AMENDMENT NO.1**
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Rule No.45 / Notice No.29 14 June 2019
Resolved by Technical Committee on 30 January 2019

ClassNK
NIPPON KAIJI KYOKAI

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

RULES FOR HIGH SPEED CRAFT

RULES

2019 AMENDMENT NO.1

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Rule No.45 14 June 2019
AMENDMENT TO THE RULES FOR HIGH SPEED CRAFT

"Rules for high speed craft" has been partly amended as follows:

Amendment 1-1

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.1 Classification Survey during Construction

2.1.2 Submission of Plans and Documents for Approval*

Sub-paragraph -1(2) has been amended as follows.

1 When it is intended to build a craft to the classification with the Society, the following plans and documents are to be submitted for the approval by the Society before the work is commenced. Plans and documents may be subjected to examination by the Society prior to the submission of the application for the classification of the craft in accordance with the provision specified otherwise by the Society:
((1) is omitted.)
(2) Machinery
((a) is omitted.)
(b) Main and auxiliary engines (including their accessories):
i) Diesel engines
Plans and data specified in **2.1.3-1(1), Part 9 of the Rules** as well as documents showing specifications of louvers for emergency generator rooms and closing appliances of ventilators fitted to the rooms (if they are of power-operated type.)
ii) Gas turbines
Plans and data specified in **3.1.~~2~~3(1), Part 9 of the Rules**
((c) to (j) are omitted.)
((3) and (4) are omitted.)

2.1.3 Submission of Other Plans and Documents

Sub-paragraph -1(7) has been amended as follows.

1 When it is intended to build a craft to the classification with the Society, the following plans and documents are to be submitted in addition to those required in **2.1.2**:
((1) to (5) are omitted.)
(7) The following plans and documents related to machinery:
(a) Main and auxiliary engines (including their accessories):
(i) is omitted.)
ii) Gas turbines

Plans and data specified in **3.1.~~2~~3(2), Part 9** of the Rules

((8) and (9) are omitted.)

Part 9 MACHINERY INSTALLATIONS

Chapter 3 has been amended as follows.

Chapter 3 GAS TURBINES

3.1 General

3.1.1 Scope

The requirements ~~of~~ in this Chapter apply to ~~gas turbines of the~~ open cycle ~~type~~ gas turbines (i.e., thermodynamic cycle in which the working fluid enters the gas turbine from the atmosphere and is discharged into the atmosphere) used ~~for~~ as main propulsion machinery, or used to drive ~~electric~~ generators and auxiliar~~y~~ies ~~machinery~~ (hereinafter referred to in this Chapter as all auxiliaries excluding auxiliary machinery for specific use, etc.~~, herein after the same in this chapter~~).

3.1.2 Terminology

The terminology used in this Chapter is as specified in the following **(1)** to **(5)**:

(1) "Gas generator" is an assembly of gas turbine components that produces heated pressurized gas to a process or to a power turbine.

(2) "Power turbine" is a turbine which is driven by the gases from a gas generator, producing power output from the gas turbine through an independent shaft.

(3) "Combustion chamber" is a component of a gas turbine in which fuel (heat source) reacts with the working fluid to increase its temperature.

(4) "Enclosure" is barriers, used to protect personnel, protect equipment from the environment, contain fires and possibly provide sound attenuation.

(5) "Principal components" of gas turbines are those listed in the following **(a)** to **(h)**:

(a) Discs (or rotors), stationary blades and moving blades of the turbine

(b) Discs, stationary blades and moving blades of the compressor

(c) Turbine and compressor casings

(d) Combustion chambers

(e) Turbine output shafts

(f) Connecting bolts for main turbine components

(g) Shaft couplings and bolts

(h) Pipes, valves and fittings attached to a gas turbine classified in **Chapter 12, Part D of the Rules for the Survey and Construction of Steel Ships** as either Group I or II

3.1.~~2~~3 Drawings and Data*

Drawings and data to be submitted are generally as follows:

(1) Drawings and data for approval

(a) Discs (and/or rotors) of the turbine and compressor~~s~~

(b) Combustion chambers

(c) Details of the fixing of moving and stationary blades

(d) Shaft couplings and bolts

(e) Piping arrangements fitted to the turbine (including fuel ~~oil~~, lubricating oil, cooling water, pneumatic and hydraulic systems, and ~~indicating~~ information on ~~pipe~~ materials, ~~pipe~~ sizes and ~~service~~ working pressures ~~specified~~ of pipes)

(f) Pressure vessels and heat exchangers (classified ~~in~~ as Group I and Group II as defined in **10.1.3, Part D of the Rules for the Survey and Construction of Steel Ships**) attached to the turbine
(g) Details of turbine installation
(h) Particulars (type and product number of the turbine, power and number of revolutions per minute of the turbine and compressors at maximum continuous rating, ~~gas pressure and~~ temperatures and pressure at turbine inlet and outlet, pressure losses in inlet air and exhaust ~~ducts~~ gas arrangements, ambient condition intended for operation, ~~service~~ fuel oil and lubricating oil to be used)
(i) Material specifications of principal components
(~~h~~j) Critical speeds of turbine rotors and compressors
(~~m~~k) Number of moving blades in each stage
(~~n~~l) Number and arrangements of stationary blades
(~~o~~m) Lists of safety devices, including those specified in **3.3.5** ~~based on the failure mode and effect analysis~~.
(n) In the case of a gas turbine without service records for Society-classed ships or the modification of specifications of a gas turbine with such service records, the following **i)** and **ii)**:
(~~j~~i) Welding details of principal components
(~~k~~ii) Maintenance instructions

(2) Drawings and data for reference
(a) A list containing all drawings and data submitted (with relevant drawing numbers and revision status)
(b) Sectional assembly
(c) Moving blades and stationary blades
(d) General arrangement
(e) Starting arrangement ~~(attached to turbine)~~
(f) Inlet air and exhaust gas arrangements
(g) Diagram of engine control systems
(h) ~~Calculation sheets for~~ Documents containing strength ~~of~~ considerations made for principal components
(i) Calculation sheets for vibration of turbine blades
(j) Documentation on the failure mode and effect analysis
(k) In the case of a gas turbine without service records for Society-classed ships or modification specifications of a gas turbine with such service records, the following **i)** and **ii)**:
(~~j~~i) Operation instructions for fuel oil control systems
(~~k~~ii) Illustrative drawing of ~~the~~ cooling method for each part of ~~the~~ turbine
(l) Other drawings and data deemed necessary by the Society

3.2 Materials, Construction and Strength

3.~~1.3~~2.1 Materials~~, Construction and Strength~~

1 Materials intended for the principal components of gas turbines (excluding those driving emergency generators) and their non-destructive tests are to ~~conform to~~ be in accordance with the requirements specified in **4.2.1-1** and **4.2.1-2, Part D of the Rules for the Survey and Construction of Steel Ships**.

2 ~~The~~ ~~m~~Materials used ~~in~~ for high temperature parts are to have properties suitable ~~for the~~

~~designed performance and service life~~ against corrosion~~s~~, thermal stress~~es~~, creep~~s~~ and relaxation~~s~~ in order to maintain intended performance and achieve the intended service life. In ~~the~~ case~~s~~ where the base material is coated, for example, with corrosion-resistant surfacing, the coating material is to have ~~such~~ properties such that it is ~~hardly detached~~ hard to detach from the base material ~~as well as not to impair~~ the strength of the base material is not impaired.

3.2.2 Construction and Installations

~~5~~1 Gas turbines are to be so designed that no excessive vibration and surging, etc. are induced within the operating speed range ~~of normal operation~~.

~~6~~2 Each part of gas turbines is to ~~have such constructions as~~ be so constructed that no detrimental deformations are caused by ~~their~~ its thermal expansions.

~~4~~3 Where the principal components of gas turbines are of welded construction, they are to comply with the requirements in **Chapter 11, Part D of the Rules for the Survey and Construction of Steel Ships**.

~~8~~4 ~~In the event of failure of the main source of electrical power, the~~ ~~g~~Gas turbines ~~for~~ used as main propulsion machinery are to be so designed ~~as not to cause the gas generator to stop, or to enable it to~~ that they can restart immediately when the electrical power supply is resumed after ~~the gas generator stopping~~ any stoppage resulting from a temporary failure of the main source of electrical power.

~~7~~5 Gas turbines are to be installed ~~on the seatings~~ so that the hull construction is not thermally affected and no excessive structural constraints are caused by thermal expansion~~s~~.

~~3~~6 Gas turbines are to be ~~designed and~~ installed ~~such~~ so that any ~~reasonably probable shedding of~~ turbine or compressor ~~or turbine~~ blade~~s~~ loss or any failure of other principal components ~~will~~ does not endanger ~~the ship, other machinery and any~~ persons and machinery ~~on board~~ in the vicinity of the gas turbine. In addition, gas turbines are to be constructed to contain, as far as possible, turbine or compressor blades and any blade debris in the event of blade loss.

3.~~2~~3 Safety Devices

3.~~2~~3.1 Governors and Overspeed Protective Devices

1 Gas turbines (excluding those driving emergency generators ~~turbines~~) are to be provided with an overspeed protective device. ~~The overspeed protective~~ This device is to be so adjusted that the output shaft speed may not exceed ~~by more than 15 % of~~ the maximum continuous speed by more than 15 % ~~as well as~~ and is to have the functions ~~as~~ specified in **3.2.2-2**.

2 Gas turbines are to be provided with a speed governor independent of the overspeed protective device specified in **-1** above. The speed governor is to be capable of controlling the speed of the unloaded gas turbine without bringing the overspeed protective device into action.

3 The governors of gas turbines used to drive generators are to comply with the requirements in **2.4.2-1** and **-2**, **Part H of the Rules for the Survey and Construction of Steel Ships**. However, when gas turbines ~~are~~ used ~~for~~ as main propulsion machinery in electric propulsion ships are used to drive generators ~~for supplying~~ to supply electric power exclusively to propulsion motors, the requirements in **5.1.2-2**, **Part H of the Rules for the Survey and Construction of Steel Ships** are to be applied.

3.~~2~~3.2 ~~Emergency Stopping~~ Shut-down Devices

1 Gas turbines (excluding those driving emergency generators) are to be provided with ~~A~~at least two independent means of quickly stopping the gas turbine ~~(excluding emergency generator turbines)~~ ~~quickly from the control station~~ under any operating conditions ~~are to be provided~~ by shutting off the fuel which are to be provided at the control station. ~~Not less than~~ At least one of

these means ~~are~~ is to be ~~operated by hand~~ hand trip gear for shutting off the fuel in an emergency. ~~Duplication of the~~ A common actuator ~~fitted to the turbine~~ may ~~not~~ be ~~required~~ used for these means.

2 Gas turbines (excluding those driving emergency generators ~~turbines~~) are to be provided with a quick closing device (shut-down device~~s~~) which automatically shuts off the fuel supply to the turbines at least in the cases of the following ~~conditions~~ **(1)** to **(7)**. ~~as well as to be provided with such alarm devices that give~~ In addition, means are to be provided so that alarms are operated at the control station by the activation of these shut-down devices ~~when the shut-down devices come into action~~.

(1) Over speed

(2) ~~Drop of~~ Unacceptable lubricating oil pressure drop (for gas turbines other than the main gas turbines, only in the case where forced lubrication is adopted.)

(3) Failure of the lubricating oil system

(~~3~~4) Failure in automatic starting

(~~4~~5) ~~Flame-out~~ Loss of flame during operation

(~~5~~6) Excessive vibrations

(7) Excessive high temperature of gas at the turbine inlet or outlet

3 In addition to the requirements specified in **-2** above, gas turbines ~~for~~ used as main propulsion machinery are to be provided with a quick closing device (shut-down device~~s~~) which automatically shuts off the fuel supply to the turbines in at least the following ~~conditions~~ **(1)** to **(3)** cases. ~~as well as to be provided with such~~ In addition, means are to be provided so that ~~alarm devices that give~~ alarms are operated at the control station ~~when the~~ by the activation of these shut-down devices ~~come into action~~.

(1) Excessive axial displacement of each rotor (except for gas turbines with roller bearings)

~~(2) Abnormal rise of turbine inlet or outlet gas temperature~~

(~~3~~2) Unacceptable lubricating oil pressure drop of reduction gear

(~~4~~3) Excessive high vacuum pressure at the compressor inlet ~~(except for gas turbines with automatic by-pass doors etc.)~~

3.~~2~~3.3 Alarms

~~1~~ Gas turbines (excluding those driving emergency generators ~~turbines~~) are to be provided with alarm devices ~~which come into action in the following conditions~~ as required by **Table 9.3.1**. ~~In case where the shut-down devices specified in **3.2.2** are also required, the alarm is to work before the shut-down devices come into action.~~

~~(1) Abnormal rise of turbine inlet or outlet gas temperature~~

~~(2) Drop of lubricating oil pressure~~

~~(3) Drop of fuel oil supply pressure~~

~~(4) Excessive vibration~~

~~2 In addition to the requirements specified in **-1** above, gas turbines for main propulsion are to be provided with alarm devices which come into action in the following conditions. In case where the shut-down devices specified in **3.2.2** are also required, the alarm is to work before the shut-down devices come into action.~~

~~(1) Abnormal rise of differential pressure across lubricating oil filter~~

~~(2) Abnormal rise of lubricating oil inlet temperature~~

~~(3) Abnormal rise of cooling medium temperature in case where an intercooling cycle is adopted~~

~~(4) Abnormal rise of bearing temperature or lubricating oil outlet temperature~~

~~(5) Excessive high vacuum pressure at the compressor inlet~~

3.~~2~~3.4 Fire Detection ~~Devices~~ and Extinction Systems in Enclosures

Where ~~an acoustic enclosure is fitted which completely surrounds the~~ gas generators and the

high pressure oil pipes of gas turbines are surrounded by an enclosure, ~~a~~ the enclosure is to be provided with fire detection systems and a fire extinguishing system which complies with the requirements of **Part 11** ~~is to be provided for the acoustic enclosure~~.

Table 9.2.1 Emergency Shutdown and Alarm Settings(1)

Monitoring parameter	Alarm	Emergency Shutdown	
		Gas turbines used as main propulsion machinery	Gas turbines other than those used as main propulsion machinery
Turbine speed	H	X	X
Lubricating oil pressure	L(2)	X	X(3)
Failure of the lubricating oil system	○(4)	X	X
Lubricating oil pressure of reduction gear	L(2)	X	
Differential pressure across lubricating oil filter	H		
Lubricating oil temperature	H		
Oil fuel supply pressure	L		
Oil fuel temperature	H		
Cooling medium temperature	H		
Bearing temperature	H		
Flame and ignition failure	○	X	X
Automatic starting failure	○	X	X
Vibration	H(2)	X	X
Axial displacement of rotor	H	X	
Exhaust gas temperature at the turbine inlet	H(2)	X	X
Exhaust gas temperature at the turbine outlet	H(2)	X	X
Vacuum pressure at the compressor inlet	H(2)	X	
Loss of control system	○		

Notes:

(1) "H" and "L" mean "high" and "low". "○" means abnormal condition occurred.

(2) Alarms are to be activated at the suitable setting points prior to arriving the critical condition for the activation of shut-down devices in the case where such shutdown is required.

(3) Only in the case where forced lubrication is adopted.

(4) Alarms are to be audible and visual.

3.3.5 Additional Safety Devices

Gas turbines may be required to be provided with additional safety devices as required in order to safeguard against hazardous conditions arising in the event of malfunctions in the gas turbine installation. Such hazardous conditions are to be verified by the manufacturer in accordance with the failure mode and effects analysis.

3.~~3~~4 Associated Installations

3.~~3~~4.1 Air Inlet Systems

~~The~~ ~~a~~Air inlet systems ~~is~~ are to ~~have such construction~~ be so constructed and arrange~~ment~~d that any intrusion of harmful particles and water into ~~the~~ compressors can be minimized. ~~Additionally~~ In addition, means are to be provided to minimize the detrimental effects caused by any salt deposits in the suction air, and if necessary, by any icing ~~at~~ of the air intake.

3.~~3~~4.2 Starting Arrangements*

1 Starting devices are to be so arranged that the firing operation is discontinued and the main fuel valve is closed within a pre-determined time in cases where ignition fails. In addition, ~~G~~gas

turbines are to be provided with ~~suitable~~ automatic or interlocked means for the following **(1)** or **(2)** before ignition commences (on starting) or recommences ~~effective for the prevention of~~ so as to prevent abnormal combustion or ignition trouble ~~at the time of starting or restarting after starting failure~~.

(1) Clearing all parts of the main gas turbine of the accumulation of liquid fuel; or

(2) Purging gaseous fuel

2 Where ~~batteries are~~ compressed air is used for starting, the starting arrangement is ~~correspondingly~~ to comply with ~~the requirements in **2.5.3-3, Part D of the Rules for the Survey and Construction of Steel Ships.**~~ the following **(1)** to **(5)**:

(1) In order to protect starting air mains against the effects of backfiring and internal explosion in the starting air pipes (including explosion arising from improper functioning of starting valves), means are to be provided in accordance with the following **(a)** to **(e)**:

(a) An isolation non-return valve or equivalent is to be fitted at the starting air supply connection to each gas turbine.

(b) A rupture disc or flame arrester is to be fitted in way of the supply inlet to the starting air manifold.

(c) In cases where an flame arrester is provided in accordance with **(b)** above, a rupture disc is to be fitted at an appropriate position on the starting air manifold as an emergency means for pressure relief.

(d) For rupture discs which cannot be readily replaced, a mechanism of blocking up the exhaust way is to be provided for the purpose of quick restart of the gas turbine. This blocking mechanism is to be fitted with a means of indicating whether it is blocking or not.

(e) An effective arrangement to prevent the accumulation of oils in the starting air manifold or to prevent the excessive temperature rise in the starting air manifold is to be provided.

(2) The arrangement for the air starting of main propulsion machinery is to be provided with at least two starting air reservoirs which may be used independently. The total capacity of the air reservoirs is to be sufficient to provide, without their being replenished, the number of consecutive starts of main propulsion machinery under cold and ready-to-start conditions not less than the following **(a)** and **(b)**. Where the arrangements of the main propulsion machinery and shafting systems are other than those shown below, the required number of starts is to be as deemed appropriate by the Society. In any case, an additional number of starts may be required when the gas turbine is in the warm-running condition. When other consumers such as auxiliary machinery starting systems, control systems, whistles, etc., are to be connected to the starting air reservoirs, their air consumption is also to be taken into account.

(a) Ships other than electric propulsion ships

$Z = 6C$

where

Z: Total number of starts of gas turbines

C: Constant determined by the arrangement of gas turbines and shafting systems, where the following values are to be referred to as the standard

$C = 1.0$: Single screw ships, where one gas turbine is either coupled with the shaft directly or through reduction gears.

$C = 1.5$: Twin screw ships, where two gas turbines are either coupled with the shafts directly or through reduction gear, and for single screw ships, where two gas turbines are coupled with the shaft through declutchable coupling provided between gas turbines and reduction gear.

$C = 2.0$: Single screw ships, where two gas turbines are coupled with one shaft without any declutchable coupling between gas turbines and reduction

gear.

(b) Electric propulsion ships

$Z = 6 + 3\ (k\text{-}1)$

where

Z: Total number of starts of gas turbines

k: Number of engines (In the case of more than three gas turbines, the value of *k* to be used need not exceed three.)

(3) The capacity of the reservoirs specified in **(2)** above is to be about equal.

(4) The compressor to which **13.13.3-2, Part D of the Rules for the Survey and Construction of Steel Ships** applies in accordance with **8.12** is to have a capacity not less than 50% of the total capacity specified in **13.13.3-3** of said **Part D**.

(5) The capacity of starting air compressors fitted for main propulsion machinery is to be approximately equally divided between the number of said compressors.

3 Gas turbines which are arranged for electrical starting are to comply with the following **(1)** to **(3)**:

(1) Two separate batteries are to be fitted to the starting arrangement for main propulsion machinery. The arrangement is to be such that the batteries cannot be connected in parallel, and each battery is to be capable of starting the main propulsion machinery under cold and ready-to-start conditions. The capacity of each battery is to be sufficient (without recharging) to provide the number of consecutive starts specified in **-2** above within 30 *minutes*.

(2) Electric starting arrangements for gas turbines driving generators and auxiliary machinery are to have two separate batteries, but may be supplied by separate circuits from the batteries for main propulsion machinery. In the case of a single gas turbine, only one battery need be fitted. The capacity of each set of batteries is to be sufficient for at least three starts for each gas turbine.

(3) The starting batteries are to be used for starting and the gas turbine's own monitoring purposes only. Provisions are to be made to continuously maintain the stored energy at all times.

4 Gas turbines which are arranged for hydraulic starting are to comply with the following **(1)** and **(2)**:

(1) Starting arrangements for main propulsion machinery are to be provided with two sets of hydraulic systems.

(2) The capacity of the hydraulic power pack is to be sufficient (without recharging) to provide the number of consecutive starts specified in **-2** above within 30 *minutes*.

3.~~3~~4.~~5~~3 Ignition Arrangements

1 Each ~~device in~~ ignition arrangement~~s~~ is to ~~be composed~~ consist of two or more systems independent ~~with~~ of each other.

2 ~~The~~ ~~e~~Cables of an electric ignition device ~~is~~ are to be arranged so that ~~have good~~ satisfactory electrical insulation is ensured and ~~to be laid in such a way to be hardly~~ the cables are not likely to be damaged and do not to come in contact with fuel oil and other flammable oils including their pipes and tanks.

3 Ignition distributors are to be of an explosion-proof construction or are to be provided with proper shielding. No coils for any ignition device~~s~~ are to be situated in areas where explosive gases may accumulate.

3.~~3~~4.~~3~~4 Fuel Oil Arrangements

1 Sufficient consideration is to be given to the prevention of any clogging of ~~the~~ fuel manifolds and fuel nozzles due to solids ~~particles~~ contained in the fuel~~,~~ and ~~also for~~ to the prevention of any corrosion~~s~~ of turbine blades and other parts due to corrosive substances such as salts ~~and similar~~

~~corrosive substances~~.

2 The fuel control system is to comply with the following requirements.

(1) The fuel control system is to be capable of adjusting the fuel supply to the burners so as to maintain the exhaust gas temperature within the pre-determined range throughout the normal operation.

(2) The fuel control system is to be capable of ensuring stable combustion throughout the operation range where the fuel supply~~ing~~ is adjustable.

(3) The fuel control system is to be capable of maintaining the minimum speed of the turbines without stopping the gas generator ~~at a~~ in the case of sudden load fluctuations.

(4) In dual-fuel applications, provision is to be made for automatic isolation of both primary and standby fuel supplies in the event of a fire.

3.~~3~~4.~~4~~5 Lubricating Oil Arrangements

1 Gas turbines ~~for~~ used as main propulsion machinery are to be provided with an effective emergency supply of lubricating oil which comes into service automatically and has sufficient amount ~~of oil~~ to ensure adequate lubrication until the turbine is brought to rest after a shutdown of the fuel oil supply~~,~~ in ~~case~~ the event of a failure of the lubricating oil supplying system. ~~The emergency supply may be obtained from~~ For this purpose, a gravity tank or from an auxiliary lubricating oil pump driven by the turbine may be used.

~~**2** The lubricating oil arrangements for main gas turbines are to be provided with the automatic temperature controlling devices.~~

~~**3**~~**2** An oil sampling ~~connection~~ valve is to be provided at a proper location.

3.4.6 Automatic Temperature Controls

The gas turbine services specified in the following **(1)** to **(3)** are to be fitted with automatic temperature controls so as to maintain steady state conditions throughout the normal operating range of the main gas turbine.

(1) Lubricating oil supply

(2) Oil fuel supply (or automatic control of oil fuel viscosity as alternative)

(3) Exhaust gas

3.4.7 Cooling Arrangements

Gas turbines are to be provided with cooling arrangements as required, and arrangements are to be provided so that the design temperature is not exceeded.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 14 June 2019.

2. Notwithstanding the amendments to the Rules, the current requirements apply to gas turbines whose type is the same type of those for which the application for approval is submitted to the Society before the effective date.

Amendment 1-2

Part 2 CLASS SURVEYS

Chapter 3 PERIODICAL SURVEYS AND PLANNED MACHINERY SURVEYS

3.6 Annual Surveys for Machinery

Paragraph 3.6.1 has been amended as follows.

3.6.1 Requirements for Annual Surveys*

At each Annual Survey for Machinery, a general examination of the whole machinery in the engine room and the following inspections **(1)** to **(8)** are to be carried out;

(1) It is to be ascertained that the main propulsion machinery, power transmission machinery, prime movers other than main propulsion machinery, boilers, thermal oil heaters, incinerators, pressure vessels, auxiliary machinery, piping systems, control systems, electrical installations and switchboards are placed in good order.

(2) It is to be ascertained that the engine room, boiler spaces and means of escape are placed in good order with respect to dangers of fire and explosion.

(3) The clearance between the ~~after end part of the stern bush or the shaft bracket bearing~~ bush of stern tube bearing or shaft bracket bearing and propeller shaft or stern tube shaft, or the bearing wear-down is to be measured. For waterjet propulsion systems, the wearing condition of the bearing is to be ascertained by the means deemed appropriate by the Society.

(4) The stern tube sealing devices or the shaft bracket sealing device, if any, are to be examined. For waterjet propulsion systems, the forward sealing device for the main shaft is to be examined.

(5) The propellers (including impellers for waterjet propulsion systems) are to be examined. In the case where a controllable pitch propeller is fitted, it is to be ascertained that the pitch control device is in good working order.

(6) Valves and cocks fitted to the ship's hull, sea chest or distance piece mounted on the hull together with their fastenings to the hull are to be opened up and examined. The open-up examinations may be dispensed with at the discretion of the Surveyor.

(7) For ships ~~affixed with the notation "*APSS • O*" or "*APSS • W*" which periodically perform oil analysis or freshwater sample tests~~ with oil lubricated or freshwater lubricated bearings, it is to be checked as to whether lubricating oil analysis or fresh water sample tests are regularly carried out. In cases where lubricating oil analysis or water sample tests are carried out, ~~a general examination of the shafting system and a review of all the condition monitoring data available on board the ship are to be carried out in order to ascertain that the system is well maintained~~ it is to be checked as to whether the reference standards deemed appropriate by the Society are complied with based upon the lubricating oil analysis or fresh water sample test reports, in addition to a general examination.

(8) Arrangements for remote closing of valves for fuel oil tanks, lubricating oil tanks and other flammable oil tanks are to be examined.

3.9 Propeller Shaft and Stern Tube Shaft Surveys

3.9.1 General

Sub-paragraph -2 has been amended as follows.

2 The terminology used in the application of propeller shaft and stern tube shaft surveys is as specified in the following **(1)** to **(~~8~~16)**:

(1) "Shafts" mean propeller shafts as specified in the following **(2)** and stern tube shafts as specified in the following **(3)** but exclude the intermediate shaft(s) which is(are) considered part of the propulsion shafting inside the vessel.

(2) "Propeller shaft" is the part of the propulsion shaft to which the propeller is fitted.

(3) "Stern tube shaft" is a shaft placed between the intermediate shaft and propeller shaft, normally arranged within a stern tube or running in open water.

(4) "Stern tube" is a tube or pipe fitted in the shell of a ship at the stern (or rear part of the ship), through which passes the stern tube shaft or aftermost section of the propeller shaft. "Stern tube" is the housing of the shaft bearings that sustain the shaft and also accommodates the shaft sealing arrangement.

(5) "Stern tube sealing system" means the equipment installed on the inboard extremity and, for oil or freshwater lubricated bearings, at outboard extremity of the stern tube. An "inboard seal" is the device fitted on the fore part of the stern tube that achieves the sealing against the possible leakage of the lubricant media into the ship internal. An "outboard seal" is the device fitted on the aft part of the stern tube that achieves the sealing against the possible sea water ingress and the leakage of the lubricant media.

(6) "Oil lubricated" means closed loop oil lubricating systems which use oil to lubricate the bearings and are sealed against the environment by adequate sealing or gland devices.

(7) "Freshwater lubricated" means closed loop water lubricating systems which use fresh water to lubricate the bearings and are sealed against the environment by adequate sealing or gland devices.

(8) "Water lubricated" means open water lubricating systems where bearings are cooled and lubricated by water (salt or fresh) which are exposed to the environment.

(9) "Service records" are regularly recorded data showing in-service conditions of the shaft(s) and include, as applicable: lubricating oil temperature, bearing temperature and oil consumption records (for oil lubricated bearings) or water flow, water temperature, salinity, pH, make-up water and water pressure (for closed loop fresh water lubricated bearings depending on design).

(10) "Oil sample examination" is a visual examination of the stern tube lubricating oil taken in the presence of the Surveyor with a focus on water contamination.

(11) "Lubricating oil analysis" is the analysis to be carried out as specified in the following **(a)** to **(c)**:

- (a) The lubricating oil analysis is to be carried out at regular intervals not exceeding 6 *months*.
- (b) The documentation on lubricating oil analysis is to be available on board.
- (c) Oil samples to be submitted for the analysis are, in principle, to be taken under service conditions.

(12) "Fresh water sample test" is the test to be carried out in accordance with the following **(a)** to **(d)**:

(a) The fresh water sample test is, in principle, to be carried out at regular intervals not exceeding 6 *months*.

(b) Fresh water samples are to be taken in accordance with the following **i)** to **iv)**:

i) The sample is to be taken under service conditions (i.e. with a rotating shaft and the system at service temperature) and are to be representative of the water circulating within the stern tube.

ii) The sample is to be taken from the same agreed position in the system, before the filters, if any fitted in the freshwater lubrication system, which is to be positively identified.

iii) At time of survey the sample for the test is to be taken in the presence of the Surveyor.

iv) The sample, unless supervised by the Surveyor, is to be collected under the direct supervision of the Chief Engineer.

(c) Analysis results are to be retained on board and made available to the Surveyor.

(d) The fresh water sample test is to include the following **i)** to **iii)** parameters:

i) chlorides content;

ii) pH value; and

iii) presence of bearing particles or other particles (only for laboratory analysis, and not required for tests carried out in the presence of the Surveyor).

(13) "Keyless connection" is the forced coupling methodology between the shaft and the propeller without a key achieved through interference fit of the propeller boss on the shaft tapered end.

(14) "Keyed connection" is the forced coupling methodology between the shaft and the propeller with a key and keyway achieved through the interference fit of the propeller boss on the shaft tapered end.

(15) "Flanged connection" is the coupling methodology, between the shaft and the propeller, achieved by a flange, built in at the shaft aft end, bolted to the propeller boss.

(16) "Alternative means" means shafting arrangements such as, but not limited to, an approved condition monitoring scheme and/or other reliable approved means for assessing and monitoring the condition of the tail shaft, bearings, sealing devices and the stern tube lubricant system capable to assure the condition of the propeller shaft assembly with an equivalent level of safety as obtained by survey methods specified in this Part.

Paragraph 3.9.2 has been amended as follows.

3.9.2 Survey Intervals*

1 ~~Ordinary~~ Surveys of propeller shafts and stern tube shafts are to be carried out at intervals specified in the following **(1)** or **(2)** ~~below~~ corresponding to the ~~type and~~ kind of shaft~~s~~, etc. in accordance with **3.9.3**, unless alternative means are provided to assure the condition of the propeller shaft assembly.

(1) Ordinary Surveys for ~~P~~propeller shafts Kind 1 ~~specified in **2.1.24, Part 1**~~ or stern tube shafts Kind 1 ~~specified in **2.1.26, Part 1**~~ (hereinafter referred to as "shafts Kind 1" in this Chapter) are to be carried out within 5 *years* from the date of completion (i.e. the survey due date) of the Classification Survey or the previous Ordinary Survey ~~(survey due date)~~. ~~However, Ordinary Surveys for crafts fitted with oil lubricated stern tube bearings, may be postponed for not more than 3 years or 5 *years* from the date of completion of the Partial Survey provided that the Partial Survey specified in **3.9.4-1** or **-2** is carried out respectively at a time prescribed above.~~

(2) Ordinary Surveys for ~~P~~propeller shafts Kind 2 ~~specified in **2.1.24, Part 1**~~ or stern tube shafts Kind 2 ~~specified in **2.1.26, Part 1**~~ (hereinafter referred to as "shafts Kind 2" in this Chapter) are to be carried out at the following times~~,~~:

(a) Concurrently with Special Surveys; and

(b) Within 36 *months* from the date of completion (i.e. the survey due date) of the Classification Survey or the previous Ordinary Survey (survey due date)

~~However, the part of the construction of the shaft in the stern tube bearing corresponds to the shaft Kind 1 and the construction of the shaft between the stern tube and the shaft bracket bearing corresponds to the shaft Kind 2, the shaft may be surveyed at the intervals prescribed in -1(1), provided that examination for the construction part corresponding to the Kind 2 is carried out at times prescribed in (a) and (b).~~

~~4~~**2** For keyless connection shafts lubricated with water lubricated bearings, the maximum interval between two consecutive dismantling and verifications of the shaft cone by means of non-destructive examination (*NDE*) is not to exceed 15 *years*. ~~*NDE* generally refers to the magnetic particle method.~~

3 For oil lubricated or freshwater lubricated shafts Kind 1, the Partial Surveys specified in **3.9.4** can be carried out instead of the Ordinary Surveys specified in **3.9.3**. It is, however, not allowed to carry out Partial Surveys consecutively.

~~2~~**4** ~~In applying **-1(1)** and **(2)** above, for Ordinary Surveys~~ For the surveys referred to in **(1)** and **(2)** of **-1** as well as in **-3** above completed within 3 *months* before the survey due date, the next period will start from the survey due date ~~will be regarded as the date of completion of this survey~~.

~~**3** In applying **-1(1)** above, for Partial Surveys completed within 1 month before the survey due date, the survey due date will be regarded as the date of completion of this survey.~~

5 Regardless of **-1** to **-4** above, ~~Ordinary Surveys~~ surveys of the propeller shafts and stern tube shafts of ships affixed with the notation "*APSS ・O*" or "*APSS ・W*" (excluding the main shaft of water jet propulsion systems) are to be carried out as specified separately by the Society.

Paragraph 3.9.3 has been amended as follows.

3.9.3 Ordinary Surveys

1 ~~The~~ Ordinary Surveys of propeller ~~shafts~~ and stern tube shafts (excluding main shafts of waterjet propulsion systems) ~~consists of the examinations in~~ are to be carried out in accordance with the following **(1)** to **(13)**~~.~~:

(1) Drawing out of the propeller shaft and the stern tube shaft

(a) For shafts with oil or freshwater lubricated bearings, the propeller shaft and the stern tube shaft are to be drawn and the entire shafts, seals system and bearings are to be examined.

(b) For shafts with water lubricated bearings, the propeller shaft and the stern tube shaft are to be drawn and the entire shaft (including liners, corrosion protection system and stress reducing features, where provided), inboard seal system and bearings are to be examined.

(2) The shaft in way of the propeller fitting area is to be examined as follows~~.~~:

(a) For ~~shafts having~~ keyed ~~propeller~~ connections, the propeller is to be removed to expose the forward end of the taper~~.~~, and a non-destructive examination (*NDE*) by an approved surface crack-detection method ~~(generally referring to the magnetic particle method)~~ deemed appropriate by the Surveyor is to be performed all around the shaft in way of the forward portion of the taper section, including the keyway. For shafts provided with liners, the *NDE* is to be extended to the after edge of the liner except as required by **3.9.4-1(1)(a)**.

(b) For ~~shafts having~~ keyless ~~propeller~~ connections, ~~T~~the propeller is to be removed to expose the forward end of the taper~~.~~, and a non-destructive examination (*NDE*) by an approved surface crack-detection method ~~(generally referring to the magnetic particle method)~~ deemed appropriate by the Surveyor is to be performed all around the shaft in way of the forward portion of the taper section. For shaft provided with liners the *NDE* is to be extended to the after edge of the liner except as required by **3.9.4-1(1)(a)**. For shafts

with water lubricated bearings, it is recommended that the survey specified in **3.9.2-~~4~~2** also be carried out in cases where ~~the next survey due date is less than~~ the date 15 *years* after the date of completion of the previous survey specified in **3.9.2-~~4~~2** is earlier than the next survey due date. When the propeller is force fitted to the shaft, it is to be ascertained that the pull-up length is within the upper and lower limits given by **5.2.5-1, Part 9**.

(c) For ~~shaft having coupling~~ flanges connections, whenever the coupling bolts of any type of flange-connected shaft are removed or the flange radius is made accessible in connection with overhaul, repairs or when deemed necessary by the ~~s~~Surveyor, the coupling bolts and flange radius are to be examined by means of an approved surface crack detection method ~~(generally referring to the magnetic particle method)~~ deemed appropriate by the Surveyor.

(3) The sleeves, the fillet of the coupling flange to the intermediate shaft or to the stern tube shaft and the coupling bolts are to be examined with the shaft drawn from the stern tube bearings. However, coupling bolts are to be examined by an efficient crack detection method~~,~~ in cases where the Surveyor~~s consider~~ deems such testing necessary based on the external examination results. In addition, anti-corrosion covers are to be removed for shafts ~~of~~ Kind 2.

(4) The stern tube bearings (including the shaft bracket bearings~~, if any.~~. The same ~~is referred to~~ applies hereinafter in this section.) are to be examined.

(5) Clearances between bush of the stern tube bearing (including bush of shaft bracket bearings. The same applies hereinafter in this section.) and either the propeller shaft or the stern tube shaft ~~and the after bearing of the stern tube~~ are to be checked and recorded.

(6) ~~It~~ For propellers, it is to be verified that the propeller is free of damages which may cause the propeller to be out of balance.

(7) The satisfactory conditions of inboard and outboard seals (including shaft bracket sealing devices~~, if any~~. The same applies hereinafter in this section.) are to be verified during the re-installation of the shaft and propeller.

(8) ~~For~~ Where oil or freshwater lubricated bearings are adopted, the ~~measurements of~~ weardown of the propeller shaft or the stern tube shaft at ~~the after bearing of~~ the stern tube (after re-installation) ~~are~~ is to be measured and recorded.

(9) The ~~P~~propeller boss surfaces in contact with the propeller shaft taper ~~are~~ is to be examined.

(10) For controllable pitch propeller connections, the principal part of pitch control gear and working parts are to be opened and examined, and the propeller blade fixing bolts are to be examined by an efficient crack detection method.

(11) Where water lubricated stern tube bearings are adopted, the water piping for lubrication is to be examined.

(12) Where oil or freshwater lubricated stern tube bearings are adopted, the low oil level alarms of the lubricating oil or lubricating freshwater tanks, lubricating oil or lubricating freshwater temperature measuring devices, oil or freshwater lubrication lines as well as lubricating oil circulating or lubricating freshwater pumps are to be examined for verifying whether stern tube bearings are being maintained in good working condition.

(13) Where oil or freshwater lubricated stern tube bearings are adopted, the lubricating oil or lubricating freshwater record book is to be examined.

(-2 is omitted.)

Paragraph 3.9.4 has been amended as follows.

3.9.4 Partial Surveys

1 ~~At a~~ Partial Surveys for propeller shafts Kind 1 with oil lubricated or freshwater lubricated stern tube bearings~~, the examinations specified in the following (1) to (3)~~ are to be carried out~~.~~ in accordance with the following **(1)** and **(2)**:

(1) Examinations are to be carried out in accordance with the following **(a)** to **(i)**, after confirming that the results of the examinations specified in the following **(2)** are satisfactory. In cases where the results of the examinations specified in the following **(2)** or the examinations specified in the following **(a)** to **(i)** are not satisfactory, the Ordinary Survey specified in **3.9.3** is to be carried out.

(a) In the case of keyed connections, the examinations specified in **3.9.3-1(2)** are to be carried out.

(b) Checking and recording the bearing weardown measurements are to be carried out.

(c) A visual inspection of all accessible parts of the shafting system is to be carried out.

(d) The examinations specified in **3.9.3-1(6)** are to be carried out.

(e) Confirmation that the seal liner is found to be or placed in a satisfactory condition is to be carried out.

(f) Verification of satisfactory conditions of inboard and outboard seals, and of the satisfactory installation of the propeller is to be carried out.

(g) In the case of keyed connections, the examinations specified in **3.9.3-1(9)** are to be carried out.

(h) The examinations specified in **(12)** and **(13)** of **3.9.3-1** are to be carried out.

(i) Verification that the main engines have not been operated within the barred speed range for torsional vibration is to be carried out.

(2) The examinations required by **(1)** above are to be carried out in accordance with the following **(a)** to **(d)**:

(a) Review of service records is to be carried out. Confirmation of bearing temperature may, however, be omitted in cases where the installation of devices to measure temperature is not required.

(b) The review specified in the following **i)** and **ii)** is to be carried out.

i) For oil lubricated shafts, review of test records of the lubricating oil analysis is to be carried out to confirm that the reference standards deemed appropriate by the Society are complied with.

ii) For freshwater lubricated shafts, review of test records of the fresh water sample test is to be carried out to confirm that the reference standards deemed appropriate by the Society are complied with.

(c) An oil sample examination (for oil lubricated shafts) or fresh water sample test (for closed system fresh water lubricated shafts) is to be carried out.

(d) Verification of no reported repairs by grinding or welding of shaft and/or propeller is to be carried out.

~~(1) Examinations as specified in **3.9.3-1(2), (6), (9), (12)** and **(13)** as well as the following **(a) to (e)**:~~

~~(a) Checking and recording measurements of the bearing weardown of the propeller shaft or the stern tube shaft at the after bearing of the stern tube~~

~~(b) Seal liner found to be or placed in a satisfactory condition~~

~~(c) Verification of the satisfactory conditions of inboard and outboard seals~~

~~(2) Visual inspection of all accessible parts of the shafting system~~

~~(3) Verification that the main engines have not been operated within the barred speed range for torsional vibration.~~

2 ~~At a Partial Survey for~~ In the case of propeller shafts Kind 1*C*, the "Record for Monitoring System of Stern Tube Bearing and Oil Sealing Devices" is to be examined in addition to the examinations specified in **-1**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 14 June 2019.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships other than ships the delivery of which is on or after 1 January 2016 until the first propeller shaft and stern tube shaft surveys scheduled on or after 1 January 2016 are completed.

3. Notwithstanding the provision of preceding **2.**, the amendments to the Rules may apply, upon request of the owner, to ships other than ships the delivery of which is on or after 1 January 2016 before the first propeller shaft and stern tube shaft surveys scheduled on or after 1 January 2016 are completed.

Amendment 1-3

Part 9 MACHINERY INSTALLATIONS

Chapter 2 DIESEL ENGINES

2.1 General

2.1.1 General*

Sub-paragraph -5 has been added as follows.

5 Gas-fuelled engines are to be in accordance with the requirements specified otherwise by the Society in addition to those in this chapter.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 14 June 2019.

Amendment 1-4

Part 2 CLASS SURVEYS

Chapter 1 GENERAL

1.1 Surveys

1.1.5 Machinery Verification Runs

Sub-paragraph -3 has been added as follows.

1 At the time of a special survey, a dock trial in the presence of the attending surveyor is to be carried out to confirm the satisfactory operation of main and auxiliary machinery. If significant repairs have been carried out to main or auxiliary machinery or steering gear, the Surveyor may deem a sea trial necessary.
2 At the time of extended drydocking, a dock trial may be required at the discretion of the attending surveyor to confirm the satisfactory operation of main and auxiliary machinery. If significant repairs have been carried out to main or auxiliary machinery or steering gear, the Surveyor may deem a sea trial necessary.
3 For ships which rely solely on electric propulsion motors for propulsion (hereinafter referred to as “electric propulsion ships” in this part), at the time of the machinery verification runs specified in **-1** and **-2** above, the satisfactory operation of the following electrical installations related to propulsion (hereinafter refered to as “electric propulsion plants”) is to be confirmed.
(1) Generating plants for propulsion
(2) Electric motors for propulsion
(3) Electrical installations that are necessary for the satisfactory operation of **(1)** and **(2)** (e.g. control gears for electric motors, semiconductor converters, and transformers)

Chapter 3 PERIODICAL SURVEYS AND PLANNED MACHINERY SURVEYS

3.6 Annual Surveys for Machinery

Paragraph 3.6.1 has been amended as follows.

3.6.1 Requirements for Annual Surveys*

1 At each Annual Survey for Machinery, a general examination of the whole machinery in the engine room and the following inspections **(1)** to **(8)** are to be carried out;
((1) to (8) are omitted.)
2 At Annual Surveys for electric propulsion ships, it is to be ascertained as far as practical for electric propulsion systems that forced cooling apparatuses (including filters), supports and coverings of cables, capacitor elements of propulsion semiconductor converters for propulsion, windings of generating plants and motors for propulsion , slip rings, commutators and brushes, etc. are in good condition.

3.6.2 Performance Tests*

Sub-paragraph (7) has been amended as follows.

At each Annual Survey for Machinery, performance tests for the following items in **(1)** to **(7)** are to be carried out in order to ascertain that they are placed in good order.
((1) to (6) are omitted.)

(7) Operation tests for the safety devices, etc. specified in the following **(a)** to **(e)** are to be carried out. However, the tests may be omitted at the Surveyor's discretion based on the general examination, and hearing of the working conditions at sea and inspection records taken by the ship's crew.
   (a) Main propulsion machinery and auxiliary machinery
   (Omitted)
   (b) Boilers, thermal oil heaters and incinerators
   (Omitted)
   (c) Monitoring devices
   (Omitted)
   (d) Automatic control devices and remote control devices
   Operation tests for automatic control devices and remote control devices used for auxiliary machinery essential for main propulsion and auxiliary machinery for the manoeuvring and the safety as well as the means of remotely controlling the propulsion machinery (including electric propulsion plants for electric propulsion ships) from the navigating bridge (including the control, monitoring, reporting, alert and safety actions) are to be carried out.
   (e) Engineer's Alarm
   (Omitted)

3.8 Special Surveys for Machinery

3.8.1 General Examinations

Sub-paragraph -2(2) has been amended as follows.

1 At each Special Surveys for Machinery, the general examinations and inspections specified in **3.7.1** are to be carried out.
2 In addition to -1, general examinations for the following items in **(1)** to **(3)** are to be carried out.
(1) Main propulsion machinery
(Omitted)
(2) Electrical installations
Insulation resistance of the generators and switchboards (the both including those for emergency use), the motors and the cables; the main circuits of control gears for electric propulsion motors and semiconductor converters for propulsion of electric propulsion ships are to be tested to ensure that they are placed in good order, and to be adjusted if it is found not to comply with the requirements **2.18.1, Part H of the Rules for the Survey and Construction of Steel Ships**. However, where a proper record of measurement is maintained and deemed appropriate by the Surveyor, consideration may be given to accepting recent readings.
(3) Spare parts and associated fittings
Spare parts and associated fittings for Machinery are to be examined.

Sub-paragraph -3 has been amended as follows.

3 At each Special Surveys for Machinery, the verification runs specified in **1.1.5-1** and **-3** are to be carried out.

EFFECTIVE DATE AND APPLICATION (Amendment 1-4)

1. The effective date of the amendments is 14 December 2019.
2. Notwithstanding the amendments to the Rules, the current requirements apply to the surveys for which the application is submitted to the Society before the effective date.

GUIDANCE FOR HIGH SPEED CRAFT

GUIDANCE

2019 AMENDMENT NO.1

Notice No.29 14 June 2019

Resolved by Technical Committee on 30 January 2019

Notice No.29 14 June 2019
AMENDMENT TO THE GUIDANCE FOR HIGH SPEED CRAFT

"Guidance for high speed craft" has been partly amended as follows:

Amendment 1-1

Part 1 GENERAL RULES

Chapter 1 GENERAL

1.1 General

Paragraph 1.1.8 has been amended as follows.

1.1.8 Crafts Using Low-flashpoint Fuels

In applying **Part GF of the Rules for the Survey and Construction of Steel Ships** with respect to requirement **1.1.8, Part 1 of the Rules**, the wording "docking surveys carried out at the times specified in **1.1.3-1(4)(a), Part B of the Rules for the Survey and Construction of Steel Ships**" in **GF15.4.2, Part GF of the Guidance for the Survey and Construction of Steel Ships** is to be interpreted to mean "~~docking surveys~~ Special Surveys carried out at the times specified in **3.1.1-1(3), Part 2 of the Rules for High Speed Craft**".

Part 2 CLASS SURVEYS

Chapter 3 PERIODICAL SURVEYS AND PLANNED MACHINERY SURVEYS

3.6 Annual Surveys for Machinery

3.6.1 Requirements for Annual Surveys

Sub-paragraph -5 has been added as follows.

5 The "reference standards deemed appropriate by the Society" referred to in **3.6.1(7), Part 2 of the Rules** refer to the following **(1)** and **(2)**:
(1) those specified in **3.9.4-1** for oil lubricated shafts; and
(2) those specified in **3.9.4-2** for freshwater lubricated shafts.

3.9 Propeller Shaft and Stern Tube Shaft Surveys

Paragraph 3.9.2 has been amended as follows.

3.9.2 Survey Intervals

The wording "specified separately by the Society" ~~specified~~ made in **3.9.2-5, Part 2 of the Rules** means that the surveys are to be carried out in accordance with **Annex B1.1.3-7 "Alternative Propeller Shaft and Stern Tube Shaft Survey Methods", Part B of the Guidance for the Survey and Construction of Steel Ships**. In applying said **Annex**, the references are to be replaced in accordance with the following **(1)** to **(3)**:
(1) ~~t~~The references to "**7.3.1-1, Part D of the Rules for the Survey and Construction of Steel Ships**" ~~specified~~ made in note 4 of **Table 2.1** and note 2 of **Table~~s~~ ~~2.1 and~~ 2.2** of the **Annex** ~~is~~ are to be replaced by ~~the~~ references to "**5.2.5-1, Part 9 of the Rules for High Speed Craft**".
(2) The reference to "**B8.1.2-1, Part B of the Guidance**" made in **2.2.1-2(2)** of the **Annex** is to be replaced by a reference to "**3.9.4-1, Part 2 of the Guidance**".
(3) The reference to "**B8.1.2-2, Part B of the Guidance**" made in **2.3.1-2(2)** of the **Annex** is to be replaced by a reference to "**3.9.4-2, Part 2 of the Guidance**".

Paragraph 3.9.4 has been added as follows.

3.9.4 Partial Surveys

1 The "reference standards deemed appropriate by the Society" referred to in **3.9.4-1(2)(b)i), Part 2 of the Rules** means the reference standards specified in the following **(1)** and **(2)**:
(1) Metal particles (upper limits)
  (a) Iron (Fe): 50 *ppm*
  (b) Tin (Sn): 20 *ppm*
  (c) Lead (Pb): 20 *ppm*
  (d) Sodium (Na): 80 *ppm*
(2) IR Oxidation and separated water (upper limits)
  (a) IR oxidation @ 5.85μm: 10 (*Abs.unit/cm*)
  (b) Separated water: 1.0 %

2 The "reference standards deemed appropriate by the Society" referred to in **3.9.4-1(2)(b)ii), Part 2 of the Rules** means the reference standards specified in the following **(1)** and **(2)**:

(1) Chloride content and sodium content (upper limits)

(a) Chloride: 60 *ppm*

(b) Sodium (Na): 70 *ppm*

(2) pH

Lower limit values determined based upon characteristics of the corrosion inhibitors used, but not to be less than 11

(3) Bearing particles and other particles

(a) Metal particles (upper limits)

i) Iron (Fe): 25 *ppm*

ii) Chromium (Cr): 5 *ppm*

iii) Nickel (Ni): 5 *ppm*

iv) Copper (Cu): 40 *ppm*

v) Silicon (Si): 30 *ppm*

(b) Bearing particles (non-metallic content)

No polymer resins are to be found by micro-filter and/or microscopic testing.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 14 June 2019.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships other than ships the delivery of which is on or after 1 January 2016 until the first propeller shaft and stern tube shaft surveys scheduled on or after 1 January 2016 are completed.

3. Notwithstanding the provision of preceding **2.**, the amendments to the Guidance may apply, upon request of the owner, to ships other than ships the delivery of which is on or after 1 January 2016 before the first propeller shaft and stern tube shaft surveys scheduled on or after 1 January 2016 are completed.

Amendment 1-2

Part 9 MACHINERY INSTALLATIONS

Chapter 2 DIESEL ENGINES

2.1 General

2.1.1 General

Sub-paragraph -4 has been added as follows.

4 The wording "the requirements specified otherwise by the Society" in **2.1.1-5, Part 9 of the Rules** means **Annex 3** "**GUIDANCE FOR HIGH PRESSURE GAS-FUELLED ENGINES**" or **Annex 4** "**GUIDANCE FOR LOW PRESSURE GAS-FUELLED ENGINES**" **of Part GF**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 14 June 2019.

Amendment 1-3

Part 9 MACHINERY INSTALLATIONS

Chapter 3 has been amended as follows.

Chapter 3 GAS TURBINES

3.1 General

3.1.~~2~~3 Drawings and Data

~~**1** For the gas turbine manufacturer producing turbines with the drawings and data of the turbine's designer (hereinafter referred to as "licenser") which have been already approved by the Society (hereinafter the gas turbine manufacturer referred to as "licensee"), the list of identification numbers including revision status of the drawings and data may be accepted as substitution for the drawings and data specified in **3.1.2, Part 9 of the Rules**.~~

~~**2** Where the licensee proposes design modification to components relevant to drawings and data mentioned in **-1**, the associated documents are to be submitted by the licensee for approval or for information. In case of significant modifications, a statement confirming the licenser's acceptance of the changes is also to be submitted.~~

~~**3** In all cases including those according to above **-1** and **-2**, a complete set of documents are to be kept in the manufacturing workshop and to be available for the attending Surveyor's review.~~

"Documents containing strength considerations made for principal components" referred to in **3.1.3(2)(h), Part 9 of the Rules** are to include the following **(1)** and **(2)** documents:

(1) documents showing that mechanical stresses acting on principal components are clear based upon the results of stress analysis or from experimental values, etc. and it is ensured that there is an adequate safety factor for such stresses against the fatigue limit.

(2) documents showing that it has been verified for principle components on which mechanical stresses, thermal stresses, creeps, relaxations, etc. or any combination thereof is applied and that stresses corresponding to differential stresses between those in the static condition of the gas turbine at ambient temperature and those in the condition in which the gas turbine is operating at the maximum continuous output.

3.2 Materials, Construction and Strength

3.2.2 Construction and Installations

1 The restart of gas turbines used as main propulsion machinery specified in **3.2.2-4, Part 9 of the Rules** does not require an automatic restarting function.

2 The phrase "installed so that (...) does not endanger persons and machinery in the vicinity of the gas turbine" specified in **3.2.2-6, Part 9 of the Rules** means that the following **(1)** to **(3)** are, as far as possible, to be located outside of the plane of high speed rotating parts of the gas turbine, taking into account those cases where the casing is unable to contain a blade or another principal component, or any debris in the event of the loss of a blade or the failure of such a principle component.

(1) Fuel oil, lubricating oil and other systems having a fire risk

(2) Fire detection and alarm systems as well as fire extinguishing systems
(3) Areas normally manned in the compartment where the gas turbine is installed

3.~~3~~4 Associated Installations

3.~~3~~4.2 Starting Arrangements

1 In cases where the "means" specified in **3.4.2-1, Part 9 of the Rules** is automatic, ~~The~~ fuel oil systems, lubricating oil systems and cooling systems, etc. are to be ~~so~~ designed ~~as to be provided with appropriate interlocks or to be~~ so that they can be operated sequentially according to ~~the~~ a pre-determined programme~~s on starting-up and stopping of the engines~~ when the engine starts or stops. ~~As for~~ Regarding the sequence and operation related to these systems, attention is to be paid to the following~~s~~ **(1)** to **(7)**.

(1) ~~The l~~Lubricating oil pumps are to be in operation before the starting-up and after the stopping of ~~the engines~~ any engine. However, ~~the~~ this requirement~~s~~ may be dispensed with in cases where the engine~~s are~~ is equipped with roller bearings and the lubricating oil pumps are being driven by the engine~~s~~.
(2) ~~Before ignition, the combustion chamber is~~ Combustion chambers are to be pre-purged by a sufficient volume of air before ignition.
(3) The opening of the main fuel valve is not to precede the ignition spark.
(4) The ignition period of each burner (~~the period until~~ after the main fuel valve ~~closes when~~ has been opened, in the event of ~~the~~ ignition ~~has~~ fail~~ed~~ure, ~~after~~ the amount of time until the valve ~~opens~~ is closed.) is not to exceed ~~the~~ a pre-determined length of time ~~length~~. The engine starting trial ~~for starting engine~~ is to be halted in cases where the engine does not start within ~~the~~ such a pre-determined time period.
(5) Excessive fuel is not to be supplied to ~~the~~ combustion chambers during ignition~~s~~.
(6) After shutting off the fuel valves, a suitable measure is to be taken to prevent ~~the~~ any abnormal combustion or ignition trouble at ~~the~~ times of restarting~~,~~. ~~I~~For example, this could be achieved by ~~means of~~ opening the drain valves located at ~~the~~ positions between the fuel oil shut off valve and the fuel nozzle.
(7) ~~The s~~Starting devices are to be disconnected from gas generators after their running becomes self-sustaining.

2 In cases where the "reservoirs" specified in **3.4.2-2(2), Part 9 of the Rules** are utilized for the "purging" specified in **3.4.2-1(2), Part 9 of the Rules**, the total capacity of the reservoirs is to be such that a capacity necessary for the purging is added.

3.4.4 Fuel Oil Arrangements

The "sufficient consideration" referred to in **3.4.4-1, Part 9 of the Rules** means that provisions such as those in accordance with the following **(1)** and **(2)** are made.

(1) At least two filters are to be fitted in the fuel oil supply lines to the gas turbine and be so arranged that any filter may be cleaned without interrupting the supply of filtered fuel oil to the gas turbine.
(2) Fuel treatment systems, including filtration and centrifuging devices, are to be provided so as to control the level of water and particulate contamination within the limits specified by the manufacturer of the gas turbine.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 14 June 2019.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to gas turbines whose type is the same type of those for which the application for approval is submitted to the Society before the effective date.

Amendment 1-4

Part 2 CLASS SURVEYS

Chapter 1 GENERAL

1.1 Surveys

1.1.3 Occasional Surveys

Sub-paragraph (3) has been amended as follows.

For the occasional surveys specified in **1.1.3(5), Part 2 of the Rules**, the following is to be complied with:

((1) and (2) are omitted.)

(3) Crafts Using Low-flashpoint Fuels

(a) For crafts that fall under the following ~~**(a**~~**i)** or ~~**(b**~~**ii)**, a survey is to be carried out to verify compliance with the requirements of **1.1.8, Part 1 of the Rules** before using low-flashpoint fuels or undertaking to use ~~below specified~~ different low-flashpoint fuels than specified~~.~~:

~~(a~~i) Crafts which convert to using low-flashpoint fuels on or after 1 January 2017; or

~~(b~~ii) Crafts which, on or after 1 January 2017, undertake to use low-flashpoint fuels different from those which ~~it was~~they were originally approved to use before 1 January 2017.

(b) For ships that fall under the following **i)** or **ii)**, a survey is to be carried out to verify compliance with the requirements of **GF11.3.1-1**, **GF11.3.1-2**, **GF12.5.2-2** and **GF15.10.1, Part GF of the Guidance for the Survey and Construction of Steel Ships**. before using low-flashpoint fuels or undertaking to use different low-flashpoint fuels than specified:

i) Ships which convert to using low-flashpoint fuels on or after 1 July 2019; or

ii) Ships which, on or after 1 July 2019, undertake to use low-flashpoint fuels different from those which they were originally approved to use before 1 July 2019.

EFFECTIVE DATE AND APPLICATION (Amendment 1-4)

1. The effective date of the amendments is 1 July 2019.

Amendment 1-5

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.3 Sea Trials and Stability Experiments

2.3.1 Sea Trials

Sub-paragraph (2) has been amended as follows.

Details of each test to be carried out during sea trials are to be in accordance with the following requirements.

((1) is omitted.)

(2) Astern test

The astern test is to be carried out in accordance with the following **(a)** ~~and~~to **(~~b~~d)**:

(a) While the main propulsion machinery is running ahead at its maximum continuous output, an order for full astern is issued and the reversing operation from ahead run to full astern run is carried out as quickly as possible, and the astern performance and stopping performance of craft are to be verified. In applying this provision, the tests are to be carried out from all control positions where there are multiple control positions for the reversing operation to astern run.

(b) It is to be confirmed that the machinery is functioning normally while the ship is running astern. The main engine is to be kept at a rate of more than 70% of the maximum continuous revolutions until the astern speed (rotational speed in rpm) stabilizes.

(c) For low pressure gas-fuelled dual fuel engines, the confirmation specified in **(b)** is to be carried out for all operating modes (gas mode, diesel mode, etc.).

(d) To high pressure gas-fuelled dual fuel engines, the requirements for low pressure gas-fuelled dual fuel engines specified in **(c)** apply mutatis mutandis.

((3) to (11) are omitted.)

EFFECTIVE DATE AND APPLICATION (Amendment 1-5)

1. The effective date of the amendments is 1 July 2019.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to gas-fuelled engines for which the application for approval is submitted to the Society before the effective date.