16-502

RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

Rules for the Survey and Construction of Inland Waterway Ships
2016 AMENDMENT NO.1
Guidance for the Survey and Construction of Inland Waterway Ships
2016 AMENDMENT NO.1

Rule No.45 / Notice No.43 30th June 2016
Resolved by Technical Committee on 5th February 2016
Approved by Board of Directors on 22nd February 2016

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NIPPON KAIJI KYOKAI

RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

RULES

2016 AMENDMENT NO.1

Rule No.45 30th June 2016

Resolved by Technical Committee on 5th February 2016

Approved by Board of Directors on 22nd February 2016

Rule No.45 30th June 2016
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

"Rules for the survey and construction of inland waterway ships" has been partly amended as follows:

Amendment 1-1

Part 7 MACHINERY INSTALLATIONS

Chapter 9 WELDING FOR MACHINERY INSTALLATIONS

9.4 Welding of Boilers

Paragraph 9.4.5 has been amended as follows.

9.4.5 ~~Radiographic~~Non-destructive Testing for Longitudinal and Circumferential Joints

1 For boiler shells (including headers), the entire length of both the longitudinal and the circumferential welded joints is to be subjected to radiographic testing.

2 The radiographic technique employed is to be such as to detect a defect as small as 2% of the welding depth and the wire of the penetrameter, corresponding to 2% of the thickness of the base metal, is to be clearly shown on the radiographic film.

3 Each radiograph film is to be clearly marked with respect to the relative position of the welds and the radiograph position.

4 The following items are to be included in the radiographic testing report:

(1) Thickness of the material (flush or reinforced)

(2) Distance from the radiation source to the weld surface

(3) Distance from the film to the weld surface

(4) Type of penetrameter used

5 Reinforcement of the welded joints, where radiographic testing is carried out, is to be evenly finished to ensure trouble free examination. In this case, the height of the reinforcement is to be in accordance with the following standards:

(1) Double-welded butt joints:
To be as given in **Table 7.9.4**

(2) Single-welded butt joints:
To be 1.5 *mm* or less, regardless of the plate thickness

6 Any defects found as a result of radiographic testing~~s are~~is to be dealt with according to the following requirements:

(1) In cases where there are defects such as crack, lack of fusion, incomplete penetration, etc., the defective part is to be chipped off and rewelded.

(2) Defects such as blow-holes and slag-inclusions are to be reconditioned in accordance with procedures deemed appropriate by the Society after taking into consideration the shape, dimensions and distribution of the defect.

7 In cases where repairs are carried out on welded joints, the repaired part of the joint is to be subjected to a radiographic testing once again.

8 Notwithstanding the requirements in **-1** to **-7** above, other appropriate non-destructive testing may be conducted in lieu of the radiographic testing using a radiograph film in cases where the Society specifically grants approval.

Table 7.9.4 Allowable Height of Reinforcements

Thickness of base metal (*mm*)	12 or less	Exceeding 12 but not more than 25	Exceeding 25
Allowable height of reinforcement (*mm*)	1.5	2.5	3.0

Paragraph 9.4.6 has been amended as follows.

9.4.6 Non-destructive Testing for Other Welds

1 For important welds other than those specified in **9.4.5**, non-destructive tests are to be carried out as considered appropriate.

2 ~~Radiographic~~Non-destructive testing procedures are to comply with the requirements specified in **9.4.5-2** ~~through~~to **-7** and any other non-destructive testing procedures are to be appropriate for the type of tests employed. The radiographic testing, however, may be conducted in another appropriate method in lieu of the radiographic testing using a radiograph film in cases where the Society specifically grants approval.

9.5 Welding of Pressure Vessels

Paragraph 9.5.5 has been amended as follows.

9.5.5 ~~Radiographic~~Non-destructive Testing for Welded Joints

1 The entire length of butt weld joints corresponding to the following **(1)** or **(2)** are to be subjected full radiographic testing.

(1) Longitudinal and circumferential weld joints of pressure vessels of Group I

(2) Weld joints whose joint efficiency has been determined by full radiographic testing.

2 For the pressure vessels whose joint efficiency has been determined by spot testing, radiographic testing is to be carried out in accordance with the following requirements.

(1) For welds that were welded by the same method and by the same welder, a length which is not less than 20% (minimum 300 *mm*) of the length of the longitudinal joint as well as the weld at the intersecting section of any circumferential joints with a longitudinal joint are to be spot radiographed.

(2) Locations to be spot radiographed are to be chosen by the Surveyor.

3 Radiographic testing procedures and disposal of test results are to conform to the requirements in **9.4.5-2** to **-7**. The radiographic testing, however, may be conducted in another appropriate method in lieu of the radiographic testing using a radiograph film in cases where the Society specifically grants approval.

4 Notwithstanding the requirements specified in **-1** and **-2**, ultrasonic testing~~s~~ may be conducted in lieu of the radiographic testing in cases where the Society specifically grants approval.

9.6 Welding of Piping

9.6.5 Non-destructive Testing

1 Butt weld joints of Group I pipes having nominal diameters exceeding 65*A* are to be subjected to full radiographic testing.

Sub-paragraphs -2 to -4 have been amended as follows.

2 Butt weld joints of Group I pipes having nominal diameters not more than 65*A* and Group II pipes having nominal diameters exceeding 90*A* are to be subjected to a radiographic ~~examination~~testing by sampling in accordance with the instructions of the Surveyor.

3 The Society may approve other appropriate non-destructive testing in lieu of a radiographic ~~examination~~testing.

4 The requirements in **9.4.5-2 to -7** are to be applied ~~mutatis mutandis~~ to radiographic ~~examinations~~testing. The radiographic testing, however, may be conducted in another appropriate method in lieu of the radiographic testing using a radiograph film in cases where the Society specifically grants approval.

5 With respect to the fillet welding of Group I or Group II pipes, the Society, in consideration of the material, dimensions and service conditions of the pipes, etc., may require a magnetic particle examination or other suitable examination.

6 The Society, in consideration of the welding materials or the welding procedure, may require a special examination.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2016.

Amendment 1-2

Part 2 CLASS SURVEYS

Chapter 1 GENERAL

1.4 Preparation for Surveys and Miscellaneous

Paragraph 1.4.6 has been amended as follows.

1.4.6 Firms Engaged in ~~Surveys~~Inspections, Measurements and Maintenance

1 Unless otherwise specified, third parties engaged in thickness measurements, in-water surveys by divers or remote operated vehicles, or tightness testing of closing appliances such as hatches, doors, etc., with ultrasonic equipment are to be firms deemed appropriate by the Society.

2 Unless otherwise specified, third parties engaged in ~~surveys~~inspections and maintenance of fixed fire extinguishing systems, portable fire extinguishers, self-contained breathing apparatuses, emergency escape breathing devices or fire detection and alarm systems are to be firms deemed appropriate by the Society.

EFFECTIVE DATE AND APPLICATION(Amendment 1-2)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to manufacturing works and service suppliers approved by the Society before 1 July 2016 until 30 June 2019 or the expiry date of their certificate, whichever comes first.

Amendment 1-3

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.1 Classification Survey During Construction

2.1.2 Submission of Plans and Documents for Approval

1 When it is intended to build a ship for classification by the Society, the following plans and documents are to be submitted for the approval by the Society before the work is commenced. The plans and documents may be submitted for examination by the Society prior to making an application for the classification of the ship as stipulated otherwise by the Society.

(2) Machinery

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

(b) Main and auxiliary engines (including their attachments):
Plans and data specified in **2.1.~~2~~3, Part 7**

Part 7 MACHINERY INSTALLATIONS

Chapter 2 DIESEL ENGINES

2.1 General

Paragraph 2.1.1 has been amended as follows.

2.1.1 ~~Scope~~General

1 The requirements of this Chapter apply to diesel engines which are used as the main propulsion machinery or used to drive generators and auxiliaries (hereinafter referred to in this Chapter as all auxiliaries excluding auxiliary machinery for specific use etc.).

2 For each type of diesel engines, an approval of use is to be obtained by the engine designer (hereinafter referred to "licensor" in this Chapter) as specified separately by the Society.

~~3~~3 Electronically-controlled diesel engines which are used as the main propulsion machinery are to be in accordance with the requirements specified otherwise by the Society in addition to those in this Chapter.

Paragraph 2.1.2 has been renumbered to Paragraph 2.1.3, and Paragraph 2.1.2 has been added as follows.

2.1.2 Terminology

The terminology used in the application of **-1(3)** and **-2** of **2.1.3** as well as **2.1.4** is as specified in the following **(1)** to **(36)**:

(1) "Acceptance criteria" mean a set of values or criteria which a design, product, service or process is required to conform with, in order to be considered in compliance.

(2) "Appraisal" means evaluation by a competent body.

(3) "Approval" means the granting of permission for a design, product, service or process to be used for a stated purpose under specific conditions based upon a satisfactory appraisal.

(4) "Assembly" means equipment or a system made up of components or parts.

(5) "Assess" means to determine the degree of conformity of a design, product, service, process, system or organization with identified specifications, rules, standards or other normative documents.

(6) "Certificate" means a formal document attesting to the compliance of a design, product, service or process with acceptance criteria.

(7) "Certification" means a procedure whereby a design, product, service or process is approved in accordance with acceptance criteria.

(8) "Competent body" means an organization recognized as having appropriate knowledge and expertise in a specific area.

(9) "Component" means a part, member of equipment or system.

(10) "Conformity" means that a design, product, process or service demonstrates compliance with its specific requirements.

(11) "Contract" means an agreement between two or more parties relating to the scope of service.

(12) "Customer" means a party who purchases or receives goods or services from another.

(13) "Design" means all relevant plans, documents, calculations described in the performance, installation and manufacturing of a product.

(14) "Design appraisal" means evaluation of all relevant plans, calculations and documents related

to the design.

(15) "Equipment" means a part of a system assembled from components.

(16) "Equivalent" means an acceptable, no less effective alternative to specified criteria.

(17) "Evaluation" means systematic examination of the extent to which a design, product, service or process satisfies specific criteria.

(18) "Examination" means assessment by a competent person to determine compliance with requirements.

(19) "Inspection" means examination of a design, product service or process by a Surveyor.

(20) "Installation" means the assembling and final placement of components, equipment and subsystems to permit operation of the system.

(21) "Manufacturer" means a party responsible for the manufacturing and quality of the product.

(22) "Manufacturing process" means systematic series of actions directed towards manufacturing a product.

(23) "Material" means goods supplied by one manufacturer to another manufacturer that will require further forming or manufacturing before becoming a new product.

(24) "Modification" means a limited change that does not affect the current approval.

(25) "Product" means a result of the manufacturing process.

(26) "Quality assurance" means all the planned and systematic activities implemented within the quality system, and demonstrated as needed to provide adequate confidence that an entity will fulfil requirements for quality. Refer to *ISO* 9000 series.

(27) "Regulation" means a rule or order issued by an executive authority or regulatory agency of a government and having the force of law.

(28) "Repair" means to restore to original or near original condition from the results of wear and tear or damages for a product or system in service.

(29) "Requirement" means specified characteristics used for evaluation purposes.

(30) "Information" means additional technical data or details supplementing the drawings requiring approval.

(31) "Specification" means technical data or particulars which are used to establish the suitability of materials, products, components or systems for their intended use.

(32) "Substantive modifications" mean design modifications, which lead to alterations in the stress levels, operational behaviour, fatigue life or an effect on other components or characteristics of importance such as emissions.

(33) "Sub-supplier/subcontractor" means one who contracts to supply material to another supplier.

(34) "Supplier" means one who contracts to furnish materials or design, products, service or components to a customer or user.

(35) "Test" means a technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. A technical operation to determine if one or more characteristic(s) or performance of a product, process or service satisfies specific requirements.

(36) "Witness" means an individual physically present at a test and being able to record and give evidence about its outcome.

Paragraph 2.1.3 has been amended as follows.

2.1.~~2~~3 Drawings and Data

1 Drawings and data to be submitted are generally as follows:

(1) Drawings and data for approval

~~(a) Engine particulars (to be in the form designated by the Society)~~

~~(b) Details of welding procedures for principal components~~
~~(c) Crankshaft (including component details, shaft coupling bolts, balance weights and their fastening bolts)~~
(~~d~~a)Connecting rod ~~and its~~ bearings (including bolts details) of 4-stroke cycle engines
~~(e) Thrust shaft (if integral with engine)~~
~~(f) Arrangement of foundation bolts (including foundation bolts, chocks and stoppers)~~
~~(g) Structural detail and arrangement of crankcase explosion relief valves~~
~~(h) Material specifications of principal components~~
(~~i~~b) High pressure oil pipes for driving exhaust valves with its shielding
(~~j~~c) High pressure fuel oil pipes with its shielding and clamping
(~~k~~d)Piping arrangements fitted to engines (including fuel oil, lubricating oil, cooling oil, cooling water, pneumatic and hydraulic systems, and information regarding the size, materials and working pressure of pipes)
(e) The drawings and data as specified in **(3)(d)** to **(f)**
(f) The drawings and data, etc. as required by the requirements of **2.1.4** (excluding those specified in **2.1.3-1(3)**)
(~~l~~g) Sectional assembly of exhaust driven turboblower

(2) Drawings and data for reference
(a) A list containing all drawings and data submitted (~~including~~with relevant drawing numbers and revision status)
~~(b) Longitudinal section of engine~~
~~(c) Transverse cross-section of engine~~
~~(d) Bedplate and thrust block (if integral with engine)~~
~~(e) Frames~~
~~(f) Cylinder cover, cylinder jacket, and cylinder liner~~
(~~g~~b)~~Piston and g~~Gudgeon pins
~~(h) Tie rods (including coupling and set-screw)~~
~~(i) Assembly of piston and piston rod~~
~~(j) Piston rod~~
(~~k~~c)Connecting rod ~~and its~~ bearings (including bolts details) of 2-stroke cycle engines
~~(l) Assembly of thrust bearing~~
~~(m) Assembly of crosshead~~
~~(n) Camshaft driving gear and assembly of cam and camshaft~~
(~~o~~d)Rocker valve gears
~~(p) Fuel oil injection pump~~
~~(q) Main bearing bolts~~
(~~r~~e) Cylinder cover fixing bolts and valve box fixing bolts
~~(s) Flywheel (in the case of a power transmission component)~~
(~~t~~f) Engine control system diagram (including the monitoring, safety and alarm systems)
~~(u) Construction and arrangement of thermal insulation for exhaust pipes fitted to the engine~~
(~~v~~g)Construction and arrangement of dampers, detuners, balancers or compensators, bracings as well as all calculation sheets related to engine balancing and engine vibration prevention
~~(w) Operation and service manuals for the engine~~
(~~x~~h)Other drawings and data deemed necessary by the Society

(3) Drawings and data for the purpose of inspection and testing of diesel engines
(a) A list containing all drawings and data submitted (including relevant drawing numbers and revision status)
(b) Engine particulars to be in the form designated by the Society

(c) Material specifications of main parts with information on non-destructive testing and pressure testing as applicable to the material
(d) Bedplate and crankcase of welded design, with welding details and welding instructions for approval of materials and weld procedure specifications. The weld procedure specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.
(e) Thrust bearing bedplate of welded design, with welding details and welding instructions for approval of materials and weld procedure specifications. The weld procedure specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.
(f) Frame/framebox/gearbox of welded design, with welding details and instructions for approval of materials and weld procedure specifications. The weld procedure specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.
(g) Crankshaft, assembly and details
(h) Thrust shaft or intermediate shaft (if integral with engine)
(i) Shaft coupling bolts
(j) Bolts and studs for main bearings
(k) Bolts and studs for cylinder heads and exhaust valve (two stroke design)
(l) Bolts and studs for connecting rods
(m) Tie rods
(n) Schematic layout or other equivalent drawings and data on the diesel engine of the following **i)** to **vii)** (Details of the system so far as supplied by the licensee such as: main dimensions, operating media and maximum working pressures).
i) starting air system
ii) Fuel oil system
iii) Lubricating oil system
iv) Cooling water system
v) Hydraulic system
vi) Hydraulic system (for valve lift)
vii) Engine control and safety system
(o) Shielding of high pressure fuel pipes, assembly
(All engines)
(p) Construction of accumulators for hydraulic oil and fuel oil
(q) High pressure parts for fuel oil injection system
The documentation to contain specifications for pressures, pipe dimensions and materials.
(r) Arrangement and details of the crankcase explosion relief valve (only for engines of a cylinder diameter of 200 *mm* or more or a crankcase volume of 0.6 m^3 or more)
(s) Oil mist detection and/or alternative alarm arrangements
(t) Cylinder head
(u) Cylinder block, engine block
(v) Cylinder liner
(w) Counterweights (if not integral with crankshaft), including fastening
(x) Connecting rod with cap
(y) Crosshead
(z) Piston rod
(aa) Piston, assembly, including identification (e.g. drawing number) of components
(ab) Piston head
(ac) Camshaft drive, assembly, including identification (e.g. drawing number) of components

(ad) Flywheel
(ae) Arrangement of foundation (for main engines only)
(af) Fuel oil injection pump
(ag) Shielding and insulation of exhaust pipes and other parts of high temperature which may be impinged as a result of a fuel system failure, assembly
(ah) Construction and arrangement of dampers
(ai) For electronically controlled engines, assembly drawings or arrangements of the following **i)** to **iv)**:
i) Control valves
ii) High-pressure pumps
iii) Drive for high pressure pumps
iv) Valve bodies, if applicable
(aj) Operation and service manuals
Operation and service manuals are to contain maintenance requirements (servicing and repair) including details of any special tools and gauges that are to be used with their fitting/settings together with any test requirements on completion of maintenance.
(ak) Test program resulting from FMEA (for engine control system) in cases of engines that rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves
(al) Production specifications for castings and welding (sequence)
(am) Certification of an approval of use for environmental tests, control components. Documents modified for a specific application are to be submitted to the Society for information or approval, as applicable.
(an) Quality requirements for engine production
(ao) Other drawings and data deemed necessary by the Society

2 The drawings and data specified in **-1(3)** above are to be submitted by the engine manufacturer producing engines with the drawings and data whose approval of use has been obtained in accordance with **2.1.1-2** (hereinafter referred to "licensee" in this Chapter) but may be submitted by the licensor in accordance with **2.1.4-2**.

Paragraph 2.1.4 has been added as follows.

2.1.4 Approval of Diesel Engines

1 Diesel engines are to be approved in accordance with the following **(1)** to **(6)**:

(1) Development of documents and data for engine production

(a) Prior to the start of the diesel engine approval process in accordance with the following **(3)** and subsequent sub-paragraphs of this paragraph, a design approval is to be obtained as specified separately by the Society.

(b) Each type of diesel engine is to be provided with a certificate of approval of use obtained by the licensor in accordance with **2.1.1-2**. For the first engine of a type or for those with no service records, the process of an approval of use and the approval process for production by the licensee may be performed simultaneously.

(c) The licensor is to review the drawings and data of the diesel engine whose approval of use has been obtained for the application and develop, if necessary, application specific drawings and data for production of diesel engines for the use of the licensee in developing the diesel engine specific production drawings and data listed in **2.1.3-1(3)**.

(d) If substantive modifications to the the drawings and data of the diesel engine whose approval of use has been obtained have been made in the drawings and data of diesel engines to be produced, the affected drawings and data are to be resubmitted to the

Society as specified separately by the Society.

(2) Drawings and data for the purpose of inspection and testing of diesel engines

(a) The licensee is to develop the drawings and data listed in **2.1.3-1(3)** and a comparison list of these drawings and data to the drawings and data of the diesel engine whose approval of use has been obtained by the licensor and submit these drawings and the comparison list to the Society.

(b) In applying **2.1.3-1(3)**, if there are differences in the technical content on the licensee's production drawings and data of the diesel engine compared to the drawings and data of the diesel engine whose approval of use has been obtained by the licensor, the licensee is to submit "Confirmation of the licensor's acceptance of licensee's modifications" approved by the licensor and signed by the licensee and licensor. If the licensor acceptance is not confirmed, the diesel engine manufactured by the licensee is to be regarded as a different engine type and is **2.1.1-2** is to apply to the diesel engine.

(c) In applying **(b)** above, modifications applied by the licensee are to be provided with appropriate quality requirements.

(d) The Society returns the drawings and data specified in **(a)** and **(b)** above to the licensee with confirmation that the design has been approved.

(e) The licensee or its subcontractors are to prepare to be able to provide the drawings and data specified in **(a)** and **(b)** above so that the Surveyor can use the information for inspection purposes during manufacture and testing of the diesel engine and its components.

(3) Additional drawings and data

In addition to the drawings and data listed in **2.1.3-1(3)**, the licensee is to be able to provide to the Surveyor performing the test specified in **2.6.1** upon request the relevant detail drawings, production quality control specifications and acceptance criteria. These drawings and data are for supplemental purposes to the survey only.

(4) Licensor approval

(a) The Society assesses conformity of production with the Society's requirements for production facilities comprising manufacturing facilities and processes, machining tools, quality assurance, testing facilities, etc. as specified separately by the Society.

(b) Satisfactory conformance with **(a)** above results in the issue of a document showing the licensee has been approved by the Society.

(5) Engine assembly and testing

The licensee is to assemble and test the diesel engine according to the Society's technical rules each of the diesel engine assembly and testing procedure is to be witnessed by the Surveyor unless the manufacturer of the diesel engine is one approved in accordance with **the Rules for Approval of Manufacturers and Service Suppliers** and use of a mass production system is agreed between the manufacturer and the Society.

(6) Issue of certificates of diesel engines and components

(a) The attending Surveyors, at the licensee/subcontractors, will issue product certificates as necessary for components manufactured upon satisfactory inspections and tests.

(b) An engine certificate is issued by the Surveyor upon satisfactory completion of assembly and tests specified in **(5)** above.

2 In applying **-1** above, for those cases when a licensor - licensee agreement does not apply, a "licensor" is to be understood as the following **(1)** or **(2)**:

(1) The entity that has the design rights for the diesel engine type; or

(2) The entity that is delegated by the entity having the design rights to modify the design.

3 Components of licensor's design which are covered by the certificate of approval of use of

the relevant engine type are regarded as approved whether manufactured by the diesel engine manufacturer or sub-supplied.

4 For components of subcontractor's design, necessary approvals are to be obtained by the relevant suppliers (e.g. exhaust gas turbochargers, charge air coolers, etc.).

EFFECTIVE DATE AND APPLICATION(Amendment 1-3)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to diesel engines 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 2 CLASSIFICATION SURVEYS

2.1 Classification Survey During Construction

2.1.2 Submission of Plans and Documents for Approval

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

1 When it is intended to build a ship for classification by the Society, the following plans and documents are to be submitted for the approval by the Society before the work is commenced. The plans and documents may be submitted for examination by the Society prior to making an application for the classification of the ship as stipulated otherwise by the Society.

(2) Machinery

(b) Main and auxiliary engines (including their attachments):
Plans and data specified in **2.1.~~2~~3, Part 7**

Part 7 MACHINERY INSTALLATIONS

Chapter 2 DIESEL ENGINES

2.1 General

Paragraph 2.1.2 has been renumbered to paragraph 2.1.3, and paragraph 2.1.2 has been added as follows.

2.1.2 Terminology

In this chapter, exhaust driven turbochargers are categorised into the following three groups according to the engine power at maximum continuous rating (*MCR*) supplied by a group of cylinders served by the actual turbocharger (e.g., turbocharger size is to be 50% of total engine power for a V-engine with one turbocharger serving each bank of cylinders).

(1) Category *A* turbochargers
The engine power at *MCR* supplied by a group of cylinders served by the turbocharger is not more than 1000 *kW*.

(2) Category *B* turbochargers
The engine power at *MCR* supplied by a group of cylinders served by the turbocharger is not less than 1000 *kW*, but not more than 2500 *kW*.

(3) Category *C* turbochargers
The engine power at *MCR* supplied by a group of cylinders served by the turbocharger is not less than 2500 *kW*.

Paragraph 2.1.3 has been amended as follows.

2.1.~~2~~3 Drawings and Data

1 Drawings and data to be submitted are generally as follows:

(1) Drawings and data for approval
((a) to (k) are omitted.)
(l) ~~Sectional assembly of exhaust driven turboblower~~ The following drawings and data for exhaust driven turbochargers:
i) Sectional assembly
ii) Particulars (only for category *B* or *C* turbochargers)
iii) Documentation of containment in the event of the disc fracture specified in **2.5.1-4** (only for category *B* or *C* turbochargers with novel design features or no service records)
iv) Drawings of the housing and rotating parts, including details of blade fixing (only for category *C* turbochargers)
v) Material specifications of the parts mentioned in **iv)** above (only for category *C* turbochargers. Mechanical property and chemical composition are to be provided.)
vi) Welding details and welding procedures for the parts mentioned in **iv)** above, if made of welded construction (only for category *C* turbochargers with novel design features or no service records)

(2) Drawings and data for reference
((a) to (x) are omitted.)
(y) Location of measures preventing oil from spraying out from joints in flammable oil piping

(if fitted)

(z) The following drawings and data for exhaust driven turbochargers:

i) Documentation of safe torque transmission specified in **2.5.1-5** when the disc is connected to the shaft by an interference fit (only for category *C* turbochargers with novel design features or no service records)

ii) Information on expected lifespan (only for category *C* turbochargers with novel design features or no service records)

iii) Operation and maintenance manuals (only for category *C* turbochargers with novel design features or no service records)

2.2 Materials, Construction and Strength

2.2.1 Materials

Sub-paragraph -1 has been amended as follows.

1 Materials intended for the principal components of diesel engines and their non-destructive tests as well as surface inspections and dimension inspections are to conform to the requirements given in **Table 7.2.1**. However, with respect to ultrasonic testing as well as surface inspections and dimension inspections, submission or presentation of test results to the Surveyor may be considered sufficient. In cases where deemed necessary by the Society, tests or inspections may also be required for any parts not specified in **Table 7.2.1**.

Table 7.2.1 has been amended as follows.

Table 7.2.1 Application of Materials and Non-destructive Tests as well as Surface Inspections and Dimension Inspections to Principal Components of Diesel Engines

Principal components			Cylinder bore D (mm)								
			$D \leq 300$			$300 < D \leq 400$			$400 < D$		
			I	II	III	I	II	III	I	II	III
1	Crankshaft	Solid forged type	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖
		Web, pin and journal for all built-up and semi-built-up types	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖
		Others (for example welded type)	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖
2	Coupling flanges on crankshaft (if not integral)								⊖		
3	Coupling bolts for crankshaft								⊖		
4	Steel piston crowns				⊖			⊖	⊖	⊖	⊖
5	Piston rods		⊖	⊖		⊖	⊖		⊖	⊖	⊖
6	Connecting rods together with connecting rod bearing caps		⊖	⊖		⊖	⊖		⊖	⊖	⊖
7	Steel parts of cylinder liners					⊖			⊖		
8	Steel cylinder covers				⊖	⊖		⊖	⊖	⊖	⊖
9	Bedplates of welded construction	Plates and transverse bearing girders made of forged or cast steel	⊖			⊖			⊖		
		Cast steel parts including welded joints		⊖	⊖		⊖	⊖		⊖	⊖
10	Thrust blocks of welded construction, plates and transverse bearing girders made of forged or cast steel		⊖			⊖			⊖		
11	Frames and crankcases of welded construction		⊖			⊖			⊖		
12	Entablatures, scavenging reserves, etc. of welded construction		⊖			⊖			⊖		
13	Tie rods		⊖	⊖		⊖	⊖		⊖	⊖	
14	Steel gear wheels for camshaft drives								⊖	⊖	
15	Bolts and studs (for cylinder cover crossheads, connecting rod bearings, main bearings)					⊖			⊖	⊖	
16	Turbine discs, blades, blower impellers and rotor shafts of exhaust driven turboblowers as well as shafts, rotors and blades of superchargers (excluding auxiliary blowers)		⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖
17	Crossheads								⊖		
18	Pipes, valves and fittings attached to engines classified in Chapter 10 as either Group I or Group II.		⊖			⊖			⊖		

Principal components			Cylinder bore D (*mm*)								
			$D \leq 300$			$300 < D \leq 400$			$400 < D$		
			I	II	III	I	II	III	I	II	III
1	Welded bedplate		○	○		○	○		○	○	
2	Bearing transverse girders (cast steel)		○	○		○	○		○	○	
3	Welded frame box		○	○		○	○		○	○	
4	Welded cylinder frames (5)		○	○		○	○		○	○	
5	Engine block (spheroidal graphite cast iron)(6)		○			○			○		
6	Cylinder liner					○			○		
7	Cylinder head (cast steel or forged steel)					○	○		○	○	
8	Piston crown (cast steel or forged steel)								○	○	
9	Crankshaft	made in one piece	○	○	○	○	○	○	○	○	○
		Web, pin and journal for all built-up and semi-built-up types	○	○	○	○	○	○	○	○	○
		Others (including coupling bolts)	○	○	○	○	○	○	○	○	○
10	Piston rod								○	○(7)	
11	Cross head (5)		○	○(7)		○	○(7)		○	○(7)	
12	Connecting rods together with connecting rod bearing caps		○	○	○	○	○	○	○	○	○
13	Bolts and studs (for cylinder heads, connecting rods, main bearings)					○	○	*TR*(8)	○	○	*TR*(8)
14	Tie rod (5)		○	○	*TR*(8)	○	○	*TR*(8)	○	○	*TR*(8)
15	High pressure fuel injection pipes including common fuel rail					○			○		
16	High pressure common servo oil system					○			○		
17	Heat exchanger, both sides (9)					○			○		
18	Accumulator of common rail fuel or servo oil system (10)		○			○			○		
19	Piping, pumps, actuators, etc. for hydraulic drive of valves (11)		○			○			○		
20	Pipes, valves and fittings attached to engines classified in **Chapter 12** as either Group I or Group II. (excluding items listed in this table)		○			○			○		
21	Bearings for main, crosshead, and crankpin (11)		*TR*(12)	*TR*(13)	○	*TR*(12)	*TR*(13)	○	*TR*(12)	*TR*(13)	○
22	Turbine discs, blades, blower impellers and rotor shafts of exhaust driven turbochargers (14)		○	○		○	○		○	○	
23	Casings of exhaust driven turbochargers (14)		○(15)			○(15)			○(15)		

Notes:

(1) Materials intended for the components marked by a circle in Column I are to comply with the requirements in **Part K of the Rules for the Survey and Construction of Steel Ships**.

(2) Materials intended for the components marked by a circle in Column II are to be tested by a magnetic particle test or a liquid penetrant test as well as an ultrasonic test.

(3) Materials intended for the components marked by a circle in Column III are to be tested by ~~an ultrasonic test~~ a surface inspection and a dimension inspection.

(4) For items marked by *TR*, submission of a test report which compiles all test and inspection results in an acceptance protocol issued by the manufacturer may be accepted. The test report is to be signed by the manufacturer and state that components comply with specifications stipulated by the manufacturer. Such specifications are to be submitted to the Society in advance. Tests or inspections may be carried out on samples from the current production.

(5) Only for crosshead diesel engines.

(6) Only when engine power exceeds 400 *kW/cyl*. Chemical composition analysis may be omitted.
(7) After final machining, a magnetic particle test or a liquid penetrant test is to be carried out again.
(8) Only for threaded bolts and studs used for connecting rods or tie rods.
(9) Charge air coolers need only be tested on the water side.
(10) Only when capacity exceeds 0.5*l*.
(11) Only when engine power exceeds 800 *kW/cyl*.
(12) Mechanical property test may be omitted.
(13) Magnetic particle tests and the liquid penetrant tests may be omitted. An ultrasonic test is to be carried out for full contact between the base material and bearing metal
(14) In cases where the manufacturer has a quality system deemed appropriate by the Society, materials and non-destructive tests as well as surface inspections and dimension inspections for categories *A* and *B* turbochargers may be substituted for by tests deemed necessary by the manufacturer. In such cases, the submission or presentation of test records may be required by the Society.
(15) Chemical composition analysis may be omitted.

2.5 Associated Installations

Paragraph 2.5.1 has been amended as follows.

2.5.1 Exhaust Driven ~~Turboblowers~~ Turbochargers

1 For main propulsion engine equipped with exhaust driven ~~turboblowers~~ turbochargers, means are to be provided to ensure that the engine can be operated with sufficient power to give the ship a navigable speed in case of failure of one of the ~~turboblowers~~ turbochargers.

2 Where the main propulsion engine cannot be operable only with the exhaust driven ~~turboblowers~~ turbochargers in case of starting or low speed range, an auxiliary of scavenging air system is to be provided. For the event of failure of such an auxiliary system, proper means are to be provided so that the main propulsion engine can be brought into the condition that its output increases enough as the exhaust driven ~~turboblowers~~ turbochargers show their function.

3 The air inlets of exhaust driven turbochargers with novel design features or no service records are to be fitted with filters.

4 Exhaust driven turbochargers with novel design features or no service records are to be capable of containment in the event of a rotor burst. This means that no parts are to penetrate the casing of exhaust driven turbochargers or escape through the air intake in the case of a rotor burst. It is to be assumed that the discs disintegrate in the worst possible way.

5 In the case of category *C* turbochargers with novel design features or no service records where the disc is connected to the shaft by an interference fit, calculations are to substantiate safe torque transmission during all relevant operating conditions such as maximum speed, maximum torque and maximum temperature gradient combined with minimum shrinkage amount.

6 For categories *B* and *C* turbochargers with novel design features or no service records, the indications and alarms listed in **Table 7.2.5** are to be provided. Indications may be provided at local locations, monitoring stations or control stations. Alarm levels may be equal to permissible limits, but are not to be reached when operating the engine at 110% power, or at any approved intermittent overload beyond 110% in cases where the turbochargers are fitted to engines for which intermittent overload power is approved.

7 Turbochargers are to have compressor characteristics that allows the engines, for which they are intended, to operate without any audible high pitch vibrations or explosion-like noises from the scavenger area of the engine (hereinafter referred to as “surging” in this Part) during all operating conditions and also after extended periods of operation. For abnormal, but permissible, operation conditions, such as misfiring and sudden load reduction, repeated surging (hereinafter referred to as “continuous surging”) is not to occur.

Table 7.2.5 has been renumbered to Table 7.2.6, and Table 7.2.5 has been added as follows.

Table 7.2.5 Alarms and Indications of Turbochargers

Monitoring Item	Category *B* Turbochargers		Category *C* Turbochargers		Remarks
	Alarm	Indication	Alarm	Indication	
Speed	H(1)	○(1)	H(1)	○(1)	Alarm level is to be based upon an air inlet temperature of 45°C.
Exhaust gas temperature at each turbocharger inlet	H(2)	○(2)	H	○	High temperature alarms for each cylinder at engine are acceptable.(3)
Lubrication oil temperature at turbocharger outlet	—	—	H	○	If not forced lubrication system, oil temperature near bearings is to be monitored.
Lubrication oil pressure at turbocharger inlet	L	○	L	○	Only for forced lubrication systems.(4)

Notes:

(1) For turbocharging systems where turbochargers are activated sequentially, speed monitoring is not required for the turbocharger(s) being activated last in sequence, provided all turbochargers share the same intake air filter and are not fitted with waste gates.

(2) Exhaust gas temperature may be alternatively monitored at the turbocharger outlet, provided that the alarm level is set to a safe level for the turbine and that correlation between inlet and outlet temperatures is substantiated.

(3) Alarms and indications for exhaust gas temperatures at turbocharger inlets may be omitted if the alarms and indications for individual exhaust gas temperatures are provided for each cylinder and the alarm level is set to a value safe for the turbocharger.

(4) Separate sensors are to be provided when the lubrication oil system of the turbocharger is not integrated with the lubrication oil system of the diesel engine, or when it is separated from the diesel engine lubrication oil system by a throttle or pressure reduction valve.

(5) "H" and "L" mean "high" and "low", respectively.

Paragraph 2.5.7 has been added as follows.

2.5.7 Engine Driven Chargers

Engine driven chargers are, in principle, to be in accordance with the requirements of exhaust driven turbochargers specified in this chapter.

2.6 Tests

Paragraph 2.6.1 has been amended as follows.

2.6.1 Shop Tests

1 For components or accessories specified in **Table 7.2.~~5~~6**, hydrostatic tests are to be carried out on the water or oil side of the component at the pressures shown in the Table. In cases deemed necessary by the Society, tests may also be required for any components not specified in **Table 7.2.6**.

~~5~~2 For diesel engines, shop trials are to be carried out according to the test procedure deemed appropriate by the Society.

~~6~~3 For diesel engines with novel design features or for those with no service records, ~~in cases where it is deemed necessary by the Society,~~ tests are to be carried out to verify their durability according to a procedure deemed appropriate by the Society.

~~2~~4 For rotating assemblies of exhaust ~~gas turboblowers~~ driven turbochargers, dynamic balancing tests are to be carried out ~~after their assembly~~.

~~3~~5 For the impellers and inducers of exhaust ~~gas turboblowers~~ driven turbochargers, overspeed

tests are to be carried out according to test procedures deemed appropriate by the Society.

~~**4** For exhaust gas turboblowers, trial runs are to be carried out according to test procedures deemed appropriate by the Society.~~

6 For categories *B* and *C* turbochargers with novel design features or for those with no service records, tests are to be carried out to verify durability according to procedures deemed appropriate by the Society.

Table 7.2.6 has been amended as follows.

Table 7.2.~~5~~6 Hydrostatic Test Pressure

~~Part~~	~~Test Pressure[6] (*MPa*)~~
~~Cylinder cover, cooling space[1]~~	~~0.7~~
~~Cylinder liner, over the whole length of cooling space[2]~~	~~0.7~~
~~Cylinder jacket, cooling space~~	~~0.4[3] or 1.5*P*, whichever is greater~~
~~Exhaust valve, cooling space~~	~~0.4 or 1.5*P*, whichever is greater~~
~~Piston crown[1],[4]~~	~~0.7~~
~~Fuel injection system: Pump body (pressure side[5]), Valve[5], Pipe~~	~~1.5*P* or *P* +30, whichever is smaller~~
~~Scavenging pump cylinder~~	~~0.4~~
~~Turboblower, cooling space~~	~~0.4 or 1.5*P*, whichever is greater~~
~~Exhaust pipe, cooling space~~	~~0.4 or 1.5*P*, whichever is greater~~
~~Heat exchanger~~	~~0.4 or 1.5*P*, whichever is greater~~
~~Engine driven pumps~~	~~0.4 or 1.5*P*, whichever is greater~~
~~Piping system~~	~~Apply the requirements in **10.6**~~

Part		Cylinder bore *D* (*mm*)		Test Pressure[1](*MPa*)
		D ≤ 300	300<*D*	
Cylinder block (gray cast iron or spheroidal graphite cast iron)[2][3]		○	○	1.5*P*
Engine block (gray cast iron or spheroidal graphite cast iron)[3][4]		○	○	1.5*P*
Cylinder liner[3]			○	1.5*P*
Cylinder head (gray cast iron, spheroidal graphite cast iron, cast steel or forged steel)			○	1.5*P*
High pressure fuel line	Fuel injection pump body	*TR*[6]	○	1.5*P* or *P* +30, whichever is smaller
	fuel injection valves[5]			
	fuel injection pipes including common fuel rail[5]		○	
High pressure common servo oil system			○	1.5*P*
Turbocharger, cooling space[7]		○	○	0.4 or 1.5*P*, whichever is greater
Heat exchanger, both sides			○	1.5*P*
Exhaust gas valve cage[2]		○	○	1.5*P*
Accumulator of common rail fuel or servo oil system[8]		○	○	1.5*P*
Piping, pumps, actuators, etc. for hydraulic drive of valves[9]		○	○	1.5*P*
Engine driven pumps (oil, water, fuel, bilge)[9]		○	○	1.5*P*
Piping system other than those listed in this Table		○	○	Apply the requirements in **12.6**

Notes:

~~(1) For forged steel cylinder covers with cooling spaces that have been machined up without a welding procedure and for piston crowns, if the accurate gauging of thickness after being machined up on both the inside and the outside, and confirmed of being free from surface defects by the Surveyor, the results may be accepted as a substitution for the above hydrostatic test.~~

~~(2) Where cylinder liners are machine finished on both the inside and the outside, accurately gauged for thickness, and confirmed free from surface defects by the Surveyor, the above test pressure of cylinder liners may be reduced to 0.4*MPa*.~~

~~(3) For diesel engines having no cylinder liner, the hydrostatic test pressure is to be 0.7*MPa*.~~

~~(4) The cooling space of piston crowns of crosshead type diesel engines are to be hydrostatically tested after assembled with piston rods.~~

~~(5) Where fuel oil injection pumps and fuel injection valves are made of forged steel, the hydrostatic test may be omitted.~~

(~~6~~1) *P* is the maximum working pressure (*MPa*).

(2) Only for crosshead diesel engines.

(3) Hydrostatic tests are also required for those parts filled with cooling water that have the ability to contain water which is in contact with the cylinder or cylinder liner.

(4) Only when engine power exceeds 400 *kW/cyl*.

(5) Only when not autofretted.

(6) For items marked by *TR*, submission of a test report signed by the manufacturer which compiles test results in an acceptance protocol issued by the manufacturer may be accepted. Tests or inspections may be carried out on samples from the current production.

(7) In cases where the manufacturer has a quality system deemed appropriate by the Society, hydrostatic tests for categories *A* and *B* turbochargers may be substituted for by manufacturer tests. In such cases, the submission or presentation of test records may be required by the Society.

(8) Only when capacity exceeds 0.5*l*.

(9) Only when engine power exceeds 800 *kW/cyl*.

EFFECTIVE DATE AND APPLICATION(Amendment 1-4)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to diesel engines or exhaust driven turbochargers for which the date of application for approval is before the effective date.

Amendment 1-5

Part 7 MACHINERY INSTALLATIONS

Chapter 6 TORSIONAL VIBRATION OF SHAFTINGS

6.1 General

Paragraph 6.1.3 has been amended as follows.

6.1.3 Measurements

1 Torsional vibration measurements are to be carried out to confirm the correctness of the estimated values of calculation results if deemed necessary by the Society; for example, cases where the torsional vibration calculations indicate the possibility of dangerous critical speeds in the operating speed range, etc.

2 In cases where the barred speed ranges specified in **6.3.1** are marked for main diesel engines, the following **(1)** and **(2)** are to be confirmed and recorded.

(1) Passing time as well as the ship draft and speed of passing through the barred speed range (accelerating and decelerating). In the case of a controllable pitch propeller, the pitch is also to be confirmed and recorded.

(2) Running condition of engines at both the upper and lower borders of the barred speed range. In this case, the oscillation range of fuel index (fuel injection quantity (fuel rack position)) is normally to be less than 5% of the effective stroke (maximum fuel injection quantity (possible fuel rack range)). Alternatively, in the case of engines which do not have means to confirm fuel index, an oscillation range of speed less than 5% of maximum continuous revolution may be confirmed and recorded.

EFFECTIVE DATE AND APPLICATION(Amendment 1-5)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to diesel engines for which the date of application for approval is before the effective date and which are installed on ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-6

Part 8 ELECTRICAL INSTALLATIONS

Chapter 2 ELECTRICAL INSTALLATIONS AND SYSTEM DESIGN

2.4 Rotating Machines

2.4.15 Shop Tests

Sub-paragraph -3 has been amended as follows.

3 In the case of generators, voltage regulation tests are to be carried out and comply with the requirements given in **2.4.13-4**, or **2.4.14-2** and **-3**. In the absence of precise information concerning the maximum values of any sudden loads when applying the requirement given in **2.4.14-3**, 60% of the rated current with a power factor of between 0.4 lagging and zero is to be suddenly switched on with the generator running at no load, and then switched off after attaining steady-state conditions. However, the voltage regulation during transient conditions may be calculated values based upon the test records of identical type generators subject to the Society's permission.

Sub-paragraph -6 has been amended as follows.

6 Steady short-circuit tests for synchronous generators are to be carried out and comply with the requirements given in **2.4.6-2**. However, the duration of steady short-circuit may be of any time delay which will be fitted in the tripping device for selective tripping where precise data showing such time delay is available in accordance with the following **(1)** and **(2)**. The manufacturer's simulation model for the generator and the voltage regulator may be used where this has been validated through tests of identical types of the same model.

(1) In order to provide sufficient information to the party responsible for determining the discrimination settings in the distribution system where the generator is going to be used, the generator manufacturer is to provide documentation showing the transient behaviour of the short-circuit current upon a sudden short-circuit occurring when excited, and running at nominal speed.

(2) The influence of the automatic voltage regulator is to be taken into account, and the setting parameters for the voltage regulator are to be noted together with the decrement curve. Such a decrement curve is to be available when the setting of the distribution system's short-circuit protection is calculated. The decrement curve need not be based upon physical testing.

EFFECTIVE DATE AND APPLICATION(Amendment 1-6)

1. The effective date of the amendments is 1 January 2017.

2. Notwithstanding this amendment to the Rules, the current requirements may be applied to generators installed on board ships whose contracts for construction*and whose applications for manufacturing process approval are dated before the amendment's effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No. 29 (Rev. 0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which 1. and 2. above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

GUIDANCE

2016 AMENDMENT NO.1

Notice No.43 30th June 2016
Resolved by Technical Committee on 5th February 2016

Notice No.43 30th June 2016
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF INLAND WATERWAY SHIPS

"Guidance for the survey and construction of inland waterway ships" has been partly amended as follows:

Amendment 1-1

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.1 Classification Survey During Construction

2.1.4 Presence of Surveyor

1 At the surveys for fire extinguishing systems referred to in **2.1.4-1(8), Part 2 of the Rules**, the following examinations are to be carried out. Where it is impractical to carry out the examinations on board the ship, the examinations may be replaced with examinations carried out at the place of manufacture under the presence of the Surveyor.

(1) Confirmation that the fire extinguishing system is installed according to the approved plans
(2) Confirmation that a fire control plan is provided
(3) For fire extinguishing systems, fire detecting systems and manually operated call points:

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

(a) Fire main line including associated pumps
Confirmation that each fire main pump can be operated so that one jet of water ~~(at least 12 *m*)~~ is produced from the highest positioned hydrant and a hydrant which imposes the most strict condition taking into account the distance from the fire pump, etc. and that the pressure at each hydrant is to be not less than the minimum pressure required by **8.2.1-6(1), Part 9 of the Rules**.

((b) to (g) are omitted.)

Part 7 MACHINERY INSTALLATIONS

Chapter 9 WELDING FOR MACHINERY INSTALLATIONS

9.4 Welding of Boilers

Paragraph 9.4.5 has been amended as follows.

9.4.5 ~~Radiographic~~Non-destructive Testing for Longitudinal and Circumferential Joints

1 The criteria for evaluating radiographic testing are as follows:

(1) Classification of defects

Defects shall be classified into 4 types in accordance with **Table 7.9.4.5-1**.

Table 7.9.4.5-1 Classification of defects

	Kind of defects
Type 1	Round blow holes and similar defects
Type 2	Elongated slag inclusions, pipes, incomplete penetration, incomplete fusion, and similar defects
Type 3	Cracks and similar defects
Type 4	Tungsten inclusions

(2) Type 1 defects

Type 1 defects are to be rejected, if the score of a particular defect exceeds the value of the acceptable score specified in **Table 7.9.4.5-2** according to thickness of the base metal. However, the score of one defect is determined on the basis of the axis length of the defect shown in **Table 7.9.4.5-3**. In cases where the axis length of a defect is shorter than the value specified in **Table 7.9.4.5-4**, the score may be uncounted. The score of two or more defects is to be sum of the scores for each defect in the sight of test field.

Table 7.9.4.5-2 Acceptable criteria for type 1 defects

Thickness of base metal (*mm*)	10 or less	More than 10, 25 or less	More than 25, 50 or less	More than 50
Score of one defect	3	6	12	15
Test field of vision (*mm*)	10×10		10×20	

Table 7.9.4.5-3 Score of type 1 defects

Axis length of one defect (*mm*)	1.0 or less	More than 1.0, 2.0 or less	More than 2.0, 3.0 or less	More than 3.0, 4.0 or less	More than 4.0, 6.0 or less	More than 6.0, 8.0 or less	More than 8.0
Score	1	2	3	6	10	15	25

Table 7.9.4.5-4 Maximum axis length of type 1 defects for an uncountable score

Thickness of base metal (*mm*)	Axis length of one defect (*mm*)
20 or less	0.5
More than 20, 50 or less	0.7
More than 50	1.4% of thickness of base metal

(3) Type 2 defects
Type 2 defects are to be rejected, if the length of a defect exceeds the value of the acceptable score specified in **Table 7.9.4.5-5** according to thickness of the base metal. The length of defect is to be determined by measuring the length of a defect. However, in cases where the defects are present in a row and the mutual distance between the defects does not exceed the length of the larger defect, the length of all defects including the spaces between them is to be measured as the length of the defect specified in **Table 7.9.4.5-5**.

Table 7.9.4.5-5 Acceptable criteria for type 2 defects

Thickness of base metal (*mm*)	Length of defect (*mm*)
12 or less	3
More than 12, 48 or less	1/4 of the base metal thickness
More than 48	12

(4) Type 3 defects
Any type 3 defect is to be rejected.
(5) Type 4 defects
The acceptable criteria and score of defects are to be according to the requirements specified in **(2)** (in this case, "type 1 defect" is to be read as "type 4 defect"). However, in cases where the type 4 defects coexistent with the type 1 defects in the sight of the test field, the score of defect is to be the sum of both scores.

2 The wording "other appropriate non-destructive tests" referred to in **9.4.5-8, Part 7 of the Rules** means the following **(1)** or **(2)**:

(1) The radiographic testing to be carried out in accordance with *ISO* 17636. The criteria and others that are not specified in the *ISO* are to be in accordance with **9.4.5, Part 7 of the Rules** and this **9.4.5-1**. In cases of the radiographic testing using no radiograph film, the testing plan is to be submitted to and approved by the Society, prior to the testing.

(2) The ultrasonic testing to be carried out in accordance with **9.4.6, Part 7 of the Rules** and **9.4.6-2** of this Chapter. In this case, **1.1.2-2** of **Annex M1.4.2-3(1)** "Guidance for Non-destructive Inspections on Internal Imperfections of the Welded Joints of Hull Constructions"**, Part M** is to be applied.

Paragraph 9.4.6 has been amended as follows.

9.4.6 Non-destructive Testing for Other Welds

1 The wording "important welds" means, for example, the following parts with a plate thickness of 6 *mm* or more:

(1) Welds between flat end plates or cover plates and shell plates
(2) Welds between furnaces or ogee rings and shell plates
(3) Welds for manholes
(4) Welds for nozzles

2 The standards for ultrasonic testing~~s~~ are to be in accordance with the following:

(1) The testing method is to be in accordance with *JIS Z* 3060 (1994) or equivalent thereto.
(2) Any indicated defect length according to L-line sensitivity specified in the method in **(1)**, which exceeds the value given in **Table 7.9.4.6-2** with respect to plate thickness, is not acceptable. Two or more defects existing at a same depth, separated by an interval shorter than the length of the largest defect are to be regarded as a continuous defect which includes the interval between them.

Table 7.9.4.6-2 Acceptable Criteria for Indicated Defect Length

Plate thickness t (*mm*)	Length of defect (*mm*)
$t < 12$	3
$12 \leq t < 48$	$t/4$[(1)]
$48 \leq t$	12

Note:
(1) t is the plate thickness on the open edge side of the base material (*mm*). However, in cases where the value of the thickness of the base material and value of the thickness of the section at the butt welding are different, the lesser of the two values is to be taken as the plate thickness.

3 The standards for magnetic particle tests are to be in accordance with the following:
((1) and (2) are omitted.)
4 The standards for liquid penetrant tests are to be in accordance with the following:
((1) and (2) are omitted.)
5 The criteria for acceptable defects detected by the radiographic testing are to be in accordance with **9.4.5-1**.
6 The wording "another appropriate method" referred to in **9.4.6-2, Part 7 of the Rules** means those specified in **9.4.5-2(1)**.

9.5 Welding of Pressure Vessels

Paragraph 9.5.5 has been amended as follows.

9.5.5 ~~Radiographic~~Non-destructive Testing for Welded Joints

1 The criteria for acceptable defects detected by the radiographic testing are to be in accordance with ~~those specified in~~ **9.4.5-1.**
2 The wording "another appropriate method" referred to in **9.5.5-3, Part 7 of the Rules** means those specified in **9.4.5-2(1)**.
~~2~~3 The ~~criteria for acceptable defects detected by~~ ultrasonic testing ~~are~~is to be in accordance with ~~those specified in~~ **9.4.6-2.**

Paragraph 9.5.6 has been amended as follows.

9.5.6 Non-destructive Testing for Other Welded Parts

1 The criteria for acceptable defects detected by the radiographic testing are to be in accordance with ~~the requirements specified in **9.4.5-2** to **-7, Part 7 of the Rules**. The criteria for acceptable defects detected by radiographic testing are to be in accordance with the requirements specified in~~ **9.4.5-1**.
2 The testing procedures and criteria for acceptable defects detected by the ultrasonic testing are to be in accordance with ~~the requirements specified in~~ **9.4.6-2**.
3 The testing procedures criteria for acceptable defects detected by ~~magnetic particle~~the testing ~~and liquid penetrant testing~~ are to be in accordance with ~~those in~~ **9.4.6-3** and **9.4.6-4** respectively for magnetic particle testing and liquid penetrant testing.

9.6 Welding of Piping

Paragraph 9.6.5 has been amended as follows.

9.6.5 Non-destructive Testing

1 The criteria for acceptable defects detected by the radiographic testing are to be in accordance with ~~those specified in~~ **9.4.5-1**.

2 The ~~criteria for acceptable defects detected by~~ ultrasonic testing ~~are~~is to be in accordance with ~~the requirements specified in~~ **9.4.6-2~~(2)~~**.

3 The ~~criteria for acceptable defects detected by~~ magnetic particle testing and liquid penetrant testing are to be in accordance with ~~those in~~ **9.4.6-3~~(2)~~** and **9.4.6-4~~(2)~~** respectively.

4 The wording "another appropriate method" referred to in **9.6.5-4, Part 7 of the Rules** means those specified in **9.4.5-2(1)**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2016.

Amendment 1-2

Part 2 CLASS SURVEYS

Chapter 1 GENERAL

1.4 Preparation for Surveys and Miscellaneous

1.4.2 Preparation for Surveys

Sub-paragraph -8 has been added as follows.

8 The following preparations are to be made before carrying out the engine tests specified in **2.3.1-1(3), Part 2 of the Rules** and **2.6.1-2, Part 7 of the Rules**.

(1) All relevant equipment for the safety of attending personnel such as oil mist detection arrangements, overspeed protective devices and any other shut down functions are to be made available and are to be operational.

(2) The overspeed protective device is to be set to a value which is not higher than the allowable overspeed value. This set point is to be verified by the surveyor.

(3) The engines are to be run as prescribed by the engine manufacturer.

(4) All fluids used for testing purposes (fuel oils, lubrication oils, cooling water, etc., including all fluids used temporarily or repeatedly for testing purposes only) are to be suitable for their intended purposes (i.e., they are to be clean, preheated if necessary and cause no harm to engine parts).

EFFECTIVE DATE AND APPLICATION(Amendment 1-2)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to engine tests that fall under the following:

(1) engine tests conducted during the river trials of diesel engines for which the date of application for approval is before the effective date and which are installed on ships for which the date of contract for construction* is before the effective date; or

(2) engine tests conducted during the shop tests of diesel engines for which the date of application for approval is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-3

Part 2 CLASS SURVEYS

Chapter 1 GENERAL

1.4 Preparation for Surveys and Miscellaneous

Title of Paragraph 1.4.6 has been amended as follows.

1.4.6 Firms Engaged in ~~Surveys~~Inspections, Measurements and Maintenance

EFFECTIVE DATE AND APPLICATION(Amendment 1-3)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to manufacturing works and service suppliers approved by the Society before 1 July 2016 until 30 June 2019 or the expiry date of their certificate, whichever comes first.

Amendment 1-4

Part 2 CLASS SURVEYS

Chapter 2 CLASSIFICATION SURVEYS

2.3 River Trials and Stability Experiments

2.3.1 River Trials

1 The Astern test required by **2.3.1-1(1), Part 2 of the Rules** is to be carried out in accordance with the following **(1)** and **(2)** below.

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

(2) 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. The ship is to be kept running astern ~~for a period of 10 *minutes* or~~ until the astern speed (rotational speed in rpm) stabilizes~~, whichever is the greater~~ and the performance is to be confirmed in accordance with **1.3.2, Part 7 of the Rules**.

Sub-paragraph -3 has been amended as follows.

3 The performance tests of machinery installations required by **2.3.1-1(3), Part 2 of the Rules** are to include the following **(1)** to **(~~6~~7)** in order to verify that the machinery installations have sufficient normal functions and reliability and are free from detrimental vibration within the numbers of revolutions used. However, these tests may be dispensed with where such tests have been conducted while the ship was anchored or at dockside. The details of these tests may be found in *JIS F* 0801 "Test Code of Propelling Machinery at Sea Trials" or other documents considered equivalent thereto. The preparations specified in **1.4.2-8, Part 2 of the Guidance** are to be made before tests are carried out.

((1) to (4) are omitted.)

(5) Governor tests

For engines for main sources of electrical power (including engines driving generator for both propulsion and main power supply), the characteristics for governors specified in **2.4.2-1, Part H of the Rules** are to be confirmed.

(~~5~~6) Function tests of the safety devices and alarms of boilers

(~~6~~7) Function tests of the safety devices and alarms of exhaust gas economizers

Table 2.2.3.1-5 has been amended as follows.

Table 2.2.3.1-5 Trials of Diesel Engines

~~Test items~~	~~Use of engines~~		
	~~Main engines of diesel ships(1)~~	~~Main engines of electric propulsion ships(2)~~	~~Engines driving generators or auxiliaries (excluding auxiliary machinery for specific use etc.)(2)~~
~~110% power run(3)~~	~~30 *minutes* at engine speed in accordance with nominal propeller curve~~	~~30 *minutes* at n_0 (n_0 is the rated engine speed.)~~	~~Capability of supplying 110% power is to be demonstrated~~
~~100% power (rated power) run(4)~~	~~4 *hours* at engine speed in accordance with nominal propeller curve~~	~~4 *hours* at n_0~~	~~4 *hours* at n_0 (4) (5) (100% power run is to be included.)~~
~~Normal continuous cruise power run(4)~~	~~2 *hours* at engine speed in accordance with nominal propeller curve~~	~~2 *hours* at n_0~~	
~~Minimum revolution test of main engine~~	~~To be carried out(6)~~	~~-~~	~~-~~

Test items		Use of engines		
		Main engines of diesel ships(1)	Engine driving generators (including main engines of electric propulsion ships) (2)	Engines driving auxiliaries (excluding auxiliary machinery for specific use etc.)
Load test	110% power run	—	10 *minutes* at n_0 (n_0 is the rated engine speed.) (3)	—
	100% power (rated power) run	4 *hours* at engine speed in accordance with propeller curve (4) (5) (6)	1 *hour* at n_0 (3)	30 *minutes* at n_0
Overspeed run		30 *minutes* at $1.032n_0$ or more (7) (8)	—	—
Minimum revolution test of main engine (9)		○ (7)	—	—
Intermittent overload (10)		○		○

Notes:

~~(1) In the case of controllable pitch propellers, the tests with various propeller pitches are to be included.~~

(1) After testing has been completed, the fuel delivery system is to be blocked so as to limit engines to run at not more than 100% power, excluding propulsion engines for which intermittent overload is approved as well as propulsion engines also driving generators.

(2) The tests ~~are to be performed at a rated speed with a constant governor setting and~~ to be performed based on the rated electrical powers of the driven generators.

~~(3) The tests may be dispensed with where deemed appropriate by the Society in consideration of the test results of shop tests specified in **2.6.1, Part 7.**~~

(3) This may, if possible, be done during the electrical propulsion plant test, which is tested at 100% propulsion power (i.e., total electric motor capacity for propulsion) by distributing the power on as few generators as possible. The duration of this test is to be sufficient to reach the stable operating temperatures of all rotating machines or for at least 4 hours. When some of the generator set(s) cannot be tested due to insufficient time during the propulsion system test mentioned above, those required tests are to be carried out separately.

~~(4) The duration of the tests may be shortened (however, the tests at 100% power run for main engines are to be conducted for not less than one hour.) where deemed appropriate by the Society in consideration of the test results of shop tests specified in **2.6.1, Part 7.**~~

(4) In the case of controllable pitch propellers, the test is to be performed at rated engine speed n_0 at a propeller pitch leading to 100% power, or to the maximum achievable power if 100% power cannot be reached.

~~(5) The test loads may be decreased if the engine is unable to handle the specified loads.~~

(5) In the case of propulsion engines also driving generators, tests are to be also carried out for 2 hours at 100% propeller branch power (unless already covered in the test at 100% power) and 1 hour with 100% power take off branch power at rated engine speed n_0 in addition to the test for 4 hours at 100% power.

(6) For ships in which the tests specified in **2.2.5-2(1), Rules for Automatic and Remote Control Systems** are performed for not less than 4 hours at 100% power, the 100% power test specified in this table may be omitted.

(7) Only for engines driving fixed pitch propellers.

(8) The test may be omitted if a 100% power test is performed at $1.032n_0$ or more. In cases where engine speed cannot reach the specified speed due to the planned propeller curve, etc., an overspeed test may be performed at maximum achievable continuous revolution (i.e., maximum engine speed within the range of torque limit etc.).

(~~6~~9) The test is to be carried out to identify the minimum working revolution of the main engine when the ship is steered to the maximum rudder angle.

(10) Only for engines for which intermittent overload is approved. The test is to be performed for the duration agreed upon with the manufacturer.

Sub-paragraph -7 has been amended as follows.

7 The measurements of the torsional vibration for shafting systems required by **2.3.1-1(7), Part 2 of the Rules** are to be carried out in accordance with the requirement of **6.1.3, Part 7 of the Rules**. In cases where the confirmation of engine running conditions specified in **6.1.3-2, Part 7 of the Rules** is performed at the estimated upper and lower borders by calculation, it is recommended that the fuel index around estimated borders also be confirmed with consideration given to possible differences between estimated borders and actual borders confirmed through measurements.

EFFECTIVE DATE AND APPLICATION(Amendment 1-4)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to diesel engines for which the date of application for approval is before the effective date and which are installed on ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-5

Part 7 MACHINERY INSTALLATIONS

Chapter 2 DIESEL ENGINES

2.1 General

Paragraph 2.1.1 has been amended as follows.

2.1.1 ~~Scope~~General

1 The wording "as specified separately by the Society" specified in **2.1.1-2, Part 7 of the Rules** means "in accordance with **Chapter 8, Part 6 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**".

2 The wording "the requirements specified otherwise by the Society" in **2.1.1-~~2~~3**, **Part 7 of the Rules** means "**GUIDANCE FOR THE ADDITIONAL REQUIREMENTS ON ELECTRONICALLY-CONTROLLED DIESEL ENGINES**" in **Annex D2.1.1**, **Part D of the Guidance for the Survey and Construction of Steel Ships**~~"~~.

2.1.2 Drawings and Data

Sub-paragraphs -1 to -4 have been deleted.

~~**1** For the engine manufacturer producing engines with the drawings and data of the engine's designer (hereinafter referred to as "licenser") which have already been approved by the Society (hereinafter the engine manufacturer referred to as "licensee"), a list of identification numbers, including the revision status of all drawings and data, may be accepted as substitution for those drawings and data specified in **2.1.2, Part 7 of the Rules**.~~

~~**2** In cases where the licensee proposes design modifications to components relevant to the drawings and data mentioned in **-1**, all associated documents are to be submitted by the licensee for approval or for reference. In cases where significant modifications are made, a statement confirming the licenser's acceptance of these modifications is also to be submitted.~~

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

~~**4** The "Operation and service manuals for the engine" specified in **2.1.2(2)(w), Part 7 of the Rules** are to contain maintenance requirements, including the details of any special tools and gauges that are to be used with their fittings/settings together with any test requirements on completion of maintenance.~~

Paragraph 2.1.4 has been added as follows.

2.1.4 Approval of Diesel Engines

1 In applying **2.1.4, Part 7 of the Rules**, reference for the approval procedures is to be made to **Fig. 7.2.1.4-1**.

2 The phrase "design approval is to be obtained as specified separately by the Society" specified in **2.1.4-1(1)(a), Part 7 of the Rules** means that the design approval and design appraisal

are to be obtained in accordance with **Chapter 8, Part 6 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

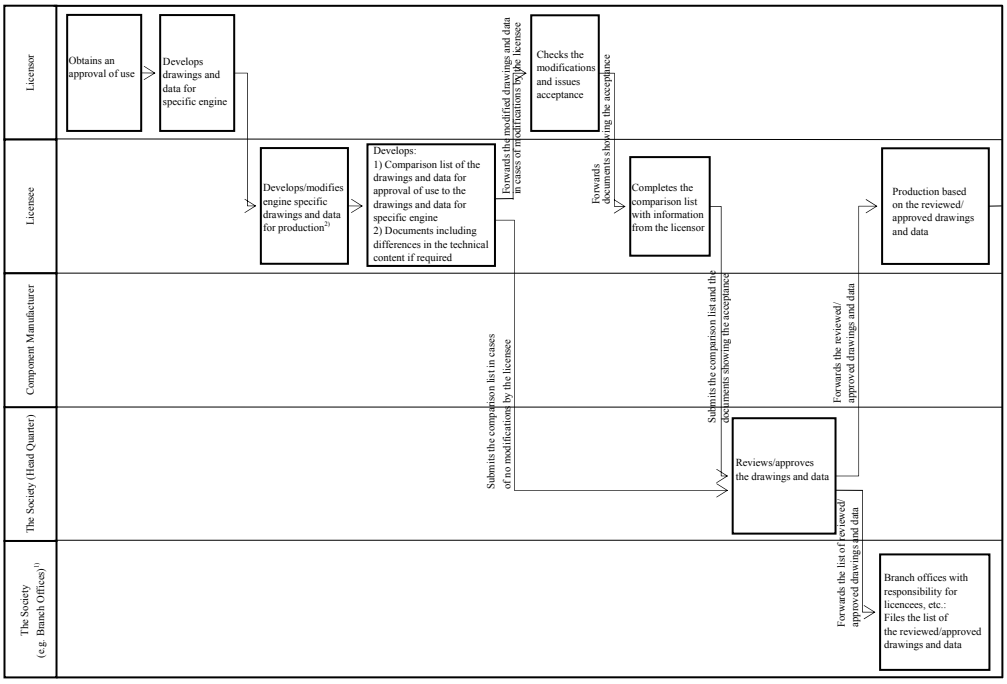
3 The wording "the drawings and data of the diesel engine whose approval of use has been obtained" specified in **(1)(c)**, **(1)(d)**, **(2)(a)** and **(2)(b)** of **2.1.4-1, Part 7 of the Rules** means those listed in **8.2.2, Part 6 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

4 The wording "as specified separately by the Society" specified in **2.1.4-1(1)(d), Part 7 of the Rules** means "in accordance with **8.2.2-2, Part 6 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**".

5 In applying **2.1.4-1(2)(c), Part 7 of the Rules**, quality requirements specified by the licensor are to be satisfied.

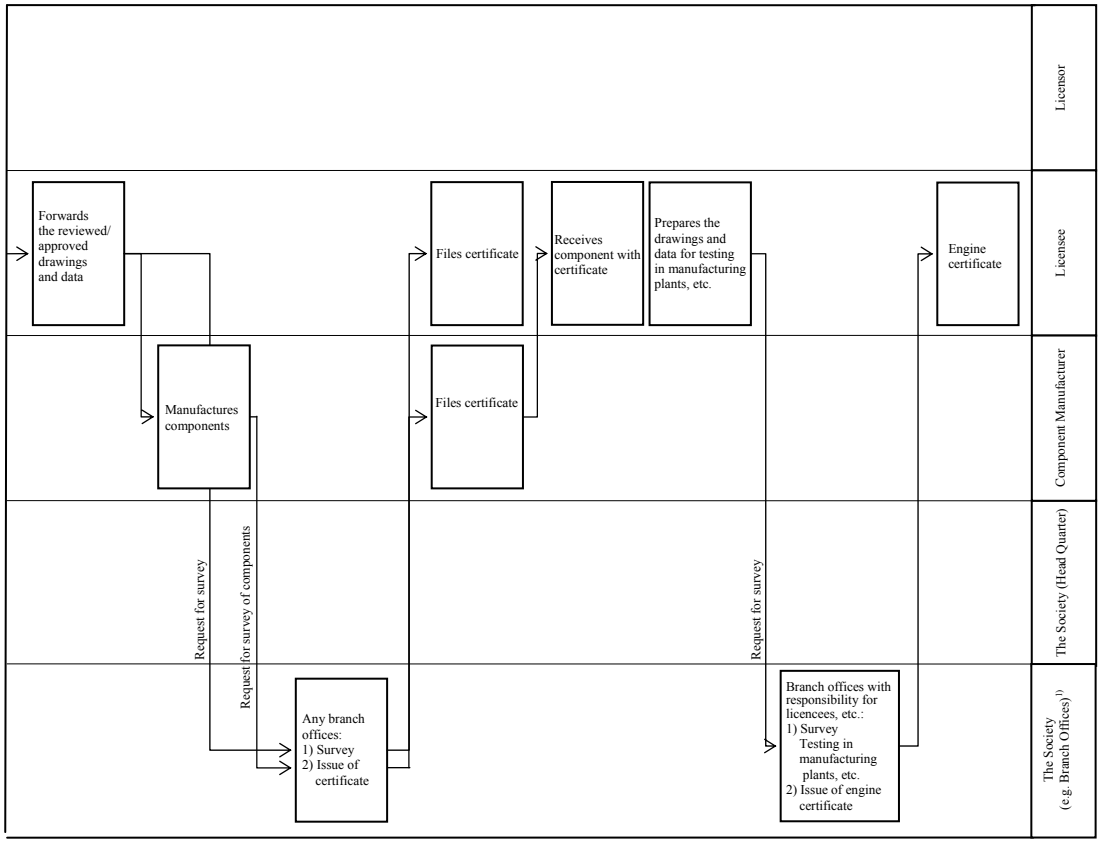
6 The wording "as specified separately by the Society" specified in **2.1.4-1(4)(a), Part 7 of the Rules** means "in accordance with **8.2.2-4, Part 6 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**".

Fig. 7.2.1.4-1 Flow of Approval of Diesel Engines



1) Branch offices with responsibility for licensees and/or component manufacturers in different locations
2) In cases of modifications by the licensee, refer to **(b)** and **(c)** of **2.1.4-1, Part 7 of the Rules**

Fig. 7.2.1.4-1 Flow of Approval of Diesel Engines (continued)



EFFECTIVE DATE AND APPLICATION(Amendment 1-5)

1. The effective date of the amendments is 1 July 2016.

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

Amendment 1-6

Part 7 MACHINERY INSTALLATIONS

Chapter 2 DIESEL ENGINES

2.1 General

Paragraph 2.1.2 has been amended as follows.

2.1.~~2~~3 Drawings and Data

1 For the engine manufacturer producing engines with the drawings and data of the engine's designer (hereinafter referred to as "licenser") which have already been approved by the Society (hereinafter the engine manufacturer referred to as "licensee"), a list of identification numbers, including the revision status of all drawings and data, may be accepted as substitution for those drawings and data specified in **2.1.~~2~~3, Part 7 of the Rules**.

(Sub-paragraph -2 and -3 are omitted.)

4 The "Operation and service manuals for the engine" specified in **2.1.~~2~~3-1(2)(w), Part 7 of the Rules** are to contain maintenance requirements, including the details of any special tools and gauges that are to be used with their fittings/settings together with any test requirements on completion of maintenance.

5 For engines equipped with exhaust driven turbochargers, the drawings and data specified in **2.1.3, Part 7 of the Rules** are to include the following items according to the category of turbocharger specified in **2.1.2, Part 7 of the Rules**. However, this applies only to turbochargers with novel design features or no service records.

(1) Category *A* turbochargers

(a) The sectional assembly listed in **2.1.3-1(1)(l)i), Part 7 of the Rules** is to include principal dimensions and names of components. The submission of the drawings may be omitted where deemed appropriate by the Society.

(2) Category *B* turbochargers

(a) The sectional assembly listed in **2.1.3-1(1)(l)i), Part 7 of the Rules** is to include principal dimensions and materials of housing components for containment evaluation.

(b) The turbocharger particulars listed in **2.1.3-1(1)(l)ii), Part 7 of the Rules** are to include the following items:

i) Maximum permissible operating speed (rpm);
ii) Maximum permissible exhaust gas temperature at the turbine inlet;
iii) Minimum lubrication oil inlet pressure;
iv) Maximum lubrication oil outlet temperature; and
v) Maximum permissible vibration levels (self- and externally generated vibration).

(c) The engine control system diagram listed in **2.1.3-1(2)(t), Part 7 of the Rules** is to include the following items:

i) Alarm level for overspeed;
ii) Alarm level for exhaust gas temperature at the turbine inlet;
iii) Lubrication oil inlet pressure low alarm set point; and
iv) Lubrication oil outlet temperature high alarm set point.

(3) Category *C* turbochargers

(a) The items as listed in **(2)** above are to be included.

(b) The documentation for safe torque transmission specified in **2.1.3-1(2)(z)i), Part 7 of the Rules** may be for any two sizes within a series of turbocharger which is of the same design, but scaled to each other.
(c) The information on expected lifespan listed in **2.1.3-1(2)(z)ii), Part 7 of the Rules** is to consider creep, low cycle fatigue and high cycle fatigue.
(d) The operation and service manuals listed in **2.1.3-1(2)(z)iii), Part 7 of the Rules** are to include guidance for the operation and maintenance of exhaust driven turbochargers. This guidance may be for any two sizes within a series of turbocharger which is of the same design, but scaled to each other.

Section 2.2 has been added as follows.

2.2 Materials, Construction and Strength

2.2.2 Construction, Installation and General

With respect to the ambient reference conditions specified in **2.2.2-7, Part 7 of the Rules**, expected component lifespan of the turbochargers with novel design features or no service records is to be based upon an air inlet temperature of 45°C.

2.5 Associated Installations

Paragraph 2.5.1 has been added as follows.

2.5.1 Exhaust Driven Turbochargers

The safe torque transmission specified in **2.5.1-5, Part 7 of the Rules** is to be substantiated by calculations.

2.5.3 Starting Arrangements

Sub-paragraph -1(4) has been amended as follows.

1 For main propulsion machinery starting arrangements operated by compressed air, the following requirements, in addition to those in **2.5.3**, **Part 7 of the Rules**, are to be complied with:
(1) Starting air reservoirs for main propulsion machinery are to be of approximately the same capacity.
(2) For ships designed to use the compressed air stored in starting air reservoirs for main propulsion machinery for purposes other than starting, the capacity of such air reservoirs is to take into account total compressed air consumption.
(3) For main propulsion machinery starting arrangements operated by compressed air, at least one of the starting air compressors is to be driven by a power source other than one used for the main propulsion machinery, and the capacity of this compressor is to be 50% or more of the total capacity specified in **2.5.3-2**, **Part 7 of the Rules**.
(4) ~~It is recommended that s~~Starting air compressors for main propulsion machinery are to be of approximately the same capacity.

2.6 Tests

Paragraph 2.6.1 has been amended as follows.

2.6.1 Shop Tests

~~3~~**1** The ~~programme for~~ purpose of the shop trials specified in **2.6.1-~~5~~2**, **Part 7 of the Rules** is to verify design premises such as power, safety against fire, adherence to approved limits such as maximum pressure, and functionality as well as to establish reference values or base lines for later reference in the operational phase. The programme is to be in accordance with the following:

(1) The preparations specified in **1.4.2-8, Part 2** are to be made before any tests are carried out are carried out.

(~~1~~2) For all stages of testing, the following **(a)** to **(c)** ambient conditions in are to be recorded and the pertaining operation values (normally the following **(d)** to **(k)** items) are to be measured and recorded by the engine manufacturer for each load point. All results are to be compiled in an acceptance protocol to be issued by the manufacturer. Calibration records for the instrumentation are to be presented to the attending surveyor. In addition, crankshaft deflection is to be checked and recorded in the results in cases where such a check is required by the manufacturer during the operating life of the engine.

(a) Ambient air temperature
(b) Ambient air pressure
(c) Atmospheric humidity
(d) Power
(e) Speed
(f) Fuel index (or equivalent reading)
(g) Maximum combustion pressures (only when the cylinder heads installed are designed for such measurement)
(h) Exhaust gas temperature at the turbine inlet and from each cylinder
(i) Charge air temperature
(j) Charge air pressure
(k) Turbocharger speed

(~~2~~3) All measurements conducted at the various load points are to be carried out under steady operating conditions. However, provision is to be made for time needed by the surveyor to carry out visual inspections for all load points. The readings for 100% power (rated power at rated speed) are to be taken twice at an interval of at least 30 *minutes*.

(~~3~~4) In cases where a no-load operation is conducted for adjusting engine conditions, the fuel delivery system, manoeuvring system and safety devices are to be properly adjusted by the manufacturer before the operation.

(~~4~~5) The programme shown in **Table 7.2.6.1-1** is to be used as the standard for the shop trials of diesel engines. In this case, refer to the *JIS* specified below or those considered equivalent thereto for more details on each respective testing procedure:

(a) For the main engines of diesel ships or electrical propulsion ships;
JIS F 4304 "Shipbuilding - Internal combustion engines for propelling use-shop test code"
(b) For diesel engines driving generators or essential auxiliary machinery;
JIS F 4306 "Shipbuilding - Water cooled four-cycle generator diesel engines"

(6) The following **(a)** to **(c)** are to be inspected. However, a part of or all of these inspections may be postponed until shipboard testing when agreed to by the Society.

(a) Jacketing of high-pressure fuel oil lines, including the system used for the detection of leakage
(b) Screening of pipe connections in piping containing flammable liquids

(c) Temperature of hot surface insulation

Random temperature readings are to be compared with corresponding readings obtained during the type test. This is to be done while running at the rated power of engine. If the insulation is modified subsequently to the type test, the Society may request temperature measurements as required by the type test.

In the case of an engine with an application for approval of use dated before 1 July 2016 which is an engine type that does not have the results of temperature measurements required by the type test, temperature measurements are to be performed in accordance with **8.4.2-2(10), Part 6 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

(7) Category *C* turbochargers used on propulsion engines are to be checked for surge margins in accordance with the following. However, if successfully tested earlier on an identical configuration of the engine and turbocharger (including the same nozzle rings), submission of this test report may be accepted instead.

(a) For 4-stroke engines, the operations give in the following **i)** and **ii)** are to be performed without any indication of surging.

i) While at maximum continuous rating (maximum continuous power and speed), speed is to be reduced with the constant torque (fuel index) down to 90% power.

ii) While at 50% power and 80% speed, speed is to be reduced to 72% while keeping constant torque (fuel index).

(b) For 2-stroke engines, the surge margin is to be demonstrated by at least one of the following **i)** to **iii)**:

i) The engine working characteristics established at shop tests of the engine is to be plotted into the compressor chart of the turbocharger (established in a test rig). There is to be at least a 10% surge margin in the full load range, i.e., working flow is to be 10% above the theoretical mass flow at the surge limit where there are no pressure fluctuations.

ii) A sudden fuel cut-off to at least one cylinder at the following **1)** and **2)** loads is not to result in continuous surging and the turbocharger is to be stabilised at the new loads within 20 seconds. For applications with more than one turbocharger, the fuel supply to the cylinders closest upstream to each turbocharger is to be cut off.

1) The maximum power permitted for one cylinder misfiring.

2) The engine load corresponding to a charge air pressure of about 0.06 *MPa*, but without auxiliary blowers running.

iii) No continuous surging and the turbocharger is to be stabilised at the new load within 20 seconds when the power is abruptly reduced from 100% to 50% of the maximum continuous power.

Table 7.2.6.1-1 Programme for Shop Trials of Diesel Engines

~~Test items~~	~~Use of engines~~		
	~~Main engines of diesel ships(1)~~	~~Main engines of electric propulsion ships(2)~~	~~Diesel engines driving generators or auxiliaries(2) (excluding auxiliary machinery for specific use)~~
~~110% power run(3)~~	~~45 *minutes* at engine speed in accordance with nominal propeller curve~~	~~45 *minutes* at n_o (n_o is the rated engine speed.)~~	~~same as for diesel ships~~
~~100% power run(4)~~	~~2 *hours* at n_o~~	~~same as for diesel ships~~	
~~Normal continuous cruise power run(5)~~	~~30 *minutes* at engine speed in accordance with nominal propeller curve~~	~~—~~	
~~75% power run(6)~~		~~30 *minutes* at n_o~~	
~~50% power run(6)~~			
~~25% power run(5)~~		~~—~~	
~~Starting manoeuvres~~	~~○~~	~~○~~	~~○~~
~~Reversing manoeuvres(7)~~	~~○~~	~~—~~	~~—~~
~~Governing characteristics~~	~~○~~	~~○~~	~~○~~
~~Performance of monitoring, alarm and safety devices~~	~~○~~	~~○~~	~~○~~
~~Open-up inspection~~	~~○~~	~~○~~	~~○~~

Test items		Use of engines		
		Main diesel engines(1)	Engine driving generators (including main engines of electric propulsion ships) (2)	Engines driving auxiliaries (excluding auxiliary machinery for specific use etc.) (1)
Load test	110% power run	15 *minutes* or until steady conditions have been reached, which is shorter, at 1.032 n_0 (n_0 is the rated engine speed) or more (3), (4)	15 *minutes* after having reached steady conditions at n_0	15 *minutes* after having reached steady conditions at n_0
	100% power run	60 *minutes* at n_0	60 *minutes* at n_0	30 *minutes* at n_0
	90% power run (or normal continuous cruise power) (5), (6)	30 *minutes* at engine speed in accordance with nominal propeller curve	—	—
	75% power (5), (6)		30 *minutes* at n_0	30 *minutes* in accordance with the nominal power consumption curve (7)
	50% power (5), (6)			
	25% power (5), (6)			
Idle run (5)		—	An adequate time at n_0	—
Reversing manoeuvres (8)		○	—	—
Intermittent overload (9)		○	—	○
Governor test		—	○	—
Performance of monitoring, alarm and safety devices		○	○	○
Open-up inspection		○	○	○

Notes:

(1) After testing has been completed, the fuel delivery system is to be blocked so as to limit the engines to run at not more than 100% power, unless intermittent overload power is approved by the Society. In the case of propulsion engines also driving power take-off generators, the fuel delivery system is to be adjusted so that overload of generator (110%

power) can be given in service, and the electrical protection of downstream system components is activated before the engine stalls.

(2) After testing has been completed, the fuel delivery system is to be adjusted such that overload (110% power) can be given in service after installation on board, so that the governing characteristics including the activation of generator protective devices can be fulfilled at all times.

(3) ~~The testing time may be shorten to 20 *minutes* for engines having cylinder bores of 400 *mm* or less and to 30 *minutes* for engines having cylinder bores exceeding 400 *mm* when deemed appropriate by the Society, in consideration of the conditions of quality assurance, etc. of the manufacturer. However, for the main diesel engines of diesel ships,~~ ~~s~~Submission of a test report for the same ~~type~~ engine and turbocharger configuration proving their compatibility for over-loaded operation may be accepted as substitutions for the 110% power run.

~~(4) The testing time may be shortened to one hour when deemed appropriate by the Society, in consideration of the conditions of quality assurance, etc. of the manufacturer.~~

(4) In the case of propulsion engines also driving power take-off generators, the test is to be carried out at n_0 for 15 *minutes* after having reached a steady operating condition.

~~(5) The test item may be dispensed when deemed appropriate by the Society.~~

(5) The sequence is to be selected by the engine manufacturer.

(6) The testing time may be shortened to 20 *minutes* for engines having cylinder bores of 400 *mm* or less when deemed appropriate by the Society.

(7) Only for variable speed engines.

(~~7~~8) The test item applies only to direct reversible engines.

(9) Only for engines for which intermittent overload is approved. The test is to be performed for the duration agreed upon with the manufacturer.

2 The wording "a procedure deemed appropriate by the Society" in **2.6.1-3, Part 7 of the Rules** means the tests specified in **Chapter 8, Part 6 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

3 In cases where the manufacturer has a quality system deemed appropriate by the Society, the dynamic balancing tests specified in **2.6.1-4, Part 7 of the Rules** for categories *A* and *B* turbochargers may be substituted for by manufacturer tests. In such cases, the submission or presentation of test records may be required by the Society.

~~1~~4 The programme for the overspeed tests required by **2.6.1-~~3~~5**, **Part 7 of the Rules** is to be in accordance with the following:

(1) Overspeed test for a duration of 3 minutes at either of the following speeds:

(a) ~~An overspeed test for the duration of 3 *minutes*, a~~120% of the ~~maximum~~ alarm level speed at room temperature; or

(b) 110% of the ~~maximum~~ alarm level speed at ~~working~~ an inlet temperature of 45°C when tested in the actual housing with the corresponding pressure ratio~~, is to be carried out~~.

(2) For forged impellers and inducers subject to quality control through an approved non-destructive test method, overspeed tests may be dispensed with.

(3) In cases where the manufacturer has a quality system deemed appropriate by the Society, tests for categories *A* and *B* turbochargers may be substituted for by manufacturer tests. In such cases, the submission or presentation of test records may be required by the Society.

~~**2** The programme for the shop trials required by **2.6.1-4**, **Part 7 of the Rules** is to be in accordance with the following:~~

~~(1) For exhaust gas turboblowers with novel design features or for the first unit of those with no service record, a 1-hour mechanical running test at maximum speed and maximum working temperature is to be carried out. exhaust gas turboblowers other than the first unit are to comply with the following requirements from **(2)** to **(4)**.~~

~~(2) A 20-minute mechanical running test at maximum speed is to be carried out. However, the Society may reduce the duration of the test after taking test records, etc. into consideration.~~

~~(3) In cases where exhaust gas turboblowers are produced under an approved quality system and the type of exhaust gas turboblowers has sufficient test records, the test in **(2)** may be carried~~

~~out on a sample basis.~~

~~(4) For manufacturers who have facilities at their works for testing exhaust gas turboblowers on the engines for which they are intended, the trial run may be replaced by a trial run on said engine for 20 *minutes* at 110% of the maximum continuous output of the engine.~~

5 The wording "procedures deemed appropriate by the Society" in **2.6.1-6, Part 7 of the Rules** means the tests specified in **Chapter 11, Part 6 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

Chapter 8 PRESSURE VESSELS

8.9 Tests

Paragraph 8.9.1 has been amended as follows.

8.9.1 Shop Tests

1 Pressure vessels for which hydraulic tests are considered necessary by the Society, as specified in **8.9.1-2(1)(b)**, **Part 7 of the Rules**, are pressure vessels such as those given in **(1)** or **(2)** below:

(1) Pressure vessels in cases where the product of the design pressure (*MPa*) and internal capacity (m^3) exceeds 1.0

(2) Heat exchangers such as fresh water coolers, lubricating oil coolers, hydraulic oil coolers, lubricating oil heaters, fuel oil heaters, condensers, feed water heaters, air coolers, etc., and air tanks such as control air tanks, etc. which are necessary for the operation of the following installations as well as other essential pressure vessels:
   (a) Main propulsion machinery and shafting;
   (b) Boilers and thermal oil installations (main boilers, essential auxiliary boilers, and other boilers and thermal oil installations used for any fuel oil heating necessary for the operation of main propulsion machinery or cargo heating that is continuously required); or
   (c) Electric generators and auxiliaries (excluding auxiliary machinery for specific use, etc.) and their prime movers.

2 Notwithstanding the requirements in **8.9.1-2, Part 7 of the Rules**, hydrostatic tests of heat exchangers fitted to engines having cylinder bores of 300 *mm* or less may be omitted. (see **Table 7.2.6, Part 7 of the Rules**)

EFFECTIVE DATE AND APPLICATION(Amendment 1-6)

1. The effective date of the amendments is 1 July 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to diesel engines or exhaust driven turbochargers for which the date of application for approval is before the effective date.