

# M44 Documents for the approval of diesel engines

(1982)

(Rev.1

1983)

(Rev.2

1984)

(Rev.3

1986)

(Rev.4

1989)

(Rev.5

1992)

(Rev.6

Nov 2003)

(Rev.7

May

2004)

(Rev.8

Mar 2015

Complete

Revision)

(Rev.9

Dec 2015)

(Corr.1

June

2016)

(Corr.2

Nov 2016)

(Rev.10

Feb 2021)

(Corr.1

Feb 2022)

## 1. Scope

The documents necessary to approve a diesel engine design for conformance to the Rules and for use during manufacture and installation are listed. The document flow between engine designer, Classification Society approval centre, engine builder/licensee and Classification Society's Surveyors is provided.

## 2. Definitions

Definitions relating to approval of diesel engines are given in Appendix 1.

## 3. Overview

### 3.1 Approval process

#### 3.1.1 Type approval certificate

For each type of engine that is required to be approved, a type approval certificate is to be obtained by the engine designer. The process details for obtaining a type approval certificate are in Section 4. This process consists of the engine designer obtaining:

- drawing and specification approval,
- conformity of production,
- approval of type testing programme,
- type testing of engines,
- review of the obtained type testing results, and

#### Notes:

1. The requirements of M44 Rev.8 and Rev.9 are to be uniformly implemented by IACS Societies for engines for which the date of an application for type approval certification is dated on or after 1 July 2016.
2. The "date of application for type approval" is the date of documents accepted by the Classification Society as request for type approval certification of a new engine type or of an engine type that has undergone substantive modifications in respect of the one previously type approved, or for renewal of an expired type approval certificate.
3. Engines with an existing type approval on 1 July 2016 are not required to be re-type approved in accordance with this UR until the current Type Approval becomes invalid. For the purpose of certification of these engines, the current type approval and related submitted documentation will be accepted in place of that required by this UR until the current type approval expires or the engine type has undergone substantive modifications.
4. The requirements of M44 Rev.10 are to be uniformly implemented by IACS Societies for engines for which the date of an application for type approval certification is dated on or after 1 July 2022.

**M44**  
(cont)

- evaluation of the manufacturing arrangements,
- issue of a type approval certificate upon satisfactorily meeting the Rule requirements.

### 3.1.2 Engine certificate

Each diesel engine manufactured for a shipboard application is to have an engine certificate. The certification process details for obtaining the engine certificate are in Section 5. This process consists of the engine builder/licensee obtaining design approval of the engine application specific documents, submitting a comparison list of the production drawings to the previously approved engine design drawings referenced in 3.1.1, forwarding the relevant production drawings and comparison list for the use of the Surveyors at the manufacturing plant and shipyard if necessary, engine testing and upon satisfactorily meeting the Rule requirements, the issuance of an engine certificate.

## 3.2 Document flow for diesel engines

### 3.2.1 Document flow for obtaining a type approval certificate

3.2.1.1 For the initial engine type, the engine designer prepares the documentation in accordance with requirements in Tables 1 and 2 and forwards to the Classification Society according to the agreed procedure for review.

3.2.1.2 Upon review and approval of the submitted documentation (evidence of approval), it is returned to the engine designer.

3.2.1.3 The engine designer arranges for a Surveyor to attend an engine type test and upon satisfactory testing the Classification Society issues a type approval certificate.

3.2.1.4 A representative document flow process for obtaining a type approval certificate is shown in Appendix 2, Figure 1.

### 3.2.2 Document flow for engine certificate

3.2.2.1 The engine type must have a type approval certificate. For the first engine of a type, the type approval process and the engine certification process (ECP) may be performed simultaneously.

3.2.2.2 Engines to be installed in specific applications may require the engine designer/licensor to modify the design or performance requirements. The modified drawings are forwarded by the engine designer to the engine builder/licensee to develop production documentation for use in the engine manufacture in accordance with Table 3.

3.2.2.3 The engine builder/licensee develops a comparison list of the production documentation to the documentation listed in Tables 1 and 2. An example comparison list is provided in Appendix 4. If there are differences in the technical content on the licensee's production drawings/documents compared to the corresponding licensor's drawings, the licensee must obtain agreement to such differences from the licensor using the template in Appendix 5.

If the designer acceptance is not confirmed, the engine is to be regarded as a different engine type and is to be subjected to the complete type approval process by the licensee.

**M44**  
(cont)

3.2.2.4 The engine builder/licensee submits the comparison list and the production documentation to the Classification Society according to the agreed procedure for review/approval.

3.2.2.5 The Classification Society returns documentation to the engine builder/licensee with confirmation that the design has been approved. This documentation is intended to be used by the engine builder/licensee and their subcontractors and attending Surveyors. As the attending Surveyors may request the engine builder/licensee or their subcontractors to provide the actual documents indicated in the list, the documents are necessary to be prepared and available for the Surveyors.

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

3.2.2.7 The engine builder/licensee assembles the engine, tests the engine with a Surveyor present. An engine certificate is issued by the Surveyor upon satisfactory completion of assembly and tests.

3.2.2.8 A representative document flow process for obtaining an engine certificate is shown in Appendix 2, Figure 2.

### **3.3 Approval of diesel engine components**

Components of engine designer's design which are covered by the type approval certificate of the relevant engine type are regarded as approved whether manufactured by the engine manufacturer or sub-supplied. 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.).

### **3.4 Submission format of documentation**

The Classification Society determines the documentation format: electronic or paper. If documentation is to be submitted in paper format, the number of copies is determined by each Society.

## **4. Type approval process**

The type approval process consists of the steps in 4.1 to 4.4. The document flow for this process is shown in Appendix 2, Figure 1.

The documentation, as far as applicable to the type of engine, to be submitted by the engine designer/licensor to the Classification Society is listed in Tables 1 and 2.

### **4.1 Documents for information Table 1**

Table 1 lists basic descriptive information to provide the Classification Society an overview of the engine's design, engine characteristics and performance. Additionally, there are requirements related to auxiliary systems for the engine's design including installation arrangements, list of capacities, technical specifications and requirements, along with information needed for maintenance and operation of the engine.

**M44**  
(cont)**4.2 Documents for approval or recalculation Table 2**

Table 2 lists the documents and drawings, which are to be approved by the Classification Society.

**4.3 Design approval/appraisal (DA)**

DA's are valid as long as no substantial modifications have been implemented. Where substantial modifications have been made the validity of the DA's may be renewed based on evidence that the design is in conformance with all current Rules and statutory regulations (e.g. SOLAS, MARPOL). See also 4.6.

**4.4 Type approval test**

A type approval test is to be carried out in accordance with IACS UR M71 and is to be witnessed by the Classification Society.

The manufacturing facility of the engine presented for the type approval test is to be assessed in accordance with IACS UR M72.

**4.5 Type approval certificate**

After the requirements in M44.4.1 through M44.4.4 have been satisfactorily completed the Classification Society issues a type approval certificate (TAC).

**4.6 Design modifications**

After the Classification Society has approved the engine type for the first time, only those documents as listed in the tables, which have undergone substantive changes, will have to be resubmitted for consideration by the Classification Society.

**4.7 Type approval certificate renewals**

A renewal of type approval certificates will be granted upon:

4.7.1 Submission of information in either 4.7.1.1 or 4.7.1.2.

4.7.1.1 The submission of modified documents or new documents with substantial modifications replacing former documents compared to the previous submission(s) for DA.

4.7.1.2 A declaration that no substantial modifications have been applied since the last DA issued.

**4.8 Validity of type approval certificate**

The Classification Society reserves the right to limit the duration of validity of the type approval certificate. The type approval certificate will be invalid if there are substantial modifications in the design, in the manufacturing or control processes or in the characteristics of the materials unless approved in advance by the Classification Society.

**4.9 Document review and approval**

4.9.1 The assignment of documents to Table 1 for information does not preclude possible comments by the individual Classification Society.

**M44**  
(cont)

4.9.2 Where considered necessary, the Classification Society may request further documents to be submitted. This may include details or evidence of existing type approval or proposals for a type testing programme in accordance with UR M71.

**5. Certification process**

The certification process consists of the steps in 5.1 to 5.5. This process is illustrated in Appendix 2, Figure 2 showing the document flows between the:

- engine designer/licensor,
- engine builder/licensee,
- component manufacturers,
- Classification Society approval centre, and
- Classification Society site offices.

For those cases when a licensor – licensee agreement does NOT apply, an “engine designer” shall be understood as the entity that has the design rights for the engine type or is delegated by the entity having the design rights to modify the design.

The documents listed in Table 3 may be submitted by:

- the engine designer (licensor),
- the manufacturer/licensee.

**5.1 Document development for production**

Prior to the start of the engine certification process, a design approval is to be obtained per 4.1 through 4.3 for each type of engine. Each type of engine is to be provided with a type approval certificate obtained by the engine designer/licensor prior to the engine builder/licensee beginning production manufacturing. For the first engine of a type, the type approval process and the certification process may be performed simultaneously.

The engine designer/licensor reviews the documents listed in Tables 1 and 2 for the application and develops, if necessary, application specific documentation for the use of the engine builder/licensee in developing engine specific production documents.

If substantive changes have been made, the affected documents are to be resubmitted to the Classification Society as per 4.6.

**5.2 Documents to be submitted for inspection and testing**

Table 3 lists the production documents, which are to be submitted by the engine builder/licensee to the Classification Society following acceptance by the engine designer/licensor. The Surveyor uses the information for inspection purposes during manufacture and testing of the engine and its components. See 3.2.2.3 through 3.2.2.6.

**5.3 Alternative execution**

If there are differences in the technical content on the licensee’s production drawings/documents compared to the corresponding licensor’s drawings, the licensee must

**M44**  
**(cont)**

provide to the Classification Society approval centre a “Confirmation of the licensor’s acceptance of licensee’s modifications” approved by the licensor and signed by licensee and licensor. Modifications applied by the licensee are to be provided with appropriate quality requirements. See Appendix 5 for a sample format.

**5.4 Manufacturer approval**

The Classification Society assesses conformity of production with the Classification Society’s requirements for production facilities comprising manufacturing facilities and processes, machining tools, quality assurance, testing facilities, etc. See IACS UR M72. Satisfactory conformance results in the issue of a class approval document.

**5.5 Document availability**

In addition to the documents listed in Table 3, the engine builder/licensee is to be able to provide to the Surveyor performing the inspection upon request the relevant detail drawings, production quality control specifications and acceptance criteria. These documents are for supplemental purposes to the survey only.

**5.6 Engine assembly and testing**

Each engine assembly and testing procedure required according to relevant IACS URs are to be witnessed by the Classification Society unless an Alternative Certification Scheme meeting the requirements of UR Z26 is agreed between manufacturer and the Society.

Table 1 Documentation to be submitted for information, as applicable

No.	Item
1	Engine particulars (e.g. Data sheet with general engine information (see Appendix 3), Project Guide, Marine Installation Manual)
2	Engine cross section
3	Engine longitudinal section
4	Bedplate and crankcase of cast design
5	Thrust bearing assembly <sup>1</sup>
6	Frame/framebox/gearbox of cast design <sup>2</sup>
7	Tie rod
8	Connecting rod
9	Connecting rod, assembly <sup>3</sup>
10	Crosshead, assembly <sup>3</sup>
11	Piston rod, assembly <sup>3</sup>
12	Piston, assembly <sup>3</sup>
13	Cylinder jacket/ block of cast design <sup>2</sup>
14	Cylinder cover, assembly <sup>3</sup>
15	Cylinder liner
16	Counterweights (if not integral with crankshaft), including fastening
17	Camshaft drive, assembly <sup>3</sup>
18	Flywheel
19	Fuel oil injection pump
20	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
	For electronically controlled engines, construction and arrangement of:
21	Control valves
22	High-pressure pumps
23	Drive for high pressure pumps
24	Operation and service manuals <sup>4</sup>
25	FMEA (for engine control system) <sup>5</sup>
26	Production specifications for castings and welding (sequence)
27	Evidence of quality control system for engine design and in service maintenance
28	Quality requirements for engine production
29	Type approval certification for environmental tests, control components <sup>6</sup>

## FOOTNOTES:

1. If integral with engine and not integrated in the bedplate.
2. Only for one cylinder or one cylinder configuration.
3. Including identification (e.g. drawing number) of components.
4. 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.
5. Where engines rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves, a failure mode and effects analysis (FMEA) is to be submitted to demonstrate that failure of the control system will not result in the operation of the engine being degraded beyond acceptable performance criteria for the engine. ~~The FMEA reports required will not be explicitly approved by the Classification Society.~~
6. Tests are to demonstrate the ability of the control, protection and safety equipment to function as intended under the specified testing conditions per UR E10.

# M44

(cont)

**Table 2 Documentation to be submitted for approval, as applicable**

No.	Item
1	Bedplate and crankcase of welded design, with welding details and welding instructions <sup>1,2</sup>
2	Thrust bearing bedplate of welded design, with welding details and welding instructions <sup>1</sup>
3	Bedplate/oil sump welding drawings <sup>1</sup>
4	Frame/framebox/gearbox of welded design, with welding details and instructions <sup>1,2</sup>
5	Engine frames, welding drawings <sup>1,2</sup>
6	Crankshaft, details, each cylinder No.
7	Crankshaft, assembly, each cylinder No.
8	Crankshaft calculations (for each cylinder configuration) according to the attached data sheet and UR M53
9	Thrust shaft or intermediate shaft (if integral with engine)
10	Shaft coupling bolts
11	Material specifications of main parts with information on non-destructive material tests and pressure tests <sup>3</sup>
	Schematic layout or other equivalent documents on the engine of:
12	Starting air system
13	Fuel oil system
14	Lubricating oil system
15	Cooling water system
16	Hydraulic system
17	Hydraulic system (for valve lift)
18	Engine control and safety system
19	Shielding of high pressure fuel pipes, assembly <sup>4</sup>
20	Construction of accumulators (for electronically controlled engine)
21	Construction of common accumulators (for electronically controlled engine)
22	Arrangement and details of the crankcase explosion relief valve (see UR M9) <sup>5</sup>
23	Calculation results for crankcase explosion relief valves (see UR M9)
24	Details of the type test program and the type test report <sup>7</sup>
25	High pressure parts for fuel oil injection system <sup>6</sup>
26	Oil mist detection and/or alternative alarm arrangements (see UR M10)
27	Details of mechanical joints of piping systems (see UR P2)
28	Documentation verifying compliance with inclination limits (see UR M46)
29	Documents as required in UR E22, as applicable

FOOTNOTES:

1. 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.
2. For each cylinder for which dimensions and details differ.
3. For comparison with Society requirements for material, NDT and pressure testing as applicable.
4. All engines.
5. Only for engines of a cylinder diameter of 200 mm or more or a crankcase volume of 0.6 m<sup>3</sup> or more.
6. The documentation to contain specifications for pressures, pipe dimensions and materials.
7. The type test report may be submitted shortly after the conclusion of the type test.



# M44

(cont)

**Table 3 Documentation for the inspection of components and systems**

- Special consideration will be given to engines of identical design and application
- For engine applications refer to UR M72

No.	Item
1	Engine particulars as per data sheet in Appendix 3
2	Material specifications of main parts with information on non-destructive material tests and pressure tests <sup>1</sup>
3	Bedplate and crankcase of welded design, with welding details and welding instructions <sup>2</sup>
4	Thrust bearing bedplate of welded design, with welding details and welding instructions <sup>2</sup>
5	Frame/framebox/gearbox of welded design, with welding details and instructions <sup>2</sup>
6	Crankshaft, assembly and details
7	Thrust shaft or intermediate shaft (if integral with engine)
8	Shaft coupling bolts
9	Bolts and studs for main bearings
10	Bolts and studs for cylinder heads and exhaust valve (two stroke design)
11	Bolts and studs for connecting rods
12	Tie rods
	Schematic layout or other equivalent documents on the engine of: <sup>3</sup>
13	Starting air system
14	Fuel oil system
15	Lubricating oil system
16	Cooling water system
17	Hydraulic system
18	Hydraulic system (for valve lift)
19	Engine control and safety system
20	Shielding of high pressure fuel pipes, assembly <sup>4</sup>
21	Construction of accumulators for hydraulic oil and fuel oil
22	High pressure parts for fuel oil injection system <sup>5</sup>
23	Arrangement and details of the crankcase explosion relief valve (see UR M9) <sup>6</sup>
24	Oil mist detection and/or alternative alarm arrangements (see UR M10)
25	Cylinder head
26	Cylinder block, engine block
27	Cylinder liner
28	Counterweights (if not integral with crankshaft), including fastening
29	Connecting rod with cap
30	Crosshead
31	Piston rod
32	Piston, assembly <sup>7</sup>
33	Piston head
34	Camshaft drive, assembly <sup>7</sup>
35	Flywheel
36	Arrangement of foundation (for main engines only)
37	Fuel oil injection pump
38	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
39	Construction and arrangement of dampers
	For electronically controlled engines, assembly drawings or arrangements of:
40	Control valves
41	High-pressure pumps

# M44

(cont)

No.	Item
42	Drive for high pressure pumps
43	Valve bodies, if applicable
44	Operation and service manuals <sup>8</sup>
45	Test program resulting from FMEA (for engine control system) <sup>9</sup>
46	Production specifications for castings and welding (sequence)
47	Type approval certification for environmental tests, control components <sup>10</sup>
48	Quality requirements for engine production

#### FOOTNOTES:

1. For comparison with Society requirements for material, NDT and pressure testing as applicable.
2. 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.
3. Details of the system so far as supplied by the engine manufacturer such as: main dimensions, operating media and maximum working pressures.
4. All engines.
5. The documentation to contain specifications for pressures, pipe dimensions and materials.
6. Only for engines of a cylinder diameter of 200 mm or more or a crankcase volume of 0.6 m<sup>3</sup> or more.
7. Including identification (e.g. drawing number) of components.
8. 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.
9. Required for engines that rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves.
10. Documents modified for a specific application are to be submitted to the Classification Society for information or approval, as applicable. See 3.2.2.2, Appendix 4 and Appendix 5.

# M44

(cont)

## UR M44 - APPENDIX 1 - GLOSSARY

Term	Definition
Acceptance criteria	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
Accepted	Status of a design, product, service or process, which has been found to conform to specific acceptance criteria
Alternative Certification Scheme (ACS)	<p>A system, by which a society evaluates a manufacturer's quality assurance and quality control arrangements for compliance with Rule requirements, then authorizes a manufacturer to undertake and witness testing normally required to be done in the presence of a Surveyor. The Alternative Certification Scheme as presently administrated by the Member Societies is generally known as:</p> <p>ABS: Product Quality Assurance            BV: Alternative Survey Scheme            CCS: Type Approval-A            CRS: Examination of the manufacturing process and quality assurance system            DNV-GL: Manufacturing Survey Arrangement            IRS: IRS Quality Assurance Scheme            KR: Quality Assurance System            LR: LR Quality Schemes            NK: Approval of Manufacturers            PRS: Alternative Certification Scheme            RINA: Alternative Survey Scheme            RS: Agreement on Survey</p>
Appraisal	Evaluation by a competent body
Approval	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
Assembly	Equipment or a system made up of components or parts
Assess	Determine the degree of conformity of a design, product, service, process, system or organization with identified specifications, Rules, standards or other normative documents
Audit	Planned systematic and independent examination to determine whether the activities are documented, the documented activities are implemented, and the results meet the stated objectives
Auditor	Individual who has the qualifications and experience to perform audits
Certificate	A formal document attesting to the compliance of a design, product, service or process with acceptance criteria

**M44**  
 (cont)

Term	Definition
Certification	A procedure whereby a design, product, service or process is approved in accordance with acceptance criteria
Class	Short for Classification Society
Class approval	Approved by a Classification Society
Classification	Specific type of certification, which relates to the Rules of the relevant Classification Society
Competent body	Organization recognized as having appropriate knowledge and expertise in a specific area
Component	Part, member of equipment or system
Conformity	Where a design, product, process or service demonstrates compliance with its specific requirements
Contract	Agreement between two or more parties relating to the scope of service
Contractor	see Supplier
Customer	Party who purchases or receives goods or services from another
Design	All relevant plans, documents, calculations described in the performance, installation and manufacturing of a product
Design analysis	Investigative methodology selectively used to assess the design
Design appraisal	Evaluation of all relevant plans, calculations and documents related to the design
Design review	Part of the appraisal process to evaluate specific aspects of the design
Drawings approval/ plan approval	Part of the design approval process which relates to the evaluation of drawings and plans
Equipment	Part of a system assembled from components
Equivalent	An acceptable, no less effective alternative to specified criteria
Evaluation	Systematic examination of the extent to which a design, product, service or process satisfies specific criteria
Examination	Assessment by a competent person to determine compliance with requirements
Inspection	Examination of a design, product service or process by an Inspector
Inspection plan	List of tasks of inspection to be performed by the Inspector

**M44**  
 (cont)

Term	Definition
Installation	The assembling and final placement of components, equipment and subsystems to permit operation of the system
Manufacturer	Party responsible for the manufacturing and quality of the product
Manufacturing process	Systematic series of actions directed towards manufacturing a product
Manufacturing process approval	Approval of the manufacturing process adopted by the manufacturer during production of a specific product
Material	Goods supplied by one manufacturer to another manufacturer that will require further forming or manufacturing before becoming a new product
Modification	A limited change that does not affect the current approval
Modification notice	Information about a design modification with new modification index or new drawing number replacing the earlier drawing
Performance test	Technical operation where a specific performance characteristic is determined
Producer	See manufacturer
Product	Result of the manufacturing process
Prototype test	Investigations on the first or one of the first new engines with regard to optimization, fine tuning of engine parameters and verification of the expected running behaviour
Quality assurance	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 9001:2015
Regulation	Rule or order issued by an executive authority or regulatory agency of a government and having the force of law
Repair	Restore to original or near original condition from the results of wear and tear or damages for a product or system in service
Requirement	Specified characteristics used for evaluation purposes
Information	Additional technical data or details supplementing the drawings requiring approval
Revision	Means to record changes in one or more particulars of design drawings or specifications
Specification	Technical data or particulars which are used to establish the suitability of materials, products, components or systems for their intended use

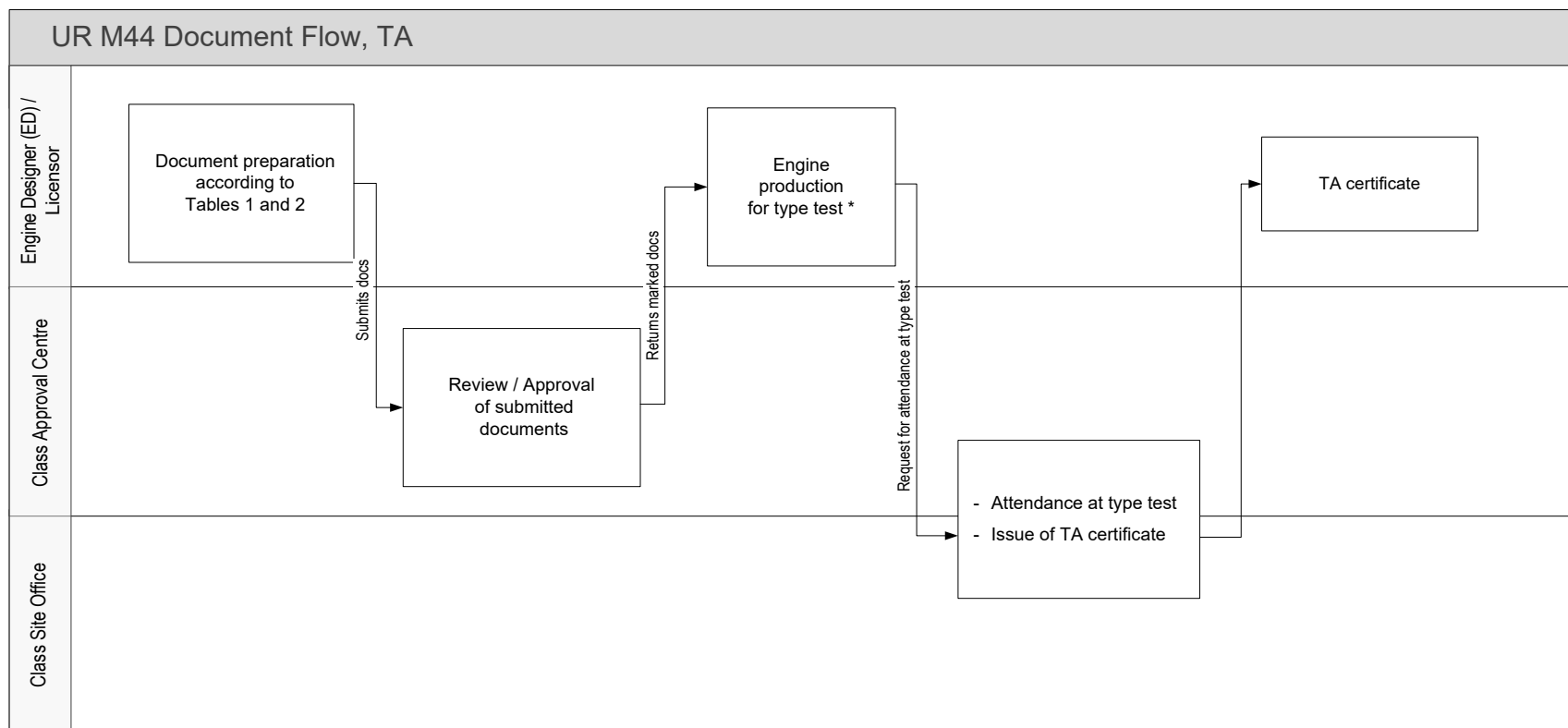
**M44**  
 (cont)

Term	Definition
Substantive modifications or major modifications or major changes	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
Subsupplier/subcontractor	One who contracts to supply material to another supplier
Supplier	One who contracts to furnish materials or design, products, service or components to a customer or user
Test	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
Traceability	Ability to follow back through the design and manufacturing process to the origin
Type approval	<p>The establishment of the acceptability of a product through the systematic:</p> <ol style="list-style-type: none"> <li>1. Evaluation of a design to determine conformance with specifications</li> <li>2. Witnessing manufacture and testing of a type of product to determine compliance with the specification</li> <li>3. Evaluation of the manufacturing arrangements to confirm that the product can be consistently produced in accordance with the specification</li> </ol>
Type approval test	Last step of the type approval procedure. Test program in accordance with UR M71
Witness	Individual physically present at a test and being able to record and give evidence about its outcome

**M44**  
(cont)

**UR M44 - APPENDIX 2 - REPRESENTATIVE DOCUMENT FLOW DIAGRAMS**

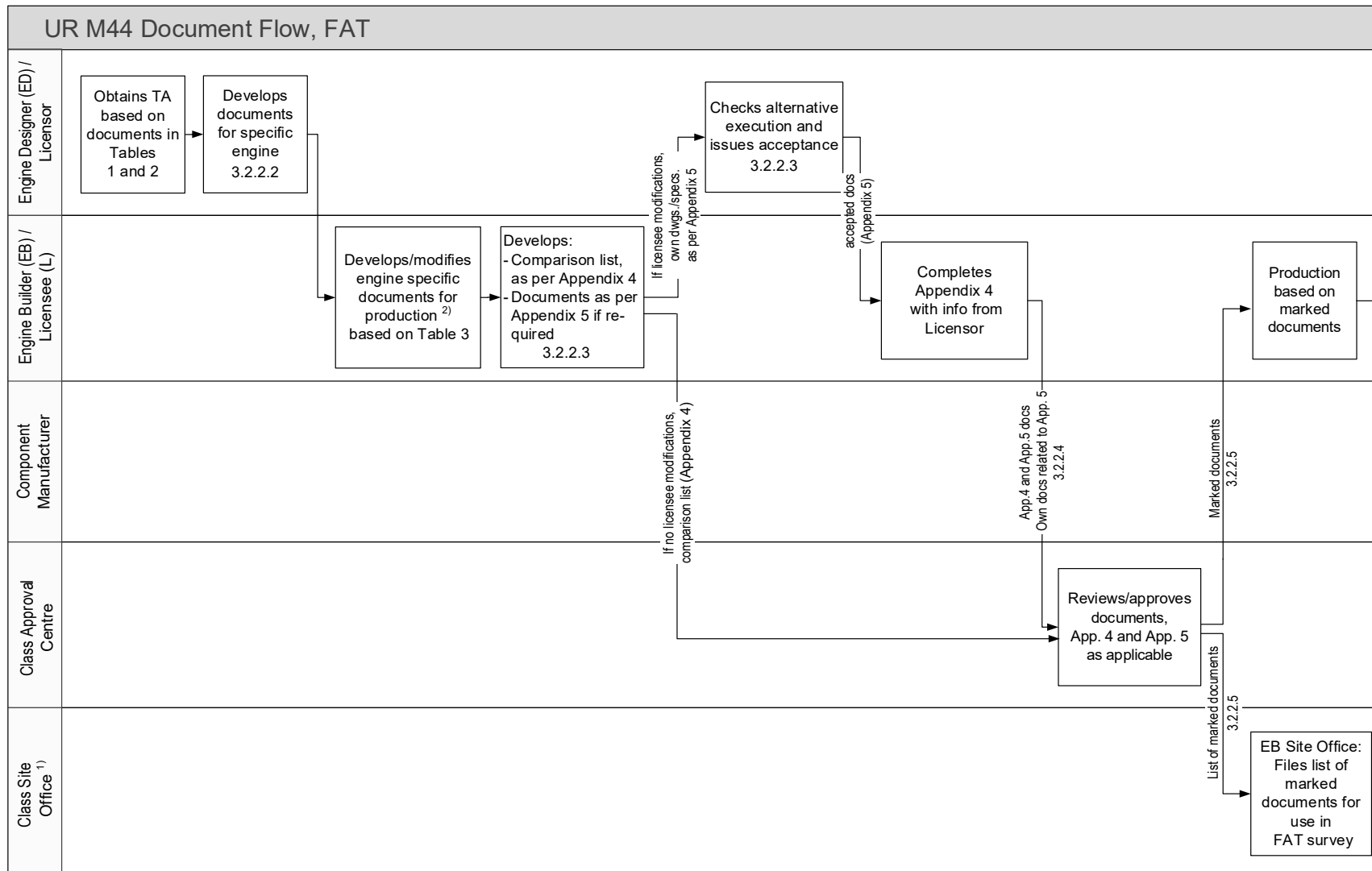
The document flow diagrams in this appendix are provided as an aid to all parties involved in the engine certification process as to their roles and responsibilities. Variations in the document flow may vary in response to unique issues with regard to various factors related to location, availability of components and surveys. In any case, the text in the UR takes precedence over these flow diagrams.



\* May also be produced by licensee

**Figure 1 Type approval document flow**

M44  
(cont)



1) Class Site office with responsibility for engine builder and/or component manufacturers in different locations  
 2) For alternative execution, see 5.3

**Figure 2 Engine certificate document flow**



**M44**  
(cont)

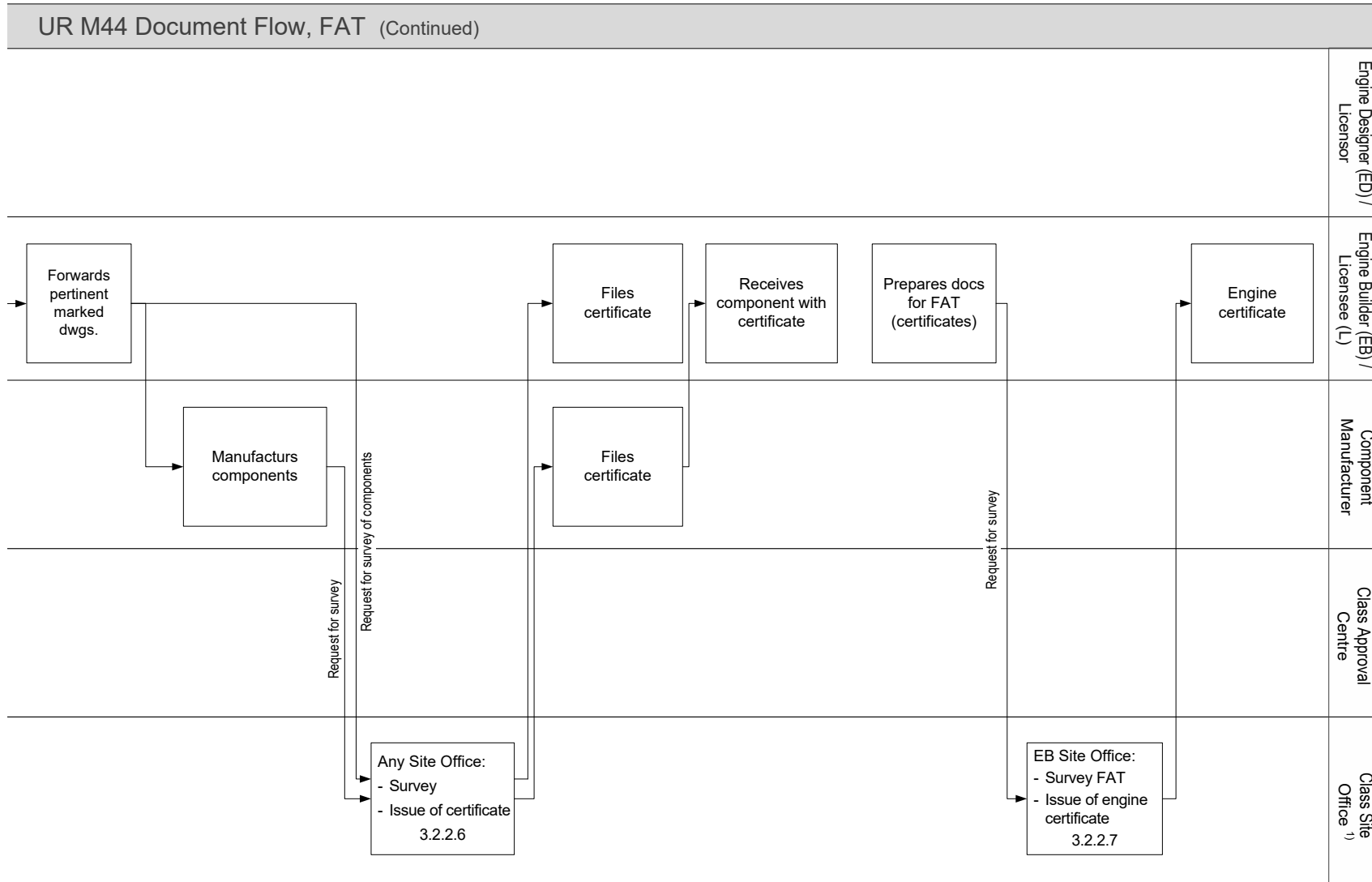


Figure 2 Engine certificate document flow (continued)

UR M44 - APPENDIX 3 - Internal Combustion Engine Approval Application Form  
and Data Sheet

Class Application number (if applicable):

Engine Manufacturer's Application Identification Number:

General Data			
Engine Designer: Contact Person: Address:		Engine Manufacturer(s), Licensee(s) and/or Manufacturing Sites* Name Country	
1. Document purpose (select options from either 1a or 1b)			
1a. Type Approval Application			
Service Requested		Required activities <sup>†</sup>	
<input type="checkbox"/> New Type Approval <input type="checkbox"/> Renew Type Approval <input type="checkbox"/> Amend Type Approval <input type="checkbox"/> Design Evaluation <input type="checkbox"/> Update TA Supplement <input type="checkbox"/> Other		<ul style="list-style-type: none"> <li>• DA, TT, CoP</li> <li>• CoP, if design change then amended or new certificate process to be followed</li> <li>• DA &amp; CoP, Further TT if previously approved engine has been substantively modified (as required by UR M71)</li> <li>• DA, TT, applicable where designer does not have production facilities, Type Approval to be granted to specific production facility once associated CoP has been completed</li> <li>• Update to Supplement, only for minor changes not affecting the Type Approval Certificate</li> <li>• e.g. National/Statutory Administration requirements i.e. MSC.81(70), as amended by IMO resolutions up to MSC.472(101), for emergency engines</li> </ul>	
For TA Cert amendments or Supplement updates, details of what is to be changed:			
For 'Other', Details of the requirements to be considered:			
1b. Addendum for Individual Engine FAT and Certification			
<input type="checkbox"/> Individual engine requiring FAT and Certification, only where the performance data for the engine being certified differs from the details provided on the original Type Approval Application. Only section 3b requires completion. Where changes to other sections are necessary, a new Type Approval Application may be required.			
Reference number of <i>Internal Combustion Engine Approval Application Form</i> previously submitted and reference number of the Type Approval Certificate.		(Copy of original application form to be attached to this document)	
2. Existing documentation			
Previous Class Type Approval Certificate No. or related Design Approval No. (if applicable)			
Formerly issued documentation for engine  (E.g. previous type test reports, in-service experience justification reports, etc.)	Issuing Body:	Document Type:	Document No.:
Existing Certification  (E.g. Manufacturer's quality certification ISO 9001:2015 etc.)	Issuing Body:	Document Type:	Document No.:
3. Design (mark all that apply)			
3a. Engine Particulars:			
Engine Type Manufactured Since <sup>‡</sup> :		Number of delivered marine engines <sup>‡</sup> :	
Application	<input type="checkbox"/> Direct drive Propulsion <input type="checkbox"/> Single engine / <input type="checkbox"/> Multi-engine installation		<input type="checkbox"/> Auxiliary <input type="checkbox"/> Aux. Services / <input type="checkbox"/> Electric Propulsion
	<input type="checkbox"/> Emergency		
Mechanical Design	<input type="checkbox"/> 2-stroke <input type="checkbox"/> Cross-head Cylinder bore(mm)	<input type="checkbox"/> 4-stroke <input type="checkbox"/> Trunk-piston	<input type="checkbox"/> In-line <input type="checkbox"/> Vee (V-angle °) <input type="checkbox"/> Reversible <input type="checkbox"/> Non-reversible Length of piston stroke (mm)
	<input type="checkbox"/> Other ( )		
Supercharging	<input type="checkbox"/> Without supercharging <input type="checkbox"/> With supercharging		<input type="checkbox"/> Without charge air cooling <input type="checkbox"/> With charge air cooling
	<input type="checkbox"/> Constant-pressure charging system <input type="checkbox"/> Pulsating pressure charging system		
Valve operation	<input type="checkbox"/> Cam control <input type="checkbox"/> Electronic control		
Fuel Injection	<input type="checkbox"/> Direct injection <input type="checkbox"/> Indirect injection	<input type="checkbox"/> Cam controlled injection <input type="checkbox"/> Electronically controlled injection	

**M44**  
**(cont)**

Fuel Types <sup>s</sup> (Classification according to ISO 8216-1:2017)	<input type="checkbox"/> Marine residual fuel <input type="checkbox"/> Marine distillate fuel <input type="checkbox"/> Marine distillate fuel <input type="checkbox"/> Low flashpoint liquid fuel (specify fuel type) <input type="checkbox"/> Gas (specify gas type) <input type="checkbox"/> Other (specify) <input type="checkbox"/> Dual Fuel (specify combinations of fuels to be used simultaneously)	cSt (Max. kinematic viscosity at 50°C) DMA, DMB, DMC DMX
3b. Performance Data (Related to: Barometric pressure 1,000 mbar; Air temperature 45°C; Relative humidity 60%; Seawater temperature 32°C)		
Model reference No. (if applicable)		
Max. continuous rating	kW/cyl	
Rated speed	1/min	
Mean indicated pressure	MPa	
Mean effective pressure	MPa	
Max. firing pressure	MPa	
Charge air pressure	MPa	
Compression ratio	-	
Mean piston speed	m/s	
3c. Crankshaft		
Design	<input type="checkbox"/> Solid <input type="checkbox"/> Semi-built <input type="checkbox"/> Built	
Method of Manufacture	<input type="checkbox"/> Cast <input type="checkbox"/> Forged <input type="checkbox"/> Slab forged <input type="checkbox"/> Approved die forged <input type="checkbox"/> Continuous grain flow process	
State approved forge/works name:		
Is the crankshaft hardened by an approved process which includes the fillet radii of crankpins and journals? <input type="checkbox"/> Yes <input type="checkbox"/> No		
If yes, state process:		
Crankshaft material specification:		
U.T.S. (N/mm <sup>2</sup> )	Yield strength (N/mm <sup>2</sup> )	
Hardness value (Brinell/Vickers)	Elongation (%)	
Dimensional Data		
If shrunk on webs, state shrinkage allowance (mm)	Yield strength of crankweb material (N/mm <sup>2</sup> )	
Centre of gravity of connecting rod from large end centre (mm)	Radius of gyration of connecting rod (mm)	
Mass of each crankweb (kg)	Centre of gravity of web from journal axis (mm)	
Mass of each counterweight (kg)	Centre of gravity of each counterweight from journal axis (mm)	
Axial length of main bearing (mm)	Main bearing working clearance (mm)	
Mass of flywheel at driving end (kg)	Mass of flywheel at opposite end (kg)	
Nominal alternating torsional stress in crankpin (N/mm <sup>2</sup> )	Nominal alternating torsional stress in crank journal (N/mm <sup>2</sup> )	
Length between centres (Total length)(mm)		
3d. Firing order		
State numbering system of cylinders from left to right as per above diagrams ( as applicable)		
Number of cylinders	Clockwise firing order	Counter-clockwise firing order

M44  
(cont)

4. Engine Ancillary Systems					
4a. Turbochargers		<input type="checkbox"/> Fitted		<input type="checkbox"/> Not Fitted	
Turbocharger oil supply by:		<input type="checkbox"/> Engine lub. oil system		<input type="checkbox"/> TC internal lub. oil system	
No. of cylinders	No. of aux blowers	No. of charge air coolers	No. of TC	TC manufacturer & type	TC type approval certificate No.
				/	
				/	
				/	
				/	
				/	
				/	
4b. Speed governor					
Engine application (Main/Aux/Emergency)		Manufacturer / type		Mode of operation	Type approval cert. No. (if electric / electronic gov.)
		/			
		/			
		/			
4c. Overspeed protection					
Independent overspeed protection available		<input type="checkbox"/> Yes <input type="checkbox"/> No		Mode of operation:	
Manufacturer / type, if electronic: /		Type approval certificate No.			
4d. Electronic systems					
Engine control and management system					
<i>Note: use Remarks section to identify when a different engine control system will be used for Type Test</i>					
Hardware: Manufacturer & Model: /		Type approval certificate No.			
Software: Name & Version: /		Software conformity certificate No.			
Additional electronic system 1:			System function:		
Manufacturer & type: /			Type approval certificate No.		
Additional electronic system 2:			System function:		
Manufacturer & type: /			Type approval certificate No.		
Additional electronic system 3:			System function:		
Manufacturer & type: /			Type approval certificate No.		
4e. Starting System					
Type:					
4f. Safety devices/functions					
A flame arrestor or a bursting disk is installed		before each starting valve		<input type="checkbox"/> Yes <input type="checkbox"/> No	
in the starting air system:		in the starting air manifold		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Crankcase relief valves available		<input type="checkbox"/> Yes <input type="checkbox"/> No		Manufacturer / type: /	
Type approval certificate No.					
No. of cyl.	Total crankcase gross volume incl. attachments (m <sup>3</sup> )	Type & size (mm) of relief valve		Relief area per relief valve (mm <sup>2</sup> )	No. of relief valves
		/			
		/			
		/			
		/			
Method used for detection of potentially explosive crankcase condition:					
<input type="checkbox"/> Oil mist detector: Manufacturer / type: /		Type approval certificate No.			
<input type="checkbox"/> Alternative method:		<input type="checkbox"/> crankcase pressure monitoring		<input type="checkbox"/> bearing temperature monitoring <input type="checkbox"/> other:	
<i>(mark all that apply)</i>		<input type="checkbox"/> oil splash temperature monitoring		<input type="checkbox"/> recirculation arrangements	
Cylinder overpressure warning device available		<input type="checkbox"/> Yes <input type="checkbox"/> No			
Type:		Opening pressure (bar):			
4g. Attached ancillary equipment <i>(Mark all that apply)</i>					
Engine driven pumps:					
<input type="checkbox"/> Main lubricating oil pump		<input type="checkbox"/> Sea cooling water pump		<input type="checkbox"/> LT-fresh cooling water pump	
<input type="checkbox"/> HT-fresh cooling water pump		<input type="checkbox"/> Fuel oil booster pump		<input type="checkbox"/> Hydraulic oil pump <input type="checkbox"/> Other ( )	
Engine attached motor driven pumps:					
<input type="checkbox"/> Lubricating oil pump		<input type="checkbox"/> Cooling fresh water pump		<input type="checkbox"/> Fuel oil booster pump	
<input type="checkbox"/> Hydraulic oil pump		<input type="checkbox"/> Other ( )			

# M44

(cont)

Engine attached cooler or heater:				
<input type="checkbox"/> Lubricating oil cooler	<input type="checkbox"/> Lubricating oil heater	<input type="checkbox"/> Fuel oil valve cooler		
<input type="checkbox"/> Hydraulic oil cooler	<input type="checkbox"/> Cooling fresh water cooler			
Engine attached filter:				
Lubricating oil filter	<input type="checkbox"/> Single	<input type="checkbox"/> Duplex	<input type="checkbox"/> Automatic	
Fuel oil filter	<input type="checkbox"/> Single	<input type="checkbox"/> Duplex	<input type="checkbox"/> Automatic	
5. Inclination limits <i>(engine operation is safeguarded under the following limits)</i>		Athwartships		Fore-and-aft
		Static	Dynamic	Static      Dynamic
Main & Auxiliary machinery	<input type="checkbox"/> 15.0°	<input type="checkbox"/> 22.5°	<input type="checkbox"/> 5.0°	<input type="checkbox"/> 7.5°
Emergency machinery	<input type="checkbox"/> 22.5°	<input type="checkbox"/> 22.5°	<input type="checkbox"/> 10.0°	<input type="checkbox"/> 10.0°
Emergency machinery on ships for the carriage of liquefied gas and liquid chemicals	<input type="checkbox"/> 30.0°	<input type="checkbox"/> 30.0°		
6. Main engine emergency operation				
At failure of one auxiliary blower, engine can be started and operated at partial load			<input type="checkbox"/> Yes	<input type="checkbox"/> No
At failure of one turbocharger, engine operation can be continued			<input type="checkbox"/> Yes	<input type="checkbox"/> No
7. References: <i>Additional Information Attached to Application</i>				
Document Name/Number		Summary of information contained in document		
8. Further Remarks:				

- \* All parties that affect the final complete engine (e.g. manufacture, modify, adjust) are to be listed. All sites where such work is carried out may be required to complete CoP assessment.
- † DA = Design Appraisal, TT = Type Test, CoP = Assessment of Conformity of Production. See 'Definitions' at the end of this application form for more information.
- ‡ Only in case of TA Extension.
- § See 'Definitions' at the end of this application form for more information.

Completed By:

Signature: \_\_\_\_\_

Company:

Job Title:

Date:

Stamp:

# M44

(cont)

## Definitions:

**Design Appraisal:** Evaluation of all relevant plans, calculations and documents related to the design to determine compliance with the IACS and individual Societies' technical requirements. This includes requirements for all associated ancillary equipment and systems essential for the safe operation of the engine i.e. the Complete Engine. The Design Appraisal is recorded on a Supplement to the Type Approval Certificate.

**Type Testing** requires satisfactory completion of testing of the Complete Engine against the requirements of the Classification Societies' applicable engine Type Testing programme (based on minimum requirements of IACS Unified Requirement M71). Type testing is only applicable to the first in series; all engines are to complete factory acceptance and shipboard trials as defined by IACS Unified Requirement M51 and Society requirements.

**Design Evaluation Certification** may be granted upon satisfactory completion of Design Appraisal and Type Testing.

**Assessment of Conformity of Production** means the assessment of quality assurance, manufacturing facilities and processes and testing facilities, to confirm the manufacturer's capability to repeatedly produce the complete engine in accordance with the approved and type tested design.

**Type Approval Certification** will be granted upon satisfactory completion of Design Appraisal, Type Testing and assessment of Conformity of Production of the complete engine. The Type Approval Certificate will incorporate outputs from the Design Appraisal, the Type Test and the Assessment of Conformity of Production.

**Complete Engine** includes the control system and all ancillary systems and equipment referred to in the Rules that are used for safe operation of the engine and for which there are rule requirements, this includes systems allowing the use of different fuel types. The exact list of components/items that will need to be tested in together with the bare engine will depend on the specific design of the engine, its control system and the fuel(s) used but may include, but are not limited to, the following:

- (a) Turbocharger(s)
- (b) Crankcase explosion relief devices
- (c) Oil mist detection and alarm devices
- (d) Piping
- (e) Electronic monitoring and control system(s) – software and hardware
- (f) Fuel management system (where dual fuel arrangements are fitted)
- (g) Engine driven pumps
- (h) Engine mounted filters

**Fuel Types:** All fuels that the engine is designed to operate with are to be identified on the application form as this may have impact on the requirements that are applicable for Design Appraisal and the scope of the tests required for Type Testing. Where the engine is to operate in a Dual Fuel mode, the combinations of fuel types are to be detailed. E.g. Natural Gas + DMA, Natural Gas + Marine Residual Fuel, the specific details of each fuel are to be provided as indicated in the relevant rows of the Fuel Types part of section 3a of this form.

**M44**

(cont)

**UR M44 - APPENDIX 4 - Tabular Listing of Licensor's and Licensee's Drawing and Data**

Licensee: \_\_\_\_\_

Licensor: \_\_\_\_\_

Licensee Engine No. : \_\_\_\_\_

Engine type: \_\_\_\_\_

No.	Components or System	Licensor			Licensee		Has Design been modified by Licensee?		If Yes, indicate following information	
		Dwg. No. & Title	Rev. No.	Date of Class Approval or Review	Dwg. No.	Rev. No.	Yes	No	Identification of Alternative approved by Licensor	Date of Class Approval or Review of Licensee Dwg.
1										
2										
3										
4										
5										
6										
7										
8										
9										
...										

I attest the above information to be correct and accurate.

Person in Charge (Licensee):

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Signature

Date: \_\_\_\_\_

**M44**  
(cont)

**UR M44 - APPENDIX 5 SAMPLE TEMPLATE FOR CONFIRMATION OF THE LICENSOR'S  
ACCEPTANCE OF LICENSEE'S MODIFICATIONS**

<i>Engine Licensee Proposed Alternative to Licensor's Design</i>			
<i>Licensee information</i>			
Licensee:		Ref No.:	
Description:		Info No.:	
Engine type:		Main Section:	
Engine No.:		Plant Id.:	
Design Spec: <input type="checkbox"/> General <input type="checkbox"/> Specific Nos:			
<i>Licensor design:</i>	<small>State relevant part or drawing numbers. Insert drawing clips or pictures. Add any relevant information</small>		<i>Licensee Proposed Alternative</i>
		<p>For example:</p> <ul style="list-style-type: none"> <li>• Differences in geometry</li> <li>• Differences in the functionality</li> <li>• Material</li> <li>• Hardness</li> <li>• Surface condition</li> <li>• Alternative standard</li> <li>• Licensee production information introduced on the drawing</li> <li>• Weldings or castings</li> <li>• etc.</li> </ul>	
Reason:	<input type="checkbox"/> Licensee's production <input type="checkbox"/> Sub-supplier's production <input type="checkbox"/> Cost down <input type="checkbox"/> Tools	Interchangeability w. licensor design  <input type="checkbox"/> Yes <input type="checkbox"/> No	Non-conformity Report Research, Assessment, Evaluation  <input type="checkbox"/> NCR <input type="checkbox"/> RAE
Certified by licensee: Initials: Date:			
<b>Licensor comments</b>			
LoAE:	<input type="checkbox"/> Accepted as alternative execution <small>(Licensor undertakes responsibility)</small> <input type="checkbox"/> No objection <input type="checkbox"/> Not acceptable <small>(Licensee undertakes responsibility)</small>	NCR:	<input type="checkbox"/> Approved <input type="checkbox"/> Conditionally approved <input type="checkbox"/> Rejected
Certified by licensor: Initials: Date:			
Licensor ref.:			Date:
Licensee ref.:			Date:

End of  
Document