M87 Certification Scheme for Reciprocating Internal Combustion Engines

(Apr 2025)

1. General

An engine product certificate is required for each reciprocating internal combustion engine (hereafter is referred to as “engine”) for shipboard application for propulsion, electrical power generation or other auxiliary purposes including emergency generators.

The Engine Certification Scheme is a certification process based on engine type approval, (including drawings and specifications approval, type test and manufacturer assessment) and, issuance of a product certificate for each individual engine, upon satisfactory components inspection, assembly inspection and factory acceptance test.

As an alternative, an engine may be individually certified, provided that the individual engine is subjected to a similar process, including Drawing approval per UR M44 a Type test per UR M71 and a Factory acceptance test per UR M51.

2. Scope

This Unified Requirement (UR) outlines the process and associated URs for the certification of engines. The provisions of this UR can be incorporated into and applied in accordance with the society’s Type Approval scheme.

The following referenced associated URs give further details concerning the different steps in the engine certification process:

M28 Ambient reference conditions
M44 Documents for the Approval of Reciprocating Internal Combustion Engines
M71 Type Testing of Reciprocating Internal Combustion Engines
M72 Certification of Engine Components
M51 Factory Acceptance Test of Reciprocating Internal Combustion Engines
M88 Shipboard Trials of Reciprocating Internal Combustion Engines
M78 Reciprocating Internal Combustion Engines Fuelled by Natural Gas
Z26 Alternative Certification Scheme (ACS)

For engines with the maximum continuous rating (MCR) of 110 kW or less (except for main propulsion engines), or engines not directly relating to safe operation of the ship, the drawing approval per UR M44 and the type test per UR M71 may be simplified and Product Certificate may be waived if agreed by the Society.

3. Definitions

Definitions used in the above URs are given in Appendix 1.

4. Approval and certification process

The type approval and individual engine certification process consists of different stages and pathways, as shown in Figure 1.

Notes:

1. This Unified Requirement is 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 January 2027.

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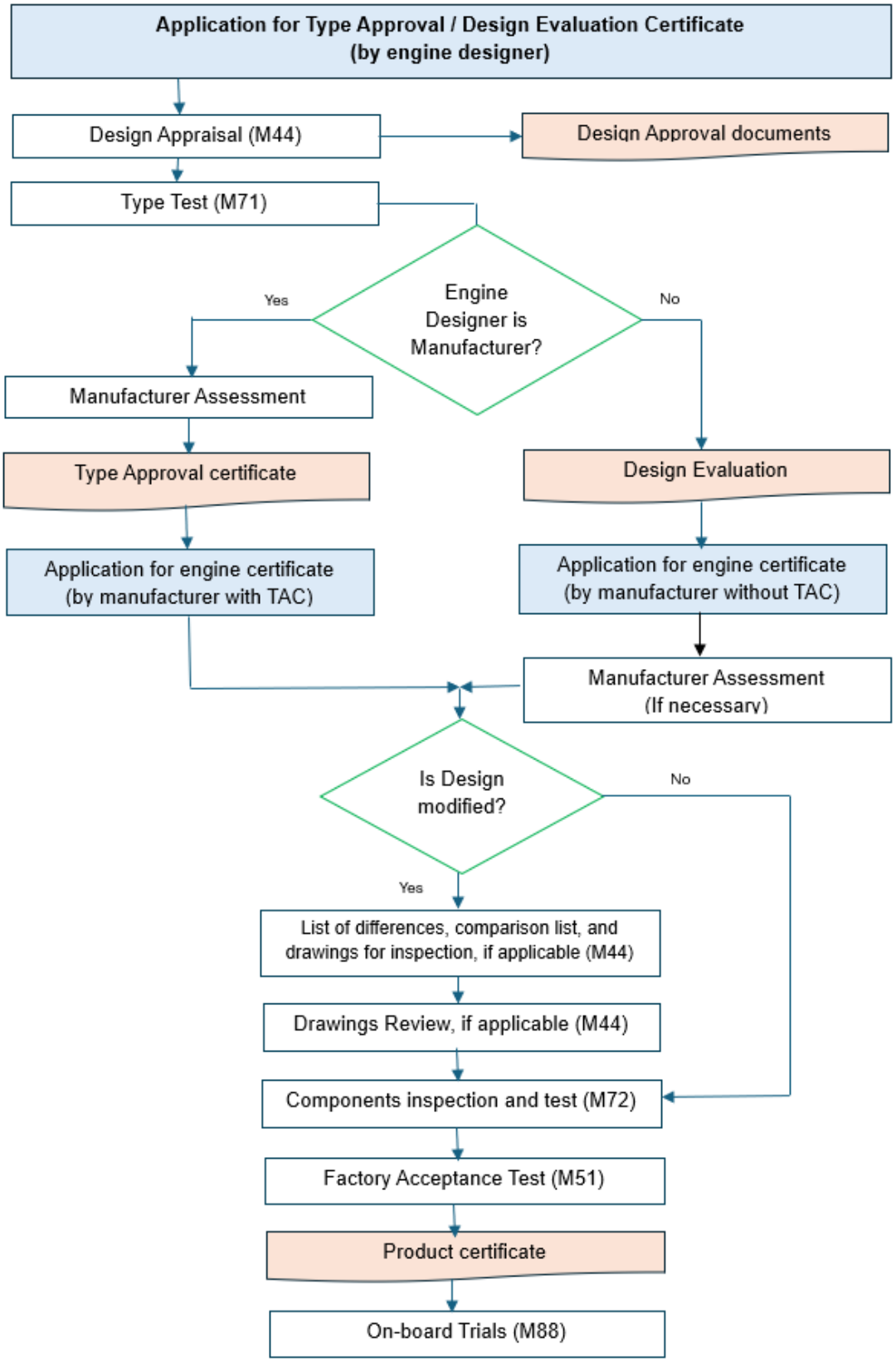

Figure 1 type approval and individual engine certification process

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5. Type approval

5.1 Principles of Type approval

The type approval of engines is a certification process based on a design appraisal and type testing of the engine type together with a manufacturer assessment including quality assurance system assessment.

This process consists of:

- drawing and specification approval according to UR M44, and
- type testing of engines according to UR M71, and
- evaluation of the manufacturing arrangements for assessment of conformity of production and certification of components, according to UR M72 and UR Z26 as applicable, and
- issuance of a Type Approval certificate

5.2 The scope of type approval

5.2.1 An engine type is defined by:

- Bore and stroke
- Injection method (direct or indirect)
- Valve and injection operation (by cams or electronically controlled)
- Further type characteristics for dual-fuel and gas engines are given in M78.4.1.2
- Working cycle (4-stroke, 2-stroke)
- Turbo charging system (pulsating or constant pressure)
- The charging air cooling system (e.g. with or without intercooler)
- Cylinder arrangement (in-line or V)

Engines with the same type characteristics as defined above can be included in the same engine type for a type approval.

Note that where the same engine type (as defined) is capable of using different fuels, its suitability shall be demonstrated by integration testing for each new fuel type.

Additionally, if an engine has varying parameters, new functions, or alternative sub-systems beyond those listed above, it may still be defined as the same engine type, but an extended approval is required in accordance with 5.2.2 to 5.2.3 and Appendix 2.

5.2.2 There are further possible scopes to a type approval, which may occur depending on circumstances, such as:

Extension of the scope of a Type approval, to include e.g. (list not exhaustive):

- New place of production
- Alternative sub-systems
- Alternative or additional duty cycle or applications
- Additional or extended ratings

5.2.3 Engines rating

1) The engine is type approved up to the rating considered in the Design approval and Type test according to UR M71 (whichever is the lower, in case of differences).

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2) Approval of increased rating is subject to review of Design approval and a Type test, except in the cases detailed in UR M71.5.3.

5.3 Design Approval

Design approval is based on evidence that the design is in conformance with all current Rules and statutory regulations (e.g. SOLAS, MARPOL), and it is valid as long as no substantial modifications have been implemented. The details of drawings and specification approval are given in UR M44.

After the Classification Society has approved the engine type for the first time, documents as listed in M44, which have undergone substantive changes, have to be resubmitted for consideration by the Classification Society (see also 5.8).

5.4 Type approval test

A type approval test is to be carried out in accordance with IACS UR M71, under the attendance of a Surveyor.

The type testing program is to be approved by the Society, and the conformity of the engine presented for type approval test is also to be assessed.

5.5 Manufacturer assessment

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 and UR Z26 as applicable.

5.6 Type approval certificate

After the requirements in 5.3 through 5.5 have been satisfactorily completed the Classification Society may issue a type approval certificate (TAC) to the engine Designer.

When applicable, the authorized engine manufacturers approved in 5.5 or 6.2 may be listed in the notes of type approval certificate at the request of applicant

5.7 Design evaluation certificate

Where the issuance of a design evaluation certificate is part of the certification process of the Society, a Design evaluation certificate may be issued instead of a Type Approval certificate, with the engine designer as applicant, in the case manufacturer assessment in 5.5 cannot be carried out, but the requirements in 5.3 and 5.4 have been satisfactorily completed.

5.8 Validity of type approval and Design evaluation certificates

The maximum period of validity of a Type Approval Certificate or a Design evaluation certificate, where issued by the Society is 5 years. The Classification Society reserves the right to further limit the duration of validity.

The type approval certificate or Design evaluation certificate, where issued by the Society 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.

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5.9 Renewal of type approval or design evaluation certificate

A renewal of Type approval certificate or Design evaluation certificate, where issued by the Society will be granted upon:

5.9.1 Submission of information in either a) or b),

a) modified documents or new documents with substantial modifications replacing former documents compared to the previous submission(s) for design appraisal, or

b) a declaration that no substantial modifications have been applied since the last design appraisal issued.

5.9.2 An assessment to verify, in either above case a) or b), that the applicable requirements have not changed, and the product also complies with applicable requirements.

5.10 Extension of the scope of a Type approval certificate or Design evaluation certificate and Approval of sub-systems

5.10.1 The scope of a type approval certificate or a design evaluation certificate, where issued by the Society may be extended by the issue of a new certificate or an extension document.

5.10.2 Approval of engine components and sub-system
The design of components and sub-system which are covered by the type approval certificate or by a design evaluation of the relevant engine type is regarded as approved whether manufactured by the engine manufacturer or sub-supplied. For some components or sub-system of subcontractor's design, necessary approvals are to be obtained by the relevant suppliers (e.g. exhaust gas turbochargers, charge air coolers, etc.).

In case the extension is requested to allow the incorporation of an additional or alternative sub-system, the requirements in Appendix 2 apply. As an alternative, the complete engine incorporating additional or alternative sub-system may be subjected to the complete Type approval process, in which case Appendix 2 is not applicable.

6. Individual engine certification

The individual engine certification is based on a valid type approval certificate or a valid design evaluation certificate. For the first engine of a type, the type approval process and the individual engine certification process may be performed simultaneously.

6.1 Documents for individual engine certification

Prior to the start of the individual engine certification process, a design approval is to be obtained according to the procedure given in UR M44.

Where the engines were design approved in type approval process without any modification, document approval for individual engine can be waived.

6.2 Manufacturer assessment

To verify the arrangements intended to ensure the conformity of production, a manufacturer assessment according to 5.5 is to be carried out by the Classification Society, except when the manufacturer arrangement was already addressed for issuance of the type approval certificate or were assessed satisfactorily before.

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6.3 Inspection of engine components and sub-system

The attending Surveyors will inspect and witness the test of engine components according to the requirements in UR M72, and issue product certificates as necessary upon satisfactory inspections and tests.
Where applicable, inspection for sub-system may also be required according to rules of each individual Classification Society or quality specification accepted by the Society.

6.4 Engine assembly and test

Each engine assembly and testing procedure required according to relevant IACS URs is to be witnessed by the Classification Society, except when otherwise allowed by an Alternative Certification Scheme meeting the requirements of UR Z26, in which case the relevant records are to be reviewed.

The details of Factory acceptance test are given in UR M51.

6.5 Certification

The Surveyor will issue a product certificate for the engine upon satisfactory outcome of previous steps and review of inspection and test records.

7. Shipboard trials

Irrespective of contractual arrangements, shipboard trials are regarded as part of the engine certification process to verify quality and conformity after installation on board, even if a product certificate was already issued.

This process consists of:

- testing the engine when installed on board and connected to ancillary equipment, according to UR M88.

Note: depending on the contractual arrangement between the manufacturer and shipyard/shipowner, the responsibility for shipboard trials may lie on either part.

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UR M87 - APPENDIX 1 –DEFINITIONS AND ACRONYMS

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
Acceptance test	Test carried out as an overall check of the manufacturing quality and to establish that the contractual commitments have been fulfilled
Accepted	Status of a design, product, service or process, which has been found to conform to specific acceptance criteria
Alternative Certification Scheme (ACS)	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: ABS: Product Quality Assurance BV: Alternative Survey Scheme CCS: Alternative Survey Scheme CRS: Examination of the manufacturing process and quality assurance system DNV: 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 Certification Scheme
Ancillary Equipment	An auxiliary equipment or a system outside the engine which located in engine room or in separate space outside engine room
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
Assessment of Conformity of Production	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

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Term	Definition
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 the compliance of a design, product, service or process with acceptance criteria
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 describing the performance, installation and manufacturing of a product
Design analysis	Investigative methodology selectively used to assess the design
Design approval	The granting of permission for the design of a product, service or process upon a satisfactory design appraisal
Design appraisal	Evaluation of all relevant plans, calculations and documents related to the design
Design evaluation certificate	Design evaluation certificate is a certificate that may be issued by the Society, depending on its certification process, upon satisfactory completion of Design appraisal and type testing.
Design review	Part of the design appraisal process to evaluate specific aspects of the design

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Term	Definition
Designer/Engine designer	The entity that has the design rights for the (engine type/product) or is delegated by the entity having the design rights to modify the design. When a licensor-licensee agreement is applied, it could be regarded as the “licensor”
Drawings approval/ plan approval	Part of the design approval process which relates to the evaluation of drawings and plans
Engine	Reciprocating internal combustion engine
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
Extended Factory Acceptance Test	Factory acceptance test with additional test items for the purpose of extension of a type approval
Extension of a type approval	Extension of a type approval means issuance of a type approval certificate with inclusion of new features in respect of a previously issued certificate for the same equipment
Factory acceptance test	A technical operation that consists of the determination of one or more characteristics or performance of a given product or equipment, according to a specified procedure
Information	Additional technical data or details supplementing the drawings requiring approval
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
Installation	The assembling and final placement of components, equipment and sub-systems to permit operation of the system
Manufacturer	Party responsible for the manufacturing and quality of the product When a licensor-licensee agreement is applied, it could be regarded as the “licensee”
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

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Term	Definition
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	Same as manufacturer
Product	Result of the manufacturing process
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
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
Society	Short for Classification Society
Sub-systems	assembly of components belonging to engine, intended to achieve a defined function and which may affect the engine performance
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
Sub-supplier/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

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Term	Definition
Surveyor	means a surveyor to the Classification Society unless otherwise specified
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	The establishment of the acceptability of a product through the systematic: 1. Evaluation of a design to determine conformance with specifications 2. Witnessing manufacture and testing of a sample of product to determine compliance with the specification 3. Evaluation of the manufacturing arrangements to confirm that the product can be consistently produced in accordance with the specification
Type approval certificate	Type Approval Certificate is a certificate issued by the Society upon satisfactory completion of Design Approval, assessment of Conformity of Production and Type test of the complete engine
Type test	Test carried out on a representative sample of a certain product (engine type in the context of this UR) to establish its main performance data, as far as possible, to enable its reliability in service to be assessed
Witness	Individual physically present at a test and being able to record and give evidence about its outcome

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1. Definitions and concepts

Sub-system can be an assembly of components belonging to an engine, intended to achieve a defined function and engine performance (output, emission behaviour, availability etc.).

The sub-system can be separately approved before integration in the engine, if required by Society or on a voluntary basis. Using this modular system may simplify the certification process, design approval and testing. It does not affect the definition of the engine type.

- The Society will evaluate whether an assembly of components is to be considered as a sub-system or as an integral part of the engine, and in the latter will require a Type approval to be obtained. Examples of sub-systems are electronical engine control system, turbocharger, etc.

- The engine designer can also choose type approval for the sub-system voluntarily, when they deem it is helpful to get an Extension of the scope of engine type approval. Examples of such sub-systems are fuel injection/admission system, exhaust gas recirculation system, exhaust gas treatment system, etc.
  Basic engine parts are not to be regarded as sub-systems, examples of such parts are crankshafts, con-rods, pistons, camshafts, intake and exhaust valve actuating systems, etc.

2. Extension of the scope of a Type approval of engine

2.1 Certification process of extended type approval using sub-system concept

In case an extension of the scope of an engine type approval is requested, to allow the incorporation of additional or alternative sub-systems, the process in Fig.2 is to be applied as an alternative to a complete type approval process.

2.2 Drawings approval

Drawings of sub-system and engines are to be reviewed by Classification Society. Details see M44.7.

2.3 Integration test

The engine is to be subjected to an integration test in the presence of a Surveyor to verify the response of the complete mechanical, hydraulic and electronic systems is as predicted for the engine manufacturer defined operational modes and based on the required FMEA in M71.
This may take the form of an extended Factory Acceptance test.
On completion of test, a report shall be issued, identified by number and date which accurately, clearly and unambiguously presents the test results and all other relevant information.

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2.4 Certificate of extended approval

An extended approval certificate may also be issued at the discretion of the Society, taking into consideration of the engine defining parameters in M87-5.2.1 and individual rules or standards for specific sub-systems. The extended type approval recognition may take the form of any of the following,

- New type approval certificate (for new engine type according to 5.2.1), or
- Extended engine type approval certificate, or
- Extended Design evaluation certificate, or
- Certificate of extension of a Type approval or Design evaluation certificate.

3. Type approval of Sub-system

The type approval of sub-system is to be subjected to:

3.1 Drawing and specification approval

The application and submitted documents must contain sufficient information to allow the product to be assessed against the design criteria (see M44.7 for details).

3.2 Type testing in the presence of a surveyor

3.2.1 The aim of the inspection and testing is to:

- Examine and test the material and workmanship and confirm that the equipment has been manufactured and tested in accordance with the rules, the applicable specified design codes, national and international standards, manufacturer's specification in so far as they are applicable;
- Demonstrate that the product is able to perform its specified function
- Establish the performance characteristics of the product / component, where applicable.

3.2.2 Type testing requirements for specific sub-system are determined by each individual Classification Society, taking into consideration the following factors,

- The relevant requirements of the Classification Society Rules.
- Product specification and/or reference to design codes, standards, regulations etc.
- Relevant design drawings with materials specified, catalogues, data sheets calculations, functional description.
- Tests required by FMEA, when applicable.
- The type approval tests are adequate to demonstrate that the safety, function and performance provisions of the specified standard(s) can be fulfilled;

On completion of test, a report shall be issued, identified by number and date which accurately, clearly and unambiguously presents the test results and all other relevant information.

3.2.3 The Society may accept a design analysis instead of type testing, where:

- there is evidence, in the form of performance measurements from similar products, to validate the findings of the analysis, and
- the analysis method is recognized by class and is well established; and

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- it is mutually agreed that type approval tests cannot be performed or are inappropriate.

3.3 Issue of Type Approval Certificate for sub-systems

A type approval certificate may be issued upon satisfactory design approval, type testing in the presence of a Surveyor, and a manufacturer assessment.

Note: For detail type approval process, please refer to Clause 5.

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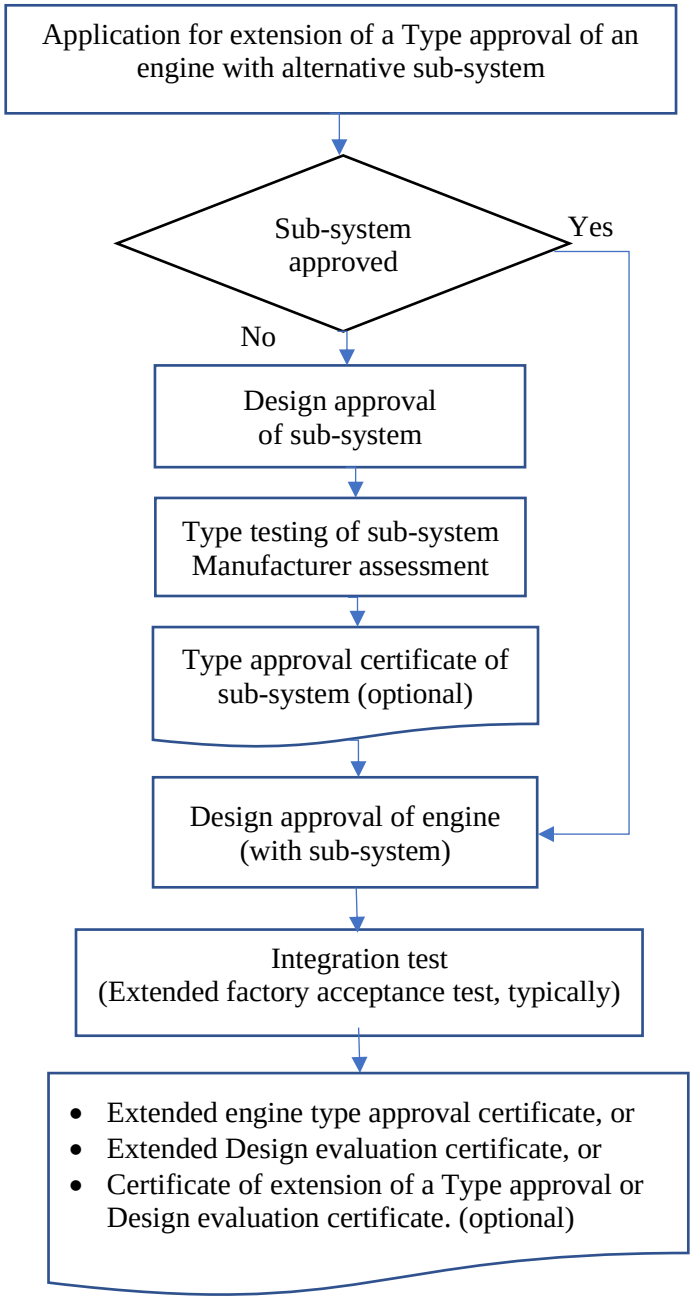

Figure 2 Certification process of extended type approval using sub-system concept