GUIDELINE

NKRE-GL-WT01

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ClassNK

NIPPON KAIJI KYOKAI

Certification of Wind Turbine System

RENEWABLE ENERGY

Revision History

I. Newly issued in May 2014. (Document Name: Guideline for Certification of Wind Turbine and Windfarm)

II. Revised version is issued at October 2021. (Document No.: NKRE-GL-WT01, October 2021)
- Document name is changed as Certification of Wind Turbine System.
- The format of the document is integrated into the new format.

Contents

Chapter 1 General

1.1 General

1.1.1 Scope

-1. These guidelines were stipulated by NIPPON KAIJI KYOKAI as its unique rules and procedures to certify wind turbines and wind farms based on the requirements defined in JIS C1400-22 for the certification bodies. Most of the requirements are identical with JIS C1400-22, however there are some changes.

(1) Consideration was given to allow flexible handling of some application standards.

(2) The term of validity for project certificates is set to 5 years.

-2. These guidelines define rules and procedures for a certification system for wind turbines (WT) that comprise both type certification and certification of wind turbine projects installed on land and off-shore. This system specifies rules for procedures and management for carrying out conformity evaluation of WT and wind farms, with respect to specific standards and other technical requirements, relating to safety, reliability, performance, testing and interaction with electrical power networks. It provides:

(1) definitions of the elements in a wind turbine certification process;

(2) procedures for conformity evaluation in a wind turbine certification system;

(3) procedures for conformity surveillance; and

(4) rules for the documentation that is to be supplied by an applicant for the conformity evaluation.

-3. The rules and procedures are not limited to WT of any particular size or type. However, special rules and procedures apply for small wind turbines (SWT).

1.2 Normative References

1.2.1 General

-1. The following referenced standards make up part of these guidelines. For references dated in the anno domini year, only the edition cited applies and the revision won't be applied (including any amendments). For references not dated in the anno domini year, the latest edition of the referenced standard (including any amendments) applies.

[R-01] IEC 60034(all parts) : Rotating Electrical machines

[R-02] IEC 60050-415:199 : International Electrotechnical Vocabulary – Part 415: Wind turbine generator systems

[R-03] IEC 61400(all parts) : Wind turbine generator systems

[R-04] IEC 61400-2 : Part 2: Design requirements for small wind turbines

[R-05] IEC 61400-3-1 : Part 3-1: Design requirements for fixed offshore wind turbines

[R-06] IEC 61400-3-2 : Part 3-2: Design requirements for floating offshore wind turbines

[R-07] IEC 61400-4 : Part 4: Design requirements for wind turbine gearboxes

[R-08] IEC 61400-11 : Part 11: Acoustic noise measurement techniques

[R-09] IEC 61400-12-1 : Part 12-1: Power performance measurements of electricity producing wind turbines

[R-10] IEC 61400-12-2 : Part 12-2: Power performance of electricity-producing wind turbines based on nacelle anemometry

[R-11] IEC/TS 61400-13 : Part 13: Measurement of mechanical loads

[R-12] IEC 61400-13 : Part 13: Measurement of mechanical loads

[R-13] IEC 61400-21-1 : Part 21-1: Measurement and assessment of electrical characteristics – Wind turbines

[R-14] IEC/TS 61400-23 : Part 23: Full-scale structural testing of rotor blades

[R-15] IEC 61400-23 : Part 23: Full-scale structural testing of rotor blades

[R-16] IEC 61400-24 : Part 24: Lightning protection

[R-17] ISO/IEC 17020 : General criteria for the operation of various types of bodies performing inspection
[R-18] ISO/IEC 17021 : Conformity assessment – Requirements for bodies providing audit and certification of management systems
[R-19] ISO/IEC 17025 : General requirements for the competence of testing and calibration laboratories
[R-20] ISO/IEC Guide 2 : Standardization and related activities – General vocabulary
[R-21] ISO/IEC 17065 : General requirements for bodies operating product certification systems
[R-22] ISO 9001:2008 : Quality management systems – Requirements
[R-23] ISO 9001:2015 : Quality management systems – Requirements
[R-24] ISO 81400-4:2005 : Wind turbines – Part 4: Design and specification of gearboxes

1.3 Terms and Abbreviations

1.3.1 Definition of terms

-1. For the purposes of these guidelines, the terms and definitions are given in Table 1-1, together with the relevant definitions contained in ISO/IEC Guide 2 and IEC 60050-415.

Table 1-1 Definition of terms

Term	Definition
Applicant	Entity applying for certification.
Certificate holder	Entity holding a certificate after the certificate is issued. NOTE: This entity may not be the original applicant but nevertheless is responsible for the maintenance of the certificate.
Certification	Procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements, also known as conformity assessment.
Certification system	System that has specific rules for procedure and management to carry out certification of conformity.
Commissioning	Process that encompasses functional safety checks, connecting the wind turbine to the grid and putting it into operation.
Conformity statement	Document issued upon successful completion of evaluation of a certification module. The statement includes identification of the receiver, the object, the main normative standards and validity.
Evaluation of conformity	Systematic examination of the extent to which a product, process or service fulfils specified requirements.
Final evaluation report	Report containing the results of conformity evaluations relating to type certification or project certification. The basis for the decision to issue the certification.
Inspection	Systematic examination of the extent to which a product, process or service fulfils specified requirements by means of measuring, observing, testing or gauging the relevant characteristics.
Installation	Process that encompasses site fabrication, assembly and erection.
Manufacture	Process that encompasses fabrication and assembly in a factory or workshop.
Manufacturer	Entity manufacturing the rotor nacelle assembly, components of the wind turbine, or a support structure that is a part of the wind turbine.
Modification	Making changes to the original design or specification of a new installation or an existing installation.
Operating body	Body that conducts certification of conformity, testing or inspection.

Term	Definition
Project certificate	Document issued upon successful completion of project certification.
Project certification	Procedure by which NIPPON KAIJI KYOKAI gives written assurance that one or more specific wind turbines, including support structure and possible other installations, are in conformity with requirements for a specific site.
Rotor nacelle assembly (RNA)	Part of a wind turbine carried by the support structure.
Repair	Repair of a unit or a piece of equipment to its original design or specification.
Replacement	Replacement of a unit or a piece of equipment in conformance with its original design or specification.
Support structure	Part of a wind turbine consisting of the tower, sub-structure and foundation, see Figure 1 of IEC 61400-3-1 and IEC 61400-3-2.
Surveillance	Ongoing monitoring and verification of the status of procedures, products and services, and analysis of records in relation to referenced documents to ensure specified requirements are met.
Type certificate	Document issued upon the successful completion of type certification.
Type certification	Procedure by which NIPPON KAIJI KYOKAI gives written assurance that a wind turbine type conforms to specified requirements.
Type testing	Action of carrying out tests for a given wind turbine type according to specified procedures.
Wind turbine type	Wind turbines of a common design, materials and major components, subject to a common manufacturing process and uniquely described by specific values or ranges of values of machine parameters and design conditions.

1.3.2 Definition of abbreviations

-1. For the purposes of these guidelines, the abbreviations and definitions are given in Table 1-2.

Table 1-2 Definition of abbreviations

Abbreviations	Definition
RNA	Rotor Nacelle Assembly
SWT	Small Wind Turbine
WT	Wind Turbine

Chapter 2 Management of the Certification System

2.1 General

2.1.1 General

-1. The certification system shall be managed and operated in accordance with the provisions in this chapter.

2.2 Agreement on Certification

2.2.1 General

-1. NIPPON KAIJI KYOKAI (hereafter referred to as "the Society") shall upon request be prepared to take on work for certification of wind turbines or wind farm projects according to the rules of these guidelines. The services of the Society shall be available to all applicants without undue financial or other conditions.

-2. Prior to starting certification work, an agreement between the applicant and the Society shall be made. In addition to financial and other usual contract conditions, the agreement shall include the type of certification, standards to be evaluated for conformity and so forth.

2.3 Issue of Certificates and Conformity Statements

2.3.1 General

-1. The certification system covers the issue of certificates and conformity statements.

-2. A certificate or conformity statement is based on the evaluation of wind turbine documentation and the results of inspection, surveillance or testing. The results of evaluation shall be documented in a final report.

-3. In the case of outstanding issues regarding a certified object device, a provisional certificate or conformity statement may be issued for a limited period of validity after confirming that those won't affect safety.

-4. A certificate or conformity statement shall identify the scope of evaluation, the wind turbine type, the supplier, the design assumptions and the set of normative documents, standards and other technical requirements.

2.4 Validity, Maintenance and Expiration of Certificates

2.4.1 General

-1. The period of validity for type and component certificates and associated conformity statements shall be 5 years. The period of validity of a prototype certificate shall be 3 years.

-2. A project certificate is valid for the installation at the site specified in the certificate, and the period of validity shall be 5 years.

-3. The period of validity of a provisional certificate or conformity statement during which all outstanding issues shall be documented by the applicant and evaluated by the Society shall be 1 year.

2.4.2 Maintenance of type certificate

-1. The applicant shall prepare an annual report for the certified wind turbine to be sent to the Society for review. The report shall include information on installed turbines and abnormal operating experience or failures known to the certificate holder and any minor modifications.

-2. The applicant shall report major modifications to the certified product to the Society without delay and provide corresponding design documentation, procedures, specifications or processes. In a case where the certificate holder intends to maintain and extend the validity of the certificate, an update of all documents affected by such modifications shall be provided.

-3. The Society shall perform periodic surveillance required by ISO/IEC 17065 with the purpose to check that the wind turbines

produced correspond to the type-certified wind turbines. The period shall in general not exceed 2 years and 6 months if the serial production has started. Such surveillance shall be on a recently installed wind turbine or in the workshop. The scope of the surveillance has to be significantly lower than for the inspections as they were performed as a part of the type certification.

-4. If the applicant does not operate a quality system that is certified according to ISO 9001, the Society shall verify at least once a year that manufactured wind turbines continue to be in conformance with the certified design. This verification shall follow the element of 4.5.

2.4.3 Maintenance of project certificate

-1. A project certificate is issued for wind turbine(s) and additional installation(s) as installed at the site specified in the certificate at the date of issue.

-2. The applicant shall report major modifications to the certified project to the Society without delay. In a case where the certificate holder intends to update the certificate, all the documents affected by the modification shall be provided.

-3. The Society shall perform operation and maintenance surveillance at least once a year, see 5.16, with the purpose of checking that operation and maintenance are performed periodically in conformity with the certified O&M manual and the guidelines separately determined by the Society. If the result of operation and maintenance surveillance is satisfactory, the inspector from the Society shall endorse the project certificate.

-4. If the periodic operation and maintenance surveillance confirms that appropriate operation and maintenance are carried out continuously, the Society shall renew the project certificate every 5 years.

2.4.4 Dealing with outstanding matters

-1. A provisional certificate or associated conformity statement can be issued by the Society to allow manufacturing of devices that are not series manufactured, as well as to allow for outstanding matters with no safety implication.

-2. The outstanding matters should be limited to matters with no safety implication.

2.5 Corrective Actions

2.5.1 General

-1. The Society shall be informed if, from logbook data or other information brought to the attention of the certificate holder, a wind turbine or project in question is shown not to function according to the design specifications and/or other criteria relevant to the certificate.

-2. Incidents known to the certificate holder where the safety of a wind turbine, project or the surroundings is involved shall be reported to the Society without delay.

-3. If after preliminary evaluation the Society determines a serious defect affecting the safety of a wind turbine in question, the certificate shall be immediately suspended. The Society shall subsequently carry out a thorough evaluation of the defect. This evaluation shall result in either reaffirmation or withdrawal of the certificate.

Chapter 3 Extent of Certification

3.1 General

3.1.1 General

-1. The certification procedures specified in these guidelines are applicable to a wind turbine type, a major component type, or one or more wind turbines at a specific location, from design evaluation to monitoring of commissioning and operation. The evaluation result becomes one of the following:

(1) a type certificate;

(2) a project certificate;

(3) a component certificate; or

(4) a prototype certificate.

-2. A type certificate covers a wind turbine, including the tower and the proposed type of connection between tower and foundation. It also covers the requirements governing the foundation, insofar as they arise from the wind turbine design, and may include one or more foundations.

-3. A project certificate covers one or more wind turbines, including the foundation(s) and optionally other installations at the site, evaluated for specific external conditions at an installation site. A project certificate presumes a type certificate and includes site conditions assessment and foundation design evaluation as mandatory modules.

-4. A component certificate covers a major wind turbine component such as a blade or gearbox.

-5. A prototype certificate covers a wind turbine not ready for series manufacture at a specific site.

-6. The approach given in these guidelines has a modular structure in order to account for requests for individual conformity statements, e.g. design evaluation.

-7. The normative documents, i.e. standards and other specified technical requirements, conformity with which shall be evaluated in the certification process, shall be IEC or ISO standards, when available.

3.2 Type Certification

3.2.1 General

-1. The purpose of type certification is to demonstrate that the wind turbine type is designed, documented and manufactured in conformity with design conditions, specific standards and other technical requirements. Demonstration that it is possible to install, operate and maintain the turbines in accordance with the design documentation is required. Type certification applies to a series of wind turbines of common design and manufacture. It consists of the following mandatory modules (see Figure 3-1):

(1) design basis evaluation;

(2) design evaluation;

(3) type testing;

(4) manufacturing evaluation; and

(5) final evaluation.

-2. The optional modules are as follows:

(1) foundation design evaluation;

(2) foundation manufacturing evaluation; and

(3) type characteristic measurements.

-3. An evaluation report and a conformity statement shall be issued upon completion of satisfactory evaluation of each module.

-4. A type certificate is issued for a wind turbine designed and evaluated for conformance with the technical requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate.

-5. A type certificate documents conformity for all the mandatory modules and may additionally document conformity for optional modules.

-6. The modules and their application are described in Chapter 4.

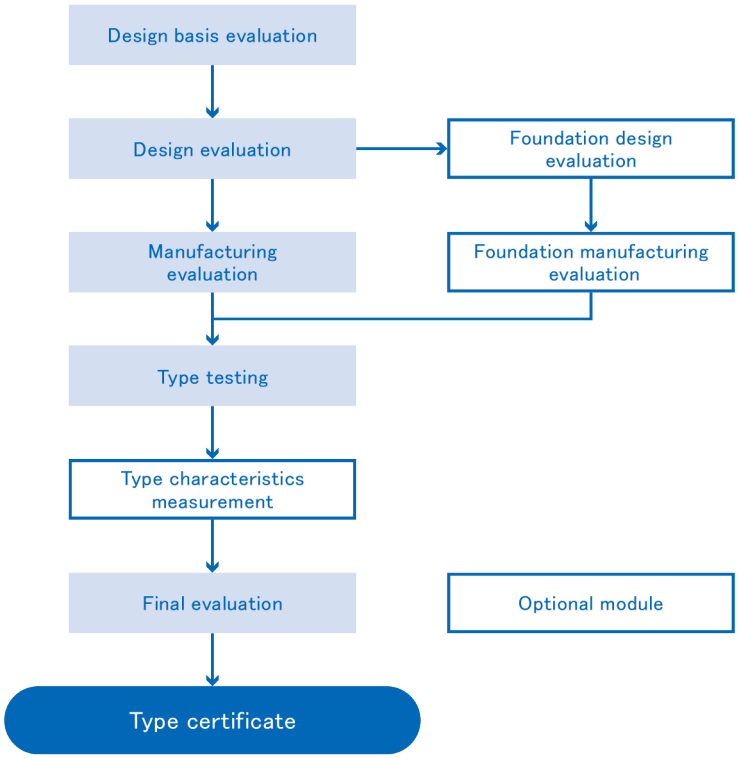

Figure 3-1 Modules of type certification

3.3 Project Certification

3.3.1 General

-1. The purpose of project certification is to evaluate whether type-certified wind turbines and particular support structure and foundation(s) designs are in conformity with the external conditions, applicable construction and electrical codes and other requirements relevant to a specific site.

-2. If there is no type certificate issued for the wind turbine, the evaluation according to type certification specified as the modules of the project certification, see Figure 3-2, shall be required.

-3. The Society shall evaluate whether the wind conditions, other environmental conditions, electrical network conditions and soil properties at the site conform to those defined in the design documentation for the wind turbine type and foundation(s). The evaluation includes safety and quality.

-4. Project certification of type-certified wind turbines consists of the following modules:

(1) site conditions evaluation;

(2) design basis evaluation;

(3) integrated load analysis;

(4) site-specific wind turbine (RNA) design evaluation;

(5) site-specific support structure design evaluation;

(6) other installations design evaluation;

(7) wind turbine (RNA) manufacturing surveillance;
(8) support structure manufacturing surveillance;
(9) other installations manufacturing surveillance;
(10) project characteristics measurements;
(11) transportation and installation surveillance;
(12) commissioning surveillance;
(13) final evaluation; and
(14) operation and maintenance surveillance.

-5. An evaluation report and a conformity statement shall be issued upon completion of a satisfactory evaluation of each module.

-6. A project certificate documents conformity for all the mandatory modules and may additionally document conformity for optional modules.

-7. The modules and their application are described in Chapter 5.

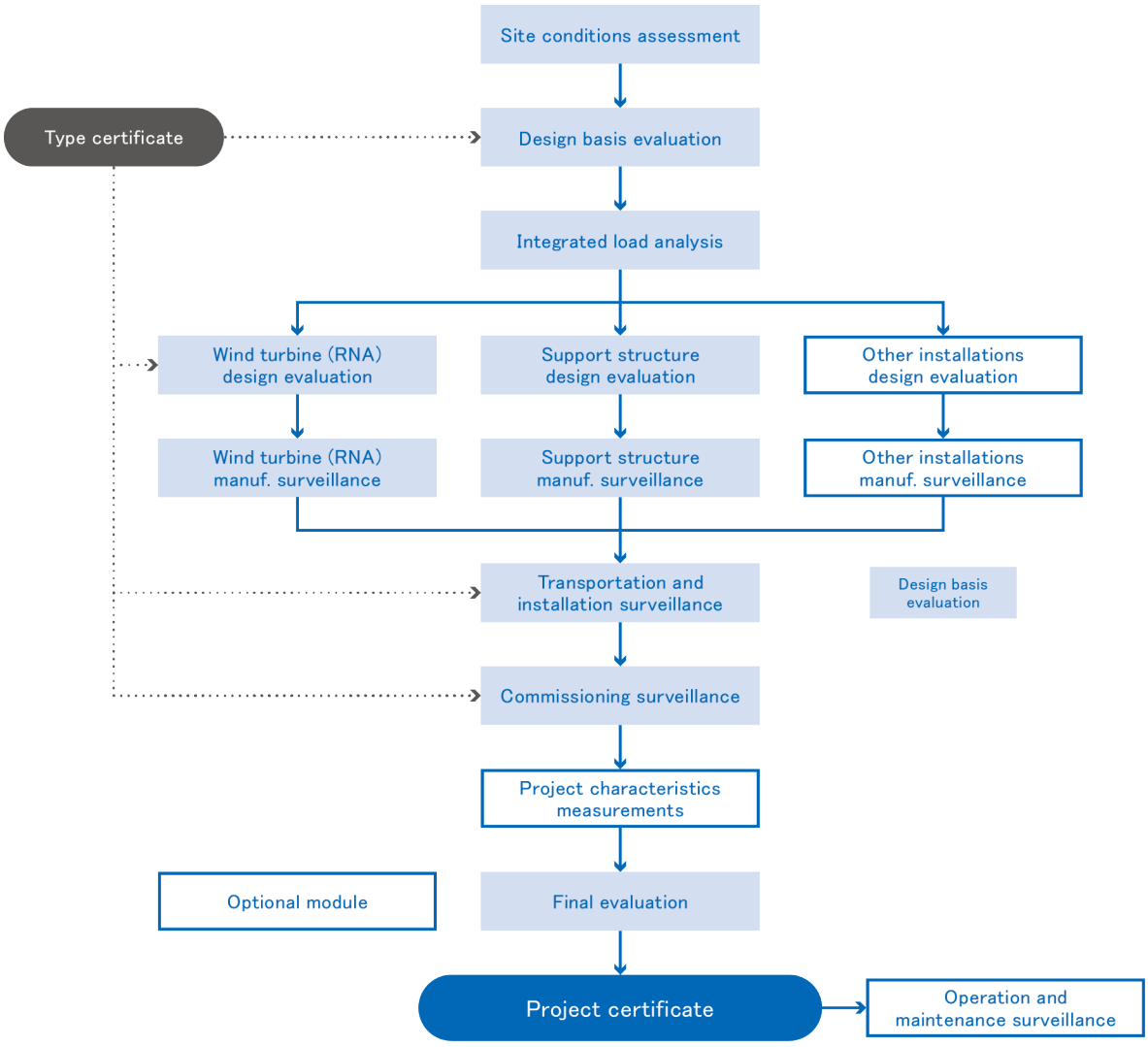

Figure 3-2 Modules in project certification

3.4 Component Certification

3.4.1 General

-1. The purpose of wind turbine component certification is to demonstrate that a major component of a specific type is designed, documented and manufactured in conformity with design conditions, specific standards and other technical requirements.

-2. Component certification consists of the following modules:

(1) design basis evaluation;

(2) design evaluation;

(3) type testing;

(4) manufacturing evaluation; and

(5) final evaluation.

-3. These modules as well as their application for the type certification process are illustrated in Figure 3-3. The procedures for component certification should be in line with the type certification procedures described in Chapter 4. The specific content of a module depends on individual components. Where applicable, the type certification evaluation method described in Chapter 4 shall be applied.

-4. For components that are required to undergo specified type testing as part of the wind turbine type testing module, it is recommended that the type testing is to be included as part of any component certification.

-5. Special attention shall be given in design documentation to the specification of the interface between such components and the rest of the wind turbine system and to the specification of critical conditions, such as operating conditions, loads and dynamic properties.

-6. Component certificates may be issued for components designed and evaluated for conformance with the technical requirements of IEC 61400 series standards or a standard that the Society deems appropriate.

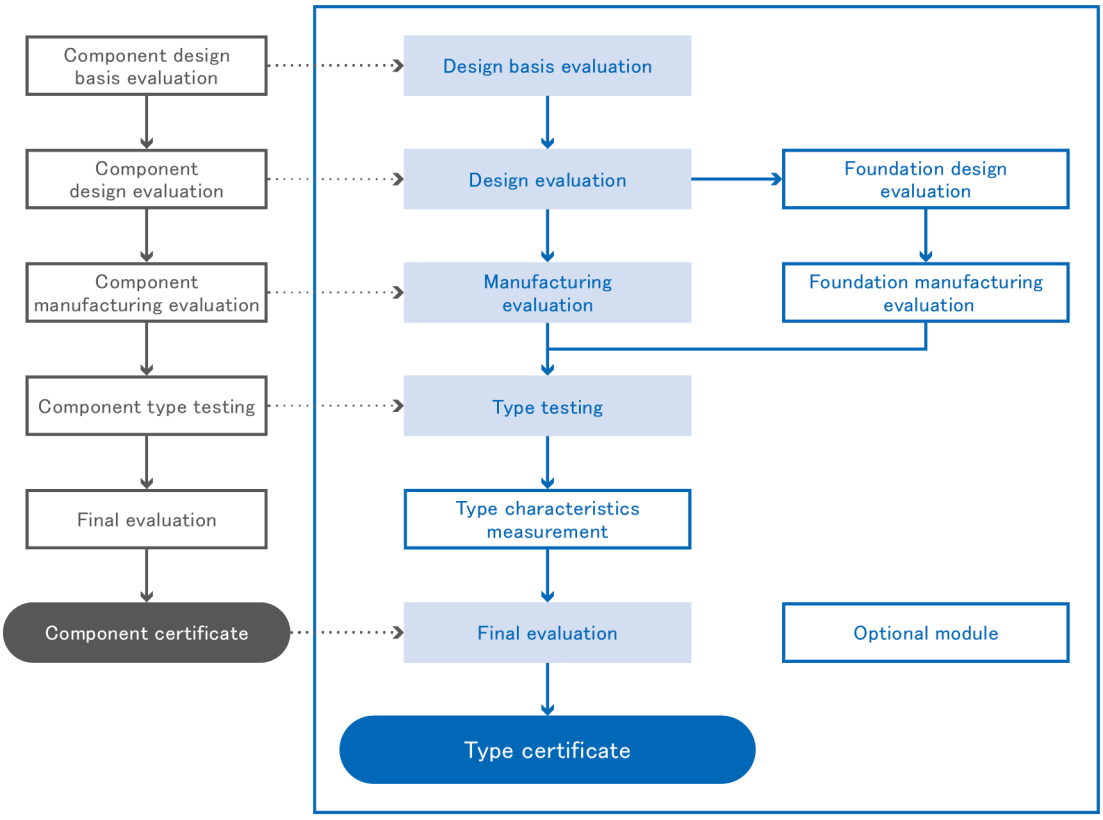

Figure 3-3 Modules in component certification

-7. A component certificate attests that conformity has been established for all modules of evaluation. An evaluation report and a conformity statement shall be issued upon completion of a satisfactory evaluation of each module.

3.5 Prototype Certification

3.5.1 General

-1. The purpose of wind turbine prototype certification is to enable testing of a new wind turbine type in order to obtain type certification in accordance with these guidelines.

-2. A prototype certificate is issued for a wind turbine that is not yet ready for series manufacture at a specific site and for a limited period of maximum 3 years.

-3. The Society shall evaluate that the prototype is safe during the specified period. If a prototype is modified affecting the safety of the wind turbine, a new prototype certificate is required.

-4. Prototype certification consists of the following modules:

(1) basic design evaluation;

(2) prototype test plan evaluation; and

(3) safety and function test.

-5. Basic design evaluation includes the mandatory modules design basis evaluation and wind turbine design evaluation, described in 4.2 and 4.3. The evaluation can be limited to control and protection systems, loads and load cases, rotor blades, main structural and electrical components and personnel safety issues.

-6. The applicant shall submit a prototype test plan for evaluation by the Society. The test plan shall specify main components to be tested during the test period and loads to be documented during the tests.

-7. A prototype test plan shall comprise a minimum of the elements described in 4.4. However, this shall exclude prototype certification that is carried out as part of project demonstration testing for offshore wind turbines.

-8. The safety and function test shall be carried out and evaluated as part of prototype certification. The applicant shall submit a safety and function test plan for evaluation by the Society.

Chapter 4 Type Certificate

4.1 General

4.1.1 General

-1. Type certification shall confirm that the wind turbine type is designed in conformity with the design assumptions, specific standards and other technical requirements. It shall also confirm that the manufacturing process, component specifications, inspection and test procedures, and corresponding documentation are in conformity with the design documentation and that the manufacturer operates an accepted quality system. Furthermore, it covers the testing of the wind turbine.

-2. The Society shall require an applicant to provide documentation that meets all the requirements detailed in this chapter. The Society shall evaluate the wind turbine type for compliance with the technical requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate and additional assumptions and requirements stated in the design basis.

4.2 Design Basis Evaluation

4.2.1 General

-1. The purpose of design basis evaluation is to examine that the design basis is properly documented and sufficient for safe design of the wind turbine type.

-2. The design basis includes the following elements. All the requirements, assumptions and methodologies, which are essential for the design and the design documentation, shall be identified.

(1) codes and standards;

(2) design parameters, assumptions, methodologies and principles, and

(3) other requirements, e.g. for manufacture, transportation, installation and commissioning as well as for operation and maintenance.

4.3 Design Evaluation

4.3.1 General

-1. The purpose of design evaluation is to examine whether the wind turbine type is designed and documented in conformity with the design assumptions, specific standards and other technical requirements. Normally, the design evaluation consists of the elements shown in Figure 4-1.

-2. For SWT designed according to IEC 61400-2, the element “evaluation of design data confirmation test” shall be considered in addition to the elements of Figure 4-1. The element “evaluation of the rotor blade” can be replaced by the element “evaluation of static blade load test.”

-3. For SWT, the static blade load test, test for design data and component tests can be performed in- house by the manufacturer, if in agreement with the Society.

-4. The Society shall require an applicant to supply all documentation necessary for design evaluation. A list of design documentation is provided in Annex A (reference) of JIS C1400-22. This list may be extended or reduced, depending on the wind turbine concept and complexity of the design.

4.3.2 Design control

-1. The applicant shall submit the quality procedures used to control the design process to the Society. Design control procedures shall be required to:

(1) comply with ISO 9001 design and development; and

(2) include control of documents such that the revision status of every document is clear to all parties.

-2. The requirement for evaluation is satisfied if the quality system of the applicant has been certified according to ISO 9001.

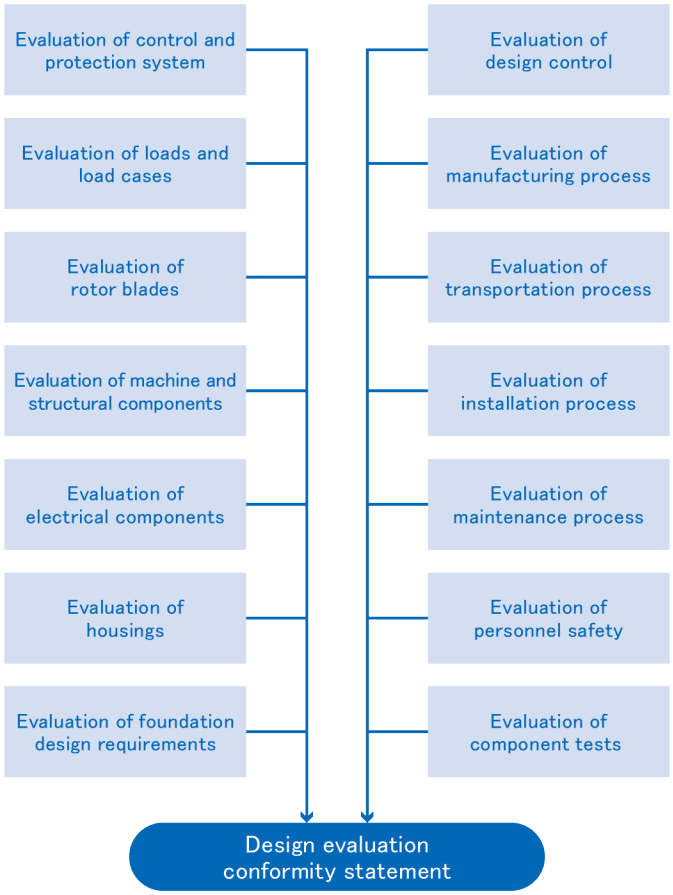

Figure 4-1 Elements of design evaluation

4.3.3 Control and protection system

-1. The applicant shall submit the documentation of a control and protection system to the Society that comprises:

(1) description of wind turbine modes of operation;

(2) design and functionality of all elements;

(3) fail-safe design of the protection system;

(4) system logic and hardware implementation;

(5) authentication of reliability of all safety critical sensors;

(6) braking system(s) analysis;

(7) condition monitoring system if applicable; and

(8) test plan for the verification of the control and protection system functions.

4.3.4 Loads and load cases

-1. The loads and load cases shall be compliant with IEC 61400 series standards or a standard that the Society deems appropriate.

-2. The applicant shall provide the load case description, description of calculation models and load data to the Society.

-3. The applicant shall provide the following input data to the Society if a request is made:

(1) parameter values related to aerodynamics;

(2) structural characteristics; and

(3) parameter values relating to the control system.

4.3.5 Rotor blades

-1. The design of the rotor blades shall be compliant with the requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate and the agreed additional codes and standards as defined in the design basis.

-2. The applicant shall submit the design documentation relating to rotor blades to the Society. The design documentation will normally consist of specifications, descriptions, drawings and design calculations, which may be combined with measurement, test reports, schematics and part lists. The design documentation shall clearly refer to the design basis and contain sufficient information, such as:

(1) codes, standards and references;

(2) design loads and relevant external conditions;

(3) static load conditions and boundary conditions;

(4) influence of adjacent structures and components;

(5) materials and permissible stresses;

(6) material and component test program;

(7) full-scale blade test program;

(8) manufacturing processes;

(9) tolerances influencing the design; and

(10) quality control procedures and level.

4.3.6 Machine and structural components

-1. The applicant shall submit the design documentation of all load-bearing machinery structures and components of the wind turbine to the Society, such as:

(1) casted, forged or welded structures;

(2) nacelle frame;

(3) tower;

(4) pitch and yaw systems;

(5) bearings and elastomer bushings;

(6) gearboxes;

(7) brakes, couplings and locking devices;

(8) bolts for connecting these structures and components;

(9) cooling and heating systems; and

(10) hydraulic systems.

-2. The designs of the machinery structures and components shall be evaluated for compliance with the requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate, and the agreed additional codes and standards as defined in the design basis.

-3. The design of the gearbox shall be evaluated for compliance with the requirements of ISO 81400-4 or IEC 61400 series standards. The applicant shall submit the result of the workshop test for the prototype gearbox as well as the prototype gearbox field test plan to the Society upon request.

-4. The Society may request an applicant to define requirements for testing of such component, carry out testing, and submit the report of the test to evaluate the design of the component that is being manufactured or assembled.

-5. The design documentation relating to machinery structures and components will normally consist of specifications,

descriptions, drawings and design calculations, which may be combined with measurement, test reports, diagrams, data sheets, schematics and part lists. The design documentation shall clearly refer to the design basis and contain sufficient information, such as:

(1) codes, standards and references;
(2) design loads and relevant external conditions;
(3) static load conditions and boundary conditions;
(4) influence of adjacent structures and components;
(5) influence of drive train dynamics;
(6) materials and permissible stresses;
(7) type and data sheet (for mass-produced parts); and
(8) work instructions (for bolted connections).

4.3.7 Electrical components

-1. The applicant shall submit the design documentation of the following electrical components of the wind turbine to the Society, such as:

(1) generators;
(2) transformers;
(3) converters;
(4) medium and high voltage components;
(5) electrical drives;
(6) charging equipment and storage batteries;
(7) switch and protection equipment;
(8) cables and electrical installation equipment; and
(9) lightening protection.

-2. The design of the electrical components shall be evaluated for compliance with the requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate as well as further IEC-standards and the agreed additional codes and standards as defined in the design basis.

-3. The design of lightening protection shall be evaluated by referring to IEC 61400-24.

-4. The manufacturer of the generator shall carry out workshop tests for the generator according to the IEC 60034 series standards and a standard that the Society deems equivalent, and the result of the test shall be documented. The applicant shall submit the results of the workshop tests to the Society.

-5. The Society may request an applicant to define requirements for testing of such component, carry out testing and submit the report of the test to evaluate the design of the component that is being manufactured or assembled.

-6. The design documentation relating to electrical components will normally consist of specifications, descriptions, drawings, diagrams, data sheets, type test reports and design calculations, which may be combined with schematics and part lists. The design documentation shall clearly refer to the design basis and contain sufficient information, such as:

(1) codes, standards and references;
(2) design requirements and relevant external conditions;
(3) boundary conditions;
(4) influence of adjacent structures and components; and
(5) materials.

4.3.8 Housings

-1. The applicant shall submit the design documentation of the following housings to the Society, such as:

(1) spinners; and

(2) nacelle covers.

-2. The design of the housings shall be evaluated for compliance with the requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate and the agreed additional codes and standards as defined in the design basis.

-3. The design documentation relating to housings will normally consist of specifications, descriptions, drawings and design calculations, which may be combined with measurement, test reports, schematics and part lists. The design documentation shall clearly refer to the design basis and contain sufficient information, such as:

(1) codes, standards and references;

(2) design loads and relevant external conditions;

(3) static load conditions and boundary conditions;

(4) influence of adjacent structures and components; and

(5) materials and permissible stresses.

4.3.9 Evaluation of component tests

-1. The strength and other functional requirements of some structural, mechanical or electrical components may be documented by measurements or test results only.

-2. When the relevant analysis for a component is found to be inadequate, the Society may require additional component measurements and/or tests to be carried out as an alternative to further analysis. In this case, the design of such component has to be made sure to incorporate the test results.

-3. Measurement and test reports shall clearly identify the component, the test standards or procedures, as well as the conditions for which the tests have been carried out.

4.3.10 Foundation design requirements

-1. The foundation design requirements detailed in the design documentation for a turbine shall be compliant with respect to compliance of one or more foundation design(s) with IEC 61400 series standards or a standard that the Society deems appropriate, and relevant agreed structural codes. In addition, the foundation design(s) shall conform to interface geometry requirements (flatness, height and bolt pattern tolerances) and the strength requirements defined in the turbine design documentation.

-2. For offshore wind turbines, the foundation design requirements shall also include design requirements for the sub-structure connecting the tower to the foundation.

-3. The foundation is designed based on the characteristic and design loads at the interfaces of tower, sub-structure and foundation stated in the design documentation. These loads shall include both horizontal and vertical forces as well as any moments about horizontal and vertical axes at the interface. The extreme dynamic loads as well as fatigue loads resulting from the combination of all relevant load cases shall be considered in the design. Because overall turbine and support structure system natural vibration frequencies and vibration modes can be affected by foundation flexibility, a permissible range for horizontal, vertical and rotational foundation rigidity at the interface between foundation and sub-structure or tower shall be stated.

-4. The resistance and flexibility of the foundation depend on the representative soil conditions at sites suitable for installation of the foundation. These soil conditions shall be described in the foundation design documentation.

4.3.11 Manufacturing process

-1. The applicant shall submit the documentation relating to the manufacturing process of the turbine to the Society to demonstrate that the turbine design can be manufactured according to any quality requirements identified in the design documentation.

-2. The manufacturing process may be documented in the following preliminary

(1) manufacturing specifications;

(2) work instructions, purchasing specifications; and

(3) quality control procedures.

-3. The documentation describing the manufacturing process shall include requirements for workshop tests related to manufacturing.

-4. The applicant shall submit the final version of these documents before the Society performs the final evaluation described in 4.9 at the latest.

4.3.12 Transportation process

-1. The applicant shall submit the documentation relating to the transportation process of the wind turbine to the Society to demonstrate that the wind turbine can be transported according to any requirements identified in the design documentation.

-2. This description of the transportation process shall, if applicable, include the following elements:

(1) technical specifications applicable for the transportation;

(2) limiting environmental conditions;

(3) transportation devices including required fixtures, tooling and equipment; and

(4) transportation loads and load conditions.

-3. The transportation process may be documented in a preliminary transportation/installation manual. The final documentation related to the transportation process shall be submitted before the Society performs the final evaluation described in 4.9 at the latest.

4.3.13 Installation process

-1. The applicant shall submit the documentation relating to the installation process to the Society to sufficiently describe the adequacy of the wind turbine design, taking into account specified installation processes, including commissioning. The documentation related to the installation process shall, if applicable, include the following elements:

(1) identification of requirements and necessary skills of workers;

(2) identification of interface points and any required technical specifications for civil and electrical construction works including grounding circuits;

(3) identification of specialized tooling and required lifting fixtures or equipment;

(4) quality control check points, measurements and inspections, required by the design;

(5) description of personnel safety and planned environmental protection measures;

(6) outline of a planned installation manual;

(7) commissioning procedures and check-list; and

(8) quality recording and record keeping procedures.

-2. The installation process may be documented in a preliminary installation/commissioning manual. The final documentation related to the installation process shall be submitted before the Society performs the final evaluation described in 4.9 at the latest.

4.3.14 Maintenance process

-1. The applicant shall submit the documentation relating to the maintenance process to the Society to sufficiently describe the adequacy of the turbine design, taking into account specified maintenance processes. The documentation related to the maintenance process shall, if applicable, include the following elements:

(1) scheduled maintenance actions including inspection intervals or maintenance activities;

(2) identification of all safety-related operational procedures or maintenance activities;

(3) description of planned environmental protection measures;

(4) identification of required specialized tooling and maintenance equipment;
(5) identification of requirements and skills related to workers;
(6) outline of planned operating instructions and maintenance manual; and
(7) quality control recording and record keeping procedures.

-2. The maintenance process may be documented in a preliminary O&M manual. The final documentation related to the maintenance process shall be submitted before the Society performs the final evaluation described in 4.9 at the latest.

4.3.15 Personnel safety

-1. Personnel safety aspects in the design documentation (drawings, specifications and instructions) shall be compliant with IEC 61400 series standards or a standard that the Society deems appropriate, and the agreed additional codes and standards.

-2. Personnel safety aspects to be considered include:

(1) safety instructions;
(2) climbing facilities;
(3) access ways and passages;
(4) standing places, platforms and floors;
(5) hand rails and fixing points of safety catchers;
(6) lighting;
(7) electrical and ground circuits;
(8) fire prevention;
(9) emergency stop buttons;
(10) provision of alternative escape routes;
(11) provision for an emergency stay at an offshore wind turbine for one week; and
(12) offshore specific safety equipment for an offshore wind turbine.

-3. The applicant shall identify elements in the design documentation that pertain to personnel safety and submit them to the Society.

4.3.16 Design evaluation conformity statement

-1. The Society shall issue a conformity statement based on the satisfactory evaluation of a design evaluation report(s). The conformity statement shall include:

(1) identification of the wind turbine type;
(2) identification of the applicant;
(3) list of standards used such as the IEC 61400 series standards;
(4) specification of external conditions with reference to WT class and other principal data; and
(5) specific reference to the evaluation report(s).

4.4 Type Testing

4.4.1 General

-1. The purpose of type testing is to provide data needed to verify power performance, aspects that are vital to safety and need additional experimental verification, and any other aspects that cannot be reliably evaluated by analysis. Type testing comprises the elements shown in Figure 4-2.

-2. Testing of these elements shall be carried out as needed on a turbine or component of a turbine representative of the type to be certified in type testing. Inspection records shall be completed, preferably prior to the tests, to demonstrate satisfactory conformity of the turbine or component with the design documentation.

-3. The detailed test program shall be defined by the applicant and be subject to approval by the Society on a case-by-case basis.

-4. The type testing elements given in Figure 4-2 and the duration test shall be carried out by an accredited testing laboratory or the Society shall verify that the party conducting the testing complies with at least the criteria of ISO/IEC 17025 or ISO/IEC 17020. The requirements for the durability test are described in IEC 61400-2.

-5. The applicant shall submit a test report that documented the description of the test and the test results to the Society. The tests shall be carried out in accordance with the approved detailed test program and the test report shall precisely document the aspects required for certification. The critical personnel safety features shall be satisfactorily implemented in the installed wind turbine to be tested.

-6. A type testing conformity statement shall be issued when the evaluation of a type testing is satisfactory. The signatories of the conformity statement shall be different from the persons responsible for the test reports, attestation of the tests and accreditation of the test laboratories.

-7. For SWT designed according to IEC 61400-2, the “load measurements” and “blade tests” have to be replaced by the “duration test.”

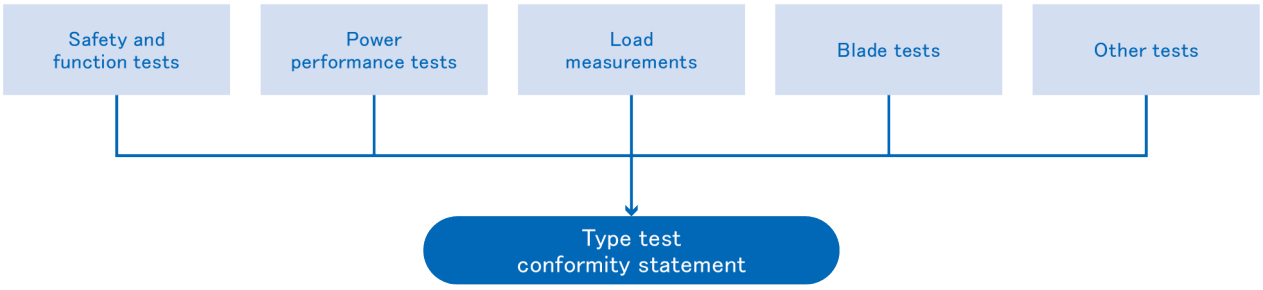

Figure 4-2 Type testing elements

4.4.2 Safety and function tests

-1. The purpose of safety and function testing is to verify that the wind turbine under test displays the behavior predicted in the design.

-2. The control and protection system functions shall be satisfactorily demonstrated in regard to the approved test plan described in 4.3.3 of these guidelines. The test plan shall at least include testing of the protection functions below. In addition, the dynamic behavior of the wind turbine at rated wind speed or above shall be verified by the testing if this has not been verified within the scope of the load measurements (see 4.4.4).

-3. The protection function test shall be carried out including functions with a single fault in the control and protection system.

-4. The detailed requirements for testing are given in Annex D (reference) of JIS C1400-22.

4.4.3 Power performance measurements

-1. The purpose of power performance measurements is to document a measured power curve and predicted annual energy production for the wind turbine type, in accordance with IEC 61400-12-1.

-2. The measurement procedures shall conform to IEC 61400-12-1. In addition, a test report shall describe the measurement conditions, instrumentation, calibrations and analysis results also in accordance with IEC 61400-12-1.

4.4.4 Load measurements

-1. The purpose of load measurements is to confirm design calculations and to measure the magnitude of loads under specific

conditions.

-2. A type testing report (or a load measurement report) shall clearly indicate the description of load measurements carried out for type certification and the analysis results of measured data.

-3. Measurements and analysis shall be conducted on the basis of the minimum requirements detailed in Annex C (reference) of JIS C1400-22.

-4. Measurements shall be made on a wind turbine that is dynamically and structurally similar to, but may differ in detail (such as alternative tower designs) from, the turbine submitted for certification. In case of differences, the applicant shall evaluate the differences, e.g. perform load and dynamic behavior predictions for the wind turbine under testing.

-5. Guidance for test procedures and evaluation of tests may be found in IEC/TS 61400-13 or IEC 61400-13.

4.4.5 Blade tests

-1. The purpose of blade tests is to verify blade structural design and to assess the suitability of manufacturing processes. Full-scale structural testing is required for every new type of blade. A type of blade is described not only in terms of its size and shape but also in terms of its internal construction and structure. Fatigue tests as well as static load tests are required.

-2. Guidance for test procedures and evaluation of the tests may be found in specifications for structural testing of blades within the IEC/TS 61400-23 or IEC 61400-23.

-3. Test blades shall be representative for the blade design considered for design evaluation. Deviations shall be subject to approval by the Society. If the blade design is changed, the Society shall determine the need and requirements for any new tests, through consultation with the manufacturer. New tests shall be required following any significant changes in blade design. Changes in the following, for example, may be significant:

(1) the structural system, including the internal reinforcing structure;
(2) the aerodynamic profile;
(3) material for critical load carrying parts; and
(4) transition zones in the blade root.

4.4.6 Other tests

-1. The Society may request the applicant to carry out additional tests or measurements if deemed necessary. The following tests may be included in additional tests or measurements:

(1) thermal conditions of main mechanical and electrical components;
(2) mechanical conditions (vibrations, clearances, response) of main mechanical and electrical components;
(3) environmental testing of electronic assemblies; and
(4) electromagnetic compatibility testing.

-2. The type test for a wind turbine equipped with main gearbox(es) shall additionally include a field test for main gearboxes as required in ISO 81400-4 or IEC 61400-4.

4.4.7 Type test reports

-1. Type test reports shall conform to the requirements of ISO/IEC 17025 and relevant standards used to define the test requirements. In addition, test reports shall include a description of:

(1) the wind turbine or component, with identification by means of a serial number (and control system software revision number(s), where applicable);
(2) any differences between the wind turbine or component under testing with the corresponding part included in the certification; and
(3) any significant unexpected behavior.

-2. Attestation by the operating body shall be attached to the final type test report(s).

4.4.8 Type test conformity statement

-1. The Society shall issue a type test conformity statement based on satisfactory evaluation of the type test reports created by the applicant or the testing body. The conformity statement shall describe the following elements:

(1) the tests carried out;

(2) the test standards applied; and

(3) identification information of the test reports.

4.5 Manufacturing Evaluation

4.5.1 General

-1. The purpose of manufacturing evaluation is to assess if a specific wind turbine type is manufactured in conformity with the design documentation verified during the design evaluation. This evaluation shall include the following elements:

(1) quality system evaluation; and

(2) manufacturing inspection.

-2. The manufacturing evaluation presupposes that the manufacturer of the wind turbine and the main components operates a quality system. It requires manufacturing of at least one representative specimen of the type under certification.

4.5.2 Quality system evaluation

-1. The requirement for evaluation of the quality system is satisfied if the quality system of the applicant (manufacturer) is certified to be in conformance with ISO 9001. This system certification shall be carried out by an accredited body that operates according to ISO/IEC 17021.

-2. If the quality system is not certified, the Society shall evaluate the system of the applicant for the following elements:

(1) responsibility sharing;

(2) control of documents;

(3) sub-contracting;

(4) purchasing;

(5) process control;

(6) inspection and testing;

(7) corrective measures;

(8) quality recordings;

(9) training; and

(10) product identification and traceability.

4.5.3 Manufacturing inspection

-1. Manufacturing and assembly of wind turbines and components shall be implemented according to the requirements identified during the design evaluation with regard to critical components and critical manufacturing processes. The Society shall confirm by inspection that at least one representative wind turbine is manufactured according to the design under type certification.

-2. The inspection by the Society shall comprise:

(1) confirmation that design specifications are property implemented in the workshop;

(2) work instructions at the workshop, purchase specifications and installation instructions;

(3) evaluation of the manufacturer’s workshop, if relevant;

(4) confirmation of fabrication methods, procedures and qualifications of personnel;

(5) review of material certificates;

(6) random inspection on effectiveness of procedures for acceptance of purchased components; and

(7) random inspection of fabrication processes.

-3. The Society shall inspect critical components at the wind turbine manufacturer in principle. However, the Society shall inspect manufacturing processes at the component manufacturer if the manufacturer's incoming goods inspection is insufficient to ensure that the requirements identified during the design evaluation are met. In general, the following components shall be inspected:

(1) rotor blades;

(2) rotor hub;

(3) rotor shaft;

(4) main bearing, pitch bearing and yaw bearing (pitch and yaw systems);

(5) main bearing housings;

(6) gearbox;

(7) locking devices and mechanical brake;

(8) generator and transformer;

(9) main frame and generator frame;

(10) tower;

(11) sub-structure (optional);

(12) foundation (optional);

(13) bolt connections; and

(14) hub and nacelle assembly (in workshop).

-4. If a critical component is produced by more than one component manufacturer and the components differ significantly in specifications and/or manufacturing processes, the Society may request to inspect all differing components.

-5. Changes in manufacturing processes that significantly influence the component quality or properties shall be reported to the Society. In this case, the applicant shall submit documentation to the Society for new evaluation and, if necessary, the inspection shall be held again.

-6. For the renewal of the type certificate, the Society shall perform an inspection equivalent to the manufacturing inspections as part of the renewal procedures. However, the inspections may be omitted partially or entirely if equivalent inspections performed by another certification body can be confirmed.

4.5.4 Manufacturing conformity statement

-1. The Society shall issue a manufacturing conformity statement based on the manufacturing evaluation results.

4.6 Foundation Design Evaluation

4.6.1 General

-1. The purpose of the foundation design evaluation, which is an optional module, is to enable the inclusion of one or more foundation designs in the type certificate, as selected by the applicant.

-2. Any wind turbine foundation included in the type certification shall be designed in accordance with the foundation design requirements detailed in the wind turbine design documentation (see 4.3.10) and be in accordance with the agreed applicable standards and coded.

-3. For an offshore wind turbine, the scope of the foundation design evaluation shall include the sub- structure connecting the foundation to the tower.

-4. Reinforcement, concrete layout and construction sequence plans shall be included in the foundation design documentation, if applicable. These plans shall be in sufficient detail to allow the Society to verify the adequacy of the foundation design, taking into

account the specified construction processes.

-5. A foundation design evaluation conformity statement shall be issued based on the evaluation results stated in the foundation design evaluation report. The conformity statement shall include:

(1) identification of the wind turbine type;

(2) description of assumed soil and other external conditions;

(3) identification of the tower configuration;

(4) identification of the sub-structure configuration; and

(5) identification of the foundation type.

4.7 Foundation Manufacturing Evaluation

4.7.1 General

-1. The purpose of manufacturing evaluation is to assess if a specific wind turbine foundation type is manufactured in conformity with the design documentation verified during the design evaluation. This evaluation shall include the following elements:

(1) quality system evaluation; and

(2) manufacturing inspection.

-2. The manufacturing evaluation presupposes that the manufacturer of the foundation operates a quality system. It requires manufacturing of at least one representative foundation of the type under certification.

-3. For an offshore wind turbine, the scope of the foundation manufacturing evaluation shall include manufacturing evaluation of the sub-structure connecting the foundation to the tower.

4.7.2 Quality system evaluation

-1. The requirement for evaluation of the quality system is satisfied if the quality system of the manufacturer is certified to be in conformance with ISO 9001. This system certification shall be carried out by an accredited body that operates according to ISO/IEC 17021.

-2. If the quality system is not certified, the Society shall review the quality system of the manufacturer for the following elements:

(1) responsibility sharing;

(2) control of documents;

(3) sub-contracting;

(4) purchasing;

(5) process control;

(6) inspection and testing;

(7) corrective measures;

(8) quality recordings;

(9) training; and

(10) product identification and traceability.

4.7.3 Foundation manufacturing inspection

-1. Foundation manufacturing shall be implemented according to the requirements identified during the design evaluation with regard to critical manufacturing processes. The Society shall confirm by inspection that at least one representative wind turbine foundation is manufactured according to the design under type certification.

-2. The inspection by the Society shall comprise

(1) confirmation that design specifications (e.g. reinforcement, concrete layout and construction sequence plans) are properly implemented on-site;

(2) manufacturing instructions, purchase specifications and installation instructions;
(3) confirmation of fabrication methods, procedures and qualifications of personnel;
(4) review of material certificates;
(5) random inspection on effectiveness of procedures for acceptance of purchased components; and
(6) random inspection of fabrication processes.

-3. If a foundation is produced by more than one manufacturer and the foundations differ significantly in specifications and/or manufacturing processes, the Society may request to inspect all differing foundations.

-4. Changes in manufacturing processes that significantly influence the foundation quality or properties shall be reported to the Society. In this case, the applicant shall submit documentation to the Society for new evaluation and, if necessary, the inspection shall be repeated.

-5. For the renewal of the type certificate, the Society shall perform inspection equivalent to the manufacturing inspections as part of the renewal procedures. However, the inspections may be omitted partially or entirely if equivalent inspections performed by another certification body can be confirmed.

4.7.4 Foundation manufacturing evaluation conformity statement

-1. The Society shall issue a foundation manufacturing evaluation conformity statement based on the foundation manufacturing evaluation results.

4.8 Type Characteristics Measurements

4.8.1 General

-1. The purpose of type characteristic measurements is to demonstrate performance-related characteristics of the wind turbine type, other than power performance, which is a mandatory element of type testing (see 4.4.3). These optional measurements may be selected by the applicant and shall conform to the relevant IEC 61400 series standards listed in the following elements. The type characteristics measurements comprise one or more of these elements, as shown in Figure 4-3:

(1) power quality tests;
(2) low voltage ride-through tests; and
(3) acoustic noise measurements.

-2. In cases where applicable IEC standards are not available, the measurement procedure needs to be agreed between the applicant and the Society.

-3. The Society shall confirm and evaluate that a measurement of characteristics has been carried out on a wind turbine representative of the type to be certified. The applicant shall prepare for inspection records prior to measurement in order to demonstrate satisfactory conformity of the wind turbine with design documentation.

-4. The measurements shall be carried out by an accredited test laboratory or the Society shall verify that the party conducting the measurement complies with at least the criteria of ISO/IEC 17025 or ISO/IEC 17020.

-5. The applicant or the test laboratory shall submit a test report that has documented measurements and test results to the Society. The measurements shall be carried out in accordance with an approved detailed program and the report shall properly document the characteristics required for certification.

-6. A type characteristic measurements conformity statement shall be issued upon completion of a satisfactory evaluation.

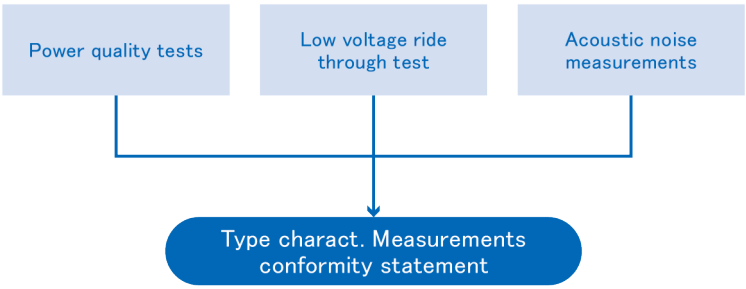

Figure 4-3 Type characteristics measurements elements

4.8.2 Power quality measurements

-1. The purpose of power quality measurements is to document the characteristic quality of the power generated by the wind turbine type.

-2. The measurement procedures shall conform to IEC 61400-21-1. In addition, the measurement conditions, instrumentation, calibrations and analysis results shall be described in a test report in accordance with IEC 61400-21-1.

4.8.3 Low voltage ride through measurement

-1. The purpose of low voltage ride through (LVRT) measurements is to document the low voltage ride through the capabilities of the wind turbine type.

-2. The measurement procedures shall conform to the relevant standards. In addition, the measurement conditions, instrumentation and equipment, calibrations and analysis results shall be described in a test report in accordance with the relevant standards. The relevant standards shall comprise:

(1) IEC61400-21-1; and

(2) other standards agreed between the applicant and the Society.

4.8.4 Acoustic noise measurements

-1. The purpose of acoustic noise measurements is to document the acoustic emission characteristics of the wind turbine type.

-2. The measurement procedures shall conform to IEC 61400-11. In addition, a test report shall describe the measurement conditions, instrumentation, calibration and analysis results and include at least the following elements:

(1) apparent sound power level at a wind speed of 8 m/s,

(2) sound directivity index at the three required positions, and

(3) tonality of any tones above the minimum threshold.

4.8.5 Test reports

-1. The test reports shall conform to the requirements of ISO/IEC 17025 and relevant standards used to define the test requirements. The reports shall include the following descriptions:

(1) the test turbine, including serial number and control system software revision number(s);

(2) any differences between the test turbine and the wind turbine type under certification; and

(3) any significant unexpected behavior.

-2. Attestation by the operating body shall be attached to the final test report(s).

4.8.6 Type characteristics measurements conformity statement

-1. The Society shall issue a type characteristics measurements conformity statement based on satisfactory evaluation of the test reports. The conformity statement shall specify:

(1) the measurements carried out;

(2) the measurement standards applied; and

(3) identification of the test report(s).

4.9 Final Evaluation

4.9.1 General

-1. The purpose of final evaluation is to provide documentation of the findings of all operating bodies involved in the evaluation of the elements of the type certification.

-2. The final evaluation report created by the Society shall consist of:

(1) a reference list of all supporting product documentation for the type certificate;

(2) report of whether the detailed documentation is complete and whether the type test results conform to all relevant requirements set out in the design documentation; and

(3) review of the final product documentation, including drawings, component lists, procurement specifications and manuals (see following paragraph), to confirm that this is consistent with the manufacturing evaluation report and with the supporting design calculations and relevant design assumptions.

-3. The installation manuals, operator's instructions and maintenance manuals shall be compliant with the relevant requirements in IEC 64100 series standards or a standard that the Society deems appropriate. The manuals shall satisfy the following elements:

(1) format and detail are such that a skilled worker with technical training can understand the documentation;

(2) notes regarding safety and regulations for the prevention of accidents are arranged in the text such that they can be seen before the operation in question takes place; and

(3) these notes shall be clearly identified as safety-related items.

-4. The final evaluation report shall be delivered to the applicant.

4.10 Type Certificate

4.10.1 General

-1. The Society shall issue a type certificate based on satisfactory evaluation of the final evaluation report(s). The type certificate shall include the results of the mandatory elements and, when applicable, document the optional foundation design manufacturing evaluation (see 4.6 and 4.7) and type characteristic measurements (see 4.8).

-2. The type certificate is valid for the wind turbine type specified in the certificate. The specifications may include alternative components and configurations. The allowable combinations of alternatives shall be clearly identified.

-3. The type certificate shall reference in an appropriate way the standards and normative documents used.

-4. The type certificate shall stipulate the validity of the certificate indicated in 2.4.1.

-5. If the applicant does not operate a quality system that is certified according to ISO 9001, the Society shall verify at least once a year that manufactured wind turbines continue to be in conformance with the certified design. This verification shall follow the elements of 4.5.

Chapter 5 Project Certification

5.1 General

5.1.1 General

-1. Project certification shall confirm for a specific site that type-certified wind turbines and particular foundation designs meet requirements governed by site-specific external conditions and are in conformity with applicable local codes and other requirements relevant to the site. Project certification may also confirm conformity for other installations in relation to the wind turbine installations. The certification shall confirm that the wind conditions, other environmental and electrical network conditions, and soil properties at the site conform to those defined in the design documentation for the wind turbine type(s) and foundation(s).

-2. Project certification may also confirm that installation and commissioning are in conformity with specific standards and other technical requirements, and that the wind turbines are operated and maintained in conformity with relevant manuals.

-3. The certificate and conformity statements for project certification shall be issued only for wind turbines that are type-certified (see Chapter 4) or that are evaluated in accordance with the type certification.

-4. The applicant shall submit documentation that covers all the aspects detailed in this chapter to the Society. The Society shall evaluate the submitted documentation for compliance with the technical requirements of these guidelines, IEC 61400 series standards or a standard that the Society deems appropriate, and additional codes or standards chosen by the designer and agreed with the Society.

5.2 Site Conditions Evaluation

5.2.1 General

-1. The purpose of site conditions evaluation is to examine whether the environmental, electrical and soil properties at a site conform to the parameter values defined in the design documentation.

5.2.2 Site conditions evaluation requirements

-1. The application shall submit the documentation that assessed the site conditions to the Society. Evaluation of the site conditions shall conform to the requirements relating to assessment of the external conditions as detailed in IEC 61400 series standards or a standard that the Society deems appropriate. The site conditions are classified in the following categories:

(1) wind conditions;
(2) other environmental conditions;
(3) earthquake conditions;
(4) electrical power network conditions; and
(5) geotechnical conditions.

-2. For offshore sites, these conditions are supplemented by:

(1) marine conditions, and
(2) weather windows and weather downtime.

-3. Assessment of the site conditions may be based on site-specific measurements supported by hindcasts and/or applicable standards or methods valid for the installation site. Site-specific measurements shall normally be correlated with data from a nearby location for which long term measurements exist. The monitoring period for the site-specific measurements shall be sufficient to obtain reliable data.

-4. The Society may carry out independent calculations for selected parameters based on the environmental and geotechnical data provided.

-5. Measurements of the external conditions of the site shall be carried out by a testing laboratory accredited to ISO/IEC 17025,

or the Society shall verify the satisfactory quality and reliability of the measurements. The verification shall include evaluation of the following elements:

(1) test and calibration methods;
(2) test equipment;
(3) measurement traceability;
(4) assurance of the quality of test and calibration results; and
(5) reporting of the results.

-6. Qualified personnel (e.g. meteorologists, engineers or geologists) shall carry out the data acquisition, analysis and reporting of the external conditions at the site.

-7. Reports relating to the site external conditions shall precisely document the external conditions as well as the data acquisition, the applied statistical methods and the design parameters for the external conditions.

5.2.3 Site conditions evaluation conformity statement

-1. The purpose of design basis evaluation is to examine that the design basis is properly documented and sufficient for a safe design and execution of the project.

5.3 Design Basis Evaluation

5.3.1 General

-1. The purpose of design basis evaluation is to examine that the design basis is properly documented and sufficient for a safe design and execution of the project.

5.3.2 Design basis requirements

-1. The design basis shall include the following elements:

(1) design parameters for the external conditions;
(2) design methodologies and principles;
(3) codes and standards which form the basis for the project;
(4) other relevant statutory requirements (e.g. embarkation, rescue and decommissioning);
(5) wind turbine type; main specifications or type certificate with identifications of deviations from standard specifications;
(6) support structure concept;
(7) requirements for manufacturing, transportation, installation and commissioning;
(8) requirements for operation and maintenance;
(9) requirements for grid connection; and
(10) other project requirements, e.g. requirements from the project owner.

-2. The design basis shall include all relevant overall design aspects and parameters to be applied in the calculations regarding the site external conditions, loads, design load cases, partial safety factors applied on loads and materials, geometric tolerances, corrosion allowance growth, etc.

-3. The design basis shall describe the design principles and methodology, including how the following have been established:

(1) codes and standards;
(2) external design parameters;
(3) wake effects;
(4) design load cases;
(5) load factors and load reduction factors;
(6) duration of simulation as well as number of simulations; and

(7) extreme and fatigue design loads and response analyses.

-4. The design basis shall include relevant manufacturing, transportation, installation and commissioning requirements such as:

(1) codes and standards;

(2) quality management system;

(3) environmental conditions relevant for installation; and

(4) requirements for the manufacturing, transportation, installation and commissioning manuals.

-5. The design basis shall include relevant operation and maintenance requirements such as:

(1) codes and standards;

(2) quality management system;

(3) inspection scope and frequency;

(4) target lifetime of components, systems and structures;

(5) requirements for service and maintenance manuals;

(6) requirements for conditioning monitoring systems; and

(7) requirements with respect to personnel safety.

5.3.3 Design basis conformity statement

-1. The Society shall issue a design basis conformity statement based on satisfactory evaluation of the design basis. The conformity statement shall include identification of the evaluated reports.

5.4 Integrated Load Analysis

5.4.1 General

-1. The purpose of the integrated load analysis is to examine whether the site-specific loads and load effects on the integrated wind turbine structure, including the rotor-nacelle assembly plus the support structure and supporting soils, are derived in conformity with the design basis.

5.4.2 Integrated load analysis requirements

-1. If the conditions and requirements in the design basis regarding loads and load effects are more benign than assumed for the type certification for the wind turbine and the support structure and the wind turbine characteristics and the support structure characteristics are identical, no further load analysis needs to be made.

-2. If further load analyses are to be carried out, the applicant shall perform these calculations taking due account of complete structural dynamics. The applicant shall provide full documentation to the Society of the load calculations and a comparison with the loads assumed for the type certificate.

-3. The Society shall evaluate:

(1) the combinations of external conditions and design situations (e.g. normal, fault, transport, installation);

(2) the respective partial load safety factors;

(3) the calculation methods, e.g. simulation procedure, number of simulations and combinations of wind and wave loads, if applicable;

(4) the design driving load cases defined with reference to the site conditions and the operation and safety system of the wind turbine; and

(5) any difference between the site-specific loads and the loads assumed for the type certification.

-4. If the wind turbine and the support structure are not certified for the type certificate, appropriateness shall be determined by the Society.

5.4.3 Integrated load analysis conformity statement

-1. The Society shall issue an integrated load analysis conformity statement based on satisfactory evaluation of the integrated load analysis.

5.5 State-specific Wind Turbine (RNA) Design Evaluation

5.5.1 General

-1. The design of the site-specific wind turbine shall be compliant with the design basis.

-2. In addition to wind and marine conditions, other conditions can affect the integrity and safety of the site-specific wind turbine, e.g. by thermal, photochemical, corrosive, mechanical, electrical or other physical action.

5.5.2 Site-specific wind turbine design (RNA) requirements

-1. The wind turbine type certification conditions and limitations shall be compared to the actual site conditions as given in the design basis. This comparison shall be part of the design documentation. The comparison shall, in addition to loading conditions, include other relevant conditions such as:

(1) temperature;
(2) humidity;
(3) solar radiation;
(4) rain, hail, snow and ice;
(5) chemically active substances;
(6) mechanically active particles;
(7) salinity;
(8) electrical conditions; and
(9) lighting, etc.

-2. The action taken with respect to the applicable conditions above shall be stated in the design documentation.

-3. Structural, mechanical and electrical components shall be designed for the appropriate site conditions. The corrosion protection systems shall be evaluated for the site-specific environment. Special attention shall be given to the effects of the site-specific conditions on electrical components such as the generator, converter, transformer, switches and enclosures.

-4. The site-specific loads resulting from the integrated load analysis have to be evaluated with respect to the design loads used in the type certification. The applicant shall report any increases in load level as well as any changes in vibration modes or natural frequencies to the Society. The Society shall consider the validity and effectiveness of load measurements, functional testing and component tests, such as a blade test, and evaluate the design documentation.

-5. The applicant shall submit design documentation for any new, modified or reinforced components and systems that are not fully covered by the type certificate for the wind turbine to the Society.

-6. Design documentation for new or modified electrical components and systems shall comply with the design basis. In addition, it shall also comply with the requirements for the type certification if applicable.

-7. If the wind turbine is not certified for the type certificate, appropriateness shall be determined by the Society.

5.5.3 Site-specific wind turbine (RNA) design evaluation conformity statement

-1. The Society shall issue a site-specific wind turbine design evaluation conformity statement based on a satisfactory design evaluation.

5.6 Site-specific Support Structure Design Evaluation

5.6.1 General

-1. The site-specific support structure (tower, sub-structure and foundation) design shall be compliant with the design basis. In cases where the scope of the design basis does not cover the support structure, the applicant may refer to a standard or design method that the Society deems appropriate. In any event, the resulting safety level shall comply with the intended level in IEC 61400 series standards or a standard that the Society deems appropriate.

5.6.2 Design evaluation

-1. The Society shall evaluate the design of the support structure for at least the following elements:

(1) evaluation of the design of the support structure with respect to the results of the integrated load analysis;

(2) calculated support structure stiffness and damping as compared to the assumptions made in the load calculations;

(3) evaluation of the geotechnical design documentation based on the design basis;

(4) evaluation of the design documentation for the support structure;

(5) evaluation of a manufacturing plan, transportation plan, installation plan and maintenance plan, however only with respect to the structural integrity of the final installed (permanent) support structure; and

(6) evaluation of a proposed corrosion protection system(s) against design premises specified in the design basis.

-2. The design documentation for the support structure, including documentation of the geotechnical aspects, shall at least include design drawings, part lists, manufacturing specifications and design calculations, which may be combined with measurement or test reports. The applicant shall submit the documentation that clearly identifies the design basis and agreed codes and standards, as well as loads and relevant external conditions, to the Society.

-3. If the support structure is not certified for the type certificate, appropriateness shall be determined by the Society.

5.6.3 Site-specific support structure design evaluation conformity statement

-1. The Society shall issue a site-specific support structure design evaluation conformity statement based on a satisfactory design evaluation.

5.7 Other Installations Design Evaluation

5.7.1 General

-1. A project may comprise other installations such as substations and cables, etc. In this case, these designs shall be evaluated as required by the client. Such other installation designs shall be evaluated for compliance with the standards and other specifications in the approved design documentation as well as with site-specific loads and conditions. In cases where the design basis does not do so, the applicant may refer to a standard or design method that the Society deems appropriate. In any event, the resulting safety level shall comply with the intended level in IEC 61400 series standards or a standard that the Society deems appropriate.

5.7.2 Design evaluation

-1. The Society shall identify a scope of work relating to other installation design evaluations and perform design evaluation upon agreement with the applicant. The design evaluation of the other installations shall at least include:

(1) evaluation of the design documentation;

(2) evaluation of the design of the other installation with respect to the results of the integrated load analysis, if relevant;

(3) evaluation of the geotechnical design documentation based on the design basis, if relevant; and

(4) evaluation of proposed corrosion protection system(s) against design premises specified in the design basis.

-2. The design documentation for the other installations shall at least include design drawings, part lists, documentation of the geotechnical aspects where relevant, manufacturing specifications and design calculations that may be combined with measurement

or test reports.

-3. The applicant shall submit the documentation that clearly identifies the design basis and agreed codes and standards, as well as loads and relevant external conditions, to the Society.

5.7.3 Other installations design evaluation conformity statement

-1. The Society shall issue another installations design evaluation conformity statement based on a satisfactory design evaluation.

5.8 Wind Turbine (RNA) Manufacturing Surveillance

5.8.1 General

-1. The type certification of the wind turbine is based on a design evaluation, type testing and measurements as well as a manufacturing evaluation, including a quality system evaluation and manufacturing inspection. The evaluation of a quality system mainly relies on the presence of a quality system certified based on ISO 9001. The manufacturing inspection during type certification is based on one specimen only. The project certification will, in addition to this, include surveillance (inspection) in order to confirm that the manufacturing of wind turbines for the specific project is carried out according to the approved design and with the intended quality.

5.8.2 Surveillance implementation

-1. The Society shall carry out manufacturing surveillance for wind turbines according to the guidelines determined separately.

-2. The results of the wind turbine manufacturing surveillance shall be documented as a surveillance report.

5.8.3 Wind turbine (RNA) manufacturing surveillance conformity statement

-1. The Society shall issue a wind turbine (RNA) manufacturing surveillance conformity statement based on satisfactory surveillance report result(s).

5.9 Support Structure Manufacturing Surveillance

5.9.1 General

-1. The project certification shall include surveillance (inspection) in order to verify that the manufacture of support structure(s) for the specific project is carried out according to the approved design and with the intended quality.

-2. It is a precondition for the manufacturing surveillance of the support structure that the manufacturer of the support structure or the main parts of the support structure operate a quality system. Manufacturing surveillance shall focus on the quality system applied during manufacture and confirm that the quality system is operated appropriately.

5.9.2 Surveillance implementation

-1. The Society shall carry out manufacturing surveillance for support structures according to the guidelines determined separately.

-2. The results of the support structure manufacturing surveillance shall be documented as a surveillance report.

5.9.3 Support structure manufacturing surveillance conformity statement

-1. The Society shall issue a support structure manufacturing surveillance conformity statement based on satisfactory surveillance report result(s).

5.10 Other Installations Manufacturing Surveillance

5.10.1 General

-1. The project certification shall include surveillance (inspection) in order to verify that the manufacture of other installation(s) for the specific project is carried out according to the approved design and with the intended quality.

-2. It is a precondition for the manufacturing surveillance of the other installation that the manufacturer of the other installation or the main parts of the other installation operates a quality system. Manufacturing surveillance shall focus on the quality system applied during manufacture and confirm that the quality system is operated appropriately.

5.10.2 Surveillance implementation

-1. The Society shall carry out manufacturing surveillance for other installations according to the guidelines determined separately.

-2. The results of the other installation manufacturing surveillance shall be documented as a surveillance report.

5.10.3 Other installations manufacturing surveillance conformity statement

-1. The Society shall issue an other installations manufacturing surveillance conformity statement based on satisfactory results described in the surveillance report.

5.11 Project Characteristics Measurements

5.11.1 General

-1. The purpose of project characteristics measurements within project certification is to demonstrate performance-related characteristics of the wind turbine project with a specific wind turbine or at a specific site. These optional measurements may be selected by the applicant and shall conform to the relevant IEC 61400 series standards or a standard that the Society deems appropriate. The measurements comprise one or more of the following elements:

(1) grid connection compatibility according to grid codes;

(2) confirmation of power generation performance; and

(3) confirmation of acoustic noise characteristics.

-2. In cases where applicable IEC standards are not available, the measurement procedure needs to be agreed between the applicant and the Society.

-3. The measurements shall be carried out by an accredited test laboratory or the Society shall confirm that the party conducting the testing complies with at least ISO/IEC 17025 or ISO/IEC 17020.

-4. The applicant or the test laboratory shall document measurements and test results in a test report and submit it to the Society. The Society shall evaluate that the measurements have been carried out in accordance with an approved detailed program and that the report precisely documents the characteristics required for certification.

-5. A conformity statement shall be issued by the Society, attesting that the measurements have been carried out in accordance with the appropriate test procedures and relevant IEC 61400 series standards or a standard that the Society deems appropriate.

5.11.2 Grid connection compatibility according to grid codes

-1. The Society or an accredited body shall confirm and evaluate specified reactions (e.g. during grid fault conditions) defined in the grid codes applicable to the site in grid connection compatibility measurements. For project certification, the Society or an accredited body shall evaluate grid connection compatibility by comparing the measurements with the electrical network and conditions given in the grid codes. The measurement procedures shall conform to the relevant IEC 61400 series standards and/or grid codes. The measurement conditions, instrumentation and equipment, calibrations and analysis results shall be described in a test report.

-2. The purpose of these measurements is to document the grid connection compatibility of a specific wind turbine or wind turbine

project at a specific site.

5.11.3 Verification of power performance

-1. The Society shall evaluate power performance test results and measurements in order to verify the power generation output of one or more wind turbines included at the project site. For project certification, the Society may evaluate the performance of the wind turbine(s) by comparing the results of the tests and measurements with the reference individual performance of the wind turbines supplied by the customer.

-2. The Society shall also verify that the measurement procedures conform to the relevant IEC61400-12-1, IEC 61400-12-2 and/or customer defined requirements or procedures. The standards or procedures applied shall be clearly referenced in the conformity statement issued by the Society.

-3. The purpose of these measurements is to document the power performance of one or more specific wind turbines installed at a specific site.

5.11.4 Verification of acoustic noise emission

-1. The Society shall evaluate compliance with specific acoustic noise emission criteria established either by the client or by local codes.

-2. The Society shall verify that the measurement procedures conform, to the extent it is possible, to the IEC 61400-11 and with the relevant standards and compliance criteria. The standards and evaluation results applied shall be clearly referenced in the conformity statement issued by the Society.

-3. The purpose of these measurements is to document compliance with respect to acoustic noise emission of a specific wind turbine or the project as a whole installed at a specific site.

5.11.5 Test reports

-1. The test reports shall conform to the requirements of ISO/IEC 17025 and relevant standards used to define the test requirements (e.g. grid codes). The following descriptions shall be stated in the reports:

(1) the specific wind turbine or wind turbine project at a specific site, including the test turbine(s), serial number(s) and control system software revision number(s); and

(2) any significant unexpected behavior.

-2. Attestation by the operating body shall be attached to the final test report(s).

5.11.6 Project characteristics measurement conformity statement

-1. The Society shall issue a project characteristics measurement conformity statement based on satisfactory evaluation of the test report(s). The conformity statement shall specify:

(1) the measurements carried out;

(2) the measurement standards applied; and

(3) identification information of the test report(s).

5.12 Transportation and Installation Surveillance

5.12.1 General

-1. The purpose of transportation and installation surveillance is to verify conformity with the requirements of the design basis and to verify that the loads on components and subsystems of the wind turbines are not exceeding the design envelope during transportation and installation and that possible transportation and/or handling damages are being detected.

5.12.2 Surveillance implementation

-1. The transportation and installation processes of the wind turbine(s) shall be in conformance with the design basis and the requirements in the relevant IEC 61400 series standards or a standard that the Society deems appropriate.

-2. The Society shall ensure that components are inspected for damage that may have occurred during transport and handling. This is including, but not limited to, damage to corrosion protection or actual corrosion. After completion of the installation, a final visual inspection of all relevant components shall be made.

-3. For offshore projects, surveillance shall include:

(1) monitoring of sea-transportation;

(2) compliance with respect to acceptable weather conditions during transport and installation; and

(3) compliance with the support structure and wind turbine installation procedures.

-4. The surveillance report shall describe the surveillance activities carried out.

5.12.3 Transportation and installation surveillance conformity statement

-1. The Society shall issue a transportation and installation surveillance conformity statement based on satisfactory evaluation of the surveillance reports.

5.13 Commissioning Surveillance

5.13.1 General

-1. The purpose of commissioning surveillance is to verify that the wind turbines installed in a specific project at a specific site are commissioned in conformity with the relevant manuals included in the design documentation.

5.13.2 Surveillance implementation

-1. The Society shall verify that the commissioning of the wind turbine(s) is in conformance with the instructions supplied by the manufacturer in accordance with the relevant IEC 61400 series standards or a standard that the Society deems appropriate. Other tests may be performed during commissioning in addition to tests in accordance with the general instructions based on the agreement with the manufacturer.

-2. The wind turbine manufacturer shall carry out the commissioning and create commissioning records.

-3. The Society shall witness the commissioning of at least one wind turbine. For wind farms with multiple wind turbines installed, which wind turbine to be witnessed shall be decided based on consultation with the applicant considering the number of wind turbines installed and the installation positions and so forth.

-4. The Society shall as a minimum verify that:

(1) the commissioning instructions supplied by the manufacturer are adequate;

(2) the instructions supplied by the manufacturer are followed during commissioning; and

(3) the commissioning reports are created.

-5. The surveillance report shall describe the surveillance activities carried out.

5.13.3 Commissioning surveillance conformity statement

-1. The Society shall issue a commissioning surveillance conformity statement based on satisfactory evaluation of the surveillance report(s).

5.14 Final Evaluation

5.14.1 General

-1. The purpose of final evaluation is to provide documentation of the findings of all operating bodies (including the Society)

involved in the evaluation of the elements required for the project certificate.

-2. Following verification of the contents of the evaluation reports and conformity statements of each module, the Society shall create the final evaluation report(s), consisting of:

(1) a reference list of all supporting product and project documentation for the project certification; and

(2) a report of all conformity statements issued for the project certification modules for outstanding issues.

-3. The final evaluation report shall be delivered to the applicant.

5.15 Project Certificate

5.15.1 General

-1. The Society shall issue a project certificate based on satisfactory results described in the final evaluation report(s). The certificate shall include the results of the mandatory modules and the agreed optional modules.

-2. The project certificate is valid for wind turbine(s) and additional installation(s) as installed at the site specified in the certificate at the date of issue.

-3. The project certificate shall reference in an appropriate way the standards and normative documents used.

-4. The term of validity of the project certificate shall be 5 years. The Society shall renew the project certificate every 5 years if the continued validity of the project certificate is verified through periodic operation and maintenance surveillance described in 5.16 and the surveillance result is satisfactory.

5.16 Operation and Maintenance Surveillance

5.16.1 General

-1. The purpose of operation and maintenance surveillance is to establish that a specific wind turbine installation or wind turbine project at a specific site is operated and maintained in conformity with the relevant manuals and the guidelines determined separately by the Society included in the design documentation.

-2. The applicant shall report major modifications to the site or the wind turbine(s) to the Society without delay.

-3. The Society shall carry out operation and maintenance surveillance at least once a year.

5.16.2 Surveillance implementation

-1. The Society shall carry out operation and maintenance surveillance in accordance with the guidelines determined separately.

-2. The surveillance report shall describe the surveillance activities carried out.

5.16.3 Operation and maintenance surveillance conformity statement

-1. The Society shall issue an operation and maintenance surveillance conformity statement based on satisfactory evaluation of the surveillance report(s).

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Certification of Wind Turbine System

NIPPON KAIJI KYOKAI
4-7, Kioi-cho, Chiyoda-ku, Tokyo 102-8567, JAPAN　Tel +81-3-5226-2032　E-mail re@classnk.or.jp

RENEWABLE ENERGY