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Wind turbine generator systems –

Part 23:
Full-scale structural testing of rotor blades

Aérogénérateurs –

Partie 23:
Essais en vraie grandeur des structures des pales

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

IEC 61400-23, which is a technical specification, has been prepared by IEC Technical Committee 88: Wind turbine systems.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
88/116/CDV	88/137/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2003. At this date, the publication will be

- transformed into an International Standard;
- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

Annexes A, B and C form an integral part of this technical specification.

Annex D is for information only.

Compliance with this technical specification does not relieve any person, organization or corporation of the responsibility of observing other applicable regulations.

INTRODUCTION

The blades of a wind turbine rotor are generally regarded as the most critical components of the wind turbine system. Many national standards address the blades separately in the design, but few require the testing of blades as a requisite for certification. Nevertheless, blade testing laboratories are currently operating in many countries throughout the world. Each laboratory has independently developed a unique set of test equipment, procedures and terminology that are used to test blades. Though each laboratory's techniques may be valid, the results of blade tests done at different facilities may be difficult to compare and evaluate.

The primary emphasis of the IEC TC 88 Working Group 8 effort was to identify commonly accepted practices among the various laboratories and to give guidance in establishing blade test criteria. Due to the wide range of methods (dictated by the test system hardware) used by the various laboratories, writing a restrictive standard that favoured one method to the exclusion of all others would not have been equitable. Therefore, the present technical specification has been written to provide guidelines on recommended practices. Many different methods are included.

The full collection of tests described in this specification should not be considered a requirement for every blade design. The need for tests will depend on the level of uncertainty in the design assessment due to the use of new materials, new design concepts, new production processes, etc. and the possible impact on the structural integrity. In some cases, alternative ways to perform a test are commonly used (see annex D). For the alternatives discussed in this specification, the advantages and disadvantages are noted.

WIND TURBINE GENERATOR SYSTEMS –

Part 23: Full-scale structural testing of rotor blades

1 Scope

This technical specification provides guidelines for the full-scale structural testing of wind turbine blades and for the interpretation or evaluation of results, as a possible part of a design verification of the integrity of the blade.

The following tests are considered in this technical specification:

– static strength tests;
– fatigue tests;
– other tests determining blade properties.

It is assumed that the data required to define the parameters of the test are available. In this technical specification, the design loads and blade material data are considered starting points for establishing and evaluating the test loads. The evaluation of the design loads with respect to the actual loads is outside the scope of this technical specification.

The technical specification is **not** intended to:

– form a detailed specification for the procurement of the test equipment;
– be a detailed work instruction covering all aspects of conducting a strength test;
– be used for establishing basic material strength or fatigue design data for blades and/or components;
– replace a rigorous design process;
– address the testing of mechanism function.

At the time this technical specification was drawn up, full-scale tests were carried out on blades of horizontal axis wind turbines. The blades were mostly made of fibre reinforced plastics and wood/epoxy. However, most principles would be applicable to any WTGS configuration, size and material.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this technical specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical specification are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050-415:1999, *International Electrotechnical Vocabulary – Part 415: Wind turbine generator systems*

IEC 61400-1:1999, *Wind turbine generator systems – Part 1: Safety requirements*

ISO 2394:1998, *General principles on reliability for structures*

ISO/IEC 17025:1999, *General requirements for the competence of calibration and testing laboratories*