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Space engineering - Structural finite element models

Ingénierie spatiale - Modèles éléments finis pour les structures

Raumfahrttechnik - Strukturmodelle der finiten Elemente Methode

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Foreword

This document (EN 16603-32-03:2014) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16603-32-03:2014) originates from ECSS-E-ST-32-03C.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2015, and conflicting national standards shall be withdrawn at the latest by February 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been developed to cover specifically space systems and has therefore precedence over any EN covering the same scope but with a wider domain of applicability (e.g. : aerospace).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The concept of model is of primary importance in all the fields of the science. In engineering disciplines - and specifically in structure mechanics - a model is a representation, able to describe and predict the behaviour of a structure in terms of quantifiable variables. A first step to build a model is to choose the variables which are relevant to the studied phenomenon (e.g. displacements, stress, or frequencies) and the types of relationships among them (e.g. the theories provided by elasticity, plasticity, stability, statics, or dynamics): this representation is called the physical model. The second step is to build a mathematical representation (e.g. using differential equations, integral equations, or probability methods): this representation is called the mathematical model. A third step is to build a numerical model, which is a formulation of the mathematical model by means of numerical algorithms, based on several approaches (e.g. the finite element method, the boundary method, or the finite difference method). A finite element model of a structure is such a type of numerical model of structure behaviours.

This Standard is restricted only to the requirements for finite element models of space structures, to be fulfilled to ensure modelling quality, i.e. the correct use of this specific technology – the finite element method - and the acceptance of the results.

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Scope

ECSS-E-ST-32-03 (Space engineering – Structural finite element models) defines the requirements for finite element models used in structural analysis.

This Standard specifies the requirements to be met by the finite element models, the checks to be performed and the criteria to be fulfilled, in order to demonstrate model quality.

The Standard applies to structural finite element models of space products including: launch vehicles, transfer vehicles, re-entry vehicles, spacecraft, landing probes and rovers, sounding rockets, payloads and instruments, and structural parts of all subsystems.

This standard may be tailored for the specific characteristics and constrains of a space project in conformance with ECSS-S-ST-00.

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Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications, do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system – Glossary of terms
EN 16603-32	ECSS-E-ST-32	Space engineering – Structural general requirements

koniec náhľadu – text ďalej pokračuje v platenej verzii STN