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Iacoviello, F., Susmel, L. orcid.org/0000-0001-7753-9176 and Berto, F. (2018) Guest editorial: Special issue-IGF international-structural integrity. Fatigue and Fracture of Engineering Materials and Structures, 41 (4). p. 717. ISSN 8756-758X

https://doi.org/10.1111/ffe.12776

Guest editorial: special issue - IGF international - Structural Integrity

Structural integrity is an aspect of engineering which deals with the ability of a structure to bear a specific service load so that sudden failures are prevented. The study of past structural failures in order to prevent failures in future designs is a fundamental step of this process. The ability of warranting the structural integrity of a component or of a complex structure consisting of many parts is a challenging task to be achieved and requires advanced approaches for the design able to integrate in a unified way material properties at all scale, geometrical discontinuities and defects induced by the fabrication process. From a macroscopic point of view structural integrity is the ability of a structural component to be loaded under a certain load, including its own weight, without breaking or deforming excessively. An appropriate design allows to assure that the structure or a component performs its designed function for its intended life span. Structural Integrity allows to prevent catastrophic failures, which can result in human injuries, severe damage, death, and in many cases important monetary loss. In the ambit of continuously improving of manufacturing processes, short product life cycles and the ever-growing need for high performance, low-weight products with minimal production needs, stringent requirements on both time and sophistication of modern structural design and property prediction are the key. For production of advanced integrated components of the future, conventional design methods, structural evaluation routines and production techniques need to fulfil the necessary requirements for structural complexity leading to increased performance. The structural design cannot be limited only to the macroscopic effects but requires an accurate capacity of understanding and modelling the material properties at different scale levels. A multiscale view is the only way for facing the challenges required by advanced structural design and for the developing of new materials able to satisfy the requirements of the severe service conditions of new micromechanical and nanomechanical systems as well as of traditional optimized components. In this regard the design has to address clean production, pollution prevention and zero waste which is the main challenge that all engineers, professional designers and academic educators and researchers have to face.

The present special issue contains original research articles selected from the international conference IGFXXIV held in Urbino (Italy) in March 2017. The contributions seek to define possible solutions and criteria to warrant structural integrity of structures and components and to present or discuss new sets of experimental data. The key areas covered in the present Special Issue are as follows: case histories, material selection and structure design, sample calculations of practical design problems, material characterization procedures, fatigue crack growth and corrosion, nondestructive testing and inspection, structural failure and ageing, failure prevention methodologies, and maintenance and repair. The papers submitted by the authors were subjected to the normal journal peer-review process. We thank the reviewers who assisted us in the review process providing useful comments and proposing constructive improvements to the authors. A special “thank you” to the Editor-in-Chief of Fatigue and Fracture of Engineering Materials and Structures, Prof. Youshi Hong, for the valuable and constant support during the preparation of the present volume. Least but not last, the guest editors are thankful to Mrs Autida Princess for the continuous and valuable contribution for the professional management of the submissions during all the steps of the reviewing process.

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