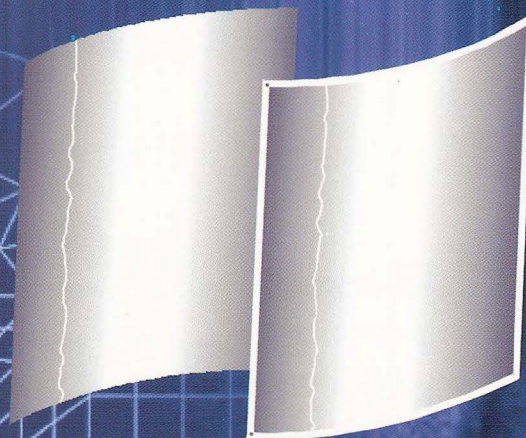


10TH PORTUGUESE CONFERENCE ON FRACTURE

10^{as} JORNADAS DE FRACTURA



PROGRAMME and ABSTRACTS

February 22-24, 2006

UNIVERSITY OF MINHO

GUIMARÃES





OPENING NOTE

This brochure contains the papers and plenary lectures abstracts of the 10th Portuguese Conference on Fracture organized by the Fracture Department of the Portuguese Society of Materials (SPM) and under the auspices and collaboration of ESIS (European Society for the Integrity of Structures). This meeting and their proceedings come from an ESIS approved meeting. The Conference was held in the University of Minho, town of Guimarães, from 22nd - 24th February 2006.

The fracture meetings of SPM were initiated in 1987 in Braga with the following calendar:

1989 - Lisbon ; 1991 - Lisbon ; 1994 - Lisbon ; 1996 - Luso (Iberic)

1998 - Oporto ; 2000 - Covilhã ; 2002 - Vila Real ; 2004 - Setúbal

The Scientific Committee has selected some papers which will be submitted for publication in leading scientific journals in the areas of Fracture and Fatigue of Materials.

The number and quality of the papers have increased. We would like to thank the collaboration of all authors and members of the Organizing and Scientific Committees who only with their effort could be possible to organize this Conference. In particular to prepare and send in time, the papers.

The papers cover a larger number of research themes than previous meetings.

We hope that the interchange of experiences will contribute to the progress in this field of engineering and technology which interest and importance we all share. We wish that the stay of all participants be as fruitful as possible and also this contact between friends will last in our future memory.

The editors would like to thank all entities who have participated in this event specially the University of Minho, as host and one of the organizers.

We thank to all sponsors, either state institutions or private companies, who their support was fundamental for that the Conference could be possible with success.

Guimarães, February 2006

**DETERMINATION OF STRESS INTENSITY FACTORS ALONG CRACKED SURFACES IN
PIPING ELBOWS STRUCTURES**

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Abstract

Piping elbows represent an essential role in pipework systems. These structures are part of the plant process in all industries. High safety standards in design are inherent to these projects due to complex mechanical or thermal loading. When these accessories carry defects, project engineers should assess their integrity in duty. This paper present a contribution in fracture mechanics applied to piping systems. Stress intensity factors are determined along cracked surfaces in piping elbows subjected to bending moment using a developed finite curved pipe element. This element is based in high order polynomial and trigonometric functions for rigid beam displacement and Fourier series modelling the transverse section warping or ovalization. Computational effort is saved with this element in the evaluation of the stresses or strains. Numerical tests are performed for different standard pipe elbows containing an axial or longitudinal crack. This study is compared with analyses reported by other authors.