ISODYNE STRESS ANALYSIS OF STRESS STATE IN CONTACT REGIONS

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Abstract. The rapid progress in analytical and numerical stress analysis, together with engineering requirements regarding reliability and economic aspects of the applied procedures, and the progress in measurement science, have altered the objectives of experimental stress analysis (ESA). At the present time, three major issues of the contemporary ESA can be identified: to test the reliability and accuracy of prediction of the analytical solutions and numerical procedures; to produce reliable data on the actual stress fields in real bodies made of real materials, which can be used for development of new analytical and numerical procedures; and to determine in the form of benchmarks--the practical boundaries between the regions in plates where stress state deviates insignificantly from the plane stres state, and the regions where the stress state is three-dimensional [10].
These issues are main objectives of the three-dimensional experimental stress analysis. The third issue is of major importance, considering that it has been well known for more than fifty years that stresses in plates in regions of notches (and cracks) are strongly three-dimensional. Those facts are still neglected in determination of such design parameters as the stress concentration factors and stress intensity factors, which are of major importance to design engineers. The procedure developed to date and presented in the paper is a hybrid electronic-manual procedure. It involves electronic recording of the isodyne fields, manual determination of the isodyne orders in chosen sections, electronic determination of the indicated and load-induced isodyne functions, and of the isodyne surfaces. It is shown that the developed techniques are more reliable and accurate, and more cost-efficient than the traditional techniques of the photomechanics.

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In memory to professor J.T. Pindera.

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