THE APPLICATION OF THE REFLECTIVE MOIRE METHOD TO THE BUCKLING AND BENDING OF STEEL PLATES BY BRIAN WHALEY

The object of the research described in this dissertation was to develop the reflective moire method as a means of measuring the lateral deformations of metal plates. Although the method is not new, it's use has been limited mainly to the study of perspex models. A novel method of applying a high quality reflective surface to the steel plates provided the basis for the work.

A self contained moire rig was designed and built. It was used to study the formation of buckle patterns in thin steel plates subjected to uniaxial compressive displacements. Much of the published research work is theoretical. Experimental corroboration has been limited by the excessive data logging requirements necessary to accurately monitor the lateral deformations of plates. The aim of this research is to produce an experimental method which can be used to record the whole field deformations without the necessity of employing mechanical or electrical transducers.

Photographs of the moiré patterns produced have been analysed automatically using a scanner devised by the author. The scanner comprises a light sensitive probe and carriage driven over the photographs by servomotors and controlled by a computer. The method of scanning and data logging has been described. The computer has been used to interpret the experimental data and to generate plate deflections. The use of a powerful main frame computer with sophisticated data handling facilities has been avoided. The research was not considered to be a computing exercise, rather a way of using the computer in a more practical manner. The minicomputer employed does not have any software support other than the standard functions and therefore all the programs had to be written by the author.

A plot of slope contours, as determined by the automatic scanner, for several of the test plates are presented so that they may be compared with the photographs of the moire patterns. A series of isometric projections for each plate show the development of the buckling modes. The experimental results for out of plane deflections are compared with the theoretical results predicted by [illegible] finite difference program for plates under in plane