

POINT LOADS ON SHELL STRUCTURE

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Abstract

The thesis discusses the effects of loading spherical and cylindrical shells by point loads applied radially through a rigid boss. Both structural configurations are treated analytically on the assumption that the material may be described broadly as elastic-perfectly plastic. It is further assumed that there will be non-overlapping parameter regimes in which the behaviour is dominated by elastic and plastic effects respectively.

The analysis which follows is based on the assumption that plastic effects predominate and that the structural behaviour may be followed by doing simple plastic analysis of a sequence of structures, the geometry of each being determined from that of the previous structure and its associated “collapse mechanism”. Two methods are employed to find these collapse mechanisms, one regarding the structure as a three-dimensional body, the other exploiting non-linear programming techniques. The enquiry also discusses under what circumstances these assumptions are justified.

The study also reports on observations made during the course of an experimental investigation into the effects of radially loading a cylindrical shell through a rigid boss.