

CHAPTER 1

INTRODUCTION



S-beams and Z-beams find instrumental application in building construction as they offer vital structural reduction of the classical beam network meanwhile confer aesthetic effect on the principal commonplace. These beams which submit to the combined action of bending and torsion may be called upon to form main elements for zigzagged corridors, passages between buildings, et al. Prudently dimensioned in proportion to other relevant building components an S-beam or a Z-beam may be regarded as having fixed supports, the particular instance to which this enquiry is confined. Further, to render the presentation commensurate with the academic research nature, the investigation draws on symmetry in respect of both geometry and loading.

A symmetric S-beam or Z-beam with fixed supports, under symmetric uniform load, personifies a structure indeterminate to the third degree. By virtue of symmetry the third-degree indeterminacy is reducible via removal of continuity at centre-span and instrumentalisation of strain energy principle. In this manner the problem transforms into one with only two redundants. These incorporate the bending and torsional moments at centre-span of the beam.

Despite relative simplicity of the problem at issue analytical aids facilitating a rapid design of S-beams and Z-beams have not hereunto emerged, at home or abroad alike. In the meantime an experimental examination into the behaviour of these beams has never been reported.

Consequently both the analytical and experimental aspects have been incorporated into the present research. Part I, "Analytical Aspects", describes the analytical method of solution and presents indices enabling a convenient analysis and design. Part II, "Experimental Enquiry", delineates model testing of an S-beam and a Z-beam.

Figures 1.1 and 1.2 give rendering respectively of an S-beam and a Z-beam.

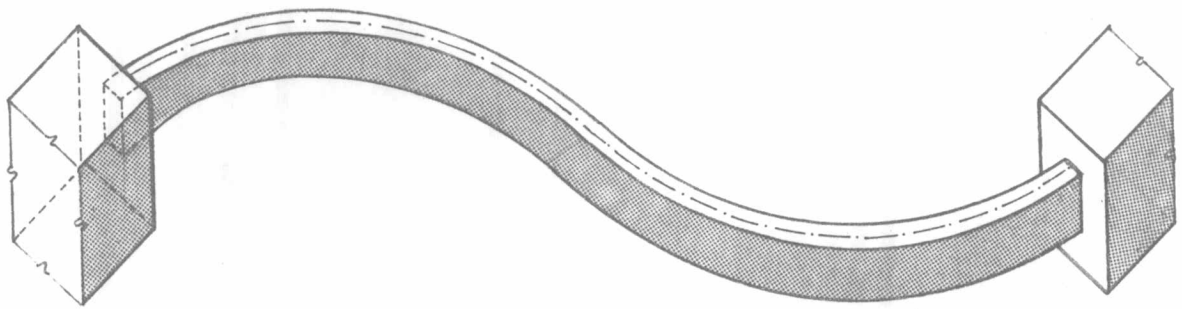


FIGURE 1.1 An S-beam with Fixed Supports

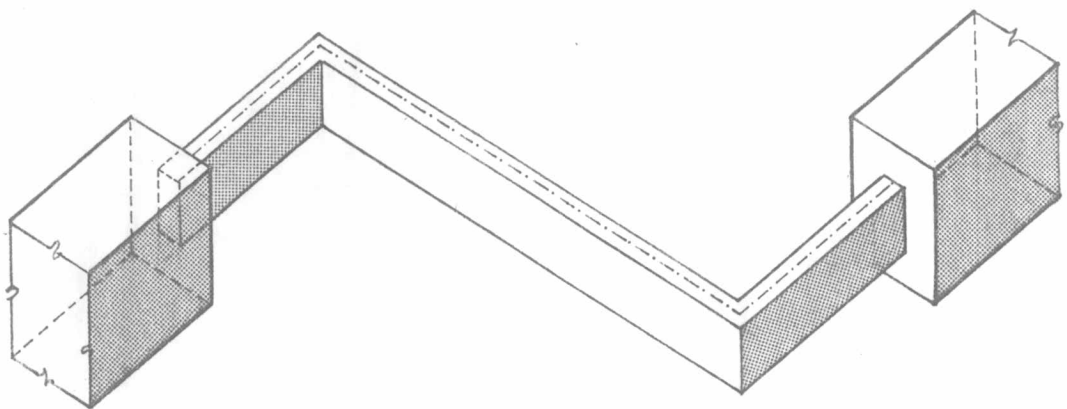


FIGURE 1.2 A Z-beam with Fixed Supports

PART I
ANALYTICAL ASPECTS