COMPUTERIZED DESIGN OF R.C. BEAMS

By

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1. INTRODUCTION

The aim of design is to provide safety through out the working life of a structure.
The basic approach in designing for safety is the assessment of loads under worst conditions in the structure that are expected to occur in practice. These loads are called working loads.
The designer's aim is to provide a substantial margin of strength between the working condition and the strength of the structure. This margin of strength is provided by taking into account uncertainties in the loading, the strength of materials and the construction process.
It is the way in which this margin is provided that the various design methods differ.
The "elastic" design method aims at ensuring that the working stresses do not exceed a set of defined permissible stresses which are obtained by reducing the material strengths by a safety factor.
The "ultimate load" or "load factor" method uses ultimate loads obtained by increasing the working loads by a safety factor and it aims to ensure that the strength of the structure, calculated using the expected actual material strength, is sufficient to support this ultimate loading.
The methods described above use a single safety factor. This is called global safety factor approach.
The limit state method of design provides a set of partial safety factors, one for each material and type of load. These factors take into account all the uncertainties mentioned above. This approach in dealing with uncertainties, except of being more logical, has the following advantage over the other design methods. For structures subjected simultaneously to different types of loading, the critical design condition arises when one loading is at its maximum value and the other at its minimum value. The global factor approach automatically increases both maximum and minimum loads giving a less critical condition while in the partial factor approach only the maximum load is increased.

The aim of the project is to develop a computer program for the design of reinforced concrete beams as integral parts of a plane frame. To do so, programming skills had to be developed. Also, for the needs of the project, the developer had to familiarize with a computer program for the analysis of plane frames developed by H.T.I students in 1994 as part of their 3rd year project. The computer language chosen is FORTRAN because it has superiority over other languages in numerical and engineering applications.

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