OPTIMUM STRUCTURAL ELEMENT DESIGN USING MS-EXCEL

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Structural optimization deals with the efficient design of structures. Efficiency implies minimum cost or minimum weight while satisfying a variety of strength and stiffness requirements. In all engineering problems, designers try to find solutions giving good performance, which satisfy several requirements. Using optimization techniques, engineers can obtain the optimum, within the imposed conditions. Structures designed in this way are safer, more reliable and less expensive than the traditional designs

The optimization theory originated as a branch of study in Mathematics. The Mathematical discipline that deals with parameter optimization is called mathematical programming. Many optimization problem deal with mathematical programming techniques and their application to structural optimization problems defined by discretized models. In this problem the structure is modeled very often by finite elements.

This paper describes how MSExcel is utilized to organize, manage and direct for solving and optimizing a pre-stressed concrete beam section. Although there are several optimization software (Genesis, Femap, VisualDoc) available in the market, they are very expensive relatively to MSExcel. Moreover, MSExcel is easy to learn and is a user-friendly software. Numerical design optimization provides the designer with a computational tool that finds the best design, based on predefined performance requirements. The optimizer automatically makes changes to problem parameters that are allowed to vary, referred to as design variables, perform a new analysis (linear or non-linear) to evaluate the influence of the changes and repeat the process until the design that best satisfies the performance requirement is found.

Using the MSExcel optimization programme, several test cases were considered with HA loading and the optimized results were compared with the manual design results. The study shows that the optimized results are economical than the manual design results.

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