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Use of Ms-Excel Sheets to Design Various Parameter of RCC Structure Review

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Abstract: Structural designers especially in India use MS-Excel to execute the structural analysis and design purpose. The manual calculation is being used. It leads to a cumbersome and time-consuming process to obtain analysis results to design sheets that have been developed. A VBA program has been developed to access the analysis results in MS- Excel such that the design process is fully automated which reduces manual interference.

Keywords: MS-Excel, VBA, IS 456-2000, analysis, calculation, design.

I. INTRODUCTION

Computers are used extensively in almost every phase of structural design practice. A wide variety of computer-aided drafting and structural analysis programs are being used in everyday work. More recently a large number of programs have also appeared that automatically perform all pertinent design code checks. Despite all these tools typical design office practice still requires many tedious and repetitive calculations. Part of the reason is the nature of the design process itself which is more of an art than science and hence difficult to fully automate. As a result, the use of spreadsheets and small special-purpose programs, typically written by the designers themselves, is very common. Tremendous advances have been made in the development of spreadsheets and computer algebra (CA) systems. These systems are capable of performing complex computational tasks involving numerical and symbolic calculations, graphics, and animation. The design requirements from applicable codes are entered as equations using essentially the same notation in which such equations appear in books and design manuals. After defining suitable equations for design requirements, the designer specifies values for the design variables, the system performs calculations, and the designer then examines the results to see if the requirements are satisfied or not. The same set of equations can also be turned into an optimization problem by defining an expression for an objective function and suitable constraint functions. Instead of using big and costly software excel sheets can be used for this purpose. And also, is easy to use as compared to other software. Many software is fixed to do specific operations. We can program the excel sheet in such a way that we can do all various types of calculations in one place. Mainly the required knowledge is to know every formula of RCC designing structure and apply it thoroughly and properly in the sheet, as a slight mistake can be very problematic in the future. The main motive is to design different RCC structures using an excel sheet and minimize the use of the software and manual calculations. As an excel sheet provides an ease to design structure. The achievement of an acceptable structure that is being designed using MS- Excel and will perform satisfactorily compared to other software. To maximize the use of excel sheets and to improve its knowledge as it is convenient to use other than various software. Designing can be done easily in MS-Excel as compared to various software like STAAD Pro, Revit, etc.

The design structure should sustain all loads and deform within limits for construction and use. For a strong, ductile, and durable construction the reinforcement needs to have the following properties at least to be satisfied high relative strength, high toleration of tensile strain, and good bond to the concrete, irrespective of pH, moisture, and similar factors, thermal compatibility, not causing unacceptable stresses in response to changing temperatures, Durability in the concrete environment, irrespective of corrosion or sustained stress. There are three methods used for designing RCC structures i.e. working stress method, ultimate load method, and limit state method.

II. DISCUSSION

While discussing the project we came across many different research papers regarding our topic. In these research papers, we found that from the early year 2000 many different authors have published various papers related to different RCC components. Some of them discussed only a few components like only slabs or only columns. While some of them discussed components that are defective due to external factors such as fire (heating factor), wind (wind load), etc. some of them organized these methods to

enhance the way of studying and teaching between teacher and students.

The main purpose of creating these excel sheets was to minimize the human effort and errors occurring while doing calculations by hand. By creating them, solving and designing the procedure of RCC components gets easy.

Another purpose for creating these excel sheets was to minimize the use of the software. As many software is difficult to use and has many complicated functions in them. Many of them used various management gear such as PERT (Program Evaluation Review Technique), GANTT (type of chart used in project management system), and CPM (critical path method) are used for the designing process. But they fail to compute interdependency. So DSM (design structure matrix) has been developed. Some of the authors also compared their EXCEL results with manual work. After comparing they concluded that the results were approximately the same. And after completing the research we started working on them as the previous authors have worked on creating excel sheets.

III. CONCLUSIONS

The objective for automation of the design of RCC structure using MS-Excel has been accomplished. The above analysis and design problems have been verified with standard textbooks. It reduces time as compared to the manual calculation for the design of structural elements of a large project. In future automation of design processes for RCC structure, elements can be carried out. The reaction from manual to MS Excel will be useful in advanced foundation design. The objectives for automation of the design of RCC structure using MS-Excel have been accomplished. The above analysis and design problems have been verified with standard textbooks. It reduces time as compared to the manual calculation for the design of structural elements of a large project. In future automation of design processes for RCC structure, elements can be carried out.

The reaction from manual to MS Excel will be useful in advanced foundation design. In this paper, EXCEL spreadsheet software has been used in analyzing and calculating rebars of different RC elements like beams, columns, and slabs. Five different types of EXCEL spreadsheet like a simply supported beam, cantilever beam, short column, long column, one way, and two-way slab has calculated in this project work. Different characteristics conditions like effective span, nominal cover, and effective length of compression members have been applied in our study. Apart from the inclusion of various characteristic properties, different checks have been assigned to the RC elements. Reference has been taken from RCC code IS 456:2000.

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