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**Study on Economical Aspect of R.C.C Beam Slab Construction and Grid Slab
Construction**

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Abstract

This paper presents the comparison of R.C.C Beam Slab, One-Way Continuous Slab and Grid Slab. This work includes the design and estimates for R.C.C Beam Slab, One-Way Continuous Slab and Grid Slab. The aim of this work is to design R.C.C Beam Slab, One-Way Continuous Slab as well as Grid Slab for spans 15m X 27m and then compare the results. Programming in MS EXCEL is done to design all the three types of slabs. The idea is to reach a definite conclusion regarding the superiority of the above techniques over one another. Results reveal that a R.C.C. One-Way Continuous slab is more economical than other two types of slabs for the considered span.

Keywords: R.C.C Beam Slab, One-Way Continuous Slab, Grid Slab.

Introduction

Importance & Necessity

The main obstacle with concrete constructions, in case of horizontal slabs, is the high weight, which limits the span. For this reason major developments of reinforced concrete have focused on enhancing the span, either by reducing the weight or overcoming concrete's natural weakness in tension.

Without any semblance of doubt, Reinforced cement concrete construction has been the most revolutionary construction technique of modern times. Combining the high compressive strength of concrete with high tensile strength and elasticity of steel has resulted in a composite material that is strong, durable and economical. Moreover, it is time tested. One of the greatest assets of "homo-sapiens" is their quest for excellence. The human being has constantly refused to sit over his laurels and become complacent. This has often resulted in new invention and improved products and techniques. Very weak tensile strength of concrete lead to the discovery of steel embedded concrete, called as Reinforced Cement Concrete.

The aim of this work is to design R.C.C Beam Slab, One-Way Continuous Slab as well as Grid Slab for spans 15m X 27m and then compare the results.

Scope

This work includes the design and estimate for Conventional Beam Slab and Grid Slab of same span of 15m X 27 m by M20, M25 and M30 grade of concrete. For smaller spans, associated with normal building works, conventional beam slabs are found more cost effective, in this project comparison of

conventional beam slab and grid slab is made on the basis of major material requirements of the slab.

Methodology

To begin with, an R.C.C. One Way Continuous Slab was manually designed by using the limit state method based on IS: 456-2000. Based on the steps & formulas involved, a design program was prepared in MS EXCEL. The veracity of the program was checked by first designing the manually designed SLAB by using the program & comparing the results. The grade of concrete was maintained at M: 20 for R.C.C. and steel is of Fe415

An identical procedure was followed for Two Way Grid Slab. The manual design was based on the limit state method based on IS: 456-2000 by P.C. Varghese second edition. The program for designing the same was developed by using MS EXCEL & its fidelity was checked by first solving the manual problem & comparing the results. Since our target is comparison of slab for economy One Way Ribbed Slab is also design for the same span of 15 m x 27 m. For obtaining more accurate result the depth of beam in Two Way Grid Slab and One way ribbed slab was changed and difference in quantity of steel, concrete and formwork was evaluated.

Rates are based on the latest CSR in Maharashtra. In case of Grid Slab, some of the rates were obtained from a well-known private Infrastructure company.

Results and discussion

Table 1 below gives the cost in rupees for various types of slab such as one way continuous slab, two way grid slab of different depth and one way ribbed slab of different depth. Figure 6.1 below shows the same statistics with the help of bar charts.

As we know steel and concrete are the main factors on which cost of any structure depends Figure 1 below represents the quantity of concrete required for different types of slab. Figure 2 represents the quantity of steel required for different type of slab.

The cost of M20 grade of concrete included the cost of formwork and other accessories. Quantity of Formwork required for any structure is also a very essential aspect for comparison of economical aspect of structure. Figure 3 shows the formwork required for different type of slab which were consider for design.

Traditionally, column spacing and floor spans in the buildings such as commercial complex, shopping mall and warehouse etc. have been in the range of 6 to 9 meters, to both contain costs and simplify construction. However, recently there is an

increasing preference by building owners and tenants for large floor areas with column-free space and for architectural. This has focused the interest of designers and builders on methods of reducing costs and speeding construction of long-span floors.

From the statistic, it is cleared that there is not much more difference between cost of oneway continuous slab and one way ribbed slab of 700 mm depth but in case of one way continuous slab we are getting clear height is less as compare to oneway ribbed slab though the steel and formwork required for one way ribbed slab is more as compare to one way continuous slab but the overall cost is low as compare to oneway continuous slab. From architectural point of view the two way grid slab is best suitable for column free space like Function hall, Cinema halls, assembly etc but when there is cost comparison has done one way continuous slab is more effective.

Table.1: “ Cost Comparison of R.C.C. One way continuous slab, Two way grid Slab and One way Ribbed Slab ”

Type of slab	Estimated Cost of different types of slab (Rupees)	Estimated Cost of one way ribbed Slab (Rupees)	% Difference in the cost (%)
RCC One Way Continuous Slab	8,91,595	8,45,162	5.21
Two way Grid Slab of 700 mm depth	12,42,895.5	8,45,162	32
Two way Grid Slab of 900 mm depth	14,88,224	8,45,162	43.21
One way Ribbed slab of 900 mm depth	9,06,479	8,45,162	6.76

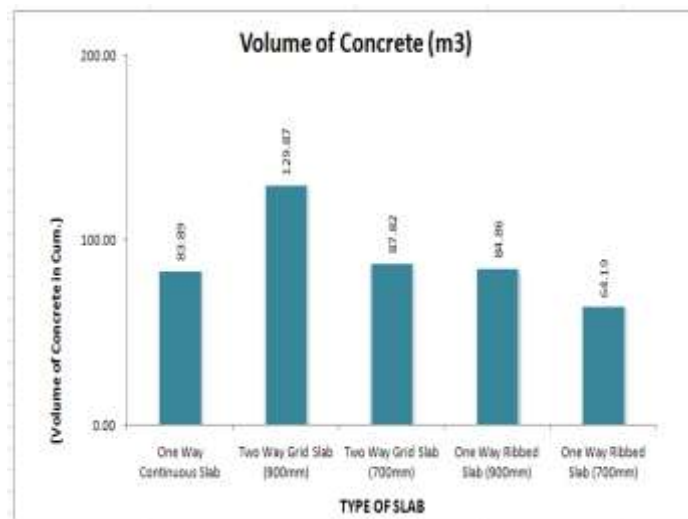


Figure 1: Variation of volume of concrete with type of Slab

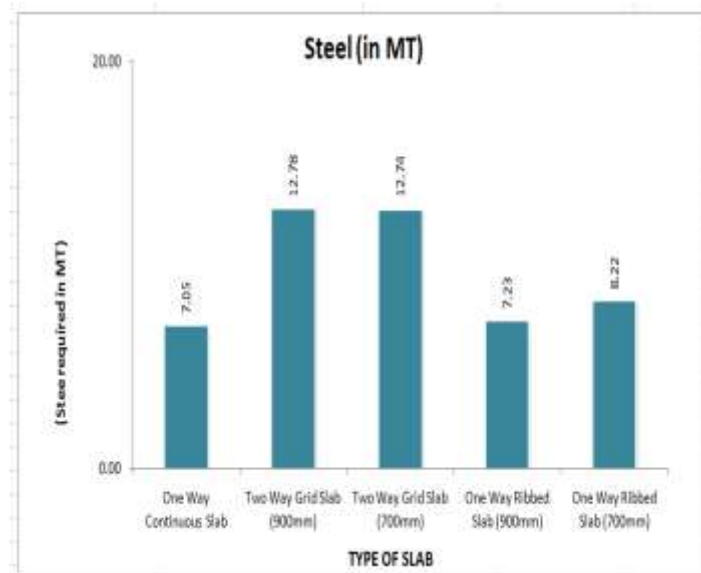


Figure 2: Variation of Quantity of steel required with type of Slab

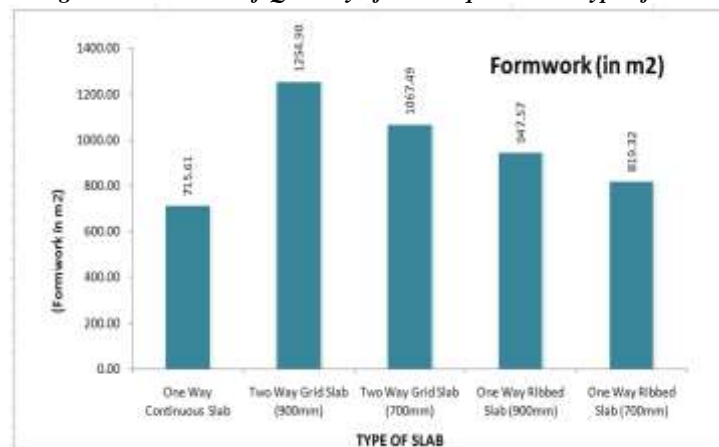


Figure 3: Variation of Quantity of formwork required with type of Slab

Conclusions

Based on the study and design conducted for a plan of 15 m x 27 m it could be concluded that RCC One way ribbed slab is more preferable than other two types of slab that is RCC one way continuous slab and grid slab. From cost point two way grid slab is more costlier than other two types, there is a slight difference in between cost of One way continuous slab and one way ribbed slab of 700 mm depth but in case of one way continuous slab the clear head is less as depth of beam is 900 mm where as in one way ribbed slab we are getting more clear head.

Besides, Two way grid slab of 700 mm depth provide greater headroom and give column free space and good architectural view. From economical point view RCC one way continuous slab is 5.21% costlier than one way ribbed slab of 700 mm depth. Similarly

two way grid slab of 900 mm depth is 43.21 % costlier and two way grid slab of 700 mm depth is 32 % costlier than one way ribbed slab.

Future scope

Cost comparison of RCC and Prestressed concrete waffle slab for various span.

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