COST OPTIMIZATION
in Reinforced Cement Concrete (RCC)

CREDAI
AFFORDABLE HOUSING COMMITTEE PRESENTS

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INTRODUCTION

India is a developing country, huge construction projects are yet to come as undeveloped cities are needed to develop since so many years. In current century, many construction projects all over the world are going through financial crises because of high financial budgets. Time delay takes place which in turn affects the growth of the construction of huge projects. In order to avoid time delay and thereby the growth, economic construction methodology should be adopted. To economize the structure structural optimization techniques should be used. For large projects it is necessary to go for structural optimization because it directly affects cost of construction. Many Metropolitan cities are facing vast growth of infrastructure whether it may be in terms of horizontal development or vertical development. Metropolitan cities like Delhi and Mumbai have high population and in forth coming years land availability problems will increase tremendously which will in turn affect the overall growth of the city, so most of the builders in construction industries prefers vertical development of structures. As we increases number of stories or height of structure, huge lateral forces come into picture which will tend to increase the construction cost of the project in terms of consumption of steel, concrete and such other materials. Hence usually optimization techniques are adopted to economize the structure. New and different approaches to design have become possible through the increased speed of computers and software tools of optimization theory. The optimization exercise commences right from the architectural concept stage. Suggested grid dimensions by architecture usually do not result into most economical structural member sizes and reinforcement consumption.

1. CEMENTITIOUS MATERIAL:

Concrete contributes to almost 40% of the construction cost for any housing project. One of the key ingredients in concrete is cementitious material which comprises of a combination of OPC cement and pozzolanic material such as GGBS or fly ash. The proportions of OPC & GGBS/flay ash depend on the mix design strength requirement. The cost of cement varies between Rs. 5/- to Rs. 6/- per kg and whereas the cost of GGBS or fly-ash is about Rs. 2.5/- per kg. Hence, in order to optimize the cost, it is important to ensure that the replacement percentage of GGBS / fly-ash is maximum. Since GGBS is silica based, it affords a higher replacement percentage as compared to fly-ash, however, the type of concrete mixer required for GGBS use is pan type and also it has a slightly lower setting time. The ideal replacement percentage for GGBS is around 45% and that for flyash is 18%. Hence, typically for affordable housing projects it may be advisable to go ahead with GGBS by using RMC plant on site. Also, the prices of cement fluctuate almost daily. A trend has been observed wherein the prices of cement typically surge during the first 10 days of a month and then start to stabilize over the next days and during the last 10 day of the month the prices fall. Hence this trend can be used to optimize the purchasing price of cement.

2. REINFORCEMENT:

Due to the new IS code, the requirement of reinforcement steel has increased. Moreover, the rate of steel has also increased substantially in the last 6 months. Hence it is important to ensure that the structure is not overdesigned and the procurement of steel is done at the right time thereby reducing inventory holding costs. Generally the comparison of steel consumption is done on Kg/sq.ft. However, a lot depends on which area is considered for comparison. For eg. Whether builtup area or saleable area or carpet area is considered as the ratios will fluctuate significantly due to this. Hence it is advisable to calculate the consumption of steel on Kg/Cu.m of concretre. The optimum consumption is around 110 kg/cu.m

3. ON SITE RMC:

There is approximately 500/- per cu.m rate difference if concrete is procured through external RMC rather than setting up own RMC plant on site. Hence, it is advisable to setup an RMC plant on site with pump wherever the concrete consumption for the site is more than 15,000 cu.m

4. RETAINING WALL IN RUBBLE STONE:

Many times, the strata we face in Pune & in deccan plateau is made of basalt rock. During excavation, this stone is chsseled and disposed off outside the site. Additional expenditure is incurred on RCC retaining wall. Hence, in order to reduce wastage and optimize costs, it is advisable to construct the retaining wall in plum concrete wherein most of the plum can be used from the excavated rock from site itself thereby reducing the additional cost that is spent on external disposal of rock and on new RCC required to construct the wall.

5. PODIUM & BASEMENT SLABS:

It is a standard practice to lay either tremix flooring or chequered tiles on podium / basement slabs as final finished surface. This adds to unnecessary dead load on the structure and also increase the cost of finishing. Hence for affordable housing projects, wherever there are podium slabs, it is advisable to cast the podium slab 10mm higher and finish the same using power floater and broom finish with non metallic epoxy floor hardener. This not only saves cost but also reduces the time required for construction and because of the epoxy hardner the surface durability also increases.

1. TYPE OF SHUTTERING:

Although conventional column beam slab shuttering made of Ply & MS plates may be cheaper than system formwork, it is advisable to use system formwork for RCC because the finishing cost optimizes. This can be best explained as under: The offsets within column bean slab reduce when system formwork is used there by the thickness of plaster, POP & floor bedding reduces due to which the overall cost and time of the project reduces. The wastage in concrete also reduces due to system formwork as the slab level is achieved in mm and no excess concrete is required.

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