

FACTOR AFFECTING SELECTION OF FORMWORK

IN HIGH RISE BUILDING

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ABSTRACT

Formwork is the use of support structures and moulds to create structures out of concrete which is poured into the moulds. Formwork allows contractors to cast and construct the main parts of a building which are required to be strong and support the structure such as floors and walls, as well as smaller parts of a building such as stairs relatively quickly. Now in modern era consumer is using or choosing formwork based upon the maximum possible uses, initial and maintenance cost, erection and dismantling time, suitability of labor. This study is to focus on identifying the qualitative factors affecting the selection of the formwork at high rise buildings from the various literatures and the interview with the selected respondents.

Keywords: *Building, formwork, selection factors etc.*

I. INTRODUCTION

This chapter describes the myriad forming systems available to concrete contractors and formwork subcontractors. Many concrete buildings may efficiently utilize either a few or many of these system depending on the requirements of the individual areas of the buildings. The selection of formwork system requires adequate information about available horizontal (slabs) and vertical (columns/walls) forming systems. The information collected that describes the formwork systems should include the criteria used by contractors to select the system. These criteria are : The formwork system should be available and economically feasible for the contractor. All major parties – owner, designer, and contractor should be familiar with the selected forming system, since certain systems, such as slip forms, require special economic evaluation, design configuration and safety precautions. The selected formwork system must be consistent with the architectural and structural requirements of the building. The selected system must be compatible with the mechanical and electrical requirements of the building. Totally 30 respondents participated in this survey. The respondents are project manager, contractors, site engineer. As well as over all respondents is also calculated. The surveying was conducted in **GURGAON**. The site was high rise and commercial building. The mivan formwork was used on the first site, and the mostly of the formwork used was steel and plywood formwork on sites. We can select/use various types of formwork on the sites after considering various factors which are as given below.

2.1. Forming Systems

The type of forming system has an essential effect in the analysis of concrete structures during construction. Therefore, selecting the forming system that is, making structural Frames faster, simpler, and less costly to build, must begin in the earliest phase of the Design efforts. There are several horizontal and vertical forming systems currently used for different structural elements; these are described below

2.1.1 Horizontal Forming Systems

There are five horizontal forming systems that can be used to support different slab types. These are conventional, flying truss, column-mounted shoring, tunnel, and joist-slab Forming systems (Jensen, 1986)

2.1.2 Vertical Forming System

Vertical forming systems are those used to form the vertical supporting elements of the Structure (Le. columns, walls). Five types of vertical forming systems are available. These are conventional, gang, slip, jump, and self-raising forms (Smith and Andres, 1993).

2.2 Design Loads

Numerous loads and pressures, vertical and horizontal, live and dead, must be taken Under consideration during the design of formwork false work facilities (Lew,1985). The Design loads for formwork can be divided into four categories: vertical; lateral pressures; Horizontal; and special loads.

2.3 Formwork Capacity

Overall strength of the false work depends on the strength and stiffness of the formwork, the shoring together with lateral bracing, and the support, which provides reaction to the Loads, transmitted through shores. Factors of safety used in each of these components Vary from 1.5 to 4.0. Some of these factors are based on allowable stresses and others are based on ultimate load tests (UW, 1976).Both wooden and metal forms are subjected to bending, shearing, and compression stresses, each of which must be kept within acceptable allowable limits. In addition to Strength requirements, deflection limitation must be taken into consideration. The Adequacy of shores and re shores can be determined simply by checking that the uniformly distributed loads calculated from the slab/shore analysis multiplied by inappropriate tributary areas are less than the safe working loads of the shores Formworks are used for many times for different projects. Therefore, the quality of Formwork elements should be checked before reuse. Sufficient lateral braces should be provided to maintain integrity of supporting system in case of uplifting to prevent shore Buckling and resist horizontal load (Duane and Chen, 1996)

2.4 Concrete Strength

Formwork should be removed as soon as possible to provide the greatest number of uses, but not und the concrete has attained sufficient strength to ensure structural stability and to carry both the dead load and any construction loads that may be imposed on it. The Prediction of concrete strength is very

Table 1: Usage of various types of formwork systems

Factors	Scores	Proportional ratio	Percentage
Wooden formwork	81	0.5001	50%
Steel formwork	79	0.4874	49%
Aluminium formwork	2	0.0123	1%
Plastic formwork	0	0	0

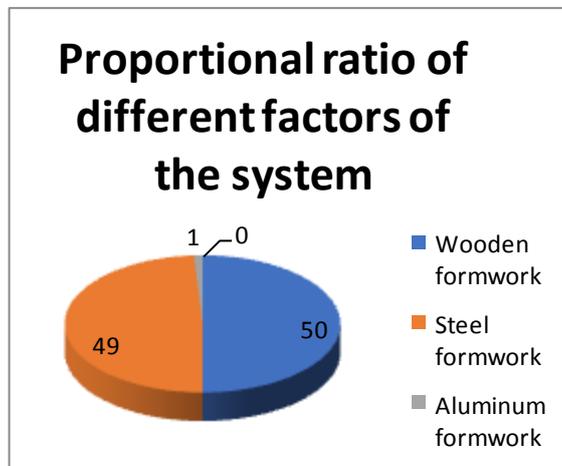


Figure 5.2: different factors

2.0 Current stage, easily supply as suitability of labors.

Factors	Scores	Proportional ratio	Percentage
Wooden formwork	91	0.52	52%
Steel formwork	82	0.4685	47%
Aluminium formwork	2	0.0114	1%
Plastic formwork	0	0	0

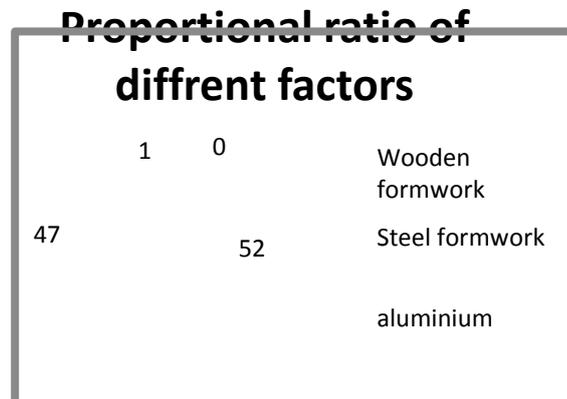


Figure 3: Top 5 factors

5. The top five factors according to rank

Factor	Survey points	Rank
Quality and surface smooth	87	1
Time factor	85	2
Lifespan	84	3
Cost	83	4
Safety	82	5

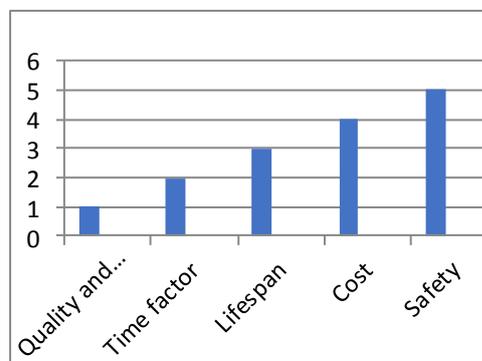


Figure 4: Top factors on formwork selection

The selection of a formwork system has been identified as one of the major problems which the construction planner/designer encounters. Furthermore, the current practices of rapid placement of concrete have forced the planner/designer to search for new or modified system that can facilitate the construction process.

6.1 Summary and issues of system development

Two issues related to system development have:

- (1) the process of knowledge acquisition, and
- (2) the collection, organization, and transformation of the acquired knowledge.

6.2 Current status of the system

Slab formwork and wall formwork are production systems utilizing backward chaining to reach a conclusion. They have the ability to explain their reshoring during and after the consultation session. Confidence factors have been utilized to provide the user with a degree of certainty for the final selection. The system also provides the user with recommendations in regard to the selection of other formwork components.

6.3 Areas for future research

Construction planning has frequently been identified as one of the major factors in the success of any construction project. Formwork selection is one of several important decisions that have to be made during the planning phase of project. Little work has been carried out to provide the construction planner with a computer tool that can facilitate his work. The following areas for future research which ultimately integrate the construction planning process.

1. Selection of the number, type, and position of tower or mobile crane combines mathematical algorithm with rules of thumb.
2. Selection of materials handling equipment, which includes the selection of concrete delivery method (crane delivery or pumping).

6.4 CONCLUSION

A questionnaire survey is conducted on high rise building construction projects (above G+5) for find out factors influencing formwork selection in construction projects. The Selection of formwork system is highly dependent on individual site/project environment. This study received 30 responses. Respondents were include of contractors, site engineer and project managers. The major conclusions arrived are: Erection and dismantling time is found at prime importance for the Adoption level of formwork. Wooden and steel frameworks are at maximum usage with 50% and 49% respectively. Relatively Cost wise reduction and Quality assurance are expected from construction industry at adoption level. Wooden and steel frameworks are at higher acceptance from the Formwork availability itself and involved labor supply point of view. Steel Framework is at higher demand at labour level in at various suitability of construction. And the most used formwork was steel and steel with plywood formwork because of material initial purchasing cost is low compared with mivan formwork and the observed constrain in adaptation of mivan formwork lack of confidence as well as skilled labor requirement and cost. According to their rank indexes the top 5 factors has been ranked accordingly for 30 completed surveys. The top 5 factors are quality and surface smooth, time factor, lifespan, cost and safety. For the major

constrain the model need to be prepared from that project managers select the appropriate formwork to their construction sites.

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