

# Selection Criteria of Formwork by Users in Current Age In South Gujarat Region

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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. There are many different types of formwork used in construction, usually differing according to what the building requirements and challenges are in construction. Formwork is used by creating moulds out of wood, steel, aluminum or prefabricated forms into which the concrete is poured. This is then allowed to harden and set after which it is stripped, or in the case of stay-in-place formwork it is left as part of the structure. 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 labour. In this research work, Factors for selecting and applicability criteria have been decided from the various literatures and the interview with the selected respondents. Questionnaire has been prepared with keep in mind about residential projects and commercial projects only and prepared different questionnaires for different respondents in the different language too. Questionnaire will be distributed to various consultant, Contractor and manufacturer/distributor of formwork in various parts of south Gujarat Region.

**KEYWORDS:** formwork, cost, erection and dismantling, safety, suitability of labours

## I. INTRODUCTION

Formwork is a temporary construction; however care must be taken to prevent damage to permanent work. There are some general principles governed formwork design and construction like Quality, Safety, Economy. Based on the title of my research, this dissertation is to research on what are the factors that has been considered in determining the choice of formwork. Throughout the research you will see various types of formwork details and also the factors, the system or the methods that are being used in our Construction Industry nowadays. The purpose of determining the choice of formwork mainly is to reduce the cost of construction. The cost of formwork is occupying a big percentage in the total construction cost, as we do not allow to reduce the cost by changing other building components requirement due to they were all specified in the Contract Documents, therefore choose and plan the system of formwork wisely will greatly reduce the cost of construction. In addition, choosing a proper system of formwork will also reduce the time of construction and the wastage thus reduces the total construction cost. Therefore, choosing the system of formwork wisely is a good practice for every construction work.

## II. OBJECTIVES OF STUDY

To carry out the study review on prevailing wooden formwork, steel formwork, and aluminium formwork plastic formwork used in construction. To study regarding factors affected like safety, availability and quality involved in usage of typical formwork at various stages of the construction work. To contrast and compare the performance of the formworks under the influence of study which focusing by considering cost and safety aspects.

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### III. FACTORS CONSIDERED FOR STUDY

The various Factors affecting selection of Brick are determined by viewing various literatures. From that 13 factors considered for this study are: Cost, Availability, safety, Erection & dismantling, life span, Easily fixable size, quality assured, important, Time factors, Quality of work, suitability to labour, market trend, inaccessible to supply.

### IV. RESEARCH METHODOLOGY

The research methodology for present study based on questionnaire survey which was prepared based on above considered factors. This questionnaire is based on approach of ranking the Factors affecting selection of formwork of statistical some computational criteria is used to rank the factors. The questionnaire for survey was distributed to contractor, consultants and consumers to seek their view

### V. DATA COLLECTION

The target population included civil engineering and buildings construction firms of South Gujarat region of India. The Consumers, Consultants and contractors of Surat&Tapi district of South Gujarat were targeted for survey. The details of various stakeholders and total numbers of them were collected through internet. These details were considered as size of population to decide sample size of study. To obtains a statistically representative sample of the population, the formula shown in Eq. (1) was used:

$$n = \frac{m}{1 + \frac{m-1}{N}}$$

Where n, m, and N = the sample size of the limited, unlimited, and available population, respectively. m is estimated by Eq. (2) was used:

$$m = \frac{z^2 * p * (1-p)}{\epsilon}$$

Where z = the statistic value for the confidence level used, i.e., 2.575, 1.96, and 1.645, for 99%, 95%, and 90% confidence levels, respectively; p = the value of the population proportion that is being estimated; and a = the sampling error of the point estimate. Because the value of p is unknown, suggested a Conservative value of 0.50 be used so that a sample size that is at least as large as required be obtained. By using a 90% confidence level, i.e., 10% significance level, the unlimited sample size of the population, m, is approximated as follows: Accordingly, for the total number of consultant, i.e., N, of 4391, the representative sample size of the population required, is determined as shown below:

$$m = \frac{1.645^2 * 0.5 * (1-0.5)}{0.1^2} = 65$$

Similarly,

Sample size of contractor 65 developer's 65, suppliers 65

First of all, list of the stakeholders was generated from local survey and the internet through their websites and accordingly questionnaires were distributed to various stakeholders by going personally or through email. Personal interview and mail back techniques were used in this research, where respondents had a clear opportunity to take part or not; therefore, the voluntary participation in research was ensured. The telephone number, e-mail contacts of researcher were given in the questionnaire for contact regarding any query as well as for sending back the response. The questionnaire were distributed to various stakeholders by informing them regarding the purpose of the research and asking them about their willingness to participate in the research. Once the initial willingness was shown by them, a questionnaire was given to them. Total 380 questionnaires were distributed to different respondents in South Gujarat. They were sent the reminder for sending their feedback after 10 to 15 days of sending the questionnaire. This study received 227 responses. So, the response rate in this research is 59%. Total responses are 59 % out of the total sample

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size requirement. Due to constraint of time limit, this study could not collect the responses as per sample size requirement, which is considered as very good in this kind of survey

## VI. DATA COLLECTION

Based on the collected data, analysis will be made to find out relation of between various criteria for manufacturers or supplier, contractor and developers for selection of Formwork with the help of statistical some computational criteria for selection process of formwork in South Gujarat region

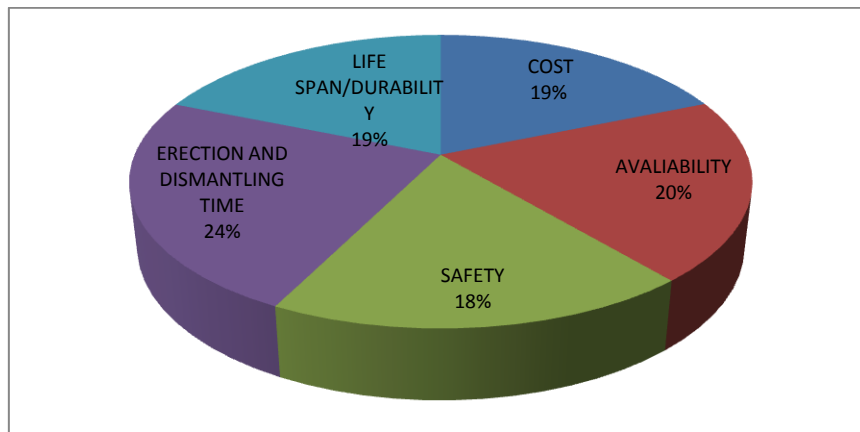
## VII. RESULTS AND FINDINGS

The all ranking indices explained earlier were used to rank delay causes from viewpoints of the three parties (Developers', Contractors and suppliers). Total 227 respondents participated in this survey. These respondents included 72 Developers', 114 contractors and 41 suppliers. The ranking by Spss is determined for developer's, Contractors and suppliers Individually as well as Ranking for Overall Respondents is also calculated.

### A. CONSIDERATIONS IN ADOPTING A FORMWORK SYSTEM

TABLE 1 TOTAL SCORES; MEAN SCORES AND PROPORTIONAL RATIOS OF DIFFERENT FACTORS IN Q1

Factors	Scores	Means. Scores	Proportional ratio
Cost	204	1.7894	0.1875
Availability	218	1.9122	0.2003
Safety	203	1.7807	0.1865
Erection and dismantling time	258	2.2631	0.2371
Life span/durability	205	1.7982	0.1884



Graph 1: Proportional Ratio of the Different Factors in Q1

### B. USAGE OF VARIOUS TYPES OF FORMWORK SYSTEMS

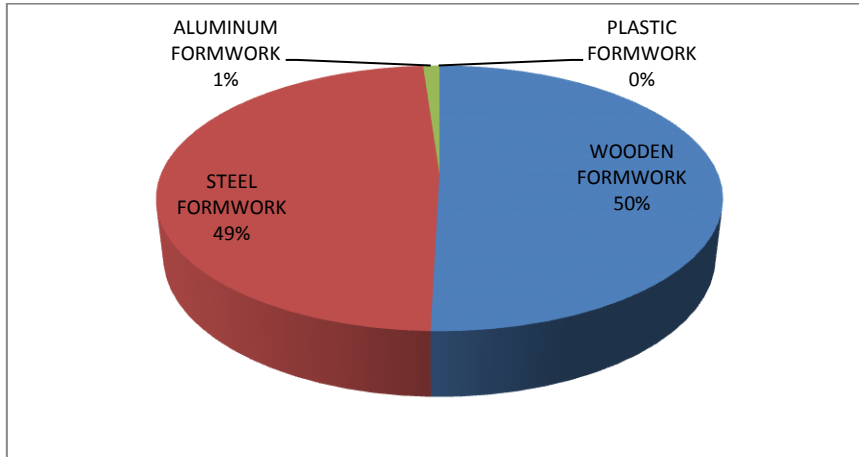
TABLE 2 TOTAL SCORE; MEAN SCORES AND PROPORTIONAL RATIO OF THE SYSTEMS IN Q.2

Factors	Scores	Means. Scores	Proportional ratio
Wooden formwork	181	1.5877	0.5041
Steel formwork	174	1.5263	0.4846
Aluminum formwork	4	0.0350	0.0111
Plastic formwork	0	0	0

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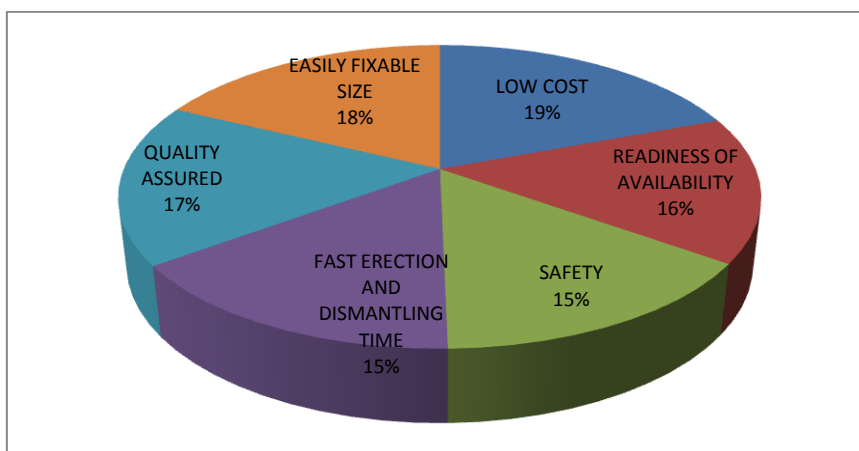
Graph 2: Proportional Ratio Of Different Factors Of The Systems

C. REASONS FOR ADOPTING THE MOST FREQUENTS USED FORMWORK.

D.

TABLE 3. TOTAL SCORES; MEAN SCORES AND PROPORTIONAL RATIO OF WOODEN, STEEL, ALUMINUM AND PLASTICS FORMWORK IN Q.3

Factors	Scores	Means. Scores	Proportional ratio
Low cost	266	2.3333	0.1928
Readiness of availability	214	1.8771	0.1551
Safety	205	1.7982	0.1486
Fast erection and dismantling time	211	1.8508	0.1530
Quality assured	237	2.0789	0.1718
Easily fixable size	246	2.1578	0.1783



Graph 3: Proportional Ratios Of Various Reasons In Choosing Formwork As The Most Frequently Adopted

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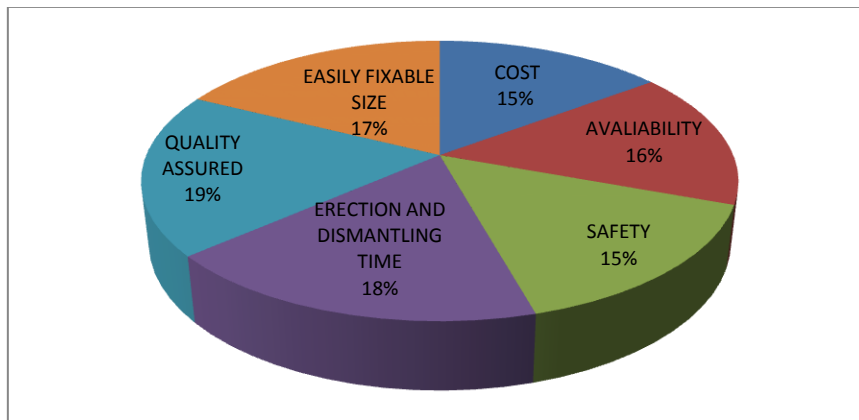
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*D.AREAS THAT NEED IMPROVEMENT MOST*

TABLE 4. TOTAL SCORES; MEAN SCORES AND PROPORTIONAL RATIOS OF DIFFERENT FACTORS IN Q4

Factors	Scores	Means. Scores	Proportional ratio
Cost	208	1.8245	0.1479
Availability	222	1.9473	0.1578
Safety	212	1.8596	0.1507
Erection and dismantling time	252	2.2105	0.1792
Quality assured	264	2.3157	0.1877
Easily fixable size	248	2.1754	0.1763



Graph4 : Proportional Ratios Of The Different Factors In Q4

*E.AT CURRENT STAGE, EASILY SUPPLY AS PER SUITABILITY OF LABORS.*

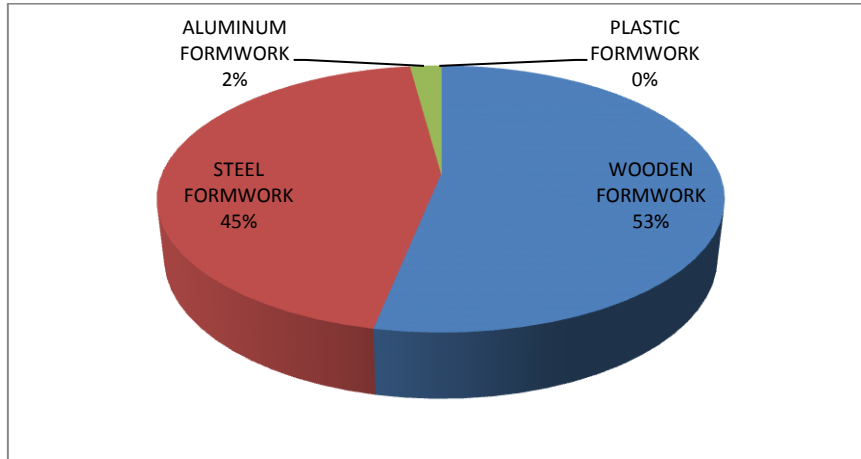
TABLE 5.TOTAL SCORES, MEAN SCORES AND PROPORTIONAL RATIO OF DIFFERENT FORMWORK Q5

Factors	Scores	Means. Scores	Proportional ratio
Wooden formwork	201	1.7631	0.5317
Steel formwork	169	1.4824	0.4470
Aluminum formwork	8	0.0701	0.0211
Plastic formwork	0	0	0

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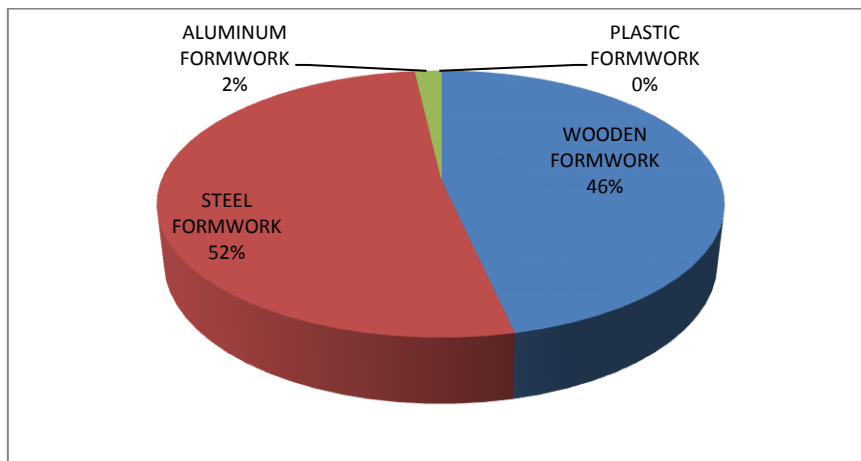


Graph.5 : Proportional Ratios Of Different Factors Of Q 5

## F. SUITABILITY OF FORMWORK DEMANDED BY LABOUR/WORKER

TABLE.6 TOTAL SCORES, MEAN SCORES AND PROPORTIONAL RATIO OF DIFFERENT FORMWORK IN SUITABILITY OF FORMWORK DEMANDED BY LABOUR/WORKER

Factors	Scores	Means. Scores	Proportional ratio
Wooden formwork	181	1.5877	0.4652
Steel formwork	201	1.7631	0.5167
Aluminum formwork	7	0.0614	0.0179
Plastic formwork	0	0	0
Others	0	0	0



Graph6 : Suitability Of Formwork Demanded By Labour/Worker

## VIII. CONCLUSION

Total 13 factors affecting selection of formwork were identified through literature study & experts opinion. As per population of stakeholder in district of South Gujarat region total 380 numbers of respondents were required. Due to time constraints, it was possible to distribute 227 questionnaires to stakeholders. This study received 227 responses.

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So, the response rate is 59%. Respondents were comprised of 114 contractors, 72 developers and 72 suppliers the collected data was analyzed through Relative Importance Index technique. The major conclusions arrived are: Erection and dismantling time is found at prime importance for the Adoption level of form work. 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 labour supply point of view. Steel Framework is at higher demand at labour level in at various suitability of construction. The observed constraints in adoption of wooden formwork (percentage wise) in descending order are difficulties in transportation (15%), Erection and dismantling and Quality measure (14%), life span (13%), No confidence and inaccessible to supply (12%) Cost and time factor (10%). The observed constraints in adoption of steel formwork (percentage wise) in descending order are difficulties in transportation (15%), life span (14%), inaccessible to supply (13%), Erection and dismantling and Quality measure and time factors, time factor (12%), No confidence and Cost (11%). The most observed constraints in adoption of Aluminium formwork are lack of confidence at implementation, cost factor as well as requirement of skilled labours. .

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