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 ijirset@gmail.com

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Investigation of COVID-19 Effect on Material Cost Used in Construction within Maharashtra State (India): Material Based Approach

Er.V.A.Patil, Mr. P.B.Shinde

Assistant Professor, Department of Civil Engineering, Dr.J.J.Magdum College of Engineering, Jaysingpur, India

Lecturer, DKTE Society's Yashwantrao Chavan Polytechnic Ichalkaranji, India

Abstract: Construction industry contributes majorly in world economy, whereas it is highly influenced by availability as well as purchase cost of construction material. As per cost optimization is concerned, it is very important to evaluate the impact of corona epidemic on the construction industry in Maharashtra state (India). As long as the economy is considered contractors must check the rates of material used for construction activities & overall construction cost can be revised and kept in front of clients. Price escalation plays crucial role in such cases. Building materials as a raw element contributes 40-50 % of total cost of project. In this paper the factor which affects the cost of project is studied. This paper focuses on the market survey in Maharashtra state (India) to prepare the cost comparison statement of post corona and pre-corona stage.

KEYWORDS: Epidemic, Construction Industry, cost comparison statement

I. INTRODUCTION

Various factors influence the cost estimation of a construction project. Preparation of a construction cost estimate for any project is a very complex process which consists of many variable factors. Every variable has to be correctly estimated based on proper study, past experience and research to calculate total project cost of construction. Many researchers worked on the precautionary measures on construction site, theoretical and explanatory research sharing the workforce issue [1]. This paper shed light on the price escalation in construction industry and relatively the increased rate of production of a building; in short, the expenses on material purchase will be studied and compared for concluding the effect on production cost of building at Maharashtra state.

II. OBJECTIVES

1. To identify the factors affecting construction cost of project
2. Investigate the market rates on construction site before and after corona
3. To compare the project cost considering the material price only

III. LITERATURE REVIEW

1. Ihsan Ali Husien, 2021 COVID-19: Key global impacts on the construction industry and proposed coping strategies, E3S Web of Conferences **263**, 05056, pp 2-4

The author states that supply of construction material and delay of project occurred due to Covid 19. Shortage of imported construction material affected all over the world. All the parties who participated in project have to undergo financial consequences for through the completion of work.

2. Apurva Pamidimukkala, 2021, Impact of Covid-19 on field and office workforce in construction industry, (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), Project Leadership and Society 2, ppno 5 August 2021, 2666-7215

The author states, due to material costs and difficulties that owners had making timely payments to contractors during the pandemic, cash flow delays became a major issue and negatively affected the delivery of materials, slowed productivity, delayed projects' progress, and sometimes even led to projects being suspended.



IV. METHODOLOGY

Detailed literature review was conducted to collect relevant articles by using different search engines such as Google Scholar, Science Direct, Scopus to study different factors affecting construction cost of a project before and during Covid-19, and further a keen market survey is carried out all the Maharashtra state (India).

3.1 Factors Affecting Construction Cost of the project-

1. Construction Material Costs
2. Labour Wage
3. Site Conditions
4. Inflation Factor
5. Project Schedule
6. Quality of Plans & Specifications
7. Regulatory Requirement
8. Size and Type of Construction Project

3.1.1 Construction Material Costs:

Construction material cost consists of material cost, shipping charges and taxes applicable if any. So, it is important consider all these variations while calculating construction material cost. [1]

3.1.2 Labour Wage :

Labor wages varies place to place. So, local wage rate should be considered in calculation. If the project has to be started after several months of estimating the project cost, the probable variation in wage rates has to be considered in the calculation.

3.1.3 Construction Site Conditions:

Project site conditions can increase construction costs. Site conditions such as poor soil conditions, wetlands, contaminated materials, conflicting utilities (buried pipe, cables, overhead lines, etc.), environmentally sensitive area, ground water, river or stream crossings, heavy traffic, buried storage tanks, archaeological sites, endangered species habitat and similar existing conditions etc. can increase the project cost during construction phase if these variations are not considered during estimation.

3.1.4 Inflation Factor:

A construction project can continue for years before completion. During the construction period, the cost of materials, tools, labors, equipment etc. may vary from time to time. This variation in the prices should be considered during cost estimation process.

3.1.5 Project Schedule:

Duration of construction project is affects the cost. Increase in project duration can increase the construction project cost due to increase in indirect costs, while reduction in construction cost also increases the project cost due to increase in direct costs. Therefore, construction project schedules also need to be considered during project cost estimation. [1]

5.1.6 Quality of Plans & Specifications:

Good quality construction plans and specifications reduce the construction time by proper execution at site without delay. Any vague wording or poorly drawn plan not only causes confusion, but places doubt in the contractor's mind which generally results in a higher construction cost.

5.1.7 Regulatory Requirements

Approvals from regulatory agencies can sometimes be costly. These costs also need to be considered during cost estimate.



5.1.8 Size and Type of Construction Project:

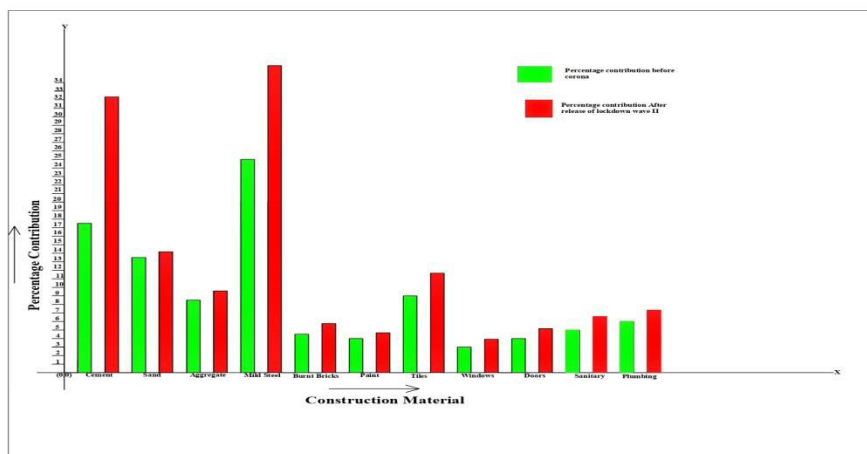
For a large construction project, there can be high demand for workforce. For such requirements, local workmen may not be sufficient and workmen from different regions need be called. These may incur extra costs such projects and also for the type of construction project where specialized workforce is required.[2]

5.2 Percentage contribution of material cost:

After detailed theoretical study of the factors affecting the construction cost of project, a market survey was carried out to check the variation of material cost after the release of lockdown at second wave. The table below gives percentage distribution of material occupying the project-

Sr No	Material Used For Construction	Percentage Contribution (%)
1	Cement	16.5-17
2	Sand	12.2-13.1
3	Aggregate	7.5-8
4	Steel	24.7-25
5	Brickwork	4.5
6	Paint	4
7	Tiles	8.1
8	Windows	3
9	Doors	3.5
10	Sanitary	4.5
11	Plumbing	5.5-6

Table1. Contribution of material in production process



Percentage contribution for construction material

After explanatory study of percentage contribution of construction material mild steel rates were taken from the local brands serving the Maharashtra state. The rates given below are in the form of cost comparison-



Size of Bar (mm)	Rs/Kg Before Corona	Rate/Kg after Corona
Tata		
6	67	83
8	65	80
10	64.2	78.5
12	64	78
16	64	78
20	64	78
25	64	78
Jindal		
6	58.5	62.7
8	56.2	60.2
10	55	60
12	55	60
16	55	60
20	55	60
25	55	60
Rajuri		
6	59.5	65
8	57.3	62.2
10	56	61
12	56	61
16	56	61
20	56	61
25	56	61
Maga		
6	54.7	65
8	49.5	60.7
10	49.5	59.5
12	49.5	59.5
16	49.5	59.5
20	49.5	59.5
25	49.5	59.5
Shirdi TMT		
6	55	62
8	53.2	60
10	52	59
12	52	59
16	52	59
20	52	59
25	52	59
Mahalaxmi		
6	54	64
8	51.4	61.2
10	50	61
12	50	60



16	50	60
20	50	60
25	50	60

Table2. Market Rates of Steel Bar before and After Corona Epidemic
(Note- Rates are taken from all the vendors all around the Maharashtra state)

Sr. No	Material Used For Construction	Percentage Contribution	
		Before	After
1	Cement	17.5	32.3
2	Sand	13.5	14.17
3	Aggregate	8.5	9.77
4	Steel	25	36
5	Brickwork	4.5	5.71
6	Paint	4	4.8
7	Tiles	9	11.7
8	Windows	3	3.9
9	Doors	4	5.2
10	Sanitary	5	6.65
11	Plumbing	6	7.28
Impact on project cost (%)		100	137.48

Table3. Percentage contribution of material rates and the relative growth before and after Corona Epidemic

V. RESULT & CONCLUSION

Market survey was carried out for all types of construction material used in construction process. From the market survey it can be concluded that presently the building production cost is rapidly increasing with the rate of 37.48%.

1. The table 3 clearly shows the **37.48%** of increase in the production cost of building including labour charges, equipment charges. (Date of market survey- 19 February 2022)
2. Cement, mild steel and plastic played crucial role in the cost of building considering the raw and final product.
3. The production cost of building per sq. Ft changed from 1200/- to 1600/- according to the present market rates. Location wise rate may vary.

(Note- conclusion statements are made on the basis of data collected during market survey and can vary for all locality and material brand.)

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1. Ihsan Ali Husien, 2021 COVID-19: Key global impacts on the construction industry and proposed coping strategies, E3S Web of Conferences **263**, 05056,pp 2-4
2. Apurva Pamidimukkala , 2021, Impact of Covid-19 on field and office workforce in construction industry, (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), Project Leadership and Society 2, August 2021, 2666-7215, ppno 5
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