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COST OPTIMIZATION THROUGH CONSTRUCTION WASTE MANAGEMENT

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Abstract - *Construction industry consume extensive amount of raw materials in the process and the output is obviously the product and most importantly the waste material. Construction industry also known as worst environment polluters. This study is to determine the use of waste management technique in creating sustainable waste management in order to identify the technique which has the most capabilities to reduce waste on site. The objective is to assess the waste minimization techniques taken from the 3R concept which is reduce, recycle and reuse. The most used waste minimization technique found in 3R concept would be the waste reduction. The study revealed that changes made to the design while construction is in progress, inadequate material management, over allowance, inappropriate and wrong storage facilities. The use of prefabrication of buildings element was thought to be very beneficial for waste reduction.*

***Key Words*: Waste reduction, Waste material calculation, permissible waste, actual waste, Waste comparison, Cost optimization**

1. INTRODUCTION

The development business is confronting difficulties, for example, low yield, nonattendance of master laborers, time and cost attacks, and so forth. These are significant waste makers in the development businesses. We will confront exceptionally enormous waste evacuation challenges in the coming ages. The fundamental issue with squander is cleaning and evacuating however according to present and future situation it will coordinate impact on complete estimation of undertaking and our wellbeing. Urbanization and relocation are significant purpose behind waste creation, if another example of waste decrease and reuse won't in requests. As a necessity to actualizing current development esteems, in which a significant exertion is on disposal of waste, it is critical to comprehend and measure the measure of waste really present in Indian building locales. This examination intends to explore the frequency of waste in Indian development industry. There is no Indian approach record which looks at squander as a feature of a pattern of creation consumption recuperation or sees squander through a crystal of generally speaking supportability. Actually, intercessions have been divided and are regularly opposing. The new metropolitan strong waste oversight rules 2000, which became effective from January 2004, come up short, even to oversee squander in a cyclic procedure. Squander the executives despite everything is a liner arrangement of assortment and removal, making wellbeing and condition dangers.

3R concept:

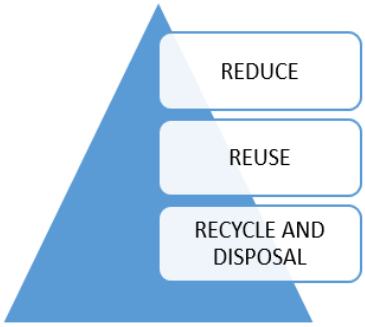

Fig -1: 3R Concept

2. OBJECTIVE

The objective of this study was to explore the following aspects:

- To minimize resource use.
- To focus on total estimation and cost.
- To reduce cost and time overrun.
- To reduce procurement cost
- To reduce Negative environment impact.

3. SCOPE OF WORK

To make the study more detailed, wide and achievable, surveys and study is limited within the defined boundary. The scope of study is limited to Ahmedabad city. Total plot area is 47,361 Sq.ft. type of building is residential which is located at Bopal, Ahmedabad.

4. RESEARCH METHODOLOGY

Following methodology was implemented to complete the research work.

1. Primary data was gathered by site visit and expert interview amongst many specialists like project manager, contractors, and builders.
2. Review of literature was done referring local and global research papers, reference books, construction journals.
3. Data analysis was done on the basis of the collected data. Calculating actual site waste and compare to permissible waste.
4. Declaring the results and conclusion from the analyzed data.

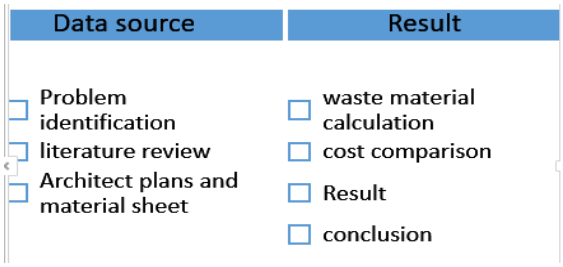

Fig -2: Research Methodology

5. PROJECT INFORMATION

Sr No	Description	
1	**Name of Project**	Sukirti Greens
2	**Type of project**	Residential
3	**Location**	Ahmedabad
4	**Basic Information**	5 Blocks (2 basement + ground + 11 floor + garden)
5	**Project Architects**	Design view Architects
6	**Structural Consultants**	Bhavin patel
7	**MEPF Consultants**	Vishal consultants
8	**Plot Area**	47,361.2058 sq.ft.
9	**Built up Area**	3,56,291 sq.ft (approximate)

Fig -3: Project information

There are a total 5 buildings. All blocks are 11 storied buildings. The activities considered such as flooring, reinforcement, brick work, concrete work, plaster work.

Materials	Price
Steel (Reinforcement)	40 rs/kg
Tiles	280-300 rs/pec
Cement	350 rs / bag
Bricks	4 rs / pec
Sand	700 rs / ton
Concrete (m 30)	3845 rs / m3

Fig – 4: Material and price list

Factor affecting for construction waste:

- Changes in structure and architects plans
- Changes in specification
- Quality of product
- Difficulty of detail
- Absence of information in drawing
- Imperfect documentation
- Lack of quality management
- Delay of inspection

No.	Construction stage	Expected major construction waste
1	Site clearance	Soil, rock
2	Sub-structure work	Reinforced concrete, steel bar, wood
3	Super-structure	Wood, steel bar, cement, sand, aggregate, bricks
4	Finishing work	Cement, sand, aggregate, tile, paint, lime
5	Infrastructure work	Bitumen material, timber, concrete

Fig -5: expected waste generate

6. DATA ANALYSIS

Here, after data collection by case study and site visit, the analysis to be done. In data collection, all information collected such as architect plan, material list and price. And also collect data through project manager and sr. engineer. After that calculate the collected data and compare with standard percentage which give in IS code and other literature, journals. Total five activities covered in data analysis such as flooring, reinforcement, brick work, plaster work and concreting. After find the actual waste of these activities. The comparison of the actual waste and permissible waste will be done for the different activities having different material. The cost optimization chart will be made using the data received from the comparison of actual waste and permissible waste. The following activities were taken.

- Flooring
- Reinforcement
- Brick work
- Concreting
- Plaster work

Material	Permissible waste (%)	Actual waste on site (%)
Tiles	5-7	10-12
Cement	1-1.5	2-3
Sand	2-3	3-5
Reinforcement	6-8	14-20
Bricks	8-10	13-15
Concrete	3-4	3-4

Fig -6: permissible and actual waste in %

- Now cost comparison between actual waste cost and permissible waste cost of all five activities.

Flooring work

material	Actual waste price (rs)	Permissible waste (rs)	Difference (rs)
Tiles	2,67,000	1,33,500	1,34,000
cement	5950	2540	3410
sand	4935	3300	1635

Reinforcement work

Actual waste price (rs)	Permissible waste (rs)	Difference (rs)
4,18,000	2,37,687	2,67,000

Brick work

material	Actual waste(rs)	Permissible waste (rs)	Difference (rs)
Bricks	2,96,358	1,69,347	1,27,011
cement	15,938	7,469	8,469
sand	14,900	9,991	4,908

Concrete work

Actual waste (rs)	Permissible price (rs)	Difference (rs)
1,39,983	76,900	63,083

Plaster work

material	Actual waste (rs)	Permissible waste (rs)	Difference (rs)
cement	7,700	3,850	3850
sand	5,262	3508	1,754

7. RESULTS

After find quantities of waste material, and compare with permissible waste cost we find optimized cost as follow.

material	Compared price (rs)
Tiles	1,34,000
Steel	2,67,000
Concrete	63,083
Bricks	1,27,011
Cement	15,730
Sand	8,297

Fig -7: optimized cost

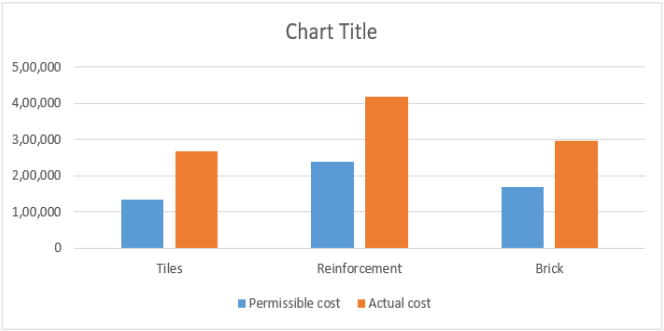

Fig 8: Graph of optimized cost

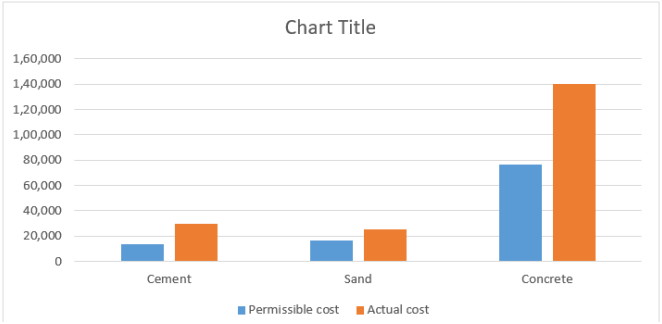

Fig 9: graph of optimized cost

8. CONCLUSION

From the study it is conclude that wastage of material in construction industries are usually because of documents, site management, procurement stage, material handling, and operational attributes. Mostly waste generates in case of design changes in structural plans and architects plans. Materials consists 50-60 % of total cost of the project. This analysis should be used in each and every construction project. It is very important as it gives the information about the waste occurring in construction projects and how to overcome it. Mainly this analysis work focuses on the cost optimization. The total cost of the project optimizes if we follow the above mentioned procedures and techniques to reduce the waste. This analysis will help to procure the right amount of material without being wasted.

9. RECOMMENDATIONS

By controlling and knowing the source of waste, it will be easy for one to schedule and plan that activity in such a way that wastage can be eliminated. This can be helpful for procuring any material in future, such that no unnecessary material is procured or stacked at site. Proper labour and worker will be employed who are aware about the methodology to use the material such that it crates the minimum wastage.

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