SITE LAYOUT PLANNING USING BUILDING INFORMATION MODELING FOR RESIDENTIAL PROJECT

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Abstract: Each temporary facility in a building construction project requires a particular space at suitable location. This helps to execute their functions efficiently. Inappropriate allocation of location causes a functional problem which results in a loss of productivity, safety hazards, and time delay. Therefore, the site layout should be considered one of the significant resource and constraints to manage at a construction site. One of the most important construction resources for long ignored is space, having equal position as other construction resources. In highly crammed sites, space becomes a very scarce resource, that requires careful planning. On the other hand, large sites having plentiful space, positioning of site facilities plays important role in increasing efficiency. There are n number of temporary facilities to be planned on a construction site. It is very important to understand the importance of these facilities. This could be well done by taking views of field experts and analyzing these by using descriptive statistics software Statistical Package for the Social Sciences (SPSS). Once the importance is understood the facilities can be planned well, using Building Information Modeling (BIM), in which a detailed site layout plan is prepared. This site layout plan helps in carrying out the construction work in a much planned manner. Due to this time delay is reduced and moreover productivity of labors increases.

IndexTerms: *Temporary facility, site layout planning, BIM, safety, SPSS.*

1. INTRODUCTION:

Construction-site layout is an important planning activity, the outcome of this is a detailed drawing of the locations and areas kept for the temporary support facilities. Temporary support facilities are diverse in nature but have the same common function, to support construction activities.They range from simple lay down areas to warehouses, fabrication shops, maintenance shops, batch plants, job offices, and labor residence facilities, depending on the size and location of the project.The impact of good layout practices on money and timereduction becomes more obvious on the larger projects.For preparing a site layout it is first necessary to know the importanceand shortlist the important temporary facilities. This is done by taking personal interviews of contractors, engineers, field persons etc. of diverse township projects in Nashik. Also an online questioner survey is carried out. The responses collected are analyzed in Statistical Package for the Social Sciences (SPSS).Using this information detailed site layout plan is prepared using Building Information Modeling (BIM).

1.1 Objectives of Study

- To identify the requirement of different temporary facilities which are necessary in a site layout.
- To recognize the factors that affect the site layout .
- To carry out a questionnaire survey to know the important factors to be considered and its analysis using SPSS software.
- To prepare final site layout by means of Building Information Modeling (BIM).

1.2 Methodology

The following diagram gives the detail work carried out with the sequence of the activities from starting to the end of work.

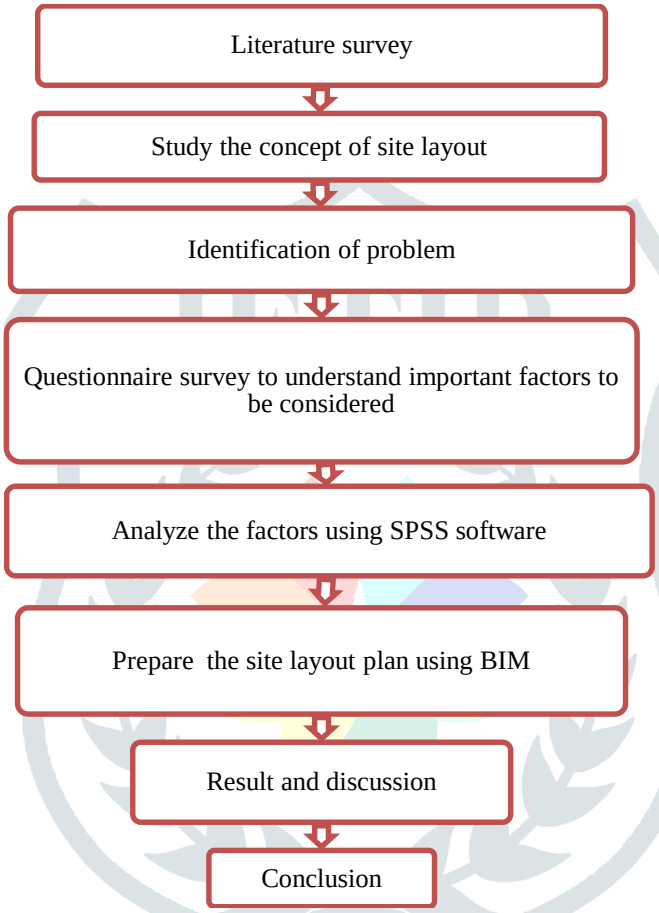

Figure 1 : Methodology of Study

1.3 Literature review

Factors that affect site layout are described [1] Different softwares used for site layout planning are explained [5] Ant colony optimization technique is used for layout planning. [8] Work space has been characterized by its purpose and transportability and suggests a framework planning for work space [15]. Site layout elements which touch safety and progress on construction site layout are discovered[19]. Propose an automated framework to create dynamic site layout models leveraging the BIM tools[23]. Presents the progress of an imprecise dynamic programming model [27]

2. DATA COLLECTION AND ANALYSIS:

1. A detailed list of temporary facilities using literature survey from different journals is prepared.

Table 1: Types of Temporary Facilities

Sr. No.	Temporary Facilities	Sr. No.	Temporary Facilities
1	Site Office	16	Welding Shop
2	Booking Office	17	Material Warehouse
3	Subcontractor Office	18	Labor Toilet/Bathroom
4	First Aid	19	Water Tank
5	Guard Room	20	Water Tank 2 (RMC)
6	Toilet	21	Parking For Machine
7	Staff Quarter	22	Central Steel Yard
8	Labor Quarter	23	Cement Go Down
9	Parking	24	RMC
10	Bar Bending Shop	25	Testing Lab
11	Fabrication Shop	26	Canteen
12	Carpentry Shop	27	School
13	Batch Plant	28	Nursery
14	Storage Yard	29	Weighing Bridge
15	Scaffolding Storage Yard		

2. Questionnaire survey is carried out using this data collection sheet

Table 2: Data collection sheet

Temporary Facilities	Not important	Slightly important	Moderately important	Important (…and so on)
Site Office				
First Aid				
Booking office				
Subcontractor office (…and so on)				

3. Sample of frequency table and bar chart for temporary facility cement warehouse.

Table 3: Frequency table for cement warehouse

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderately important	1	5.3	5.3	5.3
	Important	2	10.5	10.5	15.8
	Very important	16	84.2	84.2	100.0
	Total	19	100.0	100.0	

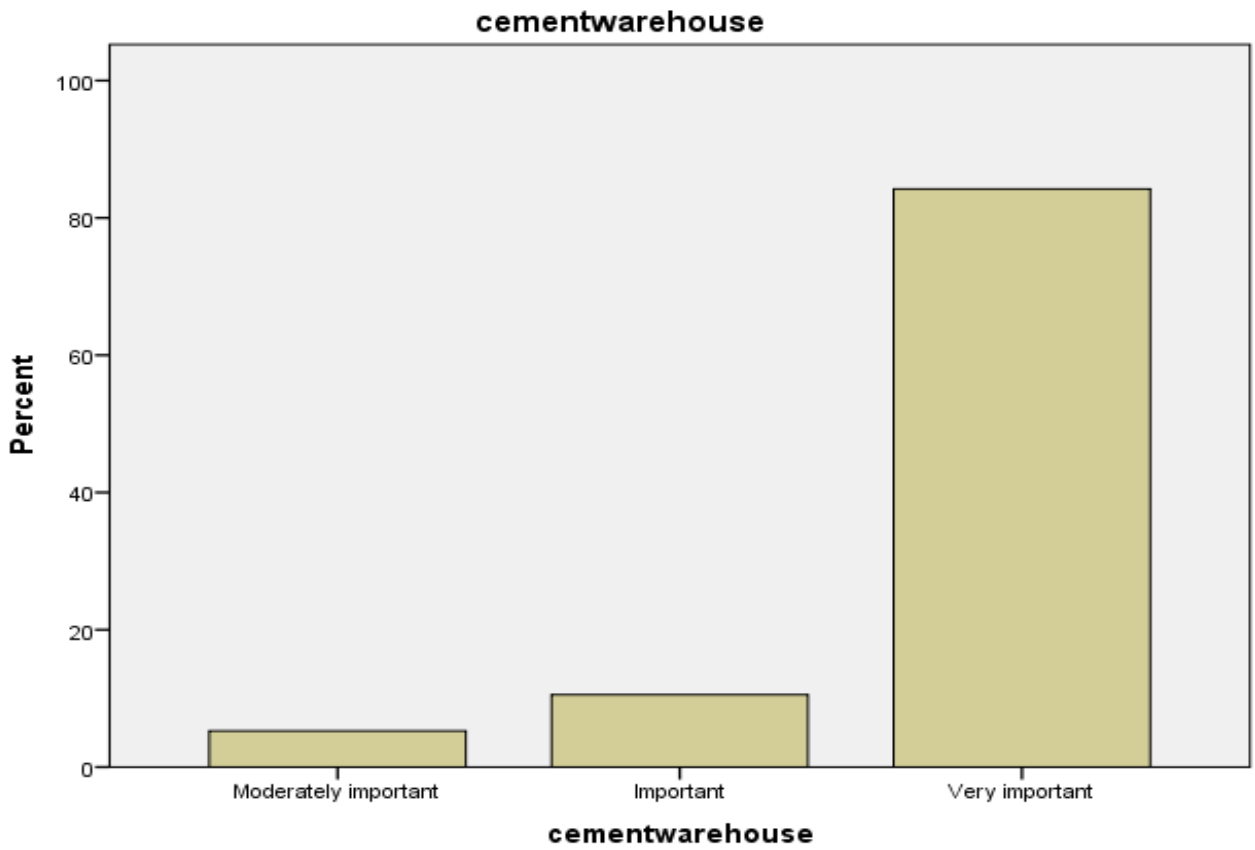

Figure 2: Bar chart for cement warehouse

3. RESULT AND DISCUSSION

The factors analysis is done using descriptive statistics using SPSS software and the ranks of factors are obtained according to their mean. The means are calculated according to their respective importance given by the respondents.

Table 3: Rank assigned to factors

Factor	Mean	Rank
Cement warehouse	4.778	1
Toilet	4.7222	2
Water tank	4.6111	3
First aid	4.3889	4
Labour quarters	4.3333	5
Bar bending shop	4.2788	6
Site office	3.6111	7
Aggregate storage	3.3889	8
Storage yard	4.1667	9
Guard room	4.0000	10
Material warehouse	3.8333	11
Parking	3.7778	12
Fabrication shop	3.6111	13
Booking office	3.6111	14
Staff quarter	3.5000	15
Testing lab	3.5556	16
Carpentry shop	3.3889	17
Scaff folding storage	3.2778	18
RMC plant	3.2222	19
Welding shop	3.0000	20
Weighing bridge	2.9444	21
Canteen	2.8889	22
Subcontractors office	2.8889	23

4. CONCLUSION:

- The temporary facilities are studied thoroughly. Requirement of each facility as per the requirement of site is studied.
- Important factors that affect site layout or which actually constitute site layout are studied. These factors whether absent or present affect site layout planning.
- Questionnaire survey was carried out by visiting residential township projects in Nashik. Project managers, contractors or site engineers were interviewed to get the responses. These responses were analyzed using Statistical package for the Social Sciences i.e. SPSS software, to calculate their mean values.

5. REFERENCES:

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