

Systematic Site Layout Planning

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Abstract— Each Temporary facility in a building construction project requires a specified space at the appropriate location. This helps them to execute their function 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 important resource and constraints to manage at a construction Site. Researchers have attempted to put together models that perform or assist planners in site layout planning. But all these models consist of complicated calculations and hectic process. This research presents a model that is designed on basis of contractor's experience. It's simple to implement and any new person in the field of construction industry can use this for his site. A case study is analyzed to illustrate the use and capabilities of the model in generating an optimal solution for site layout planning of construction projects.

Key words: Closeness Value, Systematic Site Layout Planning, Temporary Facilities

I. INTRODUCTION

The construction business has very high risks, which could lead to failure, come from the sensitivity of the business to economic cycles and from high level competition. As there are large numbers of contractors, it's easy to establish a new firm. Since, the entry into the construction business is easy; implementation could easily be poor and unorganized, which increase the probability of a construction company failure. As per the twelfth five year plan 40% investment share is given for infrastructure sector. That means there is going to be huge investment in construction sector. And lack of proper planning of construction planning can result in cost and time over-run.

Space is a major resource required on construction sites for accommodating various types of materials and equipment. Efficiently allocating this resource throughout the duration of a project is a critical concern for construction planners as it has a significant impact on cost, productivity and safety of construction operations

Neglecting site layout planning during the early planning stages can lead to unsuitable layouts that need correction. Correcting a mistake costs much more than preventing it in the first place. Considering the dynamic nature of construction projects and its direct reflection on site requirements in general further complicate the layout process

To overcome this limitation, dynamic models aim to reflect the changes in construction requirements and make more efficient use of space.

II. LITERATURE REVIEW

A comprehensive literature review has been conducted to establish a solid starting point to pursue the proposed study. The literature review focused on investigating and analyzing current practices or procedure for site layout planning in construction projects.

There are various models present in market for static and dynamic site layout planning of construction industry. By studying various types of model for site layout planning, it was noted that the model or theory used for constructing a solution are quite difficult. And as per Indian construction scenario, industry needs a simpler model that can be used for dynamic nature of construction industry. Systematic planning approach can be such method. But it had consider only static nature of industry.

III. METHODOLOGY

Any effective layout needs to start with an in-depth discussion of work relationship. In this case, the primary focus of the discussion surrounded the issue closeness. Each of the tasks is related to every other task in the site.

So, the first stage in systematic site layout planning is preparing relationship diagram. For this data required is,

- Type of temporary facilities required at site
- Closeness relationship between this facility

A. Type of temporary facility

Temporary Facility required at site should be determined according to the nature of construction project. For the huge construction site, RMC plant can be required which is not necessary for small scale project. So, accordingly temporary facilities to be required at site would be listed. Various type of temporary facilities requires at site are listed below. (Table 1)

Sr. No	Temporary Facilities	Sr. No.	Temporary Facilities
1	Site Office	17	Scaffolding Storage Yard
2	Booking office	18	Material Warehouse
3	Subcontractor office	19	Labor Toilet/ Bathroom
4	First aid	20	Water Tank
5	Guard room	21	Water tank 2 (RMC)
6	Toilet	22	Parking For Machine
7	Staff quarter	23	Central Steel Yard
8	Labor quarter	24	Cement Godown
9	Parking	25	RMC
10	Bar bending shop	26	Testing Lab
11	Fabrication shop	27	Canteen
12	Carpentry Shop	28	School
13	Batch plant	29	Nursery
14	Testing lab	30	Subcontractors office
15	storage Yard	31	Weighing bridge
16	Welding shop		

Table 1: Temporary Facilities

B. Closeness relationship between these facilities

Closeness relationship means the degree with which certain temporary facility is required to be placed next to another

facility at construction site. Site office and booking office should be placed to next to each other. That means degree of closeness is high among this facilities. On other hand, Booking office and labor quarter should be placed far away from each other. Hence degree of closeness is very low between these facilities.

The closeness value is based on following scale:

- 5 = absolutely necessary
- 4 = Especially Important
- 3 = Important
- 2 = Unimportant to be close
- 1 = Undesirable

For determining the closeness value between various Facilities, 10 experts having experience more than 15 years were interviewed and data was collected. The final closeness value is the average of corresponding data.

Then the final data would be grouped and analyzed in excel and dynamic relationship diagram would be prepared. With this diagram, one could easily study the interrelationship between various temporary Facilities. From this relationship diagram, facilities would be adjusted on the site layout plan.

IV. CASE STUDY

The Practical example is taken from the construction site named Suyojit Viridian Vallis, which is an integrated township located on 100acres. Site layout plan of this project is shown in figure. 1



Fig. 1: Site Layout Plan.

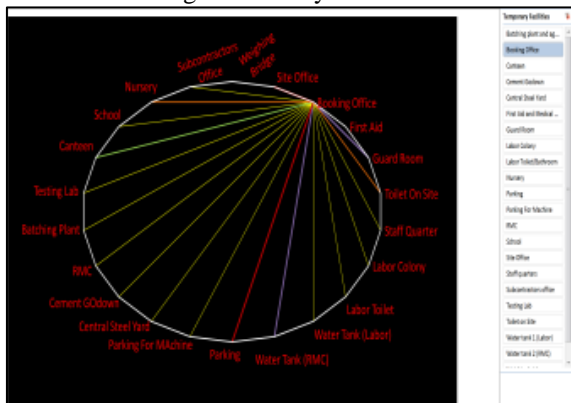


Fig. 2: Dynamic Relationship Diagram

By interviewing the contractor assigned for the project, the list of temporary facilities to be required at various stages of construction is listed down.

By studying the closeness value of all this facilities, the dynamic relationship diagram is designed on excel. (Figure 2).

Slider attached with graph enlists all the temporary facilities considered. By clicking on any of the facility, its relationship with all other facilities is shown by the graph.

Colour coding is given on the following basis (Table 2)

Sr. No	Description	Colour Code
1	5 = absolutely necessary	Red
2	4 = Especially Important	Orange
3	3 = Important	Blue
4	2 = Unimportant to be close	Green
5	1 = Undesirable	Purple

Table 2: Colour Coding

Using Relationship diagram, standard site layout plan is prepared. This layout can be imposed on any residential construction site and we can have a rough idea of facility location. (Figure No. 3)



Fig. 3: Standard Site Layout Plan.

The standard layout obtained is overlapped on the raw layout. Thereby; the rough idea of positioning of temporary facilities is identified. (Figure No 4)



Fig. 4: Initial Location Of Temporary Facilities.

V. RESULT

While constructing final layout, the boundary conditions and the required area of the facility is considered. As per site demand, Extra toilet near labor quarter and staff quarter is added. As water tank would be required throughout the construction period, it is placed at the corner so that it would not hamper the movement of men/material/machinery at the site. (Figure no 5)



Fig. 5: Final Layout Plan

VI. CONCLUSION

The systematic layout planning is a tool used to arrange construction site by locating two areas having more closeness and logical relationship with each other. The technique permits the quickest material flow on site at lowest cost and least time for handling of material. The temporary facilities are located accordingly for the easy flow of material.

Thus, systematic layout planning is a simple approach to having finalized site layout plan without any hectic calculation

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