

## RESEARCH ARTICLE

# Performance Evaluation of Construction Project in Erbil City by adopting Site Layout planning

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## ABSTRACT

In general, construction site management is planning, organizing, leading, directing, monitoring, and controlling overall construction activities, during the implementation phase, one of the key elements of construction site management is site layout planning, which is identifying, sizing, and placing temporary facilities within construction boundaries. It has got enormous influence on project parameters. The main aim of this study is to investigate Erbil's project's site layout performance. The study was carried out in Erbil, 16 projects have selected for assessment. From the result, it was found that these projects suffer from poor site layout planning, as there was a poor plan for construction facilities, the location of these facilities was wrong, almost, all projects have neglected safety-related issues and much more factors which have been discussed in the analysis section. As a solution, the researcher believes that the current site layout design of projects need immediate improvement, planning should be considered as priority for every single temporary facility during construction; safety basic should be implemented, including wearing PPE; labor accommodation should be improved; sanitation of the workforce should be good; and many other site layout elements should be developed.

**Keywords:** Construction facilities; Performance; Safety; Site layout planning; System

## INTRODUCTION

Management is a technical science or art of directing, organizing, and controlling people to achieve the organization's goals using resources (Oberlender, 2014; Cleland, 2006). Managing construction staff is known as construction site management which is establishing the most effective ways to implement construction process that involves various projects such as highways, bridges, buildings, and so on (Levy, 2007; Mulchay; Elbeltagi, 2012). The critical task of site management is site layout planning.

In general, site layout planning is one of the most essential elements in construction site management which Tommelein et al. defined as determining the required facilities for the construction process and identifying their shape and size, placing them within construction boundaries (Tommelein et al., 1992). Lambeck and Eschemuller emphasized that the triumphant key of the construction project is planning (Lambeck and Eschemuller, 2009). Cleland describes that after defining projects, one of the most critical questions facing the construction manager is what construction technique or method should be selected? (Cleland, 2007; Halpin and Senior). To be specified, construction site layout planning involves identifying, sizing, and placing temporary

facilities (TFs) within the boundaries of the construction site. These TFs range from laydown areas to warehouses, fabrication shops, maintenance shops, batch plant, and residence facilities.

Many researchers stressed that one of the crucial factors that influence projects in positive ways to have high quality, more productivity, and safe work environment is having appropriate site layout plan for TFs (Hegazy and Elbeltagi, 1999; Elbeltagi et al., 2001; Elbeltagi et al., 2004). Having a good strategy of planning site layout leads to improve efficiency and effectiveness of the project by improving project performance generally, including increasing profit, reducing time, and increasing productivity.

## PROBLEM STATEMENT

Detailed planning of the site layout and location of TFs can enable the management to make considerable improvement by minimizing travel time, waiting for time, and increasing worker morale by showing a better and safer work environment. Unlikely, poor site layout planning leads to many severe problems for instance material stacks wrongly located, this problem may involve double or triple handling of materials to another location (too far, impede flow, too remote from hoists, etc.), equipment wrongly

located and this might be unreachable or insufficient. Due to its importance, this research focuses on the site layout planning problem. Planning should be in detail which includes site safety control, access routes to the project, and parking areas for mobile equipment that will be used during construction, lay-down areas, storage areas, and so on for both the general contractor and all of the subcontractors.

KRG construction industry suffers from poor site layout planning due to many reasons. The first and most important factor is neglecting or having an impoverished site layout plan at the beginning of the project. It is sporadic to see a project to have a professional strategy before starting the projects. Lack of good yards and storage another issue which faces many construction sites in KRG, exact locations for storages must be selected in planning stages.

There are many other issues such as lack of information signs, accommodations, water supply, and sanitation. In contrast, in KRG, site layout planning is almost ignored in every situation, the above reasons alone enough to encourage the researcher to evaluate the performance of projects in respect of site layout planning and recommend reasonable statements to improve them, to find out the weakness in KRG's site layout planning and improving them, the following objectives were set:

1. Overview of site layout planning in the construction industry, in brief.
2. Investigating KRG's site layout planning performance.

## METHODOLOGY

The methodology of this research is based on exploring literature review and site visiting. For the resources exploring, many papers, books, and international conferences have been studied to get the answer of objective one. On the other hand, 16 major projects have been selected in Erbil, they were investigated to evaluate their site layout planning's performance, and the research steps have been listed below:

1. Forming research groups (25 engineer student groups from forth stage, Civil Engineering Department, TIU).
2. Selecting 16 projects from Erbil based on the budget size and capacity building criteria.
3. Five scales provided to indicate each element's performance level, which included non-exist, very poor, poor, good, and very good.
4. Visiting site for collecting data.
5. Analyzing data and result from discussion.

About 150 civil engineering students have participated in data collection, and three researchers have analyzed the data

under the supervision of a senior professor. The common elements of site layout planning have been selected for data collection, each element was given five scale to indicate its performance condition. The scales designed to be: non-exist, very poor, poor, good and very good.

## DATA COLLECTION AND DISCUSSION

### Part One: Site Layout Elements

To get the first part of the objective of this study, the results were imported from pieces of literature, including exploring books, scientific papers, and scholars. The most common and key elements of site layout planning have been summarized below:

- Safety: Fire prevention, first aid kit, and personal protective equipment are a must and shall be available at every project (Guidline, 2012) (CINTAS, n.d.).
- Site Accessibility: Having right road and proper accessibility plan can decrease the accidents' chance (Kynyn, 2011) (Lin et al., 2113).
- Information Signs: Site map: Project-related information shall be included in the site map and displayed at the entrance gate.
- Display of labor relations' policy and safety rules: This is used to control over construction crew and avoiding any disputes among labors (Cleland D. R., 2006).
- Security: Entrance visitors can be tracked and controlled in the entrance point and also people from the public are not allowed to enter the project. Fencing: All the boundary around the project should be fenced for security to prevent theft or vandalism of construction equipment, materials or the work in progress, however, it can also be to protect people from getting hurt while construction is underway (LeValley, 2016)
- Accommodation: A reasonable accommodations must be provided for those who involved in the project, especially in the substantial projects.
- Offices: It is a must to have offices before constructing the project, offices must be close together, away from the noisy zone, located in the safe area, have proper office equipment, and so on.
- Water supply and sanitation: It is essential to have water and toilet facilities in convenient locations to accommodate the workforce (OSHA, 2011).
- Material Handling: Appropriate plan and using sound equipment and tools for material handling lead to avoid multiple handling, which reduces loss, reduce wastage, save time, and improve project performance.
- Storage: Proper plan for storage areas, decrease or avoid multiple movements; it is mainly prepared by the project manager.
- Laydown areas: It is for delivering and storage of large equipment and material, such as tracks and shovels

and other big machines; it can be used for long-term or short-term.

- Warehouses: Warehouses are facilities that provide a proper environment to store goods and materials that require protection from the elements.
- Material staging areas: Areas are reserved temporarily for short duration and usually located nearby the construction zones.
- Site cleaning: It is essential to have a cleaning program for the construction site that all debris, scraps, wastage of materials must be removed regularly during construction or repair process. All work area, stairs, passageways, and the road must be routinely cleaned (Muiruri & Mulinge, 2014) (Young, 2010)
- Craft Change-Houses: Another vital element which improves the morale of staff is Craft change-houses, which give them a space for change and store clothes.
- Batch plant and workshops: In case of a large quantity of concrete, having batch plants on site which it is more economical to produce concrete rather than to buy.

## Part Two

Assessing site layout planning aspects, the selected projects were inspected based on some criteria, as shown in Figure 1. Five scales were set for evaluation purposes to indicate the site layout's elements performance.

In general, site layout of selected projects is weak, as it did not follow standards and the lack of having qualified people

in the field of managing projects. For further detail, about the evaluation process and discussion, see below points.

- Beginning with PPE, overall performance was very poor, as 50% of the total have not provided any PPE which is a must, based on standards.
- Craft changed houses are scarce, while only 12% of projects have inferior quality. Similarly, accommodation of construction craftsmen in terrible conditions, as only 25% is in a reasonable environment.
- Information signs, storages, and site cleaning are among those elements which are not considered during site layout planning, or they are planned improperly, for instance, none of the important signs were available in the project and even guiding signs were not available on the road to the site plus, the dangerous places were not provided with warning signs, for further detail see Figure 1.
- However, there are some strong points in those projects; the security of projects was planned very well before the beginning of the works, as the entrance gate provide enough security guides and lighting provided to all required areas. In short, as observed, several elements are planned incorrectly ways, such as offices, material handling, water supply, and sanitation.

## CONCLUSION

To sum up, site layout planning is about locating and identifying required facilities during the construction phase

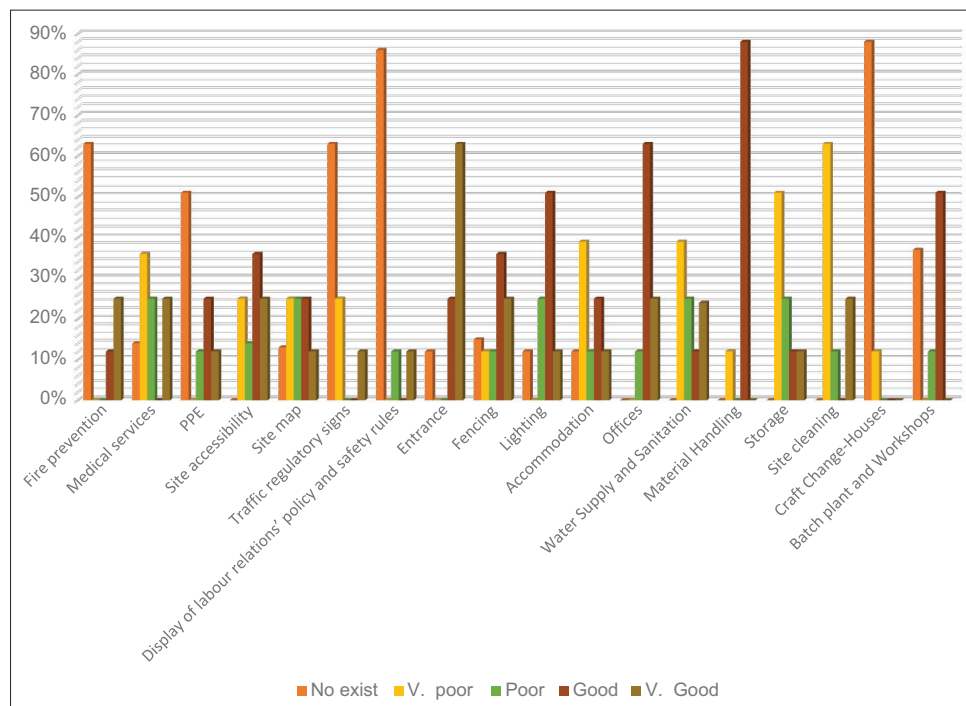


Figure 1: Site layout planning elements performance of selected projects

of the project. Is it a key point of accelerating project progress, as it directly affects the project's time, quality, and cost. The researchers have summarized site layout planning in the 12 most common and essential elements, as it has been mentioned in the literature review.

Another part of this study was evaluating Erbil's site layout planning performance by selecting 16 biggest projects in Erbil, as a case study. From the study, it was found that the performance was abysmal, as it needs urgent improvement by taking account of the ones which are not appropriately planned or not exist in the project which impacts KRG's reputation strongly, as well as projects productivity.

To be clear, it is infrequent to see projects having information signs, particularly safety rules and signs at the worksite. Accommodation of labor in deplorable condition, there is not any system of having a good housekeeping plan and many other issues. As a solution, it is recommended to have an excellent site layout planning before the starting job and have followed up the system of the worksite to improve all necessary TFs. As a solution, based on the literature of this study, many reputed references, and writer perspective, having proper site layout plan and taking account each element separately with full layout detail will directly improve KRG's projects' performance significantly, as it will increase productivity, improve quality, and reduce cost.

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