

EXAMING THE PRACTICE OF MANAGEMENT ASPECTS AND MAINTENANCE IMPLEMENTATIONS OF WELFARE FACILITIES IN IRAQ'S CONSTRUCTION INDUSTRY

Zaid Mohammed Hatem^{a*}, Abdul Rahim Abdul Hamid^a, Ogundipe Kunle
Elizah^b, Abdulrahman Zahid^a, Ahmed Allawi^a, Yousef Almthalee^a

^aSchool of Civil Engineering, Faculty of Engineering, Universiti Teknologi
Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

^bCovenant University, KM 10 Idiroko Rd, Ota, Nigeria

Article history

Received

15 December 2020

Received in revised form

20 March 2021

Accepted

26 March 2021

Published online

30 July 2021

*Corresponding author
mhzaid@graduate.utm.my

Abstract

The Iraqi construction industry has many problems, especially when it comes in terms of coordinating and managing welfare facilities for the construction project. Proper managing and regular maintenance of welfare facilities is a task divided between official parties in charge of safety and health, mostly the contractors, clients, managers, and work-force. The need for safe work conditions that seem very much lacking in the Iraqi construction sites. This research examines how effectively management is mainly conducted within construction welfare facilities in Iraq's construction industry. Using a quantitative methodology for collecting and analyzing data in accordance of the listed objectives, A questionnaire survey was administered to experienced engineers (58) that are involved in the construction industry for investigating the keys causative in management and maintenance aspects. The data was analyzed and interpreted using SPSS-12. Most of the analyzed results were classified as important and very important, but some awareness was missing related to planning and inspection. Finally, the interpretation illustrated that the awareness of management and maintenance of welfare facilities are in need to be more studied within the scope of worker's productivity, health, and safety.

Keywords: welfare facilities, construction project, management, maintenance, Iraq

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1.0 INTRODUCTION

Malaysia is working actively towards achieving a high-income. The increasing demand for construction services and supplies requires the overall growing construction industry to provide the vital needs for site welfare facilities to be incorporated into the construction process, especially concerning the worker's health and well-being (HSE)[1]. Moreover, the nature of work in the construction industry is commonly considered dangerous and hazardous, consequent to the amount of excessive and sophisticated construction labour work, which differs widely with the environment of the project [2]–[4]. The construction industry is mainly known as labour-intensive, besides the fact known as most of the labourers are unqualified and unskilled for such works. Ironically, even though the construction sector has been providing continuous employment for a broad category of the Iraqi population, yet, little efforts have been put to correctly and extensively educate contractors and managers on the vital aspect of welfare facilities on each project. Not to mention, that suitable and sufficient welfare facilities on construction sites can have a crucial effect on the

productiveness of workers and the return on the project [5]. It can also result in the low output as well as the loss of profit when workers are disappointed in with insufficient facilities. Welfare facilities in Iraq have not been adequately taught in all associated construction institutions that are facing challenges every day. The role of management is neglected in all the essential parts that can have a crucial impact on industry requirements leading to a gap between academic and practical knowledge regarding construction management in terms of occupational safety and health administration [6].

The Iraq construction industry is facing a considerable challenge from the communities to improve their productivity, value, and quality. This is because the construction industry has been seen as the highest in-demand industry [7]. The problems that could occur due to the management and maintenance such as delay overrun cost, and the adoption rate is still slow, the production of the low product quality the intensive worker still using old methods of running and managing the project. This is happening because in dealing with the complex project and involves many parties that should drive the development and adoption of new ways and implantations of technical

solutions to address this low productivity rate[8]–[10]. Little interest has been conducted in terms of practical, research studies, reports, and basic academic tutoring on the crucial aspect of health, safety, and environment in Iraq leading to disregarding the critical feature of applying management roles and maintenance inspection in most construction projects [11]. In fact lack of useful reports have yet to be represented or allocated for the public institution, especially from the ministry of construction, housing, municipalities, and public works (Iraq) Hence, all large-scale construction projects are at the realistic possibility of experiencing hazards, accidents, and ongoing health issues at the workplace, unexpected conditions, and unpredictable insignificant worker's performance [10,12]. This research extends the capabilities of a spreadsheet model initially designed for welfare facilities management to include the role of management and maintenance for welfare facilities on the construction site. While several efforts in the literature attempt to solve individual sub-problems of welfare needs such as (satisfaction of workers, factors leading to inadequate welfare facilities, awareness on the regulations), little effort has been made to achieve the overall role of optimization of the management and maintenance [14], [15].

To fully understand welfare facility practices, comprehensive knowledge on the nature of work in the construction industry that is commonly known as risky and dangerous, furthermore, the building and construction industry activates or services are known to be depending upon the quantum of work, which generally differs with the nature of the project [12]. The type of work is highly labour-intensive and sophisticated in this industry, and most of the workers are not skilled and trained. Consequently, even though the industry has been creating employment for a large section of the Iraqi population from time to time, so the workers in this sector are neglected when it comes in facing everyday health and safety challenges, most of them are struggling with health issues they expose themselves to on construction site [3, 11]. With the challenge of limited and constraints space on the project layout, especially in urban working construction sites that are mainly known for continuous construction and development. With the chronical management design of construction layout that is part of the pre-construction plan to make use of available space on the project [1]. Thus, this process will cater to an exemplary aspect for the safety and health of people who may and additionally seem like challenging to reconcile with productivity. Proper making plans with the aid of management is a crucial part of preparation and budgeting for the secure and efficient running of a production operation. Welfare facilities can even turn to have negative impacts on the work-force if they are not adequately provided and maintained in an appropriate state. Failure to plan the required and necessary site welfare facilities is a top reason for operational inefficiency and might affect the overall cost of a project notably. Inside the absence of a precise site welfare plan for maintenance applications, many issues may additionally affect the whole management and maintenance program secured for the well-being of the construction workers located in many characteristics' construction sites in Iraq [3].

To examine the management roles and maintenance implementation of welfare facilities in the Iraqi construction sites and to recommend a practical solution for any leading mismanagement that affects the flow of the work for the construction site. The research evaluated the current situation

of the management and maintenance of welfare facilities on the construction worksites and how it impacts based on the standards that are enlisted in many codes of practices in developed and developing countries (CIDB-MS-2015, HSE-4th Edition, OSHA-2018-3021-06R, ILO-1956-No.102) as a reliable benchmark [17]. The study mainly focuses on different locations in Iraq, such as Baghdad, Karbala, Najaf, and Irbil. There are different construction sectors some of them are public and private international companies, for example, Inpex, Shell, Sumo, and their primary interest is in the oil, gas industry and the infrastructure of the country, the research mainly focuses on the response of professional expertise is in the construction site. They are at the top management of the construction project having direct effect and responsibility on the site[12]. The research considered welfare services such as the provision of clean drinking water, washing water to clean any dirt or remnants of the construction works, clean and places to have accommodation for sleeping, rest-rooms and shelter, facilities for preparing and consuming meals, temporary housing, and help in transport from place of residence to the work of the construction site and back. It further focused on the condition, adequacy, and management that are enforced by law according to the codes of practices to protect the worker's well-being on construction work sites. This study is significantly important because it creates an understanding and appreciation of the importance of management and maintenance of the welfare facilities on Iraqi construction worksites as well as emphasizing its relationship with productivity, satisfaction, and effect on the construction projects. This research will tend to investigate the level of satisfaction with construction site welfare provisions towards addressing the problem of poor welfare facilities on Iraqi construction sites. More so, this study is unique because it reveals and examines for the first time in Iraq's history the mismanagement of welfare facilities on Construction worksites and their consequential implications on the challenge of delivery. This in turn will assists to present to the stakeholders with crucial statistics wanted in dealing with troubles on employees at the welfare.

2.0 LITERATURE REVIEW

2.1 Construction Management Definition

Construction management is a professional service that provides a project's owner(s) with effective management of the project's schedule, cost, quality, safety, scope, and function. Construction management is compatible with all project delivery methods. No matter the setting, a Construction Manager's (CMs) responsibility is to the owner and to a successful project. Researcher stated that the construction site work-force needs to be supplied with good enough welfare facilities; however, these necessities are frequently neglected. The provision of welfare facilities affects the labours and may be pricey if workers are upset. Exact welfare facilities have a worthwhile contribution to the health and well-being of construction labourers and work-force[18]. Managing and planning for welfare facilities has been establishing in many developed construction industries around the world, is considered to be one of the crucial aspects to be deemed because it can have a direct effect on construction workers'

productivity, inconsequently, can be interrelated to the effect on completion of construction projects at a high standard.

Managing and preparing for welfare facilities has been initiated and recognized officially in the early 1950s in the much-developed construction industry around the world. It has considered being one of the necessary components to be respected because it can be regarded as an essential element related to the direct importance on construction works productivity; moreover, welfare facilities can be interrelated to the consequence represented in the final results (cost, time, quality, safety, and environment) of construction projects at great integrity [19]. According to [20], one of the management schemes is project risk assessment and mitigation that are vital and important to measure the potential risks that are introduced daily; also, post risk mitigation is by establishing a secure procedure for preventing any danger on construction workers. Moreover, establishing and managing welfare facilities is considered as of the proper techniques used in planning for a large scale construction project, so that corrective solutions can be made to meet the health and safety

requirements [21]. The effect of mismanagement for the owner can cause the following problems, losing revenue of the construction project, inflation, increase of workers' remuneration, and price of materials and raw materials for completion of the project, etc. While for contractors, construction delays refer to top prices, long work length, high labor costs, materials, and redoubled instrumentation refers to prices, etc.[19]. The construction site is always facing factors that could affect the management aspects, which will have a direct effect on the construction workers. Generally, the origin of the delay includes teams involved in the project, available resources, environmental conditions, interference of third parties, and contractual relationships [6]. Figure 1 shows the main factors related to the whole process and results of construction project, yet its not limited to the mentioned factors in the figure it extends to more factors from major and minor effects all shape the outcome of the construction project as explained by previous studies [22], [23].

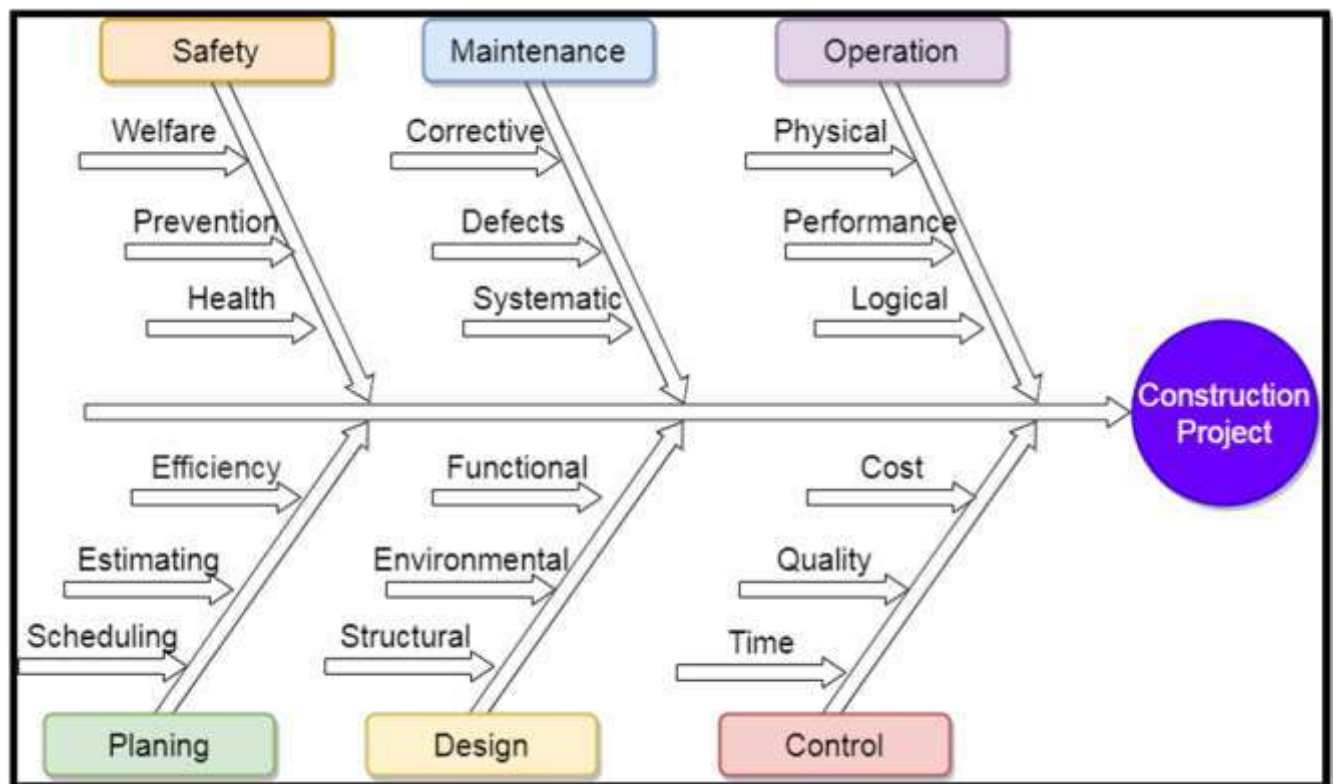


Figure 1 Construction project management aspects

2.2 Construction Safety Management

Managing and controlling occupational safety and health for a construction project can be a difficult task, also, maintaining stable and efficient productivity of construction labours is even a more significant challenge [24]. Nonetheless, various welfare facilities resource management is intergraded with construction workers on the site that have been analyzed, such as time, resource, quality, and cash flow management [25].

These resources are applied in succession to a project rather than leading to failing the whole project by protecting and keeping workers in full health and safety. Many practical ways and implementation has been developed and interpreted on actual practical systems of management that make sure that the officials responsible for large scale construction projects (business owners, managers, and supervisors) can manage the construction project without any struggles. The importance of providing welfare facilities to workers in construction sites is

laid against the backdrop of the overarching significance of welfare facilities and services to other workers in their workplaces. Therefore, workers that are well prepared for through welfare provisions, will perform their duties to the best of their abilities. The welfare of workers should be a priority at any point in time since it will encourage and boost workers' competence and effectiveness, reflecting the organizational commitment. One of the essential investments in the world are in construction projects which are the of the essential for all growing countries, where construction projects are always in demand and required; also construction projects are one of the primary income resources of money in many countries, and Iraq is one of this country [20], [21]. A final solution to the complicated nature of projects, will includes creating models for all the factors combined, and the lack of ability of standard optimization methods to remedy large-scale problems, among the constrained efforts that focused on typical management and maintenance optimization using practical solutions to these problems. Construction workers or employers that are using the facilities should be easily and comfortably do so in a smooth and accessible condition that will assure no damages to the services provided, the place or locations of services that are supplied in every other premise near close to the site.

2.3 Construction Safety Practice In Iraq

Even with the importance of the construction and building industry, its unfortunately notorious known for being one of the most neglected industries in Iraq, with the majority in control of little experience contractors or subcontractors responsible for managing most of the construction projects. The work in the construction sector is most hazardous and vulnerable because of poor employment conditions characterized by way of its informal nature, the brief relationship between company and employee, unsure working hours, lack of primary services, and inadequacy of welfare facilities[2], [11], [22], [23]. Contractors in Iraq regularly disregard the fundamental necessities for welfare services. These unique characteristics of the construction industry make it challenging to implement labour welfare measures compared to other industries. The construction industry is an important industry and sector in every country; the temporary place for the workers during their stay and from one construction site to another, working in harsh situations and living in unhygienic conditions thereby; suffering from occupational severe health issues and are vulnerable to illnesses. In Iraq, with unique cultural practices and perceptions, engineering companies' policies drive individual perceptions and satisfaction. In other words, Iraq does not have its specific code of practice and regulations, so for the most of the construction companies uses other countries code of practice especially foreign companies working in the construction industry, for example, the impanation of Occupational Safety and Health Administration (OSHA), Health and Safety Executive (HSE) and International Labour Organization (ILO)[24]–[26]. Nevertheless, the requirements of required practices to facilities have to be maintained employing persons using maintenance apparatuses[21], [26]. Site preparation for monitoring and running the welfare facilities provision, preservation, and use of humanitarian services have to be prepared and organized in entirely.

In the context of this policy, maintenance is defined as production on constructions present offered with the expanse of returning to the actual state of the preferred distinct holding more inclusive or negligence degeneration reestablishing emendation performance in peculiar parameters succeeding elements, after their financial routine course with innovative engineering equivalents arranging interim improvements for indispensable assurance health, and reasons protection (e.g. after a fundamental constructing breakdown). Decrease of the disciplines of natural trouble evaluating structures for obligations preservation, e.g. to realize indisputable and accurate details of the functioning situation, physical and including hazard and financial purpose of maintenance [13], [27], [28]. Maintenance upgrades and upgrading helps to grant extra or new service functionality or feature upgrading to meet new statutory necessities major refurbishment and replacements to extend the useful existence of the constructing restoration of the whole constructing to operational circumstance after complete or close to the whole failure such as emanating from natural hazards act performed beneath guarantee or defects statutory engagement session operational assignments to facilitate occupation and apply, e.g. cleansing, safety, waste management) Quantity of services, e.g. power, water, and telecommunications[3].

2.4 Effective Factors of Construction Maintenance

Welfare facilities may be categorized beneath sorts namely; intra-mural, additional-mural and intra-mural activities include facilities provided inside the working area or sites and it consist of sickbay, the supply of "water, rinse and washing amenities, changing rooms, canteens, provision of safety measures", services which aid in improving the circumstances of production, and so like. Greater-mural liveliness consists of the amenities and aids fitted outside the construction locality or operations consisting of residence accommodation, indoor and outdoor rest facilities, instructional buildings, etc. Table 1. The rules and regulations state and advise that the minimal welfare facilities required to consist of sanitary conveniences, washing facilities, drinking water, changing rooms and lockers, facilities for rest [17], [26], [28], [29]. The pre-eminence of maintenance is always crucial because all the needs of the workplace and the equipment, devices, and systems must be in accordance to the standards and regulation that must be applied all the time to be maintained (including cleaned as appropriate) in an efficient state, in efficient working order, and good repair. An 'efficient condition' or in other words indicate that the workplace and the equipment, gadgets, and structures stated in these requirements and rules have to be free of faults likely to have an effect on the health, protection, or welfare of workers and supply an adequate level of hygiene. If a doubtlessly dangerous defect is discovered, the defect should be rectified at once or steps need to be taken to protect anyone who would possibly be put at danger. Equipment that should fail and put employees at danger has to be correctly maintained and checked at regular intervals, as appropriate, through inspection, testing, adjustment, lubrication, restoration, and cleaning. Any faults ought to be right rectified as quickly as possible. Action must be taken without delay to isolate and rectify the fault where there is a danger of serious or imminent harm[1], [3], [4], [8], [10], [18], [19], [30]. Wherever the deficiency begins not to act a fulmination though presents the

equipment inadequate for the application, for illustration, a not function bathroom, it may further comprise considered without

of service till it is restored or replaced in Table 1.

Table 1 The major effective factors of maintenance

No.	Maintenance	[20]-[38]	[31]-[32]	[11]-[32]	[7]-[26]
1	Repairing pneumatic systems	✓			✓
2	Replacing faulty electrical circuits		✓		
3	Maintaining boilers			✓	
4	Inspecting restrooms and other areas			✓	
5	Heating and air conditioning system				
6	Lack of first aid kit	✓		✓	
7	Safety equipment's repair and refurbishment				✓
8	Diagnosing mechanical issues	✓			
	Total	3	1	3	2

2.5 Effective Factors of Construction Management

Many scholars elaborate on-site welfare facilitates management and planning practice, which includes identifying sizes and places of temporary facilities, which will have excellent outcomes at the project valuables of safety, cost, time, and productivity of work-force and labours[33]–[36]. Thus, extensive studies by governmental and private agencies in safety, health, and environment have been undertaken to enhance the effectivity of making plans for the construction welfare facilitates layouts. Most models and programs developed for this extend always overlooked the impact of facility measurement on project value and continuously tried to enhance practicable models to embark and shift the enormous impact of site welfare facilitates variables (i.e., construction site resources and properties) into effective programs such as production [8], [17]. In this undertaking, there are numerous demanding situations and problems due to the fact their limitations and valued buildings, tree, plants, sidewalks, and so forth., which ought to be taken into a physical problem on the construction project [37].

There is a continuous cycle of needs and demands to assort with management tools of construction-site welfare facilitates carefully and make it most efficient and effective for positive results. Before construction work starts, the availability and adequacy of welfare facilities, their location on construction sites, and how they may be maintained and operate are taken into consideration on the design and planning during pre-construction and progressively with each phase of each construction activities and services on site. According to world-recognized safety and health organizations (HSE, OHSA, ILO, CIDB, MS,)[19], [29], [38]–[40], before construction works kickoff, it is usually standard practice and consideration that maximum contractors and sub-contractors supply sufficient welfare facilities for its operatives and coordination. Table 2 list the important factors or aspect of managing welfare facilities is adequate regarded and a well-planned management program that integrates all elements and potential challenges that can occur. These aspect are considered in developing and developed industries around the world within the context of construction management and safety practice for various types of construction projects.

Table 2 The major effective factors of management

No.	Management	[9]-[20]	[32]-[41]	[37]-[44]	[19]-[36]
1	Delivery and storage of materials and components.		✓		✓
2	Overcrowded work areas	✓		✓	✓
3	Location and use of plant and equipment	✓	✓		
4	Health and safety responsibilities			✓	
5	Planning of welfare facilities	✓			
6	Providing adequate welfare facilities according to legal regulation		✓		
7	Minimum standard of welfare facilities	✓			✓
8	Monitoring and assessment of welfare facilities conditions	✓		✓	✓
	Total	5	3	3	4

3.0 RESEARCH METHODOLOGY

This research was carried out using descriptive survey techniques as it was intended to investigate welfare facilities in the construction sites. A defined descriptive survey as the process of collection of data in response to questions concerning the current state of the problem. Provided the experiential, existential, and philosophy groundwork formed for this research within safety and health management application in the literature review, and the basic idea was undertaken in the previous studies conducted Table 1 and Table 2, as well the questionnaire was developed with reference to the previous research papers, past reports, and instructions books related to this research. It was established that a quantitative analysis concept was taken by essential for data collection and analysis. A quantitative concept implemented knowledge suits to be constructed depended on interpretations that were philosophically formed and analyzed how people set up the system surrounding them [12], [13]. Such studies were initiated in construction situations; knowledge, practice, and experience surveyed as particular proficiency and proceeding, through inductive and analytical techniques researching management ideology application, temporally and situationally definitive management processes aspects. In extension to accomplishing compatibility with the underlying outlook of this research, a quantitative research concept is strongly supported the study purpose; to examine how effectively management is mainly conducted within construction welfare facilities in Iraq's construction industry [12]. The suggested aim instructs a technique that was thoroughly identified in the safety and health agencies around the world of construction and building society. A quantitative approach was applicable for such pleasing surrounding and set up the questionnaire of people in their settings or surroundings, as this is one of the dynamic instruments in data collections [41].

This study employed a descriptive structured questionnaire to be adopted for data collection. Based on health and safety practices, a number of respondents of at least

30 personals are required extensively for investigation purposes. The sample size selection is based on precious studies that emphasis and recomanend a basic survey size of such studies in context of safety and construction research [3], [19]. Moreover, questionnaires were constructed based on previous methods and studies adopted to comprehensively analyze the required purposes related to management and supervision duties on the construction project. The conduct and form of data to respond and determine the answers are based on a structured explanation measurement that is based on a psychometric scale regularly suggested in research that uses questionnaires, it is used mostly in practical approaches to scaling feedbacks in audit inquiry [42]. The classification for the user data is in a structure of 5 based responses of variables that are obtained from the primary Likert scale index [19].

The collected data was constructed in a way to be analyzed using frequency distribution analysis and the average Index process. The results are categorized according to the level importance and frequency, respectively, to be presented in tables and figures for straightforward interpretation in Table 3. Moreover, it is analyzed utilizing mathematical proceeding (average index structure) to calculate the practical value to be used as accepted feedback of an outcome of respondents; thus, it is calculated by using the following formula (3.1). It is also referred to as average mean in statistics. The calculation and analysis are conducted by utilizing the support of advanced computer software of SPSS and Excel [43].

$$\text{Average Mean Index (A)} = \frac{\sum a_i x_i}{\sum x_i} \quad (\text{Formula 3.1})$$

Where; a_i = index of a class (1 to 5)(Frequency or Importance) x_i = mean of the i values i = Targeted response

Table 3 Average Index Rating Scale

Response Set	Frequency	Importance	Attributes
1	Never	Not at all important	$0.00 \leq 1.00$
2	Rarely	Slightly important	$1.00 \leq 2.00$
3	Sometimes	Moderately important	$2.00 \leq 3.00$
4	Often	Very important	$3.00 \leq 4.00$
5	Always	Extremely Important	$4.00 \leq 5.00$

4.0 RESULTS AND DISCUSSION

A total 58 questionnaires sets were shared, but only 35 returned complete, the personals were experts and professionals involved or associated with management duties on construction projects answered the survey, the collection of data were being distributed by emails, online survey, and hand-to-hand papers, to assemble comprehensive feedback on the study objectives. The data was analyzed and interpreted using SPSS-12, this software is used to evaluate the raw data obtained for a more effecent and practical interpration and illustration of the results [44]. The manual calculation also is

made to check the value from the software. The analysis results are divided into multiple sections; 1) Respondents general information. 2) General data description and interpretation 3) Classified unique management and maintenance aspects impacts.

4.1 Respondents Background

The first section of the questionnaire requests the respondents to respond to a few inquiries considering routine information covering the type of project, designation role, years of experience, age of the organization, level of education. Figure 2

shows the respondents' type of project. Respondent mostly being dominated by 48% major projects (infrastructure, industrial, and welfare projects), while minor projects (building, residential, and commercial projects) respondent only 29%, and off-site projects (precast and operation facilities) with 23%. Figure 3 shows the respondents' designation role. The majority of the respondents' (33%) were site engineers, followed by a resident engineer which was 20%, while quantity surveyor was 14%, supervisors and project managers represented 11%, project architects and foreman's consisted 8% and 3% respectively. Figure 4 shows the respondents' working experience. 58% of the respondents' had working experience for less than 5 years, and 5% had less than 10 years of experience, while 17% already worked for 15 to 10 years; also,

14% had less than 20 years, the less than 6% had more than 21 years of experience. Figure 5 shows the respondents' organization age. The majority of respondent organizations (25%) aged 6-10 years and more than 21 years, by 20% of organizations aged less than 5 years, while the rest organizations formed a percentage of 19% and 11% for a lifetime of 11-15 and 16-20 years respectively. Figure 6 illustrates the respondents' level of education, most of the respondents 42% had a bachelor of science degree (BSc), while 28% had a postgraduate degree of master of science (MSc), about 19% diploma degrees; also 8% had research degrees of doctor of philosophy (PhD), and finally, 3% had a necessary working certificate in construction.

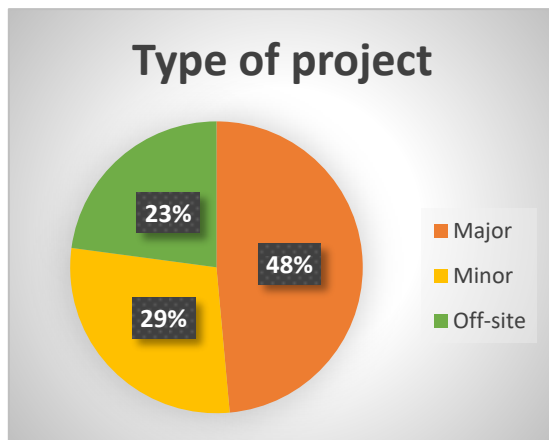


Figure 2 Type of construction project



Figure 3 Designation role



Figure 4 Working experience

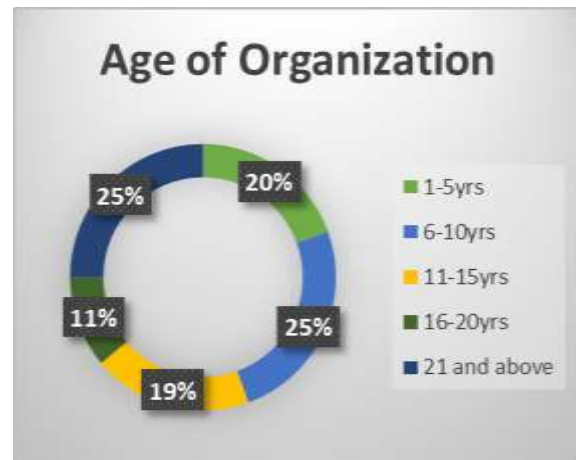


Figure 5 Organization age

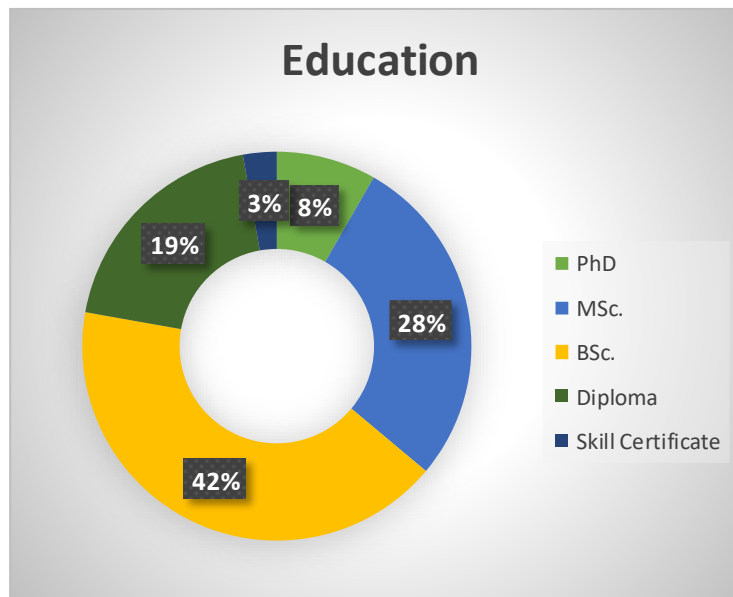


Figure 6 Level of education

4.2 Overall Impact Of Management And Maintenance On Construction Welfare Facilities

Figure 7 reveals the outline findings for the listed purpose of the study by considering the critical effect and sorting the significance of both managerial and maintenance aspects into classified effectiveness. A total of eighty-eight (83) questions were set under six categories (6) for the checklist, which is to be optimum. Around 57% of the Respondent stated that the role of team management in welfare operation was very important with an impact (3.89); also 19% inspection and regular maintenance repetitions were considered very

important (3.67), and 16% revealed that safety and health procedure related to welfare facilities management protocols had an impact of (3.55), while 3% revealed that the security role had an impact of (2.43), lastly the final proportion of respondents' 5% regarded consultation and grievance consultations impact (2.21). These results are supported with previous research findings in line with welfare facilities practices and safety criteria conducted by Hatem et al. (2019). In addition, an evidence lead supports the theory of management and maintenance another relevant research that states being as mainly misunderstand and non-satisfactory in terms of practice and usage



Figure 7 Summary impact of welfare facilities management aspect & maintenance implementations

4.2 Detailed Management Aspects And Maintenance Implementation On Construction Welfare Facilities

Table 4 shows whether the management team has a significant impact on welfare facilities operations. The highest aspect attribute was very important for a management role in providing detailed plans and policies on construction welfare

facilities (3.89); also day to day maintenance role had a very important effect (3.79), while the lowest impact slightly important were for regulations set and implementation with an average index of 2.46 and 2.14 respectively. The rest of the management aspect had an impact on important concerning management and maintenance duties. Further, Table 4. shows whether the consultation and grievance mechanism influence

the aspect of management and maintenance of construction welfare facilities, the results reveal that the impact is important with an average index of 3.14 and 3.03. From the results obtained a initial concurrens can be cocncluded with previous research conducted in scope of management and maintenece criteras, the results resamble some simliartes in the Gulf region countrreis that share a typical view on management knowlodge and maintence installation at construction projects [7], [11], [15], [35], [36], [46].

Table 4 Management team, consultation, and grievance mechanism factors average index

Attribute	AI	Percentage
Management team		
Management provides detailed policies or plan	3.89	20.67%
Maintaining the facilities day to day	3.79	20.14%
Workers amenities rules, procedure, and mechanisms	3.43	18.21%
Relating code of facilities conduct with the contract	3.11	16.55%
Regulations set by the management team	2.46	13.07%
Implementation of the management plan	2.14	11.37%
Consultation and grievance mechanism		
Complaint about the accommodation, management decision, action, or inaction	3.14	50.93%
Procedure for workers grievances implemented	3.03	49.07%

Table 5 shows the safety and health consequences. Respondents decided that most of the safety and management procedure of training, awareness, and instruction have an important impact (3.11-3.31), while for fire prevention practice and drills of how a building would be evacuated in the event of a fire had a relatively low effect of (2.60) of moderately important, and finally for first aid usage and other emergencies training recorded the lowest effect (1.47) of slightly important.

As for security involvement in construction welfare facilities, respondents determined that most of the security protocols adapted were important with an average index (3.03-3.37), while the least influence was the contractors selected for security services with a slightly important outcome (2.46).

This draws some factors that need to be address by official responosable such the usage of first aid kits and the important role of contractors in having a stable security services. Thus, this is in line with the context of the scope of examining the management and maintenance of welfare facilities in the Iraqi construction sites [47].

Table 5 Safety, health and security factors average index

Attribute	AI	Percentage
Safety and health		
Adequate safety, health policy is designed and implemented	3.11	11.21%
Management plans for electrical, mechanical, and structural and food safety	3.29	11.83%
Managing temporary construction amenities according to health authorities	3.20	11.52%

Regular training on how to use first aids	1.47	8.89%
Fire safety by including training, periodic testing, and monitoring of equipment	2.60	9.36%
Guidance on the detrimental effects in the facilities	3.31	11.93%
Security		
Policies regarding the use of force	3.17	25.69%
Contract security services	2.46	19.91%
Plan to assess the risk to temporary workers amenities	3.37	27.31%
Duties of a security guard are described and implemented	3.34	27.08%
Procedure for workers grievances implemented	3.03	49.07%

Table 6 illustrate the inspection and testing role by the representative of main contractors and sub-contractors in keeping their quality plan in force for management and maintenance. Respondents selected the aspect of the kitchen, preventive, plumbing, and cleaning programs and routine for construction welfare facilities as the highest impact with a classification of very important and an average index 3.74, 3.60, 3.57, and 3.51 respectively. While respondent's that the lowest concerned was for pest control treatment programs with a slightly important effect (2.91), for the remaining programs and routines of inspection or maintenance, respondents showed that most of the regular maintenance schemes are important with an average index (3.00-3.46).

With the aim to check and evaluate the maintenance componetes of welfare facilities in the Iraqi construction sites that are part of the research objective, findings indicate that the procedure for prevention and control of communicable and noncommunicable diseases is in need to be investage and regulated more in construction site that are exposed to such condition. Also, the control of constrcution pollution is an another aspect that most be considerard and prevent any pollution intials as this can led to many defects problem that can become difficult to control in the future [48].

Table 6 Inspection and maintenance of buildings and facilities factors average index

Attribute	AI	Percentage
Inspection and maintenance of buildings and facilities		
Regular inspection and maintenance schemes	3.40	7.87%
Maintenance of mechanical, electrical, drinking water, wastewater treatment	3.23	7.47%
Waste disposal inspection and maintenance	3.00	6.94%
Facilities painting inspection and maintenance	3.46	8.00%
Plumbing inspection maintenance	3.51	8.13%
Kitchen facilities inspection and maintenance	3.74	8.66%
Cleaning of building inspection and maintenance	3.57	8.26%
Security and access control system inspection and maintenance	3.26	7.53%
Pest control inspection and maintenance	2.91	6.74%
Fire safety equipment inspection and maintenance	3.06	7.07%
Toilet and bathrooms inspection and maintenance	3.20	7.40%

Perimeter drains inspection and maintenance	3.29	7.60%
Preventive maintenance program is designed and implemented	3.60	8.33%

* Average Index (AI)

5.0 CONCLUSION AND RECOMMENDATIONS

From the analyses and interpretation, it is clear that the majority of respondents' revealed that the necessary part of management in construction welfare facilities is related to worker's productivity, health, and safety, further, maintenance is regarded as a vital part in running and operating required facilities for construction workers with an overall classification of important in the survey from the returned survey. However, some crucial aspects in the roles of management and maintenance were not sufficient in completing the obligations of safety and health, especially in management areas of regulation, plan, and regular program on how to use safety equipment. As for the maintenance section, systematic schedules on regular examination and monitoring of safety and health equipment were ineffective and neglected as shown from results. Implying that specialists and leading executive in charge has limited proficiency and knowledge on how to manage and maintain some of the vital parts involved in construction welfare facilities, this action has an interconnection influence on the necessary provision and adequacy of welfare facilities for construction workers. This concurs with previous studies results that regraded management and maintenance implementation on welfare facilities at construction, with many similarties indicating that there are a knowledge gap in the practice of management aspects and maintenance implementations[35], [36], [46].

To extensively bring in the uses and help of construction welfare facilities in Iraq, public and private construction organizations, companies and firms should always be compelled by involving and committed to providing welfare facilities services at their sites[49], [50]. This must be prepared ahead of the actual construction works kickoff.

I. Client and consultant should provide the minimum welfare facilities required and be educated on how to regularly running and operating them; moreover, managers and supervisors should conduct routine checks on welfare facilities needed to be provided at the construction site to make sure that there is continuous maintenance for the welfare facilities.

II. Welfare facilities on sites have to include an adequate number of needed facilities; also its prerequisite is provided at the design and planning phase by the top management in charge of the construction project.

III. This study is influential and relevant due to the mere fact that there is a lack of studies, reports, laws, and code of practice in Iraq related to construction welfare facilities facets and supervision. Consequently, when a new code of practice and regulations is introduced in the construction industry that is suitable with current conditions faced by the workers and employers in Iraq, a notable improvement will be seen for the continues challenges and situation faced by most employers in the construction in terms of the safety and health.

References

- [1] Abba, N., Hamid, A. R. A. and Hatem, Z. M. 2019 'Provision and Awareness of Welfare Facilities on Construction Sites', *Proceeding of Civil Engineering UTM*, 4(1): 133–140.
- [2] Abbas, H. F. and Erzaij, K. R. 2019 'Study of the complexity factors associated with the theory of complexity in Iraqi construction projects', *Periodicals of Engineering and Natural Sciences*, 7(4): 2034–2044. doi: 10.21533/pen.v7i4.987.
- [3] Adams, B. K. (2008) 'HSE Considerations During Land Acquisition and Design and Construction of New Facilities', in *SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production*. Society of Petroleum Engineers.
- [4] Ahmed, M. N. et al. 2019 'Investigating factors affecting feasibility study of construction projects in Iraq', *Periodicals of Engineering and Natural Sciences*, 7(3): 1209–1217. doi: 10.21533/pen.v7i3.664.
- [5] Al-agele, H. K. B. 2016 'Identification Of Key Factors Affecting Waste Management In Life Cycle Of The Construction Project By Using Delphi Technique', *Journal of Engineering*, 22(7): 19–34.
- [6] Al-Taie, E., Al-Ansari, N. and Knutsson, S. 2014 'The Need to Develop a Building Code for Iraq', *Engineering*, 06(10): 610–632. doi: 10.4236/eng.2014.610062.
- [7] Al-Zwainy, F. M. S., Mohammed, I. A. and Al-Shaikhli, K. A. K. 2017 'Diagnostic and assessment benefits and barriers of BIM in construction project management', *Civil Engineering Journal*, 3(1): 63–77.
- [8] Al-Zwainy, F. M. S., Mohammed, I. A. and Raheem, S. H. 2016 'Investigation and assessment of the project management methodology in Iraqi construction sector', *International Journal of Applied Engineering Research*, 11(4): 2494–2507.
- [9] Baxendale, T. and Jones, O. 2000 'Construction design and management safety regulations in practice—progress on implementation', *International Journal of Project Management*. 18(1): 33–40. Elsevier
- [10] Buniya, Mohanad K et al.(2021 'Barriers to safety program implementation in the construction industry', *Ain Shams Engineering Journal*. 12(1): 65–72. Elsevier
- [11] Buniya, Mohanad Kamil et al. 2021 'Safety Program Elements in the Construction Industry: The Case of Iraq', *International Journal of Environmental Research and Public Health*. 18(2): 411. Multidisciplinary Digital Publishing Institute
- [12] Cameron, I. and Hare, B. 2008 'Planning tools for integrating health and safety in construction', *Construction Management and Economics*. 26(9): 899–909. Taylor & Francis
- [13] Chan, T. K. 2009 'Measuring performance of the Malaysian construction industry', *Construction Management and Economics*., 27(12): 1231–1244. Taylor & Francis
- [14] Chitkara, K. K. 1998 *Construction project management*. Tata McGraw-Hill Education.
- [15] Cotton, A. P., Sohail, M. and Scott, R. E. (2005) 'Towards improved labour standards for construction of minor works in low income countries', *Engineering, Construction and Architectural Management*. Emerald Group Publishing Limited.
- [16] Echezona, O. N. 2011 'Client Perception of Engineering and Construction Services Management in Present-Day Iraq: An Exploratory Study and Assessment'. Walden University.
- [17] El-Reedy, M. A. 2019 *Offshore Structures: Design, Construction And Maintenance*. Gulf Professional Publishing.
- [18] Fang, D. P., Huang, X. Y. and Hinze, J. 2004 'Benchmarking studies on construction safety management in China', *Journal Of Construction Engineering And Management*. American Society of Civil Engineers, 130(3): 424–432.
- [19] Fass, S. et al. 2017 'Understanding causes of fall and struck-by incidents: What differentiates construction safety in the Arabian Gulf region?', *Applied ergonomics*. Elsevier, 58: 515–526.
- [20] Giang, D. T. H. and Pheng, L. S. 2011 'Role of construction in economic development: Review of key concepts in the past 40 years', *Habitat international*. 35(1): 118–125. Elsevier,
- [21] Gómez, M. R. 1997 'Factors associated with exposure in Occupational Safety and Health Administration data', *American Industrial Hygiene Association Journal*. 58(3): 186–195. Taylor & Francis Group
- [22] Gyansah, N. T. (2017) 'An investigation into worker satisfaction with construction site welfare provisions'.

- [23] Hamid, A. R. A. et al. 2004 'Integration of safety, health, environment and quality (SHEQ) management system in construction: a review', *Malaysian Journal of Civil Engineering*, 16(1).
- [24] Hatem, Z. et al. 2021 'Barriers to the Adoption of Industrialized Building System in Iraqi Construction Industry', *Zanco Journal of Pure and Applied Sciences*, 33(3 SE-Mathematics ,Physics and Engineering Researches). doi: 10.21271/ZIPAS.33.3.4.
- [25] Hatem, Z. M. 2020 Management and Maintenance of the Welfare Facilities at Construction Sites in Iraq. *Universiti Teknologi Malaysia*. doi: 10.13140/RG.2.2.22996.96643.
- [26] Hatem, Z. M., Hamid, A. R. A. and Abba, N. 2019 'Factors that Leads to Poor Welfare Facilities Implementation at Construction Sites in Iraq', *Proceeding of Civil Engineering UTM*, 4(1): 72–79.
- [27] Holt, A. S. J. and Holt, A. S. J. 2001 *Principles of construction safety*. Wiley Online Library.
- [28] Hughes, P. and Ferrett, E. 2012 *Introduction to health and safety in construction*. Routledge.
- [29] Ibrahim, M. N. I. et al. 2020 'Welfare Facilities Implementation at Construction Sites in Malaysia', *Proceeding of Civil Engineering UTM*, 5(1): 81-93 b. doi: 10.6084/m9.figshare.13298810.v1.
- [30] ILO, S. 1999 'Health and Welfare on Construction Sites', ILO, A Training Manual.
- [31] Jaber, F., Al-Zwainy, F. and Jasim, N. 2020 'Forecasting techniques in construction industry: earned value indicators and performance models', *Przegląd Naukowy Inżynieria i Kształtowanie Środowiska*, 29(2): 234–243. doi: 10.22630/PNIKS.2020.29.2.20.
- [32] Jannadi, M. O. and Assaf, S. 1998 'Safety assessment in the built environment of Saudi Arabia', *Safety Science*. 29(1): 15–24. Elsevier
- [33] Jannadi, O. A. and Bu-Khamsin, M. S. 2002 'Safety factors considered by industrial contractors in Saudi Arabia', *Building and Environment*. 37(5): 539–547. Elsevier
- [34] Khamis, N. et al. 2017 'A Qualitative Comparison on Guidelines for Construction Workers Accommodation and Facility', in *MATEC Web of Conferences*. EDP Sciences, 3010.
- [35] Lingard, H. and Rowlinson, S. M. 2005 *Occupational Health And Safety In Construction Project Management*. Taylor & Francis.
- [36] Mahmoud, A. H. 2009 'Evaluating the Effectiveness of Occupational Health and Safety Management System of Construction Companies in Iraq (Al-Rasheed State Contracting Construction Company as a case study)', *Journal of Engineering and Sustainable Development*. 13(2): 182–197. Al-Mustansyriah University
- [37] Naji, Z. M., Dakhil, A. and Jasim, S. Al (2019) 'Bond the Gap between Academic and Industry Requirements for Undergraduate Civil Engineering Students in Iraq', *IOP Conference Series: Materials Science and Engineering*, 584(1). doi: 10.1088/1757-899X/584/1/012001.
- [38] Othman, I., Kamil, M., et al. 2020 'Critical success factors influencing construction safety program implementation in developing countries', in *Journal of Physics: Conference Series*. 42079. IOP Publishing.
- [39] Othman, I., Kineber, A. F., et al. 2020 'Drivers of value management implementation in building projects in developing countries', in *Journal of Physics: Conference Series*. 42083. IOP Publishing.
- [40] Rasheed, E. K. 2015 'Control Facility Layout Problems in Construction Project Sites in Iraq', *Journal of Engineering and Sustainable Development*, 19(6): 118–129. Al-Mustansyriah University
- [41] Rashid, I. A. et al. 2019 'Unethical Behaviour Among Professional in the Malaysian Construction Industry', *Proceeding of Civil Engineering UTM*, 4(1): 126–132.
- [42] Reese, C. D. and Eidson, J. V. (2006) *Handbook of OSHA construction safety and health*. Crc Press.
- [43] Ricca Jr, L. and Kormans, D. B. (2008) 'OSHA Construction Partnerships: A Case Study On the Value And Benefits', in *ASSE Professional Development Conference and Exhibition*. American Society of Safety Engineers.
- [44] Rountos, E. A. (2008) *Troubled projects in constructions due to inadequate risk management*. University of Seattle.
- [45] Sohail, M. (1999) 'Review of safety in construction and operation for the WS&S Sector-A literature review: Part II', Well Study, UK.
- [46] Soundararajan, V. (2013) 'Construction workers: Amending the law for more safety', *Economic and Political Weekly*. 21–25. JSTOR
- [47] Talib, M. H. and Kashkol, A. M. H. (2019) 'Theory of Constraints in Construction Projects', *Journal of University of Babylon for Engineering Sciences*, 27(2): 109–124. doi: 10.29196/jubes.v27i2.2302.
- [48] Taylor-Powell, E. (1998) *Questionnaire Design: Asking questions with a purpose*. Cooperative Extension Service, University of Wisconsin-Extension.
- [49] Umar, T. (2020) 'Applications of drones for safety inspection in the Gulf Cooperation Council construction', *Engineering, Construction and Architectural Management*. Emerald Publishing Limited.
- [50] Viscusi, W. K. (1986) 'The impact of occupational safety and health regulation, 1973-1983', *The RAND Journal of Economics*. JSTOR. 567–580.
- [51] Williams, O. S., Hamid, R. A. and Misnan, M. S. (2018) 'Accident causal factors on the building construction sites: a review', *International Journal of Built Environment and Sustainability*, 5(1): 78-92