Journal Engineering Sciences
& Information Technology
Issue (1), Volume (3)
March 2019
ISSN: 2522-3321

المجلة العربية للعلوم و نشر الأبحاث
Arab Journal of Sciences & Research Publishing
AJSRP

Formwork Construction system in Kuwait

Anwar Abdullah Jdaie Alghanim

Construction Training Institute || The Public Authority for Applied Education & Training (PAAET) || Kuwait.

Abstract: This study aimed to evaluate the differences between steel and timber formwork regarding cost, quality, and time of completion of building construction projects in Kuwait. Forty projects were selected to represent the construction business in the country. The study method was based on survey data collection (questionnaires, interview, and observation).

The findings of the study showed that the contractors prefer to buy steel formwork than timber formwork system, although timber formwork is cheaper than steel formwork. Also the study found that the field of steel formwork reached a mean of (4.425), which puts steel formwork in first rank.

Keywords: Construction system; steel formwork; timber formwork; Kuwait; SPSS.

Introduction:

Different various reasons formwork systems such as (Cost ,Quality, Speed) and safety of work. Are considering as the determining the success of a building construction project. While lack quality of formwork systems will directly affect the speed and cost of construction through problems such as misalignment, on other hand the use right formwork system can achievement to the overall success of a project.

Steel panel and timber formwork systems are the building construction industry, the timber formwork is the mainly dominant style of formwork used in the building construction industry by domestic contractor in the country, while steel panel are being used in small scale in the building construction.

In our study we will evaluate the cost, time and quality consideration in the use of timber and steel formwork in building construction industry of Kuwait. forty projects are selected, this study used same technique adopted by (FeteneNega, 2008) study , which depended on survey Questionnaire by Likert's scale.

The main problem of the study is to evaluate the steel and timber formwork systems for building elements regarding cost ,quality, and speed) to the contractor.

Objectives:

This study aimed to:

- Comparison regarding the cost which is better used for building projects (steel or timber system formwork) .
- comparison quality of concrete finishing made by steel and timber formwork system.

- Comparison the speed time of construction of building projects that use timber and steel formwork system.
- Comparison the different types of building such as (apartment, office, multipurpose buildings).
- Comparison the different types of different category of contractors (local, and foreigners).

The study methods based on survey data collection methods (questionnaires, interview, and observation)

Normally there are two groups of formwork system as horizontal formwork system, and vertical formwork system, in the horizontal formwork system the slab, beam, stair cases and foundation is used as horizontal concrete structures. The systems Conventional wood or metal, Flying/Table, Column-mounted shoring, Tunnel, Joist-slab that can be used to support different slab types .

Many factors which affecting horizontal formwork selection: Factors related to structural design, job specification, schedule, local conditions, and Factors related to the supporting facilities organizations such as available capital, equipment, office support(Awad S. Hanna, 1999).These factors are similar to those factors affecting the selection of vertical formwork system, there are a number of factors that are mostly important to the selection of vertical formwork systems. Such as, lateral pressure caused by plastic concrete on vertical formwork system depends on the floor height of the building, therefore the floor height is very significant in selecting a vertical formwork system

The construction of formwork normally involves the following operations: propping and centering, shuttering, provision of camber and cleaning, and surface treatment (Abebe, 2007)

The economy in design of a concrete structure, economy in design, planning and building formwork it is requirements for economic construction of formwork.

Quality consideration of formwork construction need to ensure the quality of the formwork system to satisfy strength requirement, rigidity, position and dimensions.

(Kreimer, Arnold, Carlin, 2003), (ICC, 2009), (Tricker, Algar, 2006), (Foulger, 2004), (Polley, 2001) (Argaw Tarekegn,2010),(Peurifoy , and Oberlender, (2011). (Australian Building Codes Board, 2008),found that the majority of building codes in many counties deal with safety of life. In the US the building code has more detailed requirements, whereas in the UK the building code on focus is on energy efficiency, while in Australia the building code focus on sustainability.

According to (ICC, 2009) the building code is to establish the minimum requirements to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and

other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations.

Kuwait as well as many other countries has a kind of components and structures of Building Codes System (BCS). Article 19 of Building law 1972 states that the Municipality is responsible to safeguard citizens and properties by promoting, developing, planning, establishing, building and cities, and safeguarding the public health, safety, general welfare, and hygiene (Kuwait National Assembly,1972).

In 1976 Kuwait National Assembly, the building licenses section, and the inspection section were set up in 1985, the first set of building regulations were formed, and in 2005 ,some amendments were made to these building regulations (ALFahad, J(2005).

The articles (34, 35), by the Law No.15 of 1972,gave the right to the Municipality of Kuwait to make special decisions, and codes in some subjects, associated to the building special system, property rights, digs, wells and residential. Any one disagree with these rules is punished by a fine .In 2001 by Kuwait Municipality Building Code Committee. Kuwait Institute for Scientific Research has been selected as the consultant to produce the code. It was decided to study The ICC codes as major model codes.

Limitation of the Study

This study is aimed to evaluate the timber and steel formwork system for a building regarding to cost, quality and speed of construction in Kuwait.

The Research Questionnaire form:

The study questionnaire model formed in its initial image into four parts. The first part, which contains a general information about what type (steel or timber) formwork used for different building component in the project. The second part revolves around about which type (steel or timber) formwork is good for different building element with regard to cost. The third part focus on formwork system and finished concrete quality. The fourth part focus on the speed of construction.

Methodology of the Study:

The sample of the study consisted of forty contractors that are working in construction of building projects in Kuwait.A descriptive statistics using SPSS has been used to analyze the collected data by Questionnaire .

Study Results & Discussion:

Which contains a general information about what type (steel or timber) formwork used for different building component in the project?

Table (1)Arithmetic means and standard deviations for the sample contractors estimates to their estimations forQ1, q2, q3, q4, q5according to the means.

Rank	Number	Q1,q2,q3,q4,q5	Arithmetic Mean	Standard Deviation	Using Effectiveness
1	5	steel formwork	4.425	1.212	High
2	1	timber formwork	4.136	1.054	High
3	2	Beams	3.972	0.923	High
4	6	Column	3.425	0.882	Medium
5	3	Slab	3.407	1.041	Medium
6	4	Staircase	2.287	0.956	Low
Tool as a whole			3.625	0.878	High

It is noted from table (1) that the total degree's mean for the (Q1,q2,q3,q4,q5) has reached in an arithmetic mean of (3.625) in a high degree, while the means are ranged between (4.425-2.287), by looking to this result, we find that all these fields can be used in a varying degrees (High, medium, low).

in first rank the field of (steel formwork), reached an arithmetic mean of (4.425), in the second rank (timber formwork) with an arithmetic mean of (4.136), in the third rank, the field of (beams) and got the arithmetic mean of (3.972), in the fourth rank (column), and obtained the arithmetic mean of (3.425), in the fifth rank field of (slab) and got the arithmetic mean of (3.407), while in the sixth and last rank, the field of (staircase) got the arithmetic mean of (3.387). The results showed that the field of (steel formwork) came in first rank with a mean of (4.425) with a high degree. This could be the biggest in this field, due to the contractors prefer to buy steel formwork for beams than timber formwork on initial cost .while on rental cost, steel formwork is preferred by the contractors over the timber formwork system.

Over 62% of contractors prefer modern timber formwork system for smooth and regular finished concrete. Regarding the speed of construction mostly of the contractors observed that steel formwork takes faster time to construct than timber formwork.

Conclusions:

- The contractors prefer to buy steel formwork than timber formwork system, even when timber formwork is cheaper than steel formwork.
- Regarding the rental cost, the contractors prefer steel formwork system than timber formwork system, due to the difficulty of rental timber formwork, and there is a little company deals with renting timber formwork in Kuwait.

In first rank the field of (steel formwork), reached an arithmetic mean of (4.425), due to the contractors prefer to buy steel formwork for beams than timber formwork on initial cost

- In speed of construction matter, the contractors prefer steel formwork takes over timber formwork.

REFERENCES

- Abebe D. (2007). A Text book of Building construction.1stedition, Addis Ababa: Addis Ababa University Printing press. P224-238.
- ALFahad, J(2005).The number and coordination of the management systems, building codes and legislation for local government authorities and municipalities. Expert's Department, Ministry of Justice. Workshop.Kuwait
- Argaw Tarekegn. (2010). Application of modern formwork system in Ethiopia. Unpublished master's thesis, Addis Ababa University. Addis Ababa, Ethiopia.
- ASCC: American Society of Concrete Contractors (2008).The Contractor's Guide to Quality Concrete Construction, USA.
- Edward, G. (2008). Concrete Construction Engineering Hand Book. 2nd edition, New Brunswick, New Jersey.
- Fetene N. (2008). Causes and Effects of Cost overrun on Public building construction projects in Ethiopia. Unpublished master's thesis, Addis Ababa University, Addis Ababa, Ethiopia.
- Foulger R. (2004).Building Regulations Explained, London: London District Surveyors.
- Hanna, A.S. (1999). Concrete formwork system, 1stedition, New York: Marcel Dekker Inc.
- Kreimer, A., Arnold M., Carlin A. (2003).Building Safer Cities: The Future of Disaster Risk. Disaster Risk Management Series. The World Bank. Disaster Management Facility, London.
- Kuwait National Assembly. (2018). Retrieved in 15/11/2018 from http://www.kna.kw/.
- Law No. 15 of 1972 Concerning Kuwait Municipality, and amending laws

- Niekerk, A.J. (2009). Concrete elements: Timber faced formwork versus steel faced formwork systems, and which is truly better for the contractor. Unpublished master's thesis, University of Pretoria. Pretoria, South Africa.
- Peurifoy , R.L. and Oberlender, G.D. (2011).Formwork for concrete structures. (4th ed.). New York: McGraw-Hill Inc.
- Polley, S.(2001). Understanding the Building Regulations, 2ndedition, Spon Press.
- The Australian Building Codes Board. (2008) retrieved in 15/11/2018 from http://www.abcb.gov.au/go/aboutabcb/
- Tricker R., Algar, R. (2006) Building Regulations in Brief. 5th edition, Butterworth.

نظام صب الخرسانة في الكويت

الملخص: هدفت هذه الدراسة إلى تقييم الاختلافات بين القوالب المصنوعة من الصلب والخشب فيما يتعلق بالتكلفة والجودة ووقت الانتهاء من مشاريع بناء المباني في الكويت، تم اختيار أربعين مشروعًا لتمثيل مشاريع البناء في البلاد. اعتمدت هذه الدراسة على جمع بيانات المسح من خلال الاستبيانات والمقابلة والملاحظة.

أظهرت نتائج الدراسة أن المقاولين يفضلون شراء القوالب الفولاذية على نظام قوالب الخشب، بالرغم من أن القوالب الخشبية أرخص منها. كما توصلت الدراسة إلى أن مجال القوالب الفولاذية وصل إلى متوسط (4.425)، وهو ما يضعه في المرتبة الأولى.

الكلمات المفتاحية: نظام صب الخرسانة، القوالب الخشبية، القوالب الفولاذية، الكويت، SPSS.