

Defects Management practice during DLP in the UAE Construction Industry

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Abstract

Building defects are a key concern in the construction industry. Defects represent not only a loss to the project but also hamper the smooth operation of a building. The UAE construction industry accounts for heavy defects during DLP (Defects Liability Period) that lead to significant rework, delays in project handover, disputes and construction claims among construction parties. This paper presents preliminary findings of a research study which is investigating defects management practices in the UAE. The paper presents an overview of construction defects, defect types and main causes of construction defects. The research findings are drawn from a literature review, and semi-structured interviews, which encapsulates UAE construction LAW and its implications in managing defects during defect liability period for different stakeholders. The paper highlights that future research is needed to investigate construction defects in relation to relevant work disciplines to identify root causes and remedies, which will improve overall defect management practice in the UAE construction industry.

Keywords

Building Defects, Defect Liability Period, UAE, Construction Management, Facility Management

1. INTRODUCTION

Defects in construction projects are a persistently worrying problem despite continually improving technology, education and legislation. Construction defects can be the result of design errors by professionals, a manufacturing flaw, defective materials, improper use or installation of materials, not conforming to the design by the contractor or any combination of the above. Construction defects account for cost overruns, claims, handover delays and disputes among construction stakeholders. However, construction defects are often not recorded, and resolved on an ad-hoc basis, ignoring the causes and effects of such defects for future improvements.

The UAE construction industry is a key contributor to the UAE's economy. According to Deloitte & Touche (2017), the UAE construction industry was awarded projects of over 45 billion USD in the year 2017. Previously, the UAE construction industry has completed approximately 70 billion USD construction projects between the year 2015 and 2016 (Deloitte, 2016), which were mostly residential and commercial high rise building projects. Construction projects in the UAE often face commercial pressure to complete and handover on strict timelines by property developers and project owners. Therefore, building defects becomes a key concern at the handover stage, as well as during the operation & maintenance stage. These defects lead to significant rework, delays in project handover, unsatisfactory

clients and poor-quality projects. This paper reports preliminary findings of a study which is investigating architectural defects in the UAE construction projects, aiming to understand the nature of the defects and associated defect management practices in the UAE construction projects.

2. LITERATURE REVIEW

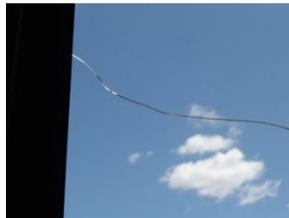
Construction Defects and Defect Liability period

Building defects can be defined as a failure or shortcoming in the building's function, performance, statutory or user requirements, and this may occur in its structure, fabric, services or other facilities. Most construction contracts contain a specific period within which the contractor has responsible and obligation to remedy any defects in the construction work it has performed, that period it's called Defects liability period (DLP). Generally, the DLP period starts with the certificate of substantial completion and extends for a specific duration depending upon the nature of the project and contract type. The DLP can help both owners and contractors in managing their respective risks under the construction contract, as the DLP creates a contractual obligation under which the contractor is required to return to the site and rectify any defects identified in the works it has performed. Since DLP is a contractual obligation, therefore its length and are established within each contract. The related contractual clauses should specify the duration of DLP, the scope of work for different types of defeats, the procedure to notify, approvals process and circumstances under which DLP may be extended (Asante et al., 2017).

Defects can be classified into two main categories, patent defects and latent defects. Patent defects can be clearly recognized during inspection throughout the construction phase and during the project's Defects Liability Period. Examples of patent defects include cracks in windows, water leakage, wall cracks, electrical and plumbing issues etc. Figure 1 presents some example of patent defects that generally appear during DLP.



(a) Wall is moldy due to leaking pipes



(b) Cracks in windows



(c) Poor finishing quality

Figure 1:

Examples of patent defects (Shwan, 2011)

Parent defects are generally the contractor's responsibilities and are mandatory to be repaired within a Defect liability period (Shwan, 2011). On the other hand, Latent defects are those defects that may not become apparent or readily detectable until many years after completion of the project and after the completion of the defect liability period. Examples of latent defects are shown in Figure 2.



(a) Crack on the wall



(b) Leak in the roof



(c) Plumbing and wiring issues

Figure 2: Examples of latent defects (Shwan, 2011)

For example, inadequate foundations causing subsidence of the building that may take years to become apparent. Patent defects that appear during the DLP are more common in the UAE construction industry, especially in the high-rise building projects. These defects lead to significant rework, delays in project handover, disputes among construction parties and construction claims. Due to the limitations of this study, this paper only focuses on the patent defects which appear during the DLP and become a cause of rework, change orders and disputes among the construction parties. By systematically recording and tracking defects, the types, causes and categories of each defect can be identified. Besides this, the recurring defects can also be traced. These significant data can be used to provide limited liability to assist the project team in identifying what went wrong and how to better manage future projects. As a result, they could improve their cost efficiency and increase their design and performance quality.

2.2 Causes of defects during DLP

Building defects that appear during DLP may have various underpinning reasons, and thus different responsibilities for remedial actions. Previous studies on the cause and effect of defects in buildings suggest that most of the defects are due to 'weaknesses' in the project implementation process (Hopkin, Lu, Rogers, & Sexton, 2014, 2016) Whilst poor specifications, selection of materials, workmanship and supervision are the commonly cited causes of defects, poor design decisions are identified as the most significant contributor to the defects. Several researchers stressed the importance of designers to play their roles in eliminating defects occurrence. They should ensure that all the client requirements are well captured, translated and communicated to the other project team members throughout the project implementation process supported with proper documentation system. In addition, the problem with defects is not so much a matter of not knowing what to do but applying correctly what is known (Asante et al., 2017). Forcada et al., 2016) concluded that most common defects that arise during construction are technical faults related to the stability of the structure and inappropriate installation of roofs and façades caused by poor workmanship rather than the quality of the materials or products used. These authors previously highlighted that most defects identified during DLP are predominately functional, rather than technical in nature (Forcada et al., 2016). According to Dahanayake & Ramachandra (2015) faulty design, faulty construction, building type and change in use, climatic conditions, and lack of supervision are primary causes and factors of the building defects that appear during the defect liability period. In addition to primary causes of defects, there are several other factors which contribute to construction defects. These secondary causes of defects are mainly attributed to poor organizational practices and communication failures. Dahanayake and Ramachandra (2015) pointed out that the lack of documentation and standardization of communication are also reasons that contribute to building defects. Lack of communication and resources are another secondary reason which can contribute to developing a building defect.

In summary, main causes for building defects during DLP can be linked with 6 main causes, which are (1) material failures (2) design failure (3) workmanship errors (4) external factors (5) wear and tear and (6) poor communication and documentation. Re-learning construction defects is an emergent popular subject of research. There are limited studies that investigate defects and its relation to the work disciplines such as architectural, structural, mechanical and electrical, and the defects inherent in them. Recognizing this, research is needed to investigate the causal relationship between the types of defects and their root cause within each work discipline involved. By systematically recording and tracking defects, the types, causes and categories of each defect can be identified. Besides this, the recurring defects can also be traced. These significant data can be used to provide limited liability to assist the project team in identifying what went wrong and how to better manage future projects. As a result, they could improve their cost efficiency and increase their design and performance quality

3. METHODOLOGY

The first step in this study is an extensive literature review on the subject, which is used to understand the type and causes of construction defects that appear during DLP. Secondly, this study will identify a case study to investigate architectural defects during DLP, using a combination of qualitative and quantitative data collection methods. Data collection for the quantitative element of the research will be drawn from audit records of defects identified during the projects DLP. These will be sorted, grouped and transferred into analysis using the measure of central tendency and frequency analysis. Qualitative methods (such as Interviews) will be used to investigate the types and causes of the defect. This will be carried out by critically analyzing project audit documents. For the purpose of tracking the root cause of the defects, data on the defects will be categorized into design, workmanship, material, lack of protection, vandalism, nature, maintenance and mishandling defects. This paper only presents preliminary findings of the literature review and semi structured interviews which were conducted with construction professionals to understand the defect management practices in the UAE construction industry.

4. FINDINGS AND DISCUSSION

4.1 UAE legal system and construction law

The United Arab Emirates constitution was a result of an agreement between seven emirates joined to adopt it. It reflects the incorporation of the seven constituent emirates, and it declares the United Arab Emirates as a Federal state, therefore it leads to the creation of a Federal or Union Government. The limit of the power of the UAE Federal Government is defined by the UAE Constitution which lays down the guidelines for legislation required to establish the machinery of government. As the rulers of each emirate gave the power in some matters to the Federal Government according to the Constitution guidelines, they, on the other hand, retained for themselves and their heirs the power over the internal affairs of their respective emirates. This resulted in having two layers of government in the United Arab Emirates: The Federal Government and each government of the seven emirates. In consequence, there are two layers of law: Federal laws which apply in all emirates, and emirate laws which apply only in the emirate.

Power over construction work and its related activities was not given to the Federal Government except for the construction, maintenance and improvement of union roads. Therefore, each emirate retains the power to create legislation covering the construction industry, but that legislation should not conflict with any Federal laws. The civil code of UAE is the primary source for construction law; therefore, the code includes a Muqawala Section. According to UAE's Civil Code, Article 872 A Muqawala is defined as "A contract whereby one of the parties thereto undertakes to make a thing or to perform work for consideration which the other party. This section conducts the policy, actions, and affairs of professional services including construction matters and have a mixture of general and specific articles, thus it is being used as a reference for judicial decisions related to construction. Alongside a civil code, there is a commercial code which is applied for conducting business including commercial contracts. However, In the commercial code, none of the provisions is directed towards construction contract, but it contains provisions that can be applied incidentally to construction contracts. Therefore, the commercial code is considered as a secondary source for the construction law.

4.2 Legal provisions of DLP in the LAW

The International Federation of Consulting Engineers' (FIDIC) Conditions of Contract for Construction, more commonly known as the FIDIC Red Book, is the most widely used construction contract in the UAE. FIDIC Contracts define several clauses related to material, workmanship, statutory duties and remedial actions to manage defects during the defect liability period. UAE Civil Code has adopted FIDIC legal clauses and considers defect liability as a matter of contract where agreements containing obligations to supply materials and execute work are binding and are applied in accordance with their express terms. As per UAE's civil code applied to construction, following clauses address defect management during the DLP (Grose, 2016).

Materials: The key statutory provision of local law on the quality of materials in the United Arab Emirates provides that "If the client requires that the contractor should provide the materials for the work, either in whole or in part, the contractor shall be liable for the quality thereof in accordance with the conditions of the contract, if any, or in accordance with the current practice. If the contract is silent, the quality of materials must comply with current practice"

Workmanship: Unlike in common law jurisdictions, there is no tradition of imposing a contractual test of quality by implying terms into the contract in the absence of express agreement about the quality, it cannot be taken for granted that warranties that materials shall be fit for their intended purpose and of satisfactory quality or that the work shall be performed in a 'good and workmanlike. It is for the Court of Merits to ascertain whether an obligation has been performed, which is a task that is usually delegated, without significant, to an expert appointed by the court. Whether an expert is required to apply an agreement that (1) specifies the standard of workmanship; (2) or to determine the standard to be met in the absence of agreement.

Statutory duties: Other pertinent provisions include those set out as "Supply-only contracts are governed by the sale which shall be deemed to have been concluded on the basis that the goods sold are free of any defects, save such as are within customary tolerances". A purchaser of materials has certain remedies including the right of rejection if the goods 'differ in quantity or in kind from the goods agreed, or are defective', but the purchaser is not entitled to reject the materials unless the defects result in the materials being unfit for their intended purpose.

Remedies: An employer is entitled to require a contractor to correct work being carried out in a defective manner or, with the consent of the court, to terminate a contractor's employment if rectification within a reasonable period is not possible. The main contractor has the same rights against a subcontractor. The requirement to obtain a court order for termination presents the difficulty that, in practice, a delay is likely to compound any loss, and significant delay will deprive the measure of its utility altogether. Although the rule is that the employer must refer to the concerned judge for permission to vest in another contractor the completion of the work at the expense of the first contractor, the case where it becomes necessary for the employer to perform the work without such permission is an exception. In such cases, it appears that termination affects neither the accrued rights of the parties, including a contractor's right to be paid for the work performed up to termination, nor an employer's entitlement to damages for breach, including damages for defective work.

Decennial Liability

In the United Arab Emirates, the risk of structural failure is imposed on a consultant and contractor in the following terms:

1. If the subject matter of the contract is the construction of buildings or other fixed installations, the plans for which are made by an architect, to be carried out by the contractor under his supervision, they shall both be jointly liable for a period of ten years to make compensation.
2. The obligation to make compensation shall remain although the defect or collapse arises out of a defect in the land itself or that the employer consented to the construction of the defective buildings or installations.
3. The period of ten years shall commence as from the time of delivery of the work.

In characterizing decennial liability as a contractual obligation and an obligation imposed on consultants and contractors. Significantly, failure to achieve the result, while giving rise to a presumption of liability, is excusable if the failure is attributable to an external cause. As a law of UAE, it is mandatory to have a decennial liability and cannot be circumvented, unless the purpose was to make it stand in less duration. That will cap the amount of compensation from the contractor that also will make the cap amount equal to the damage.

4.3 Role of the client

The role of the client in defect management during DLP is central, as a client representative issues certificate of completion, identify the defect, and initiate the remedial process as per the contractual procedures agreed. A critical issue in this process is identifying if a building defect is a result of maintenance or indeed a construction defect that falls under the DLP. The client or its representatives report any defects that arise to the contract administrator who decides whether they are defects (i.e. works that are not in accordance with the contract), or whether they are in fact maintenance issues. If the contract administrator considers they are defects, then they may issue instructions to the contractor to make them good within a reasonable time. General defects that appear during the DLP in the UAE are tiles cracks from hollow underlay and paint peeling from the humidity absorbed from the ground, and perhaps leakage from the basement walls due to any crack in waterproofing, whereas the electromechanical defects can vary from AC not cooling, Elevators shutdown and Electrical Shorts. If the contractor doesn't abide by his contractual responsibility, the client may deposit the guarantee cheque or bank bond which was provided by the contractor, in order to hire a third party to maintain the defects, granted that the contractor ignored an official request

Clients generally consider themselves immune from liability for construction defects or failures. However, the client may be responsible for construction defects in certain circumstances. For example, if the client has provided the wrong design information or wrong specifications that resulted in a building defect, then any damage caused will be considered beyond DLP coverage. In addition, the client keeps a retainage amount (generally 5% of the total contract price) that protects the client from any uncorrected repairs of defects. Also, any of the clients has obtained beneficial occupancy and has damaged the structure or finishes in any way, then such defects are not covered by the DLP. It is the owner responsibility to perform the necessary periodic maintenance with respect to the conditioning and not to rely it on the DLP because this is classified as negligence of the owner and the contractor does not bear responsibility for rep.

In summary, the contractor is completely responsible for any defect in the Defects Liability Period. But in the following cases, the client will have to compensate the contractor:

- If the defect was due to misuse of items by the client.
- If the claimed inconvenience was not a defect, and in fact was a result of the consultant's design.
- If another contractor who had been appointed by the client during the DLP maintained the equipment without prior notice to the main contractor

Moreover, interview respondents explained that UAE construction laws protect the client from any defects during the DLP period, however, the terms and conditions of DLP depend upon the contract, which is usually drafted by consultants. Respondents stressed that the UAE shall adopt terms and conditions for DLP management for all projects to protect clients from inexperienced consultants.

4.4 Role of the Contractor and Consultant during DLP

The UAE civil code defines defects responsibility on the contractor but also include consultant if the defect is a result of the consultant's negligence. In the UAE, Federal Law No 5: 1985 (The Civil Code) Articles 880-883 of The Civil Code impose upon the contractor and architect strict joint liability for a ten-year period from the date of delivery of the work. This covers any defect in the structure part, designed by the architect and built by the contractor that threatens its stability or safety. Article 880 (1) of the UAE Civil Code states that if the subject of a contract is the construction of buildings or other fixed installations, the plans for which are made by an architect to be carried out by the contractor under their supervision, they shall both be jointly liable for a period of ten years. During this time they must compensate the employer for any total or partial collapse of the building or installation that they have erected and for any defect that threatens its stability or safety unless the contract specifies a longer period.

Article 880 (2) of the UAE Civil Code states that the obligation to make compensation shall remain regardless of whether any defect or collapse arises out of a fault in the land itself or that the employer consented to the construction of the defective buildings or installations.

This indicates that any defect in the land must be clarified by the contractor prior to the beginning of the work. In case the contractor starts to work and there are any defects in the land, the contractor will bear the full responsibility because in the beginning, the contractor hid the land defects. Article 880 (3) determines that the ten-year period will start from the time of delivery of the work. Depending on the terms of the contract, the ten-year liability provision could exclude the contractual defects liability period, therefore possibly extend the overall liability time.

The role of contract in managing defects starts with rectifying any defects before the handover, including (1) Cracks in the building; (2) Any leakage in the building; (3) Any defect in the electrical system; (4) Any defect during the final finishes; and (5) site cleanliness. In case of emergency or high inconvenience, the contractor must be present within 24 hours from the official request. If the contractor has replaced the defective item with an item that doesn't comply with the contractual specifications intentionally, the client may hire a third party. Each independent case is handled according to its conditions. In addition, the contractual "specifications" which are signed and stamped at the beginning of the project determines the quality of rectified defects.

5. Conclusions and Future work

Management of construction defects during the defect liability period is a key concern for contractors as well as construction clients. This paper has presented an overview of construction defects, and defect management during DLP in the context of the UAE construction law. Construction Law in the UAE following DIFIC contracts general terms and conditions which are applied to defect management during DLP, and clearly defines contractual responsibilities of construction clients, consultants and contractors in managing defects during DLP. The types of defects that appear during DLP vary in their nature and intensity, which is a separate research topic. There are limited studies that investigate defects and its relation to the work disciplines such as architectural, structural, mechanical and electrical, and the defects inherent in them. Recognizing this, future research is needed to investigate the causal relationship between the types of defects and their root cause within each work discipline involved. The study of defects identified during the DLP can be very significant as a control mechanism to ascertain the validity and reliability of a project's implementation process.

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BIOGRAPHIES

Muhammad Tariq Shafiq is an Assistant Professor at the Department of Architectural Engineering at UAE University. He has extensive research & industry experience in enabling organizations for collaborative working using the latest digital technologies and processes. He has MSc in Project Management in Construction a PhD in Building Information Modelling (BIM) from the UK. He has contributed to several research projects in the UK & UAE and has published in conferences and Journals. His research focus has been to explore BIM collaboration workflows using model servers and cloud computing, providing strategic and technical support for BIM collaboration on multi-disciplinary projects.

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