AWARENESS STUDY ON THE QUALITY ASSESSMENT SYSTEM IN CONSTRUCTION (QLASSIC) FOR CONSTRUCTION WORKS IN PULAU PINANG

MUHAMMAD FIRDAUS BIN YUSOFF

SCHOOL OF CIVIL ENGINEERING
UNIVERSITI SAINS MALAYSIA
2015

AWARENESS STUDY ON THE QUALITY ASSESSMENT SYSTEM IN CONSTRUCTION (QLASSIC) FOR CONSTRUCTION WORKS IN PULAU PINANG

By

MUHAMMAD FIRDAUS BIN YUSOFF

This dissertation is submitted to

UNIVERSITI SAINS MALAYSIA

As partial fulfilment of requirement for the degree of

BACHELOR OF ENGINEERING (HONS.)
(CIVIL ENGINEERING)

School of Civil Engineering,
Universiti Sains Malaysia

May 2017

SCHOOL OF CIVIL ENGINEERING
ACADEMIC SESSION 2016/201

FINAL YEAR PROJECT EAA492/6
DISSERTATION ENDORSEMENT FORM

Title: Awareness Study on The Quality Assessment System In Construction (QLASSIC) For Construction Works in Pulau Pinang.

Name of Student: Muhammad Firdaus Bin Yusoff

I hereby declare that all corrections and comments made by the supervisor(s) and examiner have been taken into consideration and rectified accordingly.

Signature: Approved by:

_____ _____

(Signature of Supervisor)

Date: Name of Supervisor: Professor Dato' Sr. Dr. Wan Muhd. Aminuddin Wan Hussin

Date:

Approved by:

_____

(Signature of Examiner)

Name of Examiner: Dr. Farid Ezanee Mohamed Ghazali

Date:

ACKNOWLEDGEMENT

I would like to acknowledge my supervisor Professor Dato' Sr. Dr. Wan Muhd Aminuddin Wan Hussin who has given me support and guidance throughout the period of this study. His patience and perseverance toward the outcome of the study subject is on the highest standard. Without him, this project report will not become reality.

I would like to acknowledge to my parents especially my father Yusoff Bin Mamat and my mother Noraani Binti Harun to give birth to me and rise me up to be a good person, beside that I want to thanks to others family members who has contributed their moral support and encouragement helps me to go through all critical time. Without all of them I'm not strong to survive toward the completion of this project report. I also feel grateful to my fellow friends that help me during this case study.

Finally, I would like to acknowledge all the expert panels and respondents to the questionnaire for participants in this study exercise and without them this study will be meaningless.

ABSTRAK

Sistem Penilaian Kualiti (QLASSIC) dilaksanakan pada tahun 2006 adalah untuk menilai dan meningkatkan tahap kualiti di dalam kerja-kerja bangunan di kalangan para pemaju dan kontraktor. QLASSIC mengetengahkan satu tahap di mana kualiti terhadap kerja-kerja pemasangan dan pembinaan fokus kepada cara kerja untuk setiap elemen bangunan dan infrastruktur. Walaubagaimanapun, QLASSIC masih kurang diaplikasi oleh sebilangan besar pihak pemaju dan kontraktor di Malaysia atas alasan sistem kualiti ini tidak termaktub sebagai kriteria wajib untuk mendapatkan projek. Sehubungan dengan itu, ada di kalangan para pemaju dan kontraktor mengaplikasikan sistem kualiti ini kerana kesedaran terhadap kebaikan-kebaikan pengaplikasian QLASSIC di dalam projek mereka. Selain itu, terdapat juga halangan-halangan yang menghalang sesetengah pihak dari menggunakan sistem ini. Laporan projek tertumpu pada cabaran QLASSIC dan penerimaannya oleh para pemaju dan kontraktor yang berdaftar di bawah CIDB di dalam mencapai tahap kualiti di dalam cara kerja. Dengan itu, semua data dikumpul melalui bacaan, data dikeluarkan oleh pihak CIDB dan borang kaji selidik. berdasarkan analisis, kebanyakan pemaju dan kontraktor masih tidak memahami sepenuhnya QLASSIC. Antara halangan-halangan yang menjadi penyebab kepada keengganan pihak pemaju dan kontraktor untuk mengaplikasi sistem ini adalah tidak memahami tentang QLASSIC, kekurangan tenaga professional semasa proses penilaian kualiti, kekurangan penilai QLASSIC, dan kemerosotan latar belakang pihak kontraktor jika skor QLASSIC rendah dari kehendak CIDB. Majoriti pihak responden di dalam syarikat pemaju bersetuju dengan mengatakan bahawa halangan utama menghalang mereka dari menggunakan sistem QLASSIC ini adalah disebabkan peningkatan kos sesebuah projek dan melambatkan tempoh projek.

ABSTRACT

The Construction Industry Standard (CIS 7:2006) on Quality Assessment System (QLASSIC) was developed in November 2006 to evaluate and improve the quality of the building construction work among the developers and contractors. QLASSIC sets out the standards for the quality of workmanship for various construction elements of building and also infrastructure works. QLASSIC is not fully implemented and applied by all developers and contractors in Pulau Pinang as this element is not a compulsory requirement in getting projects. Moreover, there are only small numbers of developers And Contractors who are aware on the benefits of the application of QLASSIC in their construction projects. Besides, there are some barriers that cause those parties to avoid using QLASSIC. The aim of this study is to study on the challenges of QLASSIC assessment and its acceptance by Developers and Contractors that register under the CIDB, Malaysia for the construction projects in order to achieve the standard of quality in construction in terms of workmanship. Data was collected from the literature study and from Construction Industry and Development Board (CIDB) by means of interviews and questionnaires. Based on the analysis, most of the developers and contractors are still not familiar with QLASSIC. The barriers that contributed to developers and contractor refusal to comply with QLASSIC are unfamiliar with QLASSIC system, less of technical personnel during the QLASSIC assessment, less of QLASSIC's assessors and low reputation if QLASSIC score less than CIDB's requirement. Most of the respondents in the developers companies agree with the barrier in which the main reason that stops them from applying QLASSIC is that the project cost will increase and project period will delayed.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CIDB	Construction Development Industry Board
QLASSIC	Quality Assessment System In Construction
CIS	Construction Industry Standard
ISO	Eurocode 1
TQM	Total Quality Management
QPMS	Quality Performance Management System
CII	Construction Industry Institute
QMS	Quality Management System
CONQUAS	Construction Quality Assessment System
BCA	Building And Construction Authority
ACMV	Air-Conditioning And Mechanical Ventilation Works
M&E	Mechanical And Electrical
SOHO	Small Office Home Office
SOFO	Small Office Flexible Office
SOVO	Small Office Virtual Office
GFA	Gross Floor Area

CHAPTER 1

INTRODUCTION

1.1 Background of Study

The construction industry one of the sector that contributes to the economic growth of the country. This can be realizing through participation in the construction industry. The pace of development will be increased from time to time in accordance with population growth. This will increase the country's economy.

Building construction should be in accordance to quality specifications because it is an asset to be used in life expectancy. Therefore to construct a good quality building, a method to assess the “Quality of workmanship” was established by the Construction Development Industry Board (CIDB).

CIDB takes responsible in establishing the quality assessment against projects. CIDB’s objective is to develop the capacity and capability of the construction industry through the enhancement of quality and productivity by placing great emphasis on professionalism, innovation and knowledge in the endeavour to improve the quality of life. In addition, relevant with their policy that focus on encouraging the award of construction contracts based on "value for money" rather than cost efficiency. To ensure construction product in this country is following Industrial Standard, the construction firm need to hire skilled labour standing to National Skills Standards to achieve competitive advantage in global market.

Therefore this method is known as the QLASSIC Method. It is a method to measure and evaluate the “Quality of workmanship "for a construction job. It is assessed based on the quality requirements of the construction industry which refers to the Standard (CIS 7: 2006) issued by the CIDB for their reference during the

assessment. QLASSIC method, 'quality of workmanship' could be objectively evaluated through a scoring system.

QLASSIC sets the standard of 'quality of workmanship' to various elements of building construction and infrastructure construction. Scoring for the construction elements is based on a scoring system and the needs of 'quality of workmanship that has set the standard (CIS 7: 2006). Cumulative scores will be used to calculate the QLASSIC Score in percentage (%) for a construction project. The results are derived from the site inspection that carried out on the first time of inspection within the elements of the building from upon completion of the projects. For the works that are rectified after assessment will not be summed up into the score.

Nowadays, customer seems highly sensitive about quality and knowledgeable customer aware about building quality. They desire for zero defect, comfortable and suitable for living especially their resident area to them live for long term period. Furthermore, QLASSIC approach was still new in construction industries in Malaysia. The reception among developers and contractors are still in earlier stage, the encouragement in application of QLASSIC in every project are highly suggested by the Construction Development Industry Development (CIDB) Malaysia.

1.2 Problem Statement

Quality has been identified as one of the fundamental needs of clients. As such, construction projects that are able to be completed with distinctive quality will definitely enable to delight their customers. In this regard, Construction Industry Development Board (CIDB) has introduced two quality related programs namely ISO 9001 DIY Scheme and QLASSIC. The latter is essentially a quality performance

assessment tool to evaluate the level of quality of a building construction work based on quality standards stipulated in CIS 7:2006 (Ali, 2014).

QLASSIC is not fully implemented and applied by all developers and contractors in Malaysia as this element is not a compulsory requirement in getting projects. Moreover, there are only a small number of developers and contractors who are aware of the benefits of the applications of QLASSIC in their construction projects. Besides, there are some barriers that cause those parties to avoid using QLASSIC (Kenn Jhun Kam. & Ahmad Hilmy Abdul Hamid, 2012).

A small number of government projects rarely apply this assessment system. In other words, QLASSIC is a minor application in construction industry as QLASSIC is not a compulsory requirement for the developers and contractors to bid for the projects. The score of the construction works was first published in 2007 (Kenn Jhun Kam. & Ahmad Hilmy Abdul Hamid, 2012).

The lacks of skilled labour in this industry and poor management have resulted in poor workmanship in construction projects. Besides that, potential clients today are well informed of information from the construction industry, thus becoming increasingly demanding in terms of quality towards their potential purchases as these clients want to get what they have paid for in the first place (Kenn Jhun Kam. & Ahmad Hilmy Abdul Hamid, 2012).

1.3 Aim of study

This study is about to study the awareness of QLASSIC system in construction in Pulau Pinang and the challenges in implementing QLASSIC with regard to the standards, construction industries, construction quality and construction value that guide the study to get the factors and trends for QLASSIC usage in order to achieve the objectives.

1.4 Objectives

The objectives of this study is:

1. To investigate the awareness of QLASSIC in construction sector in Pulau Pinang.
2. To identify issues and challenges in implementing QLASSIC.

1.5 Importance and Benefits of Study

Benefits from this research are to obtain the effectiveness QLASSIC method to improve construction quality issues. The construction industries need to avoid the major issues in implementing quality of construction in Pulau Pinang and to create new level of construction industries with low percentage of building defects and highly quality awareness. Therefore the construction industries standard in Pulau Pinang is aimed to achieve a standing to global standard and therefore increase the country economy.

1.6 Scope of Work

The study uses the questionnaires distributed to the respondents are from the developers, contractors, consultants and government agencies. Questionnaires were distributed to the 25 construction sites that are operating in Pulau Pinang nowadays. The data obtained were used to create the database by analysing QLASSIC questionnaires responds.

CHAPTER 2

LITERATURE REVIEW

2.1 Quality Definition

No consensus has been reached on a definition for quality; the term is defined differently for different products and services, industries and for different levels of dimensionality. This study investigates the major definitions of quality and the antecedents of customer retention establish a foundation for a new definition of quality based on satisfaction. Quality is defined as the summation of the affective evaluations by each customer of each attitude object that creates customer satisfaction (Wicks & Roethlein, 2009).

Creating a definition of quality that is relevant for physicians is a daunting task. Truly, quality is an elephant being described by blind men. There is no single definition of quality that can be applied to management, marketing, or health care areas. Quality definitions appear to be tailored for specific applications. More than 100 definitions of quality was found in the literature. All-inclusive definition of quality applicable to health care systems from the Institute of Medicine is as follows: "Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Penneys, 1997). Definitions vary between manufacturing and services, between academicians and practitioners, and between industries. And definitions vary just because of the intangible nature of the components associated with quality (Wicks and Roethlein, 2009).

Satisfaction is so important as it, examines the various definitions of quality and how these definitions of quality are evolving examines the commonalities in the various definitions of quality to determine whether quality or satisfaction should be the central concept for developing customer retention, which in turn will determine the focus of a quality definition. This research resulted in defining quality as the summation of the affective evaluations by each customer of each attitude object that creates customer satisfaction, where the term customer is defined as any internal or external stakeholder of the organization and an attitude object is defined as the particular entity of interest. This definition addresses aspects of customer satisfaction other than the strict process and service quality definitions by capturing all aspects that create value for the customer and include cost, product improvements, technological implementation, and strategic focus (Wicks and Roethlein, 2009).

2.1.1 The Concept of Quality

Alongside time and cost, quality has remained as the most important parameter, which is the concern of the key players in the realisation of a typical construction project. Yet, the subjectivity surrounding the definition of quality has made it very difficult for a concrete method of quality measurement to be developed (Rad & Khosrowshahi, 1998). Subsequently, the establishment of a trade-off between time and cost against quality has remained largely unexplored. The paper reviews quality from various perspectives and lays the foundation for the development of a concrete definition of quality, in terms of its constituent attributes, and its measurement in quantified manner. Through a comprehensive literature review and validation through a questionnaire, the work brings together a series of attributes associated with quality and groups them under a number of categories (Rad & Khosrowshahi, 1998).

It is contemplated that the constructor and the client have varied perspectives on quality and that a third party point of view can bridge the gap and help to develop a unified perceptive on the subject. The work develops a methodology for a more objective measurement and quantification of quality encompassing measurable as well as subjective attributes of quality. This is carried out through a bi-directional ranking system applied to the attributes of quality. Also, triangulation is applied by cross-comparing the three perspectives on quality from client, constructor and third party (Rad & Khosrowshahi, 1998).

2.1.2 Client Perspective on Quality

The majority of research work in this area indicates that the client's main concern boils down to 'value for money' and 'fit for the purpose'. However, these objectives are rather broad in definition and encompass a vast variety of factors. Because of the subjectivity associated with these definitions, their objective assessment is very difficult. An outline definition is provided. Value for Money, basically value for money means the best available for the client, for a given money (Rad & Khosrowshahi, 1998).

This is a measure of how well the product is and the level of satisfaction it creates. Different buildings have different characteristics however; it may be possible to use statistical techniques in order to develop quantified method for measuring value for money. Fit for Purpose, this parameter from client's point of view, is a reflection of the degree to which the product satisfies his requirements as defined, as early as, the briefing phase (Rad & Khosrowshahi, 1998).

2.1.3 Contractors' Perspective on Quality

The prime concern of the constructors are 'client's satisfaction' and 'fashion' (prestige) yielded by the project. Client's Satisfaction, how pleased the client is with

the final product is a matter of concern to the constructor. This can be divided into subjective and measurable parameters. Therefore, perception of the client about the subjective parameters, such as design features and finishing, is a matter of concern to the constructor. For the measurable parameters, such as the quality of materials, a form of scaling system can be adopted. Fashion, although fashion lies within the category of subjective parameters, nevertheless, an evaluation system can be used to allocate a scaling system for each product. The system can be based on experience (in form of knowledge) and should be adaptable to varying circumstances. To this end, a method of quantification should be developed for each type of building (Rad & Khosrowshahi, 1998).

2.2 Total Quality Management (TQM)

Over the last few decades, Total Quality Management (TQM) philosophy has been applied to many organisations as a tool to improve quality and corporate performance. However, the benefit of TQM to organisational performance improvement is mixed. While many studies indicate that TQM could benefit organisational performance, it has been reported that not all TQM application has given satisfactory results to the organisations that implemented it (Panuwatwanich & Nguyen, 2017).

As building projects get larger and more complex, clients are also increasingly demanding higher standards for their delivery. Total quality management (TQM) has been recognized as a successful management philosophy in the manufacturing and service industries. TQM can likewise be embraced in the construction industry to help raise quality and productivity. TQM performance measures were also reflected through top management commitment, customer involvement and satisfaction, employee involvement and empowerment, customer–supplier relationships, and process

improvement and management. Finally, a framework for implementing TQM in construction is recommended (Pheng & Teo, 2004).

2.3 Quality Performance Management System (QPMS)

One of the most important TQM tools which can be used by engineering for a plant construction project is a quality performance management system (QPMS). QPMS is a product of the Construction Industry Institute (CII), which was formed in 1983 by a group of major owners and contractors that now include about 90 member firms and academic institutions. QPMS was first introduced in 1990 and modified through applications to its present form in 1993 (Willis & Willis, 1996).

Measuring performance is important, not only for providing a sense of where we are, but where we are going. Proper measurements guide the organization towards established goals and help reveal problems. Performance measurement is also a powerful behavioural tool as it communicates to the workforce what is important and, thus, what should be done. To be effective, management must be sure to measure the right things for the right reasons (Willis & Willis, 1996).

2.4 Advantages and disadvantages of Quality Management System (QMS)

Generally the implementation of QMS in construction projects is to integrate the resources effectively towards improving the quality performance of construction works. Quality management is a critical component to the successful management of construction projects. The common features of construction projects usually have a prescribed scope, schedule and budget to produce quality ‘product’ The four common characteristics for a given construction project are each project is unique and not repetitious. A project works against schedules and budgets to produce a specific result. The construction team cuts across many organizational and functional lines that involve

virtually every department in the company. Projects come in various shapes, sizes and complexities (Che Ali et al., 2012).

With the emergence globalisation economy, the local contractors need to compete with foreign contractors for market share. In this scenario contractors with effective QMS may have the advantage to survive. As a result a well-established QMS enable the contractors to improve the management capacity and capability to produce a desirable quality product or service, is becoming the most important decision in business nowadays. The tools and methods used to manage QMS have emerged from those based on statistical techniques, quality circles, quality standards to those broadly categorized under the label of total control/management (Che Ali et al., 2012).

The results of this study have shown that it is difficult to define quality in the construction industry. Contractors often have an attitude of 'looks good, feels good (Hoonakker et al, 2010). This type of quality is hard to quantify, and that is also one of the main results of the study it is hard to find a quantifiable outcome measure of quality in construction (Hoonakker et. al., 2010).

Through our research, it has become clear that a necessary first step is to define quality specifically, then quantify it. Customer satisfaction is an obvious outcome measure but most of the time, this measure is not adequately quantified in construction. Contractors are more than willing to show references from satisfied customers, but a standardized outcome measure would be welcome. If, for example, all construction contractors would use a standardised customer satisfaction questionnaire, it would be possible to compare the quality.

Records of contractors (benchmarking) and analyse which factors contribute to high customer satisfaction and high quality. Efforts to develop such a questionnaire have been made. However, even when contractors do collect data on customer

satisfaction, they often fail to analyse the data. Results of this study have shown that although more than half of the contractors in the survey report that they collect data on a variety of measures. They fail to understand that analysis of the data is crucial to quality improvement (Hoonakker et al., 2010).

2.4.1 Nature of the Construction Process

The 'nature' of construction is a complex system in which several participants, each with their own perspectives and interests, are brought together to complete a project plan that typically changes several times during construction, while each tries to minimise the effects of weather, occupation hazards, schedule delays, and building defects (Hoonakker et al., 2010). The many changes can lead to delays in completion of the construction project, complaints about quality, and rework, which in turn can lead to further delays and so forth. In short, the industry is characterised by confrontational instead of cooperative relationships between the different parties involved, with claims by the different parties as a result (Hoonakker et al., 2010).

2.4.2 Many Parties Involved in a construction project

The construction industry consists traditionally of three primary participants: the owner (or customer), the architect/ designer/engineer, and the (general) contractor. The basic construction process occurs like this: the owner hires an architect/engineering firm to design the project and place the project out for bid to contractors (in a competitive bidding process), and the contractors perform the actual construction work. Even though a common project goal is shared (completion of the plan), participants differ in what they hope to gain from the construction process. The typical owner would probably agree that they would like to spend as little as possible to get their desired project completed (Hoonakker et al., 2010).

Designers are in business to provide a service to the owner; however, their relationship with the contractors is often unclear. The contractors attempt to provide the product as drawn by the designer as efficiently as possible, in order to maximise their profit. Apart from the three primary participants, there are many other parties involved in the construction process: a variety of sub-contractors and suppliers. The many sub-contractors (ironworkers, carpenters, masons, plumbers, electricians, roofers) are a particularly important factor, and company size is a related factor that explains the difficulty in implementing quality (Hoonakker et al., 2010).

2.4.3 Non-Standardisation

The construction industry is characterised by its non-standardisation. Very often, products are one-offs and the production processes are to some extent different from each other. Hence, no universal standard or specification can be applied to the product, which leads to difficulties in quality assurance. Also, changes to the details of the design of a project are typical and may be frequent throughout the construction process. Quality is often at risk when a plan is changed during construction (Hoonakker et al., 2010).

Contractor may try to reduce allotted resources towards safety or quality management in order to maintain a healthy profit margin for the job. Attempts to reduce involvement in safety and/or quality management can be very costly to a contractor, if they encounter accidents during the project. They may also experience schedule delays for many reasons: weather, labour shortage, late delivery of equipment or materials, and other events beyond the control of the contractor (Hoonakker et al., 2010).

2.5 Introduction QLASSIC

QLASSIC is an acronym for 'Quality Assessment System in Construction'. It was mooted by Construction Industry Development Board (CIDB) somewhere in late 90's which led to the introduction of QLASSIC Guideline. Eventually in the year 2006, the said document was upgraded to Construction Industry Standard (CIS) known as CIS 7:2006 'Quality Assessment System for Building Construction Works' (Che Ali et al, 2012).

The main assessment structure of this standard is adapted from Construction Quality Assessment System (CONQUAS) practiced by Building and Construction Authority (BCA) in Singapore. There are several similarities in the categorizing the buildings as well as the distribution of the weightage on the building components between QLASSIC and CONQUAS. One of the deliverables of QLASSIC is the assessment report that can be potentially used to continually improve the quality performance in construction quality management system (QMS). Quality performance can be measured either qualitatively or quantitatively and QLASSIC adopts both of these approaches (Che Ali et al., 2012).

The internationally accepted quality management regime is ISO 9001 QMS. The current ISO QMS is ISO 9001:2008. This standard was introduced somewhere in 15th November 2010 to replace ISO version 2004. The latest ISO 9001 has no major changes on the standard requirements but elaborate further clarity on some elements. One has to remember that ISO 9001 is a generic and prescriptive standard. However it does not provide the tool to implement it. Thus the organization needs to develop or select any available management tools in the market that fit their purpose (Che Ali et al., 2012).

2.5.1 QLASSIC Objective

Quality Assessment System for Building Construction Works was designed and developed to enable the user to achieve any of the following objectives. First objective is to benchmark the level of quality of the construction industry in Malaysia. Second is to have a standard quality assessment system for quality of workmanship of building projects. The next objective is to assess quality of workmanship of a building project based on CIS standard. After that is to evaluate the performance of contractors based on quality of workmanship. Lastly is to compile data for statistical analysis (CIS: 7, 2014).

2.5.2 Scope of QLASSIC

This standard sets out the quality of workmanship for the various aspects of the construction element for the general building works. QLASSIC covers four main components, which are Structural Works, Architectural Work, M&E Work and External Work (CIS: 7, 2014).

Assessments on the workmanship are carried out based on CIS 7 standard and marks are awarded if the workmanship complies with the quality standard. These marks are then summed up to give a total quality score (%) for the building project. However, the assessment excludes works such as piling, foundation and substructure works, which are heavily equipment-based and called under separate contracts or subcontracts (CIS: 7, 2014).

The building is assessed primarily on workmanship standards achieved through site inspection and field testing. For structural and M&E works, assessment is carried out throughout the construction process. For completed building projects, the assessment is done for architectural, M&E fittings and external works (CIS: 7, 2014).

Apart from site inspection on finishing works, the assessment also includes field tests, test results on the materials and the functional performance of selected services

and installations. These tests help to ascertain the quality of building workmanship for occupants in relation to safety, comfort and aesthetics, whereby, defects may surface only after sometime (CIS: 7, 2014).

2.5.3 Quality Assessment System for Building Construction

Quality Assessment System for Building Construction Works is intended to complement the normal contractual drawings and specifications in a project. It is not intended to be used independently as working specifications. Unless specified in the building contract, qualified persons should not use Quality Assessment System for Building Construction Works to decide if the building or parts of the building project are in accordance with the relevant by-laws. It is still the responsibility of the qualified person to ensure that the quality of the construction works conforms to approved standards, practices, specifications and drawings, as specified in the contract.

2.5.4 Assessment Approach

In line with the CIDB Act, it is a prerequisite that all projects, which applied for QLASSIC assessment, submit a declaration document by the Superintendent Officer (SO) on the compliance to Section 33C of the said act. In general, the assessor determines the samples (elements or locations) to be assessed prior to each assessment. The samples are selected from floor plans and site plans. The selected samples shall be distributed as uniformly as possible throughout the project and construction stages. All locations are to be prepared for the assessment (CIS: 7, 2014).

The scoring will be done on the works that are inspected for the first time. Rectification and correction carried out after the assessment will not be rescored. The objective of this practice is to encourage contractors towards “doing things right at the first time and every time” (CIS: 7, 2014).

According to this system, the symbol (√) is used to illustrate the work meets the standards and the symbol (X) for jobs that do not meet the standard. Since it is difficult to monitor the project, this QLASSIC are using statistical sampling approach to identify the number of locations to be considered for each element of construction to reflect the whole project (CIS: 7, 2014).

The quality of a project is calculated as a percentage (√) given and compared with the total number of locations in the bushes for all elements of construction. But for this study is just one component to be considered the architecture as it contributes the highest percentage in the three other components of fifty per cent (CIS: 7, 2014).

2.5.5 QLASSIC Quality Standard

Structural works, which is the structural integrity of the building is of paramount importance as the cost of failure and repairs are very significant. The assessment of structural works comprises Site inspection of reinforced concrete, structural steel and pre stressed concrete structures during construction, test results of compressive strength of concrete and tensile strength of steel reinforcement and non-destructive testing of the uniformity and cover of hardened concrete (CIS: 7, 2014). Architectural works, deal mainly with finishes. This is when the quality and standard of workmanship are most visible. Architectural works encompass floors, internal walls, ceilings, doors, windows, fixtures, external walls, aprons, perimeter drains, structure car parks and car porches (CIS: 7 2014).

The quality of M&E works, is important in view of its increasingly high-cost proportion and its impact on the performance of a building. The assessment covers electrical works, air-conditioning and mechanical ventilation works (ACMV), fire protection works, sanitary and plumbing works, and basic M&E fittings. External works, cover the general external work elements in building construction such as the

link-way or shelter, external drain, roadwork, car park on the ground, footpath, turfing, playground, court, gate, fence, swimming pool, electrical substation, guard house and bin centre (CIS: 7, 2014).

2.5.6 QLASSIC WEIGHTAGE

The weightage for structural, architectural, M&E and external works are allocated in accordance to four categories of buildings (Table 2.1).

Table 2.1: Allocation of weightage for components of the building construction work according to Building category (CIS: 7, 2014)

Component	Category A Landed Housing	Category B Stratified Housing	Category C Public Building	Category D Special Public Building
Structural work (%)	25	30	30	30
Architectural work (%)	60	50	45	35
M&E work (%)	5	10	15	25
External work (%)	10	10	10	10
Total score (%)	100	100	100	100

The weightage system is aimed at making the score quantitative and represents the quality of workmanship of a building project. It has taken into consideration the distribution between the cost proportions of the four components in the various buildings (CIS: 7, 2014).

2.5.7 QLASSIC Building Category

Category A covers landed housing that is, Detached, semi-detached, terrace and cluster house For Category B is Stratified housing that is flats, apartments, condominiums, service apartments, small office home office (SOHO) and town houses.

Category C is Public, commercial, industrial buildings without centralised cooling system such as Office buildings, schools, factories, warehouses, workshops, hangers, small office flexible office (SOFO), small office virtual office (SOVO), religious buildings, stadiums, community halls, hospitals, airports, universities, colleges, police stations, and else. The last is Category D which cover Public, commercial, industrial buildings with centralised cooling system such as Office buildings, schools, factories, warehouses, workshops, hangers, small office flexible office (SOFO), small office virtual office (SOVO), religious buildings, stadiums, community halls, hospitals, airports, universities, colleges, and police stations (CIS: 7, 2014).

2.6 QLASSIC Assessment

The QLASSIC assessors are accredited and regulated by CIDB. They are updated with the latest relevant information on a regular basis to ensure consistency and effective implementation of the assessment. As it is impractical to assess all elements in a building project, the assessment is carried out through a sampling approach (CIS: 7, 2014). The sampling, which is based on the gross floor area (GFA) for the building and 10 m length section or per location for the external works, is to ensure that the assessment adequately represents the entire building project (CIS: 7, 2014).

Therefore, some changes to be made to fit with the data. Value of one (1) is given for work that does not meet the standards and score zero (0) is given for satisfactory work. Percentage for each element of the work involved will be compared to see the highest value for the identification of the most common defects (CIS: 7, 2014).

2.6.1 Structural Work Assessment

Assessment of structural works is carried out during construction of the building project. The assessment covers performance testing. For a typical reinforced concrete structure, selection of samples for assessment is based on Table 2.2. Each sample represents a beam, column, slab or reinforced concrete wall (CIS: 7, 2014)

Table 2.2: Weightage for Concrete Structure Element (CIS: 7, 2014)

Concrete Structure Element	**Weightage Cast in-situ (%)**	**Weightage precast (%)**
Formwork	20	0
Rebar	15	5
Finished concrete	25	35
Concrete quality	5	0
Steel reinforcement quality	5	0
Precast specific requirement	-	20
NDT– UPV test for concrete uniformity	15	20
NDT – Electro-cover meter test for concrete cover	15	20
Total	**100**	**100**

The resulting scores for precast and finished concrete will be the sum of the number of checks that meet the standards. There is no assessment of precast components at the precast yard. The assessment is applicable for all types of precast components at site. The assessment of the non-destructive tests, i.e., on concrete uniformity and cover for steel reinforcement, is to minimise the risk of carbonation and

steel corrosion, which affect the durability of the concrete structures. If the structural works consist of structural steel works, which constitute more than 20% of the structural cost, assessment will be required for the latter and the marks will be distributed proportionately (CIS: 7, 2014).

This applies to prestressing works as well. In any case, the distribution should follow the cost composition for these three types of structural works in the projects If the structural steel in all structural works is to be casted, the assessment shall be performed prior to the covered works (CIS: 7, 2014).

2.6.2 Architectural Assessment

Assessment of architectural works is carried out upon completion of the building project and before the handover of the project. A location for Internal Finishes assessment is a functional space of a building such as room, hall, toilet, kitchen, corridor or lobby. Locations are further categorised into three types such as Principal locations are major functional places such as halls and rooms and Circulation locations are passages and areas of human traffic such as lift lobbies, corridors and staircases. Service locations are utility areas such as toilets, kitchens, balconies and yards (CIS: 7, 2014). The total number of locations will be distributed according to "Principal", "Circulation" and "Service" based on the percentage set out in the four categories of buildings.

Scoring of internal finishes is based on the defects 'Defects Group for Assessment of Architectural Works (Internal Finishes)'. In general, any item which is not available in a project will not be considered for scoring. For such cases, the architectural score will be prorated accordingly (CIS: 7, 2014). For the assessment of external wall, a minimum 50% of the total number of building will be assessed. For a building, the external wall will be divided into four walls assessment (CIS: 7, 2014).

For example in figure 2.1 there are inspection for wall surface by QLASSIC accessor also in (Figure 2.2, 23, 2.4, 2.5, and Figure 2.6).

Figure 2.1: An inspection for the wall surface section (Construction Industry Development Board Malaysia, 2014)

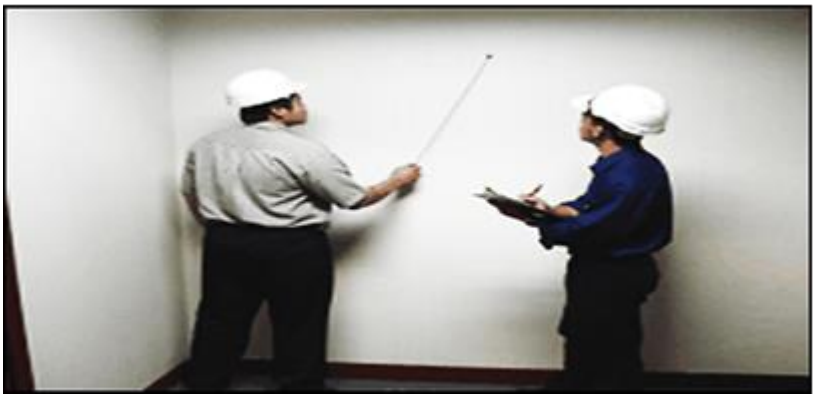

Figure 2.2: An inspection for the hollowness on the wall (CIDB, 2014)

Figure 2.3: Inspection for the wall angle (CIDB, 2014)

Figure 2.4: Inspection for the door frame (CIDB, 2014)

Figure 2.5: Inspections for tile hollowness (CIDB, 2014)

Figure 2.6: Inspections for ‘fall’ floor (CIDB, 2014)

An item under assessment will be considered to have failed if it does not meet the standards. In addition, any item found to be defective functionally such as evidence of water seepage in the window, slab, ceiling or roof, is considered to have failed the assessment. Likewise for a particular defect that is found excessive in an item (for instance, excessive cracks on a wall) the weightage of architectural works is at Table 2.3 and Table 2.4.

Table 2.3: Weightage of Architectural Work According To Building Category (CIS: 7, 2014).

Location	Category A Landed Housing (%)	Category B Stratified Housing (%)	Category C Public/ Commercial/ Industrial Building (%)	Category D Public/ Commercial/ Industrial Building (%)
Principal	40	40	60	60
Service	40	40	15	15
Circulation	20	20	25	25
Note: For other types of building, the distribution of percentage shall be in accordance to Category C.				

Table 2.4: Sampling Guide Line of Architectural Work (CIS: 7, 2014)

No.	Item	GFA per	Min sample	Max sample	Remark
1a	Internal finishes	70 m2	30	700	Category A
1b	Internal finishes	70 m2	30	600	Category B
1c	Internal finishes	500 m2	30	150	Category C
1d	Internal finishes	500 m2	30	100	Category D
2	Roof	-	50%	-	50% of the blocks/units
3	External walls	-	50%	-	50% of the blocks/units
4	Apron and perimeter drain	-	2	-	10 m length section per drain sample
5	Car park/Car porch	-	2	-	10 m length section per car park floor
6	Skim coat or repacked plaster	-	-	-	Declaration by QP
7	Wet area water-tightness test	-	-	-	Declaration by QP

2.6.1 M&E Works

Assessment of M&E works is carried out during construction and upon completion of the building project and before the handover of the project. The assessment covers basic M&E fittings and performance tests. The assessment covers the following area, with their weightages allocated in accordance with the four categories of projects category (CIS: 7, 2014). (Table 2.5).