

The building defects of construction construction essay



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Introduction

Building defects are always under the spotlight and the grave concern of the construction industry. Different buildings or structures produce different types of defects and require numerous levels and types of quality, which rely on the building functions, the construction or maintenance systems and also materials adopted.

According to Watt (1999), “ a defect may be considered to be a failing or shortcoming in the function, performance, statutory or user requirements of a building and it might manifest itself within the structure, fabric, services or other facilities of the affected building.”

Josephson and Hammarlund (1998) quoted from Svensk Standard, SS 020104 (1987) states that defect is defined as ‘ the non-fulfilment of intended usage requirements’ in which requirements are determined by law, regulations, building standards as well as in contract documents, site meeting records and other project documentation. However, not all requirements can be specified as there are many details which are difficult to specify such as non-expressed basic needs of each individual. Therefore, these demands are referred as ‘ usage’ requirements. Opinions and responses from project participants are needed whenever specified requirements are wrong and defects will likely occur if those opinions are not complied.

There is a clear difference between failure and defects. Failure is defined as deviation from original specifications which can or cannot be corrected prior to the handing over of the building. On the other hand, defect is termed as <https://assignbuster.com/the-building-defects-of-construction-construction-essay/>

deficiency of the performance which becomes apparent once the building is operational. Failing to differentiate the two terms may lead to inaccurate and incomplete measurements, cost determination and perhaps inappropriate methods to reduce its occurrence (Atkinson, 1987).

Georgiou et al (1999) suggest that defects can be classified as major defect or minor defect. Major defect is considered as those which cause the building to become unsafe, unsuitable for living in and not suitable to be used for the purposes for which the building was designed. On the other hand, minor defects is considered as those originate from poor workmanship or deficient materials used in the construction of the building but do not cause the building to become unsafe, unsuitable for living in and not suitable to be used for the purposes for which the building was designed. Defects which require less than Australian \$500 to repair are considered as minor defects. In the meantime, major defects are defects exist after 12 months which need more than Australian \$500 to repair and most of them are structural deficiencies (Georgiou et al, 1999).

Georgiou (2010) and, Andi and Minato (2003) state that defects occur if a component has a shortcoming and does not comply its intended functions and acceptable level of quality as required by owners, contractors or regulations.

Causes of defects

Some of the defects are caused by natural consequences that developed over the period of time such as aging and typical uses. However, many premature defects occur due to the fact that improper skills and care are

assigned on the building. The study by Building Research Establishment concludes that over 90 per cent of the building defects are caused by the promptly diagnosable faults in design or construction which could be foreseen beforehand and prevented.

Generally the causes of defects are stated as the followings: (Lee, 1987)

Insufficient brief

Defects are often interpreted as originated from the strokes of designer or on the drawing board in many instances but in some cases they can be attributed as occurring at an even earlier stage. For instance, client may lay down unrealistic cost limits or fail to give clear indication about the functional requirement of the building. Normally, there is no clear information about the intended building life-cycle or maintenance requirements.

Inaccurate design decisions

The most common faults can be sorted as follows:

Failure to follow well established design criteria in the choice of structural system and selection of materials

Ignorance of the basic properties of material. For example, failing to make allowance for the differing thermal and moisture movements of materials used in combination.

Usage of new materials or technologies which have not been thoroughly examined its effectiveness. This is often the result of uncritical reliance on manufacturers' literature quoting stimulated laboratory tests.

Misjudgement of user and climatic conditions under the material will have to perform.

Complex details which have low probability of successful execution on an open building site.

Poor communications between different parties such as design and construction teams.

Construction method

The construction projects normally take place in less ideal conditions and always emphasize on speedy completion due to time constraint which often resulted in careless delivery. Some manufacturers of so-called high technology components have little awareness of the strictness of a building site or the standards of accuracy achievable under such conditions although only a small proportion of defects were attributable to faulty materials.

Materials may easily be damaged during transportation, loading and unloading, inappropriate condition of storage on site and placing in position even though the materials may be flawless upon leaving the factory. The defects can be prevented with by taking greater care during all the stages during construction project, providing appropriate training to all the workers and staffs, and ensuring closer supervision.

User Activities

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Defects may be caused by unintended misuse due to the lack of knowledge on the correct method of usage or intentional acts of vandalism. This problem can be solved by providing more information such as the degree of severity of use and condition of use to the designer so that a better output can be yield. Besides, some defects may be correlated to the users' financial conditions and also social attitudes. For instance, condensation is affected by the amount of money spent on heating and ventilating, and occupancy pattern.

Maintenance

Incorrect identification of root of the defects may lead to inappropriate remedial work. It won't rectify the original defects but may deteriorate the condition of the building further. Furthermore, negligence during inspection and repair works may lead to defects in previously satisfactory structures or elements. For example, stepping on unprotected felted roof can drive the gravel into the felt which can cause splits and cut and eventually lead to roof leaking.

On the other hand, defects often occur due to the designer's decisions. Designers often do not take into consideration how the materials will behave and react toward other adjoining materials during construction and during the life of the building. For instance, the application of green, rotting or damaged timber for floor joists will result in floor in the floor after completion. It is obvious that a material is often wrongly used even though the material itself is in perfect condition.

Effective communication between designers and construction workers aids in solving problems. Sometimes, construction workers readily implement their own ideas of how to construct rather than discussing with designers when they encounter with messy construction drawings produced by inexperienced designers. This is quite common in design-and-build form of contracts as the contractor stands to gain contractual advantage from drawing attention to design defects (Evans, 2005).

Building defects are a matter of concern for a various reasons:

The employer is eligible for what he or she is investing for. The presence of defects means that he or she doesn't get anything proportional of the amount paid for.

Defects might delay the completion of the project and thus affecting the handover of the building. This is because it will take some time to inspect and rectify the defects.

Lot of time and money may also be used up in identifying possible causes of defects, especially to attach blame.

There may be significant disruption and consequential loss if defects are to be corrected in occupied buildings.

Resources spent on defect rectification are not available for use elsewhere.

Defects represent inefficiencies in construction procurement processes.

Design defects affecting maintenance

Civil

Inadequate provision for movement

Ignoring aggressive environment and weather condition effects

Ignoring biological effects

Inadequate structural design such as foundation

Ignoring variations in soil conditions

Ignoring load impact on structural stability

Exceeding allowable deflection limits

Ignoring wind effect on the structure

Inadequate concrete cover on the reinforcement

Improper locating conduits and pipe openings at critical structural locations

Architecture

Narrow stairs, passages & doors

Incompatible finishes with climate

Specifying finishes which need complete replacement

Ignoring climatic effects on exterior shapes

Inadequate joints between faces

Maintenance practically

Ignoring access for maintenance equipment

Designing permanent fixing which should be removable for maintenance

Ignoring maintenance equipment availability

Ignoring maintenance requirements in the design

Civil

Inaccurate measurement

Damaged form work

Excavation too close to the building

Painting in unsuitable condition

Inadequate water proofing and drainage

Insufficient reinforcement concrete cover

Cold joints

Loss in adhesion between materials

Early form work removal

Poor soil compaction

Inadequate curing

Materials

Different thermal movement in dissimilar material

Selection of material which is unsuitable for the existing climatic condition

Use of non-durable material

Use of expired material

Poor material handling & storage

Inadequate provision for movement

This happens when designers ignore the spacing needed for contraction and expansion movements. Such movements will cause cracking of the structures which will result in corrosion of the structural elements such as beams, columns and slabs. It will also cause cracking on the wall which will affect the aesthetic value of the building. The most severe case attributed to inadequate provision for movement will be the structural collapse.

Ignoring aggressive environment and weather condition effects

The designers should always select and specify the suitable materials which are capable of withstand the existing weather condition during building design. This will result in less maintenance during the post-occupancy stage. Problems occur when a designer is used to certain weather condition in a region and then moves to another region which has different weather

without giving consideration to the weather changes. It will cause material to deteriorate in a shorter time and might affect the other parts of the building.

Ignoring biological effects

Designers should be familiar with the building location and type of plants and insects existing in that area or in the vicinity. Designers should also determine whether any special treatments are needed to prevent these biological attacks. These preventions should be specified in the design drawings with certain degrees of clarity. Failing to deal with biological factors might require continuous maintenance which can be avoided during the design and construction stage.

Inadequate structural design such as foundation

Inadequate structural design happens when designers didn't design or under-design the structural elements of the building. This will lead to building's settlement or failures. Besides, it will also cause cracking of the wall finishing.

Settlement is ' movement within a structure due to the distribution or re-distribution of loading and stresses within the various elements of construction. Foundation failures may be caused by the changes in ground conditions affecting early footings, failure of foundation arches, and decay of timber piles or chemical attack on concrete foundation (Watt, 1999).

Ignoring variations in soil conditions

Soil conditions are almost the same in most places. But, soil structure may vary in certain places or conditions. Hence, designers should always

determine whether buildings are able to be built on it by determining the soil condition and structure. This can be done by carry out proper soil investigation and surveyor geo-technical test. Poor soil condition might cause cracking of the structural elements or exterior and interior walls of the building.

Ignoring load impact on structural stability

The impact of movement resulted from physical or mechanical activities such as elevators, lifts, the vibrations of central air-conditioning systems or wind load in high rise building might causes cracking on the wall surface. Besides, vibrations from heavy traffic, machinery and piling operations will more or less produce the same impact of movement. The problem cannot be solved until the impact of the movement is isolated.

Inadequate concrete cover on the reinforcement

Insufficient concrete cover may result in the corrosion of the steel bars and cracking of the concrete. This is because the corrodents might reach the concrete reinforcement faster if there is inadequate cover or protection to the steel bars. The failing of the steel reinforcement will cause the failure in the structure.

Improper locating conduits and pipe openings at critical structural locations

Some designers do not amend the layout of the mechanical and electrical design which installs the conduits and pipes at a very critical location which might cause defects or cracking of the structural elements and damage to the electrical and mechanical system of the building.

Incompatible finishes with climate

Designers should always consider the climate, weather and environmental condition that the buildings will be exposed to before choosing suitable buildings' exterior finishes. Suitable colour and type of exterior building finishes should be selected carefully in order to prevent environmental effects on the finishes. For example, building with dark colours painting might not resist heat during hot weather.

Specifying finishes which require complete replacement

Designers should always prevent the usage of finishes which require complete replacement after failure. On the other hand, finishes which are easily available and require minimum maintenance should be adopted. The usage of wallpaper as wall finishes is not encouraged as it requires total replacement if any part of it is damaged in order to match the colour.

Ignoring climatic effects on exterior shapes

Designers should make sure that the collection of moisture, water and dust can be prevented after the buildings are ready to be occupied. Proper designs which consider the climatic effects on exterior shapes might result in less maintenance need on cleaning and repairing damages due to climatic effects such as moisture, water and dust. Improper exterior designs might cause water collection at the building roof which in turn might constitute to moisture penetration into the building.

Inadequate joints between surfaces

Designers should specify appropriate joints between structures such as floor slabs and walls to accommodate the expansion and contraction caused by

thermal. This is because insufficient joints will cause overlapping of the floor tiles and cracking of the surfaces such as walls and tiles due to thermal expansion.

Ignoring access for maintenance equipment

Buildings should be designed to allow for the maintenance access. The maintenance access factor should consider the clearance of the maintenance staffs and equipment. Failure to provide necessary access for the maintenance to be carried out will obstruct the maintenance work and deteriorate the specific part further which will cause the raise in maintenance cost.

Designing permanent fixing which should be removed for maintenance

Designers should avoid the usage of permanent fixations which require continuous maintenance and complete removal during maintenance works. All these will increase the maintenance frequency and also the maintenance time needed to be carried out. Permanent fixations that should be avoided are lamps, carpets and external windows.

Ignoring maintenance equipment availability

Building designs should be designed according to the current and existing maintenance equipment on the market. Designers should aware of the maintenance equipment on the market in designing a certain building. For example, problem may occur when cleaning a building exterior or window in a high-rise building and also changing light bulbs in a very high location.

Maintenance cost may be accelerated if maintenance equipment is not available.

Inaccurate measurement

Inaccurate measurement happens when the construction contractor wrongly measure the building element size and the material mixture ratio such as concrete ratio. For example, the changes or alteration of the gap between door and door frame or window and window frame will causes water and moisture penetration. Besides, the construction contractor wrongly increases the water content to the concrete mixture will yield porous concrete which in turn will causes corrosion to the steel reinforcements and then, collapse of the structure.

Damaged formwork

Damaged formwork will produce a honeycomb or porous concrete surface which decreases the quality of the formwork. The porous concrete surface will enable moisture penetration which can cause corrosion of the steel bars and cracking of the structure.

Inadequate water proofing and drainage

Water proofing and drainage of building are normally being carried out wrongly and inadequately. Inadequate water proofing or water proof membrane may result in water seepage or leakage through slab, wall, balcony or deck. The building will be exposed to erosion, mold, decomposition, and construction damage if there is no proper waterproof membrane to prevent water penetration. For example, the building will expose to serious construction defect if there is no water proof membrane

under the ground slab which helps to prevent ground water from penetrate into the foundation.

Cold joints

Cold joints normally happen between old and new concrete as the concrete is poured in part and left to dry before the rest of the concrete is poured. The dried concrete will not totally combine or fix together and lines will appear on the concrete. The cold joints will decrease the aesthetic value of the building. The severe case of cold joints will allow the water penetrate into the concrete gap which might cause damage to the steel bars inside the concrete. Cold joints can be overcome by inserting reinforcement bars into the fresh concrete which will bind the new concrete effectively.

Construction materials

Defects can be caused by the wrong selection or specification of materials by the designers. Selection of non-durable or low quality materials that is available at cheaper price may require plenty of maintenance during post-occupancy period. The climatic factors must be considered during selection of materials as material's quality will be affected and require replacement in a short time. For example, specifying indoor materials to be used at outdoor will cause the materials to perform irregularly. In addition, some materials which is highly adopted in overseas, might not perform effectively in Malaysia due to its hot climatic condition.

On the other hand, the properties of materials should be considered when combining two or more materials together. This is due to the chemical reactions that might occur between them. For instance, tile glue and cement

will separate from each other when used together as thermal expansion of cement is higher than the tile glue. The selection of the materials needs to be done carefully as it will affect the building quality and maintenance needs.

Unqualified designers