CHAPTER II

LITERATURE RIVIEW

2.1. Building Structure

A building represents a physical form of the result of a construction work integrated with its house, partly or completely above and in the land and/or water, which purposes as a place for humans to carry out their day job, whether for shelter or household, religious movements, activities. Buildings are managed in accordance with the functions that have been set, including the service of maintenance and periodic inspections. Maintenance stands the activity of maintaining the reliability of a structure along with its infrastructure and facilities so that it is constantly adapted for function. Therefore, periodic inspections are always carried out. Inspection of part or all of the construction, its components, artefacts, and/or facilities and infrastructure within a certain time frame to declare the proper function of the building.

2.2. Building Maintenance and Maintenance Guidance

In this study the Minister of Public Works Regulation Number: 24 / PRT / M / 2008 concerning Guidelines for Maintenance and Maintenance of buildings were referred to. Maintenance work includes boiling cleaning, tidying, checking testing, repairs and / or replacing building materials or equipment and other activities based on guidelines for the operation and maintenance of building. The scope

of maintenance is observed architectural, structural, mechanical electrical, and plumbing. However, not all building components are observed maintenance because of limited research resources. According to the guidelines used technical standards for inspection and repair of building components are as follows:

1) Collect all building components in the building.
2) Examination and entering into forms list refer to the condition of building components.
3) Develop a Building Component Maintenance Program.
4) Determine the Building Component Maintenance Schedule.
5) Determining the Priority Scale for Repairing.
6) Determine the technical proposal for the Implementation of Job Care.
7) Make a Budget Plan for Implementing Care Work.
8) Submitting a Maintenance Cost Budget Plan along with an implementation schedule for approval.
9) Informing the schedule of implementation of work to the relevant ranks
10) Carry out supervision during the execution of work.
11) Preparing Official Examination Report
12) Prepare an Official Report of Handover.

According Minister of Public Works Regulation Number: 24 / PRT / M / 2008 the scope of building maintenance includes several components as follows:

2.2.1. Architecture

1. Maintain good and regular building exit access as a means of saving (egress) for owners and users of buildings.
2. Maintain good and orderly elements outside the building so that they remain neat and clean.
3. Maintain well and regularly the elements in the room and equipment.
4. Providing adequate and functioning systems and maintenance facilities, in the form of fixed equipment / equipment and / or work aids.
5. Carry out the right way to maintain architectural and decorative ornaments by officers who have expertise and / or have competence in their fields.

2.2.2. Structure

1. Maintain well and regularly the structural elements of buildings from the effects of corrosion, weather, humidity, and loading beyond the limits of structural capabilities, as well as other pollution.
2. Maintain and regularly protect the structural elements.
3. Conduct periodic checks as part of preventive maintenance.
4. Preventing changes and/or additional activity functions that cause an increase in the load that works on buildings, beyond the planned load limit.
5. Conduct proper maintenance and structure improvements by officers who have expertise and / or competencies in their fields.
6. Maintain buildings to function according to the planned use.

2.2.3. Mechanical (Air Management, Sanitation, Plumbing and Transportation)

1. Maintain and carry out periodic inspection of the air system so that the air quality in the room meets the technical and health requirements required including maintenance of the main equipment and air ducts.
2. Maintain and conduct periodic inspections of water distribution systems which include the provision of clean water, sewage installation systems, fire hydrants, sprinklers and septic tank and also for waste processing units.
3. Maintain and carry out periodic inspection of the transportation system in the building, both in the form of elevators, escalators, stairs and other vertical transportation equipment.

2.2.4. Electrical (power supply, lighting, telephone, communication and alarm)

1. Conduct periodic checks and maintain backup power generation equipment.
2. Conduct periodic checks and maintain lightning protection equipment.
3. Conduct periodic inspections and maintain electrical installation systems, both for electric power supply and for room lighting.
4. Conduct periodic checks and maintain a network of sound and communication installation (telephone) and data.
5. Conduct periodic checks and maintain a network of alarm systems and alarms.

2.2.5. Outer Spatial Planning

1. Maintain a good and regular condition and surface of the land and / or the yard outside the building.
2. Maintain good and orderly elements of landscaping outside and inside buildings, such as vegetation (landscape), fields of pavement (hardscape), outdoor equipment (landscape furniture), sewers, fences, and gates, lighting outside and post / guard post.
3. Maintain cleanliness outside the building, yard and environment.
4. Carry out proper garden maintenance by officers who have expertise and / or competence in their fields.

2.2.6. Housekeeping

1. Cleaning maintenance (cleaning service). The building work maintenance work program includes a daily, weekly, monthly, and annual work program that aims to maintain the cleanliness of the building which includes the cleanliness of the "Public Area", "Office area" and "Toilet Area" and its equipment.
2. Maintenance and treatment of the Hygiene Service. The 'Hygiene Service' work program includes a maintenance and maintenance program for air freshener and anti-septic which gives the impression of being clean, fragrant, healthy including office space, lobby, elevator, meeting rooms and toilet which are tailored to the function and condition of the room.

3. Maintenance of Pest Control. The work program for the maintenance and treatment of 'Pest Control' can be carried out every three months or six months with a general work pattern, based on the overall building volume with the aim of removing rat pests, insects and by using pesticides, spraying, fogging or fumigation, both 'indoor' and 'outdoor' to provide comfort for building users.
4. General Cleaning Program. Hygiene maintenance programs that are carried out in general for a building are carried out to maintain the beauty, comfort and performance of the building carried out on certain days or on holidays which aim to lift or peel dirt on a particular object, such as the floor, inner glass, walls, toilets and office supplies.

2.3. Service Life

Service life is a reference for the age of the components of building materials used. Service life is used to determine the maintenance period or replacement of components used in buildings.

2.4. Definition of LCC

This instrument of the study was referred to Regulation of Minister of Public Works. Another aim is to identify service life of the building components, and conducts 25 years life cycle cost plan for the stadium management by adopting model of LCC from ISO 15686 part 5 , 2017. Based on ISO 15686 part 5 (2017),

Life cycle costing (LCC) is a methodology for the systematic economic evaluation of the life cycle costs over the period of analysis as defined in agreed scope.

There is some understanding of the LCC, according to some experts, including as follows:

1. According Fuller and Peterson, LCC is an economic method for evaluating assets that takes into consideration all costs arising from owning, operating, maintaining, and disposing of the asset
2. According Mearig et al., 1999, It is the total discounted cost of acquiring, operating and maintaining, and disposing of an asset over a fixed period of time
3. According to Pujawan, LCC (Life cycle costs) of an item is the sum of all costs associated with the item since it was designed to not be used. In other words, the definition of Life Cycle Cost is the total of procurement, the total cost of procurement and ownership cost. Therefore life cycle costs can be formulated as follows:

LCC = Initial Cost + Usage Cost + Maintenance Costs and Replacement Cost

Where, the initial cost is the cost used for the planning and implementation of the building, the usage cost is the cost used during the construction of the building, and maintenance and replacement costs are the costs used for the maintenance of the building and replacement of building components as long as the building is used.

2.4.1. LCC for Campus Center Building Institute of Technology Bandung (ITB)

Title of research conducted Kawtharazlanshah Koento namely "Estimates LCC (initiation of the concept of green building) campus center ITB". LCC calculations performed included some aspects of cost: initial cost, the cost of electricity, clean water costs, maintenance costs, costs maintenance, demolition costs, and resale value. Calculations were performed taking into account the choices made after the service life of the building exhausted. Building service life was assumed to be up to 30 years. The first option was destroyed building after passing the maid, and therefore costs demolition taken into account in the calculation of LCC. The second option was the building was sold after passing the maid, so the calculation of life cycle taking into account the cost resale value ITB Campus Center Building. The conclusion of this research was, most cost aspects the calculation of LCC was the initial cost of building Campus Center ITB which reached Rp. 16,627,638,200. The cost reached 83.93% of the overall total LCC at the first option and 80.31% in the second option. For an annual cost incurred, costs of maintenance was an aspect that had the largest percentage, reaching Rp.2.536.221.568. The cost reached 12.8% of the total LCC at the first option and 12.25% in the second option.

2.4.2. LCC Hostel Building at Kediri, Eastern Jawa, Indonesia

The study regarding LCC had carried out in Kediri at a hostel building with the following components 1) there were three groups of estimation of LCC for the hostel building, namely development cost Rp. 4.290.000.000 (46%), operational cost 2.360.412.125 (26%), and maintenance and replacement cost Rp.2.179.307.000 (28%); 2) in operational, the biggest cost go to administration Rp.56.000.000 (61%), followed by utility Rp.22.116.485 (22%), and cleaning Rp.16.300.000 (17%); 3) for maintenance and replacement, the biggest was ME Rp.987.685.000 (38%), sanitary Rp.625.000.000 (24%), wall Rp.431.328.000 (16%), ceiling Rp.197.500.000 (7,6%), accessory Rp.83.500.000 (3,3%), floor Rp.202.947.000 (7,8)% and roof Rp.62.940.000 (2,7%).