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Compilation of Alternative Building Components and Common Distresses Found Through Building Condition Assessment

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Abstract: ***The need of analysing the deterioration of the building structure and building component is very important now days. The degradation of building materials is defined as the gradual, spontaneous, slow process in which the material losses its own characteristic properties due to various Physical, Chemical and Environmental action. There are lots of factors which affects the degradation of the building materials. Degradation factors or agents can be defined as any of the group of factors that can affect the performance of a building material, component or system. These factors are classified according to their nature like mechanical, chemical, physical, biological, and environmental. The physical degradation is occurs due to physical forces. The chemical degradation is due to the reaction with the environmental components. In bio corrosion degradation the material is damaged due to the action of animals, plants, microorganisms. The degradation mechanism is very important term in degradation of building materials. The degradation mechanism of the building materials is defined as the sequence of chemical, mechanical or physical changes that lead to detrimental changes in one or more properties of the building material when exposed to one or more degradation factors.***

Keywords: Maintainability, Building condition assessment, Methodology, Factors causing building distress, Main steps of bca

1. Introduction

In this the Buildings are selected on the basis of their age from 1994 to 2015 at the interval of three years. After selecting the sites the three Building components are selected for the Failure Mode Effect Analysis. The components selected are External Plaster, Internal Plaster and Wooden Doors. so that the components availability and its performance can guide in selection of appropriate component. Performance of the component over its life span can be of great help in maintenance of the facility/component and to budget the maintenance requirement funds whenever required. Building condition assessment has been used in this study for compiling building components and to report common distresses are to be answered by the planner of construction equipment. Building condition assessment has been used in this study for compiling building components and to report common distresses found in each component over a period of time. This will help understand the maintenance needs of the component. Aim of the work is to compile and find alternative building components and occurrence of common distresses in the buildings through building condition assessment.

2. Objective of Project

1) To study the failure modes, causes and effects for different building components.
2) To prepare the event driven graph for different building components.
3) To draw the degradation curve for building components.
4) To prepare Building Condition assessment Sheet
5) To calculate FCI (Facility Condition Index).

1) **Selection of site and colleting necessary data-** In this the Buildings are selected on the basis of their age from 1994 to 2015 at the interval of three years. After selecting the sites the three Building components are selected for the Failure Mode Effect Analysis. The components selected are External Plaster, Internal Plaster and Wooden Doors.
2) **Study of Failure Mode Effect Analysis for deteriorated Building Component-** After selecting the Building from various ages find out the failure modes, causes of the failure modes and their effects on building component by using the Failure Mode Effect Analysis table. From above FMEA analysis table plot the Fishbone diagram for various causes for various building components.
3) **Preparation of Event Driven Graph of deteriorated Building Component-** From above data plot the event driven graph which is a graphical tool for showing degradation scenarios. This graph shows the process of degradation for building component.
4) **Facility Condition Index-**The maintenance replacement area is measured for calculation of Facility Condition Index.
5) **Preparation of degradation curve for deteriorated building component-**In this stage the degradation curve is plot by using Weibull Probability Distribution Model

3. Data Collection & Value Stream Collection

Evaluating the condition of building components using a distress survey requires full knowledge of the deficiencies possible in each component. To accurately detect these distresses and measure their severity, a systematic approach to field inspection is important. The aim of the inspection process is to obtain the data required in order to measure

and/ or calculate performance or to evaluate the condition of structure that is calculating a numeric value that refl In this study 8 case studies are selected to determine the performance of the components over the time. The buildings are selected from year 1994 to 2015 at an interval of 3 years which is helpful to determine the performance of the building over the time. The questionnaire is done for selecting the sites. The case studies are selected based on the basis of their age, type, use and area and those are ready to share data. Following case studies are selected from the questionnaire for Failure Mode Effect Analysis and preparation of the Degradation Curves.

Condition Rating	*Condition*	*Action Required*	*Description*
5	Very Good	Planned Preventive Maintenance	The components or building is either new or has recently been maintained does not exhibit any signs of deterioration
4	Good	Condition Based Maintenance	The components or building exhibits superficial wear and tear minor defects minor signs of deterioration to surface finishes and requires maintenance/servicing. It can be reinstated with routine scheduled or unscheduled maintenance/servicing
3	Fair	Repairs	Significant sections or components require repairs usually by a specialty. The components or building has been subjected to abnormal use or abuse and its poor state of repairs is beginning to affect surrounding elements. Backlog maintenance work exists.
2	Bad	Rehabilitation	Substantial sections or components have deteriorated badly suffered structural damage or require renovations. There is a serious risk of imminent failure. The state of repairs has a substantial impact on surrounding elements or creates a potential health or safety and risk
1	Very Bad	Replacements	The component or building has failed is not operational or deteriorated to the extent that does not justify repairs but should rather be replaced. The condition of the element actively contributes to the degradation of surrounding elements or creates a safety health or life risk.

Many programs and techniques developed in literature can be categorized in to four main groups:
a. Visual inspection
b. Photographic and optical method
c. Non-destructive evaluation methods
d. Smart sensors

Among the various techniques and technologies that can be used for the condition assessment of facilities, only visual inspection suits the nature of building assets.

Visual Inspections are defined as organized and planned visual examinations conducted by technically proficient personnel. The result of these inspections is a report that depicts the deficiencies or problems for the building components and system of the facility. The report is then used for budgeting and planning.

Visual inspection is not easy, expensive and time consuming process. Site inspection must record the condition of every component in the facility.

Photo- Surface Cracks on Plaster

Facility Condition Index or Building Condition Index is a asset management tool measures the construction at a specific point time. It was developed by US Navy for condition assessment of vessels and strategically prioritizes renewal spending. It is used in 1990 for assessment of Building Condition Assessment. FCI is obtained by aggregating the total cost of any needed or outstanding repairs, renewal or upgrade requirements at a building compared to the current replacement value of the building components. It is the ratio of the "repair needs" to replacement value" expressed in percentage terms. Land value is not considered when evaluating FCI. If the FCI values are in between 0-5 % then the asset is in good condition if in 5-10% then asset is in fair condition and in 10-30%asset in poor condition [6].

$$\text{FCI or BCCI} = \frac{\text{Total of Building Repair/Upgrade /Renewal Needs}}{\text{Current Replacement Value of Building Components}} \times 100 \quad [6]$$

Photo- Dampness in Doors

Photo-Dampness in Plaster

4. Conclusion

After inspection of the case studies following failure modes are observed in External and Internal Plaster Surface Cracks, Structural Cracks, Effloresces, Dampness, Mosses, Efflorescence and Black Patches.

In Wooden Doors only wet area doors are considered for the study and the defect observed was Dampness, Wet rot and Breaking of Wood in to small Pieces.

After performing the Failure Mode Effect Analysis following causes are observed for the above Failure Modes.

The standard service life for External Plaster is 35 years. Out of eight buildings four buildings performed as per standard service life and other buildings were early deteriorated.

The standard service life for Internal Plaster was 35 years. Out of eight buildings five buildings performed as per standard service life and other buildings were early deteriorated.

The standard service life for Wooden Door was 40 years. Out of eight buildings four buildings performed as per standard service life and other buildings were early deteriorated.

A well-designed and constructed building will have a relatively maintenance free material. In this case, qualified and experienced civil and structural engineers are essentially needed. Their involvement in building construction has a great deal of responsibility.

In most cases, the problem derives from the design and management phase. To ensure the construction product of the desired quality and to tackle the problem of poor building quality, it is suggested:

a) Increasing protection for owners or building buyers by extending the defect liability period to a certain period.
b) Residents should be allowed to manage their property as soon as they occupy the development.
c) A requirement of insurance scheme.
d) The authorities should study the common defects and hold dialogues with property managers who deal with these problems, developers, architects and engineers, so that the problems are not repeated.

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