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ENDURABLE HEALTH AND MAINTENANCE RETRENCHMENT OF BUILDINGS

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Abstract - *The essence of building maintenance is to elevate the serviceable life of a building, thereby delaying viz-a-viz problems of decay, deterioration and failure. Due to the prime reason that many building designers (architects, engineers, technicians) are not encompassed in the subsequent maintenance of the building, they decided that the maintenance is under another field. But in the constraint of maintenance, the users play a vital role, where they are benefited due to the lifetime quality of the building. This study involves in interviewing about several ways of maintenance carried out by the building users and maintainers thereby analyzing the important ways to maintain the building. Based on the preliminary survey, questionnaires were prepared. Then, the questionnaire survey and interviews will be conducted to investigate the types of maintenance in a building by bringing a relationship between the quality and occupants satisfaction. In addition, the information about the different methods of maintenance were collected from the conventional buildings and interpretation was done. Then, a scheduled framework is derived according to the ways of funding given by the management. After identifying the importance of maintenance, the appropriate maintenance strategy is framed in the form of an Algorithm. Thus, the goal of a new systematic approach is to rectify the difficulties faced by the building users and increasing the service life of the building at a reduced cost for maintenance. The main key objective for this type of maintenance algorithm is to evaluate the best combination of maintenance strategy by detecting the optimum need for the building by taking care of every individual part of the building, in terms of satisfaction, health, safety and comfortness for the users and also in the constraint of budgeting. Thereby, providing a solution for the effective maintenance of the Building at a comparatively low rate of expenses and increasing the life span of the building, which is a challenging task in the present state of affairs.*

Keywords - *building maintenance, lifetime quality, questionnaire survey, systematic approach, scheduled framework, maintenance algorithm, low rate of expense.*

1. INTRODUCTION

Maintenance Retrenchment is a skill of managing the building in smart way by ensuring whether the building and its other related assets retain the excellent operation, good appearance, safe comfort and operates at an optimum efficiency or not. Inadequate maintenance leads to reduce the operational ability, reduced performance, degradation and will affect the health and endangers the security and safety of the users, occupants with in the vicinity.

The building deteriorates at different rates depending upon its quality of raw materials, design features, workmanship ability, its function and its location, where these needed a different levels of attention. There is no existence of such buildings which need no maintenance, but the quality and other aspects can minimize the chances for maintenance up to the required level.

Maintenance can help to,

- Prevent the process of decay and degradation of the building.
- Maintain structural stability and safety.
- Prevent unnecessary damage occurring due to weather or from general usage.
- Optimize performance.
- Help inform plans for renovation, refurbishment, retrofitting or new buildings.
- Determine the causes of defects and so help prevent re-occurrence or repetition.
- Ensure continued compliance with statutory requirements.

For maintenance to be more effective, the maintenance work should be organized through a sequence of program called cyclical maintenance. From the most basic levels, this includes daily routines and also includes works upwards to periodical programs of every week, once-a-month, semi-annual, annual, quinquennial and so on.

At several circumstances, maintenance becomes very essential which has to be carried out to expand the life span of the building at a considerable lower cost for modifying it, in such a way the long-term plan may be useful for updating and revising the building related information for understanding the building further, therefore the building maintenance experts or inspection engineer should be involved to identify and rectify the defects in the building.

1.1 SCOPE OF MAINTENANCE MANAGEMENT

Maintenance Management is an recent and systematic approach of administrative, financial, and technical framework for assessing, planning, organizing, monitoring and evaluating maintenance and operation activities and their costs on a continual basis The several scope for maintenance management, are given below,

- It increases the life time of the building.
- It gives the good and comfortable environment for the users.
- It gives healthy and safe environment space.
- It prevents the unwanted expenditure of money for unexpected failure at any cause.
- It prevents from further damages and deterioration of building materials.

1.2 OBJECTIVE

Maintenance is the one whose function objective helps to ensure the maximum availability of resources equipment, practicable materials and other related facilities at optimal cost and gives good performance on quality, protection and safety of the building. The objectives are,

- To increase the lifetime health and maintenance of the institutional and residential buildings in Tamil Nadu, India.
- To frame new Algorithm by analyzing the conventional maintenance methods adopted in Residential and Institutional buildings.
- To rectify the mistakes and mishandling of buildings by the users and to scale-back the upkeep cost of the building.
- To introduce systematic approach and obtaining a collaborative results using framed Algorithm, for increasing the lifetime health of the building.

2. QUESTIONNAIRE SURVEY

Questionnaire preparation was based on the literature review and suggestions given by building maintainer. Consolidation of the major process for the maintenance of the building was done. The improper maintenance of the building causes discomfort for the users, affects the aesthetic appearance of the building, increases the cost for the repair works, reduces the lifetime serviceability of the building, etc.,
Questionnaire consists of two parts,

[1] Institutional buildings
[2] Apartment buildings

The construction and development for these two sectors were developing in the developing countries like India. Therefore, when the number of building increases, the sustainability and the lifetime for the building is also essential. In such a way, the maintenance of the building is a booming sector to achieve the serviceable life of the building. Therefore, this study involves the collection of important process of maintenance for the building to achieve their lifetime serviceability.

3. DATA ANALYSIS

3.1 Relative Important Index

The contribution of every factors to the overall cost was examined and the ranking of the attributes in terms of their essentiality as witnessed by the respondents was done using Relative Importance Index (RII). To determine the ranking of different factors from the viewpoint of users, maintainers, engineers, etc,. Relative Importance Index (RII) was computed using Octave Software.

Frequency scale is the measure taken for the analysis of how frequently the maintenance work is carried out in terms of residential building as well as for the institutional building.

3.2 Residential Building

On the basis of all the collected survey from different Residential locations, the results were being analyzed using the concept of Frequency scale. Thereby, the results were finalized and the top seven major influencing factors were brought into an account.

For Residential Building, the Frequency scale has its frequency levels as (i) Always – Rating for 5, (ii) Often – Rating for 4, (iii) Sometimes – Rating for 3, (iv) Rarely – Rating for 2, (v) Never – Rating for 1.

3.3 Institutional Building

On the basis of all the collected surveys from different Institution locations, the results were being analyzed using the concept of Frequency scale. Thereby, the results were finalized and the top seven major influencing factors were brought into an account.

For Institutional Building, the Frequency scale has its frequency levels as, (i) Frequently – Rating for 4, (iii) Sometimes – Rating for 3, (iv) Occasionally – Rating for 2, (v) Never – Rating for 1.

TABLE -1: Table of percentage of respondent for the residential building

Respondent for Residential building	Users/ Occupants	Maintainers	Maintainer Contractors	Constructors	Missing	Total
Percentage	26%	19%	6%	23%	26%	100%
No. of respondents	35	26	8	31	35	135

CHART -1: Plot of top 7 factors for the residential building

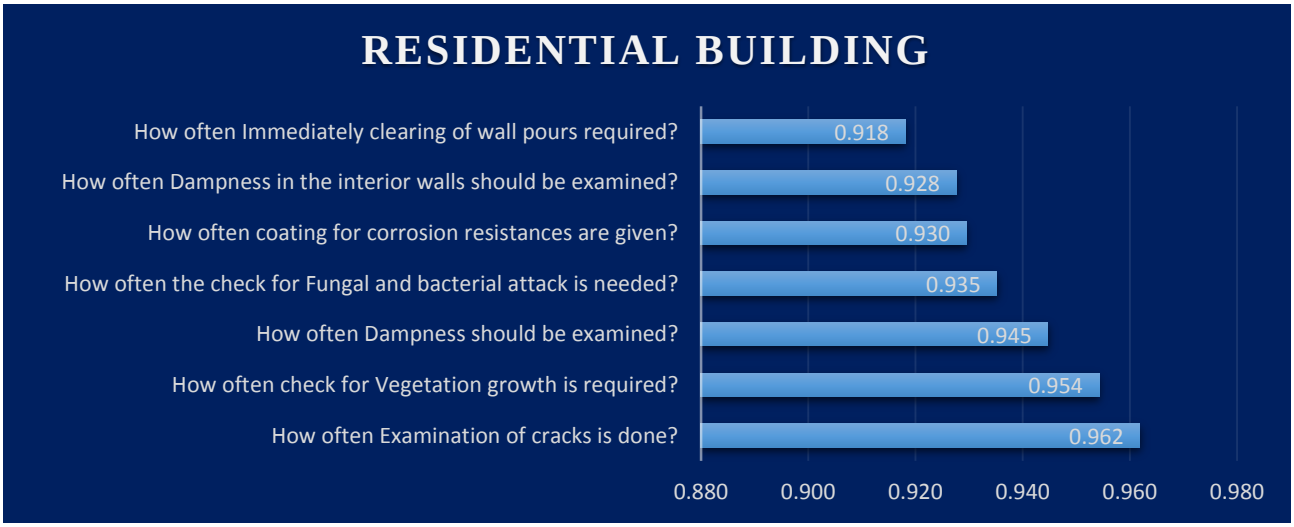
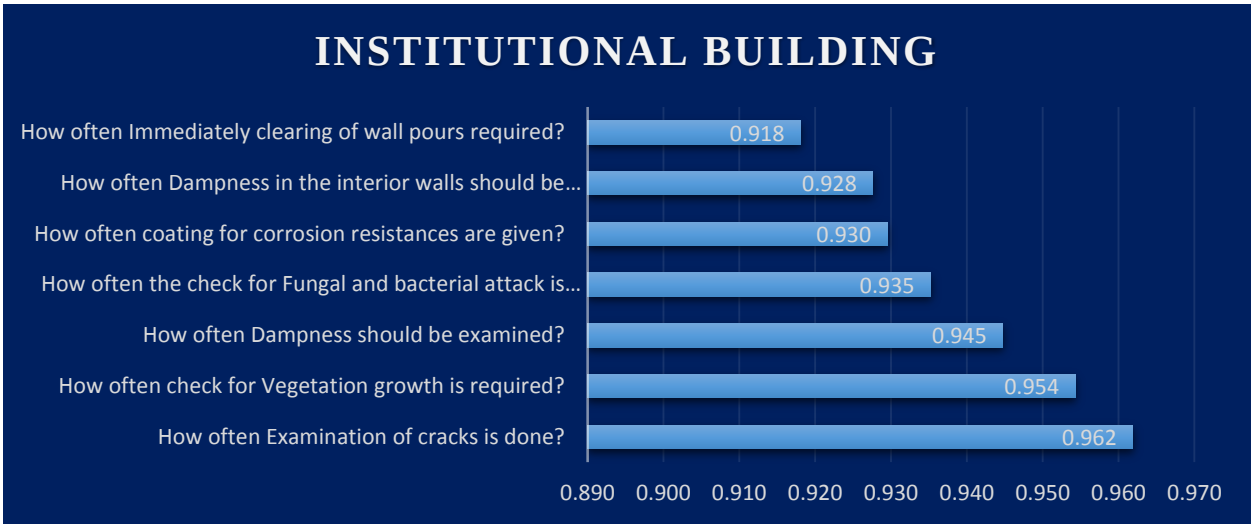


TABLE 2: Table of percentage of respondent for the institutional building

Respondent for Institutional building	Teachers	Students	Constructors	Institution Maintainer	Management	Missing	Total
Percentage	13%	21%	12%	11%	3%	40%	100%
No. of respondents	16	24	14	12	4	47	117

CHART -2: Plot of top 7 factors for the institutional building



4. A NEW APPROACH FOR MAINTENANCE MANAGEMENT

Currently adopted building maintenance strategies, whether based on planned or unplanned maintenance, are most likely to be budget driven. This means that maintenance is not carried out according to the actual need, but is dictated by financial priorities, the physical priorities will help us to decide according to the actual needs to overcome this state of problem. A new idea should be incorporated for approaching the maintenance for their building at the right time and under the economical budget for the user.

This maintenance algorithm which helps us a way for functioning, A logical process that helps us to select an appropriate handling technique and also for the cost-efficient maintenance strategy for every buildings. The main key objective for this type of maintenance algorithm is to evaluate the best combination of maintenance strategy by detecting the optimum need for the building by taking care of every individual part of the building, in terms of satisfaction, health, safety and comfortness for the users and the constraint of budgeting also.

The first step involves in developing the maintenance management algorithm is to carry out the process in a simple manner thereby reviewing all the maintenance functions in the existing building. This is carried out by breaking the entire building into physical elements and items of each system & sub-system. Engineer could inspect and calculate what type of failure that the building could experience. Therefore, each item in a building should be analysed from the point of view of failure. It is also important to identify the consequences of failure. The Engineering tools were developed to identify the major defects and to prevent those failures before the major damage.

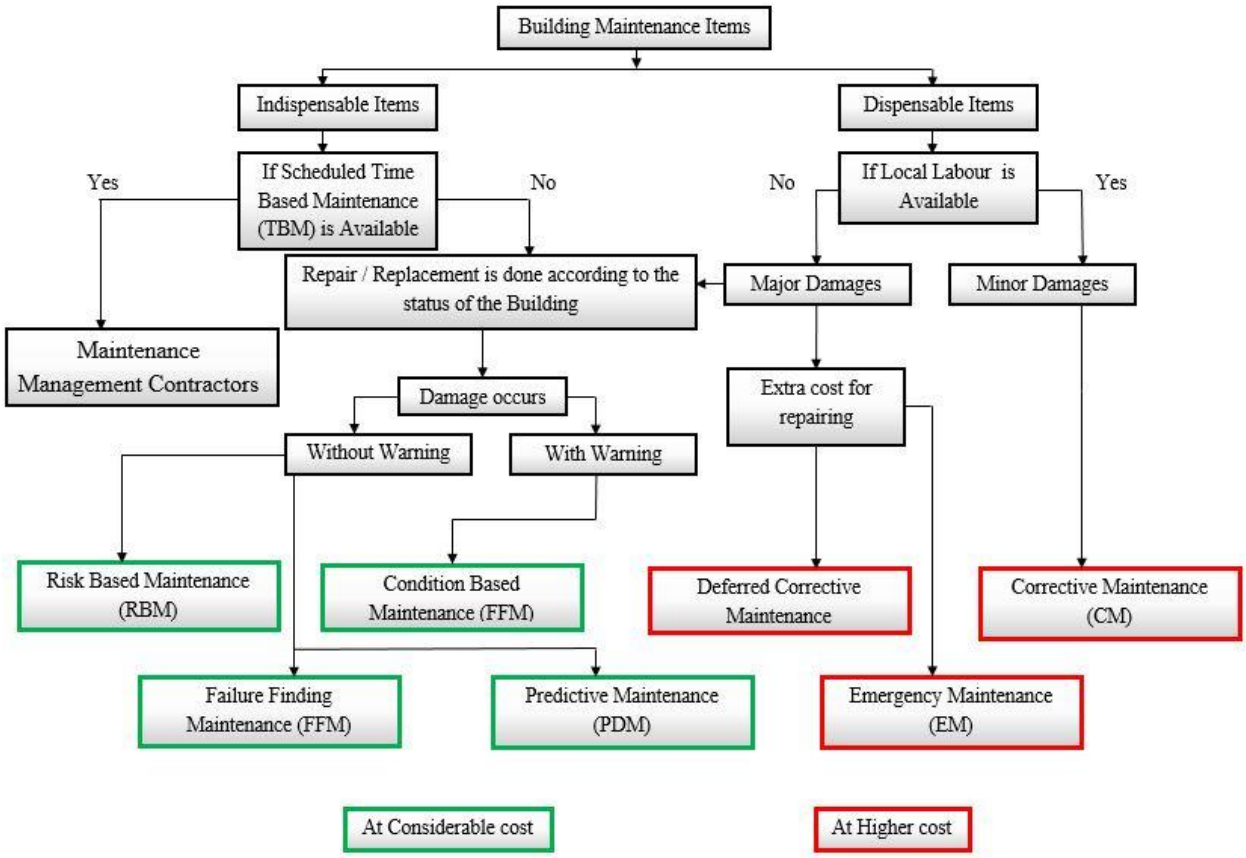
The Algorithm is derived based on the output of the information pulled-together about the existing buildings, which are collected during the Questionnaire survey, where the basic source of the categories are listed below,

[1] Site survey,
[2] Specification,
[3] Personal Interview., etc,

The building should undergo several processes, where two are listed below,
[1] Operational procedure,
[2] Maintenance program,

4.1 OPERATIONAL PROCEDURE

The operating procedure gives the step-by-step instructions to the user which is compiled by the builder organization, as a result to achieve the greatest Efficiency, proper operation, Guaranty warranty certificates, etc,. It also includes other Construction and Design details regarding Structural Design, Mechanical and Electrical services, Plumbing, Finishing, Cladding, etc,. It also includes the information sufficient for the Operation, Maintenance, Decommissioning and Demolition of the building.



Flow chart -1: The Maintenance Management Algorithm

4.2 MAINTENANCE PROGRAM

The building maintenance program that involves two major aspects, one is regulated by the essential structural damages (serious effects on Health, Safety, Environment etc.,) called Significant items and other is based on the other non-essential or outer aesthetic purpose (Hair line cracks, Dampness in partition walls, Non-Structural walls or windows) called Non-significant items.

4.3 SIGNIFICANT ITEMS

These are the types of items in a building which cause the significant damage, where the failure affects Health, Safety, Environment or utility (including cost). The combined effect of few undesirable consequences and its failure in the building which causes adverse effect is the significant item in the building. These are the items in the building that causes significant defects, where it is causing damages to the health, safety, utility or environment and money aspect.

4.4 NON-SIGNIFICANT ITEMS

The items, where their damages and failures have no or very less significant effects. This means that the failure does not affect health, safety, environment and utility.

5. RECOMMENDATIONS

To minimize the cost for the maintenance and also for increasing the serviceability of residential and institutional buildings, the following Recommendations are given.

- Recommendations for the Building users,
- Recommendations for the Constructions Contractors,
- Recommendations for the Building Maintainers.

5.1 LEVEL 1 RECOMMENDATIONS FOR THE BUILDING USERS:

1) Fixed plans during Construction i.e., no alteration in the plans during Construction,
2) Contractors should not only be selected based on cost, but have to be selected based on Technical Capacity, Financial Capacity, Sufficient men Power, Experience in the field and Quality.
3) There should be mutual understanding between the user and the construction contractors during the construction work.
4) Good source of knowledge on Information Technology should be gained for easy access of maintenance application for the instant repair works.
5) Healthy long term relationship should be developed with the maintenance contractors.

5.2 LEVEL 2 RECOMMENDATIONS FOR THE CONSTRUCTION CONTRACTORS:

1) All the Drawings and Dimensions should be properly fixed before the starting of the Project.
2) After the final submission of the entire project, the re-designing of the Project should not be done.
3) Accurate site investigation should be done.
4) Solar Panels should be installed to reduce the maximum consumption of Electricity.
5) Safe deposit fund should be done for the corpus by the contractor and by the residents of the Gated Community.

5.3 LEVEL 3 RECOMMENDATIONS FOR THE BUILDING MAINTAINERS:

1) ASM (Annual Service Maintenance) should be adopted instead of AMC (Annual Maintenance Cost).
2) Effective maintenance application should be developed.
3) Expert suggestions can be followed.
4) Develop Prospectors for the Users as well as for the Owners.
5) Effective maintenance should be given at lower cost.
6) Water-Meters should be fixed for the effective usage of water in households.
7) System level maintenance should be adopted based on the operation and maintenance.

6. CONCLUSIONS

Throughout the life cycle of a building, the largest fraction of expenses is incurred during Maintenance phase, which consists of approximately 60% of the total cost. There is a significant waste of time and money for searching information or trying to make decisions with limited information. Therefore, hereby the new systematic approach has been derived for the easy maintenance of the building.

This approach will help the Maintenance Engineer and the Managers to make their decision effectively, and also an advice for them is to make use of logistic resources such as spare parts, tools and manpower which are needed for the maintenance action.

Implementation of advance maintenance applications also help the user to be benefited on the basis of economic aspects, where they support for Easy assigned works to the users, Manage history of your assets, Organise reports, Develop assets value, provide experts suggestions, etc,.

This work has brought a better development in the improvement of Lifetime Health and Maintenance of building.

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