

UNIT – I MAINTENANCE AND REPAIR STRATEGIES

1.1 MAINTENANCE

Maintenance is preventive in nature. Activities include inspection and works necessary to fulfill the intended function or to sustain original standard of service. The maintenance of structure is done to meet the following objectives..

Prevention of damages due to natural agencies and to keep them in good appearance and working condition.

Repair of the defects occurred in the structure and strengthen them, if necessary.

- a) Preventive Maintenance
- b) Remedial Maintenance
- c) Routine Maintenance
- d) Special Maintenance

a) **Preventive Maintenance**

The maintenance work done before the defects occurred or damage developed in the structure is called preventive maintenance.

It includes thorough inspection, planning the programs of maintenance and executing the work. It depends upon the specifications, condition and use of structure.

b) **Remedial Maintenance**

It is the maintenance done after the defects in the structure. It involves the following basic steps.

- Finding the deterioration
- Determining the cause
- Evaluating the strength of the existing structures
- Evaluating the need of the structures
- Selecting and implanting the repair procedure

c) **Routine Maintenance**

It is the service maintenance attended to the structure periodically. The nature of work done and interval of time at which it is done depends upon specifications and materials of structure, purpose, intensity and condition of use.

It includes white washing, patch repair to plaster, replacement of fittings and fixtures, painting etc.

e) Special Maintenance

It is the work done under special condition and requires sanction and performed to rectify heavy damage.

It may be done for strengthening and updating of the structure to meet the new condition of usage or to increase its serviceability.

It may include particular or complete renewal occurring at long interval, such as floors, roofs etc.

Necessity of maintenance

The causes which necessitate the maintenance affects the service and durability of the structure as follows:

- a) Atmospheric agencies
- b) Normal wear and tear
- c) Failure of structure

a) Atmospheric agencies

Rain: It is the important source of water, which affects the structure in the following ways;

Physical:

Dissolving and carrying away minerals as it is universal solvent.

Expansion of water – The variation of temperature causes the expansion and contraction absorbed water and affects the micro-structures of the materials.

Erosion – Transportation, attrition and abrasion of the materials is quite evident effect of the water.

Chemical: The water available in nature contains acids and alkaline and other compound in dissolve form acts over the material to give rise, which is known as chemical weathering.

Wind: It is the agent, which transports the abrasive material and assists the physical weathering Its action is aggravated during rains and, When it is moving with high speed, it may contains acidic gases like CO₂ fumes which may act over the material and penetrates quite deeply in materials and structure.

Temperature: The seasonal and annual variation of the temperature, difference in temperature in two parts of the materials and the surface of material causes expansion and contraction, this movement of the material bond and adhesion between them is lost when it is repeated. This responsible for the development of cracks and the rocks may

break away into small units.

Exploitation or peeling off: The shell takes place if exterior layer are heated externally with respect to internal layers. The temperature variation may also cause change in the structure and chemical composition of the material.

b) Normal Wear and tear

During the use of structure it is subjected to abrasion and thereby it loses appearance and serviceability.

c) Failure of structure

Failure is defined as the behavior of structure not in agreement with expected condition of stability or lacking freedom from necessary repair or non-compliance with desired use of occupancy of the completed structure. In field it may result in visual collapse of the structure or even suspension of the services.

e.g. the collapse of towers, sliding or over turning of dam, settlement of foundation, crushing of columns etc.

The causes of failure may be broadly grouped as:

Improper Design: Due to incorrect, insufficient data regarding use, loading and environmental conditions, selection of material and poor detailing.

Defective Construction: Poor materials, poor workmanship, lack of quality control and supervision.

Improper use of structure: Overloading, selecting the structure for the use for which they are not designed such as deteriorating environment due to impurities from industrial fuel burning, sea water minerals, chemicals, storage of chemicals etc.

Lack of maintenance: Lack of upkeep, proper protection, precaution and preservation, deteriorated the structure, which may result in the failure.

Facets of maintenance:

Maintenance operations have many facets such as

a) **Emergency maintenance:** Necessitated by unforeseen breakdown drainage or damage caused by natural calamity like fire, floods, cyclone earthquake etc.

b) **Condition Based maintenance:** Work initiated after due inspection

c) **Fixed time maintenance:** Activities repeated at predetermined intervals of time.

d) **Preventive maintenance:** This is intended to preserve by preventing failure and detecting incipient faults (Work is done before failure takes place)

e) **Opportunity maintenance:** Work done as and when possible within the limits of operation demand.

f) **Day-to-Day care and maintenance**

g) **Shut down maintenance:** Thorough overhaul and maintenance after closing a facility.

h) **Improvement plans:** This is essentially maintenance operation wherein the weak links in the original construction are either replaced by new parts or strengthened.

Importance of Maintenance

- *Improves the life of structure
- *Improved life period gives better return on investment
- *Better appearance and aesthetically appealing
- *Better serviceability of elements and components
- *Leads to quicker detection of defects and hence remedial measures
- *Prevents major deterioration and leading to collapse
- *Ensures safety to occupants
- *Ensures feeling of confidence on the user
- *Maintenance is a continuous cycle involves every element of building science namely as
 - Structural
 - Electrical wiring
 - Plumbing-water-supply-sanitation
 - Finishes in floors and walls
 - Roof terrace
 - Service platform/verandah
 - Lifts
 - Doors windows and other elements

Scope of maintenance

Petty repairs, replacements and structural repairs of buildings, white and color washing, distempering and painting at prescribed intervals.

Repair and renewal of furniture.

Operation, periodical maintenance, repairs renewals of machinery and equipment for electric etc.

Repair of roads, culverts and resurfacing the roads.

Classification of Maintenance

Daily Routine Maintenance

Basically an inspection oriented and may not contain action to be taken.

Help in identifying major changes, development of cracks, identifying new cracks etc.

Inspection of all essential items by visual observation.

Check on proper function of sewer, water lines, wash basins, sinks etc

Check on drain pipes from roof, during rainy season

Weekly Routine Maintenance

Electrical Accessories

Flushing sewer line

Leakage of water line

Monthly Routine Maintenance

Cleaning Doors, windows, etc

Checking Septic Tank/Sewer

Observation for cracks in the elements

Cleaning of overhead tanks

Yearly Routine Maintenance

Attending to small repairs and white washing

Painting of steel components exposed to weather

Check of displacements and remedial measures.