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Expenditure Efficiency & Projects Authority

# National Manual of Assets and Facilities Management
# Volume 6, Chapter 18

# Facility Structure Maintenance Plan

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## 1.0 PURPOSE

The purpose of this document is to provide facility structures maintenance plans containing principles, guidelines, and minimum requirements governing the maintenance, inspection, condition assessment, repair, and alteration of existing building structures and structural systems constructed with materials such as concrete, masonry, and steel.

These are minimum requirements which are applicable to common and typical building structural systems. The Entity shall modify the requirements specific to its maintenance needs.

The maintenance, inspection, condition assessment, repair, and alteration shall conform to the Saudi Building Code (SBC), International Building Codes (IBC) and any other specific Entity maintenance requirements referred to in Section 5.0 – Codes and Standards.

## 2.0 SCOPE

This document is applicable to the following six existing facilities/types of building structures:

- Healthcare
- School and universities
- Office facilities
- Municipal facilities
- Housing facilities
- Parks and recreational building facilities

The above-mentioned facility building assets serve a functional requirement provided by:

- Civil and structural elements
- Finishing
- Drainage
- Electrical and mechanical services

This document addresses the civil and structural engineering aspects of the asset. It does not address the functional requirement of the asset, the architectural appearance, the finishing, or the plant and equipment.

This document defines the civil and structural engineering requirements for existing buildings assets through the following lifecycle stages:

- Maintenance
- Inspection
- Condition assessment/evaluation
- Analytical assessment
- Repair and rehabilitation
- Alteration

The maintenance requirements provided herein, or cited by reference, are based on the IBC, SBC, British Codes, industry standards, and best practices that should be embraced by the relevant Entity.

This document provides the minimum technical requirements to be adopted by the Entity and/or contractors to enable safety, quality, and cost effectiveness in the maintenance, repair, and alteration, of existing building and building systems that meet the needs and expectations of the relevant Entity.

The Entity shall establish and develop set procedures for continuous maintenance care and performance efficiency of the structural components of the existing building structures.

***Note:*** *In this section, guidelines and references to SBC and IBC are provided based on SBC (2007) and IBC (2018). Users shall verify the data/information against the latest and most relevant editions of SBC and IBC.*

## 3.0 DEFINITIONS

| Term | Definitions |
|---|---|
| Asset Management System/Software | A tool such as a system or software which implements a systematic procedure for the operation, maintenance, development, upgrade, and disposal of building components or assets after considering costs, risks, and performance characteristics |
| Building Enclosure | Any part of a building that physically separates the external environment from the building's interior. It is often referred to as the 'building envelope', although 'enclosure' is considered to be the more precise term |
| Building Fabric | Interior and exterior materials such as insulation, cladding, and finishes including, but not limited to, building structural components such as columns, walls, and beams |
| Building Non-Structural Components | Building components such as mechanical, electrical, and architectural elements which directly serve human needs and do not contribute to the performance of load bearing components |
| Building Structural Components | Elements that are load bearing within a building |
| Load Bearing | Building components such as walls, columns, and beams that support the load or weight of the overlying parts of the building/structure |
| Long life Assets | An asset that is reasonably expected to have an economic life equal to its design life. |
| Maintenance-to-Replacement Ratio | The ratio of maintenance costs associated with an asset over its service life, the cost of replacing the asset at the end of its life. |
| Planned Maintenance | A maintenance strategy which proactively enables maintenance, replacement, and repairs of the assets/building components in order to prevent sudden failures. |
| Primary Structural System | The elements of a structure or building such as beams, columns, load bearing walls, and foundations, that provide load bearing capacity to the structure. |
| Secondary Structural System | The elements within a building such as heavy internal partitions, curtain wall framing systems, building ornaments, and precast panels. |
| Statutory Inspection | The mandatory periodic inspections that shall be carried out by the employers, service providers, or contractors of any equipment in a building which can result in dangerous situations. This is a legal requirement as per legislations. |
| Substantial Damage | The damage to a structure caused by a natural disaster such as flooding or an earthquake, resulting in repair costs of more than 50% of the net present value of the asset immediately prior to the disaster. This percentage is based on a generic rule-of-thumb which can vary among jurisdictions. |
| **Acronyms** | |
| ACI | American Concrete Institute |
| ACR | Asset Condition Reporting |
| AISC | American Institute of Steel Construction |
| AMS | Asset Management System |
| ANSI | American National Standards Institute |
| ASCE | American Society of Civil Engineers |
| BRE | Building Research Establishment |
| BS | British Standards |
| CAPEX | Capital Expenditure |
| CM | Corrective Maintenance |
| CMMS | Computerized Maintenance Management System |
| IBC | International Building Codes |

| | |
|---|---|
| ICC | International Code Council |
| MEP | Mechanical Electrical and Plumbing |
| MRR | Maintenance-to-Replacement Ratio |
| PM | Planned Maintenance |
| PMP | Planned Maintenance Plan |
| PPE | Personal Protective Equipment |
| PM | Planned Maintenance |
| SBC | Saudi Building Code |
| SEI | Structural Engineering Institute |
| TMS | The Masonry Society |

## 4.0 CODES AND STANDARDS

Maintenance, repair, and alteration of all existing building structures shall be based upon the requirements of this subsection and existing buildings standards; these standards shall be extracted from the IBC and de SBC 2007. The Entity and the contractor are responsible for demonstrating compatibility between SBC and IBC requirements.

The material building codes and standards for all structures shall be those versions referenced by the SBC's and IBC's. Where a code or standard is not referenced by these codes, but is referenced by a material building code, the adopted version of the code shall be the one that is referenced by the material building code. If a later version of a code or standard has provisions which improve the safety or quality of maintenance, repair and alteration, such improvements may be implemented with prior approval of the Entity or regulating authority.

Adopted codes for existing building-type structures include:

**Saudi Building Code (SBC):**

| Codes | Description |
|---|---|
| SBC 301 | Loads and Force Requirements |
| SBC 302 | Testing and Inspection Requirements |
| SBC 304 | Concrete Structures Requirements |
| SBC 305 | Masonry Structures Requirements |
| SBC 306 | Steel Structures Requirements |
| SBC 901 | Existing Buildings |

**International Code Council (ICC):**

| Codes | Description |
|---|---|
| ICC IBC | International Building Code |
| ICC IEBC | International Existing Building Code |
| ICC IRC | International Residential Code for One-and Two-Family Dwellings |
| ICC IPMC | International Property Maintenance Code |
| ICC IECC | International Energy Conservation Code |
| ICC ICCPC | Performance Code for Buildings and Facilities |

**Structural Engineering Institute American Society of Civil Engineers (SEI / ASCE):**

- SEI/ASCE11-99 Guideline for Structural Condition Assessment of Existing Buildings
- ASCE 30 Guideline for Condition Assessment of the Building Envelope
- ASCE 31 Seismic Evaluation of Existing Buildings

**American Concrete Institute (ACI):**

- ACI 546R-14: Guide to Concrete Repair

- ACI 562-19: Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary
- ACI 201.1R-08: Guide for Conducting a Visual Inspection of Concrete in Service
- ACI 352-13: Guide to the Code for Evaluation, Repair, and Rehabilitation
- ACI 530/530.1: Building Code Requirements and Specification for Masonry Structures and Companion Commentaries

**American Institute of Steel Construction (AISC) and American National Standards Institute (ANSI):**

- ANSI/AISC 360-16 Specification for Structural Steel Buildings Appendix 5 Evaluation of Existing Structures and Section N Quality Control and Quality Assurance
- ANSI/AISC 303-16 Code of Standard Practice for Steel Buildings and Bridges
- Masonry Society – Guide for Condition Assessment of Masonry Façades

**American Society of Civil Engineers – Structural Engineering Institute (ASCE/SEI):**

- ASCE 5/ACI 530 Building Code Requirements for Masonry Structures

**The Masonry Society (TMS)**

- TMS 402/602 Building Code Requirements and Specification for Masonry Structures, 2016

**Building Research Establishment (BRE)**

- Good Building and Good Repair Guides – 2013: BRE

**British Standards (BS)**

- BS 8210:2012 Guide to Facilities Maintenance Management
- BS EN 13306:2010 – Maintenance – Maintenance Terminology

## 5.0 RELATED CHAPTERS/VOLUMES

The Entity/contractor should refer to the following relevant volumes, chapters, and sections of the National Manual of Assets and Facilities Management for further guidance when compiling structural and non-structural components of building structure maintenance plans.

- Volume 2, Chapter 3 – Computerized Maintenance Management System (CMMS)
- Volume 3 – Condition Assessment/ Inspection
- Volume 6, Chapter 3, Preventive and Predictive Maintenance Program Procedure
- Volume 6, Chapter 4 – Developing Maintenance Plans
- Volume 6, Chapter 24 – Building Fabric Maintenance Plans
- Volume 7 – Work Control
- Volume 8, Chapter 7 – Equipment and Tool Control
- Volume 10 – Health, Safety, Security and Environment (HSSE)

## 6.0 GENERAL REQUIREMENTS

- All staff and suppliers responsible for carrying out works shall be qualified and competent to do so.
- Health and safety aspects shall be considered throughout the maintenance, inspection, condition assessment, repair, rehabilitation, strengthening, renewal and alteration of existing building structures and compliance with applicable health and safety regulations shall be maintained.
- All activities including, but not limited, to the maintenance, inspection, condition assessment, repair, rehabilitation, strengthening, renewal and alteration of existing building structures must comply with current environmental legislation, approved codes of practice and authoritative guidance literature issued by relevant statutory bodies and entities.
- During all activities including, but not limited to, the maintenance, inspection, condition assessment, repair, rehabilitation, strengthening, renewal, and alteration of existing building structures

consideration shall be given to minimizing adverse consequences that may affect third part operations throughout the duration of such activities.

- Maintain inherent structural integrity (support itself so as not to suffer complete or partial collapse) during maintenance, inspection, condition assessment, repair, rehabilitation, strengthening, renewal, and alteration.
- Provide appropriate access and egress for all planned uses (including maintenance), and for reasonably anticipated emergency uses. Ensure safe ingress and egress by passengers, general public, employees, and emergency services in planned and reasonably anticipated emergency scenarios.
- Safeguard the health and safety of passengers, employees, and members of the general public.
- Temporary works required for the maintenance, inspection, condition assessment, repairs/rehabilitation, strengthening, renewal, alteration works shall be fully compatible with the continuing safe and reliable operation of the adjacent facilities.
- Any loads which temporary works impose on the existing assets shall be allowed for in the design.
- Existing assets which will be required to sustain loads imposed by the temporary works associated with maintenance, inspection, condition assessment, repairs/rehabilitation, strengthening, renewal, alteration works shall be checked for their ability to do so and, if necessary, additional support shall be provided.

## 7.0 BUILDING STRUCTURES

Building structures are defined as structures comprised of walls and roofs that are constructed to provide support or shelter for its intended occupants. The structural system (primary and secondary structural components) within an existing building provides the skeleton to the building and enables support, loading, and occupancy of the building. The building components that do not consist of primary or secondary structural systems and do not contribute to load bearing are considered non-structural components.

The typical structural and non-structural components of a building are shown in Figure 1.

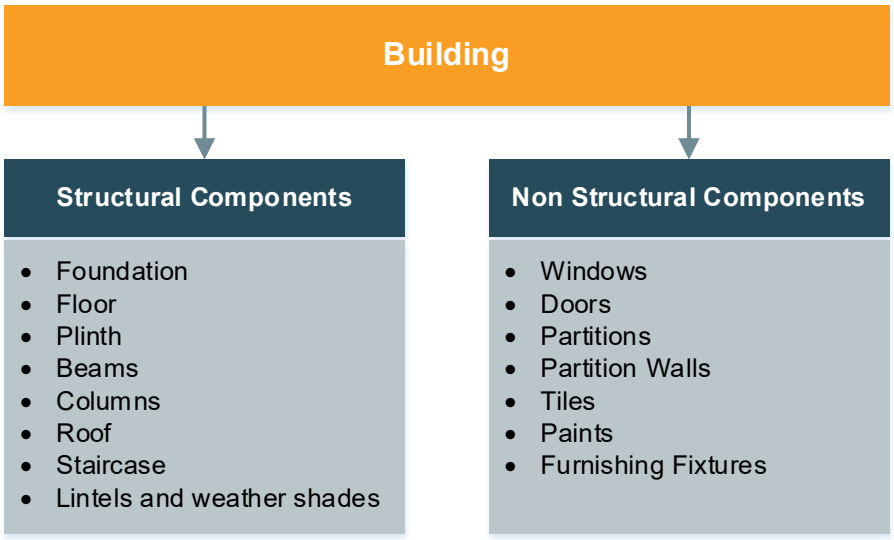


**Figure 1: Typical Structural and Non-Structural Components of a Building**

The structural elements within an existing building are comprised of materials intended to last the design life of the asset without the need for continuous planned maintenance or major repair.

The structural elements of the building are predominantly hidden by interior finishes and elements of the building enclosure on the outside. This composition can make accessibility of these elements challenging, hence the requirement for such elements to last the life of the building without requiring continuous maintenance and component replacements. Structural assets typically have a very low Maintenance-to-Replacement Ratio (MRR) since the assets have a long life.

# 8.0 ASSET MANAGEMENT SYSTEM

The Entity/service provider should consider adopting an AMS incorporating a Computerized Maintenance Management System (CMMS) or similar in conjunction with the Mechanical Electrical and Plumbing (MEP) system which should provide asset lifecycle and maintenance management for all asset types on a single platform including the maintenance for structural and non-structural components. The Entity should consider the following key functions/deliverables within the asset management system:

- Asset hierarchy and registration by location and type with unique numbering.
- Asset and maintenance management, Planned Maintenance (PM) and Corrective Maintenance (CM).
- Better matching of competencies with tasks.
- Scheduling work, PM/CM
- Automatic ordering of new parts when stock falls to a minimum level
- More efficient warranty monitoring and claim handling
- Automatic alerts to staff when competencies need to be renewed
- The ability to use mobile devices, helping remote inspections and fault-finding
- Provision for bar-coding inventory

The AMS shall have specific civil assets (structural and non-structural components) including but not limited to those listed in Figure 2.

# 9.0 MAINTENANCE

## 9.1 General

- Maintenance work shall be undertaken to ensure that assets meet their stipulated design life.
- Assets that fail to meet the design life shall have restricted operations or be withdrawn from service.

## 9.2 Maintenance Work

- Maintenance work can be planned or remedial in action, and may include repairs and damage control.
- Maintenance activity constitutes a key aspect of whole lifecycle asset management.
- During the life of the asset, service fixings and connections are required for which provision may not have been made during the initial design and construction of the asset. A process shall be followed to control the cutting, grinding, drilling, fixing, and supporting the existing structures in accordance with applicable standards and codes mentioned in Section 5.0.
- Maintenance action shall be based on:
    - Inspection Reports (section 11.0 of this document)
    - Condition Assessment/Evaluation (section 12.0 of this document) and
    - Analytical Assessment (section 12.4.1 and 12.4.2 of this document)

## 9.3 Planned Maintenance Strategy

Periodic inspections and maintenance work shall be carried out in order to preserve the service lives of structural and non-structural building components and to reduce the need for emergency repairs or major renewal of components. In order to preserve the service lives of structural and non-structural components of buildings, periodic inspections and maintenance work shall be carried out in order to reduce the requirements of emergency repairs or major renewal of components.

- Planned Maintenance: Preventive and Predictive (PM, PdM)
- Unplanned Maintenance: Corrective and Emergency (CM, EM)

This document focuses primarily on Planned Maintenance, other maintenance types are described within NMA & FM, Volume 6 Chapter 3 – Descriptions and Definitions (EOM-ZM0-PR-000002).

Figure 2 below highlights the inspection and maintenance strategies to be considered in the ongoing maintenance and periodic repairs of the structural and non-structural components of existing buildings.

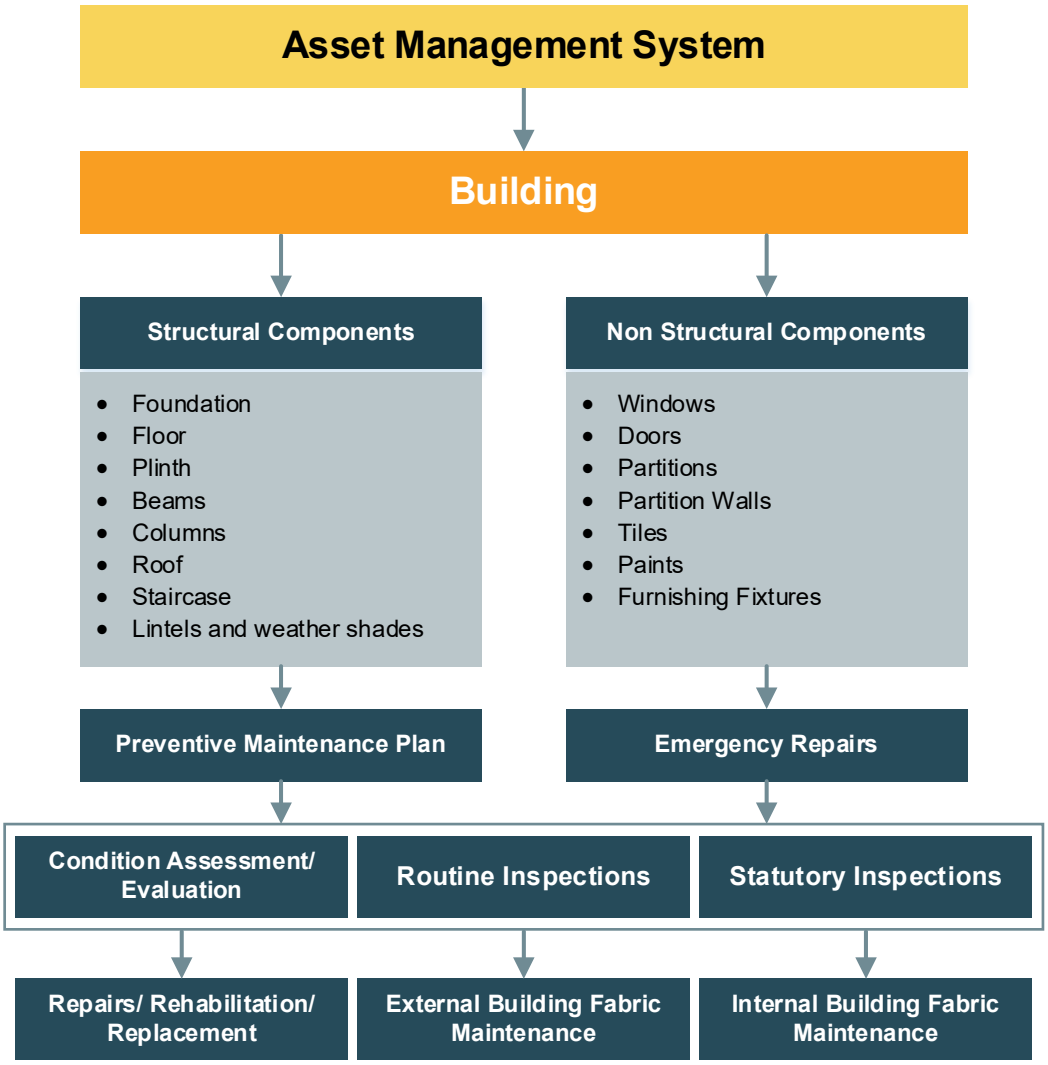


**Figure 2: Planned Maintenance Strategy**

The Entity shall develop an effective Planned Maintenance Plan (PMP) related to maintaining structural and non-structural components of existing buildings. The plan shall include regular inspections, frequent maintenance and scheduled repairs of structural and non-structural building components. A maintenance plan will keep the property and equipment in working condition leading to improved safety of operation and reduced incidence of emergency or breakdown repairs. The Entity should develop its structural maintenance plan in a manner that is capable of identifying maintenance requirements before they become high cost repairs. The PM Plan should help in achieving the lowest lifecycle cost of structural components of the building.

The Entity shall develop its PMP considering following key aspects:

- Building a structural components inventory.
- Criticality assessment of planned maintenance tasks such as operate (run) to fail, condition based, periodic based, calendar based.
- Periodic inspection program.
- Create a robust operational framework for planned maintenance programs detailing requirements that must be met and the manner in which they are to be assured.

- Use management systems tools such as a CMMS work order management system in order to optimize the PM program. Access to the system should be allowed by key staff with a management, or financial control of operational cost for maintenance purposes.
- Policy to clearly set out the roles and responsibilities of maintenance staff in key positions such as Building Manager, Fabric Manager, Facade Engineer, Structural Inspectors, and Structural Engineers
- Ensure that maintenance staff are suitably qualified, trained, and competent to carry out their duties and responsibilities.
- Cost benefit analysis of various maintenance tasks.

## 9.4 External and Internal Building Fabric - Planned Maintenance

The external fabric system of a building such as cladding, external walls and roofs is of extreme importance from both safety and public perception perspectives. The condition of the external fabric of a building has a major influence on the immediate perception of a building's quality and potentially the services it provides. It is important that the building is portrayed positively to maintain reputational status by demonstrating that it is being taken care of and that maintenance works are diligently executed.

Similarly, the internal fabric condition is of equal importance with regard to the immediate perception of a building's quality. These areas are subject to scrutiny by tenants and visitors alike. Additionally, it can also provide an indication of the external features of the building which may otherwise not be visible. Effective Planned Maintenance (PM) plan of interior building fabrics such as interiors, corridors, doors, windows, toilet areas, and staircases are essential requirements to protect the area from wear and tear.

The Entity shall develop and define the scope of the PM for the external and internal building fabric and provide it to the building maintenance contractor or in case of self-delivery of The Entity. The PM plan should be developed, and maintenance works must be regularly and diligently carried out, demonstrating effective maintenance of buildings.

The development of the PM strategy should consider the following key aspects:

- A forward-looking PM plan in liaison with the Entity/stakeholders for proactive repair and maintenance of the external and internal fabric of the building. It should also be sensitive to the needs of the tenants and cause the least amount of disruption
- Competent and qualified personnel should be employed to oversee the maintenance of the external and internal building fabric such as building manager, fabric manager, and facade engineers
- Periodic survey and inspection of existing buildings
- The Maintenance Plan shall be considered a live document and continuously monitored. The Maintenance Plan shall consider the maintenance cycles contained within it and be periodically updated as required.
- Only competent personnel shall be authorized to approve changes or deviations to agreed procedures, witness physical works at appropriate stages, and sign off activities or work elements as complete.
- Records should include photographs to demonstrate the condition at the time and as a reference to indicate any degradation over the periods between inspections. CMMS systems will generally have the facility to assign these to the asset within one platform allowing efficient retrieval.
- The Maintenance Plan should be structured to cover complete areas and identify the appropriate frequency of specific maintenance tasks and adequate budget to allow these tasks to be completed
- Identify the appropriate frequency of specific maintenance tasks and support applications for suitable budgetary provision to be made to allow necessary tasks to be completed.
- Any change in frequency of maintenance should be documented and approved by the stakeholder responsible for financial and operational management of the building
- Replacement materials should always be sourced in accordance with the building's Operations and Maintenance (O&M) manuals to match the materials that were used initially
- The materials shall be in accordance with the statutory requirements of safety (access, evacuation) and fire/smoke protection
- The materials should match the sustainability requirements detailed in the O&M Manuals and other applicable standards.

The Entity should consider detailed requirements listed in Section 6.4.20 Building Fabric Maintenance Plans to develop its external and internal Building Fabric-Planned Maintenance.

## 9.5 Planned Maintenance Activity Schedule

The planned maintenance tasks listed in Attachment 1 shall be carried out as part of PM by the relevant Entity. The list shown in Attachment 1 is not exhaustive and shall be applied solely as a representation of a collection of typical activities. The relevant Entity/contractor shall also develop a program and set of activities and interval to develop its PM plan and maintenance manual.

## 9.6 Unplanned Maintenance

- The Entity/contractor shall develop an emergency maintenance plan to accommodate unscheduled and unplanned maintenance that may arise during the life of the assets, usually managed and reported through a formal service call process.
- Wherever possible, this should be recorded against the asset number to allow historical data to be collated. It is essential for the demonstrating where CAPEX funds may need to be assigned
- The consequent inspection after the service call can result in two actions:
    - If the problem is affecting the service life of the structure and is posing threat to users, then emergency response and corrective action is required immediately.
    - If the problem is not critical then a routine planned maintenance response may be adequate.
    - Undertake a review of the current maintenance regime in place and if necessary, make adjustments to mitigate, remove or control the undesirable condition.
- The response can include the major repair or rehabilitation of the asset or asset component to protect life and property to moderate/major repair by qualified and skilled labor.

The Entity should also refer to the requirements detailed in the National Manual of Assets and Facilities Management Volume 14 – Emergency Management for further details regarding emergency response procedures during hazardous events.

# 10.0 INSPECTION

## 10.1 Purpose

The purpose of this sub-section is to set the requirements for the inspection of existing building structures and facility assets mentioned in Section 2 for which the Entity is responsible. It is the responsibility of the Entity to detail the scope required for the relevant inspection undertaken. The necessary information to be provided to stakeholders must be clearly identified at the outset to ensure, as far as it is reasonably practicable, that further costs are not incurred.

## 10.2 General

- Inspection of existing structures/assets shall be carried out for the following purposes:
    - Confirm that assets are safe for operation.
    - Provide information necessary for the managed maintenance of assets.
    - Provide the information necessary to assess the condition of the assets in a consistent and accurate manner.
    - Provide information for enabling the asset register to be maintained as an accurate record of the physical features of the assets.
    - Provide all the necessary physical information on assets to meet the requirements for the Asset Condition Reporting (ACR) process
    - Identify defects, causes and effects of damage and deterioration and vulnerable structures
    - Undertake root cause analysis for any failure or deficiency
- The asset register for each asset shall be reviewed and the records be updated as part of the reporting process.

- Inspection reports and forms shall be retained for the life of the asset. Photographic records will assist in demonstrating the condition and assist with maintenance review.
- No inspection shall commence unless the inspector has reviewed previous inspection reports, asset registers, and asset files to establish information about the asset, its previous condition and likely hazards. This should include attributes, residual risks, etc. (e.g. hidden critical elements, falling elements, etc.), and any partial inspection information.
- The inspector as part of this planning, must be fully aware of access arrangements so that there are no delays in the inspections. Wherever necessary, access equipment should be provided and installed. Equipment such as building maintenance units used for inspection purposes must have a current certificate, valid for the time of use, by an authorized 3rd party inspection organization. Competent personnel available to operate the equipment with relevant Personal Protective Equipment (PPE) must be available.

## 10.3 Types of Inspection

The Entity/contractor shall carry out following types of inspection:

- General/visual inspection
- Principal/detailed inspection
- Special inspection
- Inspection for condition assessment/evaluation/analytical assessment
- Defect advice
- Additional measures inspection

### 10.3.1 General/Visual Inspection

- The general inspections shall be carried out to obtain and record a visual check on those parts of the assets which are readily accessible without the aid of access equipment.
- General inspections shall reveal any deterioration in condition or visible development of defects.
- General inspections shall be of sufficient quality to detect and report any visual changes since the last inspection, or evidence of circumstances which may impact the condition of the asset before the next scheduled inspection.
- The general inspection report shall:
    - Confirm that the inspection has been completed
    - List significant defects which have occurred or worsened, or changes which have occurred since the last inspection.
    - Identify whether there is a need for further investigations or action.
    - General inspections shall be reported on a form approved by the Entity.

### 10.3.2 Principal/Detailed Inspection

- A close inspection of all and/or critical elements of the asset is conducted to give a visual confirmation of the maintenance requirements for managing the asset.
- Principal inspections shall bring to notice the deteriorations or visible development of defects and appraise their impact on the asset.
- The principal inspection report shall:
    - Confirm that all critical elements of the asset have been examined.
    - Record the extent and severity of any defects found.
    - Identify the extent and severity of any changes in condition since the last inspection
    - Draw attention to any observation which may affect the safety of the asset.
    - Identify the areas of further investigations (see clause 3.3.4).
    - For assets supporting transient loading, identify whether the asset was observed under such loads and if there was any evidence of unsatisfactory performance.
    - Recommend maintenance, strengthening, and renewal works as and when required
- Principal inspections shall be reported, consisting of but not limited to:
    - Principal inspection cover sheet, signed by inspectors and checkers
    - Contents sheet
    - Asset specific form

- Any additional information required

### 10.3.3 Special Inspections

- Special inspections shall be undertaken to provide additional or more frequent information on assets necessary for asset management.
- Special inspections shall be done on specific areas of concern.
- Special inspections shall be instigated in the circumstances where inspections detailed in 10.3.1 and 10.3.2 does not provide enough information.
- Special inspections shall be reported with all the findings approved by the Entity.

### 10.3.4 Inspection for Condition Assessment/Evaluation/Analytical Assessment

- An inspection for analytical assessment shall provide the physical information about an asset necessary for the assessment of the asset to be undertaken.
- The inspection shall be such that all inspectable and/or critical elements of the asset carried out within touching distance enable the person conducting the inspection to determine the actual section sizes and the extent of any deterioration, or other features having an influence on the ability of the asset to perform its required duty.
- The inspection shall also cover the condition of the structure, noting any signs of distress and their cause. The report shall be written in the Principal Inspection form relevant to the structure being inspected. In addition, the information listed in 10.3.2 shall be included in the additional sheets.
- The inspection for analytical assessment shall be undertaken by the person carrying out the analytical assessment.
- Inspections for analytical assessment shall provide information on the load applied to the assets and factors relevant to the structural resistance of the assets.
- Inspection information shall be provided under the following general headings:
    - Confirmation of information in drawings and documents.
    - Accurate estimates of dead and superimposed loads, including surcharge loadings.
    - Structural dimensions and load dispositions.
    - Details of finishes and fixings.
    - Service ducts and services.
    - Clearance dimensions enough to determine the imposed loading and structural clearances.
    - Structural condition and evidence of physical deformation.
    - Evidence of foundation deterioration.
    - Performance of bearings, expansion joints

### 10.3.5 Defect Advice Inspection

Defect Advice Inspections shall be carried out following defect advice notification or a report of an incident that causes damage to an asset or has the potential to adversely affect the ability of the asset to perform its required duty.

Enough information shall be collected to enable the safety of the asset to be assessed and for the full reporting of an incident being investigated to identify the immediate and root causes.

## 10.4 Inspection Frequency

The frequency of Entity/contractor inspections should be risk based, wherein risk is defined as the likelihood of a structure developing a fault, grave enough to interrupt user service either by partial or complete building closure.

Inspections of assets shall be undertaken at a frequency defined in Attachment 1: EOM-ZM0-TP-000006 - Checklist - Planned Maintenance Schedule

The Entity may request assistance in creating/conducting a structural inspection regime for their asset where appropriate, inspection frequencies should be according to Attachment 1: EOM-ZM0-TP-000006 - Checklist - Planned Maintenance Schedule or as agreed with the Entity

## 10.5 Specific Requirements

- Inspections shall be carried out by competent persons.
- Inspections shall be reported on the forms approved by the Entity.
- The inspector(s) has some degree of freedom when classifying defects in accordance with the system mentioned below. However, it is important that inspectors classify defects with reasonable care and that more specialized opinions are sought in case of doubt. Defects noted during inspection shall be matched to the standard severity/condition rating and priority rating mentioned in Figure 3 and Figure 4 of this document or similar categorization approved by the Entity in order to deduce the severity score that is to be entered in the inspection report.
- The inspectors shall review all the information collected during the inspection and summarize the extent and severity of the defects recorded on the specific report forms approved by the Entity, give a condition rating, recommend appropriate actions, and suggest the level of priority for that action.

| Condition Rating | | Condition Index | Condition Description |
|---|---|---|---|
| A | 0-19 | New | **New or almost new condition:** no reported problems or expected failures |
| B | 20-39 | Excellent | **Excellent condition:** performance is as desired, with no problems or concerns reported |
| C | 40-59 | Very Good | **Very good condition considering the age of facility:** asset is not new, but there is no problems or concerns reported |
| D | 60-74 | Good | **Good condition considering the age of facility:** asset is not new, and there are some problems that does not affect its performance |
| E | 75-89 | Poor | **Asset is worn out due to frequent use and is approaching the end of its lifetime:** asses does not work as intended |
| F | 90-100 | Critical | **Critically worn out or damaged:** asset has expired and is about to cause a near risk of failure |

**Figure 3: Condition Rating Classification**

| Priority | Deferred Maintenance | Regular Maintenance |
|---|---|---|
| **Priority 1** | Urgent<br>(Requires urgent action). | Closure of premises and/or address an immediate high risk to the health and safety of occupants and/or remedy a serious breach of legislation. |
| **Priority 2** | Essential<br>(Requires basic actions within two years). | Causes average impact on regular maintenance or poses moderate risk to health and safety. |
| **Priority 3** | Desirable<br>(Requires action within three to five years). | Causes low impact on regular maintenance or poses low risk to health and safety. |
| **Priority 4** | Long-Term work<br>(Outside five-year planning). | No impact on regular maintenance. |

**Figure 4: Priority Rating Classification**

# 11.0 CONDITION ASSESSMENT/EVALUATION OF EXISTING BUILDINGS

This subsection provides the methods and guides for structural condition assessment of existing buildings constructed of different materials such as concrete, steel, masonry, and wood. This section will focus on the following key components of condition assessment of existing buildings:

- Planning
- Assessment procedure
- Investigation
- Testing methodology
- Reporting

## 11.1 Purpose

The purpose of carrying out a condition assessment includes but is not limited to:

- Building performance report
- Establishing building use
- Serviceability, durability and safety
- Compliance with codes and standards
- Special purposes based on the specific building and its' current or proposed occupancy or function

**IMPORTANT NOTE:**

The Engineer should consider the possibility of the presence of hazardous materials such as asbestos when assessing an existing building, advise the client as necessary, and take or recommend appropriate precautions.

## 11.2 General Requirements

All personnel involved in the assessment shall possess the technical qualifications, including practical experience, education, and professional judgment required to perform the individual, technical tasks assigned. Interpretation of results and conclusions shall be performed by a registered Professional Engineer qualified in the appropriate discipline.

Equipment shall be obtained as appropriate to accomplish or perform the various tests and inspection methods specified in the standard document. All equipment needs to be in good working order. For equipment that can be calibrated, reports of calibration shall be available. Guidance given in Volume 8 Chapter 4 (Equipment and Tool Control) of O&M manual should be followed for accessing and using equipment.

## 11.3 Procedure

The procedure to carry out the condition assessment of buildings is illustrated in Figure 5 below:

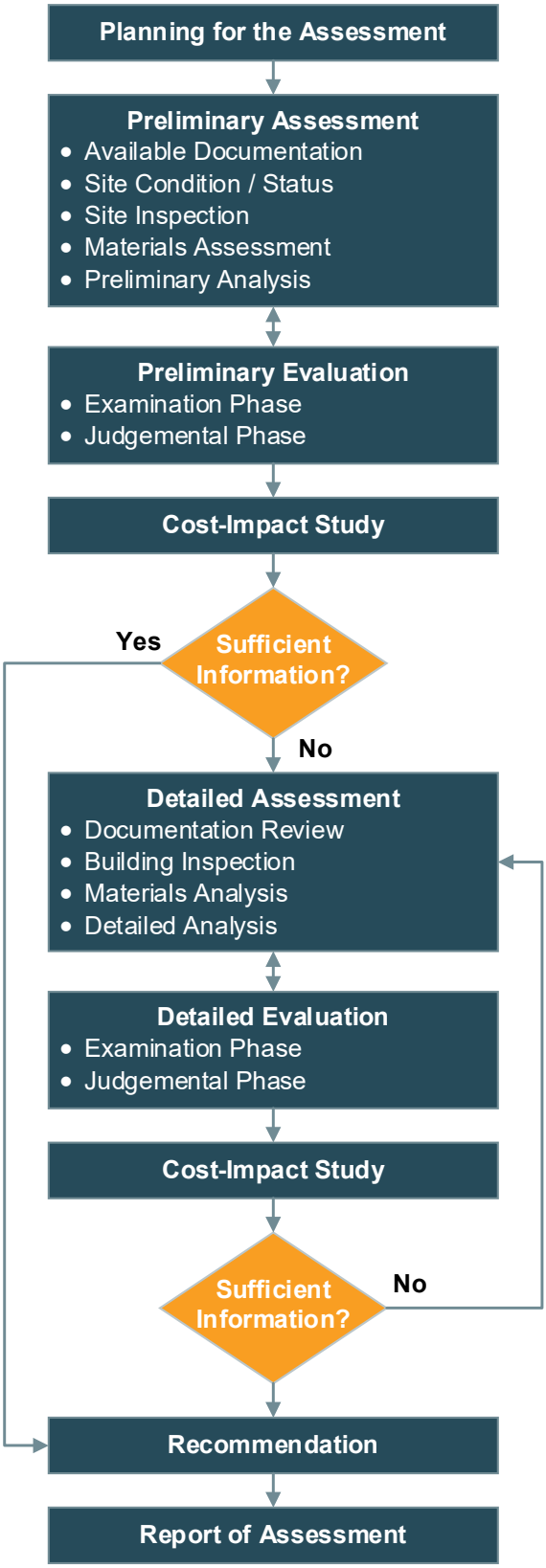


**Figure 5: General Structural Assessment and Evaluation Procedure for Existing Buildings**

### 11.3.1 Preliminary Assessment:

The Preliminary assessment shall provide the data necessary to decide and estimate the structural sufficiency of the existing building. This assessment shall provide the data to decide by the Entity for the requirement and urgency of the detailed assessment, if required.

The preliminary assessment provides the initial analytical data for estimating the structural adequacy of an existing building and for establishing the need and priority for a more detailed analysis. The primary steps include:

- Review of as built information, available data and documents prior to inspection such as design drawings, design criteria, soil investigations, calculations.
- Site Inspection
    - Confirm the design information.
    - Structural modification if any.
    - Material conditions.
    - Structural and nonstructural members and connection condition.
    - Deterioration and damage to the structural building components.
    - Suitably qualified and competent structural engineers to be part of the site inspection.
- Preliminary analysis: The preliminary analysis shall provide following information:
    - Structural analysis, structural adequacy and relevant code compliance.
    - Assessment of damage to property.
    - Identifying structural deficiencies in the building with special reference to applicable minimum life and public safety standards and codes.
    - Environmental effects on the building structure.
- Preliminary findings.
- Recommendations.

### 11.3.2 Detailed Assessment

A detailed assessment shall be performed on the building being analyzed as a result of the findings of the preliminary assessment or as directed by mandatory actions or by the Entity. The purpose of the detailed assessment is:

- Determine if the building satisfies the required performance criteria or if it requires rehabilitation; and;
- Identify its deficiencies and recommend alternatives for rehabilitation.

The detailed assessment process is similar to the preliminary assessment, except that it is done in greater detail and with more accuracy in order to increase the reliability of the resulting recommendations.

The Entity shall consider the following primary steps in the detailed assessment:

- Original design (as built), repair, rehabilitation and addition documents review:
    - Calculations, drawings, specifications, testing, Geotechnical and foundation information.
    - Historical data and information.
    - Preliminary assessment information and data.
    - Applicable standards and local codes during construction/modification.
    - Building features and structural configuration: Engineers involved in the detailed assessment should carefully identify irregularities in the structural components and other features/non-structural components which can have major impact on the behavior of the building under loads.
    - Operations and maintenance data
- Detailed inspection

Once the document review is completed, a detailed inspection of both structural, connections and non-structural components shall be carried out. If required, special inspection and tests should be carried to support the existing information. The aim of inspection should be to highlight and note any discrepancies

in the building structural system/non-structural components against the design documents. Any hazardous problems should be noted and highlighted during inspection.

- Detailed structural analysis should encompass the detailed information on the structural systems and their interactions as a total structural system and should capture following information:
    - Loading and performance criteria.
    - Critical system/members.
    - Capacities of existing systems/members.
    - Required capacities of systems/members.
    - Non-structural components and their behavior.
    - Structural evaluation (actual vs required capacity comparison).

- Detailed findings and recommendations:

  The findings from above key steps shall provide the details about the conformance of existing buildings to the required performance criteria and any abnormality and deficiency should be highlighted. The remedial procedure including the actions such as monitoring, repair, or rehabilitation should be provided in the recommendations in a report format.

- Report: The Entity/contractor shall develop a detailed condition assessment report with the following sections:
    - Executive summary
    - Introduction and purpose
    - Structure description
    - Site visit details and findings
    - Structural analysis, calculations and findings
    - Test results and findings
    - Summary
    - Conclusions
    - Recommendations

- Cost-benefit analysis:

The cost benefit analysis shall be carried out prior to and after the condition assessment. The cost benefit analysis should consider the following key aspects keeping in view that safety is of paramount importance in the final decision-making process:

- Condition assessment cost
- Rehabilitation cost and benefits
- Repair cost and benefits
- Strengthening cost and benefits
- Monitoring cost and benefits
- Disruption costs of and temporarily vacating the building

- Recommendations

# 12.0 REPAIRS/REHABILITATION TO EXISTING BUILDINGS

Indications of potential distress within the structural components or system appear in the form of deflection, cracks, spalling/delamination, dry rot etc. These types of defects may indicate a minor or a major problem. Peeling of paint and cracks in the coating are not signs of distress. Nevertheless, the defects should be appropriately assessed. Structural defects should always be assessed by competent and qualified structural engineers and appropriate repairs need to be done. It is not within the scope of this chapter to detail new construction works as these should follow the guidance of the Expro White Book.

## 12.1 General

This sub-section details the requirements to carry out required repairs to existing buildings.

## 12.2 Compliance

The repair work carried out in the existing buildings shall not make the building non-compliant before the repair was undertaken. The repair work shall be undertaken in a manner that following conditions shall be adhered to and building shall not become:

- Unsafe
- Hazardous
- Unsanitary
- Overloaded
- Mechanical and plumbing systems shall not become unsafe
- Building elements and materials such as windows, including the sash and;
- Glazed portion or safety glazing shall comply with the safety glazing requirements of applicable codes. In case of replacement of windows, they shall comply with energy requirements
- Fire protection levels shall be maintained in accordance with the applicable fire safety codes such as smoke detectors.
- The repair work shall be carried out in a manner that maintains the emergency escape, egress and rescue openings.

## 12.3 Permit

The repair and rehabilitation work shall not be carried out in the existing building without prior approval of the relevant authority and Entity.

## 12.4 Approvals

- The Entity reviews and approves all drawings and specifications related to repair/rehabilitation and alteration of existing building structures and structural systems. This is shared with the building owner, if it is other than the Entity.

## 12.5 Structural Repairs/Rehabilitations

- A competent, registered and qualified professional shall carry out the evaluation and condition assessment (Refer Section 12.0) of the damaged building and shall submit a report to the Entity
- The contractors shall provide and get approval from the Entity for the designated work area. The work area shall be clearly highlighted and identified within the construction documents

### 12.5.1 Repairs to Existing Buildings with Less than Significant Structural Damage

If the condition assessment and evaluation (Refer Section 11.0) concludes that the damage to the building is less than significant, the damaged elements shall be permitted to be restored to their pre-damage condition and meet the applicable codes and standards.

### 12.5.2 Repairs to Existing Buildings with Significant Structural Damage

The buildings with substantial damage shall be assessed and evaluated (Refer Section 11.0) by a competent, registered and qualified professional before the structural repair. This damage can generally be caused by natural events such as flooding, storms, earthquake, inappropriate initial structural design, soil movement, and differential settlement.

- If the vertical building elements such as those that resist the lateral forces are substantially damaged, then these elements or structural components shall be repaired and/or retrofitted in accordance with the applicable standards
- If the gravity load carrying elements that resist vertical loads have been substantially damaged, then these should be replaced/rehabilitated in accordance with the applicable codes and standards and should comply with the provisions of dead and live loads carried by these elements/structural components. The new design shall consider the adjacent structural elements to be rehabilitated

which may not be substantially damaged but carry the same loading to applicable codes and standards
- In flood and earthquake prone areas, buildings that have sustained substantial damage shall be brought into compliance with applicable codes, as applicable

### 12.5.3 Concrete Repairs

Concrete repairs to the existing building should be carried out in accordance with the detailed requirements highlighted in the following ACI documents:

- 546R-14: Guide to Concrete Repair
- 562-19: Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary

The requirements detailed in the above documents encompass the following key aspects in the repair and rehabilitation of the existing concrete building structures:

- General requirements for concrete repair
- Evaluation/condition assessment requirements for concrete repair
- Structural analysis for concrete repair
- Design, implementation, execution, durability, and quality assurance requirements for repairing concrete

### 12.5.4 Steel Repairs

Steel repairs to the existing building should be carried out in accordance with the detailed requirements highlighted in the following documents, steel manufacture requirements and specifications:

- SBC 306 Steel Structures Chapter 14 Existing Buildings
- ANSI/AISC 360-16 Specification for Structural Steel Buildings Appendix 5 Evaluation of Existing Structures
- ANSI/AISC 303-16 Code of Standard Practice for Steel Buildings and Bridges

The requirements detailed in the above documents encompass the following key aspects in the repair and rehabilitation of the existing steel building structures:

- General provisions for evaluation of existing steel buildings and repair
- Material properties and tests for evaluation of existing steel buildings and repair
- Evaluation by structural analysis of existing steel buildings
- Evaluation by load testing of existing steel buildings
- Evaluation report
- Design, implementation, execution, durability, and quality assurance requirements for steel repair

### 12.5.5 Masonry Repairs

- Masonry used as building material is limited in Saudi Arabia. The masonry is either repaired in case of deterioration to restore the load bearing capacity, while the strengthening techniques are used to increase the load bearing capacity of the masonry elements. Generally, the following techniques are used to repair the masonry elements of an existing building:
    - Replacement of masonry elements with similar type of material
    - Repointing the masonry by reinforcing mortar joints due to extreme weather such as cycle of freeze and thaw, roofs/gutter leakage, dampness of walls, differential settlement causing cracks along the joints, mortar cracking, missing bricks, and masonry units. Repointing is carried out by removing the damaged joints and filling new mortar after proper cleaning. This type of repair improves the shear strength, compressive strength, aesthetically improvement and any deformations
    - Covering and injecting the cracks with appropriate repair material
    - Pinning-repairing cracks using steel pins

  - Shotcreting by spray concrete
  - External steel plate reinforcement

- The repair should be carried by specialized contractors and competent and skilled labor
- The materials used for the repair, rehabilitation and strengthening of masonry should be in accordance with material specifications and requirements highlighted in SBC 305 Masonry Structures Requirements, TMS 402/602 Building Code Requirements and Specification for Masonry Structures, 2016, ASCE 5/ACI 530 Building Code Requirements for Masonry Structures and any applicable standards for masonry structures

# 13.0 STRENGTHENING, RENEWAL AND ALTERATIONS TO EXISTING BUILDINGS

- Strengthening, renewal and alteration work shall be controlled to ensure that assets are durable
- Strengthening, renewal, and alteration work shall be performed as corrective actions to address life-expired assets or elements in accordance with the supplier's program for lifecycle management or a change in use, function, or duty of the asset or element
- Strengthening, renewal and alteration work shall be justified by the principles of whole lifecycle asset management
- Strengthening, renewal, and alteration work shall be based on inspection reports (section 10.0), condition assessments and analytical assessments (section 11.0)
- Strengthening, renewal, and alteration work to the existing building can be classified as carrying out the following works to the building:
  - Change of any space
  - Addition
  - Removal
  - Reconfiguration
  - Extension
- The alteration to the buildings is classified in the following categories:
  - Level 1 Alteration: Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose. Level 1 alterations shall comply with the provisions of the IEBC (2018 Chapter 7) and other applicable standards.
  - Level 2 Alteration: Level 2 alterations include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment. Level 2 alterations shall comply with the provisions of IEBC (2018 - Chapter 7 and 8) and other applicable standards.
  - Level 3 Alteration: Level 3 alterations apply where the work area exceeds 50% of the building area. Level 3 alterations shall comply with the provisions of IEBC (2018 - Chapter 7, 8 and 9) and other applicable standards.
- The work carried by the Entity/contractors for the purpose of strengthening, renewal, and alteration work to the existing building shall comply with the provisions mentioned in the relevant sections and relevant provisions detailed in SBC, SBC 901 (Existing Building), IEBC (2018 - Chapters 6 through 12), IRC (2018 – Appendix J) and any other Entity specific regulations
- The strengthening, renewal, and alteration work shall be carried out in the manner that the minimum design loads shall be like the loads when the building was constructed. If any of the structural component is exposed during the alteration and if the condition assessment of the components establish that these structural elements are unsound or dangerous, then these shall be made to comply with applicable clauses of SBC, IEBC (2018 - Chapters 6 through 12), IRC (2018 – Appendix J) and any other relevant Entity specific regulations
- The contractors shall provide and get approval from the Entity for the designated work area and access. The work area shall be clearly highlighted and identified within the construction documents
- The Entity reviews and approves all drawings and specifications related to repair/rehabilitation and alteration of existing building structures and structural systems. This is then shared with the building owner, if other than the Entity.

## 14.0 ATTACHMENTS

1. Attachment 1 - EOM-ZM0-TP-000006 - Checklist - Planned Maintenance Schedule

## Attachment 1 - EOM-ZM0-TP-000006 - Checklist - Planned Maintenance Schedule Checklist

| Building name: | | Reference No. | | REV-000 | | |
|---|---|---|---|---|---|---|
| **No.** | **Inspection Item** | **Task** | **Frequency** | **CHECKED SATISFACTORY** | | |
| | | | | **N/A** | **YES** | **NO** |
| **1.0** | **Roof** | | | ☐ | ☐ | ☐ |
| 1.1 | Roof Coverings | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 1.2 | Roof Boarding | Visual inspection | Annually | ☐ | ☐ | ☐ |
| 1.3 | Any Other Substrates | Visual inspection | Annually | ☐ | ☐ | ☐ |
| 1.4 | Glazing | Visual inspection* | Annually* | ☐ | ☐ | ☐ |
| 1.5 | Roof frame (beams, columns and masonry walls providing support) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| 1.6 | Corrosion Protection | Test | 12 months | ☐ | ☐ | ☐ |
| 1.7 | Pipework | Visual (confirm structural integrity and function) | 12 months | ☐ | ☐ | ☐ |
| 1.8 | Insulation | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 1.9 | Louvres | Visual (confirm structural integrity and function) | 12 months | ☐ | ☐ | ☐ |
| 1.10 | Vents | Visual (confirm structural integrity and function) | 12 months | ☐ | ☐ | ☐ |
| 1.11 | Cladding | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |
| 1.12 | Eaves | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 1.13 | Soffit | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| **2.0** | **Façade** | | | ☐ | ☐ | ☐ |
| 2.1 | Façade | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |
| 2.1 | Canopies (fixed, glazed, dependent) | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |

| Building name: | | Reference No. | | REV-000 | | |
|---|---|---|---|---|---|---|
| **No.** | **Inspection Item** | **Task** | **Frequency** | **CHECKED SATISFACTORY** | | |
| | | | | **N/A** | **YES** | **NO** |
| 2.2 | Doors – Fire (including door furniture) | Visual inspection*** | Monthly*** | ☐ | ☐ | ☐ |
| 2.3 | Curtain Walling (glazing pressure plate, glazing pressure plate caps, movement joints, panels, connector, steel boom trusses, secondary structural support) | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |
| 2.4 | Doors – Sensor Operated | Inspection** | Subject to local risk assessment** | ☐ | ☐ | ☐ |
| 2.5 | Doors – Manual (including door furniture) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 2.6 | Louvres | Visual (confirm structural integrity and function) | Annually | ☐ | ☐ | ☐ |
| 2.7 | Photovoltaic Coverings | Visual inspection & Test | Annually | ☐ | ☐ | ☐ |
| 2.8 | Screens | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |
| 2.9 | Soft Finish | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |
| 2.10 | Vents (manual/powered) | Visual (confirm structural integrity and function) | Annually | ☐ | ☐ | ☐ |
| 2.11 | Windows (glass, standard, security) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 2.12 | Cladding (hard – tiles, panels) | Visual inspection* | Not less than annually* | ☐ | ☐ | ☐ |
| 2.13 | Non-Supporting Structural Walls (non-load bearing walls of masonry, steel, glass, timber or concrete) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| **3.0** | **Internal Walls** | | | ☐ | ☐ | ☐ |
| 3.1 | Walls | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 3.2 | Doors – Manual (including door furniture) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 3.3 | Hard Finish (including hard tiles) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |

| Building name: | | Reference No. | | REV-000 | | |
|---|---|---|---|---|---|---|
| **No.** | **Inspection Item** | **Task** | **Frequency** | **CHECKED SATISFACTORY** | | |
| | | | | **N/A** | **YES** | **NO** |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 3.4 | Soft Finish | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 3.5 | Windows (Glass, Standard, Security) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 3.6 | Cladding Panels | Inspection | Routinely/continuously by Building Users* | ☐ | ☐ | ☐ |
| 3.7 | Non-Supporting Structural Walls (non-load bearing walls of masonry, steel, glass, timber or concrete) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| 3.8 | Supporting Structural Walls (load bearing walls of masonry, steel, glass, timber or concrete) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| **4.0** | **Floors Finishes** | | | ☐ | ☐ | ☐ |
| 4.1 | Floors Finishes | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 4.2 | Carpets | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 4.3 | Hard Finish (including hard tiles) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 4.4 | Soft Finish | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| 4.4 | Coatings | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| **5.0** | **Ceilings** | | | ☐ | ☐ | ☐ |

| Building name: | | Reference No. | | REV-000 | | |
|---|---|---|---|---|---|---|
| **No.** | **Inspection Item** | **Task** | **Frequency** | **CHECKED SATISFACTORY** | | |
| | | | | **N/A** | **YES** | **NO** |
| 5.1 | Ceilings | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 5.2 | Hard Finish (cornices/coves, acoustical ceiling treatment) | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |
| 5.3 | Suspended ceilings (hard – tiles, access hatch, cornices/coves, grid – main) | Visual inspection**** | - | ☐ | ☐ | ☐ |
| **6.0** | **Building Structures – Permanent Elements** | | | ☐ | ☐ | ☐ |
| 6.1 | Structural Elements | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.2 | Slab (steel, concrete, masonry, timber) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.3 | Beams (steel, concrete, masonry, timber) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.4 | Columns (steel, concrete, masonry, timber) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.5 | Roof (slabs, beams, trusses) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.6 | Foundation (ground beams/slabs, special foundations/piles) | + | + | ☐ | ☐ | ☐ |
| 6.7 | Frames (formed of reinforced concrete, structural steel or timber) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.8 | Lining (decorative or fire protection linings) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| 6.9 | Barriers – Fixed (pedestrian and vehicular barriers for public or vehicle protection) | Visual inspection | Annually | ☐ | ☐ | ☐ |
| | | Detailed inspection | 5-yearly | ☐ | ☐ | ☐ |
| **7.0** | **Stairs and Ramps** | | | ☐ | ☐ | ☐ |
| 7.1 | Stairs, Handrails and Ramps | Routinely/continuously by Building Users* | Ongoing* | ☐ | ☐ | ☐ |
| | | General inspection* | Annually* | ☐ | ☐ | ☐ |
| | | Detailed inspection* | 5-yearly* | ☐ | ☐ | ☐ |

| Building name: | | Reference No. | | REV-000 | | |
|---|---|---|---|---|---|---|
| **No.** | **Inspection Item** | **Task** | **Frequency** | **CHECKED SATISFACTORY** | | |
| | | | | **N/A** | **YES** | **NO** |
| **8.0** | **Cathodic Protection (CP) – Structural** | | | ☐ | ☐ | ☐ |
| 8.1 | All CP elements such as battery, monitoring devices, supply, software, rods (electrodes) | Test | Annually | ☐ | ☐ | ☐ |
| **9.0** | **Built In Furniture/Fittings** | | | ☐ | ☐ | ☐ |
| 9.1 | Mirrors | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.2 | Cupboards | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.3 | Shelving | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.4 | Counter Tops | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.5 | Cubicles | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.6 | Floor Mats | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.7 | Blinds | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.8 | Lockers | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.9 | Benches | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.10 | Post Boxes | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.11 | Screens | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.12 | Toilet Fittings | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.13 | Whiteboards | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.14 | Fencing | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.15 | Barriers | * Visual inspection | * | ☐ | ☐ | ☐ |
| 9.16 | Safety Access | * Visual inspection | * | ☐ | ☐ | ☐ |
| **10.0** | **Specific Room Types** | | | ☐ | ☐ | ☐ |
| 10.1 | Kitchens | Routinely/continuously by Building Users*<br><br>General inspection* (Yearly)<br><br>Detailed inspection* (5 yearly) | * | ☐ | ☐ | ☐ |
| 10.2 | Toilets | | | ☐ | ☐ | ☐ |
| 10.3 | Common area including waiting areas | | | ☐ | ☐ | ☐ |
| 10.4 | Meeting Rooms | | | ☐ | ☐ | ☐ |
| 10.5 | Equipment Rooms | | | ☐ | ☐ | ☐ |
| 10.6 | Any Other Rooms | | | ☐ | ☐ | ☐ |
| **11.0** | **Hard Landscaping** | * Inspection | * | ☐ | ☐ | ☐ |
| **12.0** | **Drainage** | * Inspection | * | ☐ | ☐ | ☐ |
| **13.0** | **Specific Planned Maintenance (PM) Notes** | | | ☐ | ☐ | ☐ |

| Building name: | Reference No. | REV-000 |
|---|---|---|

| No. | Inspection Item | Task | Frequency | CHECKED SATISFACTORY | | |
|---|---|---|---|---|---|---|
| | | | | N/A | YES | NO |
| | | | | | | |



* Task nature and frequency to be determined by site-specific risk assessment - depends inter alia upon materials, exposure and location.

** Statutory Requirement - Visual inspection ensuring that there is no damage to the door, intumescent strips, cold smoke seals and furniture. A working check to ensure that the self-closing device operates correctly.

***Statutory (Health, Safety & Welfare) Regulations usually includes doors and gates. Dependent on location and use may be considered work equipment and subject to Provision and Use of Work Equipment Regulations if applicable.

**** Visual inspection to ensure that the compartmentation has not been breached. On completion of modification works by specialist contractors by permit to work system.

+ Part of foundation systems (underground). The accesses to foundations are not available in most buildings, however, any associated problems in visible components may trigger condition assessment and destructive/nondestructive inspections (Refer section 11.0).

| No. | Reviewer's Comments | | | Resolution |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Originator's Name/Signature and Date: | | | | Checker's Name/Signature and Date: |