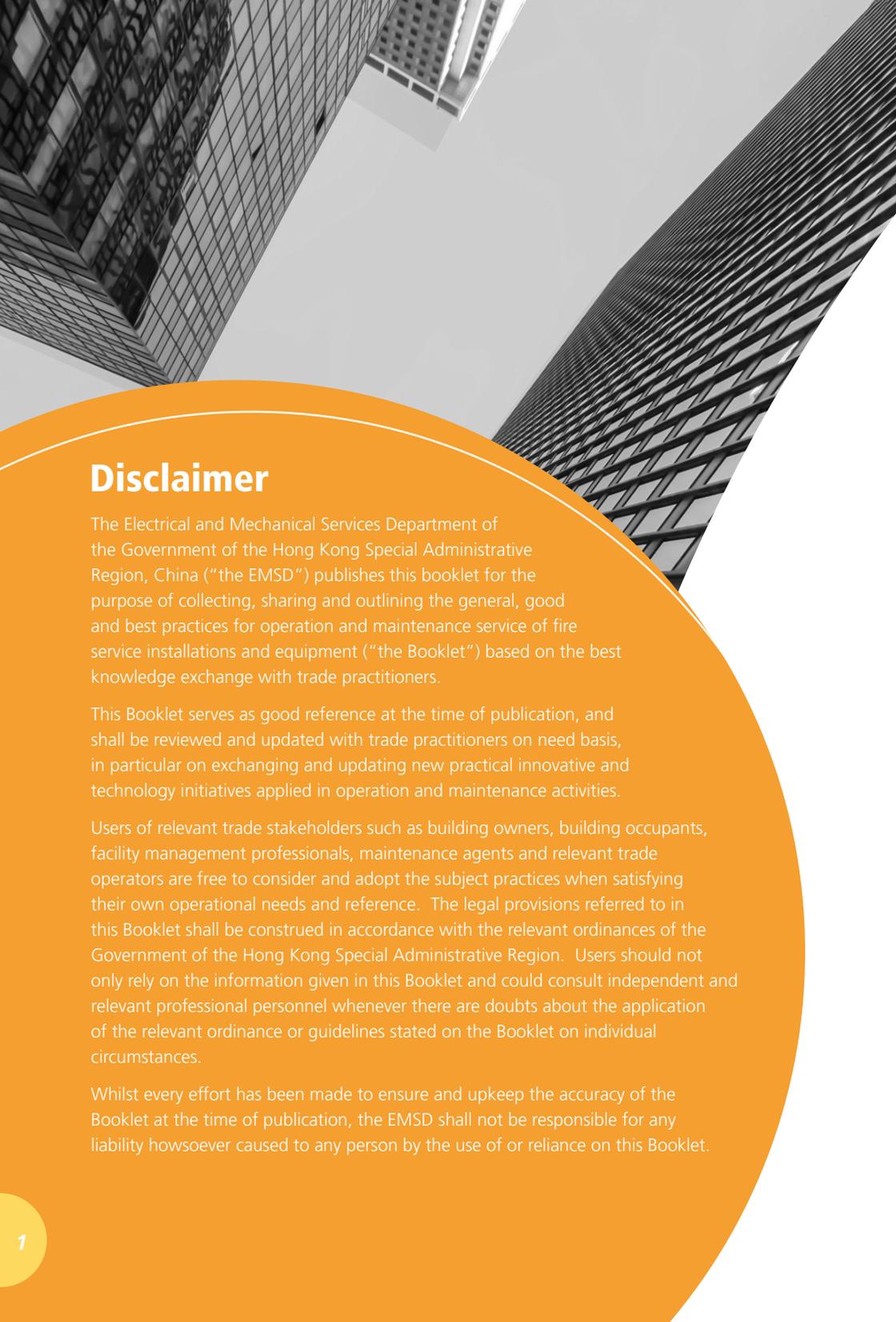


Best Practices for Operation and Maintenance Service of

FIRE SERVICE INSTALLATIONS





Disclaimer

The Electrical and Mechanical Services Department of the Government of the Hong Kong Special Administrative Region, China (“the EMSD”) publishes this booklet for the purpose of collecting, sharing and outlining the general, good and best practices for operation and maintenance service of fire service installations and equipment (“the Booklet”) based on the best knowledge exchange with trade practitioners.

This Booklet serves as good reference at the time of publication, and shall be reviewed and updated with trade practitioners on need basis, in particular on exchanging and updating new practical innovative and technology initiatives applied in operation and maintenance activities.

Users of relevant trade stakeholders such as building owners, building occupants, facility management professionals, maintenance agents and relevant trade operators are free to consider and adopt the subject practices when satisfying their own operational needs and reference. The legal provisions referred to in this Booklet shall be construed in accordance with the relevant ordinances of the Government of the Hong Kong Special Administrative Region. Users should not only rely on the information given in this Booklet and could consult independent and relevant professional personnel whenever there are doubts about the application of the relevant ordinance or guidelines stated on the Booklet on individual circumstances.

Whilst every effort has been made to ensure and upkeep the accuracy of the Booklet at the time of publication, the EMSD shall not be responsible for any liability howsoever caused to any person by the use of or reliance on this Booklet.

Acknowledgements

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Working Group on Compilation of Booklet

- **Architectural Services Department, the Government of the Hong Kong Special Administrative Region, China**
- **Building Services Operation and Maintenance Executives Society**
- **City University of Hong Kong (Division of Building Science and Technology)**
- **Hong Kong Housing Society**
- **Housing Department, the Government of the Hong Kong Special Administrative Region, China**
- **Mott MacDonald Hong Kong Limited**
- **The Association of Consulting Engineers of Hong Kong**
- **The Association of Registered Fire Service Installation Contractors of Hong Kong Limited**
- **The Chartered Institution of Building Services Engineers (Hong Kong Region)**
- **The Hong Kong Association of Property Management Companies Limited**
- **The Hong Kong Federation of Electrical and Mechanical Contractors Limited**
- **The Hong Kong Institution of Engineers (Building Services Division and Fire Division)**
- **The Hong Kong Institute of Facility Management**
- **The Hong Kong Polytechnic University (Department of Building Environment and Energy Engineering)**
- **The Real Estate Developers Association of Hong Kong**

Benchmarking Organisations

- **Henderson Land Development Company Limited**
- **Hong Kong University of Science and Technology**
- **Housing Department, the Government of the Hong Kong Special Administrative Region, China**
- **Mass Transit Railway Corporation Limited**
- **Hong Kong Jockey Club**
- **New World Development Company Limited**
- **Hong Kong Science and Technology Parks Corporation**
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- **Sun Hung Kai Properties Limited**
- **Swire Properties Limited**

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Preface

The EMSD endeavours to collaborate with the trade practitioners for adopting best practices and innovative technologies to improve the management of E&M assets, thereby enhancing the resilience and intelligence in buildings.

This Booklet recommends a basic framework for 15 key attributes important to users such as facility management professionals and relevant stakeholders involved in the design, construction, operation, maintenance, alteration, addition and replacement of fire service installations and equipment (FSI) in buildings. Under each key attribute, it outlines the general, good and best practices for operation and maintenance service of FSI based on the best knowledge exchange with trade stakeholders, regardless of size, complexity or location.

With the dedicated collaboration and commitment with our trade practitioners, it is intended to develop the guiding practices that are professional, reliable, up-to-date and widely applicable for the asset management of most of the relevant electrical and mechanical assets in Hong Kong.



Terms, Definitions and Abbreviations

AA&R	Addition, alteration and replacement
ArchSD	Architectural Services Department, the Government of the Hong Kong Special Administrative Region, China
BD	Buildings Department, the Government of the Hong Kong Special Administrative Region, China
EMSD	Electrical and Mechanical Services Department, the Government of the Hong Kong Special Administrative Region, China
EPD	Environmental Protection Department, the Government of the Hong Kong Special Administrative Region, China
FM	Facilities manager
FSD	Fire Services Department, the Government of the Hong Kong Special Administrative Region, China
FSD CoP	Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment, published by the Fire Services Department, the Government of the Hong Kong Special Administrative Region, China
FSI	Fire service installations and equipment as defined in the FSD CoP
O&M	Operation and maintenance
RFSIC	The fire service installation contractor registered under Cap.95A Fire Service (Installation Contractors) Regulations
T&C	Testing and commissioning

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1

Introduction



1.1 About This Best Practice Booklet

This Booklet is intended to outline the guiding principles on general, good and best practices to be considered during the design, construction, operation, maintenance, alteration, addition and replacement for the fire service installations and equipment (FSI) in buildings to upraise the efficiency of asset management. It is designed for those users who are currently engaged in asset management of the FSI in existing buildings or those who plan for new design and fitting-out works with the FSI in new buildings. This Booklet should be read in conjunction with applicable ordinances, regulations and codes in Hong Kong, and acceptance criteria and standards of Fire Service Department (FSD).



1.2 Target Audience

Target audiences of this Booklet are primarily for trade stakeholders including building owners, building occupants, facility management professionals, maintenance agent or relevant trade operators.

While in daily operations, the safety, system reliability, operational efficiency and sustainability of the assets rely on the daily operation and maintenance practices. In this regard, some information and recommendations to the interest of the trade stakeholders are outline in this Booklet as reference.



1.3 How to Use This Best Practice Booklet

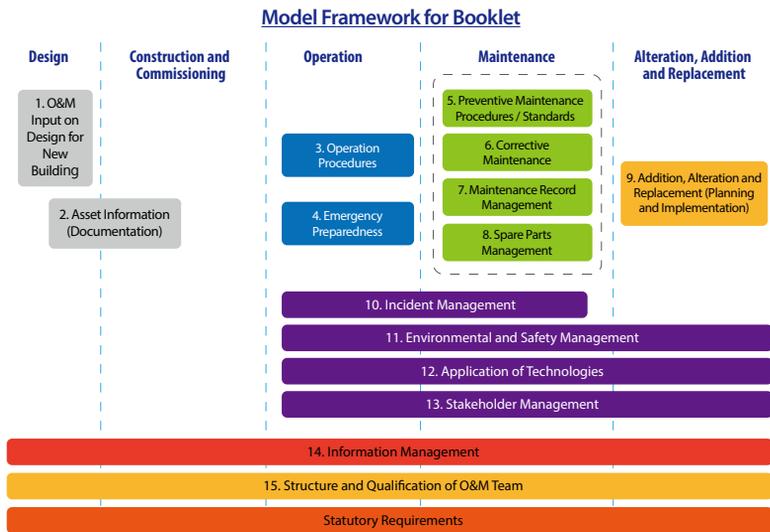
This Booklet mainly covers 15 key attributes in the following stages in new and existing buildings:

- **Design, Construction and Commissioning,**
- **Operation and Maintenance and**
- **Alteration, Addition and Replacement.**

The 15 key attributes are the key main considerations for achieving good or best performance in asset management of the FSI in buildings. Three levels of guiding principles, namely general, good and best practices, with associated examples of trade practices have been defined in each key attribute as reference. An additional chapter on “Innovative and Technology Initiatives” has also been included about the trend of technologies likely to be adopted to upraise the operation and maintenance service.

Level	Category	Description
Level 1	General Practice	Involving general operating practices in fulfilling statutory requirements and aligning common practice in the trade industry
Level 2	Good Practice	Involving good operating practices with higher standard on enhancing either asset safety, system reliability, operational efficiency or sustainability
Level 3	Best Practice	Involving best operating practices with highest standard on asset management with use of innovative technologies or relevant life-cycle considerations

The figure provides an illustrative map for the 15 key attributes in different sections of the booklet.



A summary of the contents in this booklet is as follows:

Section 1: Introduction to this Best Practice Booklet

Describes the important drivers for a building to perform efficiently and safely. This section explains what this Booklet is about, identifies key stakeholders, and directs the reader to specific sections.

Section 2: Key Model Framework

Describes the 15 key attributes for implementing good performance operation and maintenance of FSI in buildings. It defines three levels of practices, namely General, Good and Best practices, for each.

The 15 key attributes are:

- (i) O&M Input on Design for New Building – It is important for Design Engineers to consider accessibility, maintainability and system compatibility right from the planning and design of a facility, through its life cycle.
- (ii) Asset Information (Documentation) – Good documentation is essential for facilitating good operation and maintenance. This section describes the key documents that are required for the efficient operation and maintenance, and timely statutory certification of FSI.
- (iii) Operation Procedures - All activities associated with the routine, day to day use, support, and maintenance of a building or physical asset; inclusive of normal/routine maintenance. O&M procedures at the system level do not replace manufacturers' documentation for specific pieces of equipment, but rather supplement those publications and guide their use.
- (iv) Emergency Preparedness – Being prepared for emergencies is important, and emergency management allow stakeholders to anticipate the types of potential hazards that that could occur, and to think of ways to reduce the impact.
- (v) Preventive Maintenance Procedures/ Standards - Preventive Maintenance consists of a series of time-based maintenance requirements that provide a basis for planning, scheduling, and executing scheduled (planned versus corrective) maintenance. It is of a planned nature (versus the unplanned nature of Corrective Maintenance (CM)).
- (vi) Corrective Maintenance – This is an essential maintenance task performed to correct failures, breakdowns, malfunctions, anomalies or damages detected during inspections, or through monitoring, alarming, or reporting, or any other sources. The actions taken will aim to restore plant and equipment back into regular and required operation mode.
- (vii) Maintenance Record Management – This is a key part requiring efficient storage and management of maintenance records. Proper maintenance records minimise the number of expensive repairs, increase safeness in operation and enhance the equipment health.
- (viii) Spare Parts Management – Managing spare parts in an optimal way is an inherent and substantial part of O&M aimed at ensuring that spare parts are available in a timely manner for corrective maintenance in order to minimise the downtime of a system or equipment.
- (ix) Addition, Alteration and Replacement (Planning and Implementation) - This includes the analysis, procurement, management on addition, alteration as well as disposal and replacement of assets to meet the organisation's long term aims and objectives.
- (x) Incident Management – This is the essential process to restore normal service operation as quickly as possible and limit the potential disruption caused by an incident.

- (xi) Environmental and Safety Management - The Building Owner has the ultimate legal and moral responsibility to ensure the health and safety of people in and around the building and for the protection of the environment around it.
- (xii) Application of Technologies - Integration and adaptation of new technologies with innovative methods to optimise system performance as well as operational effectiveness.
- (xiii) Stakeholder Management – This is a critical component to the successful delivery of any service. It allows the correlation of stakeholders with potential known triggers, such as disruptions to their normal patterns and update on work progress, etc. It also estimates the impact that these reactions may have on your project or strategies and identifies whether targeted communication, mitigation or an alternative solution is required.
- (xiv) Information Management – This concerns a cycle of organisational activity involving the acquisition of information from one or more sources, and the custodianship and distribution of that information to those who need it.
- (xv) Structure and Qualification of O&M Team - It is of critical importance that all O&M teams have a proper structure and their personnel have the relevant qualifications to perform the works in a safe, responsible and accountable manner.

Section 3: Innovative & Technology Initiatives

Describes the latest technology development in the use of innovative and technology initiatives adopted for O&M services for Fire Service Installations.

Section 4: Industrial Standards and Requirements

Describes relevant codes and industry standards involved in the O&M services for Fire Service Installations.



1.4 Stakeholder Responsibilities

Trade stakeholders should be aware of their roles, responsibilities and commitments to drive for implementation of the good and best practices, whenever applicable, for the betterment of their routine asset management.

It is essential that all involved stakeholders shall work collaboratively as a team. While those involved for improving the current practices, they shall commit to facilitate and provide sharing on the necessary training, practical experience, knowhow and awareness of modern technology and the skills of optimising performance in their organisations.

1.4.1 Building Owner

The Building Owner has the ultimate responsibility for operating and maintaining the base / central building services installations in adherence with all applicable legal requirements.

The Building Owner should motivate and empower all stakeholders to deliver efficiencies through O&M practices. The policies and strategies set by the Building Owner should drive the process for setting up the implementation of maintenance contracts and efficiency measures.

1.4.2 Building Occupants (Tenants)

Tenants hold the responsibility to ensure that the operation of the equipment is efficient, human behavioural patterns do not affect the efficiency of the FSI, and that work carried out during tenancy fit-outs does not affect the performance of base building services installations.

Tenants should adhere to the lease conditions when available, including Green Leases and Tenancy Fit-Out Guidelines, that express mutual expectations between Building Owners and Tenants with regards to operation, maintenance and performance requirements of the building.

1.4.3 Facilities Manager

The Facilities Manager (FM) is responsible for implementation of the maintenance and environmental policies and strategies set by the Building Owner in accordance with the allocated resources. The FM must take on the role of the champion who leads the process for implementing changes that deliver better practices for the O&M of the building.

It is important for the FM to develop a maintenance regime that is geared towards delivering good outcomes in partnership with Maintenance Service Providers, who would benefit from the enhanced system reliability and secure safe operation. Forming good relationships and ensuring effective channels of communication, including good documentation of asset information and O&M activities, is an important aspect to the process.

2

Key Model Framework



2.1 O&M Input on Design for New Building

Design for maintainability emphasises the importance of timely integration of design and construction knowledge with O&M experience into the project design in order to optimise the equipment life.

Maintainability should be considered, and incorporated into the building system design, ensuring the ease, accuracy, safety, and economy of maintenance tasks within that system. Maintainability refers to the effectiveness and efficiency of maintenance activities. New working practices encouraged, such as Building Information Modelling for Asset Management (BIM-AM), require the involvement of asset owners and FMs to understand the information they require on handover. FMs should be involved during design stage and ensure the information handed over by the contractor fits their specific needs.

★☆☆ Level 1

2.1.1

- Develop design according to various codes of practice and guidance documents on operational management and maintenance of FSI.
- Seek and integrate advice from O&M team on maintenance accessibility, system compatibility and maintainability aspects of FSI.

GENERAL PRACTICE

★★★☆☆
Level 2

GOOD
PRACTICE

2.1.2

- Identify key design, commissioning and maintenance requirements for referral by designers, installers, operators and management.
- Collaborate O&M team and project design team at early design stages of project to provide a system design with the best operability and maintainability of FSI.
- Establish design checking matrix covering accessibility, compatibility and maintainability for incorporation by the designer.



★★★★★
Level 3

BEST
PRACTICE

2.1.3

- Develop design with consideration of requirements in the life cycle of FSI from commissioning, O&M, through mid-life refurbishment to decommissioning or total replacement.
- Adopt design to incorporate facilities (e.g. redundancies, interconnections, changeovers or bypass facilities) to maximise system resilience at contingency and minimise the system suspension period during maintenance or replacement activities.
- Establish in-house design guidelines on accessibility and maintainability aspects with regular review and update.
- Consider factors on Guidance Notes on Construction Design and Management (CDM) guidance to improve health and safety aspects on building construction and maintenance.



2.2 Asset Information (Documentation)

Asset Information should be compiled, covering all major items of fire service systems in a format that is useful to the FM and Maintenance Service Provider. The information should be updated regularly with:

- repairs, upgrades, refurbishments, maintenance or decommissioning work;
- assessment information (relating to performance or risk); and
- changes in the wider environment (including regulations, responsibilities or ownership).

★☆☆★ Level 1

GENERAL PRACTICE

2.2.1

- Maintain proper records of asset information including general building plan, approved schematic drawings, approved fire service notes, compliance standards, fire engineering report, fire safety management plan, approval documents by relevant authorities, etc. which have been submitted, e.g. via Form No. FSI/314, FSI/314A, FS251, etc. and finally accepted by FSD.
- Maintain as-built drawings, T&C reports, O&M manuals, test records of direct telephone link connection, equipment lists showing brand name, model, rating, year of installation, expected lifespan, software license and updates etc., recommended spare part lists, tool lists, supplier contacts, etc.
- Maintain proper record of any modification and AA&R of FSI such as as-built drawings, T&C reports, O&M manuals, equipment lists, statutory certificates and documentations as per statutory requirements by relevant parties.



☆☆☆
Level 2

GOOD
PRACTICE

2.2.2

- Maintain design documents (e.g. design criteria, room datasheet, design calculations, etc.).
- Maintain design documents (e.g. control logic, equipment shut down table, layout showing the affected areas/zones etc.) if complicated smoke control systems are adopted in buildings.
- Digitise asset information with standardised file naming system in a reliable database server for easy retrieval.



☆☆☆☆
Level 3

BEST
PRACTICE

2.2.3

- Keep audit/survey reports of asset information.
- Implement computer-based asset management systems for asset records and version control, with corresponding workflow for data retrieval and updates, to ensure validity throughout the life cycle of assets.
- Provide an interface for computerised asset information models to enable essential asset information to be retrieved from the asset information database easily whenever necessary.



2.3 Operation Procedures

Operational efficiency refers to the life-cycle, cost-effective mix of preventive, predictive, and reliability-centred maintenance technologies, coupled with equipment calibration, tracking, and computerised maintenance management capabilities all targeting reliability, safety, occupant comfort, and system efficiency.

★☆☆☆ Level 1

GENERAL PRACTICE

2.3.1

- Demarcate the responsibilities and scope of operation of FSI including routine inspection, operation and testing between the Building Owner, Building Occupants, FM, Maintenance Service Provider, RFSIC and other stakeholders. Make sure that no person other than RFSIC shall maintain, inspect or repair any FSI (except portable equipment which is not required by Law to install) which is installed in any premises (according to Reg. 7 of Cap 95B, HK Law), in the demarcation.
- Provide guidelines on requirement of manning level and qualification of operation staff in discharging the routine operation.
- Provide general safety-related guidelines, risk assessment procedures and permit-to-work systems for routine operation.
- Maintain basic operation procedure of FSI.
- Provide guidelines on the operation of tools such as ladders, trestles, hand-held communication tools, calibrated measurement & testing equipment, materials or parts necessary for execution of O&M services.
- Provide information of maintenance frequency and performance targets on fault attendance, rectification to the system operator.
- Provide basic guidelines including indicative signals of fire panels, emergency plan and contact list for the property management personnel and FM.
- Conduct routine testing of emergency generator according to the statutory requirements of EPD including routine testing within specified time period and the fuel requirements.

★★★☆☆
Level 2

GOOD
PRACTICE

2.3.2

- Maintain standardised checklists for operation, inspection and testing of FSI.
- Provide guidelines on requirement of uniform with badges and identity cards for direct staff and contractor staff.
- Conduct induction briefings and/or awareness training on “Do’s and Don’ts” of FSI to Property Management Personnel.

★★★★★
Level 3

BEST
PRACTICE

2.3.3

- Adopt a risk-based approach to review all associated guidelines and procedures by responsible competent personnel.
- Conduct regular fire risk assessment to identify the potential fire hazard in routine operation activities.
- Conduct regular review of all guidelines/procedures by responsible competent personnel.
- Adopt BIM-enabled workflow to suit the routine operation works.
- Maintain computerised database for on-line retrieval of guidelines / procedures / method statements / test records of routine inspection, operation and testing.





2.4 Emergency Preparedness

Building Emergency Preparedness is an effort to connect the emergency planning and response with the building users. The goal is to train personnel in basic emergency response actions who know the building and occupants, and can act as a resource and liaison to the stakeholders and building users.

An emergency action plan should identify all the potential hazards associated with FSI, with a personnel responsibility matrix for allocating appropriate resources. The written plan should become an action document, updated according to an appropriate timeframe to ensure accurate information, such as contact information, is provided.

★☆☆☆ Level 1

GENERAL PRACTICE

2.4.1

- Maintain an up-to-date emergency contact list with contact mobile numbers of the FM, Maintenance Service Provider, RFSIC and other registered specialist contractors and the contact no. of direct telephone link to the Fire Services Communications Centre of FSD, etc.
- Maintain an up-to-date communication flow between the FM, Maintenance Service Provider and RFSIC.
- Maintain all associated documents, such as fire service layout plans, location plans of automatic fire alarm panels and fire extinguishers, fire safety management plan etc. in a designated location, such as security room and/or property management office and an approved exit route at the prominent locations.
- Carry out fire drills and keep proper records of the drill.
- Maintain the emergency plan / procedures.
- Maintain fire safety management plan including fire action plan if the fire engineering approach is adopted in fire safety design of the building.

★★★☆☆
Level 2

GOOD
PRACTICE

2.4.2

- Include specific requirements in maintenance contracts for emergency situations, such as time for arrival, etc.
- Keep sufficient materials and critical spare parts on site for quick fix to resume operation.
- Conduct training of property management personnel when system is upgraded.
- Establish point list of automatic fire detection and fire alarm systems for easy identification of faults.
- Arrange internal sharing sessions for lessons learnt from incidents to Property Management Personnel and Building Occupants.

★★★★★
Level 3

BEST
PRACTICE

2.4.3

- Conduct annual reviews on the emergency plan / procedures and fire drills
- Maintain a computer database for on-line retrieval of related documents of FSI and layout plans.
- Establish database for faults or incidents analysis for trend prediction and preventive maintenance.
- Conduct regular training of Property Management Personnel and fire drills.
- Conduct regular fire risk assessment by competent personnel.



2.5 Preventive Maintenance Procedures / Standards

The goal of Preventive Maintenance is to prevent equipment failure caused by fatigue, neglect, or normal wear, through replacing worn components before actual failure.

Maintenance activities include partial or complete overhauls at specified periods, and include oil changes, lubrication, minor adjustments, and so on. Typical procedures recommend that personnel record equipment deterioration upon any inspection to facilitate the replace or repair worn parts before any system failure. It is necessary to undertake preventive maintenance of installations and equipment to maintain efficient working order of the building's fire service systems and their components. The FSI require periodic inspection, testing and maintenance throughout their life cycle in addition to the need for overhauling, or replacement, at a certain age or interval, or due to specific issues or causes. These must be outlined specifically in a Preventive Maintenance Program.

The Preventive Maintenance Program must include the methodology and record for all actions that are necessary to maintain the efficient working order of the FSI. The required maintenance procedures will be unique to each property and the installations and equipment within these facilities.

★☆☆☆
Level 1

2.5.1

- Engage an RFSIC to conduct periodic maintenance, inspection, testing and certification in accordance with statutory requirements.
- Follow the prevailing FSD requirements and procedures for maintenance, inspection, testing and certification of FSI as well as the reporting of FSI shutdown.
- Agree with Building Occupants on the maintenance schedule prior to any maintenance activities.
- Shut down FSI by sections and restore it to normal operation as soon as practicable in order to minimise the fire risk of affected areas.
- Avoid shutting down different fire services systems at the same time for maintenance.
- Refrain from shutting down the whole fire service system for a prolonged period of time.

**GENERAL
PRACTICE**

- Notify Building Occupants by a written notification in respect of shut down of FSI with reasons, anticipated commencement and completion dates and the areas being affected.
- Provide simple graphical notices detailing the shutdown of FSI at prominent locations of the building.
- Provide stand-by means (e.g. fire extinguishers, standalone smoke detectors, temporary firefighting water supply system, etc.) to the extent of fire risk and the areas being affected during the shutdown of FSI.
- Notify FSD and Building Occupants about the arrangement of stand-by means.
- Task the FM with formulating an emergency plan and evacuation strategy plan.
- Provide O&M personnel induction training for safety, statutory requirements, performance target and work manner of the maintenance work.
- Remove all debris arising from maintenance service and/or repair works to appropriate disposal points daily.
- Record maintenance activities including the commencement and completion dates and times, method statements and actions taken for the maintenance work.



**GOOD
PRACTICE**

2.5.2

- Prepare O&M checklists for maintenance service and keep proper record.
- Conduct Preventive Maintenance and overhauls with clear maintenance schedule and procedures with reference to the manufacturers' maintenance manual and recommendations.
- Conduct regular review on the maintenance schedule agreed with Building Occupants and counter check with related stakeholders 2 months prior to the scheduled maintenance activities.
- Provide good housekeeping.
- Set performance indicators (e.g. system availability) and targets for continuous monitoring and improvement of maintenance service.
- Conduct sample checks on compliance of performance targets.

- Provide periodic maintenance, inspection and testing of FSI in addition to the statutory requirements as follows:-
 - i) Biweekly:
 - Diagnose pre-alarm conditions of fire detection and fire alarm systems.
 - ii) Monthly:
 - Test automatic and manual start of fire service pumps and sprinkler pumps including jockey pumps.
 - iii) Quarterly:
 - Check wiring, controls, indicators, alarm bells, batteries, automatic and manual release mechanism, time delay devices, gas cylinder pressure, warning notices and operation instructions of automatic fixed installations other than water and fixed automatically operated approved appliances;
 - Clean, adjust and clear all obstruction that would impair the normal operation of deluge, drencher, fire hydrant / hose reel, sprinkler, water mist and water spray systems;
 - Check wiring, controls, indicators of all zone circuits and batteries of fire alarm system;
 - Activate gas, heat, smoke and/or multi-sensor detectors to test the operation of fire alarm bells, transmission of alarm signal to fire service communication centre, ventilation and air-conditioning control, fireman's lifts, pre-action sprinkler system, etc.
 - iv) Half-yearly:
 - Clean strainers and check the operation of pumps, pressure switches, valves, drain plugs, vent cocks, etc.;
 - Conduct a wet drill consisting of coupling lengths of hose of 2 or more hydrant outlets at the highest point and operating the valve of nozzles to check the discharge pressure and water flow rate of fire hydrant / hose reel system;
 - Check operation of FS pumps and alarm bells to be activated by manual call points;
 - Check and operate smoke curtains;
 - Check water levels of fire service and sprinkler water tanks;
 - Check power supply and system isolation;
 - Check cable and wiring connections;
 - Back up database and the latest version of the automatic fire alarm panel for any recovery work in panel fault situation.

2.5.3

- Conduct regular review and update of all procedures / standards against the latest statutory requirements.
- Conduct regular review of maintenance records and fault history to monitor the condition and performance of FSI.
- Adopt web-based system and/or mobile Apps integrated with computer system for retrieval of O&M records of FSI and monitoring fault attendance and maintenance work progress.





2.6 Corrective Maintenance

The goal of every maintenance team is to be responsive effectively, especially when it comes to unexpected breakdowns of critical plant and equipment, aiming to achieve:

- i) Reduced duration of both planned and unplanned breakdown;
- ii) Reduced cost of running a reactive maintenance strategy;
- iii) Reduced overall cost of maintenance operations.

★☆☆★ Level 1

GENERAL PRACTICE

2.6.1

- Engage an RFSIC to conduct investigation and isolate the affected sections of FSI for Corrective Maintenance, and resume normal operation for code compliance as soon as practicable.
- Follow the prevailing FSD requirements and procedure in respect of shutdown of FSI for corrective maintenance.
- Notify Building Occupants by a written notification in respect of shut down of FSI with reasons, anticipated commencement and completion dates and the areas being affected.
- Provide simple graphical notices detailing the shutdown of FSI at prominent locations of the building.
- Provide stand-by means (e.g. fire extinguishers, standalone smoke detectors, temporary firefighting water supply system, etc.) to the extent of fire risk and the areas being affected during the shutdown of FSI.
- Notify FSD and Building Occupants about the arrangement of stand-by means.
- Task the FM with formulating an emergency plan and evacuation strategy plan.
- Provide O&M personnel induction training for safety, statutory requirements, performance target and work manner of the maintenance work.

- Remove all debris arising from maintenance service and/or repair works to appropriate disposal points daily.
- Record maintenance activities including the commencement and completion dates and times, method statements and actions taken for the maintenance work.



Level 2

**GOOD
PRACTICE**

2.6.2

- Record attendance of fault call within a specified time for various types of buildings (e.g. 30 minutes for critical venues and 60 minutes for others).
- Set performance indicators (response time to emergency/fault call) and targets (compliance rate to performance indicators) for continuous monitoring and improvement of maintenance service.



Level 3

**BEST
PRACTICE**

2.6.3

- Designate personnel to attend to emergency cases and execute all works necessary to resume services promptly.
- Conduct regular review for all emergency procedures.
- Adopt web-based system and/or mobile Apps integrated with computer system for retrieval of O&M records of FSI and monitoring fault attendance and maintenance work progress.



2.7 Maintenance Record Management

Good maintenance records are essential for ensuring that a piece of equipment is performing in line with manufacturer warranties and help to determine an equipment's preventive maintenance schedule. It also assists service technicians with diagnosing repeat problems with a plant or equipment. Clear records can also provide assistance in legal proceedings, if ever necessary.

★☆☆☆ Level 1

GENERAL PRACTICE

2.7.1

- Maintain paper records of all maintenance related activities including testing and commissioning certificates, test reports, as-built drawings, statutory approved submission documents, fire engineering report, fire safety management plan, statutory maintenance certificates, calibration records of FSI, etc. for all new installations and major alterations.
- Maintain a register to monitor the due date and renewal date of all statutory maintenance certificates and calibration of testing instrument.
- Maintain stocks of spare parts, equipment and other components which are necessary to maintain the safe and satisfactory working condition and operation order of the installation at all times.
- Maintain updated preventive maintenance inspection schedule and the related duly signed inspection reports.
- Maintain emergency call / fault attendance / incident reports and the related duly signed inspection reports.
- Maintain a log book kept in safe custody to record all maintenance activities and details of work done to every FSI.
- Maintain records of FSI shut down notices with details.
- Maintain records of duty completed annual inspection checklists for at least 7 years and for verification by FSD upon request.

☆☆☆
Level 2

GOOD
PRACTICE

2.7.2

- Maintain detailed history of faults and fire alarms with information of frequency of occurrence and root causes for further analysis to improve system reliability and stability through improvement works.
- Set up efficient computerised registers and filing system to administer all the statutory certificates, records, drawings, O&M documents, etc.
- Assign designated person(s) responsible to review and update routine maintenance inspection schedules, emergency call / fault attendance reports, etc., on a monthly basis.
- Assign designated person(s) responsible to check against the logbook entry on regularly.
- Set up record systems able to automatically provide alerts for outstanding shut down notices and annual maintenance certificates.



☆☆☆☆
Level 3

BEST
PRACTICE

2.7.3

- Maintain records with regular update of maintenance service performance and corresponding performance indicator e.g. Service Availability, Response Time to Fault Calls, Response Time to Fault Call Rectification, etc. for prompt monitoring and review.
- Develop an equipment life cycle monitoring system to provide alerts for system ageing / spare parts obsolete in order to schedule replacement / improvement works.
- Assign a third-party / audit agent to check against the properness of records to review the maintenance record system and look for improvement opportunities.



2.8 Spare Parts Management

Spare parts management refers to a systematic and structured way to store and extract spare parts efficiently for any maintenance activity. A good system should minimise downtime during FSI breakdown and simplify workflow of FSI maintenance.

★☆☆ Level 1

GENERAL PRACTICE

2.8.1

- Provide information update in regular basis on spare parts and equipment including location, quantity, brand name, model, capacity, compliance standards, contact list of suppliers / manufacturers and approval documents by relevant authorities which are necessary to maintain the safe and satisfactory working condition and operation order of FSI at all times.
- Follow the prevailing FSD requirements and advisory letters from FSD website for updated information or requirements.

★★★☆☆ Level 2

GOOD PRACTICE

2.8.2

- Maintain sufficient spare parts including critical parts / equipment with long lead-time of delivery for minimising the downtime of critical systems when maintenance and repair is required.
- Assign designated responsible person(s) for regularly updating the spare parts inventory.
- Store spare parts and equipment at dedicated locations/warehouses for better management and faster delivery.
- Monitor condition of spare parts regularly to ensure their quality is satisfactory.
- Provide mitigation measures of any identified obsolete equipment with suitable upgrade or replacement plan.

2.8.3

- Derive type, quantity and expected lifespan of essential spare parts from fault history, maintenance record, age and criticality.
- Adopt barcodes and scanning systems to enhance the control of the spare parts movement and improve the accuracy of inventory.
- Review the quality and quantity of spare parts in stock and restock in regular basis.





2.9 Addition, Alteration and Replacement (Planning and Implementation)

This includes the analysis, procurement, and management on addition, alteration as well as disposal and replacement of FSI to meet the statutory requirements and to enhance the overall fire safety.

☆☆☆
Level 1

GENERAL
PRACTICE

2.9.1

- Develop design according to various codes of practice and guidance documents on operational management and maintenance of FSI.
- Develop design according to the fire engineering report, fire safety management plan and Bounding Conditions for existing buildings where the fire engineering approach is adopted.
- Seek and integrate advice from O&M team on maintenance accessibility, system compatibility and maintainability aspects of FSI.
- Obtain confirmation on AA&R works from Building Owner and appropriate authority prior to commencement of works.
- Engage an RFSIC to conduct AA&R works in accordance with the latest statutory requirements.
- Follow the prevailing FSD requirements and procedure in respect of shutdown of FSI for AA&R works if there is no other alternative.
- Shut down FSI by sections and restore it to normal operation as soon as practicable in order to minimise the fire risk of affected areas.
- Avoid shutting down different fire service systems at the same time for AA&R works.
- Refrain from shutting down the whole fire service system for a prolonged period of time.
- Notify Building Occupants by a written notification in respect of shut down of FSI with reasons, anticipated commencement and completion dates and the areas being affected.
- Provide simple graphical notices detailing the shutdown of FSI at prominent locations of the building.

- Provide stand-by means (e.g. fire extinguishers, standalone smoke detectors, temporary firefighting water supply system, etc.) to the extent of fire risk and the areas being affected during the shutdown of FSI.
- Notify FSD and Building Occupants about the arrangement of stand-by means.
- Task the FM with formulating an emergency plan and evacuation strategy plan.
- Remove all debris arising from maintenance service and/or repair works to appropriate disposal points daily.
- Provide O&M personnel induction training for safety, statutory requirements, performance target and work manner.
- Provide all drawings and documents including design calculations, equipment schedules, as-built drawings, testing and commissioning records, O&M manuals, FSD approvals of AA&R works to the O&M team.



**GOOD
PRACTICE**

2.9.2

- Establish detailed method statements and risk assessments of AA&R works to minimise impacts to Building Occupants.
- Establish a mechanism to plan and prioritise replacement works in accordance with equipment age, fault frequency and spare parts availability as well as any specific statutory and safety requirements, etc.
- Develop an action plan and contingency plan with the FM and Building Occupants for equipment replacement works.
- Conduct regular reviews on work progress with the RFSIC, FM and Building Occupants.
- Update all master records including layout drawings, schematic drawings, control diagram, O&M manual, equipment schedule, T&C records and asset information after the completion of AA&R works.

★★★
Level 3

BEST
PRACTICE

2.9.3

- Acquire feedback from the Building Owner, FM and Building Occupants on the performance of different systems to develop a more user-oriented replacement plan.
- Conduct a holistic review on system performance in the planning and design for equipment replacement and where possible, introduce the latest technology that can enhance the overall system reliability and energy efficiency.
- Develop standard T&C procedures and O&M manuals for AA&R works.
- Consider the life-cycle cost in planning and design of equipment replacement.
- Identify critical spare parts / equipment with long lead-time of delivery and consider early procurement of these spare parts / equipment.





2.10 Incident Management

Incident management refers to the "the combination of facilities, equipment, personnel, procedures and communications operating within a common organisational structure, designed to aid in the management of resources during incidents".

When a service is disrupted or fails to deliver the promised performance during service hours, it is essential to restore the service to normal operation as quickly as possible. In addition, any condition that has the potential to result in a breach or degradation of service ought to trigger a response that prevents the actual disruption from occurring. These are the objectives of incident management.

Level 1

GENERAL PRACTICE

2.10.1

- Engage an RFSIC to conduct investigation and isolate the affected sections of FSI for Corrective Maintenance, and resume normal operation for code compliance as soon as practicable.
- Keep proper records of incident investigation, downtime of system, rectification works, losses of property, recommendations for improvement, etc. (refer to Section 2.7.1).
- Review conditions of similar systems and equipment to avoid recurrence.
- Notify related stakeholders about the incident and recommendations for improvement.



Level 2

GOOD
PRACTICE

2.10.2

- Establish incident management plan with reference to Fire Safety Management Plan to define alert levels, investigation procedures, reporting mechanism and requirements of investigator.
- Maintain updated emergency contact lists of appropriate level of management staff and related stakeholders according to the pre-defined incident levels when an incident occurs.
- Specify requirements for emergency situations, such as time for attendance of fault calls and emergency calls, etc.
- Conduct necessary AA&R works to enhance the system reliability.



Level 3

BEST
PRACTICE

2.10.3

- Conduct regular review of incident management plan, emergency contact and escalation list, training and drill.
- Share incident information with all O&M personnel within the same organisation / trade, and document all outcomes.
- Set up a remote monitoring system for early fault detection and reporting.
- Set up a working group to steer incident management, maintain good communication with all stakeholders for improving system's performance and reliability.
- Conduct review on lesson learnt from incidents for staff sharing and take precautionary actions to eliminate similar potential problems.
- Establish emergency task-force teams for incident response.



2.11 Environmental and Safety Management

Environmental and Safety Management ensures that operations are safe for all building users and visitors. Building Owners are obliged to implement all reasonable precautions to protect the environment, and maximise the building's lifecycle efficiencies.

★☆☆★ Level 1

GENERAL PRACTICE

2.11.1

- Fulfil all statutory requirements on environmental and safety management.
- Handle and dispose of unserviceable fire extinguishers in accordance with appropriate procedures when discharging an unserviceable extinguisher or recovering its contents prior to disposal.

★★★★★ Level 2

GOOD PRACTICE

2.11.2

- Minimise the use of materials and resources (e.g. electricity, fuel, hazardous chemicals, etc.) wherever appropriate, to be both energy and resource efficient.
- Adopt environmentally friendly materials and equipment (e.g. energy efficient pumps, motors, fire suppression devices without halons, etc.).
- Minimise the production of all kinds of waste where applicable.
- Conduct job hazard analysis and risk assessment on hazardous activities and take appropriate risk control measures to protect personnel.

- Provide training to equip staff with knowledge to work safely and without risk to health.
- Establish and implement safety rules.
- Supervise personnel to ensure that safety rules are observed, and personal protective equipment are used and maintained properly.
- Investigate incidents and near miss cases to identify root causes and recommend measures to prevent recurrence.
- Establish and implement Environmental Management Systems (e.g. ISO14001) and Safety Management Systems (e.g. OHSAS18001 or ISO45001).

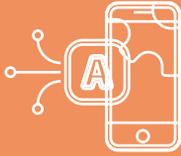


**BEST
PRACTICE**

2.11.3

- Identify of improvement and enhancement opportunities on environmental and safety aspects;
- Reuse or recycle material /waste wherever possible;
- Provide incentives to contractors similar to DEVB's "pay for safety and environmental scheme" in government works contract;
- Adopt recycled components or equipment for the maintenance works wherever possible.





2.12 Application of Technologies

Technology and tools used to lower the cost of implementing and managing O&M best management practices.

★☆☆ Level 1

GENERAL PRACTICE

2.12.1

- Adopt minimum market available technologies as required by statutory requirements;
- Check and ensure that relevant statutory requirements are fulfilled when adopting new technological solutions
- Explore the feasibility of using new technologies in enhancing the overall efficiency of O&M management.

★★★☆☆ Level 2

GOOD PRACTICE

2.12.2

- Introduce the latest technology that can enhance the overall system reliability and be more environmentally friendly for replacement.
- Establish computerised O&M management system to integrate and streamline the management process, enhance the efficiency of the workflow and strengthen the monitoring of contractors' performance.

★ ★ ★
Level 3

**BEST
PRACTICE**

2.12.3

- Adopt remote monitoring technology such as Integrated Building Management System (iBMS) to monitor system healthiness with automatic analysis and alert of abnormal conditions.
- Adopt simulation software to visualise the fire safety design for any major building modification works.





2.13 Stakeholder Management

Stakeholder management is a set of techniques that harnesses the positive influences and minimises the effect of the negative influences. It involves systematic identification, analysis, planning and implementation of actions designed to engage with stakeholders. Stakeholders are individuals or groups with an interest in the building or facility operation because they are involved in the work or affected by the outcomes. Most buildings or facilities and portfolios will have a variety of stakeholders with different, and sometimes competing, interests. These individuals and groups can have significant influence over the eventual success or failure of the work.

★☆☆☆
Level 1

GENERAL
PRACTICE

2.13.1

- Engage an RFSIC to conduct periodic maintenance, inspection, testing and certification in accordance with statutory requirements and monitor the RFSIC performance.
- Maintain effective communication and agree with Building Occupants on the maintenance schedule prior to any maintenance activities.
- Follow the prevailing FSD requirements and procedure in respect of shutdown of FSI for inspection, maintenance, modification and repair if there is no other alternative.
- Notify Building Occupants by a written notification in respect of shut down of FSI with reasons, anticipated commencement and completion dates and the areas being affected.
- Provide simple graphical notices detailing the shutdown of FSI at prominent locations of the building.
- Notify FSD and Building Occupants about the arrangement of stand-by means (e.g. fire extinguishers, standalone smoke detectors, temporary firefighting water supply system, etc.) and the areas being affected during the shutdown of FSI.
- Provide O&M personnel induction training for safety, statutory requirements, performance target and work manner of the maintenance work.
- Formulate an emergency plan with the FM and RFSIC.


Level 2**GOOD
PRACTICE****2.13.2**

- Coordinate with Building Occupants on service needs to improve system reliability and performance.
- Conduct regular review of maintenance schedule.
- Facilitate on-line sharing of information including records, schedules of planned maintenance activities, update progress of corrective maintenance and AA&R works with stakeholders.
- Establish contractor performance monitoring system to evaluate the performance of the maintenance contractor and highlight any potential area for continuous improvement.


Level 3**BEST
PRACTICE****2.13.3**

- Keep stakeholders well informed on progress of O&M activities, and performance of fire service systems.
- Establish a taskforce with stakeholders to regularly review the needs and measures to improve O&M practices, system reliability and performance.



2.14 Information Management

During the life of the system, the O&M phase is the longest and most expensive and the information system provides the most value to the organisation in this phase.

★☆☆ Level 1

GENERAL PRACTICE

2.14.1

- Maintain proper records of certificates and asset information as detailed in section 2.2.1 of this Booklet, and records of O&M and AA&R activities.
- Maintain proper records of correspondence with authorities such as shut down of FSI for inspection, maintenance, modification and repair, and suspension of direct telephone link connection.
- Maintain effective information management and filing system to administer and update the information of FSI.

★★★☆☆ Level 2

GOOD PRACTICE

2.14.2

- Digitalise information of FSI, including certificates, FSI shutdown notification, record of direct telephone link suspension, fire service installations design documents, approved schematic drawings, fire service notes, as-built drawings, O&M manuals, testing and commissioning results, record of maintenance activities, etc.
- Designate person(s) for regular updating of the information of FSI.

★★★
Level 3

**BEST
PRACTICE**

2.14.3

- Establish a common platform for storage and dissemination of O&M information with a view to enhancing the transparency.
- Establish a common platform for on-line sharing of FSI's information and activities among different stakeholders.
- Carry out periodic audits / surveys on the stored records including the asset information.



2.15 Structure and Qualification of O&M Team

Structure is the people, positions, procedures, processes, culture, technology and related elements that comprise the organisation. It defines how all the pieces, parts and processes work together. This structure must be totally integrated with the strategy defined for the organisation to achieve its mission and goals. Structure supports strategy. If an organisation changes its strategy, it must change its structure to support the new strategy. When it doesn't, the structure acts like a bungee cord and pulls the organisation back to its old strategy.

☆☆☆
Level 1

GENERAL
PRACTICE

2.15.1

- Provide on-call maintenance teams with supervisors and maintenance personnel with proper qualifications and training.
- Designate FM's to oversee and review O&M activities and practices.

☆☆☆
Level 2

GOOD
PRACTICE

2.15.2

- Employ FM's who possess professional qualification recognised by professional institutes.



☆☆☆☆
Level 3

BEST
PRACTICE

2.15.3

- Establish dedicated emergency service teams for emergency repair.
- Establish centralised / regional command centre(s) for receiving faults calls and monitoring O&M activities.

3

Innovative & Technology Initiatives

The operation and maintenance of buildings have already been facing several critical challenges, including the aging workforce, aging assets and climate change. The new generation of smart technologies such as artificial intelligence, asset management Internet of Things, building management system, building information system or even specialised drone-enabled automation applications would have brought further challenges to us with safety and well-being of occupants and visitors inside buildings elevated to a completely new level. Building O&M practitioners shall endeavour to adopt innovations, technologies and best practices/guidelines to improve the management of E&M assets, thereby enhancing the resilience and intelligence of government buildings.

Below are 5 emerging technology trends that may have impact on facilities management industry.



3.1 Technology Trend 1: CAFM Software

In the current dynamic market, computer aided facility management (CAFM) software is highly important for facility manager in the workplace. Tasked with many responsibilities, facility manager require complete day-to-day functionality by integrating technology, processes, and people. With the help of CAFM software, facility manager can better execute daily operational responsibilities from monitoring and managing customer service requests to preventative maintenance and operational facility services.



3.2 Technology Trend 2: Building Information Modelling (BIM)

Although not a new technology, Building Information Modelling -Asset Management (BIM-AM) is a tool used by contractors and architects to develop and scale virtual models of building projects. Giving building owners and operators a complete visual model of the facility prior to construction, it provides valuable insights into project delivery timelines and budgets.

When integrated with existing work order programs or facility maintenance software, BIM delivers on improved floor plans, asset information and financial estimates. As the technology continues to evolve, the importance of BIM in facilities management will continue to grow.



3.3 Technology Trend 3: Internet of Things (IoT)

The Internet of Things (IoT) refers to the network of internet accessible devices utilised by organisations. Relying on tools such as sensors, thermostats and actuators to evaluate data and reduce the unexpected occasion of the system. IoT systems effectively improve the reliability of the system and provide insightful data to improve efficiency within all facilities.

With various sensors generating data, facilities management organisations are able to identify issues and potential problems faster and easier.



3.4 Technology Trend 4: Drones

Drones are unmanned aerial vehicles (UAVs) that have the ability to improve efficiency in facilities management. Some of these opportunities include safety in inspections, and the automation of delivery services. Still in its infancy, there is no disputing that sending a drone equipped with a high-resolution camera is a quicker and safer way to evaluate a building's exterior than sending a member of the team.



3.5 Technology Trend 5: Artificial Intelligence (AI)

Artificial intelligence (AI) is the broader concept of machines being able to carry out tasks in a smart manner. AI also refers to machines imitating and bettering human performance. More adaptive than traditional systems, AI holds an array of capabilities for enhanced performance in the facilities management industry.

A part of AI, machine learning is a current application that provides machines access to data and allows them to draw insights on their own. With machine learning, facilities management organisations can better predict how much time an asset, such as a building, has before its performance degrades or fails. From online chatbots in customer service to finding patterns in historical data through the use of algorithms, AI will expand and benefit all departments within a facilities management organisation.



3.6 Technology Initiatives

Based on the above technology trends, the technology initiatives in respect of the 15 key attributes are summarised below for reference

O&M Aspect	Initiatives	Reference
O&M Input on Design for New Building	a) Simulate best practice O&M activities using BIM or other simulation software to understand operability and maintainability before construction.	<ul style="list-style-type: none"> • BIM for Facility Managers issued by International Facility Management Association (IFMA) • Building Information Modelling – Asset Management (BIM-AM) Standards and Guidelines issued by EMSD • Housing Authority BIM Standards and Guidelines
Asset Information (Documentation)	<p>a) Adopt computerised asset information model such as BIM to maintain all asset information under an efficient asset management system;</p> <p>b) Inspect, digitise and upkeep the latest record and logbook for FSI on a regular basis;</p> <p>c) Implement mobile solutions for asset management record retrieval and updating of records, e.g. O&M manual, fault history, etc.;</p> <p>d) Adopt Radio Frequency Identification (RFID) or QR codes for asset management.</p>	<ul style="list-style-type: none"> • BIM for Facility Managers issued by IFMA • BIM-AM Standards and Guidelines issued by EMSD • Construction Industry Council BIM Standards

O&M Aspect	Initiatives	Reference
Operation Procedures	<ul style="list-style-type: none"> a) Adopt cloud-based technology to store information of FSI to be accessed by property management personnel when needed; b) Implement IoT-enabled self-diagnosis function for the healthiness of major FSI; c) Incorporate on-line condition monitoring and mobile technologies on FSI to enhance maintenance and reduce downtime. 	
Emergency Preparedness	Nil	
Preventive Maintenance Procedures/ Standards	<ul style="list-style-type: none"> a) Conduct predictive maintenance based on data analysis of fault history and equipment condition. 	
Corrective Maintenance	Nil	

O&M Aspect	Initiatives	Reference
Maintenance Record Management	<p>a) Adopt computerised monitoring system to maintain detailed maintenance information with capability for prompt alerts, review and further analysis. The system at least contains the following information for weekly updates by designated person(s):</p> <ul style="list-style-type: none"> • Maintenance contractor's organisation chart and contact list • Monthly fault call and emergency repair reports • Daily fault call progress report • Details of corrective maintenance • Equipment breakdown report • Working programme for maintenance, annual inspections and tests, overhaul, drills, safety inspections and any other scheduled works • Preventive maintenance schedule • Details of preventive maintenance completed • Spare parts list • Registers of tools, equipment, materials, spare parts and instruments as well as calibration certificates of instruments • Record of plants and equipment details • Overhaul reports • Record of statutory submission • Any other useful information (e.g. site photos) 	

O&M Aspect	Initiatives	Reference
Spare Parts Management	a) Utilise an automatic inventory control system using Artificial Intelligence (AI) to manage spare parts inventory by prediction of spare parts requirements, and for advance and on-time spare parts procurement.	
Addition, Alteration and Replacement (Planning and Implementation)	a) Adopt advance management tools such as integrated facility management tools to allow a quick search of all equipment information and records, to enhance effectiveness of overall planning.	
Incident Management	a) Consider advance management tools to help optimise system performance, e.g., BIM – asset registers, equipment life-cycle track, system configuration, critical device status, maintenance history, installation visualisation, etc.; b) Adopt IoT technologies to allow quicker and instant reporting and maintenance data collection for future improvement.	
Environmental and Safety Management	a) Adopt recycled components or equipment for the maintenance / repair / replacement works.	
Application of Technologies	a) Adopt application of AI, big data analysis, IoT, etc.; b) Enable knowledge transfer from research to industry to Interface Science / Technology.	

O&M Aspect	Initiatives	Reference
Stakeholder Management	a) Establish a smart system to automatically notify stakeholders on upcoming schedules and progress of all O&M activities, addition, alteration and replacement works.	
Information Management	<ul style="list-style-type: none"> a) Establish an Integrated Building Management System (iBMS); b) Create a centralised database for automatic replacement planning for equipment; c) Establish an online real-time server for storing maintenance related information through mobile devices; d) Provide online access of all information for maintenance party during preventive maintenance works. 	
Structure and Qualification of O&M Team	Nil	

4

Industry Standards and Requirements



4.1 Guidance Notes and Codes of Practice

The readers may refer to the prevailing statutory requirements, websites of the Controlling Authorities and following documents for further information on the relevant specific requirements:-

- Fire Services Ordinance (Cap. 95), Laws of Hong Kong, HKSAR, China,
- Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment (latest edition), Fire Services Department, HKSAR, China,
- Notices, advisory letters and circular letters (latest edition), Fire Services Department, HKSAR, China,
- Code of Practice for Fire Safety in Buildings (latest edition), Buildings Department, HKSAR, China,
- Code of Practice for the Electricity (Wiring) Regulations (latest edition), Electrical & Mechanical Services Department, HKSAR, China,
- A Guidance Note on the Best Practicable Means for Electricity Works (Emergency Generators) (latest edition), Environmental Protection Department, HKSAR, China,
- A Guide to Air Pollution Control (Fuel Restriction) Regulation and its Amendment (latest edition), Environmental Protection Department, HKSAR, China,
- Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines (latest edition), Electrical & Mechanical Services Department, HKSAR, China,
- Construction Design and Management (Health & Safety Design Management) Guidance Notes (latest edition), Development Bureau, HKSAR, China,
- Testing and Commissioning Procedure for Fire Service Installation in Government Buildings (latest edition), Architectural Services Department, HKSAR, China; and
- General Specification for Fire Service Installation in Government Buildings (latest edition), Architectural Services Department, HKSAR, China.



4.2 International Standards

Fire service installations and equipment (FSI) shall be inspected, tested and maintained in accordance with the Code of Practice for Inspection, Testing and Maintenance of Installations and Equipment. FSI which is not included in the Code shall be inspected, tested and maintained in accordance with the manufacturer's recommendation or other acceptable international standards as agreed by the Director of Fire Services.

Listed hereunder are some examples of International standards mentioned in the Code of Practice for Inspection, Testing and Maintenance of Installation and Equipment (2012 revision) :-

- BS 5266-1 Emergency lighting. Part 1: Code of practice for the emergency lighting of premises
- BS 5306-3 Fire extinguishing installations and equipment on premises. Part 3: Commissioning and maintenance of portable fire extinguishers - Code of practice
- BS 5839-1 Fire detection and fire alarm systems for buildings. Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises
- BS 5588 Fire precautions in the design, construction and use of buildings
- BS EN 12845 Fixed firefighting systems — Automatic sprinkler systems — Design, installation and maintenance
- NFPA 72 National Fire Alarm and Signaling Code