Technical Services in Facility Management

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TECHNICAL SERVICES IN FACILITY MANAGEMENT

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ABOUT THE AUTHORS

Varinder Taprial is an Electrical Engineer, graduated from the Naval College of Engineering. He served in the Indian Navy for 22 years wherein he gained vast experience in operations and maintenance management including related functions like procurement, finance, budgeting etc. it was during this time that he started dabbling in writing and ran his own blog covering a variety of topics. The writing bug had bitten him and in 2009 towards the end of his time with the Navy, he published a fiction book, "Enemy in the Ranks." He then went on to share his knowledge and understanding of the Internet by publishing a book on Search Engine Optimization and another one on blogging.

After seeking voluntary discharge from the Navy, Varinder spent the next couple of years working first with a construction company and then a wind energy company. During this time, the opportunity for writing for Bookboon came knocking and the result was three books published in the period 2011–12, all related to Internet and Social Media.

Varinder then joined the Facilities Management vertical with an MNC which is one of the largest IPCs in the world. This seemed like a natural progression for him since just like a ship which is self-sustaining a building or a campus also needs to have the capability of sustaining by itself and provide a healthy, safe and secure environment to the occupants. During his association with the Facilities Management function, having handled large accounts and being the Engineering head for India, Varinder has picked up tremendous experience and developed expertise in all aspects of the function.

Priya Kanwar graduated as a dentist from Goa University in 1991, and then worked as a Research Fellow for 2 years at the Post Graduate Institute of Medical Education & Research (PGIMER), Chandigarh; followed by 6 months as a Junior Resident.

After her marriage to Varinder, who was in a transferrable job, she could not pursue her dentistry full time but kept herself occupied with jobs like a teacher in a primary school, as a sales executive for Citi bank Credit Cards, and also in a Family Clinic in different places across the country, gaining varied experience in multiple fields. During this time, she also pursued a writing course through Writing Bureau, London. From then on, her life turned to the path of a writing career.

By 2006, Google had already established itself as the best search engine and the early social media sites were evolving. Taking advantage of the opportunity, Priya started contributing content to the various user generated content sites as well as started her own blog, Reading

Café. By signing up with the Google Adsense program, she started generating revenue from her contributions.

Having gained tremendous experience on the various platforms in the five active years of contributing content to various platforms online, she then decided to move on to sharing her knowledge and co-authored two books, namely "Beginner's Guide to Blogging & Making Money Online" & "Search Engine Optimization – Handbook of Easy Tips Tools & Techniques" in the print format published by Pustak Mahal.

Subsequently, she co-authored three more e-books, published by Bookboon in 2012, with her husband Varinder Taprial, namely:

1. Google Beyond Google
2. Business Blogs – The Best Social Media Tool for Businesses (Now 2nd Edition)
3. Understanding Social Media (Now 2nd Edition)

Soon after the book on social media was published by Bookboon, they received an invitation from the Information & Broadcasting Ministry of India to contribute an article on Social Media for their quarterly magazine "Yojana." Her article "Social Media – a Double-edged Sword" was selected & published in the May 2013 edition.

Over the last year and few months, she was involved in the creation of an e-learning course in Facilities Management and created/finalized the content required for the same.

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1 INTRODUCTION TO FACILITY MANAGEMENT

Almost daily we need to visit some establishment or the other for our needs. It could be an educational facility, a shopping mall, hospital, office or factory for work, bank, government office, or any other facility for that matter. Have you ever wondered who maintains these establishments; to ensure that they are run as intended, to ensure that all services are available to support the core business that the establishment undertakes, that all people working there or visitors thereupon are provided with a healthy, safe and secure environment and all essential services like water, electricity, air-conditioning etc. are available?

No? Welcome to the world of Facilities Management!

While the term ***Facilities Management (FM)*** was formally recognized as a separate function within a business and then as an industry only a few decades back, the function by itself has been existent for thousands of years and most likely started when the first civilization emerged.

An organization or a business needs **space** to house their staff and equipment for undertaking its core function/business. The space thus acquired or leased becomes **an asset** or a strategic resource of the business and it is imperative that the same is taken care of to enhance the life of the assets i.e. the building itself and the equipment. It also stands to reason that the asset or the strategic resource is utilized to its fullest potential and therefore there is a need to ensure that all the support infrastructure is operated and maintained efficiently/effectively and is always available for continuity of the business.

In addition to the management of assets, it is also incumbent upon the business to ensure that the employees are provided with the **essential services** that they need for performing their duties as well as **a healthy, safe and secure** work environment. This helps the organization in **attracting and retaining employees** while also **enhancing their productivity**. In today's competitive world, the efficiencies provided by the FM function and **reductions of costs** thereupon, indeed results in **higher profitability** of the business.

While the FM function is still evolving, it has come a long way from just being an **infrastructure maintenance activity** to a function that owns the processes/documentation for health and safety, compliance, risk management, emergency response, business continuity, vendor management, employee services etc.

In addition to the speculation on the origins of the FM function, there is also a widespread difference of opinion in what the function comprises of. Notwithstanding, it is a fact that most businesses across the world have recognized the need for ***Facilities Management*** and its importance to their respective businesses. This is validated by the fact that the **global market** for Facilities Management is growing at a rate of approximately **15% YOY** and will cross a **trillion US dollars** by 2025.

Encouraging statistics indeed for students as well as professionals to consider FM as a career option. This book provides an introduction to FM and an overview of the technical services and how to manage them.

1.1 WHAT IS FACILITY MANAGEMENT?

Let's have some plain speak first. Oxford Dictionary defines a **Facility** as, "*A place, amenity, or piece of equipment provided for a particular purpose*" and **Management** as, "*The process of dealing with or controlling things or people*." Merging the two together, we can define **Facility Management (FM)** as *the process of dealing with or controlling things, equipment, amenities and people in a place provided for a particular purpose.*

The keyword in the definition above is **controlling**. Any facility, be it infrastructure related or a service, needs to be controlled, to ensure that it serves its purpose without running amok. Facilities have been handled or managed almost forever. Visualize the first time when man found a cave and wondered how useful it would be. But very soon, he realized the necessity to keep it clean, arranging items therein, managing defects like leaks, keeping it secure and safe from wild animals and vagaries of nature, moving when it was no longer conducive to living and having a backup plan in case something was to go wrong. The man, in essence was managing the facility, or controlling the environment that he had created for himself. Then came the civilizations and cities cropping up in Mesopotamia, Indus valley etc. They were all managing the infrastructure they created.

As time passed by, things got a tad complicated. While necessity mothered the inventions and discoveries, the very inventions or discoveries needed to be controlled and managed. This brought in the era of professionals or help being hired to manage the facilities or part thereof, which indeed eventually led to creation of a separate vertical of FM as a function, within the organization. It is obvious that as the evolution/growth took place, the **scope of work** towards managing the facilities also kept changing.

The number of facilities or the **portfolio** of the organizations grew along with the success of the business and it soon became evident to the organizations that they were spending

too much time and resources in managing the facilities and that the overheads were hitting the bottom-line quite hard. The outsourcing cliché kicked in; "*Focus on your core business and leave the rest to professionals*," which gave rise to FM as a business.

FM, as a concept, is not a new development and is not restricted to being only business centric. In broader terms, **running your home** is also a basic form of facility management. You take care of the rent, utilities, ensure the white goods are properly connected, clean and maintain everything or have it done by someone else. However, when it comes to business, it gets more complex depending upon the size of the facility, nature of business, etc.

Now that we have a vague idea of what Facility Management is, let us go back to the definition. Just like the ambiguity about the history of FM and its scope, the definition of FM also is equally confounding and multiple definitions will be found if you look for it. And there is a good reason behind it; the scope of the FM is so varied and large that it cannot be comprehensively captured in a few words.

Wikipedia notes "*Facility management (or facilities management or FM) is an interdisciplinary field devoted to the coordination of space, infrastructure, people and organization, often associated with the administration of office blocks, arenas, schools, sporting complexes, convention centers, shopping complexes, hospitals, hotels, etc.*" The etc. came in handy there; as brought out in the oxford definition above, a facility could be anything – **place, amenity, or equipment**!

IFMA, the International Facilities Management Association, defines FM as, *"a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating* ***people, place, process and technology****."*

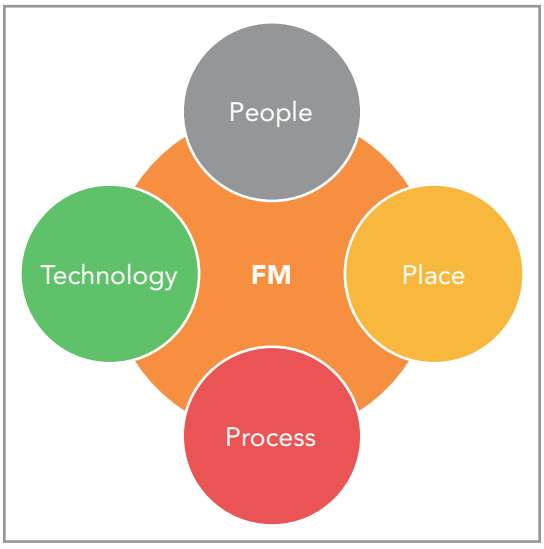

Figure 1.1: Integrated Facilities Management

The European Committee for Standardization (CEN) defines FM as *"the integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities."*

Thankfully, now the **International Organization for Standardization** has come out with a globally accepted standard on facilities management and defines FM as *"an organizational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business."*

1.2 SCOPE OF FACILITIES MANAGEMENT

In order to understand the **scope of FM**, let us first explore what a typical workplace in present times is and what it offers to its occupants. For the purpose of simplicity, let us consider a single commercial building occupied by a single entity or business (e.g. Figure: 1.2).

Figure 1.2: Modern Commercial Building

Firstly, we should note that the construction of building and utilization thereafter requires **approvals, consents** from the government/municipal bodies as per the extant regulations applicable to the location/town/city. These include but are not restricted to environmental clearances, approvals from forest department, traffic authorities, airport authorities, municipal body, electrical authorities, fire authorities, etc. Most of these approvals would be conditional and the building can be erected and used subject to the continued compliance with the conditions laid down, which also includes the term of the approval post which a renewal

may be required. Some consents/approvals may also require returns/reports to be filed with the concerned authorities. These need to be kept track of.

The shell of the building, also called as ***Building Fabric*** comprises of the structural elements, external walls, roof, slabs, shafts for services, doors, windows, cladding etc. The building fabric is what separates the external environment from the internal. It is very important to ensure the integrity of the building fabric because this is what protects the indoor environment from wind, rain, snow, dust, pests, noise and also provides security and privacy to the occupants and the business itself.

The building is further provided with **infrastructure** to serve the business/occupants. This includes water connection/supply, drainage arrangements, electrical supply and its distribution to the floors, mechanical systems like central cooling and heating systems, gas supply, network connectivity, fixed fire and life safety systems like hydrants and sprinklers, elevators, etc. Along with the building fabric, these systems comprise of what is known as ***Base Building***. It should be understood that the tenant's (i.e. occupying entity) internal infrastructure will invariably tie in to the base building services.

Once the base building systems are ready, the internal areas of the building are **fitted out** as per the tenant/occupant requirement, which comprise of work spaces, meeting rooms, reception areas, wash rooms, cafeteria, break-out areas, equipment rooms etc. This may include raised floorings, false ceilings, partitions, doors, wallpaper, carpets etc.

The distribution of the water supply & drainage is catered for, the supply water is treated for consumption and the sewage or waste water is also treated before discharge. The electrical distribution systems are laid out and it is also integrated with a power back up source like a **Diesel Generator (DG)** in case the utility power becomes unavailable. An **Uninterruptible Power Supply (UPS)** may additionally be required if there is **Critical Environment (CE)** like **Data Center** or a **laboratory** where no interruptions in electric supply are acceptable.

The environment inside a facility is **conditioned** to maintain the temperature and humidity for optimal human comfort. The emergency equipment like emergency lighting, water leak detection, fire detection and extinguishing systems etc. are also installed. The entire infrastructure that are installed within the premises has to be **operated and maintained** regularly.

In addition, the occupants expect the entire facility to be clean and hygienic, devoid of pests along with proper waste management & disposal.

Security is a prime concern not only for the occupants but also to the business to prevent intrusions by unauthorized personnel, which could include physical security, access control,

CCTV etc. Apart from these, the employees are also provided with other services, which may include transport, cafeteria, reprographics, mail management, medical facilities etc.

Other aspects like budgeting, training, health & safety, emergency response, procurement, vendor management, inventory management, risk management, business continuity, disaster recovery etc. are also essential functions of managing any facility.

As can be seen, there are various aspects, tasks & processes to be taken care of under the FM function. For the sake of understanding it better, we can classify all the services under four heads.

1. **Technical Services or Hard Services** – Comprise of operations and maintenance of all technical (Civil, Mechanical & Electrical) infrastructure including the building fabric, utilities, electrical systems, Heating, Ventilation and Air Conditioning (HVAC) Systems, plumbing, back-up equipment, emergency systems, fire safety systems, security systems and also minor projects for refurbishment, replacements and upgrades.
2. **Non-Technical or Soft Services** – Comprise of janitorial/housekeeping services, waste management, pest control, landscaping/horticulture, parking management/ valet services, events management, security.
3. **Employee Services** – Comprise of transport services, concierge, Food & Beverage (Cafeterias/Pantries), mail room services, medical facilities, reprographics, reception, FM helpdesk, etc.
4. **Other Services** – Comprise of Lease Management, Space Management, Moves & Churns, Archiving, Project Management, etc.

Having gone through the potential scope under FM, one can now understand the use of the words ***interdisciplinary*** and ***multiple disciplines*** in the definitions of Facility Management in vogue. It is this diverse scope which has made Facility Management to be recognized as an **independent function** within businesses and also as a business by itself.

The actual **scope and the delivery methodology** may vary from company to company depending on their core business and also the type of facility. However, while the specifics may vary in different facilities, the **main objective** of facility management remains unchanged, that is, to ensure that the facility runs as designed and to **facilitate the business and its employees** to perform unhindered towards the business objectives.

In the succeeding chapters, we will look into the technical aspects of FM or **"Technical Services in Facilities Management"** to understand how a modern-day facility is operated & maintained, the built-in redundancies to mitigate risks and the best practices to ensure maximum uptime of the facility.

1.3 INTERNATIONAL STANDARDS ON FACILITIES MANAGEMENT

The **International Organization for Standardization (ISO)** has published four comprehensive International standards for Facilities Management in 2017, (the last one being issued in April 2018) i.e.

1. **ISO 41011:2017, Facility Management – Vocabulary**: This document describes the terms used in FM standards.
2. **ISO 41012:2017 Facility Management – Guidance on strategic sourcing and the development of agreements:** It highlights the following:
    a. Essential elements in FM sourcing processes;
    b. FM roles and responsibilities in sourcing processes;
    c. Development processes and structures of typical agreement models.
3. **ISO 41013:2017 Facility Management – Scope, Key Concepts and Benefits:** This standard outlines the scope, key concepts and benefits of FM and provides a context for the use and application of the terms defined in ISO 41011.

4. **ISO 41001:2018 Facility Management – Management Systems – Requirements with guidance for use:** This standard specifies the requirements for a FM system when an organization:
    a. Needs to demonstrate effective and efficient delivery of FM that supports the objectives of the demand organization;
    b. Aims to consistently meet the needs of interested parties and applicable requirements;
    c. Aims to be sustainable in a globally-competitive environment.

In addition to the ISO 41000 series as described above, which is specific to FM, the following standards are also relevant:

1. **ISO 55001:2014** Asset Management – Management System Requirements
   A framework for an asset management system that will help the business to pro-actively manage the lifecycle of assets, from acquisition to decommission. This system helps to manage the risks and costs associated with owning assets, in a structured, efficient manner that supports continual improvement and on-going value creation.

2. **ISO 14001:2015** Environmental Management Systems
   ISO 14001 is the international standard that specifies requirements for an effective environmental management system (EMS). It provides a framework that an organization can follow, rather than establishing environmental performance requirements.

3. **OHSAS 18001:2007**
   Occupational Health and Safety Assessment Series, (officially BS OHSAS 18001) is an internationally applied British Standard for occupational health and safety management systems. It exists to help all kinds of organizations put in place demonstrably sound occupational health and safety performance. It is a widely recognized and popular OHS management system.

4. **ISO 50001:2011** Energy Management Systems – Requirements with Guidance for Use
   The standard specifies the requirements for establishing, implementing, maintaining and improving an energy management system, whose purpose is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy security, energy use and consumption. The standard aims to help organizations continually reduce their energy use, and therefore their energy costs and their greenhouse gas emissions.

For guidance on standards, best practices and codes on a need basis documentation from following organizations may be referred to:-

- ASHRAE – American Society for Heating, Refrigerating and Air-Conditioning Engineers
- CIBSE – Chartered Institution of Building Services Engineers
- BSRIA – Building Services Research and Information Association
- NFPA – National Fire Protection Association
- IEEE – Institute of Electrical and Electronics Engineers
- Building Codes in your country

2 TECHNICAL SERVICES IN FACILITY MANAGEMENT

Before we delve into the specifics of management, it is important to understand the typical technical infrastructure and equipment fit in a building and how they tie in with the base building systems. The equipment fit in most facilities will be dictated by **the nature of business** being conducted in the space. However, most of the buildings will have certain provisions which are common to all.

While the production equipment and any special equipment will be taken care of by the business itself, the **utility equipment** is normally taken care of by the facility function. For example, the medical equipment in a hospital will be operated and maintained by the respective department, however the power supply to the equipment will be ensured by the FM department. Similarly, in a Data Centre, while the servers and switches will be looked after by the IT department, the power supply to the racks is attended to by the facilities function.

2.1 TYPICAL INFRASTRUCTURE & EQUIPMENT WITHIN A FACILITY

As described earlier, the technical infrastructure or equipment in a building comprises of the structure itself, interior works and various electrical and mechanical equipment or plants for its daily business operations. These would include the following:

2.1.1 GENERAL

In addition to the RCC structure, there is a façade or cladding in the building, doors and windows of various types to permit entry/exit, utility shafts containing cabling, pipework etc., lobbies on each floor, fire exit staircases and external paintwork.

In the interior of the building we will have the work spaces containing work stations, partitions, raised flooring and false ceilings for covering any services running thereon and then there will be wood work, wallpaper/paint/fabric, carpets, etc. All these need to be maintained and minor repairs/patch work may be required on a regular basis.

2.1.2 ELECTRICAL POWER DISTRIBUTION & LIGHTING

The complete **Electrical Power Distribution** System from the transformers, generators and UPS/Batteries to the electrical panels and switchboards that help to distribute the electricity throughout the building, right up to the consumer/equipment comes under the ambit of **Electrical Services**.

Most facilities will opt for a dual source from the utility company to ensure that business is not interrupted if one source fails. The two sources will feed into a **Ring Main Unit** and will be set up to ensure automatic changeover if one fails. The utility companies normally supply power at a higher voltage to reduce transmission losses and the same needs to be brought down to usable levels with the help of a **Transformer**. The output of the transformer is fed into a **LT (Low Tension) Panel** through **circuit breakers**. From the LT Panels the supply is taken to the floor level **panel/closets** and then on to **distribution boards** across the floor from where the end user equipment is supplied through dedicated **Miniature Circuit Breakers**.

The importance of availability of power supply in a facility cannot be undermined considering that almost everything in a facility requires electric power to function. Therefore, it is essential that some redundancy be built in, to facilitate continuation of operations in spite of mains failure. The back-up **generators** provide this alternate source of power and can operate for long periods of time as also take on the full load of the facility. However, the only drawback is that generators take time to start, stabilize and take over the load and there is an interruption in the supply to the facility which may range from a few seconds to a minute. The interruption may not be acceptable for some critical equipment like servers, which take a long time to reboot and also for standalone computers which may lose critical data due to the interruption or maybe result in a failed transaction. This is where **UPS (Uninterruptible Power Supplies)** comes in.

Safety concerns also mandate that **emergency lighting** comes on as soon as there is an interruption in mains supply. Again, to facilitate this, UPS can be used or standalone **inverters** with battery backup can be installed.

2.1.3 HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

These are systems that provide the **air circulation** throughout the building, helping to **maintain or improve** the **indoor air quality (IAQ),** provide **sufficient ventilation** and **adequate heating/cooling** or **chilling (refrigeration) systems** as required within the facility. This could include the central air conditioning systems along with its associated components

like cooling towers, chilled water pipe network with valves, AHUs (Air Handling Units), VAV (Variable Air Volume) systems, package units, split ACs, VRV (Variable Refrigerant Volume) systems or Precision Air conditioners. There may be exhaust fans, Treated Fresh Air Units, Air Scrubbers, etc. to ventilate the area or to provide clean fresh air**.**

The HVAC system is a very important system in a modern-day facility and for the facility manager considering that it consumes a large part of the utility electric supply **(typically 35–40%)** and bad odor, hot/cold calls (request/complaints) form about 50% of the total calls received at the facility help desk.

Most of the facility is usually cooled by a central air-conditioning plant. However, there may be specific areas like data centers and labs which require very high degree of control on **temperature and humidity** and for such areas Precision Air Conditioners are deployed.

For areas where it is not practical to supply cooling through Central Air Conditioners or when there is a need to cater for back up in case of central plant failure, Ductable package ACs or commercial ACs may be deployed. There is a growing acceptance of installation of VRV systems for larger areas due to enhanced control and efficiencies.

Similarly, **central heating systems** are used in facilities in cooler climes the heat being provided by a **Boiler** or a **furnace**.

2.1.4 MECHANICAL SYSTEMS

The **water supply** and **drainage systems** of the building are managed by a network of **pipes, valves** and **plumbing fixtures** installed within the building and associated **pumps** for the water pumping systems. Typically, there would be a **domestic water system, a flushing water system** and systems for fire-fighting purpose (**Fire Hydrant and Sprinkler systems**).

Then there would be **drainage systems** for taking out the used water out of the building. If the quality of water available is not good, **water treatment plants** may be installed in the facility. Similarly, some locations/states may mandate treatment of sewage (waste water) for internal re-use or before being sent out to the city drainage system. For this purpose, **Sewage Treatment Plants (STP)** may be installed. Some facilities may also have a separate piping network for **rain water harvesting**.

2.1.5 FIRE & SAFETY SYSTEMS

Fire and Safety Systems comprise of the fire detection, fire alarms and firefighting equipment that is necessarily installed in each and every building as required by the state regulatory bodies. This would include the **Fire Hydrant system, Fire Sprinkler system, Fire Alarm system, Gaseous Fire Suppression systems, Portable Fire Extinguishers** etc.

Different varieties of early detection system like **video detection systems, water leak detection systems** and **aspirating systems** etc. may also be installed in critical areas. In addition, other sensors/detection systems may be installed for alerting high levels of **Carbon Dioxide, Carbon Mono-oxide and Hydrogen** in battery rooms.

2.1.6 LIFTING SYSTEMS

Elevators and Escalators are installed in all high-rise buildings to provide convenience to the occupants for accessing higher floors. It is very important for the elevators and escalators to have sufficient safety and control systems built in to prevent accidents and also to provide safe egress in case of failures. Usually, multiple elevators are installed to cater for the high load of occupants moving in and out of the facility and they are synchronized for optimizing energy use and reduce wait times.

2.1.7 OTHER SYSTEMS

Apart from the above systems, there may be several other systems installed in the facility and will form an inherent part of the technical services. These include the Building Management Systems (BMS), Automatic Lighting Management Systems, Access Control Systems (Security Systems), Public Address Systems, Closed Circuit Television system, Staircase Pressurization Systems, electrically operated/gates, metering, control/measuring devices etc.

All these systems play a unique and important role in the daily operations of the building and the business. Therefore, one can easily see that a breakdown or downtime in any one component of any of the systems can drastically impact the business and/or its functions. Thus, the regular maintenance and operations of all the above systems are **critical** to any business and simply **cannot be ignored or neglected** in any manner.

Please note that while we have listed the **typical equipment** installed in a facility, there are various types of systems with different configurations that can be used in a facility.

2.2 SCOPE OF TECHNICAL SERVICES

The **scope of technical services** in a typical facility may include the following:

1. Ensure that all equipment is always working at optimal efficiencies without impacting the building operation or the business continuity for the occupant businesses.
2. Operation of the equipment, Inspection of equipment and plant rooms, Logging of equipment parameters and defect history, Resolution of customer complaints/ requests, and Tracking energy consumption.
3. Maintenance (preventive as well as corrective) Program, Coordination with vendors/ authorities, Tracking Annual Maintenance Contracts and ensure services as agreed, performance management of vendors/Service Providers.
4. Maintaining records/documentation, analysis of data available to improve efficiencies.
5. Submission of returns/reports, meet all the local and national statutory requirements, maintaining spares/consumables, and Inventory Management.
6. Managing incidents (failures/defects in equipment), Emergency Response. Business Continuity Plans
7. Maintaining Environmental, Health and Safety standards and managing risk during operations and maintenance.
8. Quality Assurance and Self-Audit programs.
9. Cost controls and programs to drive continuous improvements and introduce leading practices and industry benchmarks.
10. Regular Training of Staff.

Let us take a closer look at the major aspects of management of **Technical Services** in the succeeding chapters.

3 OPERATIONS OF TECHNICAL EQUIPMENT

The primary reason for developing a facility and installing any equipment therein is to **support the business objectives** and serve some **specific function**. It is therefore required that all components function/operate the way they were intended to. For this reason, there needs to be absolute clarity on how the operations are going to be managed.

3.1 OPERATIONS STRATEGY

For a facility to function efficiently and effectively, a comprehensive plan should be in place. The overall strategy for operations will depend on the **type of the facility**, **its size** and **the nature of activities** being undertaken. However, some basic aspects need to be considered while developing the plan.

There should be a clear understanding of the core activities of the business and how it gets impacted under various conditions of operational inadequacies; like failure of equipment, utilities etc. This helps in focusing the effort in the right places. The **resources** required for managing the operations should be worked out, i.e.:

- The manpower required;
- Their numbers by trade, skill/experience level.
- The organizational structure of the team with clear roles and responsibilities of each team member.
- The service levels desired by the business.
- And arrangements for supply of consumables like diesel/gas, toiletries, stationery, tools, tackles and test equipment etc.

The sourcing of the team i.e. **on-rolls or outsourced** needs to be decided. There are multiple models of FM in practice, starting from just outsourcing only the task level staff i.e. janitors, technicians etc. to outsourcing the complete function to a FM service provider or a mix of both. Most businesses will however retain some critical aspects like strategy, technology to be used, budget approvals, space management, internal CRM and communications etc.

The integration of technology has vastly improved the efficiency and effectiveness of the operations and maintenance functions of FM. Starting with the **Computerized Maintenance Management Systems (CMMS)**, technology is now being used for **asset tracking, mobile**

apps for inspection, online helpdesk, visitor management systems (VMS), inventory management etc. Implementation of technology not only enhances efficiencies but also helps in faster data retrieval, analytics, and reporting.

3.2 ESSENTIALS OF OPERATIONS

All equipment is designed and manufactured to **operate** in a certain manner under certain conditions. **Operating the equipment** outside of the prescribed conditions/parameters will make the equipment prone to defects and reduce the reliability of the equipment. It is therefore important for staff **to know the equipment** fit in the facility, their configuration and the performance regimes of the equipment. It is also very important to **know and understand the business** needs with respect to what service/equipment is most critical to the business and how a failure or non-availability of equipment may impact the business.

It is imperative that the equipment is **handled in a safe and effective manner**; starting/stopping procedures are meticulously followed; and is **constantly monitored during the operation** of the equipment; to ensure that it is not malfunctioning; and if any external conditions exist that may not be conducive to the operations.

Hence, it is important for the **Facility Managers** and their **technical staff (operators)** to understand and incorporate following in their operations program:

3.2.1 EMPLOYEE INDUCTIONS

An induction is a training/awareness and orientation process to make a person acquainted with the facility and its working. It is a good practice as well as a necessity from a safety perspective that all new employees on a site, including the ones belonging to vendor partners/contractors, should be taken through an induction process. The induction should cover general aspects of working on the site and the safety tenets to be observed as well as site specific aspects including **emergency numbers, house rules, work hours, hazards and emergency response or safety procedures like evacuation**.

Equipment fit, their scheduling, changeover criteria for multiple redundant units, building layout, scope of work, landlord equipment need to be explained to the new employees. Contractor details for all current contractors with details of work undertaken should also be covered for technical staff. If multiple shifts are being run, the shift handing over process needs to be included in the site-specific induction process.

3.2.2 COMMUNICATIONS

Timely communication of information, notification of any **adverse event** to concerned stakeholders is a very important aspect of **managing impact** of such events on the business or the occupants. Towards this, **emergency numbers** including those of the business leaders, facility staff, vendor partners **and emergency services** like police, fire station, ambulance, hospitals etc. should be maintained and made easily accessible to all staff.

In addition, **escalation matrices** for different levels of seniority in the organization and that of the vendor partners should be maintained to preclude any delay in actions and decision making.

The emergency numbers and the escalation matrices should be tested every six months for ensuring the numbers are current. This will take care of any staff changes, office moves etc in the respective organizations.

3.2.3 STANDARD OPERATING PROCEDURES (SOPS)

SOPs are a set of **step-by-step instructions** compiled together to help workers carry out important/complex but routine tasks to ensure efficiencies, quality and consistency of performance, leading to a healthy and safe environment and reduced errors. A well written, site/equipment/activity specific SOP will ensure that all equipment is operated in the manner prescribed, irrespective of who is performing the operation and also ensures that all records/ documentation as required, is updated.

Standard Operating Procedures (SOPs) are required to be developed in accordance with the operating manuals of the **Original Equipment Manufacturers (OEMs)** and in line with the business requirement. All the concerned staff should be trained on these procedures and the procedures should also be made available in hard copy near the equipment for easy reference. For specialist equipment an approved list of personnel authorized to operate the equipment may also be included.

The SOPs should **define the equipment fit and configuration**, and the current status of the components. For example, if the level sensor/indicator of a fuel tank is not working, the fuel refilling SOP should indicate that. The risks associated with the specified process, their impact, and the methods to mitigate the same should be highlighted. The work window for that specific procedure should be clearly indicated. The personal protective equipment (PPE) and tools, test equipment required for safely and correctly undertaking the operations should also be indicated in the document. The SOP should also have any documents like **checklists, log sheets, safety data sheets** etc. attached for easy reference. Requirement of work permits, Lockout-Tagout, fire watch or any other such administrative control is to be listed in the SOP.

The SOPs should not only contain **starting and stopping procedures** but also cater for any additional procedures depending on equipment configuration, like changeover, load transfer etc. For example, for a set of Diesel Generators (DG), the starting procedure, taking DG on/off load and stopping procedures should be there, and in addition, the SOP should also contain procedure for paralleling of Generators and transfer of load from one Generator to the other Generator.

3.2.4 REGULAR ROUNDS IN PLANT ROOMS

It is important to ensure that the **equipment rooms are kept neat and clean** at all times, scrap/unused items and inflammable material is not stocked in the plant rooms and that **no unsafe condition exists** in the room. Regular and frequent rounds by the facilities staff

can help in achieving this objective. Rounds can also ensure that any signs of deterioration/ failure or an abnormal condition is identified; this could be through sensory perception i.e. **visual, smell, hearing, touch or heat** or through the parameters being displayed.

It is recommended that multiple levels of inspections be scheduled in all areas and all staff right from the technicians to the facility manager are involved in undertaking inspections. The frequency of inspections by senior staff may be lesser than, let us say, that by a technician, but the quality of the inspection can be deemed to be definitely higher. The **Facility Managers** should undertake thorough **inspections** of the **critical areas** as also **monitor the load conditions** on various **critical infrastructure**.

Traditionally, a **checklist** is placed at the plant room or equipment room for assisting the technician to undertake a thorough check during the rounds. However, this process is cumbersome and all observations needed to be manually entered into a spreadsheet or some other system to manage the tracking of status, issue of work orders and closure of the observation. This system has some drawbacks, namely:

- Personnel missing inspections completely, or ignoring some inspection points, overlooking defects, or pointing out issues already reported
- Illegible information, wrongly identified equipment/room and input errors
- Corrective actions getting delayed or missed out totally

Mobile based applications are increasingly being used now to carry out inspections. Each equipment/room is identified by a **barcode or QR code.** The inspection schedule is fed into the app and the app notifies the concerned inspector of the inspection due. On scanning the identification code of the equipment/room, the app opens up the checklist for that particular equipment/room. The inspector can then check and tick all the elements inspected on the app itself and also note down his observations along with photographs, if relevant. The app is integrated with the **CMMS (Computerized Maintenance Management System)** or **work order management system** and the work orders can be triggered from the app itself depending on the assigned priority.

This technology intervention not only takes care of the issues associated with manual inspection reports but also **speeds up the entire inspection process** towards resolution of problems. It also makes the process paperless and all records are archived for retrieval/ analysis at a later date.

3.2.5 MONITORING AND LOGGING OF PARAMETERS

In a facility, all equipment is designed to operate under certain conditions and **inputs/ outputs** under those conditions are specified by the manufacturer. Most of the equipment will also have instruments/gauges to display their operating conditions at any instant. These could include **currents drawn, voltages, pressures, temperatures** etc. During the rounds of the equipment rooms these **parameters** need to be monitored and any deviation from the normal signifies an abnormal condition that must be investigated to prevent failure of the equipment and any other associated service.

It is a good practice **to ensure logging** of these parameters in a **log sheet** for indicating the health of the equipment at the time of recording. While **monitoring of parameters** serves the purpose of identifying any abnormality before a failure occurs, the recording of the parameters **helps in analyzing** the operating conditions **prior to and at the time of failure**. This is very important towards the **Root Cause Analysis (RCA)** of the failure to put in corrective/preventive actions in place with a view to prevent re-occurrence of failures.

It should be noted that some equipment like UPS, Diesel Generators etc. may have inbuilt recording of logs and in such cases monitoring alone will suffice. However, it is still recommended that **critical parameters** are recorded to obviate the eventuality of inaccessibility of the inbuilt logs.

Like the mobile app for inspection, similar **mobile apps** are also available for logging of the parameters. However, with the **evolution of Internet of Things (IoT)** and **Big Data Analytics**, there is a gradual move towards monitoring and capturing **equipment performance data** online with inbuilt triggers for alarms/alerts. This also helps in predictive maintenance of equipment.

3.2.6 EMERGENCY OPERATING PROCEDURES (EOPS)

While **Emergency Response (ER)** and Emergency planning are vast subjects, we will limit ourselves here to handling technical emergencies i.e. those related to the technical infrastructure. While the EOPs may link to invocation of Emergency response/plan, the EOPs are totally different **set of documents** designed to **guide the staff** to take **appropriate actions** under certain emergent situations.

An emergency in the context of facilities can be defined as "*an event that may cause significant impact to critical load affecting business, health and safety of occupants, equipment and environment.*" These could be due to **equipment failure** leading to loss of resilience,

failure of automatic operations, failure of utilities, **human error or inclement weather**. Some examples include total loss of power to the facility, battery acid or diesel spill, loss of cooling to critical rooms, storm, heavy rains, loss of water to the facility etc.

For such times, depending on the **type of failure** or the circumstances, **emergency action** will need to be taken to ensure safety, business continuity or preventing catastrophic failure of equipment. **Emergency Operating Procedures** are developed for all such emergencies to guide the staff to take pre-determined steps specific to the nature of emergency to **mitigate or minimize the consequence** of the event. There is a need to carry out **risk assessment or hazard analysis** and all possible scenarios should be considered to identify potential emergencies.

While developing the EOPs, it should be remembered that the EOP will be used under taxing and stressful conditions and hence it should be **very specific, concise** with absolutely NO room for confusion. **Action verbs** should be capitalized to ensure clarity. For a complex situation, separate steps should be identified for each situation/symptom to direct the worker directly to the appropriate step rather than having to go through the entire list. For instance, *if power supply failure is partial, GO TO Step 5.*

Once developed, the **operators (technical staff)** need to be aware of the **purpose of the EOPs** and be **trained** on the same. EOPs should also be **easily accessible** since timely action is of paramount importance in such situations. As mentioned earlier, an emergency may demand invocation of **ER** and hence **escalations/notifications** should be made part of the EOP i.e. under **what circumstances** the worker should escalate the incident to the appropriate authority for decision on invoking ER/plan.

It is equally essential that **all technical staff** deployed on site are aware of the **building systems in detail** and always be thorough in **checking all equipment** for normal operations after an event and where feasible the same needs to be incorporated in the EOPs. The following cases will explain the need better:

- In a facility, many equipment may be **integrated with each other**, for e.g. the **Air Handling Units (AHUs)** may be set up to stop in the event of **a fire alarm**. Therefore, in such a case, the fire alarm may be the primary event, but the AHU would also have stopped and will need to be reset after the alarm has been investigated and found to be false.
- Similarly, some equipment may need to be **manually started** after a power failure event. In such cases, on restoration of power, either through the **Electrical Switch Board** or the DGs, the equipment will have to be manually switched on.

- Another e.g. the UPS does not come back online after having shifted the load to battery. In this case, without intervention of the facility staff, the load will continue to be on batteries thus draining them and eventually resulting in interruption of load.

3.2.7 REPORTS & RETURNS

Reports are a means of **tracking performance** and keeping an eye on **the metrics** that may help in continuous improvements. They are also a means for the senior management to be apprised of major activities/events as also a tool for them to judge the **performance of the facility function**.

Transparent reporting on all aspects of the services are the hallmark of a mature organization. The reporting requirements will vary depending on the **scope of services** and **contractual obligations**. However, it should be ensured that all reports are made as per agreed format and frequencies. In addition to the periodical reporting there may be requirement of ad-hoc reports and the same should also be provided.

Returns are filing of **statutory reports** to the **governmental bodies** and will depend on the local laws/regulations and may include items like environmental statements, waste disposal reports etc.

3.2.8 INVENTORY MANAGEMENT

Inventory Management is an important component of service delivery for FM. Operations and maintenance of equipment require some **spares/components** or **consumables** to be kept on site for ready use. This may range from some critical components of equipment, non-availability of which may cause prolonged downtime or for items which have a long lead time for supply. Similarly, some consumables like lamps, bulbs, CFLs, diesel, oils etc. are consumed regularly and hence there is a need to maintain adequate **stock** of these items at all times.

The **process of maintaining** the spares/consumables is called **inventory management** and the same can be undertaken manually or some software tool can be used. The fundamental process remains the same irrespective of the method used. Good inventory management will ensure that all consumables and critical spare parts are available when needed without **overstocking** of any item which leads to spiraling costs. An effective inventory management system will also facilitate reduction in wastage, pilferage, down-time of equipment, customer dissatisfaction, an increase in efficiencies and freeing up of storage space.

After identification of items to be stored on-site, allowance (authorized quantities) of each item should be defined based on the consumption patterns and criticality of the item. **Lead time** of supply, costs, and obsolescence of the items should be considered while deciding the **Minimum Stock Level** and **Re-Order Levels** for each item.

Regular **audits of stores** should be undertaken by the **Facility Managers** to ensure the guidelines are being followed and the processes related to **receipt/issue** of items are also in place.

Necessary record keeping for receipt, issue, disposal etc. also should be maintained.

3.2.9 RISK MANAGEMENT

Managing risk is perhaps the most important aspect of undertaking operations. Every day is a new learning opportunity in respect of the equipment and its condition. **Deviations** from **normal operating regimes**, failures, symptoms tell us about the impending **risk to the business**. Therefore, throughout the operations period, the **inspections and analysis** of the operating regimes should be continued to specifically manage the risks associated with equipment failure. It shall be ensured that all equipment operates as per the **designed parameters** and in accordance with the **manufacturer's recommendations**.

Inspections and walkabouts are a good source of **identification of hazards** which can then be analyzed to assess the **level of risk** to the business or health & safety of personnel. So are the records like equipment history, log books etc. In addition, certain tests, assessments can be conducted which can help in highlighting condition of the plant/equipment and throw up **potential risks** as well as the need to undertake **corrective action**.

Some countries/states may require contractors/personnel being deployed to **possess licenses** for undertaking the work as a **statutory obligation**. This also includes the workmen compensation policy under which the workmen are covered. The validity of all such licenses need to be tracked and ensured.

Similarly, **approvals/consents** from governmental bodies need to be tracked for validity and renewed before they expire to avoid regulatory issues.

3.2.10 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal Protective Equipment (PPE) means any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses.

Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly. Even where engineering controls and safe systems of work have been applied, some hazards might remain. These include injuries to:

- The lungs, e.g. from breathing in contaminated air
- The head and feet, e.g. from falling materials
- The eyes, e.g. from flying particles or splashes of dangerous liquids
- The skin, e.g. from contact with corrosive/toxic materials
- The body, e.g. from extremes of heat or cold

Figure 3.1: Personal Protective Equipment (PPE)

PPE is needed in these cases **to reduce the risk**. However, it is to be remembered that PPE is to be used only as a **last resort** after all other feasible measures in **Hierarchy of Controls** have been considered/implemented. PPE should be inspected for condition every six months and defective or damaged PPE is to be put out of use and replaced immediately

3.2.11 FIRST AID KITS

First Aid Kits should be made available in **all work places**. The quantity and location of the first aid kits will depend upon the **size and layout of the facility**, however, it should be kept in mind that the same should **be accessible** in a quick manner. There should be **appropriate signage** available at location to indicate presence of a first aid kit.

Figure 3.2: First Aid Kit

Facility Managers should ensure that the contents of the first aid box are always serviceable, complete and within the expiry date of the products. Any item which has expired should be immediately replaced with a new one. Prescription medicines are not to be stored in the first aid box. All employees should be made aware of the location of the first aid box and **how to use** the contents of the same through **suitable trainings**.

At times, specialist equipment like **Automatic External Defibrillator (AED)** may be available on site. Only **authorized personnel** may operate these after being nominated for operation of the same and being suitably trained.

3.2.12 PERFORMANCE MANAGEMENT

In order to determine whether the facilities function is meeting the **set goals and objectives** and to drive **continuous improvement**, **performance analysis** needs to be undertaken at regular intervals. A well-defined performance management system can throw up deficiencies in workplace environment, processes, skill levels of staff and areas for improvement.

The **Key Performance Indicators (KPIs)** should be established for the function in line with the **Service Levels** desired. It goes without saying that KPIs should be measurable and should be reflective of performance of the function. A desired **score or value** also should be specified to know what success looks like. These can include expense against budget,

number of incidents, compliance with the schedules, helpdesk calls, response and resolution times, occupant satisfaction survey results, number of innovations, energy savings etc.

The results of the measured metrics **should be analyzed** to bring a positive change to the organizational function. It should be noted that the reporting on metrics has to be transparent and accurate for the performance management system to be effective.

A **Balanced Scorecard** approach with weight assigned to each evaluation criteria may be used to judge overall performance.

If contractors are being used for operations or maintenance their performance also needs to be managed against agreed Service Levels and KPIs. These performance reviews could be monthly or quarterly depending on the criticality of the work being undertaken. The review meetings could also be used for resolution of extant issues.

4 MAINTENANCE OF TECHNICAL EQUIPMENT

The building structure, interiors and the equipment, all need to be looked after to ensure their longevity and operational reliability. The **maintenance program** may vary depending on the maintenance strategy but will include some component of **preventive maintenance or predictive (condition based) maintenance** and in some cases the strategy may be run to fail.

4.1 MAINTENANCE STRATEGY

The maintenance strategy should be developed basis the equipment fit and is aimed at **reducing the failures** while **reducing** the **cost of maintenance** at the same time. Maintenance plans are to be developed and will typically include a mix of **preventive, predictive** and **corrective maintenance** activities as appropriate to performance requirements, service levels and performance indicators. It may be part of the strategy to run some equipment to failure without any maintenance activity. The plan should be supported by comprehensive planning, scheduling and work control procedures and routines as appropriate.

It is common to have **Annual Maintenance Contracts (AMC)** with specialist vendors or the **Original Equipment Manufacturers (OEMs)**. Typically, all the critical equipment like UPS, Chillers, Precision Air Conditioners etc. are contracted under a comprehensive AMC to ensure faster resolution times and proper maintenance. Non-critical equipment or those which may have sufficient redundancy built in to the facility may be contracted under a non-comprehensive AMC. Then there are **other systems** which are maintained by the in-house staff and will typically involve **first level of maintenance** on distribution systems, plumbing, carpentry etc.

A **CMMS** may be deployed for the maintenance program which caters for all the manual work being done electronically. The CMMS will facilitate storage of all asset data, the annual maintenance planner, maintenance checklists/procedures, management of work orders, equipment history, service reports, etc. A CMMS also facilitates easy archiving and retrieval of data, accurate reporting etc. In order to understand the processes better we will discuss the manual way of doing things. Suffice to say that the CMMS can take over almost all the functions of **Maintenance Management**.

The **core objectives** of the maintenance strategy should be as follows:

- Ensuring all plants, equipment and machinery are available for use at all times.
- To minimize interruption in business activities due to failure of equipment.
- Ensure health and safety.
- Reduce total cost of ownership of assets by maintaining efficiencies of plant and equipment and prolonging their useful service life.
- Increase user/occupant satisfaction.

4.2 PLANNED PREVENTIVE MAINTENANCE (PPM)

Planned Preventive Maintenance (PPM) or **scheduled maintenance** forms the backbone of any maintenance strategy. While we can incorporate condition based predictive maintenance and breakdown maintenance in the maintenance program, for critical equipment, PPM is considered essential. The overriding factor for having a planned preventive maintenance program is to **reduce the total cost** of ownership while keeping the equipment **operationally available** for the business activities. Typically, savings of between **12 – 18%** can be achieved over reactive maintenance.

The key to good preventive maintenance program is inspection. Preventive Maintenance involves **periodic inspection of equipment/machinery** to uncover conditions that could lead to **impact on business** and harmful depreciation of equipment itself. Upkeep of plant machinery should be undertaken to correct such conditions while they are still in the nascent stage. Regular cleaning, greasing and oiling of moving parts, taking care of loose connections, replacement of worn out parts before they fail to operate and periodic overhauling of the entire machine/equipment will result in **longevity of operations**. Machines or equipment which are **critical to business** will normally have back-ups, but that should not mean that maintenance needs can be curtailed, it is still imperative that the preventive maintenance be undertaken on all units.

A well-conceived PPM should **clearly identify or define** the equipment on which PM has to be undertaken, who will do the PM, what will be done as part of PM, when to do the PM and the frequency of PM. It should put in place the processes for administrative controls like work permits, spares management etc. and the records to be maintained as part of PPM.

Some important elements of maintenance management are touched upon below.

4.2.1 ASSET REGISTER

The **Asset Register** forms the basis of all **asset management** and PPM. An asset register is essentially a **record** of all the **fixed assets** of the business. Some organizations restrict the assets listed in asset register to only the major or critical equipment. However, it may be noted that details of all equipment, critical and otherwise, will help the facilities team to **identify/track** and **manage all the assets**.

From a maintenance perspective, the asset register tells us what all fixed assets are available and where they are located. We certainly cannot maintain what we do not know exists, can we? Typically, the asset register should include the equipment name, a unique identifier, the make and model of the equipment, location, specifications, criticality rating and warranty/ AMC details.

The site/facility teams should ensure that all equipment is recorded in the asset register as per the format promulgated and that as much information as is available is provided. For this purpose, all equipment needs to be identified by a unique identification number. The identifier can be promulgated as convenient or as per company policy or as defined in the CMMS. For ease of convenience and for ensuring everything is covered, while making the asset list, the assets can be grouped as per table below

Abbreviation	Service	Guideline
EL	Electrical	All electrical
MV	Mechanical	All mechanical equipment
AC	Air Conditioning	All air con related equipment
FP	Fire Protection	All fire protection and loss prevention equipment like WLDs
PB	Plumbing	All plumbing/domestic water
BL	Building	All general building items
FN	Furniture	All furniture items
SC	Security	All security equiment including access control and CCTV

Figure 4.1: Sample Asset Grouping for Asset Register

For all major equipment like UPS, PACs, Chillers, ACs, VESDAs, WLDs, Pumps etc each item should be listed separately and not clubbed together as one-line item indicating the

quantity. For example, if there are four chillers – each should be listed as a separate line item rather than in a single line item indicating the quantity as (4).

Only in certain cases where the quantity is very large like in the case of smoke detectors, speakers, VAV boxes a single entry indicating quantities may be used. For convenience and ease of tracking, these items may also be segregated as per floors/zones in the premises. Sub-components of the main equipment need not be given a separate identifier. For example, in case of electrical distribution items restrict the assets to the level of main switchboard/ electrical panel and distribution board. Individual MCCBs/indicators/gauges/meters etc need not have separate identifiers but can be indicated as components. Similarly, the outdoor units of ACs need not be mentioned separately. A **Parent-Child concept** may be used to simplify the grouping and recording of large, complex systems.

Development of the asset register is largely a onetime activity followed by only periodic review and additions/deletions. Therefore, **utmost diligence** should be displayed while collating the asset register. **Updating the asset register** is recommended to be done **as soon as there is a change**. However, to ensure that inadvertent errors are avoided, a **review and update** of the asset register may be planned **every six months.**

If CMMS software is being used for asset management by the client, there is no need to develop a physical record/register; however, it is to be ensured that all asset information is updated in the database.

4.2.2 52-WEEK PLANNER

The **52-week maintenance planner** is an annual schedule of all **recurring maintenance activities** or processes. This includes inspection, preventive maintenance (weekly, monthly, quarterly etc) and overhauls. The 52-week planner should be maintained on all facilities to **plan, monitor and record** the PM activities which are required to be undertaken at site as per a schedule. Development of the plan is a onetime activity **for the year** and will ensure that all the requisite routines on each equipment are captured in the plan and also none of the important compliance related activities for the year are missed out. If a CMMS is being used, the scheduling needs to be updated on the CMMS.

All the site equipment, where maintenance is to be undertaken by either the in-house team or a vendor, is to be included in the schedule. If there are **multiple equipment** they have to be clearly identified e.g. in case of multiple **Chillers** they need to be identified **Chiller 1, Chiller 2** and so on. Usually the Asset Register can be used as a base for making this document. The name of the vendor undertaking maintenance is also to be indicated

for quick reference. If maintenance is to be taken up in-house the same can be indicated instead. Where maintenance of **large number** of equipment is to be planned and monitored they can be **bunched up in smaller groups**. For example, a quarterly cleaning of 300 smoke detectors can be split into four groups of 100 each and indicated as smoke detectors **Gp1, Gp2 and Gp3**. The division can be **zone wise or floor wise**.

The maintenance plan is to indicate **when and what type** of maintenance needs to be conducted on the equipment i.e. **weekly/monthly/bi-monthly** etc. The **frequency of the schedule** can be indicated by indicators like **W for weekly**, **F for Fortnightly**, **M for Monthly**, **2M for Bi-Monthly**, **Q for Quarterly**, **H for Half-Yearly** and **Y for Yearly**. Based on the frequency of the task, the schedule will be repeated at regular intervals, against the selected equipment. For example, a quarterly routine on equipment will figure four times in the planner. The schedule should be developed in consultation with the vendor, where involved.

Wherever a **higher-level schedule** falls in the same period as a lower level schedule, the higher-level schedule can be indicated and it is to be ensured that the lower level schedule is also undertaken along with the higher-level schedule. For example, if a quarterly schedule is **going to overlap** with a monthly schedule in one month of the quarter. It does not make sense to carry out the two routines on separate days and hence both the routines can be scheduled together. In this case, the 52-week planner should reflect the higher-level schedule, i.e. quarterly and the monthly schedule activities should be made a part of the quarterly routine.

Completion of an activity can be indicated as **a tick mark** or a **cross in the box**. If an activity is rescheduled, the existing box indicating the schedule is to be retained in its original form till such time it is completed. In case the equipment is under repairs or out of service the same is to be indicated in the status till such time it is put back in service. After it is back in service all the missed maintenance will have deemed to be undertaken and the completion of routines can be indicated.

4.2.3 MAINTENANCE CHECKLISTS

Just like an inspections checklist, the **maintenance checklist** defines the various maintenance tasks to be undertaken during the scheduled PM. These are usually based on guidelines provided by the equipment manufacturer and/or best practices. The purpose of having an **itemised checklist** is to ensure that all required tasks are carried out and nothing is inadvertently missed out.

Maintenance checklists should **define each task** to be undertaken on the system as a whole, its sub-systems and components if so required. The **frequency** of the activity should also be indicated. If there any **documents** which need to be referred to for the process, the same should also be **indicated in the checklist**. **Tasks** in a maintenance checklist should further be **grouped** as per frequency for ease of reference i.e. **weekly checklist, monthly checklist** etc

It can be seen that a higher frequency schedule will invariably overlap with a lower frequency schedule. For example, a weekly schedule will overlap with the monthly schedule in at least one week of the month. Therefore, it is always good to include the **higher frequency schedule tasks** in the **lower frequency schedule tasks** so that they are not missed out.

If the maintenance is outsourced, the contractor will have his own checklist to undertake the maintenance and the same can be used to monitor the activities.

4.2.4 DOCUMENTS AND DRAWING MANAGEMENT

All systems/equipment are delivered along with their respective **Operations and Maintenance (O&M)** manuals. The O&M manuals assist the users in learning how to operate the equipment, the do's and don'ts and basic maintenance needs that can be carried out in-house by the operators. Usually a basic **troubleshooting guide** is also contained in the manuals. The manuals serve as a good starting point for the new employees in understanding more about the equipment and also assist the old staff in handling the maintenance.

The manuals will usually have the **drawings of the main system** and the **system components**, which are equally important with respect to the identification of components, their dimensions and interconnectivity. **Drawings** help us to understand the systems better and are also useful **during repairs/replacement** or relocation. For bigger systems the drawings may not be part of the manuals and may be given separately.

There are other **documents and drawings** related to building construction and fit-outs which are handed over by the Projects team to the Operations team like the **GFC (Good for Construction)** drawing, **As Built Drawings, Single Line Diagrams (SLDs)**, **spare parts, attic stock** etc. These are equally important and are required to be properly stored and accounted for.

It is imperative that O&M manuals and drawings are **preserved and a record kept** as to **their whereabouts**. At a minimum the O&M manuals and drawings are to be available for **Electrical, Mechanical, BMS, Security and Fire Systems.**

A register (physical or soft version) may be created for all the manuals and drawings available at site. The format should, at a minimum, cater for the main equipment, the storage location (cupboard/rack etc) and identification number which should also be posted on the relevant document. The **identification number** for drawings should be the same as the drawing number. Here, it is to be ensured that the **latest revision** of the drawing is identified. Older versions can be stored if required but with clear indication that it has been superseded by a new drawing.

In addition to the above, an **issue register** needs to be maintained, to be used whenever any drawing/manual is issued to any of the company/service provider/contractor staff. The issue register should indicate the identification number of the manual/drawing, person issued to, date issued, borrower's signature and date received back.

4.2.5 WORK ORDERS

A **work order** is an **authorization of maintenance**, **repair or operations work** to be completed. Work orders can be manually generated through a **work request** submitted by a staff member, client or contractor, or automatically generated through a **work order management software** or a CMMS.

All jobs whether they are part of the PM or reactive maintenance need to be authorised through a work order. **No work should be allowed to be undertaken without a work order having been issued**. The work order should specifically indicate the nature of work to be undertaken, by whom and when the work will be undertaken and any other instructions like specific checklists, procedures to be followed.

After completion of the work the work order needs to be **closed and archived**. Work orders can provide information on various maintenance works undertaken, time consumed for completing the task as also material used. This information is **critical in assessing the life cycle cost of the equipment/asset**.

4.2.6 WORK PERMIT SYSTEM

The **objectives** of the **Work Permit System** are to **exercise control** over the maintenance, repair and construction activities by assigning responsibilities, ensuring clear cut communication between interested functions & safety considerations to the job, its hazards & the precautions required to be observed. It ensures that the work is properly defined, authorised, operating personnel are aware what is going on, precautions to be taken are specified and the persons executing the job understand the **nature and extent of hazards** involved.

Work Permit System is an important element of **safety management system** and implementation of this in true spirit can help in ensuring a safe working environment, thereby **reducing possibility of injury** to personnel, damage to equipment, avoid fire, explosion & any adverse effect on environment.

A work permit needs to be issued by the designated personnel in the relevant format for all works being undertaken on site, and at a minimum for the following:

1. Major and minor maintenance work.
2. Isolation and energisation of electric equipment/facilities.
3. Any hot work (Welding, cutting etc.).
4. Entry into confined space.
5. Excavation.
6. Work at height.
7. Handling of materials using mechanized means in operating areas.
8. Erection and dismantling of scaffolds.

The work permit format can be **devised and promulgated** as required to achieve a standard format across the facility or the portfolio. Following points may be noted:

1. Work permit should be issued for each maintenance activity. The work should be clearly indicated.
2. Work permit is to be issued only by authorised personnel and relevant WMS (Work Method Statement) or the job plan is to be attached with the work permit.
3. The details of staff employed for the work needs to be indicated.
4. List of PPE to be used is to be indicated.
5. Validity of permit is to be indicated. Normally the work permit should not be issued for works extending beyond the shift time.
6. After completion of work, inspection of work is to be undertaken and Work Permit closed.
7. Record of Work Permits is to be maintained.

4.2.7 WORK METHOD STATEMENT (WMS)

The facilities function performs or oversees the performance of all **maintenance and repair** activities on the sites. Some of these activities are **high risk activities** with the potential to cause disruption of business, equipment damage and injury to staff. In order to ensure that the activities are conducted safely, the process of developing and implementing **Work**

Method Statements (WMS) should be instituted and the same is recommended to be implemented on all sites/facilities.

A **Safe Work Method Statement (SWMS)** is a document that contains specific **step-by-step instructions** on how **to safely** perform a work. The document outlines the **exact manner** in how to do the work, the **hazards** that may arise while undertaking the work and the **measures** to be put in place to **control the risks**.

Both simple and complex activities can be broken down into a series of basic steps that will allow for full analysis of each part of the activity for hazards. The description of the process should not be so broad that it leaves out activities with the potential to cause incidents and prevents proper identification of the hazards, nor is it necessary to go into very fine detail of the tasks.

SWMS should be prepared for **all high risk works** whether they are being undertaken by in-house staff, vendor staff or OEMs.

For activities that are being conducted on a regular basis, a standard SWMS may be prepared and approved for use. However, the SWMS will need to be reviewed each time before the activity is carried out to ensure the efficacy of the SWMS. All standard pre-approved SWMS' should be reviewed at a frequency **not greater** than **six months** and revised as required. If revised, all the old copies are to be removed from the facility and replaced by the new ones.

A **Work Method Statement** must include:

1. Date and location of work.
2. Names of the supervisor and all other staff involved in the activity.
3. A step-by-step description of the work activities.
4. Timeframe required to complete the work(s).
5. Risks identified and the control measures required to be implemented along with person responsible.
6. Details of hazardous or dangerous goods/consumables to be used along with their MSDS.
7. Details of Personal Protective Equipment, tools and equipment to be used and their inspection.
8. Details of training to be given, if any, including the site induction, safety training and task related training.
9. Switching Plan.
10. Back out Plan; in case the maintenance cannot proceed further for some reason, how will it be handled?

4.2.8 SERVICE REPORTS

A **Service Report** is a form or a report format used for **documenting the maintenance or repair action** undertaken on the equipment. The service report comprises of details of maintenance or repair carried out on the equipment i.e. date and time of maintenance, work order details, what kind of maintenance; planned or breakdown and the exact nature of tasks undertaken, spares utilised, the condition of equipment after completion of repairs and any other observations or recommendations regarding the equipment.

It is signed off by the person who has undertaken the maintenance. It is best practice to generate reports as per agreed format and content. However, certain vendors, specifically the OEMs, may have their own formats for the service report and as long as the basic requirement is being met, it should be fine to allow them to use their own formats.

The service reports need to be reviewed by the Facilities team and any observations or recommendations should be discussed internally to create a follow-up action. It should be ensured that all components of the service report are filled up in a legible handwriting and if any testing is done post maintenance, the parameters also should be recorded.

4.2.9 EQUIPMENT HISTORY CARD

The **Equipment History Card** is a document on which all the information about the maintenance/repairs done on the equipment is recorded. The record should include **equipment details** like model, make, specifications and location etc. and the inspections, repairs, servicing, breakdowns, and the cause should be indicated. Record of spares used/ parts replaced should also be indicated along with the cost of repair.

History card is to **be maintained** for each equipment. When the equipment is relocated, or transferred to another site, the equipment history card should also accompany the equipment. Decision regarding equipment replacement or standardization becomes easier if complete history is available including the total cost of ownership, maintenance cost, downtime cost and availability.

Periodic analysis of this document can help in identification of **frequently repeating faults** or **frequently failing components** and the need for review of maintenance quality/ procedures or operations regimes.

4.3 PREDICTIVE MAINTENANCE

Predictive Maintenance (PdM) comprises of techniques to understand the **condition of the equipment** with a view to predict when maintenance should be performed. The condition of the equipment may be determined by one-off testing or continuous monitoring. Online monitoring is gaining prominence now with the availability of new technologies. Efforts should be made to deploy condition monitoring of the equipment as appropriate basis the costs and service levels required with the objective of **increasing reliability** and **decreasing maintenance costs**. Depending on the site infrastructure and condition following may be considered:

1. Vibration analysis;
2. Oil/fuel sample analysis;
3. Ultrasonic testing;
4. Infrared thermography;
5. Power quality testing;
6. Motor Current Analysis.

With the advent of **Internet of Things (IoT)**, it has now become much easier to **install sensors** and measure/record equipment parameters. **Data analytics** can help in analyzing the

performance and deviations from specified values can easily be noted. All this is expected to give a huge impetus to predictive maintenance becoming more prevalent in the maintenance strategies of the businesses in the coming days.

4.4 CORRECTIVE MAINTENANCE

There may be times when changes to the assets are required to restore the equipment to its original working condition with a view to enhance reliability and efficiencies. The need for **corrective maintenance** may arise due to design issues, implementation flaws, technology changes or plain wear & tear. Instead of continuing to live with the issues it is always good to consider all options and implement a corrective action.

Note that the corrective maintenance alludes to work on equipment that has **not broken down** but a fault or degradation has been observed which needs to be corrected for the equipment to start operating in its original state. Examples of corrective maintenance include replacement of vibration dampers for machinery, rewiring of equipment, calibration/ replacement of gauges/meters etc.

4.5 REACTIVE MAINTENANCE

Despite all the maintenance activities undertaken, failures are bound to happen and **Reactive Maintenance** refers to **breakdown repairs** i.e. repairs **after a failure has occurred** rendering the equipment non-operational and not available for use. All repair works after failure of an asset need to be undertaken in an expeditious manner to ensure that the downtime of the equipment is as low as possible. Towards this, contingency plans need to be implemented for all assets. Having spare equipment/critical components stored on-site greatly boosts the turnaround times. It should be ensured that critical spares as recommended by the manufacturers are either stocked on-site or an arrangement be made with the AMC vendor to stock the spares off-site. Response and resolution times for the vendors should be included in the **Service Level Agreements (SLA)** and be made a part of the **Key Performance indicators (KPIs)** for the vendors.

4.6 ANNUAL SHUTDOWNS

Annual Shutdowns are required for maintaining equipment that **cannot be maintained**, **taken offline** due to **business constraints**. It is an activity which is **time-bound**, usually undertaken over **one or two days** and is the only opportunity for maintaining some **critical assets** like transformer, UPS, certain single distribution paths etc. It is therefore essential that the shutdowns are **planned and executed** with utmost care and **within the timelines**.

Business approval is a must for this activity and coordination with multiple in-house and contractor teams is required to ensure safe and timely execution. A maintenance script describing the exact sequence of activities with timings along with the roles and responsibilities of all individuals/vendors is recommended to be developed.

It should also be understood that this is the only opportunity for the facilities team when all building equipment, components and distribution paths are available for testing and hence advantage should be taken to carry out all tests including **Pull the Plug Test** (total loss of power) during this period after the maintenance work is completed.

5 INCIDENT MANAGEMENT

In terms of FM, any unusual and unplanned event that has negative connotation to a business can be classified as **an Incident**. It can be equipment failure, injury, illness, environmental release, natural disaster, civic disturbance, security threat, fire, etc. In this chapter, we will look at incidents pertaining to failure of technical equipment or services only.

An Incident can be defined as, *"Any unplanned act or event which has disrupted, or has the potential to disrupt, operations is categorized as an incident."*

It should be the endeavor of Facilities Managers to ensure that the properties under their charge and the infrastructure/services therein are always up and available to the business or their clients and they should put rigorous processes/procedures in place to ensure that. However, despite all the planning and preventive measures in place there are instances when **unforeseen circumstances** may strike causing disruption in business.

Facilities Managers should put in place a robust **Incident Management Process** which ensures minimal downtime due to any incident and the fastest possible recovery. The broad components of an Incident Management Process are as follows:

1. Incident Identification
2. Classification
3. Escalation/Notification
4. Incident Report
5. Root Cause Analysis (RCA)
6. CAPA (Corrective and Preventive Action Plan)
7. Lessons Learnt

5.1 INCIDENT CLASSIFICATION

Incidents can be **classified based** on their **severity levels** i.e. impact on business. Each incident needs to be assigned a **severity level** depending on **the extent of impact** that it causes or has the **potential** to cause.

The severity of the incidents may be classified as **Low, Medium and High** or any other terminology as deemed fit as long as the level of impact is understood by the stakeholders. For ease of understanding and standardization in reporting following indicative guidelines may be used for classification of incident by severity levels.

- **Low** – A near miss, minor damage to infrastructure, non-essential equipment failure, utility failure (DGs available), false alarms, localized impact events not impacting core business activities.
- **Medium** – Medium scale damage, loss of services/utilities to part of building, impaired fire systems and security systems, poor indoor quality, essential equipment failure leading to loss in resiliency.
- **Major** – Large scale damage to infrastructure, complete loss of services, utilities to the whole building, essential equipment failure including backups, business activities impacted.

5.2 ESCALATIONS/NOTIFICATIONS

Whenever an incident occurs, there is a requirement of contacting various people for information, guidance or decisions. The first information is usually passed over a phone or by messaging. In order to ensure the right people are contacted, it is important to have clearly defined **escalations lists** and **contact details** for effective communications and notifications to the concerned staff. Typically, the escalations lists should be maintained for at least **three levels** in respect of FM Team, the service provider, the vendors and the clients (if applicable). Multiple levels are recommended in case someone is not reachable or to escalate to higher ups if resolutions are not in place as per the agreed timelines.

Escalations lists should be placed at **easily accessible** locations so that there is no delay in notifying the concerned personnel.

Once the escalation lists are in place, the notification groups may be created as per the severity levels of the incident. For example, in case of a minor incident (Low severity) it may not be necessary to inform the senior management at the first instance, however for a major incident (High Severity) it is essential that the senior management is also notified at the earliest.

A designated person, usually the Facilities Manager, should be made responsible for reporting of the incidents as per laid down guidelines. In the absence of the Facilities Manager, the next in line in terms of seniority/designation should automatically assume the responsibility for incident reporting.

5.3 INCIDENT REPORT

Incident report serves the purpose of **notifying details of the incident** to the concerned stakeholders. A format may be promulgated for standardization across the portfolio for the same and can be used for incident reporting purpose. It should include:

- Date and time of the incident.
- Location of the incident.
- Type of service impacted; equipment involved.
- Severity level of the incident.
- Chronological sequence of events.
- Business impact.
- Nature of the incident (description).
- Probable causes of the incident.

5.4 ROOT CAUSE ANALYSIS (RCA)

The eventual aim of the Incident Management is not just to "**put out fires**" but to get to the bottom of the matter. **Root Cause Analysis** is a problem-solving technique aimed at identifying **the root cause of a failure** so that the most effective solutions can be identified and implemented to prevent recurrence.

RCA is primarily a reactive strategy that addresses failure causes after they have happened. Once the root cause has been determined, this information can be used to make changes to processes, procedures, or facility design to prevent future failure events and improve the reliability of the facility.

5-Whys Analysis, Fishbone analysis, Fault Tree analysis are all examples of techniques that can be used towards RCA.

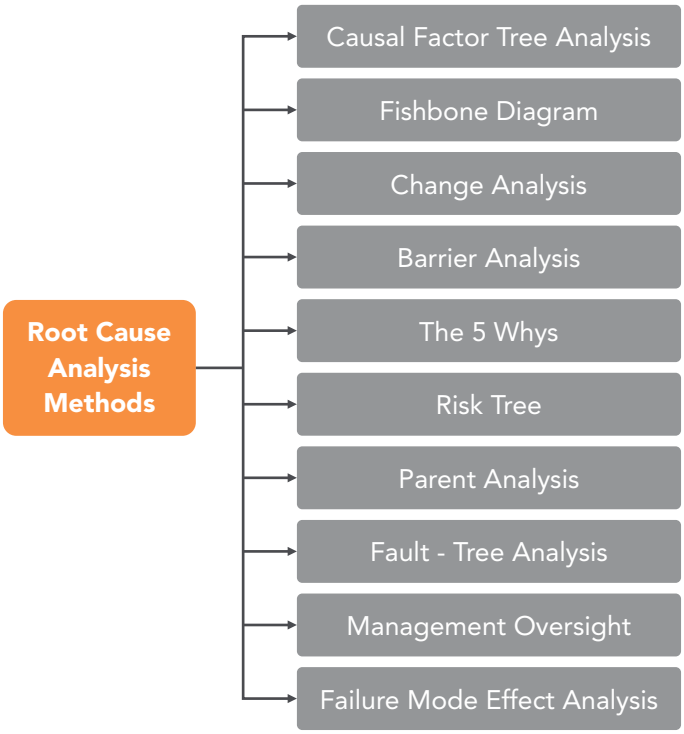

Figure 5.1: Methods for Root Cause Analysis

5.5 CORRECTIVE AND PREVENTIVE ACTION PLAN (CAPA)

The RCA is to invariably lead to formulation and promulgation of a **corrective action** and **preventive action** plan. The corrective action plan will address the **immediate needs** to restore the plant/process/people to effectively support/deliver the intended purpose.

The preventive action plan will address the **larger issues** around the root cause of the incident to ensure that the incident is prevented in future. In all cases, the CAPA have to be specific and prescriptive with responsibilities assigned to specific people by name along with the action completion date.

5.6 LESSONS LEARNT

There are lessons to be learnt each time an incident occurs. In order to bolster our defenses against unforeseen circumstances and to spread awareness amongst the team, a **Lessons Learnt Document** giving details of **what happened, why it happened and what we can do** to prevent the incident from happening again should be issued in respect of all incidents categorized as **medium and high severity**.

6 ENERGY MANAGEMENT

Energy use happens to be one of the largest expense in running a facility. A typical building will have about **30–40%** of the facility operating budget going towards energy costs. To add to this the rate at which energy is bought is also persistently rising forever plus there is a growing concern about the climate change and more and more statutory environmental obligations being promulgated. An increasing number of companies, global as well as local, have become conscious about the energy use and are implementing measures to reduce their energy consumption. While everyone in the organization can contribute towards the energy conservation measures, the onus of driving the change and implementing the measures falls upon the facilities function.

The three main objectives of managing energy are:

1. **Reduce Costs**: Reducing cost is the most compelling reason for saving energy. Most organizations/properties can save up to 20% on their fuel cost by managing their energy use;
2. **Reduce Carbon Emissions**: Reducing energy consumption also reduces carbon emissions and adverse environmental effects. Reducing the organization's carbon footprint helps build a '**green**' image thereby generating better business opportunities;
3. **Reduce Risk**: By reducing the energy demand, businesses can reduce the risk of business impact due to supply shortfalls or increase in prices.

Energy management ensures that energy is being used effectively in a building or business. By using energy-saving technologies, design principles, and maintenance practices many building owners can save over **40 percent** of their **electrical costs**, often with paybacks of **less than three years**. Energy management is the process of monitoring, controlling, and conserving energy in a building or organization. Typically, this involves the following steps:

- Establishing a baseline consumption to be used as benchmark for future performance analysis.
- Monitoring the energy consumption and collection of data.
- Identifying opportunities to save energy and estimating the potential of each opportunity to save. This includes wastage of energy, potential saving by way of replacement of equipment/other infrastructure like insulation, doors, etc.
- Implementation of action plan to target the opportunities to save energy.
- Tracking the progress and results of energy-saving efforts/initiatives.

6.1 GUIDANCE FOR FACILITY TEAMS

All Facility Managers need to ensure that there is an Energy Management plan developed and implemented for all properties under their charge. Following simple measures may be considered towards conserving energy:

1. Review and question all legacy practices in operations i.e. set points, operating hours etc.
2. Monitor and analyze the consumption data. Analysis of **daily, weekly and monthly consumption data** can highlight variations. If the reasons for variation cannot be attributed to something specific, there is a case for a deeper study that can throw up unknown issues. Advanced **smart metering devices** that can capture accurate, real-time data are available now to help in energy monitoring and, in turn, address specific issues.
3. Inspection schedules should be determined and promulgated to identify and arrest energy wastage. To curb energy waste, managers must identify potential areas of waste, including:
    - Unnecessary continuous lighting; removal of excess lighting, turning off lights when not required, review of Janitorial schedules in the night, use of occupancy sensors to curb unnecessary lighting load, promote use of natural light where feasible.
    - All kinds of leakages; water leakage, heat loss due to poor insulation.
    - Equipment left on and consuming energy during non-working hours; enable sleep mode on office equipment like computers, printers, reprographic machines, multi-function devices etc.
    - Equipment inefficiency as a result of poor maintenance, clean HVAC filters regularly as clogged filters force a higher consumption, condenser and evaporator coils of heat pumps, chillers and other air-conditioning systems should be kept clean to maintain good heat exchange which will otherwise lead to higher consumption of energy.
4. Use of energy efficient equipment and material, power factor improvements. Energy star equipment in cafeterias and office spaces can reduce energy consumption significantly.
5. Upgrade aged/obsolete equipment. Use technology and advanced automation tools like electronic ballasts, high efficiency light fittings, Lighting Management System, motion/occupancy sensors, Variable Frequency Drives, heat recovery systems etc. If upgrade is not called for, re-commissioning of equipment can help in bringing equipment to optimal efficiencies.
6. Scheduling/monitoring of equipment through BMS (Building Management System). Change of set points during the nights and low occupancy periods.

7. Process reviews, verifying correct operations of all major equipment.
8. Generate awareness amongst the occupants for their individual contribution. Education is key to the behavioral change and empowering occupants with knowledge and resources will help increase energy savings.

6.2 SAVE WATER – SAVE ENERGY

The use of **water & energy** in buildings are linked to each other. Water treatment & subsequent distribution to consumers requires the use of equipment & pumps. Waste water is also treated before being discharged into the municipal drainage. Electricity or gas is required to heat water used for cooking, washing in dishwashers/washrooms etc. All these consume energy and it should be clear how the use of water is actually contributing towards the electricity bill. Therefore, saving water or reducing consumption of water will not only reduce the water bill but also the energy bills. In order to conserve water, consider following:

1. Leaks are the major contributors to wastage of water. Efforts should be made to identify all leaks in various systems including that in the buried pipes and the same should be repaired/arrested. Repair leaking pipes, fixtures, and seals. Small leaks add up many gallons of water and money wasted each month. Ensure that automatic sensors on faucets, urinals etc. are working properly.
2. For horticulture or landscaping needs, use plants that are native to the local climate. These need less water to flourish. Drip irrigation is more efficient than sprinklers for watering. STP output water can be used for irrigation to reduce the water and energy costs.
3. Star rated devices and appliances consume lesser water and electricity. While energy star rated products are well known, most countries now have rating system for water efficient fixtures and these are available. The same should be considered for deployment to save water. Reducing the pressure in the system can also lead to savings in water consumption.
4. Use waterless urinals and dual flush system in toilets.
5. Have a schedule for running systems on water bodies i.e. fountains, waterfalls etc.
6. In commercial kitchens replace old, inefficient equipment such as pre-rinse spray valves, ice machines, dishwashers, steam cookers, and combination ovens with ENERGY STAR certified models.
7. Rain water harvesting should be considered where feasible.
8. Meter the water consumption for the various users individually including that for the cooling tower, irrigation, domestic/flushing water, cafeterias etc.
9. Conduct employee awareness campaigns to apprise them of the need and means to conserve water.

7 TRAINING

Continuous **training and personal development** is the backbone of any operations. A comprehensive training plan and its execution not only enhances the performance of an employee but also makes him/her ready to take on more responsibilities by way of career progression and skill enhancement.

All facilities managers should have a well-defined functional **training program** being run on their sites. The training program should be based on the needs of the employee and the **requirement of the sites**. The training program planned at the site should comprise of internal training and need for any external training should be communicated by the Facilities Manager to HR or the Learning & Development department for further action.

7.1 TRAINING NEEDS IDENTIFICATION

General Training – There are some trainings which need to be continued on an ongoing basis as refresher training to ensure critical aspects of various functions/infrastructure/property are always fresh in the employee's mind. This includes training on equipment operating procedures, health and safety trainings, tool box talks, environmental awareness, fire safety training and reporting requirements.

Specific Training – Facilities Managers should undertake a continuous performance evaluation of all employees and identify specific training needs of individuals. One-time skill assessments are also handy for identifying the training needs of employees.

Employee Requests – Facilities Managers should encourage personal development of their employees and any requests from employees for training should be duly considered vis-à-vis the nature of duties being carried out and the relevance of the training to the duties.

7.2 TRAINING PLAN

The training plan should necessarily cater for the following:

1. Professional training (Equipment, processes, etc.)
2. Touch Drills for equipment SOPs and EOPs
3. Energy & Sustainability
4. Maintenance of Records and Documentation
5. Reporting Requirements

7.3 TRAINING CALENDAR

A **52-week training calendar** needs to be developed and promulgated at the beginning of the year specifically indicating the topic of training, the **duration, time and date** of training and the employees required to attend the training along with who will deliver the training.

7.4 CROSS-TRAINING AND JOB ROTATION

Cross-training is a method by which employees can gain management experience, even if for short periods of time. For example, when a manager is out of the office, putting an employee "in charge" can help the employee learn skills and abilities needed to perform

that function appropriately. Through the use of job rotation, which involves a systematic movement of employees from job to job within an organization, employees can gain a variety of experiences to prepare them for upward movement in the organization. All Facilities Managers should encourage cross training and job rotation to facilitate holistic development of all employees.

7.5 TRAINING RECORD

A record of training is to be maintained at all facilities. This record should indicate the topic, date and time of training, names of personnel who attended the training and their signature. A feedback mechanism is recommended to be instituted to ensure continuous improvement in the training effort.

7.6 TRAINING TARGETS

Training targets in terms of number of hours of training should be assigned to all employees for the year and if feasible made a part of the goals and objectives towards appraisals.