NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF MANAGEMENT SCIENCES

COURSE CODE: HCM 234

COURSE TITLE: FACILITY MAINTENANCE MANAGEMENT

COURSE GUIDE

HCM 234: FACILITY MAINTENANCE MANAGEMENT

Course Developers

/Writers: Dr. J.C. Okafor

Department of Hospitality Management,

Federal Polytechnic, Ilaro

And

Dr. I.A. Akeredolu

Department of Home economics

Yaba College of technology

Lagos

Course Editor: Dr. Olusegun O. Onabanjo

Olabisi Onabanjo University

Programme Leader: Dr. (Mrs.) A. O. Fagbemi

School of Management Sciences,

National Open University of Nigeria,

Lagos.

Course Coordinator: Mr. S. O. Israel-Cookey

School of Management Sciences,

National Open University of Nigeria,

Lagos.

CONTENTS PAGE

Introduction

Maintenance is the effort in connection with different technical and administrative action to keep a physical asset, or restore it to a condition where it can perform a required function. Maintenance is also seen as restoring to or retain to a state in which an item can perform an initially specified function and all actions aimed towards this are maintenance activities
Maintenance is an investment because resources are spent today to do maintenance in order to reduce cost or get higher benefits in the future as compared to if the resources are not spent. However despite this opinion maintenance is generally separated from true investment because it is a matter of restoring an old function or keeping up an old function.
A decision maker for maintenance should think in terms of how to keep informed, how to take decision, and consideration of the fact that the future is uncertain, therefore no need for future planning.
The concept of maintenance favours minor changes and where it is possible to know in advance the rationale to do. It is also suitable for an industry characterized with more rapid changes on its specific building structure. Hotels need minor renovations because this industry is influenced by technological and societal changes.

Generally, hotels are complex and costly when it comes to maintenance with various uses of spaces that have different schedules and uses for guest rooms, restaurants, health club, swimming pool, retail store and each has a functional engineering system required for its maintenance. Maintenance therefore has to be done throughout the year, requiring competent staff to undertake building services, operation and maintenance, supplemented by outsourced contractors. In the hospitality industry the maintenance of the engineering systems is important despite its complex processes as its effectiveness will directly affect the quality of hotel services, which have direct and significant effect on guests' impression of the hotel. As such, the development of a suitable maintenance strategy is gaining publicity, greater reliance is placed on it to keep high system availability and achieve acceptable environmental conditions for the occupants.
Of the three core consumer products in the hotel: accommodation and food and beverage, accommodation standard significantly affect the customer satisfaction and inclination to return.
Maintenance management also plays a main role in improving energy efficiency and keeping the total costs optimal. The costs of operating and maintaining the engineering systems, in particular the in-house manpower, out-source contractors, energy consumption and equipment deterioration, must be properly monitored and controlled. Among the commonly adopted strategy in the hotel industry is outsourcing, which managers use to squeeze operating costs in a tough business environment. The purpose of such a strategy is to improve productivity, increase revenues; lower operating costs, and reduce risk. It allows hotel to focus efforts on its core competency and strengthen its ability to adapt in the ever-changing business environment.

The trend in Nigeria today is that facilities maintenance and sustenance must be geared up in all the sectors of the economy, hotels inclusive Thus, in order for business to be conducted in any hotel, it is essential for constructed assets to be appropriately managed if the business is to maintain the capital invested, enhance its value and sustain reasonable return.

What you will learn in this Course

During this course, the students will learn about:
Hotel facility maintenance management
Maintenance planning
Hotel maintenance staff
Hotel buildings
Water supply systems
Fuels used in hotels
Fire and fire fighting
Heating, ventilation and air conditioning
Maintenance procedure
Energy conservation
Pollution
Common building defects
Safety and security

Working through this Course

For a successful completion of this course, one is required to go through the study units, reference books, and other resources that are related to each unit.

The Tutor-Marked Assignments (TMA) should be done immediately and submitted to the Course Facilitator.

The medium and time for the submission of the TMA will be specified later. This is a two (2) credit unit course, and so you are expected to spend a minimum of two (2) hours on it weekly. It is expected that you complete the entire course outline in 18 – 25 weeks.

Course Evaluation

As earlier stated, every unit of this course has an assignment section which you are expected to do at the end of the unit. You are required to keep an assignment file. At the end of the course, the evaluation shall be as follows:

Assessment	**Marks**
Assignments	30%
Examination	70%
Total	**100%**

Out of all the assignments you will do, each shall be marked and converted to 3%. At the end, the best ten (10) shall be selected to make up 30%. The examination at the end of the course shall cover all aspects of the course.

Study Units

The study topics to be discussed have been grouped in units and modules as shown below:

Module 1

Unit 1 Facility maintenance management
Unit 2 Maintenance planning
Unit 3 Hotel maintenance staff

Module 2

Unit 1 Hotel buildings
Unit 2 Water supply systems
Unit 3 Fuels used in hotels
Unit 4 Fire and fire fighting
Unit 5 Heating, Ventilation and Air conditioning

Module 3

Unit 1 Maintenance procedure
Unit 2 Energy conservation
Unit 3 Pollution
Unit 4 Common building defects
Unit 5 Safety and security

The units shall be treated in sequential order.

Textbooks and References

G. Allen Burton, Jr., Robert Pitt (2001). *Stormwater Effects Handbook: A Toolbox for Watershed Managers, Scientists, and Engineers*. New York: CRC/Lewis Publishers. ISBN 0-87371-924-7.

Brattebo, B. O., and D. B. Booth. 2003. "Long-Term Stormwater Quantity and Quality Performance of Permeable Pavement Systems." *Water Research.* 37: 4369-4376.

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Goyal, N.C. and Arora, K.C. (1996) A textbook of hotel maintenance. Standard Publishers, Delhi.

Bob Mann and Robert S. Mann (2006) **Defect-Free Buildings**: A Construction Manual for Quality Control and Conflict. New York; McGraw-Hill.

Stuart H. Bartholomew (1998) **Construction Contracting. New Jersey;** Prentice Hall.
Mobley, Keith R. & Higgins, Lindley R. & Wikoff, Darrin J. (2008) Maintenance Engineering Handbook McGraw-Hill Professional, Seventh Edition, 2008,

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Chan, K.T., Lee, R.H.K., & Burnett, J. (2001). "Maintenance performance: a case study of hospitality engineering systems", *Facilities,* 19 (13/14) 494 – 504

Chan, K. T., Lee, R.H.K., Burnett , J.(2003). "Maintenance Practices and Energy Performance of Hotel Buildings", *Strategic Planning for Energy and the Environment*, *23(1)* 6-28.

Garg,A., Deshmukh,S.G. (2006). "Maintenance management: literature review and directions", *Journal of Quality in Maintenance Engineering*, 12 (3) 205 – 238

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Cowan, H.J. (1989) The causes of structural failure. Architectural Science Review 32 (3): 65–66.

Presentation Schedule

Specific dates for particular activities, such as submission of assignments, tutorial schedules and examination dates shall be made available to you at a later date. This will enable you plan your activities in the same line. The method of submitting your assignments and receiving other course materials shall be agreed upon on a later date. You should endeavour not to fall behind the schedule whenever it is given.

Conclusion

By the time you go through all the modules and units, you will be well grounded in facility Maintenance and Management

COURSE DEVELOPMENT

HCM 234

FACILITY MAINTENANCE MANAGEMENT

COURSE MAIN TEXT

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CONTENTS **PAGE**

MODULE 1

Unit 1 Facility maintenance management
Unit 2 Maintenance planning
Unit 3 Hotel maintenance staff

UNIT 1 Facility maintenance management

CONTENT

1.0 Introduction

Facility and equipment assets are a big investment in the hospitality industry, and the establishments need to get the most out of them. In this unit, the basics for setting up a good and effective maintenance system are addressed.

2.0 Objectives

At the end of this unit, you will be able to explain:
Maintenance, its scope and objectives.
Maintenance management and engineering
Functions of the maintenance department.

3.0 Main content

3.1 Hotel maintenance

3.1.1 What is hotel maintenance?

Hotel maintenance is the performance of general, preventative and emergency maintenance for a given hotel facility. It involves a combination of actions carried out to retain an item, equipment, system, plant or machine in order to restore it to an acceptable working condition. Maintenance procedures are performed in guest rooms, lobbies, elevators and restroom areas to ensure all equipment and materials are in proper working order. Hotel buildings face constant and heavy traffic, so it's important to keep everything running smoothly for the guests.

3.1.2 Scope of maintenance

In the hospitality industry, the scope of maintenance covers the following:
The grounds
Site development comprising boundary wall septic tank, storage tak, etc
Buildings
Plants, machinery, equipment and systems.
Water supply and heating systems,
Drainage and waste disposal systems
Gas distribution and fuel supply line system
Ventilation, refrigeration and air conditioning systems
Firefighting equipment
Maintenance equipment and hand tools
Laundry and kitchen equipment
Telephone, television, telex, fax, e-mail, and other telecommunication systems.

3.1.3 Prerequisites if effective maintenance

For effective maintenance practice, the following points are vital:

- Good information for analysis of equipment failure mode.
- Planning to maintenance programme
- Ensuring the availability of spares for equipment
- Keeping track of pending maintenance jobs
- Development of maintenance standards.
- Evaluation and control of maintenance costs.

3.1.4 Objectives of hotel maintenance

The objectives of hotel maintenance are:

- To achieve minimum breakdowns and to keep the plant/machines in good working conditions at the lowest possible cost.
- Machines and other equipment should be kept in such conditions which permits them to be used at their optimum capacity without any interruption or hindrance
- To ensure the availability of machines, buildings and services required by the customers.
- To increase safety of guests/employees of hotels
- To maximize the availability and reliability of all the assets.
- To obtain the maximum possible return on investment.
- To extend the useful life of assets
- To ensure operation readiness of all equipment required for emergency use at all times.
- To increase operational stability of the systems
- To increase the operational efficiency of facilities'
- To increase customer satisfaction.
- To ensure energy expenditure.

3.1.5 The similarity of the maintenance and renovation concepts in hotels

Renovation is the process of retaining or improving the hotel image by modifying the tangible products, due to many reasons. This process is when they stated that the meaning of maintenance as "restoring it to or retain a state in which an item can perform an initially specified function and all actions. This is done through changes in the hotel layout, such changes come in the form of new extensions and /or any additions or replacement of materials and furniture, fixtures and equipment.

Renovation incorporates replacement, restoration and redesigning. This makes it a function of facility management that deals with the physical aspects of hospitality and not 'soft' service element. This definition is therefore similar to maintenance because it requires inputs from many parts and levels of the organisation.

3.1.6 Maintenance action

The maintenance actions may include:

- Inspection
- Measurement
- Testing
- Servicing, repairs, removal, replacement, cleaning, lubrication, adjustment, alignment, re-installation, modification, overhaul, re-building, reclamation, etc.
- Disassembly, assembly and check-out
- Securing material supply, storage of spares.

- Preparation of reports about maintenance.
- Contingency items.
- Administrative duties.

3.1.7 Classification of maintenance

Maintenance management can be categorized as:

- Maintenance optimization models using programming and other software tools both qualitatively and quantitatively covering four areas involving description of technical system, its function and importance; identifying possible weakening consequences for a system; the description of the available information about the system and its objective function which helps in finding the best balance.

- Maintenance techniques comprising preventive, corrective, condition based, predictive and outsourcing techniques among others;

- Maintenance scheduling for maintenance personnel, repair rate assessment and wear out condition of equipment as well as scheduling for immediate and emergency job which are challenging areas in maintenance.

- Maintenance information systems which uses opportunity created by information technology and which have now become essential component of any maintenance in organizations.

- Maintenance performance measurements used to assess effectiveness of equipments and other repair strategies. An effective performance measurement system is essential for effective functioning of any organization as whatever gets measured has a higher probability of its completion.

- Maintenance policies which deals with maintenance concepts and new ideas to improve management decisions.

Maintenance management has also been categorized by many writers into three maintenance procedures:

- Corrective maintenance (unplanned) approach which is a failure-driven maintenance referring to running equipment until unexpected event breakdown of equipment or malfunctioning.
- Preventive maintenance (planned) which entails time-based maintenance requiring regular task of maintenance irrespective of the condition of the item.

- Condition-based maintenance which also entails periodic inspection of equipment to check it and replace it when a faulty condition is observed before breakdown

3.2 Maintenance management and Maintenance engineering

3.2.1 Maintenance Management

Maintenance Management is the planning, organizing, directing, staffing, controlling and evaluating functions of management applied to maintenance activities.
The term 'maintenance' means to keep the equipment in operational condition or repair it to its operational mode. Main objective of the maintenance is to have increased availability of production systems, with increased safety and optimized cost. Maintenance management involves managing the functions of maintenance. Maintaining equipment in the field has been a challenging task since the beginning of industrial revolution. Since then, a significant progress has been made to maintain equipment effectively in the field. As the engineering equipment becomes sophisticated and expensive to produce and maintain, maintenance management has to face even more challenging situations to maintain effectively such equipments in industrial environment. This brief lecture on maintenance management includes maintenance strategies, functions of maintenance department, maintenance organization and elements of maintenance management.

3.2.1.1 Maintenance strategies or options

A maintenance strategy or option means a scheme for maintenance, i.e. an elaborate and systematic plan of maintenance action. Following are the maintenance strategies that are commonly applied in the plants.

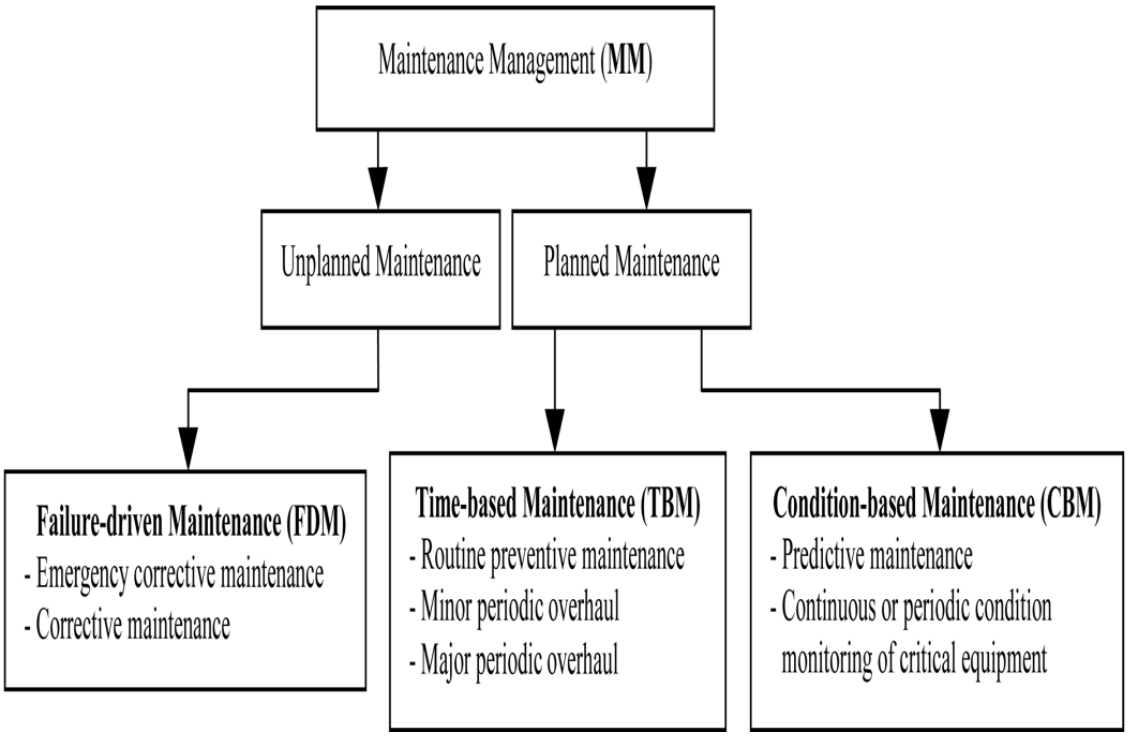
- Breakdown Maintenance or Operate to Failure or Unplanned Maintenance
- Preventive or Scheduled Maintenance
- Predictive or Condition Based Maintenance
- Opportunity Maintenance
- Design out Maintenance

The equipment under breakdown maintenance is allowed to run until it breaks down and then repairing it and putting back to operation. This strategy is suitable for equipments that are not critical and have spare capacity or redundancy available. In preventive or scheduled Maintenance, maintenance actions such as inspection, lubrication, cleaning, adjustment and replacement are undertaken at fixed intervals of numbers of hours or Kilometers.
An effective PM program does help in avoidance of accidents. Condition monitoring (CM) detects and diagnoses faults and it helps in planned maintenance based on equipment condition. This condition based maintenance strategy or predictive maintenance is preferred for critical systems and for such systems breakdown maintenance is to be avoided. A number of CM

techniques such as vibration, temperature, oil analysis, etc. have been developed, which guide the users in planned maintenance. In opportunity maintenance, timing of maintenance is determined by the procedure adopted for some other item in the same unit or plant. In design out maintenance, the aim is to minimize the effect of failures and in fact eliminate the cause of maintenance. Although it is an engineering design problem, yet it is often a responsibility of maintenance department. This is opted for items of high maintenance cost that are due to poor maintenance, poor design or poor design outside design specifications. It may be mentioned that a best maintenance strategy for each item should be selected by considering its maintenance characteristics, cost and safety.

In addition to the above, new strategies concepts such as Proactive Maintenance, Reliability Centred Maintenance (RCM), Total Productive Maintenance (TPM), etc. have recently been evolved to look it from different perspectives and this has helped in developing effective maintenance. In proactive maintenance, the aim is identify what can go wrong, i.e. by monitoring of parameters that can cause failures. In RCM, the type of maintenance is chosen with reliability of the system in consideration, i.e. system functions, failures relating to those functions and effects of the dominant functional system failures. This strategy in the beginning was applied to critical systems such as aircrafts, nuclear and space applications. At present, this is being extended to critical systems in the plant. TPM, a Japanese concept, involves total participation of all concerned. The aim is to have overall effectiveness of the equipment with participation of all concerned using productive maintenance system.

Three commonly used maintenance management approaches



Management of maintenance activities in hotels is classified into four main categories:
Routine,
Corrective,
Preventive,
Emergency.

Routine maintenance refers to the daily activities with repetitive nature, such as taking meter readings, lubricating, monitoring, start-up, and shut-down.

Corrective maintenance works are scheduled or unscheduled activities to restore the equipment to as-built functions.

Preventive maintenance includes scheduled activities of inspection, adjustment, replacement and overhaul to prevent system breakdown and extend its useful life.

Emergency maintenance refers to immediate actions to avoid further equipment damage and adverse consequences, such as loss of business.

3.2.1.2 Functions of a maintenance department

The following are the major functions of a maintenance department:

- Maintenance of installed equipment and facilities
- Installations of new equipment and facilities
- PM tasks – Inspection and lubrication of existing equipment
- CM tasks – monitoring of faults and failures using appropriate techniques
- Modifications of already installed equipment and facilities
- Management of inventory
- Supervision of manpower
- Keeping records

3.2.1.3 Maintenance organization

It concerns in achieving an optimum balance between plant availability and maintenance resource utilization. The two organization structures that are common are: Centralized and Decentralized. A decentralized structure would probably experience a lower utilization than centralized one but would be able to respond quickly to breakdowns and would achieve higher plant availability. In practice, one may have a mix of these two. A maintenance organization can be considered as being made up three necessary and interdependent components.

1. **Resources**: men, spares and tools
2. **Administration**: a hierarchy of authority and responsibility for deciding what, when and how work should be carried out.

3. **Work Planning and Control System**: a mechanism for planning and scheduling the work and feeding back the information that is needed for correctly directing the maintenance effort towards defined objective.

It may be mentioned that maintenance / production system is a continuously evolving organism in which the maintenance organization will need continuous modifications in response to changing requirements. Moreover, it is required to match the resources to workload. Maintenance activities – be it preventive or condition monitoring, involve use of resources- men and materials including documents. This requires coordination amongst the involved personnel so that these are timely undertaken. Work planning and control system under maintenance management in the plant ensures this and provides planning and control of activities associated with maintenance. This means application of general management principles of planning, organizing, directing and controlling to the maintenance functions, e.g. to the establishment of procedures for development of maintenance strategy and to models for describing the flow of work through maintenance work planning department. Control system controls the maintenance cost and plant condition.

3.2.1.4 Elements of effective maintenance management

An effective maintenance system includes the following elements:

- Maintenance Policy
- Control of materials
- Preventive Maintenance
- Condition Monitoring
- Work Order
- Job planning
- Priority and backlog control
- Data recording system
- Performance measurement measures or indices

Maintenance performance for a plant or an organization can be assessed through analysis of Reliability, Availability and Maintainability (RAM) plant data. Relevant parameters, measures or indices for specific plants can be identified. The performance over a period of time will show if it is improving, going down or being sustained. This will also help in knowing how well the objectives are being met. In addition, it will guide the areas which are strong and which need to be strengthened. Use of computers and dedicated software will certainly help in implementing this and the maintenance management system in general.

3.2.2 Maintenance engineering

Maintenance Engineering is the discipline and profession of applying engineering concepts to the optimization of equipment, procedures, and departmental budgets to achieve better maintainability, reliability, and availability of equipment.
Maintenance, and hence maintenance engineering, is becoming of increasing important due to rising amounts of equipment, systems, machineries and infrastructures. Since the Industrial Revolution devices, equipment, machinery and structures have grown increasingly complex, requiring a host of personnel, vocations and related systems needed to maintain them.

3.2.2.1 Objectives of Maintenance Engineering

The maintenance engineer's primary goal should be to continually identify opportunities of significant value to their organization. These opportunities should relate to:

- Improvements in the specific asset environment (physical plant and equipment)
- Improvements in resource utilization (people, materials, services and EAM systems)
- Improvements to the maintenance management processes – including the decision support and management systems

3.2.2.2 Typical Maintenance Engineering Responsibilities

Typical responsibilities include:

- Assure optimization of the Maintenance Organization structure
- Analysis of repetitive equipment failures
- Estimation of maintenance costs and evaluation of alternatives
- Forecasting of spare parts
- Assessing the needs for equipment replacements and establish replacement programs when due
- Application of scheduling and project management principles to replacement programs
- Assessing required maintenance tools and skills required for efficient maintenance of equipment
- Assessing required skills required for maintenance personnel
- Reviewing personnel transfers to and from maintenance organizations
- Assessing and reporting safety hazards associated with maintenance of equipment

3.2.2.3 Role of Maintenance Engineering

A maintenance engineer is responsible for the following:

1. Defining the organization's Capacity Assurance objectives
2. Developing the improvement plan(s) to achieve these objectives
3. Identifying the resources and skill sets required to execute the plan(s)

4. Developing and supporting the implementation of effective Maintenance Management Systems.
   including the Maintenance Master Schedule
5. Monitoring the progress of the plan(s)
6. Ensuring the improvement(s) deliver the expected financial and operational benefits
7. Supporting the optimization of maintenance costs. Maintenance engineers should be involved in budgeting the annual prescribed downtime and how that downtime will be spent on maintenance activities.
8. Providing advice and counsel on the design of new installations.
9. To lead the Organization, doing whatever it takes, to continually improve the way maintenance gets done, often in step change fashion "in the beginning".

4.0 Conclusion

This unit has focused on the various aspects of maintenance management and engineering. Maintenance is expected to play even much bigger roles in years to follow, as industries and hospitality outfits worldwide are going through an increasing and stiff competition and increased automation of plants and systems. The down time cost for such systems is expected to be very high. To meet these challenges, maintenance has to use latest technology and management skills in all spheres of activities to perform its effective role in profitability of the establishment.

5.0 Summary

Hotel maintenance is the performance of general, preventative and emergency maintenance for a given hotel facility.
Maintenance Management is the planning, organizing, directing, staffing, controlling and evaluating functions of management applied to maintenance activities.
A maintenance strategy or option means a scheme for maintenance, showing an elaborate and systematic plan of maintenance action.
Maintenance organization concerns in achieving an optimum balance between plant availability and maintenance resource utilization.
Maintenance Engineering is the discipline and profession of applying engineering concepts to the optimization of equipment, procedures, and departmental budgets to achieve better maintainability, reliability, and availability of equipment.

6.0 Tutor-Marked Assignment

Discuss the scope and objectives of maintenance.
Explain the following terms:
Maintenance management
Maintenance engineering

Discuss the:

a. role of Maintenance Engineering

b. functions of the maintenance department.

7.0 References/Further Reading

Mobley, Keith R. & Higgins, Lindley R. & Wikoff, Darrin J. (2008) Maintenance Engineering Handbook McGraw-Hill Professional, Seventh Edition, 2008,

Kelly, Anthony, “Managing maintenance resources”, Butterworth-Heinemann, 2006.

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Unit 2 Maintenance Planning

CONTENT

1.0 Introduction

Generally, hotels are complex and costly when it comes to maintenance, with various uses of spaces that have different schedules and uses for guest rooms, restaurants, health club, swimming pool, retail store and each has a functional engineering system required for its maintenance. Maintenance therefore has to be done throughout the year, requiring competent staff to undertake building services, operation and maintenance, supplemented by outsourced contractors. In the hospitality industry the maintenance of the engineering systems is important despite its complex processes as its effectiveness will directly affect the quality of hotel service, food, and beverage which have direct and significant effect on guests‟ impression of the hotel.

2.0 Objectives

At end of the unit, you will be able to explain
Maintenance practices in hotels
The strategies in hotel maintenance
The significance of maintenance in hotels

3.0 Main content

3.1 Maintenance Practices in hotels

3.1.1. Strategies in hotel maintenance

In the development of maintenance strategies and programmes, health and safety have become fundamental requirements for business success because they depend on good maintenance practices to avoid hazards in the buildings or workplaces. A maintenance strategy sets the

direction of maintenance management, whereas the maintenance programme is a comprehensive schedule of maintenance works carried out in a specified period of time. Both however involve a high level of decision making because customer perception of quality is determined by a number of factors relating to services, food, facilities and indoor environment.
Management is willing to make every effort to improve maintenance management for energy savings. As such a sound maintenance strategy should be developed and implemented to keep the engineering systems reliable, safe, and energy efficient, satisfying customer needs and expectations.
Some factors that influence maintenance strategy adopted include:

Health and Safety
Energy consumption
Guest Expectation
Degree of influence in business activities
Environmental Impact
Hotel Policy
Maintenance Resources (labour, tools and materials)
Legal requirement
Reliability of system
Criticality of system
System life cycle
Annual Budget
Feedback from other departmental heads
Manufacturer recommendations
Equipment history records (failure mode, frequency and cause)

In maintenance practice several factors are considered before adoption of in-house technicians, out-source contractors, or combination of both. There is no general rule for a desirable ratio of in-house to contracted-out labour force on which management decision is based, but the availability of resources and a number of other factors are considered. Limited skills of in-house technicians in specialized disciplines are the most significant factor driving management to employ outsourcing labour for some maintenance and retrofitting works.
Time constraints was considered as a factor since the main income of the hotels are from the rent of guest rooms and the provision of food and beverage services, including restaurants and banquet halls, therefore longer downtime of critical equipment and functional areas will lead to a serious loss of business. As a result, management has to carefully compare the working time needed by the outsourcing contractors with the in-house staff.

In-house and outsourced maintenance

Influential factors for considering in house and outsourced maintenance include:

Skills of in house technician
Time constraint
Statutory requirements
Degree of system complexity

Financial constraint
Technical support from manufacturers
Use of proprietary units and parts

Availability of in house labour force

Use specialized tools and requirements

In general, specialized contractors are better equipped and have flexible manpower that will ensure tasks are completed on time. Statutory requirements are also weighted. It is stipulated in local regulations that some activities, such as maintenance of fire protection systems, lifts and escalators, must be carried out by authorized contractors.
In hotel industry the hotel operator is often criticised for trying to wear “too many hats” and problems with poor performing hotel restaurants are often attributed to differing core competencies required in hotels and restaurants. Outsourcing therefore represents a way to manage this diversity problem. Furthermore, a second factor motivating the hotel sector is labour intensity which creates tension between having the incentive to outsource in order to reduce labour management. However it demands monitoring subcontracted activity outcomes.

Several factors make outsourcing particularly relevant to hotels because there is a high need for hotel managers to avoid being distracted from attending to core activities. Outsourcing strategy is the reassigning of control of an activity to a supplier and it is very different from contracting requiring challenging decision in at least three aspects. The decision to outsource is taken at a strategic level and secondly, it involves the restructuring of the organization around its core competencies.

Outsourcing is often done for both tactical and strategic reasons. Tactical outsourcing is mainly based on a cost-cutting manoeuvre, with little consideration about risks linked to the decision. Strategic outsourcing deals with firm margins. Four specific issues which make outsourcing worth considering are:

financial issues to lower fixed costs, gain tighter control of budget through predictable costs,
operational issues to get work done more efficiently or effectively by specialists, outsourcing to improve quality, flexibility, and deliveries,
Resources and competence issues which gives the ability to focus on core assets by getting rid of minor ones. This gives access to innovation, knowledge and creates the conditions for relational capability building,

Machinery and finally organisational issues which is outsourcing that responds to internal power issues and facilitates, the diffusion of new practices and forces to expand internationally.
Due to transaction cost economics (TCE) the greater the asset specificity, the more likely a transaction will be internally managed (not outsourced). The hotel industry is characterised by much outsourcing, however, there is too much focus on economic activity and some aspects of organisational behaviour which are crucial for decision making are ignored. If a resource has strategic value to a hotel activity and has some potential that makes it rare, valuable, imperfect, imitable and non-sustainable, then it should not be outsourced because that resource must not be directly transferable in the market. This will make it easier for the firm to make profit, as it gains competitive advantage over other resources.
If a hotel possess advantage when it comes to in-house performance, it is unlikely to outsource.
Finally, when a service can be provided more efficiently by third parties, it should be outsourced and activities that do not contribute to development of core competences and of little strategic value should be outsourced.

3.1.2 Significance of Maintenance in hotels

Many hospitality writers have explained many different reasons, which make renovation essential for hotel operations. These reasons include:

(a) to carry on with the competition,
(b) to keep or increase market share by pleasing the current or impending customers;
(c) to develop the operational competence of the hotel that will lead to an increase in both productivity and long term savings in operational expenses;
(d) to retain corporate image and standards;
(e) to promote the hotel to a higher class (e.g. from 4 star to 5 star);
(f) to conform with the new trends and technology in the market (e.g. the green movement);
(g) to handle governmental requirements like Disability Act, health and safety regulations in different countries);
(h) to make progress from natural disasters such as hurricanes and earthquakes.
Furthermore, maintenance is significant in hotels because room quality should reflect the price paid for it. When room rates are raised, it should be based on quality because guest must be able to perceive the quality increase.
In providing quality evaluation, hotels have been awarded “stars”, more stars means higher quality hotels. On yearly basis “star” rating increase or decreases in hotels. Managers losing star should then know that the hotel is beginning to lose ground when it comes to maintenance of amenities required to retain their rating.

Obstacle to Maintenance in hotels

Some of the perceived obstacles to hotel maintenance include:
owners who could constitute barriers to renovation in both limited and full service hotels.

lack of money,
lack of appropriate in house experience and
lack of suitable manpower to renovate.

Potential customers also have the means to picking up this signals and messages indicating lower quality. As such hotel managers should not fear increases in capital allocation when it comes to upgrading of the amenities of their hotels because the increased investment will bring increase revenue. There is much competition in this industry, so hotel management planning should be focused towards upgrading “star” rating through maintenance of hotels facilities.

3.2 Maintenance contracts

Maintenance contracts are signed when hotel operators outsource completely to private hotel property management companies. These specialized maintenance companies usually bring in their staff to form in-house maintenance department. Most 5 -star and 4 -star hotels use this maintenance arrangement.
The other alternative is that hotel operators run their own maintenance departments usually common in small hotels. An agreement between the property owner and hotel operator specifies each one’s responsibility regarding maintenance. The contract is for the duration of rent paid for the hotel, 3 years at a time, however the more hotel rooms rented the higher the revenue of the owner. Both parties have a joint interest when it comes to selling hotel rooms to acquire revenue. The hotel operator pays for cost of maintenance for all interior fixtures and fittings in hotel rooms and restaurant, whilst the owner pays for maintenance of the building, elevators etc. The hotel operator pays for all cost of maintenance when he is also the owner.

Acquisition of fixtures and fittings

All acquisitions for items are done by hotel operators based on their available funds and the design. The taste and impression of the guest is also usually considered before consideration is given to long term maintenance strategies. Some equipment requires changing of batteries so often and therefore expensive to maintain. Likewise, some fixtures and fittings get damaged very frequently because clients are violent and do not handle hotel items with much care as will be done in their homes. The rate of complains for repairs of damaged electronic equipments are therefore very high.

Changes in technology have led to the use of new fixtures that promote health, energy conservation. However, replacing them for a hotel with over 500 rooms is cost intensive and this makes operators still maintain some old designs.
Secondly clients come from all over the world and have different tastes and desires when it comes to services provided by new equipments. Hotel operators therefore consider various factors before fixing new equipments. Energy conservation is the priority of hotel operators in the decision as to which modern and new equipment to buy.

For a hotel with over 500 rooms at least each room is visited once in a week to check faults for all fixtures and fittings in hotel rooms. Hotels with fewer rooms are visited more often. Air conditioners are serviced twice in a year and there is usually a contract to service these as soon as time is due. Actual daily maintenance is done as quickly as possible depending on how important it is for the hotel and the cost. Annually there are reviews of maintenance needs, new inventory prepared and items are purchased. This process is done as part of the budget process for the coming year. Each department identifies its need to keep the hotel in a good condition and running. Some new equipment installed are modern fire alarm in hotel rooms, LED-lights all over some hotels in order to save energy, new showers introduced to reduce the amount of water being wasted. However everything done is aimed at meeting or exceeding guest expectations.

Repair and Maintenance

Preventive maintenance is more often used and convenient because it is not appropriate for guests to check in and complain before repairs are done. There is the need to maintain guest confidence. It is easier to have a plan for manpower and financial resources when using preventive maintenance because it assists one to have a better cost control.
It is a problem interpreting the border between the responsibility of the property owner and the operator when it comes to maintenance cost because there are often different opinions on whose part it is to take the cost. The priorities of owners and operators are also different, as an example, if we need to buy a spare part for a hotel room due to a problem with air condition or something, hotel operators think that it is absolutely necessary to fix the problem the same day, whereas the owner often has another view of priority.

The second difficulty is money, when problem arises, it is here and now and you have to hurry to repair and make the room available. However, if money is not available to purchase spare parts, then in the long run, it creates a lot of maintenance issues. There are always issues on maintenance planning and cost of maintenance. One cannot do magic if the hotel does not have money.

Security men help with maintenance delivery at night to change locks and batteries when maintenance staff have closed. Most times in most 4-star and 5-star hotels, a house keeping department is run alongside a maintenance department. The housekeeping department do the general cleaning up of rooms, changing batteries, fixing of bulbs whilst the latter has the technicians like carpenters and plumbers. Most 4 -star and 5- star hotels have adopted this practice and only maintain a housekeeping department and outsource the maintenance department.

Outsourcing and In-house contractors

Outsourced contractors are used for painting, electrical, carpet cleaning, maintenance of elevators, annual oiling of wooden floors among others which require special competence in the field of maintenance delivery. They are therefore hired when need arises. These services are also not needed every day and will be expensive to have stand-by technicians not doing anything. In house technicians are usually available. A combination of in-house and outsourced contactors are used by most hotels now.

Difficulties of hotel operators in the implementation of maintenance plans

- Acquisition of technicians

In the hospitality industry overcoming difficulties of recruiting right technicians to work with is a challenging situation because hotels have policies on appearance so you cannot just employ anybody. Technicians appearance with tattoos on body, long hair among others are not appealing to guest and not attractive because these technicians play dual role of repairs and meeting guests in their rooms and therefore need to appear neat and well kept. This difficulty in recruiting technicians for the hotel industry becomes even worst because craftsmen do not like this industry like other commercial properties like offices. Working in hotels requires more responsibility and much availability like from 7.00am – 19.00pm every day and even on weekends when offices are closed. Only few women technicians are also available although the hospitality industry will be much interested in such people as work crews.

- Availability of spare parts

There is difficulty in securing spare parts on time for delivery of work. Contracts to purchase spare parts only should be encouraged and handled separately by hotels. When costs of parts are not included in maintenance contracts, then cost will be on only labour charges for external providers.

Execution of Maintenance Plan

Maintenance plans for hotels have duration of 10 years, requiring that for every 7th year you have to do redecoration, but this is usually not done. There are some hotels that have not been closed down for even one day since they were built in the 17th century. Planning and implementation at most are done whilst hotel is still running and this does not promote efficiency because execution of work is accompanied by noise and during the day guest are around relaxing, whilst in the night they are sleeping.
Execution of maintenance plan is also difficult because of poor budgeting for cost of maintenance by hotels. Budgeting for redecoration and refurbishing in hotels is a challenge to operators. These figures should be known and planned for because budgeting for future works

and meeting your set target is a difficulty in the industry. Among several other factors, meeting or exceeding guest expectation on maintenance is very important.

4.0 Conclusion

This unit has shown that hotels adopt maintenance strategies that best suits their mode of operation. Today, there are many activities that are done to keep a building and its parts in good repair. Most of them are put under maintenance but the peculiarities of the hotel industry require that hotel maintenance is planned to be effective.

5.0 Summary

A maintenance strategy sets the direction of maintenance management, whereas the maintenance programme is a comprehensive schedule of maintenance works carried out in a specified period of time.

Some factors that influence maintenance strategy adopted include: Health and Safety, Energy consumption, Guest Expectation, Degree of influence in business activities, Environmental Impact, Hotel Policy, Maintenance Resources, Legal requirement, Reliability of system, Criticality of system, System life cycle, Annual Budget, Feedback from other departmental heads, Manufacturer recommendations and Equipment history records.

Obstacle to Maintenance in hotels owners who could constitute barriers to renovation in both limited and full service hotels, lack of money, lack of appropriate in house experience and lack of suitable manpower to renovate.

Maintenance contracts are signed when hotel operators outsource completely to private hotel property management companies.

Outsourced contractors are used for painting, electrical, carpet cleaning, maintenance of elevators, annual oiling of wooden floors among others which require special competence in the field of maintenance delivery.

6.0 Tutor-Marked Assignment

Discuss the significance of maintenance in the hotel
Explain the difficulties of hotel operators in the implementation of maintenance plans
Outline some factors that influence maintenance strategy adopted in hotels

7.0 References/Further Reading

Chan, K.T., Lee, R.H.K., & Burnett, J. (2001). "Maintenance performance: a case study of hospitality engineering systems", *Facilities,* 19 (13/14) 494 – 504

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UNIT 3 Hotel maintenance Staff

CONTENT

1.0 Introduction

Hotel maintenance workers, while not often seen, are an important sector of the total staff that keeps a hotel running smoothly. Hotel maintenance jobs are needed to deal with everything from stopped-up drains to malfunctioning television sets and burned out light bulbs. Larger properties employ specialists for plumbing, electrical and other maintenance responsibilities, while smaller hotels often employ one or two maintenance workers who are adept at all the trades.

2.0 Objectives

At the end of the unit, you will be able to explain:
Types of maintenance staff
Maintenance staff response to maintenance requests
Maintenance/Engineering department in the hotel
Standard Operating Policy for Hotel Engineering Departments
The Maintenance Battleground

3.0 Main content

3.1 Types of maintenance staff

General Maintenance

Most hotels employ entry-level maintenance workers to handle the steady stream of repairs that are needed on the property, from changing light bulbs to touching up paint and repairing

door locks. Entry-level maintenance workers typically do not need any formal education, but should possess a certain level of handyman skills so they can fix leaking faucets or help a guest log on to the property's network. Though low paying, in the ₦9 to ₦10 an hour range, general maintenance workers in hotels are always in demand. The position can be a good stepping off point to move into other positions within the property as well.
General maintenance and repair workers fix leaky faucets, do some painting and carpentry, make sure that heating and air-conditioning equipment works properly, mow lawns, and exterminate pests. The industry also employs cashiers, accountants, personnel workers, and entertainers. As properties acquire and use more sophisticated computer systems, they employ more computer specialists to help maintain these systems as well as the hotel's Web site, and computer connections for guests.

Engineers

Hotel maintenance engineers are more qualified to tackle larger repairs on laundry equipment, ventilation and water treatment systems, kitchen appliances and heating and air conditioning units and may hold special certifications in those areas. The chief engineer is responsible for preventive maintenance checks on all the property's systems and often directs general maintenance staff to complete minor checks of rooms and conference facilities. Hotel engineers are usually required to earn a two-year associates degree in hotel maintenance and spend time working in a general maintenance capacity. Pay for hotel maintenance engineers averages between ₦11 and ₦15 an hour.

Grounds

Hotel properties with gardens and large outdoor areas employee specialized groundskeepers and landscapers to maintain the exterior of the hotel. Most landscapers at hotels are experienced in lawn care and shrub and flower maintenance. Groundskeepers usually maintain the parking lots and walkways as well as the planted areas and are required to be physically fit to push lawnmowers, trim bushes and run leaf blowers. At most properties, the outside grounds-keeping team also maintains the swimming pools. Groundskeepers in the hotel industry earn up to ₦ 10 or ₦12 an hour.

Management

Hotel maintenance workers looking to move up to larger properties or into a management position can earn certifications geared toward maintenance management. The American Hotel & Lodging Educational Institute offer the Certified Maintenance Manager designation and the more advanced Certified Engineering Operations Executive designation to help advance a hotel maintenance career. In larger hotels, there are a number of levels of maintenance management that begin with supervisors earning salaries in the ₦30,000 range up to executive levels that earn closer to ₦60,000.

3.2 Maintenance staff response to maintenance requests

Show up quickly. If there are delays in responding, contact the guest to let them know when you can reach them.
Greet the guest and introduce yourself. Rather than saying, “Hi, air conditioning broken?” say “Hello I’m John from maintenance. I’m sorry to hear you’ve had a challenge with the A/C and I’m here to fix that for you.”

Listen interactively. When encountering guests who are reacting emotionally, it is important to give them a chance to vent their frustration by allowing them to tell their “story” of the problem and how it has inconvenienced them.

Empathize and apologize. Guests seem to get more upset about the staff’s reaction to the problem, rather than the problem itself. How many times have you read a guest comment such as: “What went wrong during our stay was…. But what really was upsetting was that no one seemed to care and no one apologized.”

For properties with specific guest parking spaces outside of each accommodation, take note of the state listed on the guest’s license plates. This gives you a great chance to express interest in their home state or perhaps comment on recent sports teams from that state. (Just be sure not to talk about politics, even if you agree with the messages on their bumper stickers!)

Always avoid blaming other staff, departments, or managers. Statements such as “They put you in this room?” or “We’ve had so many problems with these new TV’s they just installed” only serve to infuriate guests that much more.

Interact positively with the children. Most are curious as to what the maintenance technician is up to and will want to watch attentively when safety allows.

Take ownership of the “physical product.” Maintenance and engineering staff are also out and about the hotel more than most other staff. This creates a great opportunity to help pick-up trash, straighten picture frames, and putting out wet floor signs when spills are noticed.

Anticipate guest needs. When maintenance have fixed a reported problem, always remember to offer to check other features related to the problem or that might have been off for the season, such as the temperature of the refrigerator, the gas line hook-up to the outdoor grill, and to turn on the Jacuzzi.

Of course, one external key to their success is the person who fields the maintenance service requests. It is important for them to ask the right questions to “triage” the guest’s problem or concern. Often times by asking the right questions when the call comes in a maintenance call can be avoided.

3.3 Maintenance/Engineering department in the hotel

The maintenance or engineering department and front office communicate on room status and requests for maintenance service. Maintenance employees must know the occupancy status of a room before attending to plumbing, heating, or air-conditioning problems. If the room is reserved, the two departments will work out a period so the guest will be able to enter the room or be assigned to another room. Cooperative efforts produce the best solutions to sometimes seemingly impossible situations.

Likewise, the requests from guests for the repair of heating, ventilating, and air-conditioning units; plumbing; televisions; and other room furnishings are directed to the front desk. These requests are then communicated to the maintenance department. The front desk clerk must keep track of the repair schedule, as guests want to be informed of when the repair will be made.

The personnel and the equipments under their control provide the comforts demanded by the guests.
The maintenance departments affect the operation of the other departments of the lodging establishment.
The care and operation of the physical plant is largely the responsibility of maintenance department.

Duties of maintenance personal

(i) Inspection
(ii) Engineering.
(iii) Maintenance
(iv) Repair
(v) Overhaul
(vi) Construction
(vii) Salvage
(viii) Clerical jobs.

Objectives of maintenance department are:-

(a) Protect the investment in the physical plant
(b) Control the maintenance cost.
(c) Minimize the energy cost of the facilities.
(d) Minimize safety problems.
(e) Supply and distribution of power, water, etc.
(f) Reduce down time.
(g) Provide better services to customers

(h) Provide higher market value services
(i) Provide services at lower cost
(j) Provide timely services.
(k) Make life longer for equipments.
(I) Provide higher safety and morale for employees.
(m) Provide better environment for community
(n) Provide smoother and continuous running of hotel.
(0) Provide efficient waste disposal system.
(p) Ensure higher salvage value of equipments.

The functions of maintenance department are as follow –

(i) Preparation:
(a) Maintenance request
(b) Repair of equipment under breakdown
(c) Assets/facilities register
(d) Introduce check list to prevent breakdown.
(e) Maintenance Schedule
(f) Work/job specification.
(g) Programming annual & weekly planned maintenance programme
(h) Planned lubrication
(i) Work priority
(j) Facility priority
(k) Safety.
(ii) Operation: Routine analysis, loading.
(iii) Progression: Critical analysis.
Maintenance can be organized as -
(i) Centralized
(ii) Decentralized - placed under shop/section superintendent
(iii) A combination of above two
It depends upon -
(a) Physical location of facilities.
(b) Type of equipment in use and its age.
(c) Availability of skilled maintenance personnel
Layout and cost, work measurement, managing work
Maintenance of equipments need the coordinated efforts of all concerned with hotel because
(a) Maintenance is affected by the operational procedures, equipments, utilities, & service plans.
(b) Equipment life is affected by the operational parameters.
(c) Hotels are affected by the use of substandard raw materials processing, water, etc.
(d) Equipments getting affected and damaged due to scale forming, chocking of pipe lines, vessels, etc.

Traits of maintenance staff are

(a) Patience
(b) Analytical mind
(c) Dignity of labour

Training of maintenance staff consists of

(a) General training (b) Departmental training
(c) Job specification training
Training programme should cover basic concepts & necessity of maintenance, documents to be maintained, compilation of cost data, factors affecting the maintenance cost, means to be taken to reduce maintenance cost & down time due to maintenance.

3.4 Standard Operating Policy for Hotel Engineering Departments

Major duties and responsibilities

- Implement a preventive maintenance program of all building equipment and guestrooms.
- Training of the Maintenance staff on executing the preventive maintenance program.
- Maintain inventory of all parts, and supplies.
- Order all parts, supplies, tools, and equipment related to Engineering, through direct contact with sales representatives and in conjunction with Purchasing.
- Follow up on projects and assignments given by the General Manager.
- Ensure the proper operation, maintenance, and repair of all:

a) Heater, pumps, valves, and lines used in the distribution of steam and heated or processed water.
b) Refrigerant compressors, condensers, evaporators, traps, transfer pumps, expansion valves, and stop valves as well as all refrigerant lines and devices used to control temperatures.
c) Air compressors along distribution lines and all valves and devices for air control.
d) Natural and manufactured gas and distribution lines, including all valves and control devices.
e) Water filters, softeners, piping and pumps used in conjunction with water distribution, including all sinks and water closets, as well as supply lines and water lines.
f) All types of motors or engines used to power pumps, compressors and fans.
g) All types of locks, keys and locksmith related duties.

h) All electrical work and repairs.

- Coordinate the maintenance, repair, and installation of carpentry work.
- Assure the implementation and follow-up of Companies Standard Operating Procedures.
- Develop, recommend and direct the operation, policies, and procedures, plans, and programs of the department.
- Conduct a formal training program on the required job functions and criteria expected, and a department orientation with new employees. Conduct monthly departmental meetings.
- Administer required employee reference guide practices such as performance and aptitude reviews. Interview Engineering applicants.
- Oversees weekly work schedules in accordance with staffing guidelines and labor forecasts.
- Assign duties and work responsibilities to staff members to insure that work schedules are adjusted accordingly to meet weekly business demands.
- Coordinate breaks for staff.
- Inspect grooming and attire of staff, and rectify any deficiencies.
- Authorize requests for vacation/sick leave, holidays, leaves of absence schedule changes, and overtime.
- (Pre-)approve bills and invoices, statements and work orders.
- Enforce safety regulations, and investigate any accidents.
- Maintain all mechanical equipment critical to the operation of the building.
- Perform other job-related duties as assigned by Management.

Managerial skill requirements

- Actively support the selection, development, training, mentoring, and empowerment of Maintenance personnel.
- Be a team player, and lead by example.
- Provide constructive and consistent coaching, counseling, and direction to Maintenance personnel.
- Manage time well, correctly prioritize tasks, and be accountable. Keep deadlines.
- Manage the quality process in areas of internal customer service and associated guest satisfaction.
- Demonstrate self-confidence, energy and enthusiasm through actions.
- Present ideas, expectations, and information in a concise, well organized way.
- Use effective listening skills as a basis for clear communication.
- Provide appropriate recognition to motivate project personnel producing win/win results.
- Manage group or interpersonal conflict situations effectively.
- Understand how to manage in a culturally diverse work environment.

- Use problem-solving methodology for decision-making and follow up.
- Able to negotiate and create win-win situations with our internal customers.

Technical skill requirements

- Adequate command of the English language to perform duties of position,
- Adequate knowledge to maintain and troubleshoot general ventilation equipment.
- Adequate knowledge to maintain, troubleshoots, and operates central air conditioning systems, as well as window/thru wall air conditioners.
- Adequate knowledge to maintain and troubleshoot appliance and equipment including but not limited to; refrigerators, dishwashers, electric/gas ranges, toasters, and vacuum cleaners.
- Working knowledge of plumbing, electrical, mechanical codes, national and local fire codes.
- Adequate knowledge to maintain OSHA requirement logbook and records.
- Adequate knowledge to maintain and troubleshoot boilers, heating systems, hot water systems, and associated equipment.
- Adequate knowledge to maintain and troubleshoot electrical motors, controls, and systems.
- Adequate knowledge to maintain and troubleshoot general plumbing systems.
- Adequate knowledge to maintain and troubleshoot electronic and mechanical lock systems.
- Adequate knowledge to maintain and operate an emergency generator.
- Adequate knowledge to maintain and operate high-rise combination standpipe/sprinkler/fire pump installation and equipment.
- Knowledge of blueprint reading, plumbing and wiring schematics.
- Ability to accurately compute mathematical calculations.
- Ability to prepare budgets and ensure cost controls.
- Computer literate: Microsoft Word, Excel, and scheduling programs.

The Maintenance Battleground

From the finest luxury hotels to the bargain extended stay facilities, the complaints remain the same. Guests want rooms that do not have:

- **Noise problems**: Noise can be generated internally and/or externally. External noise comes from the parking lot, the room next door, the hallway, the emergency exit staircase or even a vending machine. Internal noise comes from squeaking ceiling fans, plumbing and room HVAC units.

- **Dirty Rooms/Hotel maintenance problems**: This includes dirty or grimy carpeting, dirty bedding, missing or non-working room amenities such as light bulbs, Internet access, electric sockets, ceiling fans, plumbing fixtures, remote controls, windows and doors.
- **HVAC issues**: Ranging from noisy to temperature control as well as blowing across bedding.
- **Room smells**: Room smell issues have a variety of causes. Smells come from smoking, musty air, stale air, previous smoking rooms, animals and mildew.
- **Insects and other pests**: Insects like moist places with an available food source. Moisture can come from showers, high humidity, spills etc. Food sources normally originate with the guest in the form of food scraps (ants, mice) or improperly maintained bedding (bedbugs) but can also result from the moisture itself getting a toehold (carpenter ants, termites).
- **Check-in issues**: This is the only major issue that is not preventable with a hotel CMMS maintenance program.

The Maintenance Call to Arms

The easiest way to do this is to look at the list above and tell which items can be prevented or minimized with preventive maintenance.

- **Noise problems**: External noise can be mitigated with good weather stripping around windows, better windows and minimizing door spaces. Sadly there is a limit to which preventive maintenance can help external noise. The true is answer is better built buildings. On the other hand, internal noise generators such as HVAC units, squeaking ceiling fans and doors or plumbing issues can be addressed with regular inspection and/or lubrication.
- **Dirty Rooms/Room Maintenance Problems**: Room maintenance is more than just having the cleaning crew come in and make the beds and do a quick inspection. Rooms should be inspected regularly for a list of common complaints. Some items can be fixed on the spot (missing light bulbs, non-working remote controls) and some may need to be accumulated (electrical sockets not working, mold buildup, carpet stains) before maintenance is scheduled. All safety issues should be scheduled for maintenance as soon as possible to avoid hotel maintenance liability issues.
- **HVAC Issues**: Heating, ventilation and air conditioning (HVAC) noise issues and temperature control problems can be addressed through inspection and preventive maintenance. Better maintained HVAC units/controllers will save energy for the hotel. Central air vents should be kept clean to avoid mildew and dust issues.
- **Room Smells**: Once an odor has permeated a room, bedding must be changed and upholstery cleaned. Inspections note when a room has a distinguishable odor and that needs to be cleaned thoroughly. The availability of fresh air is a hotel or resort decision. Do windows open, are HVAC filters clean? If central air is used, what percentage of the air is re-circulated? How well are the rooftop units being maintained?

- **Insects and other pests**: Insects attract predators, without constant inspection and pest control, insects can not only scare away guests but also cause physical damage to the hotel.
- **Check-in Issues**: External power issues or centralized reservation system glitches are beyond the scope of regular hotel maintenance. However, computer equipment can be checked in any establishment for dust build up on fan motors or connectivity issues. Local equipment can be made to last longer with proper care.

The Maintenance Scheduling/Manpower Battle

Realistically, there are only so many light bulbs, guest caused or wear and tear issues that hotel maintenance staff can address in any given time period. As assets age, it becomes harder and harder for hotels to balance the needs for unplanned maintenance with the goals of a proactive maintenance program that includes inspections and preventive maintenance to maintain or extend the useful lifecycle of equipment.

The question for hotel and resort owners and management is what is the cost differential between attracting new customers and getting customers to make return visits by reducing guest maintenance complaints. The answer can only come from knowing how much it costs to maintain your assets in a way to maximize their useful lifecycle in the most cost effective manner.

CMMS Technology Will Win the War

The key to knowing your costs is understanding the hotel work order lifecycle, eliminating manual procedures, automating paper functions, and finding the correct balance between reactive and proactive maintenance. The tool of choice for this task is a Computerized Maintenance Management System (CMMS). Using a hotel CMMS, helps hotel maintenance managers organize their work flow (inspections, preventive maintenance and unplanned maintenance) in the most time efficient manner.

Once the work is organized, the work order system records all maintenance activity including time spent, cause, parts used, costs, results and notes. This information can then be summarized in management reports enabling management to make better repair or replace decisions as well as identify trends or common causes that require changes in operating procedures.

Lastly, a CMMS software solution takes the maintenance history and creates a database that can be used for budget analysis, capital expenditure forecasting and a calculation of true asset maintenance costs. Most hotels will find that a CMMS for maintenance is much cheaper than the marketing budget required to attract new customers.

4.0 Conclusion

The maintenance department of a hotel is solely responsible for physical plant facilities, which includes operation, maintenance and repair of all heating, ventilation, refrigeration, mechanical equipment, and grounds of the hotel. This department is also to develop, coordinate, and monitor a rooms maintenance program to ensure the safety and comfort of guests and staff. It is also saddled with the additional responsibilities of training and supervising the departmental staff.

5.0 Summary

Types of maintenance staff are general, engineers, grounds and management
Duties of maintenance personal, Inspection, engineering, maintenance, repair, overhaul, construction, salvage, clerical jobs.
Traits of maintenance staff are patience, analytical mind, and dignity of labour
Training of maintenance staff consists of general training, departmental training**,** and job specification training.
Training programme should cover basic concepts and necessity of maintenance, documents to be maintained, compilation of cost data, factors affecting the maintenance cost, means to be taken to reduce maintenance cost and down time due to maintenance.
Guests want rooms that do not have noise problems, room maintenance problems, HVAC Issues, room smells, insects and other pests, and check-in issues

6.0 Tutor-Marked Assignment

Discuss the response of maintenance staff to repair calls.
Enumerate the technical skill requirements for maintenance staff.
Explain the major duties and responsibilities of the maintenance staff.
Discuss the maintenance battle ground

7.0 References/Further Reading

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Module 2

Unit 1 Hotel Buildings
Unit 2 Water supply systems
Unit 3 Fuels used in hotels
Unit 4 Fire and Firefighting
Unit 5 Heating, Ventilation, and Air conditioning

UNIT 1 HOTEL BUILDINGS

CONTENT

1.0 Introduction

Buildings are structures that serve as shelters for man, his properties and activities. They must be properly planned, designed and constructed to obtain desired satisfaction from the environment. The factors to be observed in building construction include durability, adequate stability to prevent its failure or discomfort to the users, resistance to weather, fire outbreak and other forms of accidents.

2.0 Objectives

At the end of the unit, you should be able to explain:
Roof problems
Emergency roof repair'
The handling of exterior walls.

3.0 Main content

3.1 Roof problems

Typical Causes of Roof Problems

A. Lack of Maintenance

The failure to find and correct minor roof deterioration in the earliest stages is probably the greatest cause of premature roof problems. This is particularly true of roofing materials applied on relatively low-sloped roofs.

B. Weathering

All roofing materials deteriorate from exposure to the weather at rates determined largely by the kind of material and the conditions of exposure. In general, inorganic roofing materials tend to deteriorate less rapidly from exposure than organic roofing materials. All types of roofing materials may be damaged by hail. Exposure to air pollutants and industrial or salt-laden atmospheres may accelerate the deterioration process of some roofing materials.

C. Wind Damage

Roofing materials are subject to damage from strong winds and flying debris. Generally, roofs are not designed to withstand winds of hurricane and tornado intensity. However, roofs may also be damaged by winds of moderate intensity, with gust that may reach 50 to 75 miles per hour. The primary cause of wind damage is from the partial vacuum created by wind blowing over the edge of the roof. Nature tries to neutralize the low-pressure area by bringing in air from a higher pressure area, usually from inside the building. This air pushes up on the bottom side of the roof assembly and, over time, loosens fasteners and breaks the adhesion making the roof susceptible to damage from the next moderate or strong wind. To counteract the effects of wind-uplift forces, the roofing and insulation should be adequately fastened to the roof deck, and a securely-fastened perimeter detail should be provided.

D. Improper Design

Troublesome and costly roofing problems are often the result of faulty initial design of the roof system. Design deficiencies are costly to correct, and usually can only be corrected during roof replacement. However, unless design deficiencies are discovered and corrected during roof repair or re-roofing, the problems relating to them most likely will recur. Some examples of faulty design are:

- Weak roof structures that deflect excessively under load, causing splitting of the roof membrane
- Inadequate roof slope, sagging roof structure, or insufficient number or location of drains, resulting in ponding water

- Inadequate provision for expansion and contraction at changes in deck material or direction, causing membrane splits.
- Incompatible roof materials - i.e. the use of asphalt to adhere a torch-on material (APP).

E. Flashing Failures

The function of flashings is to provide a watertight junction between roofing materials and roof projections or other parts of the structure, and between roof sections. Flashings should be designed to furnish service for at least as long as the materials used in the field of the roof. Flashings are the most vulnerable part of any roof. Their importance and the importance of maintaining them properly cannot be overemphasized.

Many early roof problems are actually flashing problems. Often, repairing the flashings or providing new flashings is all that is needed to make the roof watertight again. Most flashing problems result from inadequate flashing design or faulty construction. Many flashing problems can be reduced or eliminated by careful examination by competent inspectors during roof installation, and by regularly scheduled inspection and maintenance.

In many instances, leaks occur at flashings where there are no flashing defects. These leaks may be the result of open joints in a masonry wall or coping cap, which permits water to enter behind the flashings and into the building. This problem may be eliminated by "through-wall" flashings.

F. Base-Flashing Problems

Some common causes of base-flashing problems are:

- Insufficient number of base-flashing plies.
- Improper base-flashing height.
- Insufficient protective coating, resulting in accelerated weathering and deterioration.
- Omission of cant strips, making the base flashing more susceptible to damage.
- Open vertical end laps or seams caused by insufficient sealing.
- Insufficient adhesion or movement between vertical surfaces and the roof deck, resulting in separation of base flashings from vertical surfaces.
- Loose insulation, causing base flashings to separate from vertical surfaces.
- Improper fastening of base flashings to walls or curbs, resulting in sagging or separation of the flashing from the vertical surface.
- Deteriorating substrates, causing base flashings to separate from the surface, or permitting water to enter behind base flashings.

G. Metal Base Flashing and Bituminous Counter flashing Problems

The use of metal base flashings in the construction of built-up roofs is not recommended. Metal base flashings easily separate from bituminous materials and stripping felts crack at the edge of the metal because of the difference in expansion coefficients between the materials. Open joints between metal pieces and deterioration of the metal are also sources for water entry. Inside and outside corners are particularly vulnerable areas. For these reasons, metal base flashings should be replaced with bituminous base flashings whenever possible.

H. Metal Counter flashing Problems

Metal counter flashings protect the top of bituminous base flashings from water entry. The most common metal counter flashing problems are:

- Counter flashings located too high above the base flashing.
- Metal deterioration caused by a lack or loss of protective coating.
- Cracks and open joints between metal pieces.
- The separation of counter flashings from vertical surfaces.
- Reglets not being sealed.
- Counter flashings not tightly fit to base flashings.

I. Penetration Flashing Problems

Penetrations through the built-up roof membrane are usually flashed in one of two ways. Individual pipes and small vents usually use flat, metal flange flashings that are placed directly on the last ply of roofing material and are stripped in with felts and mastic or felts and bitumen.

Larger penetrations and groups of smaller penetrations usually use curbs constructed of wood, metal or concrete, flashed with bituminous base flashing and metal counter flashings.

Common penetration flashing problems are:

- The failure to properly design the flashing for the penetration.
- Open or broken seams in metal curbs caused by expansion and contraction.
- Standing water behind penetration curbs caused by the omission of crickets.
- Sagging or separating base flashings caused by omission of top wood nailers.
- Missing or deteriorated counter flashing.
- Splitting or separation of the felt stripping over the edge of metal flanges.
- Improper priming and stripping of metal surfaces.
- Fastener backout and separation of the metal flashing flange from the roof around penetration flashings.
- Movement between stack vents or pipes and the flashing.

J. Drain Flashing Problems

A roof's drainage system includes the gutters, leaders, drain openings and scuppers, as well as the slope provided by the structural deck, tapered insulation, crickets and sumps. The primary function of the drainage systems is to prevent the retention of water on the roof by removing water from the roof as quickly as possible. Every roof, including so-called "dead-level" roofs, must have some provision for drainage. Further, it is important that the drainage system be kept free from debris that might interfere with the proper flow of surface water.

Many roof problems can be traced directly to inadequately designed or improperly installed drainage systems; for example, the use of only one drain; the failure to install overflow scuppers in parapet walls; the placement of drains next to support columns instead of at points of maximum deflection; loose or missing drain clamping rings. Ponded water is the principal indication of inadequate drainage, and may indicate the presence of structural defects.

K. Gravel Stop and Metal Edge Strip Problems

The primary function of gravel stops (for aggregate-surfaced roofs) and metal roof edge strips (for smooth-surface roofs) is to close off the edges of the roof to prevent wind damage or blow-offs. Another important function of gravel stops is to prevent the loss of aggregate surfacing near the edge of the roof.

The principal problems with gravel stops and metal edge strips are leakage through open or broken joints between metal pieces, and splitting of the stripping felts at metal edges. For these reasons, gravel stops and metal edge strips should be raised out the water line whenever possible by using raised wood nailers and tapered edge strips. The use of interior drainage is preferred. However, where water must drain over the metal edge, scupper cutouts are preferable to continuous edge drainage.

L. Problems with Rooftop Equipment, Signs, Braces and Supports

Often, the rooftop is used as a platform for all types of mechanical equipment, ladder struts, antennas, flag poles, signs, bracing, etc. These items should not be placed on the rooftop except when absolutely necessary. They should never be mounted or placed directly to the top of the roof membrane, as leaks beneath or adjacent to the supports for this equipment are impossible to repair. Rather, they should be mounted to a support structure or to raised curb-type supports. Flat flange or curb flashings can then be used to keep the roof watertight, and roof replacement and recovering can be done without disturbing or removing the equipment. Pitch pans, however, should not be used to keep supports watertight, and should be avoided where possible. Refer to the ARI/NRCA/SMACNA Guidelines for Roof-Mounted Outdoor Air-Conditioner Installations, and the roof membrane manufacturer for recommendations concerning the proper mounting and flashing of these items

3.2 Emergency Roof Repairs

A. General

Emergency repairs may be required after severe weather because leakage into a building can occur at any time (nights, holidays, weekends, etc.). Caution: It is generally not advisable to attempt roof repairs until after the severe weather has ceased, due to the danger of high winds and the possibility of a lightning strike. Caution should be exercised when inspecting a roof after there has been severe weather, or when there is suspect damage to the roofing assembly, because storm damage may have left the roof in a hazardous condition. If the roof condition is questionable, have a professional roofing contractor perform the inspection and necessary repairs.

In the event a professional roofing contractor is not available, and to minimize damage to the interior building finishes and contents, emergency repairs may be performed. Emergency repair procedures should be as simple as possible so they may be performed safely by non-roofing professionals. These repairs should be considered temporary. Permanent repairs should be made by a professional roofing contractor as soon as weather permits.

If the roofing system is under a manufacturer's warranty, the roofing material manufacturer, and the installing contractor should be contacted as soon as possible. The following are emergency repair guidelines that may be performed by non-roofing professionals, or by professional roofing contractors.

B. Leak Repair Procedures

There are too many different types of roofing membranes to tailor emergency repair procedures for each. However, if literature cannot be located and/or if procedures are not detailed for emergency repairs, the following guidelines are suggested:

Protect the interior: Control the spread of water in the interior by collecting the water in containers or by using plastic sheeting to protect the building contents.

Remove excess water from the roof: Check roof drains and scuppers to be certain that they are open and functional. A frequent cause of roof leakage and roof collapse is excessive pounding on the roof surface due to clogged drains and/or scuppers.

Caution should be exercised when clearing debris from drains. Significant suction forces can be created by draining water, which can suck tools, hands, or arms placed within these vortices quickly into the drain.

Locate the source of a leak: In attempting to determine the source of a leak, locate the point on the roof surface above the area of leakage in the building interior. From this point, first check

the condition of rooftop mechanical equipment, then check all flashings at terminations and penetrations. Second, if the system is ballasted remove ballast from the immediate leak area, then check the membrane surface for cuts, splits, or punctures. Finally, check the seams (laps) in the roofing membrane.

Perform emergency repairs: Once the source of a leak is located, the materials and procedures which will cause the least amount of damage to the roofing membrane should be chosen.

C. Storm and Wind Damage Repair Procedures

If roof damage is observed during a storm, it is generally not advisable to attempt repairs or damage control until after the storm because of the danger of high winds and the possibility of a lightning strike.

In some instances, however, repairs during a storm may prevent or minimize further wind damage.

Ballasted Systems: After high winds, the roof should be inspected to determine if ballast (aggregate or pavers) has been scoured (scattered), leaving areas of bare, unprotected membrane. If so, the exposed membrane should be inspected for open seams, punctures, and tears from flying debris (from rooftop mechanical equipment or from adjacent buildings). Membrane damage should be temporarily repaired before redistributing the ballast.

Temporary repairs made to the membrane should be marked on a roof plan to aid in locating them for later permanent repair. Except for areas less than 50 square feet (e.g. five feet by ten feet), inspection and permanent repairs should be performed by a professional roofing contractor.

Temporary Ballast: On ballasted single ply systems, bare areas greater than 50 square feet should be temporarily ballasted using sandbags, tires, concrete blocks, or concrete pavers. When applying temporary ballast, use caution to avoid overloading the structure.

If lightweight concrete pavers were used for the ballast and were displaced, use concrete blocks, heavy concrete pavers, or sandbags to achieve a minimum load of about 40 pounds per linear foot around the perimeter of the bare area. (The width of the temporary ballast around the perimeter to achieve the 40 pound load will depend on the weight of the ballast being used.) Place the temporary ballast on top of the remaining lightweight pavers to provide temporary protection against further wind damage until permanent repairs are made. In conjunction with setting temporary ballast of 40 pounds per linear foot around the perimeter of a bare area, also apply temporary ballast to secure the membrane when the bare area exceeds 50 square feet.

In some instances, insulation boards below the membrane are displaced. Displaced boards

should be repositioned prior to final redistribution of ballast. If membrane cutting is required to reposition the boards, it should be performed by a professional roofing contractor. When bare areas exceed 50 square feet or when ballast is blown off the roof consult with the manufacturer because, in either of these cases, design enhancements may be advisable.

D. Installation of New Penetrations or Equipment

One of the most common causes of leakage is the improper installation of new roof penetrations or equipment. To avoid roofing problems associated with new penetrations or equipment, consult with a local roofing contractor qualified to apply the type of roofing system in place, to recommend temporary tie-in steps prior to the installation of rooftop penetrations or equipment. This would include such items as TV Antennae. sign or equipment supports, skylights, plumbing soil stacks, HVAC equipment, and electrical conduits.

If the roof system is under warranty, the name and telephone number of the roofing membrane manufacturer should be written down and kept in a safe place for future reference. Notification prior to installation will allow the contractor or manufacturer to recommend how to incorporate the new penetration or equipment and how to protect the membrane warranty, if one exists.

The permanent addition of penetrations or equipment to the roofing system should be undertaken by a professional roofing contractor qualified to perform such work. The name, address, and telephone number of a roofing contractor qualified to perform the work can usually be obtained from the roofing membrane manufacturer, or RoofHelp™, if the original roofing contractor is not available. Improper installation of penetrations or equipment may void the roof warranty. If the building maintenance person is forced to install temporary flashings, set the flashing flange(s) into a continuous layer of plastic roofing cement and follow the procedures set forth above.

E. Permanent Repair Requirements

The emergency repair procedures described in the previous sections are strictly temporary in nature and must be replaced with permanent and complete repairs by a professional roofing contractor in a timely manner. If the roofing system is covered by a warranty, notify the manufacturer of the roofing membrane as soon as possible to obtain instructions and recommendations to facilitate a permanent repair.

3.3 Exterior walls

Separating the outside from the inside

The exterior walls of a house have several functions. Not only do they define the shape of a house, they also support the floors, walls, and roof. Equally important is their role in separating

the house's interior from the outdoors, and to do this effectively they have to block the weather with systems that insulate, shed water, and repel moisture and air infiltration.

While it's important to understand the different roles walls play, if we treat them and their functions separately, we miss great opportunities to improve material efficiency, operating efficiency, and overall building performance. Green building integrates them all.

Wood-frame walls

This has been the predominant choice for houses in the United States for more than three centuries, with masonry walls a distant second. But today's alternative products and techniques are more energy efficient and have lesser environmental effects.

A lot of time and materials go into building a house's walls, and with the exception of a timber frame, all that structure is covered up when the project is finished — out of sight and out of mind. Yet decisions about wall construction have consequences that last as long as the building does, including how much maintenance it will need, how energy efficient the envelope will be, and how difficult the structure will be to repair or modify.

Choosing a type of wall

Green factors

Energy efficiency. Where will the insulation go? Will the R-value (Measure of resistance to heat flow) of the completed wall be high enough? How will the wall be sealed against air leaks? A focus on energy efficiency pays dividends over time.

Sustainability issues. Can the resources used to build the structure be produced on a sustainable basis?

Local building requirements. Areas prone to hurricanes or earthquakes, for example, may have specific rules to help structures withstand extreme natural events that affect specific areas of the country.

Durability and initial cost. Keep in mind that differences in initial cost may not seem quite as dramatic when weighed against the expected life span of the house.

Combined functions. Wall systems that combine structure with finish have an inherent material efficiency advantage and should be seriously considered.

Add more foam for a better wall

The performance of almost any wall, in any climate, can be improved by adding a layer of exterior foam. If the wall already has exterior foam, it can be made greener by making the foam thicker. Remember, depending on the type of foam and thickness, foam-sheathed walls may need to dry only to the interior. For walls with more than three inches of any foam or with any thickness of foil-faced polyisocyanurate foam, never include interior polyethylene or other impermeable interior finishes.

Siding is the first line of defense

Walls are a house's "skin," and as such must protect the building from rain, wind, and sun. Siding is the first line of defense, but how siding is applied and the kind of water-resistive barrier (WRB) installed beneath it have a lot to do with how durable the walls will prove to be. The skin also includes doors and windows, important components of a home's thermal envelope but also sources of damaging air and water leaks if not properly installed.

Interior walls define spaces and affect livability

Floors and interior walls don't keep weather out, but they often do more than just define spaces. How you lay out partitions can affect airflow, solar heat gain, natural lighting, and even how efficiently pipes, wires and ducts are laid out. Structural demands may dictate where interior walls and floors go, which is why you should plan your mechanical systems and framing at the same time.

Doors can help or hinder

Exterior wood doors just under 2 inches thick don't offer much in the way of insulation, just R-2 or less. When weatherstripping is of poor quality or worn out, the effects are magnified. Doors don't represent a huge amount of wall area, but they can help nullify all the effort of insulating outside walls carefully. Insulated doors will help, along with high quality weather-stripping. Window area in doors, along with sidelights, should be kept on the small side or eliminated altogether.

Storm doors may seem like an antiquated idea, but they can be helpful in reducing energy losses while providing an extra weather barrier. They're especially useful when the primary door is exposed to the elements and not protected by a roof overhang or porch.

3.4 Causes of building collapse in Nigeria

The causes of structural failure in Nigeria are numerous, and can be complex depending on the type and complexity of the structure. The inability of the engineer to carry out proper site investigations, inability to calculate design loads accurately, inability to prevent the use of substandard building materials, inability of the engineers/planning authority to have good

design layout and inability of the engineers to understand structural analysis and design principles lead to structural failures.

The possible causes of building collapse in Nigeria are listed below:

- the absence of soil test report;
- structural designs and details handled by quacks;
- absence of co-ordination between the professional bodies and the local town planning authority;
- lack of adherence to specifications by the unqualified and unskilled personnel;
- poor and bad construction practices;
- the use of substandard building materials;
- lack of proper supervision by professionals;
- inadequate enforcement of the existing enabling building regulations;
- illegal conversion of buildings which often lead to structural deficiencies;
- flagrant disobedience of town planning regulations by developers/landlords;
- the compromising attitude of some workers of the town planning authority;
- lack of sanctions against erring professionals and landlords.

Report of soil test of any site is very useful to the architect and the structural engineer. This will enable them to specify what type of foundation is to be used. And also they will know what precaution to take in order to avoid collapse of the structure because of settlement and other foundation problems. In some cases, buildings that are above the ground floor level do not have structural designs and details, and often times lead to failure of the structure. On the whole, the professional bodies such as Nigerian Institute of Architects, the Nigerian Society of Engineers, the Nigeria Institute of builders and the Planning Authorities, who represent the government share in the blame that cause collapse of buildings in Nigeria.

4.0 Conclusion

This unit has shown the typical causes of roof problems in buildings, as well as the cause of building collapse in the nation. It has also looked into the issues of walls and procedures for handling roof problems.

5.0 Summary

Buildings are structures that serve as shelters for man, his properties and activities
Typical causes of roof problems are lack of maintenance, weathering, wind damage, improper design, flashing failure, base flashing problems, metal base flashing.

6.0 Tutor-Marked Assignment

Discuss the causes of roof problems in buildings.
Itemize the causes of building collapse in the nation.
Explain the factors to consider when choosing a type of wall

7.0 References/Further Reading

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UNIT 2 WATER SUPPLY SYSTEMS

CONTENT

1.0 Introduction

It has been observed that lack of attention to the important aspect of Operation & Maintenance (O&M) of water supply schemes in several towns often leads to deterioration of the useful life of the systems necessitating premature replacement of many system components. As such, even after creating such assets by investing millions of rupees, they are unable to provide the services effectively to the community for which they have been constructed, as they remain defunct or underutilized most of the time.

2.0 Objectives

At the end of the unit, you will be able to explain:
The objectives of operation and maintenance of sources of water supply schemes are:
The sources of water supply.
Causes of water quality problems

Factors affecting water quality
Storm water drainage

3.0 Main content

3.1 Maintenance of Sources of water supply

3.1.1 Objectives

The objectives of operation and maintenance of sources of water supply schemes are:
1. The water sources should be able to supply water which is safe to drink after treatment.
2. The water sources should be perennial and should ensure sustainable yield.
3. The quality of water should not be allowed to deteriorate.
4. There should be least or no disruption in water supply systems due to depletion of water sources.
5. There should be least possible expenditure on the repair and maintenance of the water sources.
6. Proper record of the water sources should be maintained so that their time to time performance could be known.
7. A methodical long-range programme of source inspection and monitoring should be introduced to identify problems so that a regular programme of preventive maintenance can guarantee reliability and continuity.
8. Survey maps shall be obtained or prepared for all possible sources of water like rivers, reservoirs, lakes, canals, wells, and springs etc. The maps already available should be updated from time to tim

3.1.2 Sources

Natural sources

Rain, snow, hail and sleet are precipitated upon the surface of the earth as meteorological water and may be considered as the original source of all the water supplied. Water, as source of drinking water, occurs as surface water and ground water. Three aspects should be considered in appraising water resources e.g.,
the quantity,
the quality, and
the reliability of available water.

Surface water

Surface water accumulates mainly as a result of direct runoff from precipitation (rain or snow). Precipitation that does not enter the ground through infiltration or is not returned to the

atmosphere by evaporation, flows over the ground surface and is classified as direct runoff. Direct runoff is water that drains from saturated or impermeable surfaces, into stream,channels, and then into natural or artificial storage sites (or into the ocean in coastal areas).

The amount of available surface water depends largely upon rainfall. When rainfall I limited, the supply of surface water will vary considerably between wet and dry years.
Surface water supplies may be further divided into river, lake, and reservoir supplies. Dams are constructed to create artificial storage. Canals or open channels can be constructed to convey surface water to the project sites. The water is also conveyed through pipes by gravity or pumping.
In general, the surface sources are characterized by soft water, turbidity, suspended solids, some colour and microbial contamination.

Ground water

Part of the precipitation that falls infiltrates the soil. This water replenishes the soil moisture, or is used by growing plants and returned to the atmosphere by transpiration. Water that drains downward (percolates) below the root zone finally reaches a level at which all the openings or voids in the earth's materials are filled with water. This zone is called the zone of saturation. The water in the zone of saturation is called the ground water.

Ground waters are, generally, characterized by higher concentrations of dissolved solids, lower levels of colour, higher hardness (as compared with surface water), dissolved gasses and freedom from microbial contamination.
A well that penetrates the water table can be used to extract water from the ground basin.
The extraction of ground water is mainly by:
1. Dug well with or without steining walls
2. Dug cum bore wells
3. Cavity Bore
4. Radial collector wells
5. Infiltration galleries
6. Tube wells & bore wells.

Ground water that flows naturally from the ground is called a spring.

3.1.3 Surface water management and major sources of pollution

Use of surface reseviour

Methods of managing lakes and reservoirs used for domestic supplies vary widely depending on local conditions. In addition to serving domestic water needs, a reservoir may be used for flood control purposes, for hydroelectric power generation, for regulating releases, for recreational purposes or for providing water for agricultural, municipal and industrial uses.

The amount and type of public use allowed on reservoirs also varies according to individual situations.
The methods of treating water depend upon raw water quality and range from disinfection only to complete treatment.

3.1.4 Factors affecting water quality

Some of the factors affecting water quality within the Reservoirs and Lakes are:
Waste water, agricultural runoff, grazing of livestock, drainage from mining areas, runoff from urban areas, domestic and industrial discharges may all lead to deterioration in physical, chemical, or biological/bacteriological water quality within a reservoir.
2. Farming practices
3. Fish die off.
4. Natural factors:

- Climate: temperature, intensity and direction of wind movements as well as the type, pattern, intensity and duration of precipitation,
- Watershed and drainage areas: geology, topography, type and extent of vegetation, and use by native animals;
- Wild fires;
- Reservoir Areas: geology, land form including depth, area and bottom topography and plant growth at the time the reservoir is filled.

3.1.5 Causes of water quality problems

Nutrients
Moderate or large quantities of nutrients such as phosphates, nitrates and organic nitrogen compounds may act as a fertilizer in a reservoir to stimulate the growth of algae which may cause algal bloom.
The problems related to algal blooms are:
i) Taste, odour and colour,
ii) Increased pH
iii) Shortened filter runs of treatment plants,
iv) Dissolved Oxygen variation,
v) Organic loading.

Thermal stratification
Thermal stratification develops in lakes and reservoirs when the surface water begins to warm. The warm surface waters expand and become lighter than the lower waters. The water temperature difference causes variation in water densities, which create resistance to mixing. This ultimately results in Anaerobic Conditions in lower zones.

Anaerobic conditions

Anaerobic conditions make water unpalatable due to colour and odour which are difficult to treat. Another major problem in anaerobic water occurs when iron and/or manganese exist in bottom sediments in the reduced state and pass into solution. Due to the presence of either iron or manganese in appreciable quantities within the domestic supply the water looks reddish, brown or just plain dirty and may stain clothes during washing and stain porcelain fixtures.

3.1.6 Ground water management and major sources of pollution

Use of ground water

Important requirements of managing ground water are:
1. Regulation of Ground Water,
2. Prevention of pollution of ground water,
3. Conservation of ground water,
4. Effective preventive maintenance,
5. Artificial recharge of ground water.

Major sources of pollution

Landfills,
ii) Mining activities,
iii) Abandoned sites,
iv) Abandoned wells,
v) Agricultural practices,
vi) Underground storage tanks and pipeline,
vii) Increased salinity and salt water encroachment,
viii) Septic tank and soakage pit system,
ix) Petroleum exploration,
x) Radioactive wastes.

3.1.7 Sanitary survey of water sources

The sanitary survey should include the location of all potential and existing health hazards and the determination of their present and future importance.
The information furnished by a sanitary survey is essential to evaluating the bacteriological and chemical water quality data. It is desirable to
i) Identify potential hazards, and
ii) Determine factors which affect water quality.
Following are some of the probable essential factors, which should be investigated in a sanitary survey.

Surface water

i) Proximity to watershed and character of sources of contamination including industrial wastes, oil field brines, acid waters from mines, sanitary landfills, and agricultural drain waters.
ii) Population and wastewater collection, treatment and disposal on the watershed.
iii) Closeness of sources of fecal pollution to intake of water supply.
iv) Wind direction and velocity data; drift of pollution; algal growth potential in case of lake or reservoir supplies.
v) Character and quality of raw water.
vi) Protective measures in connection with the use of watershed to control fishing, boating, swimming, wading, ice cutting, and permitting animals on shoreline areas.
vii) Efficiency and constancy of policing activities on the watershed and around the lake.

Ground water

i) Nature, distance and direction of local sources of pollution.
ii) Possibility of surface-drainage water entering the supply and of wells becoming flooded.
iii) Drawdown when pumps are in operation, recovery rate when pumps are off.
iv) Methods used for protecting the supply against contamination from wastewater collection and treatment facilities and industrial waste disposal sites.
v) Presence of an unsafe supply nearby and the possibility of cross connections causing a danger to the public health.
vi) Disinfection: equipment, supervision, test kits, or other types of laboratory control.

3.2 Storm water drainage

A storm drain, storm sewer or storm water drain (Australia and or drainage well system or simply a drain or drain system is designed to drain excess rain and ground water from paved streets, parking lots, sidewalks and roofs. Storm drains vary in design from small residential dry wells to large municipal systems. They are fed by street gutters on most motorways, freeways and other busy roads, as well as towns in areas which experience heavy rainfall, flooding and coastal towns which experience regular storms

There are three principal ways to dispose of rain water from roots, courtyards and paved areas. They include storm water sewers water, soak away and collection in storage tanks. Storm sewers, which may consist of open channels, are more common in urban or densely built-up areas, and they normally serve to take the drainage from high ways as well as from buildings.

3.2.1 Discharge into Storm water channels or pipes

Where a storm water pipe or ditch exists within reasonable distance of the property on a building site, the drainage from the roof and from any paved or enclosed areas must be collected and discharged into the storm water pipe or ditch. In many cases, the ditches or

channels are laid alongside the road just outside the boundary of the property and are the responsibility of the highway authority, which may have its own connection requirements that should be incorporated into the plumbing code of practice. For piped sewers, any connecting drains will need to comply with requirements similar to those that apply to drains carrying wastes to the soil sewer. The saddle or junction connection must be made under the direction of alicen sed plumber or qualified person and must not obstruct the flow of the sewer or the drain. The drain itself must be laid to a self-cleansing gradient and must be properly jointed to prevent the access of tree roots or of the surrounding soil. However, the materials may not need to be of as high a quality and the drain may not need to undergo a test for watertightness.

Discharges into an open drainage channel may be through a pipe or through a subsidiary channel. Care must be taken to prevent erosion and damage to the channel lining. Subsidiary channels and pipes will usually be required to discharge in the direction of flow of the main channel at a level above that of the normal drainage flow. If the main channel is unlined and the discharge into it is through a pipe, a protective concrete apron may be required at the point of discharge. Subsidiary channels should be laid to a self-cleansing gradient, but this, together with requirements relating to diameter, may be modified according to soil conditions.

Discharges into storm water sewers or channels must not contain any human waste, sullage water or other substances that may cause a nuisance or injury6t to health. In tropical countries having a long dry season, small discharges, such as a drain from a single tap, may increase the risk of infestation because protozoan or other parasites may breed in shallow pools or waterlogged ground. Where a channel or drain may remain virtually dry for perhaps months at a time small discharges may cause considerable nuisance, especially if they contain deleterious matter such as oil or grease. The authority may make special provisions to avoid this by requiring that a paved area where cars might be washed should be provided with a petrol, sand or oil trap and plate separator.

These dangers must be balanced against the desirability of dealing with clean water discharges without requiring their being connected to human waste sewers. Such instances as the drainage from air-conditioning units and of cooling water from a dairy or small industry, or the hosing down of a warehouse floor, should not call for disposal treatment, but the volume of water may be too great to be dealt with by soakaways.

3.2.2 Combined Sewers

Some sewerage authorities operate systems of combined sewers into which both sewage and rain water may be admitted. These systems were installed in the past but are not currently recommended. Combined sewers are not economical because much greater flows must be provided for in the sewers and in the sewage disposal plant. These systems are also hazardous too health because storm over-flow must be provided to handle heavy downpours. Those overflows are necessary to relieve surcharge of the system at peak flows, and they may permit untreated sewage waste to discharge into open watercourses.

Combined sewers are rarely installed today, but they are often found in congested areas of older cities where physical and financial constraints may prevent the laying of a second system of pipes to carry off rainwater. Wastewater authorities provide separate sewerage facilities for new developments, as every additional connection to a combined sewer makes its ultimate replacement more difficult and expensive.

3.2.3 Soakaways

Rain water from sloping roofs must be collected in gutters and carried to ground level by downpipes or down spouts. Flat roofs should be drained by vertical pipes and the drainage should be conveyed by pipe to a surface water sewer or to a suitable soakaway. Except when a roof is thatched, gutters and downpipes or downspouts should always be considered essential because they prevent roof runoff falling from a height in concentrated sheets or streams, which can cause erosion close to the foundations of the building. If guttering cannot be installed a concrete path or apron should be laid immediately under the caves, and should be sloped to carry the water away from the foundations.

The sizes of gutters and downpipes or downspouts will depend on the area of roof to be drained, the slope of the gutter and the intensity of rainfall expected. To insist on guttering capable of dealing with the worst storms would be unreasonably expensive in many areas, and would be little overall benefit when the entire surrounding ground was being subjected to a downpour. The authority should calculate the average storm intensity expected and fix their standards accordingly.

Whether or not the use of soakaways is a practical option will depend to a great extent on the nature of the soil. Soakaways should be well clear of the building foundations, and should consist of holes deep enough to penetrate the subsoil, filled almost to the surface with hard material such as broken stone, concrete or brick that will not soften when wet. Where the water table is high, it may be preferable to use shallow ditches filled with hard rubble instead of soakaway pits.

3.2.4 Rainwater Tanks

When rainwater is being stored for domestic use the tanks should be of water-tight construction, covered with material that is weatherproof, insect proof and vermin proof, ventilated, and supplied with access for regular inspection and cleaning. There are many standards throughout the world. For more technical detail on this subject, please check your area for its standards. Rainwater storage tanks are a valuable supplement to mains supplied in arid areas and may even substitute for a mains supply. A system of gutters and collector piping must also be watertight, and the contents must be protected against pollution from dust and refuse blown by the wind, entry by birds and vermin, and mosquito breeding. If the rainwater is supplementary to a mains supply it may be lifted from the principal storage tank via a pump, from where it is piped to all fixtures. If there is no mains drinking-water supply then water for all purposes will need to be taken from the rainwater storage tank. Strict precautions should be

observed in such cases to maintain the quality of the stored water. A wash-out drain tap or diverter should be included in the collector pipe so that the first washings of the roof at the beginning of the rains can be run to waste (these washings will be contaminated with bird droppings, windblown dust, etc.). It is at this time that the storage tank should be given its annual cleaning, a process that is much easier if the tank is built in two sections that can be emptied and cleaned in turn.

3.2.5 Rainwater Intensity and Roof Drainage

The variable factors in selecting the size of rainwater guttering are:

- The anticipated intensity of the rainfall;
- The slope at which the gutters are to be fixed;
- The area of the roof surface drained by each gutter.

From a practical point of view an upper limit of rainfall intensity must be assumed. During downpours of higher than the assumed concentration, surplus rainwater will overflow the guttering but will add comparatively little to the general deluge.

The slope of gutter will be limited by the vertical gap between the caves and the gutter at the lower end of the run. If this gap is much greater than the diameter of the channel, small discharges will be blown clear of the gutter by quite moderate winds. A slope of 1% (0.125 inch per 1 foot run) may be taken as an average, in which case a caves length of 10 metres will result in a vertical gap of 10 centimetres. Lengths well over this will require two or more vertical downspouts with consequent increase in cost.

3.3 Operation and Maintenance scenario

Some of the key issues contributing to the poor Operation & Maintenance have been identified as follows:
i) Lack of finance, inadequate data on Operation & Maintenance
ii) Inappropriate system design; and inadequate workmanship
iii) Multiplicity of agencies, overlapping responsibilities
iv) Inadequate training of personnel
v) Lesser attraction of maintenance jobs in career planning
vi) Lack of performance evaluation and regular monitoring
vii) Inadequate emphasis on preventive maintenance
viii) Lack of operation manuals
ix) Lack of appreciation of the importance of facilities by the community
x) Lack of real time field information etc.
Therefore, there is a need for clear-cut sector policies and legal framework and a clear demarcation of responsibilities and mandates within the water supply sub-sector.

It has been observed that in the case of pumping schemes, about 20 to 40% of the total annual Operation & Maintenance cost goes towards the personnel (Operation & Maintenance Staff), 30 to 50% of the cost is incurred on power charges and the balance is utilized for consumables, repairs and replacement of parts and machinery and miscellaneous charges. In most cities, the tariffs are so low that they do not even cover the annual Operation & Maintenance cost. Measures such as control of unaccounted for water (UFW) and metering of the water connections, may help reduce the wastage of water and increase the revenue to the local body to the maximum extent.

4.0 Conclusion

It has been shown that it is very necessary to drain excess water off pavements, parking lots, sidewalks and roofs. It is also important to maintain our sources of water supply to avoid water quality problems.

5.0 Summary

Sources of water supply are surface water, ground water and natural water.
The causes of water quality problem are nutrients, thermal stratification and anaerobic conditions
Factors to be investigated in sanitary survey are surface water and ground water.
A storm water drainage is simply a drain or drain system designed to drain excess rain and ground water from paved streets, parking lots, sidewalks and roofs.

6.0 Tutor-Marked Assignment

Explain the terms
- Storm water drainage and ground water
State the objectives of the maintenance of water supply sources.
Discuss the causes of water quality problem.

7.0 References/Further Reading

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UNIT 3 Fuels used in hotels

CONTENT

1.0 Introduction

Any source of heat energy is termed as fuel. The term fuel includes all combustible substances obtainable in bulk. Fuel is a substance which produces a large amount of heat when burnt with oxygen of atmospheric air. Fuels are primarily used for heating purposes.

2.0 Objective

At the end of this unit, you will be able to explain the types of fuels in use in the hotel industry

3.0 Main content

3.1 Types of fuel

3.1.1 Solid Fuels: Coal, peat, lignite, wood, coke, anthracite, bituminous.

Advantages of solid fuels

- **Low running costs** - Solid fuel is an efficient and economical method of heating your home 24 hours a day.
- **The healthy option** - Solid fuel heating can greatly reduce condensation, eliminating household mould often associated with 'on/off' fires. Medical research has also shown that solid fuel heating can reduce the risk of hay fever, asthma and eczema.

  Homes with solid fuel heating are better ventilated than those with other forms of

heating; the very use of a chimney will induce ventilation into a home drawing in fresh air and removing the 'polluted' air.

- **Wide range of fuels** - From coal to smokeless, there's a solid fuel to suit your appliance in all parts of the country.
- **Convenient and easy to use** - Modern pre-set controls keep your home at the desired temperature throughout the day.
- **Guaranteed heat** - With solid fuel heating you can hold stock, ensuring that your home will be warm even in the most adverse weather conditions. Whatever the weather, you don't need to worry about supply failures or power cuts. You can even boil a kettle on a flat-top stove.

Disadvantages of solid fuels:

- Their ash content is high
- Their large proportion of heat is wasted during combustion, combustion efficiency is low.
- They burn with clinker form
- Their cost of handling is high.
- heir combustion operation cannot be controlled easily.
- Their caloric value is higher
- They require excess air for complete combustion
- They are dirty
- Large space is required for storage
- Require huge chimney fior the gases.

3.1.2. Liquid Fuels: Petrol, Diesel, Kerosene, Coal tar, Molasses, Spirit, Shale Oil.

Advantages

- Low excess gas is used
- It is possible to build high capacity plants for burning oil.
- Storage space is small.
- Handling during transportation is easy
- Liquid fuels do not deteriorate during storage.
- Change in load can be suitably made.
- Ash and refuse are small, they burn without forming ash and clinker.
- Operational labour is less.
- System is neat and clean.
- They have higher caloric value.
- Their finding is easy
- Their flame can be controlled.
- Loss of heat to chimney is low in these gases

Disadvantages

- Heat produced is costly
- The cost is high
- Costly storage tanks can be needed.
- Greater chances of fire hazard
- They give bad odour.
- Burners: choking is
- possible

3.1.3 Gaseous Fuels: Methane, Coal gas, Producer gas, compressed blast furnace gas, town gas, cock oven gas, water gas, compressed butane

D. Electricity: Other classification of fuels

(i) Naturally Occurring/Primary fuels: Wood, Peat, lignite, Anthracite, Oils, Shale, petroleum.
(ii) Prepared/Secondary, derived gas fuels:
Charcoal, semi coke, coke, Coal tar, Spirit, Kerosene, diesel, gasoline, Producer gas, water gas, compressed butane.

Good/Ideal Fuel- which
(a) Has low ignition point
(b) Has high calorific value
(c) Produces minimum quantity of smoke
(d) Should be easy to store & convenient for transportation & is economic.
(e) Has moderate rate of combustion
(f) Has low content of non Volatile material
(g) Produces no poisonous products on combustion
(h) Is readily & plentifully available

3.1.4 Alternative, Renewable Energy

It's no secret that alternative energy is more popular when oil and electric prices are high. Perhaps it should be popular all of the time. Environmental studies on power generation have shown that renewable energy is the most dynamic of today's global energy market. Power generators using renewable, sustainable energy sources don't burn fuels in the production of electricity, thus reducing atmosphere- harming emissions. Renewable energy sources, such as biomass, small hydro, solar, wind, geothermal, tidal energy and photovoltaic conversion systems, allow you a broader freedom of operation. The concept of alternative energy excludes fossil fuels.

Alternative energy is cleaner than fossil fuel energy, is renewable, gives you independence from foreign oil, helps control rising electric bills, and allows development of new venues in a more areas. Even if you only use alternative energy as back up during outages or peak hours, it is a good option to provide for your property.

3.1.5 Synthetic fuel

Synthetic fuel or **synfuel** is a liquid fuel obtained from coal, natural gas, oil shale, or biomass. It may also refer to fuels derived from other solids such as plastics or rubber waste. It may also (less often) refer to gaseous fuels produced in a similar way. Common use of the term "synthetic fuel" is to describe fuels manufactured via Fischer Tropsch conversion, methanol to gasoline conversion, or direct coal liquefaction.

Security considerations

A central consideration for the development of synthetic fuel is the security factor of securing domestic fuel supply from domestic biomass and coal. Nations that are rich in biomass and coal can use synthetic fuel to off-set their use of petroleum derived fuels and foreign oil.

Environmental considerations

The environmental footprint of a given synthetic fuel varies greatly depending on which process is employed, what feedstock is used, what pollution controls are employed, and what the transportation distance and method are for both feedstock procurement and end-product distribution.

In many locations, project development will not be possible due to permitting restrictions if a process design is chosen that does not meet local requirements for clean air, water, and increasingly, lifecycle carbon emissions.

Sustainability

One concern commonly raised about the development of synthetic fuels plants is sustainability. Fundamentally, transitioning from oil to coal or natural gas for transportation fuels production is a transition from one inherently depletable geologically limited resource to another.

One of the positive defining characteristics of synthetic fuels production is the ability to use multiple feedstocks (coal, gas, or biomass) to produce the same product from the same plant. In the case of hybrid BCTL plants, some facilities are already planning to use a significant biomass component alongside coal. Ultimately, given the right location with good biomass availability, and sufficiently high oil prices, synthetic fuels plants can be transitioned from coal or gas, over to a 100% biomass feedstock. This provides a path forwards to a renewable fuel source and

possibly more sustainable, even if the plant originally produced fuels solely from coal, making the infrastructure forwards-compatible even if the original fossil feedstock runs out.

Some synthetic fuels processes can be converted to sustainable production practices more easily than others, depending on the process equipment selected. This is an important design consideration as these facilities are planned and implemented, as additional room must be left in the plant layout to accommodate whatever future materials handling and gasification plant change requirements might be necessary to accommodate a future change in production profile.

Home fuel cell

A home fuel cell, also called micro combined heat and power (microCHP) and microgeneration, is a residential-scaled energy system. A home fuel cell is an alternative energy technology that increases efficiency by simultaneously generating power and heat from one unit, on-site within a home. This allows a residence to reduce overall fossil fuel consumption, reduce carbon emissions and reduce overall utility costs, while being able to operate 24 hours a day.

Combined heat and power (CHP) fuel cells have demonstrated superior efficiency for years in industrial plants, universities, hotels and hospitals. Residential and small-scale commercial fuel cells are now becoming available to fulfill both electricity and heat demand from one system. Fuel cell technology in a compact system converts natural gas, propane, and eventually biofuels—into both electricity and heat, producing carbondioxide (and small amounts of NOx) as exhaust. In the future, new developments in fuel cell technologies will likely allow these power systems to run off of biomass instead of natural gas, directly converting a home fuel cell into a renewable energy technology.

Uses

Most home fuel cells fit either inside a mechanical room or outside a home or business, and can be discreetly sited to fit within a building's design. The system operates like a furnace, water heater and electricity provider—all in one compact unit. Some of the newer home fuel cells can generate anywhere between 1 to 5 kilowatts (1.3 to 6.7 hp)—optimal for larger homes (370 square metres (4,000 sq ft) or more), especially if pools, spas and radiant floor heating are in plans. Other uses include sourcing of back-up power for essential loads like refrigerator/freezers, electronics/computers and wine cellars.

Deploying the system’s heat energy efficiently to a home or business' hot water applications displaces the electricity or gas otherwise burned to create that heat, further reducing overall energy bills. Retail outlets like fast food chains, coffee bars and health clubs gain operational savings from hot water heating.

Environmental Impacts

Because fuel cells generate electricity and heat on site, the chemical conversion of hydrocarbon fuels into energy is substantially more efficient than comparable grid-connected systems and heating by burning fuel Fuel cells provide a significant net reduction in CO_2—about one-third lighter carbon footprint is possible when both heat and electricity are used The system also reduces other harmful emissions produced by burning fuel at conventional power or heat generation sources The lower carbon footprint supports many state goals and initiatives to address climate change impacts

Installation

Home fuel cells are designed and built to fit in either an interior mechanical room or outside—running quietly in the background 24/7. Connected to the utility grid through the home's main service panel and using net metering, the home fuel cells easily integrate with existing electrical and hydronic systems and are compliant with utility interconnection requirements. In the event of grid interruption the system automatically switches to operate in a grid-independent mode to provide continuous backup power for dedicated circuits in the home while the grid is down. It can also be modified to run off-the-grid, if desired.

Fuel cell and the hospitality industry

Reliable and "green" power sources are invaluable commodities in the hospitality industry because interruptions to the grid can lead to significant loss of revenue. Hotels are turning to on-site fuel cell power plants as a reliable source of baseload power. FuelCell Energy power plants are ideal for hotel properties, as the Ultra-Clean power plants generate not only electricity for the facility, but also considerable interest from hotel guests who appreciate the "green" aspect of the plant. In addition, FuelCell Energy's Direct FuelCell® (DFC®) power systems are low profile and generate little noise.

As an added benefit to the Ultra-Clean electrical power generation capabilities of the system, waste heat produced within the fuel cell can be used for the hotel's hot water or space heating needs, reducing the need for boilers or water heaters on the property. The heat can even be used to heat large swimming pools that are typical of hotel properties. Review one of FuelCell Energy's installation spotlights for more information.

Biofuels

Biofuels have been around as long as cars have. At the start of the 20th century, Henry Ford planned to fuel his Model Ts with ethanol, and early diesel engines were shown to run on peanut oil.

But discoveries of huge petroleum deposits kept gasoline and diesel cheap for decades, and biofuels were largely forgotten. However, with the recent rise in oil prices, along with growing concern about global warming caused by carbon dioxide emissions, biofuels have been regaining popularity.

Gasoline and diesel are actually ancient biofuels. But they are known as fossil fuels because they are made from decomposed plants and animals that have been buried in the ground for millions of years. Biofuels are similar, except that they're made from plants grown today.

Much of the gasoline in the United States is blended with a biofuel—ethanol. This is the same stuff as in alcoholic drinks, except that it's made from corn that has been heavily processed. There are various ways of making biofuels, but they generally use chemical reactions, fermentation, and heat to break down the starches, sugars, and other molecules in plants. The leftover products are then refined to produce a fuel that cars can use.

Countries around the world are using various kinds of biofuels. For decades, Brazil has turned sugarcane into ethanol, and some cars there can run on pure ethanol rather than as additive to fossil fuels. And biodiesel—a diesel-like fuel commonly made from palm oil—is generally available in Europe.

On the face of it, biofuels look like a great solution. Cars are a major source of atmospheric carbon dioxide, the main greenhouse gas that causes global warming. But since plants absorb carbon dioxide as they grow, crops grown for biofuels should suck up about as much carbon dioxide as comes out of the tailpipes of cars that burn these fuels. And unlike underground oil reserves, biofuels are a renewable resource since we can always grow more crops to turn into fuel.

Unfortunately, it's not so simple. The process of growing the crops, making fertilizers and pesticides, and processing the plants into fuel consumes a lot of energy. It's so much energy that there is debate about whether ethanol from corn actually provides more energy than is required to grow and process it. Also, because much of the energy used in production comes from coal and natural gas, biofuels don't replace as much oil as they use.

For the future, many think a better way of making biofuels will be from grasses and saplings, which contain more cellulose. Cellulose is the tough material that makes up plants' cell walls, and most of the weight of a plant is cellulose. If cellulose can be turned into biofuel, it could be more efficient than current biofuels, and emit less carbon dioxide.

4.0 Conclusion

This unit has discussed the importance of fuels in the hotel industry, and their various applications.

5.0 Summary

The types of fuels are: solid fuel, liquid fuels, and gaseous fuels. Others include synthetic fuel, biofuels, home cell fuel, etc

6.0 Tutor-Marked Assignment

What is alternative renewable energy?
Discus fuel cell in relation to the hotel industry.
Itemize
i. the disadvantages of solid fuel
ii. the types of fuel

7.0 References/Further Reading

Goyal, N.C. and Arora, K.C. (1996) A textbook of hotel maintenance. Standard Publishers, Delhi.

Unit 4 FIRE AND FIREFIGHTING

CONTENT

CONTENT

1.0 Introduction

Hotels don't highlight fire safety like they do dining facilities and similar features. Apparently, this is out of concern that references to fire safety will accentuate the negative - the possibility of a fire. But fire safety is a bona fide concern. For one thing, individual travelers have concerns about their fire safety. For another, people who arrange travel and meetings for employees or organizations may take on a liability if they neglect to confirm the level of fire safety equipment. Therefore, the issue of fire safety in hotels should be taken very seriously, and all precautionary measures put in place.

2.0 Objectives

At the end of this unit, you will be able to explain:
The classes of fire
The hazards caused by fire
Firefighting, the equipment and duties of firefighting personnel

3.0 Main content

3.1 Classes of fire

i. Ordinary combustibles

Ordinary combustible fires are the most common type of fire, and are designated **Class A** under both systems. These occur when a solid, organic material such as wood, cloth, rubber, or some plastics become heated to their ignition point. At this point the material undergoes combustion and will continue burning as long as the four components of the fire tetrahedron (heat, fuel, oxygen, and the sustaining chemical reaction) are available.

ii. Flammable liquid and gas

These are fires whose fuel is flammable or combustible liquid or gas. The US system designates all such fires **Class B**. These fires follow the same basic fire tetrahedron (heat, fuel, oxygen, chemical reaction) as ordinary combustible fires, except that the fuel in question is a flammable liquid such as gasoline, or gas such as natural gas.

iii. Electrical

Electrical fires are fires involving potentially energized electrical equipment. The US system designates these **Class C**; the Australian system designates them **Class E**. This sort of fire may be caused by, for example, short-circuiting machinery or overloaded electrical cables. These fires can be a severe hazard to firefighters using water or other conductive agents: Electricity may be conducted from the fire, through water, the firefighter's body, and then earth. Electrical shocks have caused many firefighter deaths.

iv. Metal

Certain metals are flammable or combustible. Fires involving such are designated **Class D** in both systems. Examples of such metals include sodium, titanium, magnesium, potassium, uranium, lithium, plutonium, and calcium. Magnesium and titanium fires are common. When one of these combustible metals ignites, it can easily and rapidly spread to surrounding ordinary combustible materials.

With the exception of the metals that burn in contact with air or water (for example, sodium), masses of combustible metals do not represent unusual fire risks because they have the ability to conduct heat away from hot spots so efficiently that the heat of combustion cannot be maintained. This means that it will require a lot of heat to ignite a mass of combustible metal. Generally, metal fire risks exist when sawdust, machine shavings and other metal 'fines' are

present. Generally, these fires can be ignited by the same types of ignition sources that would start other common fires.

Metal fires represent a unique hazard because people are often not aware of the characteristics of these fires and are not properly prepared to fight them. Therefore, even a small metal fire can spread and become a larger fire in the surrounding ordinary combustible materials.

v. Cooking oils and fats (kitchen fires)

Fires that involve cooking oils or fats are designated **Class K** under the American system, and **Class F** under the European/Australasian systems. Though such fires are technically a subclass of the flammable liquid/gas class, the special characteristics of these types of fires are considered important enough to recognize separately.

3.1.2 Hazards caused by fire

The primary risk to people in a fire is not the flames themselves, but rather smoke inhalation which, contrary to popular belief, is the most common cause of death in a fire. The risks of smoke include:

- suffocation due to the fire consuming or displacing all of the oxygen from the air
- poisonous gases produced by the fire as products of combustion
- aspirating heated smoke that can burn the inside of the lungs and damage their ability to exchange gases during respiration

To combat these potential effects, firefighters carry self-contained breathing apparatus (SCBA; an open-circuit positive pressure compressed air system) to prevent smoke inhalation. These are not oxygen tanks; they carry compressed air. SCBA usually hold 30 to 45 minutes of air, depending upon the size of the tank and the rate of consumption during strenuous activities.

Obvious risks are associated with the immense heat. Even without direct contact with the flames, conductive heat can create serious burns from a great distance. There are a number of comparably serious heat-related risks: burns from radiated heat, contact with a hot object, hot gases (e.g., air), steam and hot and/or toxic smoke. Firefighters are equipped with personal protective equipment (PPE) that includes fire-resistant clothing (Nomex or polybenzimidazole fiber (PBI)) and helmets that limit the transmission of heat towards the body. No PPE, however, can completely protect the user from the effects of all fire conditions.

Heat can make flammable liquid tanks violently explode, producing what is called a BLEVE (boiling liquid expanding vapor explosion). Some chemical products such as ammonium nitrate fertilizers can also explode. Explosions can cause physical trauma or potentially serious blast or shrapnel injuries.

Heat causes human flesh to burn as fuel, causing potentially severe medical problems. Depending upon the heat of the fire, burns can occur in a fraction of a second.

3.2 Firefighting

What is firefighting?

Firefighting is the act of extinguishing fires. A firefighter fights fires to prevent loss of life, and/or destruction of property and the environment. Firefighting is a highly technical skill that requires professionals who have spent years training in both general firefighting techniques and specialized areas of expertise.

3.2.1 Firefighters' duties

Firefighters' goals are to save life, property and the environment. A fire can rapidly spread and endanger many lives; however, with modern firefighting techniques, catastrophe is usually, but not always, avoided. To prevent fires from starting, a firefighter's duties include public education and conducting fire inspections.

Because firefighters are often the first responders to people in critical conditions, firefighters provide many other valuable services to the community they serve, such as:

- Emergency medical services, as technicians or as licensed paramedics, staffing ambulances;
- Hazardous materials mitigation (HAZMAT);
- Vehicle Rescue/Extrication;
- Search and rescue;
- Community disaster support.
- Fire Risk Assessments

Additionally, firefighters also provide service in specialized fields, such as:

- Aircraft/airport rescue;
- Wildland fire suppression;
- Shipboard and military fire and rescue;
- Tactical paramedic support ("SWAT medics");
- Tool hoisting;
- High Angle Rope Rescue;
- Swiftwater Rescue.

3.2.2 Firefighting equipment

Some known firefighting equipment include:

a. Fire extinguishers

The fire extinguishers are classified to correspond with various kinds of fire. Color code decides the kind of the extinguisher and corresponding function. The types of fire extinguishers include:

Water Fire Extinguishers:

These are the cheapest and most widely used fire extinguishers. They are used for Class A fires. Not suitable for Class B (Liquid) fires, or where electricity is involved.

Foam Fire Extinguishers:

These are more expensive than water, but more versatile. Used for Classes A and B fires. Foam spray extinguishers are not recommended for fires involving electricity, but are safer than water if inadvertently sprayed onto live electrical apparatus.

Dry Powder Fire Extinguishers:

These are often termed the 'multi-purpose' extinguisher, as it can be used on classes A, B and C fires. They are best for running liquid fires (Class B). They will also efficiently extinguish Class C gas fires, but it can be dangerous to extinguish a gas fire without first isolating the gas supply. Special powders are available for class D metal fires.

Note that when this extinguisher is used indoors, powder can obscure vision or damage goods and machinery. It is also very messy.

CO2 Fire Extinguishers:

Carbon Dioxide is ideal for fires involving electrical apparatus, and will also extinguish class B liquid fires, but has no post fire security and the fire could re-ignite.

Wet chemical Specialist extinguisher.

This is a specialist fire extinguisher for use on Class D fires - metal fires such as sodium, lithium, manganese and aluminum when in the form of swarf or turnings.

Colour Coding

Prior to 1st Jan 1997, the code of practice for fire extinguishers in the UK was BS 5423, which advised

the colour coding of fire extinguishers as follows:

Water - Red
Foam - Cream
Dry Powder - Blue
Carbon Dioxide (CO_2) - Black

b. Personal Equipment

The set of the personal protection equipment is given to each firefighter. The personal protection equipment primarily comprises of the protective gear like jackets, pants and boots. Generally, jacket & pant consists of the 3-layer design with the reflective stripes on heat and tear resistant shell. Boots contain the steel insole that helps to prevent firefighter's foot from getting cut by the nails and other debris.

c. Self contained apparatus

One more important equipment that is a must have for firefighter is "self contained breathing apparatus". Self contained apparatus constitutes the canister that allows firefighter to breathe 15 - 60 minutes, based on the level of the activity that he is involved at. This apparatus has an Alarm Safety System that gets activated after thirty seconds of the non movement. The device also helps the firefighters to call for help if there is an urgency, and they are not able to make it to the radio.

d. Fire truck

The fire truck is a vital equipment, which generally helps in collection & distribution of water. It transports firefighters and holds their requisite equipments like first aid gear, hoses, water fittings, as well as ancillary gear.

e. Gear

Other kinds of gear that are used by the firefighters comprise of axes, shovels and pipe poles to actually examine ceilings and walls of buildings for the rolling fires. The firefighter as well carries around 150 feet of rope that is used to transport the equipment for search and rescue operations.

f. Accessories

The firefighters use various protective accessories like leather work gloves or heat resistant gloves, specialized boots, wristlets, hoods, and different types of the goggles. They also use hoses differing in sizes, ranging from one to four inches in diameter depending on circumstances.

Fire safety is implemented fully by installing sufficient number of firefighting equipment that can be

relied on during fire emergency cases.

The fire will ravage fast and destroy the property within minutes without any appropriate containment and extinguishing measures. Immediate action is vacating that area and prompting the people to go to safer areas outside premises.

Fire safety

Most hotels adopt policies where automatic fire detection and alarm systems are employed. These offer significant advantages in terms of speed of detection and the capacity for orderly evacuation. One of the problems faced by a hotel is the sheer diversity of its guests. There is no such thing as the standardized guest who is predictable and will respond in a very specific and uniform way in the event of a fire.

At the heart of an effective hotel fire safety strategy is an effective fire risk assessment, a point recognized in the seven good practices recommended guidelines:

- Designate a person to be responsible for fire safety in the hotel
- Maintain a fire safety register containing information relating to fire safety systems, management procedures and training
- Prepare an emergency response plan
- Ensure that every member of staff receives information, instructions and training in fire safety in accordance with their duties
- Organize a planned and documented fire evacuation drill in the hotel at least once a year
- Ensure that all the fire safety systems are regularly inspected and maintained by suitably qualified persons
- Have a regular fire risk assessment carried out and act on the findings of the risk assessment.

The components of a hotel fire safety system include the following items:

- Fire sprinklers.
- Smoke and fire detectors.
- Duct Smoke Detectors
- Automatic alarm systems.
- Connection between Air handling units and alarm systems
- Manual alarm systems (the pull-boxes you see near stairway doors and elevators).
- Fire department standpipes (the things that you see in stairways).
- Emergency lights.
- The emergency egress system.
- Fire Resistivity of Construction
- Exits & Exit signs.
- Pressurized stairways.
- Smoke control systems
- Portable fire extinguishers.

- Staff emergency response plans.
- Staff training.
- Gas Supply Shut-off Devices
- Fire Alarm System Required Hotels/Motels
- High Rise Buildings
- Place for a Helicopter to Land

By adopting fire safety systems that are matched to the particular requirements of a hotel and recognizing that changes in the hotel design or structure may require changes in the system, hotel guests and employees alike will be better protected from the threat of fire.

4.0 Conclusion

This unit has discussed the classes of fire and firefighting equipment. It has also explained fire safety measures and fire risk assessment procedure. It also elaborated on the duties of firefighters.

5.0 Summary

The classes of fire are ordinary combustibles, flammable liquid and gas, electrical, metal, and cooking oils and fat.
Firefighting is the act of extinguishing fires.
Hazards caused by fire are:

- suffocation due to the fire consuming or displacing all of the oxygen from the air
- poisonous gases produced by the fire as products of combustion
- aspirating heated smoke that can burn the inside of the lungs and damage their ability to exchange gases during respiration

6.0 Tutor-Marked Assignment

Discus the classes of fire.
Explain the duties of a firefighter.
Itemize the components of fire safety system.

7.0 References/Further Reading

Frank D. Borsenik and Alan T. Stutts The Management of Maintenance and Engineering Systems in the Hospitality Industry (Wiley Service Management Series)

Goyal, N.C. and Arora, K.C. (1996) A textbook of hotel maintenance. Standard Publishers, Delhi.

UNIT 5 HEATING, VENTILATION AND AIR CONDITIONING

CONTENT

1.0 Introduction

HVAC (heating, ventilation, air conditioning and refrigeration) refers to technology of indoor and automotive environmental comfort. HVAC system design is a major sub-discipline of mechanical engineering, based on the principles of thermodynamics, fluid mechanics, and heat transfer. Refrigeration is sometimes added to the field's abbreviation as HVAC&R or HVACR, or ventilating is dropped as in HACR (such as the designation of HACR-rated circuit breakers).

HVAC is important in the design of medium to large industrial and office buildings such as skyscrapers and in marine environments such as aquariums, where safe and healthy building conditions are regulated with respect to temperature and humidity, using fresh air from outdoors.

2.0 Objective

At the end of this unit, you will be able to explain the heating, ventilation and air conditioning systems.

3.0 Main content

3.1 Heating

Central heating

Central heating is often used in cold climates to heat private houses and public buildings. It provides warmth to the whole interior of a building (or portion of a building) from one point to

multiple rooms. When combined with other systems in order to control the building climate, the whole system may be an HVAC (heating, ventilation and air conditioning) system.

Central heating differs from local heating in that the heat generation occurs in one place, such as a furnace room in a house or a mechanical room in a large building (though not necessarily at the "central" geometric point). The most common method of heat generation involves the combustion of fossil fuel in a furnace or boiler. The resultant heat then gets distributed: typically by forced-air through ductwork, by water circulating through pipes, or by steam fed through pipes. Increasingly, buildings utilize solar-powered heat sources, in which case the distribution system normally uses water circulation.

Resistive heating

Heat can also be provided electrically by resistive heating. Here, conductive filaments are heated by the passage of electricity. This is used in baseboard heaters, portable heaters, and as backup or supplemental heating for heat pump (or reverse heating) systems.

The heat pump is a form of heating that gained popularity in the 1950's. Heat pumps can extract heat from the air or suck heat from the ground. Heat pumps work well in moderate climates. However, they tend to be more expensive than conventional heating systems and although more energy efficient, a ground extraction system is more costly.[3]

The heating elements (radiators or vents) should be located in the coldest part of the room, typically next to the windows, to minimize condensation and offset the convective air current formed in the room due to the air next to the window becoming negatively buoyant due to the cold glass.

The use of furnaces, space heaters and boilers as means of indoor heating may result in incomplete combustion and the emission of carbon monoxide, NOx, formaldehyde, VOC's and other combustion by-products. Incomplete combustion occurs when there is insufficient oxygen; the inputs are fuels containing various contaminants and the outputs are the harmful by-products, most dangerously carbon monoxide which is a tasteless and odorless gas that has serious adverse health effects when inhaled.

Without proper ventilation, carbon monoxide can be extremely dangerous and can vary from a small, limited amount to a lethal amount. Carbon monoxide can be lethal at high concentration, usually less than 1000 ppmv. However, at several hundred ppmv, carbon monoxide exposure can induce headaches, fatigue, nausea and vomiting. Carbon monoxide binds with hemoglobin in the blood, forming carboxyhemoglobin, reducing the blood's ability to transport oxygen. The primary health concerns associated with carbon monoxide exposure are its cardiovascular and neurobehavioral effects. Carbon monoxide can cause atherosclerosis; the hardening of arteries, and can also trigger heart attacks. Neurologically, carbon monoxide exposure reduces hand to

eye coordination, vigilance and continuous performance. It can also affect your time discrimination

3.2 Ventilation

Ventilation is the process of "changing" or replacing air in any space to control temperature or remove any combination of moisture, odors, smoke, heat, dust, airborne bacteria or carbon dioxide, and to replenish oxygen. Ventilation includes both the exchange of air with the outside as well as circulation of air within the building. It is one of the most important factors for maintaining acceptable indoor air quality in buildings. Methods for ventilating a building may be divided into:

mechanical/forced and
natural types.

3.2.1 Mechanical or forced ventilation

"Mechanical" or "forced" ventilation is provided by an air handler and used to control indoor air quality. Excess humidity, odors, and contaminants can often be controlled via dilution or replacement with outside air. However, in humid climates much energy is required to remove excess moisture from ventilation air.

Kitchens and bathrooms typically have mechanical exhausts to control odors and sometimes humidity. Factors in the design of such systems include the flow rate (which is a function of the fan speed and exhaust vent size) and noise level. Direct drive fans are available for many applications, and can reduce maintenance needs.

Ceiling fans and table/floor fans circulate air within a room for the purpose of reducing the perceived temperature by increasing evaporation of perspiration on the skin of the occupants. Because hot air rises, ceiling fans may be used to keep a room warmer in the winter by circulating the warm stratified air from the ceiling to the floor.

3.2.2 Natural ventilation

Natural ventilation is the ventilation of a building with outside air without the use of fans or other mechanical systems. It can be achieved with openable windows or trickle vents when the spaces to ventilate are small and the architecture permits. In more complex systems warm air in the building can be allowed to rise and flow out upper openings to the outside (stack effect) thus forcing cool outside air to be drawn into the building naturally through openings in the lower areas. These systems use very little energy but care must be taken to ensure the occupants' comfort. In warm or humid months in many climates maintaining thermal comfort solely via natural ventilation may not be possible so conventional air conditioning systems are used as backups.

Air-side economizers perform the same function as natural ventilation, but use mechanical systems' fans, ducts, dampers, and control systems to introduce and distribute cool outdoor air when appropriate.

An important component of natural ventilation is the concept of air changes per hour. An air change per hour is a rate used to describe the amount of ventilation moving through an area with respect to the size of the space. AC/hr is used to determine room pressure, whether it is positive or negative. Positive pressure occurs when there is more air being supplied than exhausted and conversely, negative pressure occurs when more air is being exhausted than supplied. When contaminants are being kept out, positive pressure is occurring and when things are being kept in, negative pressure is occurring.

3.3 Air conditioning

Air conditioning and refrigeration are provided through the removal of heat. Heat can be removed through radiation, convection, and by heat pump systems through a process called the refrigeration cycle. Refrigeration conduction media such as water, air, ice, and chemicals are referred to as refrigerants.

An air conditioning system, or a standalone air conditioner, provides cooling, ventilation, and humidity control for all or part of a house or building.

The refrigeration cycle uses four essential elements to create a cooling effect. The elements are:
Refrigerant
Compressor
Condenser
Evaporator

The system refrigerant starts its cycle in a gaseous state. The compressor pumps the refrigerant gas up to a high pressure and temperature. From there it enters a heat exchanger (sometimes called a "condensing coil" or condenser) where it loses energy (heat) to the outside. In the process the refrigerant condenses into a liquid. The liquid refrigerant is returned indoors to another heat exchanger ("evaporating coil" or evaporator). A metering device allows the liquid to flow in at a low pressure at the proper rate. As the liquid refrigerant evaporates it absorbs energy (heat) from the inside air, returns to the compressor, and repeats the cycle. In the process heat is absorbed from indoors and transferred outdoors, resulting in cooling of the building.

In variable climates, the system may include a reversing valve that automatically switches from heating in winter to cooling in summer. By reversing the flow of refrigerant, the heat pump refrigeration cycle is changed from cooling to heating or vice versa. This allows a residence or

facility to be heated and cooled by a single piece of equipment, by the same means, and with the same hardware.

Central, 'all-air' air conditioning systems (or package systems) with a combined outdoor condenser/evaporator unit are often installed in modern residences, offices, and public buildings, but are difficult to retrofit (install in a building that was not designed to receive it) because of the bulky air ducts required to carry the needed air to heat or cool an area. The duct system must be carefully maintained to prevent the growth of pathogenic bacteria such as legionella in the ducts.

An alternative to central systems is the use of separate indoor and outdoor coils in split systems. These systems, although most often seen in residential applications, are gaining popularity in small commercial buildings. The evaporator coil is connected to a remote condenser unit using refrigerant piping between an indoor and outdoor unit instead of ducting air directly from the outdoor unit. Indoor units with directional vents mount onto walls, suspend from ceilings, or fit into the ceiling. Other indoor units mount inside the ceiling cavity, so that short lengths of duct handle air from the indoor unit to vents or diffusers around the room or rooms.

Dehumidification in an air conditioning system is provided by the evaporator. Since the evaporator operates at a temperature below dew point, moisture in the air condenses on the evaporator coil tubes. This moisture is collected at the bottom of the evaporator in a pan and removed by piping to a central drain or onto the ground outside. A dehumidifier is an air-conditioner-like device that controls the humidity of a room or building. It is often employed in basements which have a higher relative humidity because of their lower temperature (and propensity for damp floors and walls). In food retailing establishments, large open chiller cabinets are highly effective at dehumidifying the internal air. Conversely, a humidifier increases the humidity of a building.

Air-conditioned buildings often have sealed windows, because open windows would work against an HVAC system intended to maintain constant indoor air conditions.

All modern air conditioning systems, down to small "window" package units, are equipped with internal air filters. These are generally of a lightweight gauzy material, and must be replaced as conditions warrant (some models may be washable). For example, a building in a high-dust environment, or a home with furry pets, will need to have the filters changed more often than buildings without these dirt loads. Failure to replace these filters as needed will contribute to a lower heat-exchange rate, resulting in wasted energy, shortened equipment life, and higher energy bills; low air flow can result in "iced-up" or "iced-over" evaporator coils, which can completely stop air flow. Additionally, very dirty or plugged filters can cause overheating during a heating cycle, and can result in damage to the system or even fire.

It is important to keep in mind that because an air conditioner moves heat between the indoor coil and the outdoor coil, both must be kept just as clean. This means that, in addition to replacing the air filter at the evaporator coil, it is also necessary to regularly clean the condenser coil. Failure to keep the condenser clean will eventually result in harm to the compressor, because the condenser coil is responsible for discharging both the indoor heat (as picked up by the evaporator) and the heat generated by the electric motor driving the compressor.

Outside, "fresh" air is generally drawn into the system by a vent into the indoor heat exchanger section, creating positive air pressure. The percentage of return air made up of fresh air can usually be manipulated by adjusting the opening of this vent.

4.0 Conclusion

This unit has discussed the heating of buildings an the different types of heating. It has also explained what ventilation is and the types of ventilation. It also discussed air conditioning and the essential elements that create the cooling effect

5.0 Summary

Heating is often used in cold climates to heat private houses and public buildings.
There are central heating, local heating and Resistive heating

Ventilation is the process of "changing" or replacing air in any space to control temperature or remove any combination of moisture, odors, smoke, heat, dust, airborne bacteria or carbon dioxide, and to replenish oxygen.

There are natural ventilation and mechanical or forced ventilation

The refrigeration cycle uses four essential elements to create a cooling effect:
Refrigerant
Compressor
Condenser
Evaporator

6.0 Tutor-Marked Assignment

Explain the terms heating and the types
Discuss ventilation and air conditioning.

7.0 References/Further Reading

Frank D. Borsenik and Alan T. Stutts The Management of Maintenance and Engineering Systems in the Hospitality Industry (Wiley Service Management Series)
Goyal, N.C. and Arora, K.C. (1996) A textbook of hotel maintenance. Standard Publishers, Delhi.

MODULE 3

Unit 1 Maintenance procedure
Unit 2 Energy conservation
Unit 3 Pollution
Unit 4 Common building defects
Unit 5 Safety and Security

UNIT 1 MAINTENANCE PROCEDURE

CONTENTS

1.0 Introduction

The UK Bureau of Labor Statistics define hotel maintenance as personnel that performs general, preventative and emergency maintenance for the given hotel facility. Maintenance procedures are performed in guest rooms, lobbies, elevators and restroom areas to ensure all equipment and materials are in proper working order. Hotel buildings face constant and heavy traffic, so it's important to keep everything running smoothly for the guests.

1.0 Objectives

At the end of this unit, you should be able to
explain the meaning of maintenance in the hotel industry
state the various maintenance procedures

3.0 MAIN CONTENTS

3.1 General/Scheduled Maintenance

General maintenance of a hotel includes the upkeep of the outside of the building, parking lot, lobby, front desk and lobby restrooms, and keeping equipment in guest rooms functional. The staff tackles a variety of tasks, from mowing grass to painting, and air conditioning repair to light carpentry work. Hotel maintenance also performs scheduled pest exterminations and safety inspections. The timely replacement or maintenance on a major piece of equipment could involve shut downs of other departments or blocks of guest rooms. Projects such as building of walls or complete painting of areas could also come under scheduled maintenance. Indeed, any project requires scheduling and planning.

3.1.1 Preventative Maintenance

Preventive Maintenance, as its name implies is the intent to perform timed inspections, minor adjustments, lubrication based on manufacture's recommendations with the ultimate goal of preventing unscheduled breakdowns and prolonging the life and efficiency of the equipment. During the course of the inspection if it is determined that major work may be required, then work orders are generated to schedule the maintenance.

Room Maintenance, both guest and meeting rooms again follows the above with inspections and generating work orders to schedule and correct deficiencies. The frequency of inspections should be determined to happen sometime before the area slow periods.

If guest rooms occupancy is peak in summer then schedule the inspection just prior to the downturn as it will give time to order necessary materials and schedule the labor to accomplish the tasks. The importance of inspections cannot be over emphasized because I have yet to see room attendants or banquet staff adequately report deficiencies.
Contract maintenance is mandated in some instances such as for elevator service, kitchen hood exhaust cleaning and fire systems. The reasoning behind this is to ensure that the work is performed by qualified technicians, and may also require licenses and special knowledge. Local regulations and insurance companies usually require these contracts. It also serves the purpose of making sure the work gets done regardless of budget restraints. Maintenance contracts or contracting out is almost always necessary to complement an engineering department that is undersized.

3.1.2 Emergency Maintenance

If necessary, hotel maintenance staff responds to emergencies that need immediate attention. Floods, lock-outs, alarm system problems or vandalism issues require members to be on-call 24 hours a day.

Breakdown maintenance can be both negative and positive. Negative if it has an impact on guest comfort, safety, or is detrimental to the smooth flow of production that keeps other departments operational.
Breakdowns can be very expensive if it happens after hours and outside contractors are required, or if say the main chiller shuts down and all your guests walk out. Positive as you would not want to spend ₦1000:00 a year on preventive maintenance on a blender worth ₦500:00. Also, in maintenance repairs do not waste ₦200:00 worth of time to repair something only worth ₦100:00.

3.2 Maintenance policy

The purpose of maintenance policy is to outline the roles and responsibilities of property and facility, and to define funding allocation responsibilities to achieve effective maintenance of assets.

Objectives of the maintenance policy

The objectives of this policy are to:

clarify maintenance responsibilities for land and building assets;
specify the minimum requirements for the management of maintenance;
ensure that assets are adequately maintained;
ensure that associated risks are effectively managed;
statutory compliance;
ensure that land and building assets perform effectively and efficiently throughout their service life;
appropriate decisions are made in selecting maintenance strategies; and ensure that a sound basis exists for the allocation of maintenance funds.

3.3 Maintenance process

The basic phases of the Facility Management process are

3.1.1 Manage the property

Property management covers a wide range of activities in facility management. Consequently, the functions of property management vary from entity to entity, as well as from private industry to the public sector. Since the scope of property management is so broad, only the functions with the most risk from an audit standpoint will be discussed here.. The specific areas of property management discussed will be strategic property management, property acquisition, disposal of real property, risk management, lease management, and financial and data management.

3.1.2. Plan for renovation and new facilities

Like property management, facilities planning also cover a wide range of functional areas in many different types of organizations. The emphasis in this module will include a discussion on strategic facilities planning, building design and construction, and energy management.

3.1.3. Operating and maintaining the facilities

All facilities require a maintenance and operations function. This function is critical to the protection of real property, buildings, and equipment, which generally make up a majority of an entity's assets.

Two areas of operations and maintenance discussed in this module are

a. facility maintenance and

b. condition assessment.

Condition assessment is a process an entity should use to identify all of the maintenance needs in its facilities inventory.

a. Facility Maintenance

In times of tight budgets and competing demands for public resources, it may be difficult to convince those responsible for policy making that neglect of maintenance of fixed assets and equipment can lead to significant losses of those assets. Recognition of the full cost of ownership of these assets and the commitment to properly maintain them by policy makers presents a challenge to the management that has the responsibility of operating these facilities to carry out the entity's mission. The following are general criteria that pertain to operations and maintenance:

- Being able to predict the impact decisions regarding construction materials and building systems will have on future operation, maintenance, and repair costs
- Implementing a plan to improve the methods of determining professional staffing required for field-level facilities management
- Improving procedures for programming and budgeting for operation, maintenance, and repair work
- Making effective use of diagnostic techniques for determining the need for maintenance and repair
- Establishing a direct link between the maintenance and operations budget and plan and the entity's mission, goals and objectives, as they relate to maintenance
- Setting priorities for resource allocation
- Incorrect maintenance procedures can shorten the life of systems and components and cause premature failure.

The functional areas of maintenance management include the following

- Budgeting
- Initiating - receiving and reviewing requests for work to be performed by trades people

- Planning - work assignments and material needs for the work orders
- Scheduling work requests
- Executing work request
- Reporting - measuring performance, including customer satisfaction surveys

b. Condition Assessment

The entity should implement a periodic condition assessment procedure for all facilities in its inventory. The frequency with which this assessment should be performed will vary according to the age and inventory of facilities. This could range from annually to every three to five years. A condition assessment serves as the basis for establishing appropriate levels of funding required to reduce and eventually eliminate backlog.

3.4 Facility maintenance work order procedure

3.4.1 Purpose

The purpose of this procedure provides a general overview of work orders employed at stations, the uses of each category and the procedures involved for requesting different forms of work.

3.4.2 Terms

Work order supervisor:
He/she is responsible for managing the work order.
Work order planner:
He/she is responsible for processing work order.
Maintenance coordinator
He/she approves non-facility requests.
Facilities (for this procedure) are buildings, structures, and all installed equipment. This includes the following: boilers, doors, windows, outdoor and indoor plumbing and fixtures, electrical panels lights, wiring, etc.
Non-facilities are items not installed in the building, or not associated with the normal function of the structure, e.g. recreational and gym equipment, and any specialized equipment purchased by a t for its unique use that is not required for the normal operation of the building.

There are two types of work orders:

Preventive maintenance work order
Service work orders
General maintenance work order.

Preventive maintenance work order is generated weekly by the work order planner based on preventive maintenance program.

Service work orders is written on a daily or as needed basis by the work order planner as they are written and approved.
General maintenance work order is for repair work order pair and maintenance of

3.0 Conclusion

Hotels facilities need to be maintained in order to meet the expected requirements of both guests and hotel management as well as to avoid unnecessary and untimely wear and tear.

4.0 Summary

Managers need more than budget for scheduled and preventative maintenance in their various hotels and departments. Hiring of the correct personnel and quality supervision is of prime importance in order to ensure efficiency is achieved while maintaining equipment and machinery in the hospitality industry.

5.0 Tutor-marked assignment

1. How would you define hotel maintenance?
2. Differentiate between the various types of maintenance procedures.
3.

6.0 Reference/further reading

K.C. Arora and N.C. Goyal (2006) Hotel Maintenance. London; Standard Publishers Distributors
Frank D. Borsenik and Alan T. Stutts (2007) The Management of Maintenance and Engineering Systems in the Hospitality Industry. London; Amazon.

UNIT 2 ENERGY CONSERVATION

CONTENTS

1.0 Introduction

Green is the new watchword in hospitality. If energy efficiency had a color, it would be green. It saves the environment and cash. Not surprisingly, the motivating force for sustainability in the hotel market is the potential energy savings. Innovators have laid sufficient groundwork to suggest there is a sound business case for greening at least a piece of the hospitality industry. The hotel is an energy hog—and the hotel kitchen feeds its appetite. Per square foot, foodservice consumes more energy than any other commercial operation. But when it comes to end-use efficiency, the hotel kitchen is challenged.

It is difficult to rank the utility cost of one foodservice operation against another within the same hotel or casino complex. The range in energy intensity can be dramatic. One kitchen might consume ₦125,000 in energy, while another may devour ₦250,000, both generating similar revenue. Benchmarking the energy performance of foodservice operations is a management tool in its infancy. Even the chain restaurant gurus, despite their advantage of cookie-cutter design and corporate muscle, have yet to get a good handle on energy benchmarking and control.

2.0 Objectives

At the end of this unit, you should be able to:
Understand energy conservation requirements for the various units of the hotel.

3.0 Main contents

3.1 Energy Conservation Measures for the Hotel Industry
Do's and Don'ts

Food and Beverage Department

This department consumes approximately 25% of the total energy cost so the opportunities to reduce energy consumption in this area are excellent. Some helpful guidelines are given below.

a. Food Preparation – Kitchen

01. Determine the preheating time for ovens, grills, boilers, fryers & other cooking equipments. Generally speaking 10 to 20 minutes should be sufficient.
02. When preheating ovens, set thermostat at the desired temperature. Ensure thermostat controls are operating the properly.
03. Determine cooking capacity of ovens; use smaller or more energy efficient oven when possible.
04. Use additional fry units, boilers, oven etc. only for peak business hours.
05. Load & unload ovens quickly. If an oven's door is kept open for a second, it losses about 1% of its heat.
06. Cover pots & pan switch lids while cooking.
07. Turn off cooking & heating units that are not needed.
08. Oven should not be opened during operation. Food will cook faster and lose less moisture if oven is kept closed.
09. Frozen food should be thawed in refrigerators. It will thaw easily & reduce power demand on the refrigerator.
10. When using gas range for full heat condition, the tip of the flame should just touch the bottom of the pan or kettle. Yellow flame is the indication of inefficient, incomplete combustion and wastage of gas. Clean burners, pilot light regularly. If flames are still yellow, have gas-air mixture adjusted.
11. A blue flame with a distinct inner cone is best. Flame should never flout but should just wipe the surface. Adjust flame until it is entirely blue.
12. Thoroughly clean pot & pans to ensure there is no carbon build up at the bottom.
13. Placing foil under range burners & griddles will improve the operational efficiency.
14. Fryers need to be cleaned & oil filtered at least once a day.
15. Cooking rang burners should always be smaller than the kettle or pot place on it.
16. Have broken door hinges and cracks of oven doors attended to immediately.
17. Turn off Rotary Toaster when not in use. Use pop up toasters on lean timings.
18. Shut off steam Heater on dishwasher when dishwasher in not in use.
19. Use hot water only when necessary.
20 In pot washing area fill sink for washing utensils instead of running water.
21. Cleaning should be done during day hours if possible. Do not use dishwasher till full load of soiled dishes is available.
22. Turn off lights in the walk – in refrigerators and freezers when not required. Lights not only waste energy but add load to the box.
23. Close tightly all walk-in doors after operating them.

24. Allow hot foods to air cool before placing in refrigerators.
25. Do not store items in front of the refrigerant coils or fans in a manner that restricts air circulation.
26. Fully stored refrigerators and walk-ins use energy more efficiently than partially stored ones.
27. Be sure foods requiring refrigeration are promptly placed in storage after delivery.
28. Turn off supply and exhaust fans in kitchens stores etc. when areas are not in use.
29. Report and leakage of gas immediately.
30. Keep records of all break down of equipments to find out accident prone/uneconomical equipment.
31. Turn on equipment only as needed. Make sure they are turn off at night.
32. Carefully follow instructions in the users guide for all equipments.
33. Keep equipment and door seals clean and free of debris to prevent energy waste.
34. Reduce peak loading. Your electrical bill is determined by two factors:-

(a) demand charge (if applicable)

(b) total consumption in kWh

You may achieve this by:-

(a) Intensive cooking such as baking and roasting during non-peak demand hours.

(b) Use minimum number of electric appliances at a time. Stagger their operation.

(c) Try to use electrical appliances between 6 AM to 10 AM or after mid night if possible.

35. Equipment should be turned on at specific time to a specific temperature and turned off at times when not needed. A 10-15 minutes preheat period is requires only 7 to 15 minutes for preheating.
36. Clean heating elements at least weakly. This may even be done daily if you do high volume frying.
37. Cooking foods in least volume possible for most economic use of energy.
38 If keeping electric burner on for shorter period is inevitable, when they are not in actual use keep the temperature low until you are ready to cook. This will even prolong the life of burner besides conserving energy.
39. Avoid turning on gas burners until you are ready to cook.
40. If possible, fill cooking vessels according to capacity. Large cooking vessel if used for cooking lesser quantity of food will consume more energy.
41. Use flat bottom pots and pans for maximum heat transfer.
42. Group kettles and pots on close top ranges.
43. Turn down heat as soon as food begins to boil and maintain liquids at simmer.
44. Clear boil-overs and spill-overs promptly to avoid build up of carbon deposits which will affect the efficiency of equipment adversely.
45. Always try to use roasting and baking oven to full capacity for maximum utilization of heat. If possible wait till oven is loaded up to its optimum capacity prior to switching on.
46. Regular & prompt cleaning of rotary toaster saves energy.
47. Avoid frequent opening of refrigerator doors. Door opening if planned, saves energy.
48. Do not allow frosting on refrigerator coils to save energy.
49. Close & preferably lock ice cuber bins after removing ice for use.

50. Using hot water for cooking consumes less energy as compared to cold water.
51. Switching off heater when cooking is over, not only saves energy it is safer as well.
52. Do not use dishwasher until you have sufficient load

b. Banquets

01. While air conditioning is on, try to avoid using candles on the table. They add a tremendous heat load.
02. When renting a space for function, try to fit the space to the size of function. Do not rent a 300 person ball room to 50 people even if the room can be divided. Remembers you are spending almost same on air conditioner of the space.
03. When setting up for a function, make certain that heating, cooling and lighting are off until ½ hour to 1 hour before function starts. Turn off systems as soon as the function is over. In fact, air conditioning can be turned off even ½ hours before function finishes. Air conditioning effect will stay for ½ hour.
04. If you have a choice, try to avoid function that requires the addition of many spotlight or other heat producing equipment.
05. Assign an individual responsible for turning lights on and off.
06. Keep the light off whenever any function area is vacant or unoccupied.
07. While Air-conditioning is on ensure that all doors and windows are properly closed.
08. During winter season try to use outside air for cooling.
09. Review lighting levels and prepare new standard lamping plans for meetings rooms to reduce unnecessary wastage of energy.

c. Restaurants

01. Reschedule cleaning of are during day light hours.
02. Avoid using electrical light while setting the table whenever possible.
03. Turn off air-conditioning ½ hour prior to closing the restaurant.
04. Keep wall and ceiling properly cleaned for better light reflection.
05. Turn off lights when not needed.
06. Review lighting level to provide minimum acceptable lighting level in all food service area.

Front Office and Lobby

01. Front office can play an important role in energy conservation. When occupancy is unfortunately not high, front office should rent room by virtue of their location. In summer, rooms on the east or north sides of the building will be cooler. Also, corner rooms with two outside exposures will be warmer. Rooms close to heat source should also be avoided if possible. This would certainly help reduce air conditioning load and result in saving of energy.

02. Front office should make sure that the rooms which are not to be rented out during lean period are not air conditioned or ventilated unnecessarily. If any one of these is to be rented out. Air conditioning or ventilation can be started ½ hour before the guest moves in.
03. Lower all lighting levels during late night and day light hours. Turn off all lights in offices when these are closed.
04. If possible, instruct shopkeepers to reduce the amount of shop and display lighting. Although, in most cases, shopkeepers do pay for their electric consumption, the lighting load still affects hotels cooling systems.
05. Lobby, managers should ensure that Lobby Main Entrance doors are not unduly kept opened. A door opening will result in ingress of heat from outside and adversely effect air conditioning.
06. Lobby Managers, in course of their duty, do take rounds of the property. They on their rounds, should ensure that no unnecessary lights or water tape are left ON by careless staff.
07. During day light hours reduce electric lighting load in Lobby etc. to minimum to make full use of natural light.
08. During low occupancy period try to block complete floor. If this is not practicable, attempt should be made to block as far as possible total wings of individual floor.
09. As soon as guest checks out, Front office should inform Housekeeping so that all lights of the vacant room are switched off at the earliest.
10. Report broken windowpanes to stop ingress of air.
11. Inspect public toilets periodically and report leading W.C. and faucets top stop water unnecessary illumination.

House Keeping Department

The major space in a hotel is devoted to guest rooms and corridors. Number and variety of ways to conserve energy in these areas are startling. Although the energy conserved in one room or corridor does not seem significant, but when multiplied by 100 or so rooms, it does become significant. Some of the opportunities for Housekeeping Department where they can significantly contribute to energy saving listed below:-

01. Turn off guest room lights when rooms are not physically occupied.
02. Use minimum lighting when making up and cleaning rooms. Use natural light whenever possible.
03. Turn off corridor lights, or reduce it to 50% when natural light is available.
04. Turn off lights in linen rooms, storage room and maids closets when not in use.
05. Check your areas for light level. Reduce number of lights if possible. Use lower wattage bulbs wherever possible.
06. Have lamp shades cleaned at once. Bulb gives more light with clean lampshades.
07. Keep walls and ceiling walls cleaned for better light reflection.
08. Switch off music & TV Sets when rooms are not physically occupied.
09. Turn off HVAC system when rooms are not physically occupied.
10. Report water leaks immediately

11. Keep windows closed and curtain on. The ingress of hot air in summer and cold air during winter contribute to very large waste or energy. For example 6' wide window opened just one inch would allow hot air necessitating 1.76 kwh to cool. This in terms of monetary value, will cost approximately Rs. 1150/- per hour.
12. Keep room hot water temperature at lowest acceptable limit.
13. Minimize use of lights during night cleaning by switching on only those lights which are actually required to clean a particular area.
14. Bellhops may be advised to leave only such lights on which are actually needed by the guest while leaving the room.

Laundry Department

One of the large consumers of water and heat, the hotel laundry is an outlet that can significantly reduce energy consumption with no effect on guest comfort or satisfaction. Some of the important points to achieve desired results are listed below:-

01. Have lights turned off when not in use.
02. Periodically clean lamps and lights fixtures.
03. Clean and wash walls, floors and ceiling
04. Operate washing machines at full load, partial loads may require same amount water as full loads.
05. Check and record your water consumption. Compare water consumption daily to find wastages, if any.
06. Do not leave water taps running.
07. Consider using cold water detergents. It will greatly reduce energy consumption.
08. Reduce hot water temperature to 120 o F.
09. Repair or replace all hot water piping insulation.
10. All steam line values should be checked for leaks. That is, you should be able to shut off steam to any machine not in use keeping steam supply main open.
11. If possible use final rinse water for 1st wash.
12. Reduce time between loads to prevent tumblers from cooling down.
13. Air line should be checked for leaks.
14. Periodically clean exhaust duct and blower of lint and dust.
15. Keep steam pressure at lowest possible level.
16. Shut off steam valve whenever machine is not being utilized.
17. Keep radiator coils and fins free from dirt all the times.
18. Ensure all steam traps in perfect working order.
19. Keep an eye on the preventive maintenance schedule of all laundry equipments by Engineering Department to ensure timely compliance.
20. Ensure that Drying tumblers and washing machines are kept clean and free from scale at all times.
21. Switch off laundry exhaust fans when laundry is closed.

22. Ensure that extractors are working properly. Incomplete extraction increased load on dryer and consumes more energy for drying.
23. Reschedule machine operation to reduce peak demand charges.
24. Inform boiler room when steam is not required so that boilers can be shut down to save fuel.

Engineering Department

An analysis of Hotels show that approximately 60% of then energy consumed in a property is in the equipment and machinery rooms, boiler rooms, air conditioning rooms, water treatment and pump areas and sewage plants. Engineering Department is responsible for running and maintenance this equipment.
They are also concerned with entire building and complex.
Keeping the above in view, it is imperative that the Engineering Department operates these equipments at peak efficiency. Engineering Department can help conserve energy in the following Ways:
01. By acting as an advisor to various departments to help them achieve their respective Energy Management goals.
02. By ensuring efficient and economic operation of all equipments.
03. They must maintain history card of each machine so that in-efficient and uneconomical machines can be identified and eliminated to save the wasteful uses of energy. This will also help in deciding the preventive maintenance schedule of each machine.

Some guidelines to achieve energy management goals at little or no cost are listed below:-

Heat, Ventilation and Air-conditioning (HVAC) Systems – Plant Room

01. Turn off HVAC machinery in all unoccupied spaces.
02. Eliminate or reduce duct air leakage.
03. While operating chillers ensure following:-
- As far as possible keep leaving chilled water temperature on the higher side.
- Reduce entering condenser water temperature
- Maintain proper refrigerant charge.
- Eliminate refrigerant and charge.
- Maintain proper flow rate of condenser water
- Operate chillers in proper sequence.
- Operate condenser and cooler pumps in proper sequence.
04. Lower hot water temperature for heating when outside temperature rises.
05. When chiller is not operating, make certain that chilled and condenser water pumps are shut down.
06. Use proper water treatment to prevent fouling or sealing of condensers, cooling towers and piping.

07. Repair all hot, chilled and condenser water lines, valves and pumps. A considerable quantity of water is lost through leaky pump glands which can be saved easily.
08. Repair or replace damaged hot or chilled water line insulation.
09. Check cooling water tower bleed off periodically.
10. Check efficiency of chiller against manufacturer's specifications by checking water temperature and pressure drop in and out of chillers and condensers and motor amperage on compressor.
11. Condenser tubes should be kept clean.
12. Stop all refrigerant leaks.
13. Check daily purge operation on chiller for signs of air leaks
14. Remove algae growth from cooling towers.
15. Check all belt drives. Replace worn out or frayed belts.
16. Clean AHU coils and fans periodically, check chilled water sample to know the internal condition of coil. Do periodic cleaning of coil.
17. AHU filter must be cleaned periodically.
18. Check all thermostats for correct functioning.

Boilers

01. Check Boilers Room for negative air pressure which can reduce combustion efficiency.
02. Avoid multiple boiler operation. One boiler operating at 80% is more efficient than two at 40%.
03. Operate boilers at as low steam pressure as possible.
04. Avoid excessive boiler blow down.
05. Clean burner nozzle periodically.
06. Pre-heat the fuel to correct temperature before injection.
07. Maintain a good water treatment programme.
08. Repair and replace if necessary boiler and flue insulation that is damaged.
09. Repair and replace all worn or damaged steam and condensate piping insulation.
10. Insulate all condensate and steam pipe line flanges.
11. Check and repair all steam traps.
12. Eliminate all steam leaks.
13. Check fuel lines for leaks.
14. Check combustion control in order to maintain maximum efficiency.
15. Check all safety valves for any leaks.

Heating

01. Check and back wash water filtration plant for higher efficiency and reduction in water system scaling.
02. Check water analysis periodically.
03. Repair at once all leaks, dripping faucets and shower heads.

04. Check toiler flush valves for any water leaks.
05. Lower hot water temperature to 120oF.
06. Check and adjust swimming pool make up water (not to exceed 10%).
07. Shut down pool filtration plant when pool is not in use.
08. Reduce lawn and shrubbery watering to absolute minimum.
09. Check water regulating valves on water coolers, refrigerant units and ice machines.
10. Consider sprint loaded self closing water valves in Kitchens.

Building and Grounds

01. Seal all exterior windows, doors cracks and openings to reduce outdoor air leaks.
02. Reduce gap under the doors of air conditioned spaces to minimum.
03. Check grounds for leaking pipes underground.
04. Check and repair all door closers.
05. Make certain all electric connections are tight.
06. Keep all 'contacts' clean.
07. Check Lighting levels in all Engineering spaces to see if they can be reduced.
08. Replace all incandescent fixtures with fluorescent and energy efficient lamps like PL-9 or SL-25 etc.
09. Keep all light shades clean. Use shades that allow more light to pass or reflect.
10. Do not switch on lights unless necessary.
11. Arrange schedules for turning or reducing lights in guest corridors, lobby area, function spaces, restaurants, bars, shops, kitchens etc.
12. Make a house inspection of all departments to see that energy conservation is being observed.

4.0 Conclusion

In spite of the challenge, one can trim the water and energy consumption of a commercial hotel by specifying efficient equipment. Once you replace an inefficient piece of equipment with its efficient counterpart, the green savings start immediately and compound for the life of the appliance.

5.0 Summary

The energy in a hotel facility is consumed by dozens of pieces of equipment or systems. Load reduction will be derived from an appliance-by-appliance approach. A multitude of individual strategies or equipment replacements must be considered, placing an ongoing demand on somebody's time, not to mention your operating budget. The life-cycle cost of equipment must become embedded within the purchasing process.

6.0 Tutor-Marked Assignment

1. Extensively appraise the energy conservation measurers for the hotel industry with respect to their pros and cons.

7.0 Reference/Further Reading

David Nelmes (2009) The Rewards of Making Energy-Efficient Choices: Experience the Benefits of Being Green. Brooklyn; iUniverse Star.

UNIT 3 POLLUTION

CONTENTS

1.0 Introduction

Pollution is the introduction of contaminants into a natural environment that causes instability, disorder, harm or discomfort to the ecosystem i.e. physical systems or living organisms. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or non-point source pollution.

2.0 Objectives

At the end of this unit, you should be able to:
Understand the meaning of pollution
Know major sources of pollution in the hotel industry
Know the danger of pollution and the preventive/reduction measures where necessary

3.0 Main contents

3.1 Sources of Pollution in the Hotel Industry

Resource depletion is the biggest flaw of the hospitality industry in regards to environmental abuse. Water and petroleum are not the only natural resources hotels use extensively, though they are the greater. Consider construction and decorating materials, and furnishings too. The hospitality industry may not directly cause pollution, but it contributes to it in other areas, the areas where their goods are made, and along the way to delivery. More care needs to be taken with the purchasing of goods to minimize resource depletion.
Key environmental metrics include:

- energy: total used and renewable energy bought or used
- water: total used and water pollution
- air: greenhouse gas emissions, release of heavy metals and toxic chemicals, and emission of particulates
- waste: solid, recycled, and hazardous
- compliance: notices of violations and fines or paid penalties

Also;

- Lodging properties can produce toxic air pollutants and ozone-depleting substances.

- Cleaning supplies, synthetic materials, paints, and pesticides can release toxic air pollutants and volatile organic compounds (VOC). Although emitted indoors, these air pollutants will also eventually leak into the outdoor air through doors, ventilation systems, and other openings. Once outside, the chemicals in these substances can react in the air to form ground-level ozone (smog), which has been linked to a number of respiratory effects.

- Ozone-depleting substances such as chlorofluorocarbons may be released by improperly maintained heating, ventilation, and air conditioning (HVAC) units, refrigeration units, and fire extinguishers.

3.2 Dangers of Pollution in the Hotel Industry

People who are exposed to toxic air pollutants at sufficient concentrations, for sufficient durations, may increase their chances of getting cancer or experiencing other serious health effects, such as reproductive problems, birth defects, and aggravated asthma.

3.3 Prevention/Reduction of Air Pollution

Pollution prevention can reduce the impact of air pollution by using materials, processes, or practices that reduce or eliminate air pollution at the source. The best lodging properties implement pollution prevention strategies not only to comply with federal, state, and local laws but also to further minimize impacts on human health and the environment.

Pollution prevention safeguards the health of your employees, customers, and families by using materials, processes, or practices that can reduce or eliminate air pollution at the source.

Pollution prevention practices also save money on waste disposal, materials usage, and the cost of air pollution controls. You may already be regulated by federal, state, and local, agencies and

may already voluntarily implement pollution prevention practices. However, increasing pollution prevention efforts can further minimize impacts on human health and the environment.
Other possible measure for pollution control may include;

Changing Cleaners

- When possible, use non-toxic products. For example, instead of products with toxic ingredients to clean and polish furniture, use lemon oil.

- Purchase cleaners with low toxic air pollutant and (volatile organic compounds) VOC content.

- Choose pump-style sprays, which emit fewer toxic air pollutants and VOC.

Maintaining Buildings

- Use water-based or other less toxic, paints and coatings.

- Regularly inspect floors to determine where the most wear occurs. Refinish only those portions.

- If available, use indoor furniture made of wood instead of pressed wood products, which can emit toxic air pollutants.

Controlling Ozone-Depleting Substance Emissions

- Use “good housekeeping” measures, such as checking for leaks in HVAC units and refrigeration systems, during equipment maintenance and operation.

- Recover and reuse ozone-depleting substances.

- At the end of equipment service life, replace with new and more efficient equipment that does not use ozone-depleting substances.

- Inspect halon-containing fire extinguishers frequently for leaks. Repair or replace faulty equipment.

- Get to know local lodging property managers because they know best about the materials and operations used in their businesses and the regulations with which they must comply.

- Keep local media aware of progress by sending them updates. Publicity can reward success and attract more public involvement.

Make a Plan

- One idea is to form a work group that includes local lodging owners and operators to develop and implement a workable pollution reduction plan.

Locate Resources

- Go for further information and find governmental and nonprofit contacts who can provide help with analysis, technical information, equipment, and funding.

Encourage Other Lodging Properties to "Go Green."

- A "green" lodging property is a property that is managed to be environmentally-friendly through a conscious effort to reduce pollution.

- Use media connections to provide coverage for successful efforts in reducing pollution. Positive publicity for successful "greening" efforts can mean increased business.

- Visibly displayed awards or certificates stating that the lodging property is a "green" property may also increase business.

- Motivate lodging property managers to become involved in "green" organizations for the hospitality industry such as Green Seal or the

4.0 Conclusion

Making changes in how lodging properties maintain their facilities can stop pollutants at the source and improve indoor air quality. By evaluating and improving work practices, lodging properties can decrease emissions, reduce operating costs, and protect employee and public health

5.0 Summary

The hospitality industry encompasses a wide range of services and activities such as lodging, restaurants, food services, and convention centers. The lodging sector consists of hotels, motels, resorts, and bed and breakfasts. Maintenance and operations activities within the lodging sector may release pollutants into the air and may contribute to health concerns at lodging properties and in the community.

6.0 Tutor-Marked Assignment

1. Evaluate the menace of hotel industry pollution to the society
2. How would you suggest that hotel industry pollution be minimized in your area?
3. Examine the causes of pollution from a given hotel industry in your country.

7.0 Reference/Further Reading

Edmond P. Rondeau, Robert Kevin Brown and Paul D. Lapides (1995) Facility Management. London; Amazon.

David G. Cotts (1999) The Facility Management Handbook: 2nd Edition. London; Amazon

UNIT 4 COMMON BUILDING DEFECTS

CONTENTS

1.0 Introduction

The practice of securing information on heritage buildings has been considered fundamental towards understanding the existing building conditions and defects. Such detailed and systematic collection and documentation of vital building information is commonly known as the dilapidation survey.

Dilapidation surveys are usually prepared in anticipation of the work required to rectify any identified building defect; hence, they are best conducted as part and parcel of the documentation for these works. A poor understanding regarding the extent and nature of the building defects would render an inappropriate approach and scope of repair work being carried out during the conservation project - leading to disagreements and substantial costs implications amongst building owners, clients and contractors.

A dilapidation survey is the practice of identifying and recording building defects through the means of photographic and digital documentation prior to any conservation work. The survey - usually carried out by building conservators - requires in-depth analyses of the building defects, probable causes and the proposed methods and techniques of building conservation. Normally, data and information obtained from the dilapidation survey are analyzed, documented and presented in a technical report: which is used for preparing project briefs, building specifications and the Bill of Quantity (BQ).

2.0 Objectives

At the end of this unit, you should be able to:
Understand the meaning of dilapidation survey
Understand commonly found building defects and their causes
Know how to forestall occurrences of defects in buildings

3.0 Main contents

3.1 Use of Dilapidation Surveys

As building conservation often involves various remedial works and building repairs, a thorough identification and recording of building defects are integral in determining the appropriate conservation methods and techniques to be employed. Hence, dilapidation surveys involve historians, architects, conservators, structural engineers, mechanical and electrical, and quantity surveyors. Occasionally, the expertise of microbiologists, chemists, archaeologists and geologists are also sought. In the practice of building conservation, dilapidation surveys are generally instrumental in regard of the following aspects:

1. Understanding the state of the building defects
2. Determining the causes of the building defects
3. Identifying appropriate methods and techniques of building conservation
4. Providing reference materials to clients, consultants and project contractors
5. Providing a vital resource for conducting the Historical Architectural Building Survey (HABS)

As recording and documenting are the basic components of the dilapidation surveys, a thorough investigation of the building conditions, defects and their causes are necessary. The conditions and nature of the existing building materials should be well captured in both photographic and digital forms for purposes of documentation. Existing building materials - whether timber, brick, stone, plaster or concrete - should be fully examined and documented. The same goes for the condition of roof structures, floors, doors, windows, staircases and foundation. Balustrades, pinnacles, cornices or festoons that have been broken or missing in the past should also be noted. The exact locations of all building defects should be marked clearly and plotted onto floor plans, sections and elevations. For cross-referencing purposes, windows, doors, staircases and rooms should be coded.

3.2 Types and Causes of Building Defects

Fungus stain and harmful growth

Fungal stains or mould occur when there is moisture content in the walls. It flourishes in an environment of high humidity with lack of ventilation. Harmful growth includes creeping and ivy plants that can grow either on walls, roofs or gutters. This usually happens when dirt penetrate small openings in the walls and mortar joints, creating suitable grounds for seeds to grow. Roots can go deep into the existing holes causing further cracks and water penetration.

Erosion of Mortar Joints

The main function of a mortar joint is to even out the irregularities of individual blocks either stones or bricks. Causes of mortar joint erosion include salt crystallization, scouring action of winds, the disintegrating effects of wall-growing plant, and water penetration resulting in dampness. Decayed mortar can be forcibly removed with a mechanical disc or manually raked out using a knife or spike.

Peeling Paint

Peeling paint usually occurs on building facades, mainly on plastered walls, columns and other areas that are exposed to excessive rain and dampness. Some buildings located near the sea may face a greater risk. The amount of constant wind, rain and sun received can easily turn the surfaces of the paint to become chalky and wrinkled or blistered. As is the case in many heritage buildings, several layers of paints have been applied onto the plastered walls over the decades. Apart from lime wash, other types of paints used include emulsion, oil-based, tar, bituminous and oil-bound water paint. Different types of paints require different methods of removal depending on their nature.

Defective Plastered Renderings

Defective plastered rendering occurs mostly on the external walls, columns and ceiling. In a humid tropical climate like Malaysia, defective renderings are normally caused by biological attacks arising from penetrating rain, evaporation, condensation, air pollution, dehydration and thermal stress. Other causes may be the mould or harmful growth, insects, animals and traffic vibration. Prior to being decomposed and broken apart, renderings may crack due to either shrinkage or movement in the substrate.

Cracking of Walls and Leaning Walls

External walls may be harmful to a building if they are structurally unsound. Vertical or diagonal cracks in the wall are common symptoms of structural instability. Such defects should be investigated promptly and the causes diagnosed: be it the foundations, weak materials and joints; or any shrinkage or thermal movements such as those of timber window frames. Diagonal cracks, usually widest at the foundations and may terminate at the corner of a building, often occur when shallow foundations are laid on shrinkable sub-soil which is drier than normal or when there is a physical uplifting action of a large tree's main roots close to the walls. Common causes of leaning walls include a spreading roof which forces the weight of a roof down towards the walls, sagging due to soil movement, weak foundations due to the presence of dampness, shrinkable clay soil or decayed building materials; and disturbance of nearby mature trees with roots expanding to the local settlement.

Defective Rainwater Goods

Problems associated with the defective rainwater goods include sagging or missing eaves, gutters, corroded or broken downpipes, and leaking rainwater heads. Other problems include undersized gutters or downpipes which cause an overflow of water during heavy rain, and improper disposal of water at ground level. Due to inadequate painting, iron rainwater goods can rust and fracture. Lack of proper wall fixings, particularly by projecting lead ears or lugs can cause instability to the downpipes. If routine building inspections and maintenance have been neglected, rainwater goods can be easily exposed to all sorts of defects.

Decayed Floorboards

Widely used in many heritage buildings including churches, schools, residences and railway stations, some timber floorboards have been subjected to surface abuses and subsequently deteriorated: leading to structural and public safety problems. The main causes are pest attacks, careless lifting of weakened boards by occupants, electricians or plumbers; lack of natural preservatives; and corroded nails.

Insect or Termite Attacks

Timber can deteriorate easily if left exposed to water penetration, high moisture content and loading beyond its capacity. Insect or termite attacks pose a threat to damp and digestible timber found in wall plates, the feet of rafters, bearing ends of beams and trusses, as well as in timbers which are placed against or built into damp walling. It is unwise to ignore timber that is lined with insect or termite holes because they may in time soften the timber and form further cracks. Affected timber can be treated by pressure-spraying with insecticide or fumigant insecticidal processes.

Roof Defects

As roof often acts as a weather shield, it is important to treat aging roof tiles. In Malaysia, clay roof tiles have been widely used in the heritage buildings. Common defects of roof tiles include corrosion of nails that fix the tiles to battens and rafters, the decay of battens, and the cracking of tiles caused by harmful growth. Harmful growth poses a danger to the tiles because it may lift tiles and create leaks. Another aspect to be considered is the mortar applied for ridge tiles which tends to decay or flake off over the years.

Dampness Penetration through Walls

Dampness penetration through walls can be a serious matter, particularly to buildings located near water sources. Not only does it deteriorate building structures but also damages to furnishings. The main cause of dampness is water entering a building through different routes.

Water penetration occurs commonly through walls exposed to prevailing wet wind or rain. With the existence of gravity, water may penetrate through capillaries or cracks between mortar joints, and bricks or blocks before building up trap moisture behind hard renders. Water may also drive further up the wall to emerge at a higher level. Dampness also occurs in walls due to other factors such as leaking gutters or downpipes, defective drains, burst plumbing and condensation due to inadequate ventilation. Dampness may also enter a building from the ground through cracks or mortar joints in the foundation walls.

Unstable Foundations

Foundations are a critical in distributing loads from roofs, walls and floors onto the earth below. They are structurally important to the permanence of a building and should this be lacking, it is pointless investing on superficial restoration work. Most of the common problems associated with the foundations depend on the geology of the ground upon which a building stands, structural failures as well as presence and height of a water table. Additionally, inherent failures may also happen in a building in which has to cope and carry any unsettled problem of the foundations. Problems of the foundations may lead to an unstable building structure, which is unsafe to users and occupants. Unstable foundations may occur because of several reasons including shrinking clay soil, penetration of dampness and water that may decay walls and foundations; presence of large trees near the building; and the undertaking of excavations nearby. They may also occur due to traffic vibrations, deteriorating of building materials and the increased loads, particularly with a change in building function.

Poor Installation of Air-conditioning Units

Most heritage buildings were built without air-conditioning systems. Where people have to contend with warm temperatures, the need to install air-conditioning systems to meet modern building requirements seems necessary. Subject to the building function, structures and the effects on building fabric, one should consider several factors before installing air-conditioning units in heritage buildings. The cooler and drier air produced by the air-conditioning systems may cause shrinkage of building materials. There may also be a possibility of condensation either on the surfaces or within the structure of the fabric, eventually allowing the build-up of mould. Moreover, it may be difficult installing the air conditioners as evidenced by how units were haphazardly placed on windows or the front façade of some heritage buildings. Such poor practices have gravely affected the appearance of these heritage buildings.

3.3 Fighting Building Defects

After diagnosing all building conditions, defects and causes, they should be presented with relevant graphics in the dilapidation survey report. The use of information technology may well assist in the preparation of a good-quality report. As a rule of thumb, a dilapidation survey report should contain the following information:

- Cultural attributes and historical background of heritage buildings
- Architectural details and significance of heritage buildings
- Detailed explanation of building conditions, defects and their causes
- Proposed methods and techniques of building conservation
- Proposed scientific studies and tests to be carried out in the project
- Pictorial documentation on building conditions and defects
- Floor plans, sections and elevations indicating the locations of building defects

An experienced building consultant, building surveyor or building expert will need to inspect and report on the causes of the building problem or defect. Every defect must be assessed on an individual basis so that the correct building remedial works are carried out

4.0 Conclusion

It is essential to recommend in the dilapidation survey report the proposed scientific studies and tests to be carried out during any conservation work. Such scientific studies and laboratory tests are important as they provide additional information that can lead to solving related building problems or defects. Common scientific studies required during the conservation works include microbiological studies to identify plant species, dispersion agents, control ranking and chemical fungicides; archaeological studies to trace hidden remnants; and the study of relative humidity to gauge the local temperatures and air moisture levels.

5.0 Summary

To be effective, the practice of the dilapidation survey should involve a multidisciplinary approach which requires in-depth knowledge in conservation as well as other related fields in order to correctly assess building defects, determine their causes, and propose restoration methods. Relevant scientific studies and laboratory tests are equally important as these results provide for a sound basis for decision-making in conservation works. Callous incidences of improper diagnoses of building conditions and the resultant ineffective remedial measures may pose unnecessary threats to the heritage building structures and raise concerns over public safety. It is imperative, therefore, to invest some resources in conducting the dilapidation survey prior to any conservation project. The dilapidation survey report, once completed, serves as an indispensable archival resource for future references and cyclical building maintenance programmes.

6.0 Tutor-Marked Assignment

1. Identify common defects found in buildings and evaluate their causes
2. What remedial approaches would you suggest for forestalling the occurrences of building defects?

7.0 Reference/Further Reading

Bob Mann and Robert S. Mann (2006) Defect-Free Buildings: A Construction Manual for Quality Control and Conflict. New York; McGraw-Hill.

Stuart H. Bartholomew (1998) Construction Contracting. New Jersey; Prentice Hall.

UNIT 5 SAFETY AND SECURITY

CONTENTS

1.0 Introduction

The safety of customers and employees is critically important, as is protecting a restaurant's assets. They will learn basics important in the design of safety programs to help protect people and security programs to help protect property. Procedures to protect a restaurant from consumer theft, fraudulent payments, and internal theft are presented. Finally, managers will learn how to devise, implement, and assess emergency plans to safeguard individuals and assets and to respond to crises threatening people, property, or the business itself. Managers have no task more important than taking reasonable care to protect the safety of employees and customers. They must also protect business assets. These responsibilities require an examination of routine safety and security processes and emergency procedures.

2.0 Objectives

At the end of this unit, you will be able to explain:
Safety and security programs
Safety and Security Departments.
Crisis management

3.0 Main Contents

3.1 Creating a protected environment

Managers have no task more important than taking reasonable care to protect the safety of employees and customers. They must also protect business assets. These responsibilities require an examination of routine safety and security processes and emergency procedures.

3.2 Safety and Security Management

Procedures and activities designed to protect the property and assets of customers, employees, and the business. Managers are responsible for numerous activities designed to protect people and property, which are part of a safety program and a security program.
Policies, procedures, and training programs constituting safety and security programs must be planned, implemented, and continually assessed.
Large restaurant companies employ Directors of Safety and Security, who design and encourage on-site safety and security efforts. In smaller restaurants, the manager is responsible to meet the expectations of the general public, customers, employees, and others who will be protected from harm. Failure to do so can result in tremendous liability if lawsuits occur.
Courts will not expect managers to guarantee, against all possible calamities, the safety of everyone coming in contact with a restaurant. They will expect managers to use good judgment when managing procedures that show concern for the well-being of people and the security of their property.

3.3 Crisis Management

Crisis is an occurrence with potential to jeopardize the health and well-being of individuals and/or the business. Managers sometimes face challenges that are anything but minor.

Consider Samir, who manages a restaurant near a community that has been destroyed by a tornado. He knows that storms often occur with little warning and wonders what he and his staff would do if a storm threatened his restaurant. He also wonders what he can do now to prepare in case a tornado strikes his property.

Examples of crisis situations having potential for devastating damage to restaurants include:
- Power outages
- Vandalism
- Arson/ fire
- Bomb threats
- Robbery
- Looting
- Severe storms, including Hurricanes Tornadoes Earthquakes
- Floods

- Snow and ice
- Civil disturbances
- Accidents/injuries
- Drug overdoses
- Medical emergencies, including cardiopulmonary resuscitation (CPR)
- Death/suicide of customer or employee
- Intense media scrutiny
- Adversarial governmental agency investigation

Although managers do not have control over some crises, such as storms, it is reasonable to assume that a manager could preplan for them. Crisis management involves preplanning, responding properly during a crisis, and assessing performance afterward to determine whether improvement is possible.

The legal implications of safety, security, and crisis management are important, as are the financial, marketing, public relations, and morale issues associated with creating a protected environment. Managers must keep current on changing trends and products related to customer, employee, and asset safety to ensure the physical safety of those entering their property and to reduce legal liability.

3.4 Safety and security programs

It is difficult to provide a step-by-step list of activities which, if implemented, will minimize the chances of accident, injury, or loss. Managers must assess their safety and security program needs, develop and implement programs to address them, and effectively monitor results with the goal of constant improvement.

Advantages of Preplanning

The advantages of a safe and secure environment go beyond protecting customers, employees, and business assets and include:

- Increased employee morale. When employees see safety and security programs being implemented, they know this benefits them.
- Improved management image. Often, managers are accused of placing the needs of the business ahead of the needs of people. Implementation of safety and security programs demonstrates management's concern for staff and customers and confirms that management cares for people as well as profits.
-Improved effectiveness in recruiting employees. Effective safety and security programs can affect recruiting. Consider the parents of a teenage worker counseling their child about a job offer. Uniformed security guards, closed-circuit cameras, and a management dedicated to safety will be important in the decision-making process.
-Reduced insurance rates. Insurance companies often reward businesses for safety and security efforts by reducing insurance premiums.

-Reduced employee costs. Employees who avoid injury are more productive and reliable than those who do not. Worker's compensation claims are lower in a safe work environment, and lost productivity from injury-related absence is reduced.
-Improved operating ratios. A safe and secure facility has lower costs.
When theft by customers and employees is reduced, profitability increases. Well-conceived programs to reduce theft and raise awareness about security measures yield lower operating costs and higher gross operating profits.
- Support if accidents occur. When accidents do happen, attorneys and managers will want documented evidence that programs were in place to reduce the chance of a mishap. Juries will be interested in whether managers exercised reasonable care in the operation of their property. Attorneys can best do their job when managers have done their job professionally.
- Increased customer satisfaction. The restaurant that does not protect its inventory affects the customer. Inventory stockouts and/or the need to increase prices to cover higher costs promote customer dissatisfaction.
- Marketing advantages. When a restaurant takes a genuine and documentable proactive stance in safety and security, it becomes easier to market the property to the general public.
- Reduced likelihood of negative press. Today's media typically sensationalize misfortunes. Managers can often avoid accidents and thereby escape the negative press that would otherwise result. It is always easier to avoid accidents than to defend oneself in the press.

3.5 Safety and Security Management Process

Legally, a manager's basic obligation is to act responsibly in the face of threats to people and property. One way to manage those responsibilities is to use a four-step safety and security management process, as described in the following paragraphs.

Recognize the Threat.

Safety and security programs start by recognizing that a threat to people or property exists. Consider Tunc, who manages a pizza parlor. Over the past six months, four customers and two employees have complained about vandalism to their cars. Prior to these incidents, he never had a problem.
Now he realizes the need to act responsibly to serve the interests of his customers, employees, and their property. It is common to assess the need for safety and security programs as they relate to: -
Customers and employees and their property
- Other affected persons and their property
- Business assets
A number of safety and security concerns follow. The list is not exhaustive but does indicate areas within a restaurant to be considered in developing a safety and security program.

Areas of Safety and Security Concern

Customers

- Parking lots
- Public areas
- Dining rooms
- Bars and lounges
- Rest rooms
- Meeting (function)
- rooms

Employees

- Work site safety
- Workplace violence
- Worker accidents
- Employee locker rooms

Customers' Property In
- Coatrooms
- Parking lots

Business Assets

- Cash
- Operating supplies
- Food and beverage inventories
- Equipment and service ware
- Telephone access

All People and Property

- Medical emergency
- Criminal activity
- Natural disaster
- Utility outages

Respond to Threat.

After a threat to safety or security is identified, a response can be developed. Responses can include:

- Training for threat prevention. If, for example, employee safety is threatened by back injuries caused by improper lifting, training employees in proper lifting techniques may reduce or eliminate that threat.
- Increased surveillance or patrol. Sometimes the best response to a threat is to increase necessary scrutiny. In the parking lot problem described earlier, Tunc could increase parking lot monitoring. Routine patrols by management, employees, and an outside security firm or the police may help to deter vandals.

Some safety and security threats can be addressed by using video cameras in stairwells, halls, and storerooms. Often the presence of the camera itself deters crime. (Camera systems can either record activity in an area or show such activity without recording it).

An owner's right to unlimited monitoring and surveillance, even in that owner's property is not absolute. Illegally monitoring the behavior of customers and employees can dramatically increase an owner's own legal liability.

- Systematic inspections. Systematic inspections of facilities can often identify possible safety and security threats. Managers should carefully monitor their property's compliance against accepted standards of a safe and secure operation, and such efforts should be documented.

- Modification of facilities. When the facility itself contributes to a problem, it will require modification. Examples include replacing worn carpets that may cause falls, painting curbs to make them more visible, and adding security lighting. Kitchen equipment must be properly maintained, with repairs made as soon as reasonably possible. Facility defects that are recognized but not acted upon can be damaging in the event of a lawsuit.
- Establishment of standard procedures. Routine policies and procedures can be an effective response to safety and security threats. For example, when a restaurant collects cash, the money must be counted and deposited according to specific procedures. Periodic product inventories, plate counts for buffet meals, and signing in and out for management keys are examples of standard operating procedures that affect safety and security.

Implement Program(s).

After a safety or security threat is identified and a response is developed, proper implementation becomes important. Large restaurants may have individuals specifically designated for these tasks; in smaller properties every employee may have responsibility for implementation. Large and small properties may be helped with temporary or longer-term assistance by a security guard company. Local law enforcement officials should always be a component of any safety and security efforts.

3.6 Safety and Security Departments.

Large properties may have a Safety and Security Department, whose manager reports to the General Manager. Staff would be responsible for routine duties such as patrolling the facility, performing inspections, assisting with crime reports, and serving as liaison with insurance

carriers. The department would also advise the General Manager on safety and security topics.

Security Guards.

Managers of smaller properties may contract with a security guard company to help with program implementation. Generally, a guard's role is to:

Observe the property
- Report observations to management (or police, if needed)
- Intervene only if it can be done safely or to protect the life of a customer or employee.
- Record activities and findings

Engaging security guards is an excellent option when additional help is needed (for example, in the event of large parties or when managers believe additional safety or security protection is warranted). They are not a substitute for a complete and ongoing safety and security program. If guards are to be used, insist that the security guard company do the following:
- Provide an acceptable indemnification/hold harmless agreement
-Supply proof of liability insurance that names the restaurant as an additional insured
- Demonstrate proof that it carries worker's compensation insurance
- Supply a copy of its hiring standards and procedures
- Provide a written agreement as to the specific services it will provide

4.0 Conclusion

This unit has shown the need and importance of safety and security in hotel operations. It has discussed the process of achieving and maintaining the security of the premises.

5.0 Summary

Managers are responsible for numerous activities designed to protect people and property, which are part of a safety program and a security program.
Crisis is an occurrence with potential to jeopardize the health and well-being of individuals and/or the business.
Areas of safety and security concern are customers, employees, business asset, all people and property, Customers' Property In

6.0 Tutor-Marked Assignment

Discuss Safety and Security Management Process
Explain the areas of safety and security concern
Itemize the advantages of pre-planning

7.0 Reference/Further Reading

Goyal, N.C. and Arora, K.C. (1996) A textbook of hotel maintenance. Standard Publishers, Delhi.