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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

UNIT – I–FACILITIES PLANNING AND MANAGEMENT– SARA7306

I. INTRODUCTION

Facility management

International standardization is one step that helps to bridge understanding and business opportunity. Facility management embraces the concepts of cost-effectiveness, productivity improvement, efficiency and employee quality of life.

Principle duties of a facility manager

IFMA has organized the functions into "competencies" around which it designs all of its professional programs. The eleven competencies form the basis of standardization and encapsulate all of the many functions required in FM. The competencies of facilities manager are Communication, Emergency preparedness and business, Environmental stewardship and sustainability, Finance and business, Human factors, Leadership and strategy, Operations and maintenance, Project management, Quality, Real estate and property management and Technology.

Perceptions of the Profession and Its Professionals

The important business and cultural trends that have radically changed the private and public sectors:

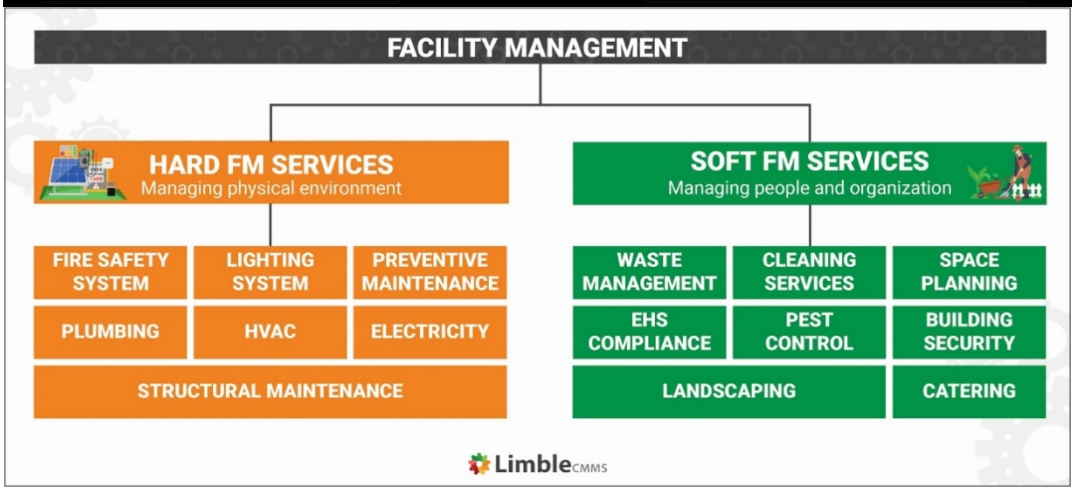
Business Trends	**Cultural Trends**
• Focus on cost reduction and shareholder value • Internationalization • Rise of the chief financial officer • Outsourcing • Rising cost, particularly in the construction area • The growth of E-commerce • The integration of facility resource information into corporate business data • Emphasis on speed of delivery • Improved information technology particularly in the areas of architecture/ engineering planning and work management • Increased use of public/private partnerships • The importance of the knowledge economy • New ways of working collaboratively and remotely, enabled by mobile technology • New sustainability initiatives and targets • Concern about security and emergency preparedness	• Aging of the population • Lack of skilled tradesmen • An increasingly diverse workforce • Environmental concerns • Lack of loyalty and trust in institutions • Generational perceptions of the value/use/importance of the workplace • Concern for better ethics and stewardship

Facilities Manager

A new facility manager profile has emerged based on the trends. The facility manager is no longer focused on a narrow technical field where the language is "FM speak," but now has the expanded viewpoint of a business leader who helps the organization take a strategic view of its facilities and their impact on productivity. The characteristics of a successful facility manager in today's business environment as Business leader, Strategic business planner and implementer,

Resource obtainer, Financial manager, Spokesperson and advocate, Agile purchaser, lessor, and contractor with a major regard for ethics, Information manager, Environmentalist, Networker, Mentor, Innovator, Risk taker and Survivor.

Figure 1.1: Facility Management



Facility management (FM) is an essential business function; the facility manager is a business manager and should be placed at the same level as the managers of human resources and information technology.Every FM organization has some element contracted out, so contract negotiation and administration skills are essential for every facility manager.Facility managers need to be innovative in their contracting. Low-bid contracts are seldom appropriate, and partnering with the contractors and consultants insisting them continue working for the organization is a best practice.

Good FM is based on good leadership of a proper organization.FM needs better basic research and better application of both existing research and best practices.Every facility manager should have a facility master plan as a priority. Included should be a recapitalization plan covering at least ten years.Sustainability, security, and emergency management are functions with great management and customer interest, which every FM must accommodate.In the public sector, it has been practiced as post engineering, public works, or plant administration for many years.

In leased property, the profession is called property management or building operating management, although most of the required skills are the same as those needed in owned property.Facility management is “a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process, and technology.”

FUNCTIONS OF FACILITIES MANAGEMENT

1. MANAGEMENT OF THE ORGANIZATION

Management of the Organization

- Planning
- Organizing
  - — By function, organization, or location
  - — Centralized versus user driven
- Staffing
  - — Personnel management
  - — Evaluation of mix of staff, consultants, and contractors
  - — Training
- Directing
  - — Work scheduling
  - — Work coordination
  - — Policy and procedure development
- Controlling
  - — Work reception
  - — Standards establishment (dollar range, quality, quantity, time to deliver)
  - — Scheduling
  - — Use of management information systems and information technologies
  - — Contract administration
  - — Policy and procedure execution
- Evaluating
  - — Design
  - — Program analysis
  - — Contractor evaluation

2. FACILITY PLANNING AND FORECASTING

Facility Planning and Forecasting

- Business unit knowledge gathering
- Strategic facility planning (three- to ten-year plans)
- Facility operational planning (twelve months to three years)
- Space forecasting (macro-level, organization-wide)
- Macro-level programming (organization-wide)
- Financial forecasting and macro-level estimating (organization-wide)
- Capital program development

3. LEASE ADMINISTRATION

Lease Administration

- Outleasing (as owner)
- Lease administration/audit (as owner or lessee)
- Property management (as owner)

4. SPACE PLANNING, ALLOCATION AND MANAGEMENT

Space Planning, Allocation, and Management

- Space allocation
- Space inventory
- Space forecasting (micro-level, one location)
- Space management

5. ARCHITECTURAL PLANNING AND DESIGN

Architectural/Engineering Planning and Design

- Macro-level programming (one location)
- Building planning
- Architectural design
- Engineering design of major systems
- Macro-level estimating (one location)
- "As built" maintenance
- Disaster recovery planning
- Design document preparation and updating
- Code compliance
- Traffic engineering
- Zoning compliance

6. WORK PLANNING, ALLOCATION AND MANAGEMENT

Workplace Planning, Allocation, and Management

- Workplace planning
- Workplace design
- Furniture specification
- Furnishings specification
- Estimating
- "As built" maintenance
- Code compliance

- Move, add, change (MAC) management and record keeping
  - — Alteration management
  - — Renovation management
  - — Furniture installation
  - — Information & Communication Technologies (ICT) installation
  - — Provision of furnishings
  - — Art program management
  - — Equipping
  - — Relocations
  - — Procurement (to move, alter, change)
  - — Preparation of "as builts" and updates
  - — Project management

7. BUDGETING, ACCOUNTING AND ECONOMIC JUSTIFICATION

Budgeting, Accounting, and Economic Justification (done concurrently with planning and design)

- Programming (same period covered as for space planning

  unless otherwise specified by the company)
- Work plan preparation
- Budget preparation (one to two years)
  - — Administrative
  - — Capital
  - — Operations and maintenance
  - — Chargeback
- Economic justification
- Financial forecasting (one to two years)
- Budget formulation
- Budget execution

8. REAL ESTATE ACQUISATION AND DISPOSAL

Real Estate Acquisition and Disposal

- Site selection and acquisition
  - — Environmental due diligence
  - — Legal due diligence
- Building purchase
- Building lease
- Real estate disposal

9. SUSTAINABILITY

Sustainability (these functions normally done concurrently with other functions)

- Site selection decisions to minimize environmental impacts
- Environmental policies to minimize waste and reduce resource usage
  - — Recycling program management
  - — Transportation management
  - — Energy audits and retrofits
  - — Building commissioning and recommissioning
  - — Building systems audits and retrofits
  - — Purchasing policies for reduced environmental impacts
  - — Vendor relationship management for sustainability
  - — Indoor air quality management
- Project management in compliance with environmental regulation
  - — Federal, state, and local requirements
  - — Sustainable guidelines adoption (Leadership in Energy and Environmental Design [LEED], Green Globes, Energy Star, etc.)

- Workplace improvements for productivity
  - — Daylighting
  - — Indoor air quality
  - — Thermal comfort
- Aligning design with business functions
  - — Sustainable maintenance and operations practices
  - — Social responsibility reporting

10. CONSTRUCTION PROJECT MANAGEMENT

Construction Project Management

- Project management
- Construction management
- Procurement management
- Preparation of "as builts"
- Punch-list preparation and execution
- Postoccupancy evaluation
- Project evaluation

11. OPERATION MAINTENANCE AND REPAIR

Operations, Maintenance and Repair

- Exterior maintenance (roofs, shell, and window systems)
- Preventive maintenance
- Breakdown maintenance
- Cyclic maintenance
- Grounds maintenance
- Road maintenance
- Custodial maintenance
- Pest control
- Trash removal
- Hazardous waste management
- Energy management
- Inventory of systems and equipment
- Maintenance projects
- Repair projects
- Correction of hazards (asbestos, bad air quality, radon, underground leaks, PCBs, etc.)
- Disaster recovery
- Procurement (operations, maintenance, and repair supplies and services

12. TECHNOLOGY MANAGEMENT

Technology Management

- Operations
- Maintenance
- Voice and data system operations and reconfiguration
- Network management
- "As built" maintenance
- Integrated workplace management system (IWMS)
  - — Selection
  - — Installation
  - — Operation

13. FACILITY EMERGENCY MANAGEMENT

Facility Emergency Management
- Emergency preparedness planning
- Threat assessment
- Command, control, and communications
- Mitigation strategies
- Training, drill, and exercise
- Disaster recovery planning

14. SECURITY AND LIFE SAFETY MANAGEMENT

Security and Life-Safety Management
- Code compliance
- Operations
- Crime prevention through environmental design
- Access control
- Physical deterrents
- Electronic security
- Vulnerability assessment

15. GENERAL ADMINISTRATIVE SERVICES

General Administrative Services
- Food services, refreshments, and vending
- Reprographics
- Mail and messenger management
- Fleet management
- Property tracking and disposal
- Moving services
- Procurement (as a function)
- Health and fitness program management
- Day care center management
- Concierge services and on-site vendors
- Records management and storage
- Assembly management support and security

Use of the term “asset management” should be reserved for major infrastructure assets such as federal, state, and local assets such as bridges, highways, electrical grid systems, water systems, and similar major infrastructure. Every facility manager will be involved in managing the functions either as the principal manager or as a major supporting manager. General administrative services

tend to be managed by facility managers in very small organizations and by FMs, often vice presidents of facilities or administration, in very large organizations.

Sound principles of planning, lease management, and energy management. Yet most facility managers are viewed narrowly as technical managers, not business managers. The characteristics of a successful facility manager in today's business environment: Business leader, Strategic business planner and implementer, Resource obtainer, Financial manager, Spokesperson and advocate, Agile purchaser, lesser, and contractor with a major regard for ethics, Information manager, Environmentalist, Networker, Mentor, Innovator, Risk taker and Survivor.

The Big Twelve: twelve major actions of facility manager

1. Conduct and regularly update an assessment of both physical facilities and operations.

2. Measure! Measure! Measure!

3. Develop a facilities master plan from which all midyear and annual planning derives. As part of the master plan, include a recapitalization plan covering at least ten years.

4. Get your organizational structure right. Don't confuse staffing with organization.

5. Recognize that in all but a few special cases, staffing is a blend of staff, contractors, and consultants, in order to minimize cost and maximize flexibility.

6. Institute a customer-based quality program that uses multiple means to obtain customer input.

7. Determine the information you need in order to manage, and then develop automation to produce it. FM information system should be budget-based.

8. Institute facility business planning can feed into company business planning. Use the company's criteria and systems for making financial decisions.

9. Show results! Companies don't pay for good intentions and plans—only for results. View your department as a business within your company.

10. Use innovative contracting. For other than simple contracting situations, low-bid contracting will result in unsatisfactory results. Partner with your contractors and consultants but demand that they perform if they are to continue to work with you.

11. Have a public relations plan each year that targets each of the constituencies that you have identified.

12. Get management commitment to good FM.

Facility management – Business function

Facility management is the quintessential business function, affecting not only revenues and costs but also production, quality of life for employees, health and safety, the work environment, and, increasingly, areas such as recruitment and employee retention. When FM is practiced properly, the following benefits accrue to the organization:

- Facility plans match the organization's plans.
- Properly outfitted space is available when and where it is needed.
- Capital expenditures are planned and controlled.

• Employee productivity is maximized.

• Costs are minimized, sometimes avoided, and always predicted.

Future challenges for Facilities manager

Facility Manager recognizes and envisions the following as being challenges for themselves in the future: Outsourcing, Changing demographics of the workforce, Increased globalization, Mergers/acquisitions and their effect on facilities, Labour shortage, Resource scarcity (and its effect on prices), Distributed work arrangements (like telework) and their impact on facilities — Shared services.

Major Themes of Facility Management

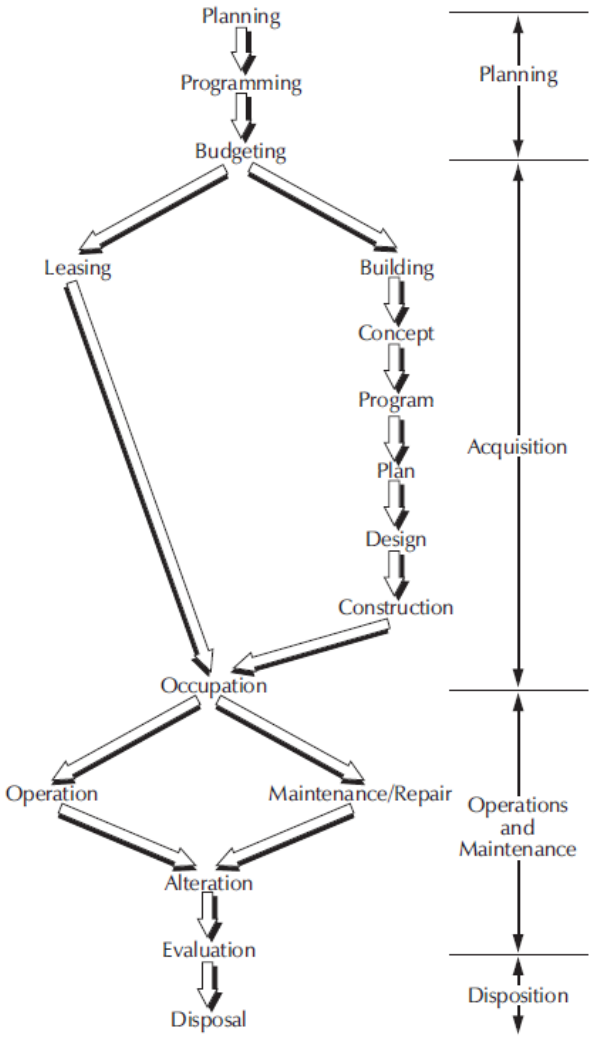
1. **The cost of ownership**: There are initial and ongoing costs to the ownership of facilities. Management must understand and provide for those costs, from planning through disposal.
2. **Life-cycle costs**: As a general rule, all economic analyses and comparisons should be based on life-cycle costs. Bad decisions are often made when only capital or initial costs are considered.
3. **Integration of services**. Good management means integrating different facility services (e.g., design and operations).
4. **Design for operations, maintenance, and sustainability**. Operators and maintainers, even if they are contractors, must be actively involved in the design review process.
5. **Delegated responsibility**. In large organizations, FM functions should be grouped into budget programs, with a manager responsible and accountable for each.
6. **Cost-effectiveness**. The key is to identify and compare costs with meaningful benchmarking partners, and make those comparisons regularly over time.
7. **Efficiency improvement**. Efficiency should be judged constantly through comparators, user feedback, and management-by-walking-around.
8. **Quality of life**. The facility manager must actively promote and protect the employees' quality of life. A safe workplace is the minimum; a workplace where the facility promotes individual and group productivity should be the goal.
9. **Integration of elements**. The facility manager is the company's expert on facilities (the place), on those factors that determine the success of work (the process), on the analysis and documentation of those factors and systems (the technology), on the employees (the people), and on how they all come together.
10. **Redundancy and flexibility**. Because the nature of this work is always partly reactive, the facility manager must build flexibility into the facilities, the organization, and departmental procedures.
11. **Facilities as assets**. The facilities should be viewed as a valued asset (not just on the organization's books) that contributes in numerous ways to the company mission. If this concept is sold to management, then the rest of the mission automatically becomes easier. There is growing evidence that employees are judging employers on the quality of the facilities; this may make this argument easier.

12. **Facility management as a business function**. The facilities deserve to be managed in a businesslike manner. Facilities must be developed in parallel with the organization's business and aligned and planned to the same degree. Facility management as a continuum, from planning through disposal. It is not a series of discrete projects.

13. **Service**. Facility management provides only one product—service support. The nature of FM is likely to emphasize control and compliance, whereas it should demonstrate flexibility and service. This is particularly true in the public sector. A quality program is based on how service is perceived by the customer, and this perception must be sought in multiple ways. A successful service program depends on long-term relationships and commitment at all levels.

14. **Contracting**. A facility manager must be an agile procurer of services. Traditional contracting methods are often subject to poor service, unsatisfactory performance, higher costs through change orders, and poor contractor–facility manager cooperation. Contracting should be ethical and performance-based, and emphasize partnership and equity for all parties.

Facility Management Life Cycle



Note:
Operations and Maintenance is the longest phase, often 15–25 times longer than all other phases for normal building use.

Building infrastructure to fleet services

Public works infrastructure - highways, streets, roads, and bridges; mass transit; airports and airways; water supply and water resources; wastewater management; solid-waste treatment and disposal; electric power generation and transmission; telecommunications; and hazardous waste management – and the combined system these modal elements comprise.

A comprehension of infrastructure spans not only these public works facilities, but also the operating procedures, management practices, and development policies that interact together with societal demand and the physical world to facilitate the transport of people and goods, provision of water for drinking and a variety of other uses, safe disposal of society's waste products, provision of energy where it is needed, and transmission of information within and between communities.

Hard and Soft Infrastructure

Hard infrastructure refers to the large physical networks necessary for the functioning of a modern industrial nation. Soft infrastructure refers to all the institutions which are required to maintain the economic, health, and cultural & social standards of a country, such as the financial system, the education system, and the health care system, the system of government, and law enforcement, as well as emergency services.

Types of Hard Infrastructure

- Transportation infrastructure
- Energy infrastructure
- Water management infrastructure
- Communications infrastructure
- Solid waste management
- Earth monitoring and measurement networks

Types of soft infrastructure

- Governance infrastructure
- Economic infrastructure
- Social infrastructure
- Cultural, sports and recreational infrastructure

Architectural Programming

Buildings / Structures have always been based on programs / typologies the Decisions were made, something was designed, Built and occupied. Architectural programming as the research and decision-making process that identifies the scope of work to be designed. “Facility programming" – includes functional and operational requirements, and scope.

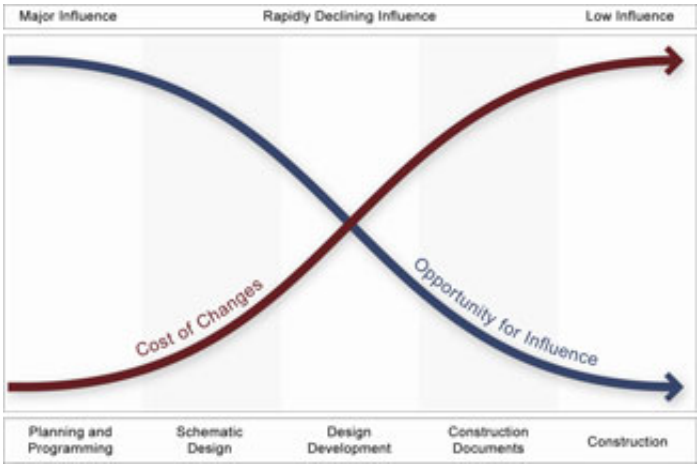
In 1960 - William Pena, John Focke, and Bill Caudill of Caudill, Rowlett, and Scott (CRS) developed a process for organizing programming efforts. Their work was documented in Problem

Seeking, this guided many architects and clients who sought to identify the scope of a design problem prior to beginning the design that intended to solve the problem.

In the 1980s and 1990s, some architectural schools began to drop architectural programming from their curriculum. The emphasis of the Post-Modern and Deconstruction agendas was instead on form-making. Programming and its attention to the users of buildings was not a priority.

Several generations of architects have little familiarity with architectural programming. The advantages include:

- Involvement of interested parties in the definition of the scope of work prior to the design effort
- Emphasis on gathering and analyzing data early in the process so that the design is based upon sound decisions
- Efficiencies gained by avoiding redesign and more redesign as requirements emerge during architectural design.
- The most cost-effective time to make changes is during programming.
- This phase of a project is the best time for interested parties to influence the outcome of a project.



- The "whole building" design approach is intended "to create a successful high-performance building".
- To achieve that goal, we must apply the integrated design approach to the project during the planning and programming phases.
- People involved in the building design should interact closely throughout the design process.
- The owner, building occupants, and operation and maintenance personnel should be involved to contribute their understanding of how the building and its systems will work for them once they occupy it.
- The fundamental challenge of "whole building" design is to understand that all building systems are interdependent.

According to standard AIA agreements, programming is the responsibility of the owner. The owner's programmatic direction can vary from vague to very specific. In some cases, the owner does not have the expertise to develop the program and must use the services of a programming consultant. Most programming consultants are either architects or have architectural training, but others have become skilled through experience. Many architects perform programming as an additional service to their standard contracts. Many building type consultants (laboratory, health care, theater, etc.) have expertise in programming components of facilities.

Levels of Programming

Programming may happen for different purposes and may impact the level of detail of investigation and deliverables.

- **Programming at the master planning level** is more strategic in nature—providing information to building owners to make decisions regarding current and projected space needs and rough budgeting for implementation.
- **Programming at the individual project** level provides specific, detailed information to guide building design.

Architectural Programming Process

Process for conducting the research and decision-making that defines the scope of work for the design effort. It is imperative that the major decision-maker—the client-owner—allows participation of all of the stakeholders, or the client-users, who are affected by the design. Experience helps the client-users' involvement in the programming process results in designs that can be optimized more efficiently.

Organizing For The Programming Effort

The programmer and the client-owner develop a list of the stakeholders to be involved. One organizational method is to form a Project Programming Committee with representatives from the stakeholder groups. For Example**,** if the project is to be a school building for the humanities department at an institution of higher education, the Project Programming Committee could include representatives from the involved academic department(s), faculty, students, and building operations and facility maintenance departments.

- Lines of communication must be established
- determine how and when meetings will be called,
- what the agenda will be,
- how contacts will be made, and
- How records of the meetings will be kept.
- The authority of the committee must be made clear. The committee's authority will make recommendations. Within the framework, the committee must decide how it will make decisions as a committee (by consensus / majority rule / other means).

Six Step Process

The design programming fits within a larger context of planning efforts which can also be programmed. A six-step process for design programming of a building includes.

1) Research the Project Type

It is a necessary step, if the programmer is working on a project type for the first time. The programmer should become familiar with some of the following relevant information:

- The types of spaces frequently included in the building type,
- The space criteria (number of square feet per person or unit) for those spaces,
- Typical relationships of spaces for these functions,
- Typical ratios of net assignable square footage (NASF—areas that are assigned to a function) to gross square footage (GSF—total area to the outside walls) for this building type,
- Typical costs per square foot for this building type,
- Typical site requirements for the project type,
- Regional issues that might alter the accuracy of the data above in the case of this project.
- Technical, mechanical, electrical, security, or other issues unique to the project type.
- These information can be obtained from literature on the building type, analysis of plans of existing projects, expert consultants familiar with the building type, and/or cost estimating services.

2) Establish Goals and Objectives

Working with the committee, the programmer solicits and suggests broad goal statements that will guide the remainder of the programming process. Each of the following categories of goals should be addressed:

- **Organizational Goals:** What are the goals of the owners? Where do they see their organization headed? How does this architectural project fit into this broad picture?
- **Form and Image Goals:** What should be the aesthetic and psychological impact of the design? How should it relate to the surroundings? Should its image be similar to or distinct from its neighbors? From other buildings belonging to the owner that are located elsewhere? Are there historic, cultural, and/or context implications?
- **Function Goals:** What major functions will take place in the building? How many people are to be accommodated? How might the building design enhance or impact occupant interactions?
- **Economic Goals:**
  - What is the total project budget? What is the attitude toward initial costs versus long-range operating and maintenance costs?
  - What level of quality is desired (often stated in relation to other existing projects)? What is the attitude toward conservation of resources and sustainability (energy, water, etc.)?
- **Time Goals:** When is the project to be occupied? What types of changes are expected over the next 5, 10, 15, and 20 years?
- **Management Goals:** These goals are not so much an issue of the nature of the project as they are the circumstances of the owner, clients, programmer, or architect.
- **Example:** The schematic design must be completed in time for a legislative request application deadline.

3) Gather Relevant Information

Based upon the goals, the categories of relevant information can be determined and researched. Typical categories include:

- Facility users, activities, and schedules: Who is doing what, how many people are doing each activity, and when are they doing it?
- What equipment is necessary for activities to function properly? What is the size of the equipment?
- What aspects of the project need to be projected into the future? What is the history of growth of each aspect that requires projection?
- What are the space criteria (square feet per person or unit) for the functions to take place?
- What other design criteria may affect architectural programming: access to daylight, acoustics, accessibility, campus/area design guidelines, historic preservation, etc.?

- Are there licensing or policy standards for minimum area for various functions? What are these standards?
- What are the energy usage and requirements?
- What code information may affect programming decisions?

Site analysis: the site is always a major aspect of the design problem and therefore should be included in the program. Site analysis components that often affect design include:

- Legal description
- Zoning, design guidelines, and deed restrictions and requirements
- Traffic (bus, automobile, and pedestrian) considerations
- Utility availability (a potentially high cost item)
- Topography
- Views (from site, towards site)
- Built features
- Climate (more important for responsive design)
- Vegetation and wildlife

Client's existing facility as a resource

- If the client is already participating in the activities to be housed in the new facility, it may be possible to make use of information at hand. Determine if the existing facility is satisfactory or obsolete as a resource.
- If a floor plan exists, do a square foot take-off of the areas for various functions. Determine the building efficiency (the ratio of existing net-to-gross area). This ratio is useful in establishing the building efficiency target for the new facility.
- If the client is a builder of similar projects (school districts, public library, public office building, etc.), obtain plans and do area take-offs; determine typical building efficiencies.
- Use the existing square footages for comparison when you propose future amounts of space. Client can relate to what they already have.

4) Identify Strategies

Programmatic strategies suggest a way to accomplish the goals given what one now knows about the opportunities and constraints. Example of a programmatic strategy is the relationship or "bubble" diagram and proximity chart. These diagrams indicate what functions should be near each other in order for the project to function smoothly. Relationship diagrams can also indicate the desired circulation connections between spaces, what spaces require security or audio privacy, or other aspects of special relationships. Other types of strategies recur in programs for many different types of projects.

- **Centralization and decentralization:** What function components are grouped together and which are segregated? For example, in some offices the copying function is centralized, while in others there are copiers for each department.
- **Flexibility:** What types of changes are expected for various functions? Do facilities need to change over a period of a few hours? A few days? A summer recess? Or is an addition what is really needed?
- **Flow:** What goods, services, and people move through the project? What is needed at each step of the way to accommodate that flow?
- **Priorities and phasing:** What are the most important functions of the project? What could be added later? Are there ongoing existing operations that must be maintained?
- **Levels of access:** Who is allowed where? What security levels are there?

Ideally, each of the goals and objectives identified in Step 2 will have some sort of strategy for addressing that goal.

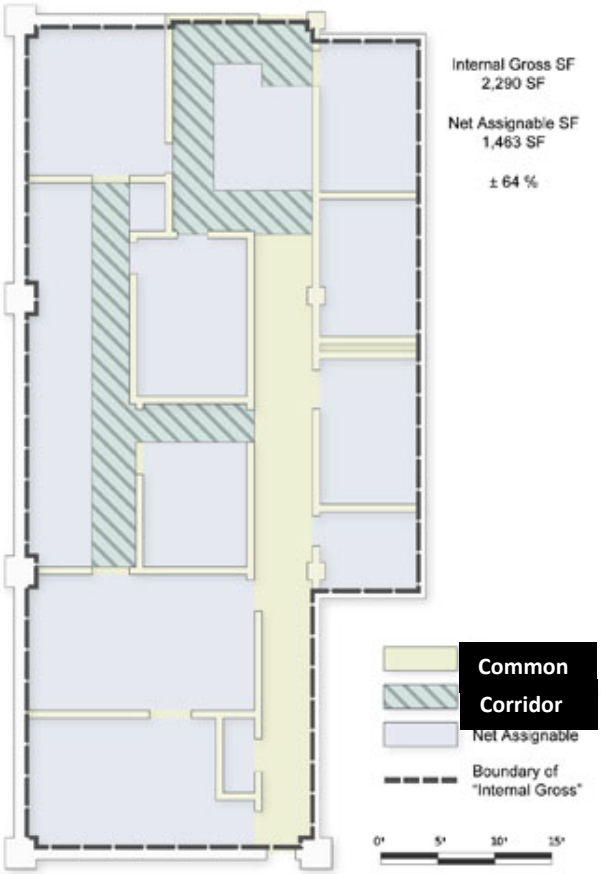
5) Determine Quantitative Requirements

Cost, schedule, and affordable area are interdependent. Costs are affected by inflation through time. Affordable area is determined by available budgets. In this step, one must reconcile the available budget with the amount of improvements desired within the project time frame. First, a list of spaces is developed to accommodate all of the activities desired. The space criteria researched in Step 3 are the basis of this list of space requirements. The space requirements are listed as net assignable square feet (NASF), referring to the space assigned to an activity, not including circulation to that space.

A percentage of common space is added to the total NASF. Common area includes spaces for circulation, walls, mechanical, electrical and telephone equipment, wall thickness, and public toilets. Building efficiency is the ratio of NASF to gross square feet (GSF), the total area including the NASF and common areas. Building efficiency equals NASF/GSF. The building efficiency for a building type was researched in Step 1 and possibly Step 3.The building efficiency of an existing space used by a client can inform the selection of the net-to-gross ratio.

Example - an office suite within an office building with the areas of net assignable square feet and common area. Some space within an office is considered circulation, even though it is not delineated with walls – internal circulation corridor that does not include as assigned space. For tenant

improvement within a larger building, internal gross of the leased space is quantified. Additional support space or common area such as mechanical rooms and public toilets would not be included in the calculation for this project type.



The desired GSF is then tested against the available budget. In drafting the total project cost, the programmer uses the cost per square foot amount researched in Step 1. Factors for inflation should be included, based upon the project schedule. Costs should be projected to the date of the mid-point of construction because bidders calculate estimates on the assumption that costs could change from the time of the bid date.

The total project cost includes the construction cost (for building and site work), plus amounts for architect's fees, furniture and equipment, communications, contingency, printing for bid sets, contingency, soils tests, topological surveys, and any other costs that must come from the owner's budget. This helps the owner prepare for all the project costs, not just those costs assigned to construction.

If the project costs is more than the budget, three things can be worked:

1) Space can be trimmed back or delegated to a later phase (a reduction in quantity);

2) The cost per square foot can be reduced (a reduction in quality); or

3) Combination of the options 1 and 2

This reconciliation of the desired space and the available budget is critical to defining a realistic scope of work.

6) Summarize the Program

Finally after all the steps executed, summary statements can be written defining "in a nut shell" the results of the programming effort. All of the pertinent information included above can be documented for the owner, committee members, and the design team as well. The decision-makers should sign-off on the scope of work as described in the program.

Once a program is completed and approved by the client, the information must be integrated into the design process. Some clients want the programmer to stay involved after the programming phase to insure that the requirements defined in the program are realized in the design work.

Emerging Issues

Emerging issues in the discipline of architectural programming include:

1. Development of standards and guidelines for owners that build similar facilities frequently. These efforts include:

    a. Formalizing (computerizing) building facility requirements for Web-based consumption.

Example - the National Park Service has developed Facility Planning Model Web-based software to assist park superintendents and other staff in the development of space and cost predictions for legislative requests. The intention is to make budget requests more realistic and more comprehensive.

    b. Facility programming to make early predictions to aid in early capital budgeting.

2. Client-owners are increasingly requiring verification that the design complies with the program.
3. New technologies are generating a need for types of space which have no precedents. Basic research on these technologies is required to determine standards and guidelines.
4. As more clients require measures for building energy and resource conservation standards (LEED, Green Globes, etc), the programming process needs to reflect these requirements in goals, costs, scheduling, and process.
5. More facility programmers are required and it’s a good career path.

RELEVANT CODES AND STANDARDS

A very important part of programming is identifying relevant codes and standards that apply to the project (in Steps 1 and 3). Codes, covenants, deed restrictions, zoning requirements, licensing requirements, and other legal obligations can have significant influence on costs and therefore, affordable GSF. These factors must be identified prior to design.

Many governments and institutions have developed standards and guidelines for space allocations. For example, the General Services Administration (GSA), military, and higher education institutions all have standards and guidelines. These standards must be adhered to in programming projects for these clients. The standards are also useful as guidelines for agencies that have not developed their own standards.

Some standards are mandated by statutes in some jurisdictions for licensing, accreditation, or equity purposes. Schools, hospitals, correctional facilities, and other licensed or accredited institutions may be required to meet these standards prior to opening their doors. Some building codes identify the number of square feet allocated per person for certain types of occupancy. However, while these ratios may determine the legal occupancy numbers for the facility, exiting requirements, fire separations, etc., they represent the minimum requirements. It may be necessary to accommodate specific activities adequately with more space.

CODES – TNCBDR, UDPFI, NBC

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

UNIT – II – FACILITIES PLANNING AND MANAGEMENT– SARA7306

II. FACILITIES DESIGN AND SPACE PLANNING

Corporate philosophies and methodologies

User input, through the facility manager, is an absolute requirement in good project planning. With high-quality design firms, competent constructors, and building standards, the project will be optimized when the expertise of the owner's representative—the facility manager—matches that of the design and construction services providers. Facility projects are planned, programmed, designed, codified, reviewed, constructed, and evaluated similarly, whether they involve a new site or merely an alteration of existing space.

New contracting devices and methods such as best value procurement and public/private partnerships, as well as new sustainability targets and guidelines, solve problems and add complexity to the profession and to the design–build function. An important new technology also impacts the design–build cycle; building information modeling (BIM) has become the tool of choice for large or complex facilities throughout the life cycle of planning, design, construction, and operation.

Facility managers who understand BIM and plan for its use from the start of any project will reap the largest benefits since facility management data will be captured through each phase of the project. This adds initial complexity but results in much more efficiency in further stages. Actions, from selecting an architect, to agreeing on what kind of service system will be used, for managing the selection of the builder, all impact huge organizational resources, and facility manager always be concerned about the actions as well as their appearance in the process.

The facility manager should program for maintainability as well as functionality, and place special emphasis on support areas. Project planning integrates information from the facility plan with requirements gathered through programming. The facility manager plans with care but always retains flexibility.

As a part of overall programming, the micro-level locational factors listed below need to be considered during the site selection process. The location factor by itself shows why the facility manager should manage real estate - Branding and image, Codes and limitations, Cleanliness, Costs of doing business, Cost of living expenses, Disability regulatory compliance, Distance to airports, harbors, and freeways, Environmental considerations, Expansion space, Ability to support sustainability, Floodplain status, Historic designations or locations, Local hazards, Mass transit , Property and business taxes, Property owner and manager reputation, if leased, Standardization , Utilities, Weather and susceptibility to natural disaster and Zoning.

Project programming, planning, and design are well-established procedures within the design community. The facility manager is responsible for deciding whether to develop the project using in-house, contracted, or consulting designers. The project programming process involves gathering the requirements for a specific project and examining the relationships of individual tasks.

The program is a tool for managing the project and a guide to anticipated results.

(1) an understanding of what is needed and expected by the users,

(2) the establishment of performance expectations at specific time intervals.

It is not possible to develop an aesthetically pleasing or functional work environment without first defining the overall objective for the space to be used. The structure, culture, and philosophy of the parent organization establish the parameters within which the project is identified, prioritized, and

executed. The organization's philosophy may be modified by circumstances that develop during the design–build cycle; the initial assumptions and resource allocations are always determined by corporate philosophy.

The purpose clearly states the goal of the project and the problem it will solve. The scope describes the limits (financial, spatial, functional, and time) of the project. Spend time and effort to ensure an understanding of the scope and purpose with management. It is the facility manager's task to transmit the understanding to the project team.

Environmental Context Analysis / Site Analysis

Study of design sources – viz, site & purpose, objective of site analysis, qualitative goals/direct functional goals and objectives, General factors & conflicting factors, affecting and influencing the site. Site topography, site drainage, site vegetation, microclimate, site acoustics etc.,

Process of site analysis.

(i) Reconnaissance surveys

(ii) Preparation of base map

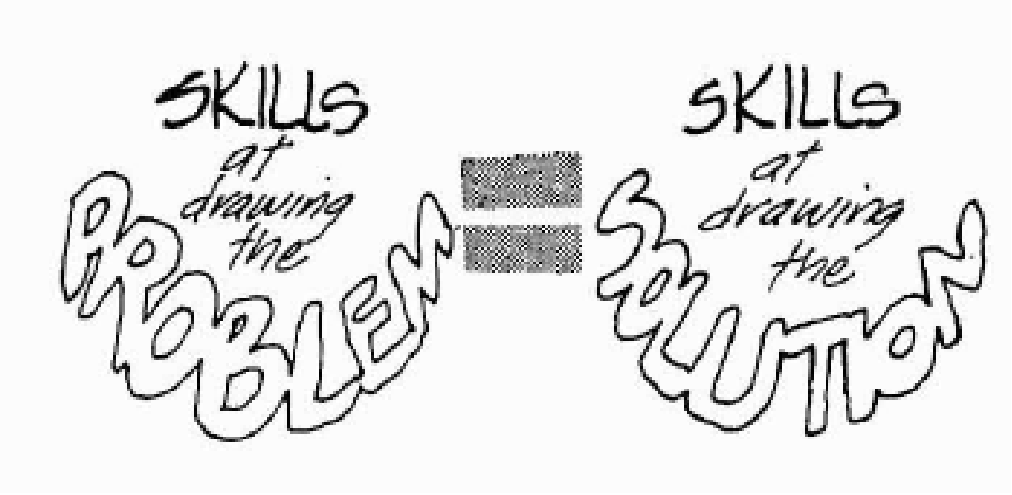
(iii) Graphical and verbal presentation.

Definitions, Issues and design Implications

- Sites as active networks
- Consequence triangle
- Being thorough
- Kinds of information
- Implications for design

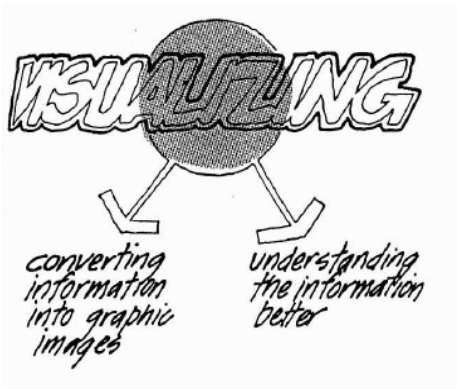
NEED TO DO plans, elevations, sections and perspectives

DO WE SEE THE project needs, issues and requirements.

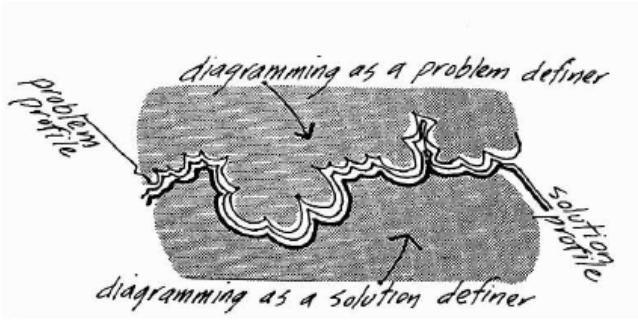


- Diagramming
- Accountability - (legal and moral obligations and responsibilities in projects)

- Communications - (boards, committees, community involvement) - strong project organization, clear procedures and effective communication techniques to facilitate thoughtful, well-informed



- Decisions
- Efficiency - (We are constantly faced with severe time pressures to expedite the completion of projects to meet client deadlines and to finish work within internal (design office), budget and time constraints.



Site design process

The site design process is divided up into three sections; research phase, analysis phase, and synthesis phase. These three phases are divided into the eight chronological steps in the design process.

Research phase: Step 1 - Defining the problem and its definition. The site design and site planning process begins with the initial problem to be solved. This is started by a client contracting a planner to work with a particular site.

Analysis phase: Step 2 - Programming the site as well as site and user analysis. There are numerous site elements related to the analysis during this phase.

Synthesis phase: From the analysis, a program is developed, which is part of the synthesis phase.

Step 3 - Schematic design of a site plan as well as a preliminary cost estimate for the site.

Step 4 - More developed designs and a detailed cost estimate.

Step 5 is the construction documents for the plan.

Step 6 - Bidding and contracting for the project

Step 7 – Construction

Step 8 - Occupation and management of the site in the site design process

Feasibility Study report

Feasibility studies help real estate owners, investors and lenders .Key sections included in a Feasibility Study include: Marketability Study, Benefits Analysis, Risk Analysis and Mitigation.

1) **Marketability Study**

- Could the project be built? Are necessary approvals in place, and if not, what needs to be done? Can the site support a building structure that is planned? Can any environment contamination be cleaned up?
- Should the project be built? Who is the target market? What do they want?
- A marketability study tries to create a market area demand model based on available demographic information and the application of common sense to develop a picture of the current and future market area trends that may effect demand (and thereby affect market penetration and sales revenues) along with preparation of market area supply information to include the effects of historical, current and potential future market competition (direct and indirect) that may impact the project's market penetration opportunity and prospective sales revenues.
- Who are the competitors? What do they offer and how is their product priced? A competitive analysis gathers this information, and compares the competitor's products to your project justifying appropriate pricing.
- Define a spatial monopoly, a sustainable market niche that should place the client's project at a distinct advantage over competitors (assuming the client company's plan is professionally executed and managed on an ongoing basis).

2) Benefits Analysis

- The benefits analyses strives to answer the question, "What's in it for me?"
- Each of the constituencies of a development project has this question, and unless the answer can be detailed comprehensively and convincingly for them, the project will have at best weak acceptance or will not move forward or be mired in endless meetings before approval is received.

3) Risk Analysis and Mitigation

- The risk analysis identifies various areas of risk that every real estate project, or corporation for that matter, has with regard to its existence. The risks are detailed in each of these areas,

and then mitigations are outlined for each of those risks. This analysis is important for two reasons:

1. it offers a checklist for the client to ensure that risks – and mitigations - are identified,

2. thinking through a project in such a comprehensive manner provides the client with a well thought out investment and demonstrates creditability to client's constituencies.

There are many other areas addressed in a Feasibility Report such as financial analyses and proformas, schedules, marketing and leasing plans, exit strategies, and so on. The Feasibility Study, attempts to answer four basic questions:

- What is it that the developer is doing?
- Who is he doing it for?
- Whom will it affect?
- Does it make financial sense?

Costing and Financing

- One should develop knowledge about basic financial concepts related to real estate, including valuation, analysis, taxation, depreciation, and life-cycle costing.
- Similarly, evaluating real estate investments and developing net operating income budgets.
- Other concepts include income capitalization approach and property taxation costs and strategies to offset these costs.

Discounted cash flow analyses, net present value, internal rate of return are also important.

Risk Management

The general categories of risk associated with corporate property:

• Financial risk,

• Property market risk

• Business risk.

• Operation risk

• Asset Impairment risk

• Competitive risk

Typology

Vacant land

Built property

Joint venture

Leasing

Mortgaged property

Role of Government

- **Applications directly admitted by CMDA**

  • Special Buildings / Group Developments

  • Multi-Storeyed Buildings

  • Ordinary Buildings with Stilt Floor

- **Applications accepted through local bodies**

  • Industrial Buildings • Institutional Buildings • Ordinary Buildings in Acqifer Recharge Area, CRZ Area and Other Restricted areas

  • Layouts

  • Reclassification

- **Individual plot and construction of a residential building:**

  • layout approval by the CMDA and sanctioned by the local body.

  • Development control rules/Incentives For Information Technology (IT) Development: documents/certificates/ ACTS/TAXES

- **Planning permission**

Form of agreements

1. Participants and stake holders
2. Identify a property
3. Check about the property
4. Seek legal opinion
5. Negotiation of price
6. Agreement for sale
7. Preparation of sale deed:

   1.Stamp duty towards Government - 8% On the market value of the property.

   2. Registration fee - 1% On the market value of the property.

   - Registering a property

<u>High rise project development PROCESS</u>

1. **Project Development**

   • Planning

   • Functional concept

• Architects

• Profitability

• Areas, parking

• Cost estimate

• Rent estimate

• Pro forma

• Partners

2. **Renting**

• Project Marketing

• Rental Management SALE

3. **Disposal of asset**

1. **PROJECT DEVELOPMENT - Planning**

• Sole purpose of future rental or disposal.

• Tenants insist on optimum efficiency of the rented areas in response to financial pressures within their own trades or sectors.

• Rental agreements contingent upon tenant's consultation with specialists.

• Multiple uses, flexibility, efficiency

FUNCTIONAL CONCEPT

• Multiuses and multifunctional planning

• Developer to direct the building to an economically feasible solution in collaboration with the Architect.

• Fire protection – core – Fire protection, no., size of escape stairwells, smoke extraction

• User comfort – rapid response time for elevators, no. of elevators, dimension of the core,

• These issues impact profitability of the building.

ARCHITECTS

• Competency of the firm

• Experience

• Expertise

PROFITABILITY

• Developer drafts a proforma , refines it till a decision to invest is made.

• Financing contract is made with banking syndicate or group of underwriters

• Basis is comprehensive cost analysis and cash-flow analysis on monthly scale to avoid inaccuracies

AREAS, PARKING

• Detailed area analysis is a basis for all profitability analysis.

• Area utilization ratio

• Reqd. storage areas and parking(may diminish profitability).

• Byelaws

COST ESTIMATE

• Quality requirements of tenant

• Location

• Target tenant group

• Discussion with landlord to evaluate potential tenant clientele w.r.t. anticipated rents

• Determination made of the standard which the investor will offer the tenant ---- if cost exceeds the overbuilding standard met by tenant.

RENT ESTIMATE

• Estimate of net rent excluding AC.

• Rental periods

• Anticipated vacancies

• This affects cash flow analysis

PRO FORMA

• Developer will seek to realize the capital once the profitability is stabilized.(ie. After full occupancy, advance payments …)

• Free and clear return on costs

• IRR indicates profitability

• In the age of investment, banking, simple cash surplus analysis not sufficient to achieve financing with adequate ratio of net worth or share capital to outside capital.

• Past method static one

• Dynamic cash flow analysis reqd. with time factor & to study impact of time defaults on the return on net worth at any given time.

• Proforma to contain sensitivity analysis to assess potential variable influences eg. Rents & bldg costs.

• Break even calculation

PARTNERS

• Investment volume high.

• So partners better for risk sharing

• Shares, structure of operation-legal also to be made on a case-by-case basis.

• Changes in tax laws, subsidies, impact sale and disposal of assets.-these have made limited liability company the favorite legal structure in today's market

• Decide early before a partnership agreement is signed whether to sell or hold on.

2. RENTING

• Optimum project marketing advance to constn. For adv rental agreements

PROJECT MARKETING

• Mailing to potential buyers

• Basic data of project

• 3d views, Brochures, Creativity in marketing

• Timing, pacing, not too early as completion will be 2 or 3 years - • Eg advantage in vicinity, Arch, historical relevance.

• Public acceptance, image, brand, direct competitors, promote visibility of the object, multiple uses, transparent arch.

• Slogans, appealing, direct, personal line of communication, future oriented, project milestones as a ground breaking ceremony,

• Laying of foundation stone, topping out ceremony,, grand opening, reporting in all media.

• Goal to solicit as many major users for the rentable areas as possible.

RENTAL MANAGEMENT

• Rental managment by RE agency

• Identify proper RE agency with sound knowledge of the market

• RE agencies prefer exclusivity in marketing but developer can can preserve a degree of flexibility with budget economies & entrust at least 2 realtors with the bid for the object.

• Draft rental concept.

• Rent for large & small areas, this influences functional planning & cost factor.(completion costs, efficiency.)

• Bulk areas may not be profitable, restructuring may delay rental agreements.

• Identify principal RE agency or agencies with sound knowledge of market

• RE agencies prefer exclusivity

• But developer should preserve a degree of flexibility with budget economies and entrust at least 2 realtors with bid

• Draft a practical rental concept

• Rental principles for Large & small spaces

• Establishing such principles early on & setting the course has an influence both on the functional planning concept & on the cost factor.(completion cost, lower efficiency)

• Large bulk areas may punish with high investment cost, poor profitability & changes in investment or outside capital if conversion into small units become necessary

• Restructuring of this kind will delay economic stability of the project as a result of multitude of rental agreements

• Overall decreases economic viability of project.

3. SALE AND DISPOSAL OF ASSET

• Full occupancy as early as possible.

• If occupied then can be sold

• Which product to be sold to whom

• Mostly to institutional investors

Space Planning and Management

Management must have a space strategy that supports the organization's objectives and reflects its culture. Good space planning proceeds from a good business plan. Space use must be managed. Space standards are needed for good space management. Ownership of space should be established, or you will never be able to manage it.

The space inventory should be managed by function, organization, and architectural use. Space planning and management are important but are not the totality of facility management. Modern integrated workplace management systems (IWMS) and building information modeling (BIM) give the facility manager the ability to manage space efficiently and effectively.

PLANNING

Each facility manager is responsible for at least one facility with definite dimensions within which at least one productive activity takes place. The physical dimensions of a facility (the space) are the special context within which the manager executes his responsibilities. Therefore, the forecasting, planning, allocation, and management of space are important components of the facility manager's degree of success. Planning in this context usually relates to growth, or the need for more space. Space growth has at least four potential components.

1. There is growth in the industry or field; for example, retirement facilities are growing in number and size.

2. There is company growth, which often reflects growth in the field but occurs on a schedule that might be different from industry growth. For example, a company in a growing field that has made a technological breakthrough.

3. There is employee growth, which is different from the company's growth, and can result from internal programs or social trends (flextime, work at home).

4. An organization's desire to accommodate individual needs translates into increased space needs. The complexity of these issues and the nonsequential nature of the requirements complicate the forecasting of space requirements and highlight the need for a good forecasting method.

FORECASTING

Forecasting is the link between planning and programming. Space forecasting involves both identifying new space requirements and projecting the need for reallocation or disposal of unneeded space - Applicable to large international Companies.

Methods of Forecasting Space Needs

A company must have a space strategy that frames the way it handles space needs. This strategy should both support the business objectives of the company and reflect the culture of the organization. There are three basic strategies possible:

1. Occupy owned space, which permits maximum control

2. Occupy leased space, which permits maximum flexibility

3. Occupy owned and leased space, providing flexibility as well as control

- Sub strategies such as over leasing or overbuilding in order to have space for future growth.

Facility managers must be aware as the market changes. An in-house or consultant real estate expert should keep the facility manager informed so that disasters are avoided and opportunities are seized when presented. This requires good business planning internally as well. At different times market factors may conspire against building a new facility (high construction costs, extreme cost consciousness within organizations, higher costs of funds, greater scrutiny of credit-worthiness). Organizations are combining functions where they can and eliminating space, particularly in rental properties. 1. ECONOMICS, 2. SUSTAINABILITY

There are two principal ways to forecast space needs.

1. To have space needs be an output of the business planning of the company. In the long run, this method is the only acceptable one.

2. If the company does not have an adequate business planning process, then space forecasting must be done periodically, using some survey technique.

For either situation, analytic tools are used in order to analyze the projected needs against the current inventory.

- **Macro level space forecast** - Facility managers tend to arrive at space forecasts by expedient estimating techniques.

- **Standard allocations** (square feet per staff) are multiplied by the appropriate unit (number of staff or seats) to produce a planning figure.

- The more details you know about the prospective occupants, the more accurate the macro-level estimate. In most of cases, the feasibility portion is completed and the options narrowed purely on a space-available versus space-needs basis.

Entire subject of space forecasting is replete with policy implications, several issues stand out. For example, the organization needs to decide how to handle

- ***swing space***—the space available to house units during renovation, alterations, and realignments
- ***growth space***—space contiguous to operational units to allow for their planned growth.

In some organizations, growth space is released to the unit manager; in others, the facility manager controls the space and assigns it as needed. Annual swing space required is 2 to 3 percent in large organizations and 5 to 7 percent in small organizations. Growth space should be based on planned growth and separate from required swing space. A work unit—departmental or higher—should be provided with three to five years' growth space.

If the rate of growth is unknown but the organization is growing, then, as a general rule, give units 10 percent excess for growth upon relocation or renovation. If the extra space is properly managed, it is almost always more economical to provide for growth up front. Too often, space projections are underestimated and buildings become full as soon as they are occupied, with no room for future growth.

A highly dynamic department may experience a growth rate of 30 to 50 percent per year. Space is not the only commodity that grows when a company is expanding. Activities that occur within that space, and must be planned for, grow also, but at differing rates. Some activities seem to grow phenomenally fast; others, move slowly. Some activities carry weighted factors in their growth. For example, activities that require exceptional support furniture or equipment for each employee require larger amounts of expansion potential, even when growing at the same rate as other activities.

Flexibility is different from growth. Growth requires additional space; flexibility requires that each space be constructed so as to permit and support a variety of different activities effectively, with minimal loss of productivity for any specific activity. Flexibility may include provision for intermediate stages of activity growth; an example is when a dynamic activity requires additional space contiguous to its current occupied space, and moving the entire activity to a more desirable location is planned for the distant future. The activity would grow into the flexible space and utilize that space until the move occurred; then it would relinquish the flexible space to some other prioritized activity.

Another space consideration is the change many organizations are accommodating for new mobility and distributed ways of working. No longer does every worker require an assigned work station or office, but collaborative ways of working and innovation may require that workers utilize various settings when they do come into the office, since they may also choose to work from home or other remote locations. Facility managers in these knowledge work settings have learned that this does not necessarily reduce the size of spaces needed, but alters the design and assignment of space.

Space management planning

There are basic planning elements that contribute to the facility manager's ability to manage space effectively within existing parameters and to forecast efficient utilization. The basic considerations are as follows:

1. The amount of space available and the time frame for the availability

2. The type of space available and the general condition and limitations of the architecture or construction.

3. Configurations of the space (dimensions, square footage, volume, shape and/or location)

4. Utilization of the space, including specific activities and necessary support functions (see Utilization of Space, below.)

1. How Much Space

How much space is needed may be more difficult to determine with changing work patterns and designs. Space standards are extremely helpful in this area, but with changing from assigned work stations to adaptable work areas or completely unassigned work stations, this decision becomes more difficult. Standards are still possible, but they change according to function.

2. Type of Space

The utilization of space dictates the alterations, construction, and renovations necessary to existing conditions. Extensive demolition and new construction may be required to accommodate the specified utilization criteria, or alterations may suffice. In almost every situation where construction and renovation of existing facilities is compared with new construction, the costs of renovation are less.

Renovation projects usually include major compromises on efficient arrangements of activities or employees (adjacencies), and frequently offer fewer alternatives or less flexibility than new construction. The age of a structure may require that structural elements and the roof be evaluated carefully. Often the power supply and telecommunication support are inadequate and inefficient as well.

3. Configuration of Space

Without launching the actual design process, the facility manager must often determine that certain space is more appropriate for one department than for another. Existing structures usually conform to a normative sizing according to the time when the structure was built and its location; that affects the space available for allocation.

Ceiling Height and Column spacing - Many modern designs are based on an assumption of infinite open areas, and they suffer greatly when applied to older buildings. New office planning concepts provide for increased functional density of workers in an open environment.

Changes in the workforce and the way that we work in the 21st century affect not only how we plan and program for space but how we provide workplaces themselves. Alternative office solutions have become so prevalent that lines of furniture and equipment have been designed solely to meet those needs. Other employees are working from home or in satellite offices, and some in anytime- anywhere virtual space.

Those who are working in a central location are more often doing so in a team mode, so collaborative space has become a higher priority than individual assigned space in many organizations. Emphasis are provided on space planning, programming, and management. Due to outsourcing and downsizing, many facility managers are becoming much more expert in consolidating space and planning for space disposition. The utilization criteria determine how efficiently a specific activity may be accomplished within a given space. Some sizes, shapes, or volumes of space lend themselves to certain kinds of activities.

In general, the more dynamic an organization, the more important is flexibility. Thus, large expanses of uninterrupted space are preferred. Existing architectural and design features prove most appropriate for companies with a less dynamic character. Older structures usually exhibit the least favorable square-foot occupancy ratios, although many have been adapted in unique ways for open collaborative work. Locations of activities within specific spaces are important for greater productivity. Many times adjacencies may not be available on the same floor. Under those circumstances, you must determine whether connectivity with another floor in the same building is appropriate, or if the same floor in an adjacent building is better.

4. Utilization of Space

Several techniques can be applied to specific activities programmed into a space. Richard Muther offers a idea for layout planning. He provides forms that can be used to gather data on flow of materials, activity relationships, and space relationships. Muther refers to his process as systematic layout planning, and applies it also to the white-collar workplace. Roger Brauer ‘s primary agenda is to define and manage “user requirements,” offering programming techniques that prioritize individuals performing activities within a space. Conformities of space and construction are an extension of user needs.

Space planners Michael Saphier and Lila Shoshkes orient their discussion toward equipment and the special displacement requirements of office workers. Their space planner model involves interviewing each employee and identifying the furniture support items. By the simple process of inventory application and activity adjacency, a place is found for all items—thus space is planned. The space planner is likely to place less importance on overall productivity than is the facility manager utilizing either the Muther or Brauer models.

Other Planning Considerations

Universal planning - Most conventional planning responses consider furniture configuration and communications matrices in relation to employee needs. The universal planning concept provides for a percentage of effectiveness by placing furniture permanently and moving employees. Flexibility, universality of design, and an allowance for growth and change can materially reduce the nearly constant renovation of space caused by churn in most modern corporations.

In addition, most companies need to optimize their modern communications technology, for which they have paid a premium, to reduce the price of churn. New ways of working and mobility have dramatically changed the office landscape and planning requirements.

Prioritizing the Space

Space is prioritized only when there is an intrinsic value to the space. Status is sometimes implied in a space or is seen to have status in its relationship to other space. Many times proximity to top management receives high priority. Value is often placed on being near a window, or viewing a panoramic vista, or being close to the top of a building. Establish policies that may determine the priority of activities taking place within the space.

Space Accounting Systems and Inventories

The company’s space needed to be managed and that good space management depended on good space accounting. The specific problem was an overload of paper storage—in a supposedly “paperless” office with a computer on every desk. This system defines all space, assigns it to a responsible manager, and carefully tracks additions, deletions, and conversions.

1. Space for architectural and design purposes – The best categories are based on area measurement terms, which are most valuable to the design team.

2. Based on functional categories (e.g., warehousing, shops, office space). The size of holdings dictates the degree of detail to which category codes are assigned and the space is accounted. International organizations may have eighty to one hundred category codes, a corporate headquarters eight to ten.

3. Accounts for space by occupant (user). Some facility managers prefer to account by occupant and category code. This system has broad application and is the information most often shared with users.

The facility space inventory should be reviewed annually. Even better, a formal review should be done twice a year: once at annual planning time and once six months later. The review should concentrate on trends, standards compliance, and equitableness between occupants. Today, integrated workplace management systems (IWMS) and building information modeling (BIM) can assist in space management. These systems are now affordable to all facility managers who manage over 100,000 square feet.

Using bar coding, a relational database, a geographic information system, and a good computer-assisted design and drawing system, the manager of a large facility can manage workplace information for a powerful impact to the business. Workplace is important to employee productivity.

WORKSPACE DESIGN

Space Planning - Universal footprint office and Non territorial office

Business-Driven	***Cost-Driven***
Focus was on goals that impact the way business is conducted and the way staff work	Focus was on short-term goals such as real estate costs
Used space-use strategy as a way of making improvements in the overall system	Did not consider using space to improve overall system
Changes made in management philosophies and practices as well as changes in space use	No changes made in management practices
Goal was most effective work environment	Goal was limited to not reducing effectiveness of existing work environment
Managers educated employees about new workplace strategy before and after the implementation	Little was done before implementation; managers "nurtured" staff after implementation to help employees accept changes
More than 75% of employees expressed satisfaction with changes	Fewer than 50% of staff expressed satisfaction with changes

ACOUSTICS IN WORKPLACE

Effects of Noise on the Individual

Decreased productivity, especially for difficult or complex tasks

Increased illness

Increased hormone levels

Stress

Lower job satisfaction

Lower morale

Fatigue

Interference with speech

Sound Solutions

Sound-absorbing materials

Rubber mats under computers, printers, or typewriters

Lowering high ceilings

Quieter ventilation systems

Antivibration machine mountings

Acoustical enclosures for noisy equipment

Space Management Solutions

Small private offices

Enclosed workrooms (to protect other workers)

Conference rooms

Lounges

Variety of work spaces during the day

INDOOR AIR QUALITY

Sick Building Syndrome, air quality, and carpet

Sick Building Syndrome (SBS) symptoms—headache; lethargy; eye, nose, and throat irritation; breathing problems; and skin irritation—are linked to building occupancy. The symptoms usually disappear when the person leaves the building. Nevertheless, these symptoms are a problem for the occupants. The indoor air

The benefits of carpet include

- appearance and feel—provides color, softness, texture, comfort;
- acoustics—makes spaces quieter by absorbing noise, reduces impact noise;
- improves indoor air—traps contaminants better than other floor coverings;
- safe surface—reduces number of serious slips, trips, and falls;
- cost-effective—is cost competitive to purchase, less costly and easier to maintain than other floor coverings.

LIGHTING IN THE WORK PLACE

- Visual impact
- Contrast
- Luminance ratio and visual effects

- Transient adaptation,

Disability glare, Discomfort glare

- Reflectance
- Ceiling luminance limits
- Illuminance
- Visual tasks

Table 1. Maximum Luminance Ratios for Offices Containing VDTs*

	Ratios
Between paper-based visual taks and an adjacent VDT screen	3 to 1
Between a visual task (paper or VDT) and adjacent dark surroundings	3 to 1
Between a visual task (paper or VDT) and adjacent light surroundings	1 to 3
Between a visual task (paper or VDT) and more remote dark surfaces	10 to 1
Between a visual task (paper or VDT) and more remote lighter surfaces	1 to 10

**The luminance of the VDT is taken as the average luminance of a character-filled screen.*

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

UNIT – III – FACILITIES PLANNING AND MANAGEMENT– SARA7306

III. FACILITY PLANNING AND DECISION SUPPORT SYSTEM

INTRODUCTION

The facility planning considers Economy and Politics. Also it is driven by real estate and prestige value of properties.

1. Efficient operation over lifespan is a challenge for management

2. This process begins in the early development phase of building projects and continues till the end of building's life.

Project structure plan for the overall and detailed structuring of a high rise project includes Organizational Structure, Goal Definition- SMART, project manual from first to last, Planning Team-benefit analysis or decision matrix , Execution, Risk Management, Contract Management, Organization manual, Organizing the Sequential structure, Planning the planning, Data & Communications Management, Managing Authorities and neighbours, Quality Management and Planning Efficiency, Optimizing the execution, Cost management and Schedule Management.

Facility Management

1. SUPPORTING ARCHITECTURAL COMPETITIONS THROUGH COST BENCHMARKING – ESTIMATING THE OPERATING COST

2. LIFETIME DOCUMENTATION OF A BLDG • Project specification • Data management • Data quality control

3. FACILITY MANGMT IN THE CONSTN PHASE • Functionality of Building Operating systems • Wear & Tear of Technical installations • Recording Operating costs • Safety concepts • Energy supply • Waste Management

4. FACILITY MANGMT DURING HANDOVER

5. FACILITY MANGMT OPTIONS 1. Owner management 2. Outsourced management 3. Owner management - outsourced labour 4. Separate purchase of Management and labour services

6. SERVICE TENDERS AND CONTRACTS 1. Pre-qualification process 2. Tender process-conventional 3. Submission process 4. Evaluating offers

7. ENSURING FUNCTIONALITY & VALUE APPRECIATION Prospects

1. SUPPORTING ARCHITECTURAL COMPETITIONS THROUGH COST BENCHMARKING

• FM consultation during Arch competitions

• Multitude of design options

1. Diff. bet. Perforated & fully glazed facades may result in considerable cost differences for management, – Additional installation of façade maintenance systems – Labour intensive requirements for cleaning external surfaces

2. Complicated joints & cantilevered elements often lead to increased additl expenditures and this impacts Operating costs. 3. Ratio of rentable area to total area also influences ancillary costs. The

smaller this is the greater the ancillary costs. Optimum area use is one of the pre-requisites for subsequent success in marketing the properties.

• Operating costs are not the only decisive factors for competition selection.

• Gross area / total usable area. Greater the ratio, greater the challenge to achieve a profitable balance bet. Constn. Cost and rental revenue. FM required.

• If this has reached its highest, higher rents to be charges to finance the project.

• Therefore efficiency of building systems in the context of façade structures needed. Efficiency in structural systems and decisions also count.

• Centralized & decentralized heating & cooling systems, expenditure for maintenance & energy consumption are other factors.

• Profitability study prior to competition

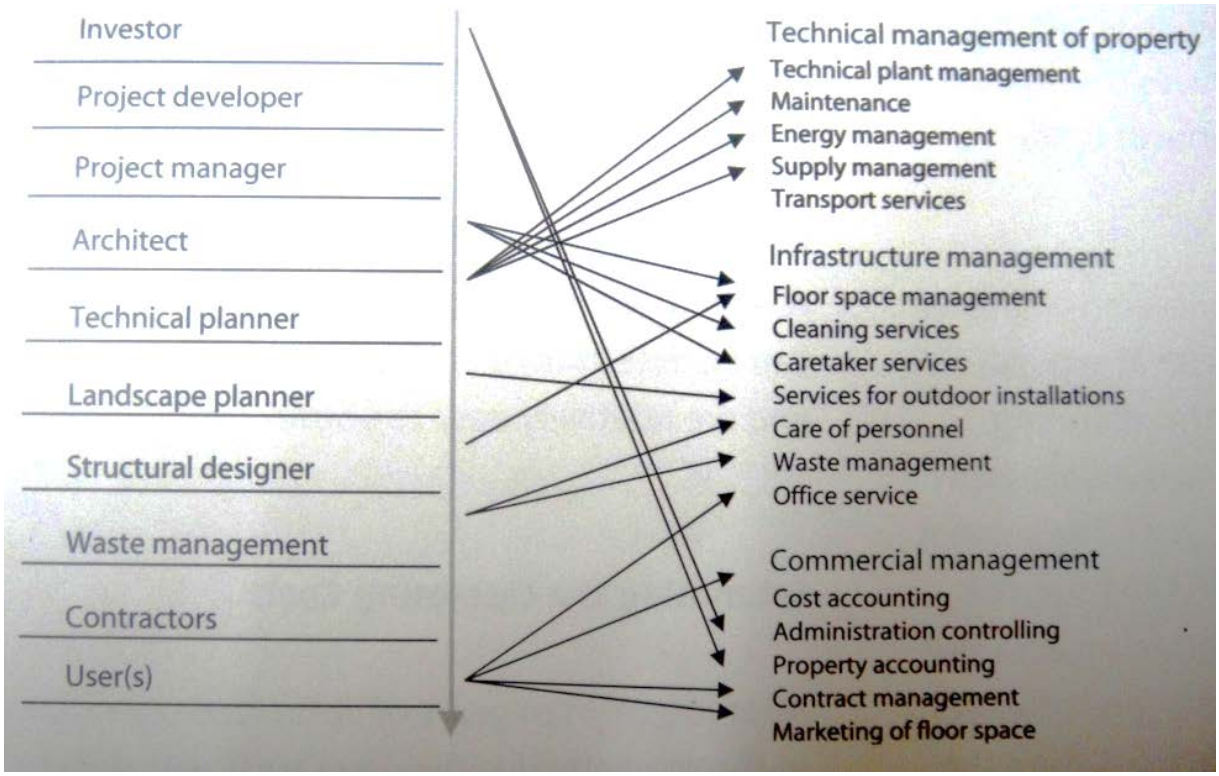
• Exhaustive cost calculation can't be done now butinfluencing factors may be determined with a benchmark system.

ESTIMATING THE OPERATING COST

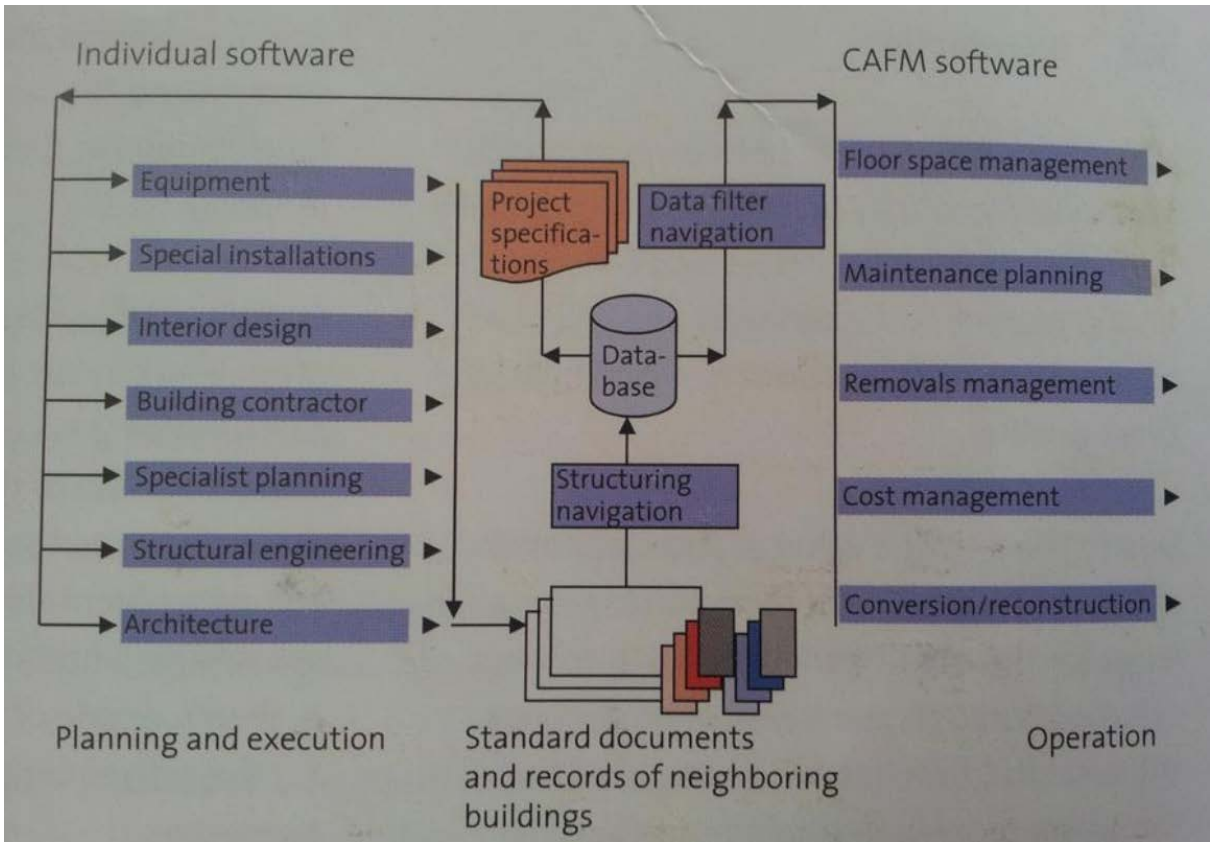
The table shows applicants being compared each on the basis of operating costs in terms of gross area, net area and principal usable area. Benchmark software –a valuable tool for estimating the operating costs of real estate if the databases are updated regularly. This can succeed if the chosen building option and the performance targets are reflected in the completed property.

Operating costs	Applicant 1	Applicant 2	Applicant 3	
Total / gross area	2.85	2.47	2.37	€/m² and month
Total / net area	3.03	2.62	2.54	€/m² and month
Total / principle usable area	4.44	3.59	3.93	€/m² and month
Building ratios	**Applicant 1**	**Applicant 2**	**Applicant 3**	
Floor space index	14.52	15.66	13.06	ratio
Site occupancy index	0.50	0.76	0.36	ratio
Cubic index	67.01	102.39	46.20	ratio
Gross area / net area	1.06	1.06	1.07	ratio
Gross area / principle usable area	1.56	1.45	1.66	ratio
Principle usable area / workstation	31.25	36.17	26.43	ratio
Property value / gross area	2.89	2.37	2.68	ratio

Architecture Competition: Comparison of Ratios and Costs



Documentation dependency from construction to building operations



Decision Support System

ORGANIZATION OF OFFICE TOWERS

1. High rise constructions by – RE funds, banks- results in mixed use, non-owner occupancy

2. Consequences of separating client & user roles- owner /occupier becomes client/landlord to 3 rd party users Project participants increase, change in planning process-earlier as per client's needs, but now, exploitation first & requirement later.

The role of the investor- goal is return on investment, long term rental agreements, may become irrelevant after 20 years, building may be pulled down. The project developer as client representative- goal-max exploit property & low production costs quality? – interested in immediate profit , price per sq.m/max use of net floor area, project participants don't live or work there , so no users at planning stage- hence affects UD, architecture. The interests of the user – realise space program with lowest rent area, low rent high finish, adaptable floor plans, rental agreements that allow expansion / downsizing org, services by landlord.

3. Criteria for office area efficiency - Price transparency, Actual rent- special requirements, incidental costs, Occupancy capacity- 2.7m x 4m unit, Area efficiency – m area lost to access, internal circulation, wash rooms, Flexibility, Use strategy- synergy potentials exploited, saving space by desk sharing, –Teamwork, teleworking and Productivity- efficiency- space : personnel cost = 1:15

OFFICE ORGANIZATION & BUILDING GRID

Earlier 2 rows of modular offices with central corridor or Open office are in practice. Now-combination of modular office, group office & combination office. With varying façade grids & bldg depth.

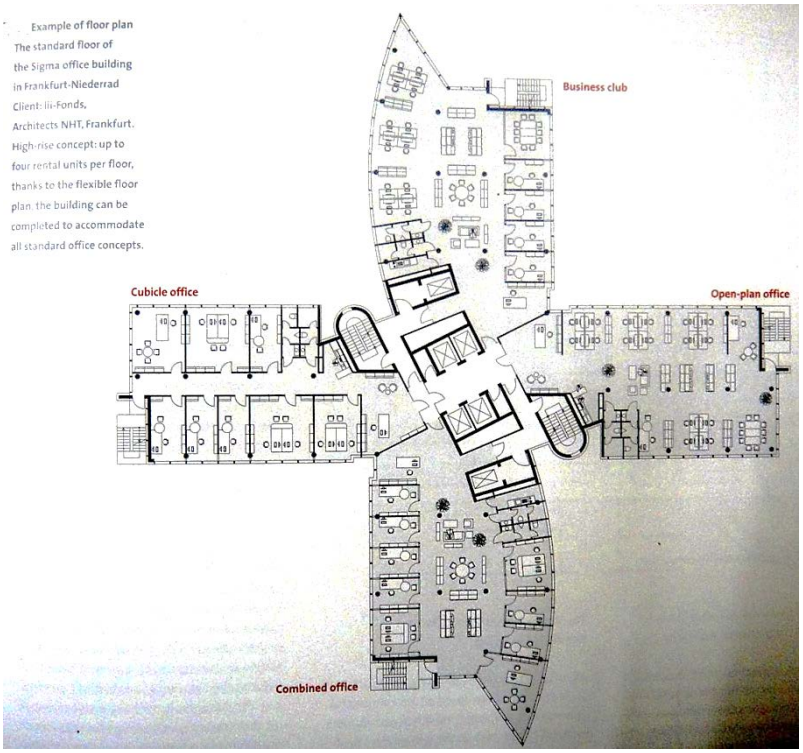
1. MODULAR OFFICE - clear 2.2m per workstation, 4.4m for double room, facade grid-1.5m, 5 to 5.5 m room depth, 2m corridor, bldg depth- 12 to 13 m

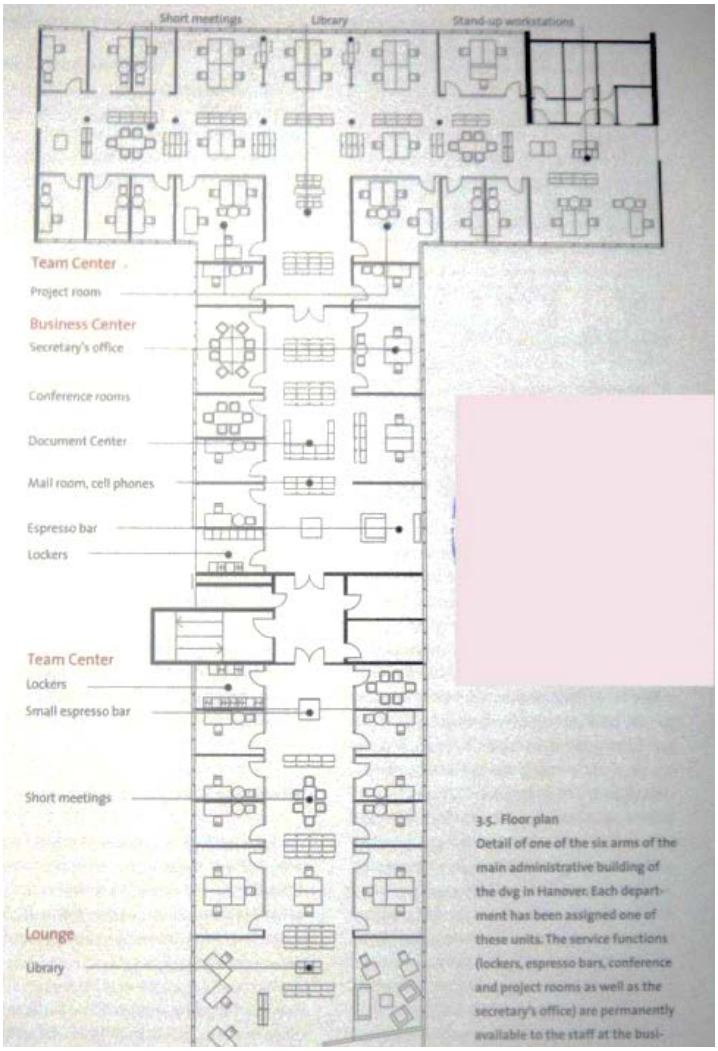
2. COMBINATION OFFICE - 20 to 25 rooms around a central zone, depth 4m, façade grid 1.25

Criteria for the operational efficiency and comparability of office propert: 1 m² is rarely 1 m²

Criteria/possibilities	€/m² heated	€/m² unheated	€/WP workplace	€/staff member	€/m²	Δ F'w
Price transparency Net/gross area	X	X	X	X	X	30%
Actual rent Net/gross area		X	X	X	X	30%
Occupancy capacity Façade grid/depth of building			X	X	X	30%
Quadrature efficiency Primary and secondary usable areas			X	X	X	30%
Variable use Flexible				X	X	30%
Use strategy Area utilization				X	X	50%
Productivity Operating result: before/after					X	100%

Example of floor plan
The standard floor of the Sigma office building in Frankfurt-Niederrad
Client: Ili-Fonds,
Architects NHT, Frankfurt.
High-rise concept: up to four rental units per floor, thanks to the flexible floor plan, the building can be completed to accommodate all standard office concepts.





3.5. Floor plan
Detail of one of the six arms of the main administrative building of the dvg in Hanover. Each department has been assigned one of these units. The service functions (lockers, espresso bars, conference and project rooms as well as the secretary's office) are permanently available to the staff at the busi-

Table 3.6 Office and special area requirement, establishing the tenant's requirements

	Number of Workplaces				
Offices	WP/OM	per office	WP	Offices	Office space in m²
Manager	(1/2)	1	1	1	41
Manager	(1/1.5)	1	1	1	31
Single office	(1/1)	1	1	1	20
Double room	(2/1.5)	2	2	1	31
Double room	(2/2)	2	2	1	41
Team office	(2/1)	4	2	1	20
Total			9	6	184

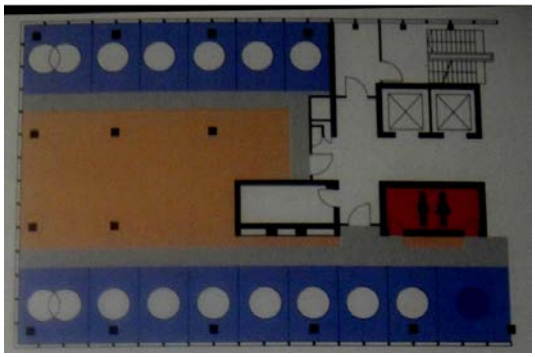
Special area requirement	WP	Quantity	Rooms in m²	Special area in m²
Reception	1	1	10	10
Conference	1	1	10	10
EDP	1	1	10	10
Archives	0	1	10	10
Conference room	0	1	10	10
Seminar room	0	1	10	10
Miscellaneous	1	1	10	10
Total	4	7		70

In order to accommodate your space requirement, you will need:

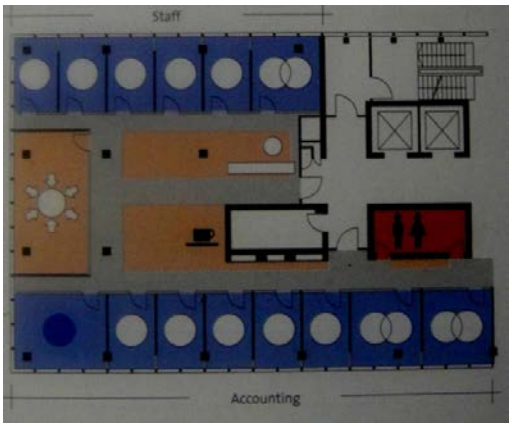
264 m² of rented space or 20.30 m² per workplace

WP = workplace

OM = office module



Preliminary Plan



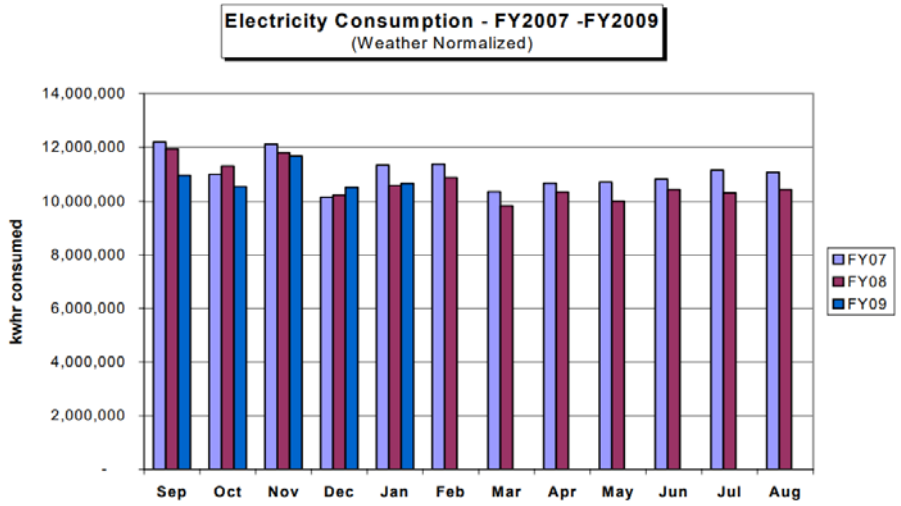
Detailed Plan

Case study on Energy Facilities & Construction Management

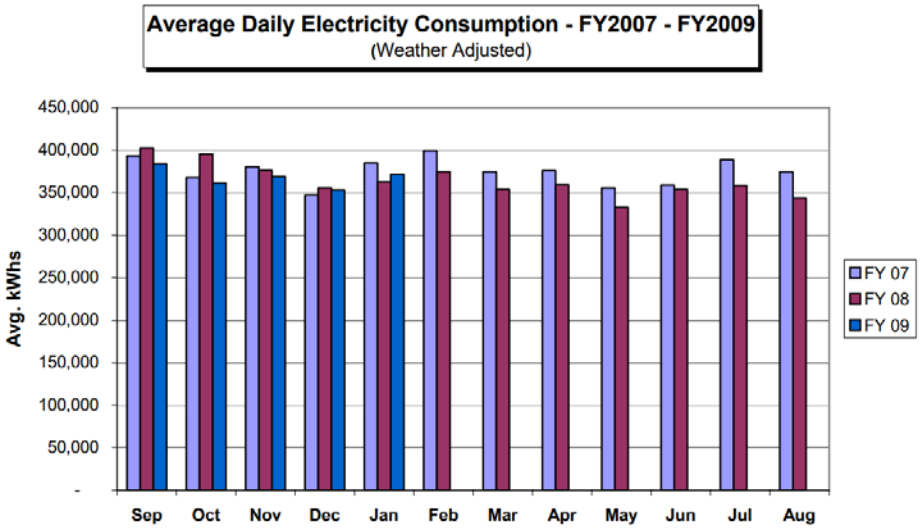
Budget Meeting

Electricity Performance includes Energy Conservation Measures its Overall Energy Performance, Forecasted Costs vs. Financial Plan, Out Year Forecast and also Energy Pricing, Market Overview, Energy Procurement

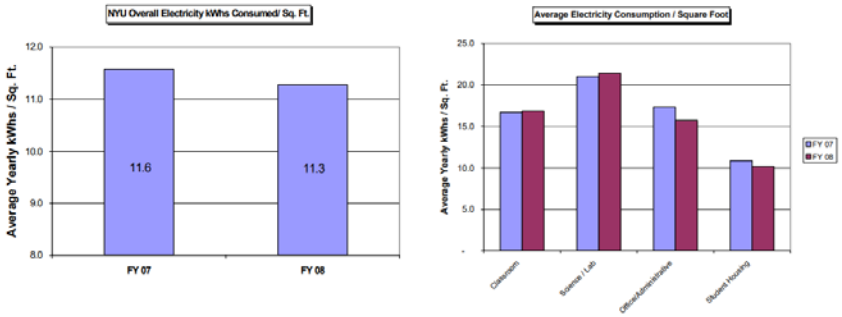
Overall decrease in electricity consumption from FY2008



Normalized for billing days, electricity consumption declined continuously from the previous year from Jan 2008 until Dec 2008



Lower electricity consumption per square foot in FY2008 led by energy savings in office/administrative and student housing space



Electricity conservation measures producing recurring savings

- Relamping – retrofitting existing building with new lighting
- Building schedules – reducing lighting, HVAC during unoccupied periods
- HVAC dorm occupancy control – occupancy sensors on HVAC in student rooms
- Compact fluorescent light bulbs – 25,000 CFLs installed or distributed
- Personal computer hibernation – shutdown personal computers when not in use
- Occupancy sensors – automatic lighting controls; 2500 installed
- Bulb specification and rebulbing – NYU-wide policy on efficient lighting
- Recommissioning – "tuning" large building HVAC systems
- Dorm room appliances – specifying Energy Star appliances during renovation
- CBS "Lights Off" policy – cleaning staff turning off lights at night
- Outreach and education – savings from higher awareness in NYU community
- Boiler controls – microprocessor controlled efficiency upgrades
- NYUnplugged – annual dorm competition to save energy
- 3rd North kitchen renovations – specifying efficient equipment during renovation
- DHW water heater installs – more efficient summer production of hot water
- Vending machines – occupancy sensors on beverage vending machine

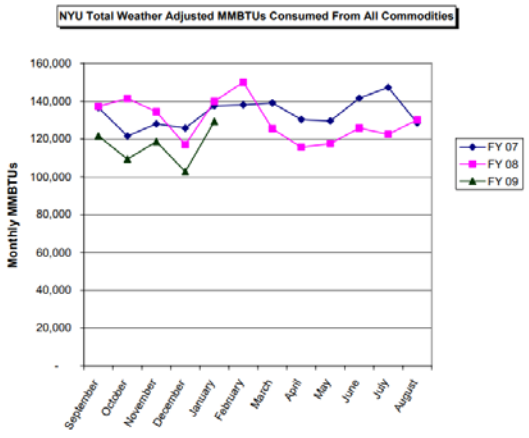
Total energy consumption is down 13.2% year to date through January from the same period a year ago

Total Energy Consumption (weather adjusted)

	FY 07	FY 08	FY 09
September	136,649	137,217	121,666
October	121,606	141,407	109,371
November	128,061	134,401	118,657
December	125,817	116,911	102,704
January	137,517	139,912	129,339
February	138,006	150,034	
March	139,107	125,436	
April	130,357	115,620	
May	129,565	117,569	
June	141,590	125,758	
July	147,277	122,479	
August	128,518	130,142	
TOTAL	**1,604,070**	**1,556,885**	**581,736**

Percent Change from Same Month Previous Year

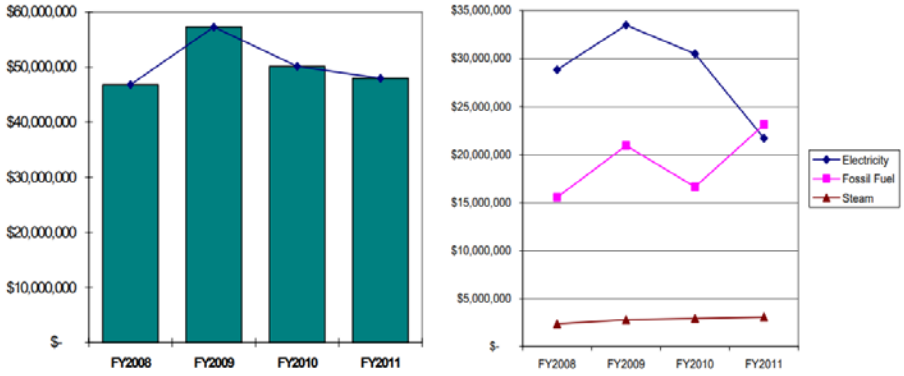
	FY 08	FY 09
September	0.4%	-11.3%
October	16.3%	-22.7%
November	5.0%	-11.7%
December	-7.1%	-12.2%
January	1.7%	-7.6%
February	8.7%	
March	-9.8%	
April	-11.3%	
May	-9.3%	
June	-11.2%	
July	-16.8%	
August	1.3%	



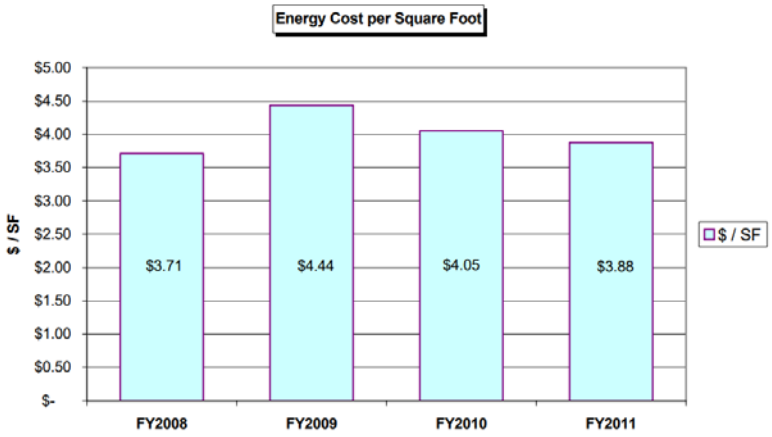
Energy costs are forecasted to be neutral to the FY2010 financial plan

	FY2008			FY2009			FY2010			FY2011		
	FCM	FCM Involved	TOTAL	FCM	FCM Involved	TOTAL	FCM	FCM Involved	TOTAL	FCM	FCM Involved	TOTAL
Electricity	$26,749,994	$ 2,109,192	$28,859,186	$31,213,776	$ 2,291,810	$33,505,586	$28,351,144	$ 2,165,863	$30,517,007	$20,102,958	$ 1,627,623	$21,730,581
Oil	$ 7,935,432	$ 11,478	$ 7,946,910	$10,624,946	$ 10,664	$10,635,610	$ 4,226,801	$ 10,554	$ 4,237,355	$ 4,226,801	$ 10,554	$ 4,237,355
Gas	$ 7,536,293	$ 74,014	$ 7,610,307	$10,241,573	$ 77,327	$10,318,900	$12,342,997	$ 78,001	$12,420,998	$18,816,835	$ 80,333	$18,897,168
Steam	$ 2,381,629	$ -	$ 2,381,629	$ 2,816,334	$ -	$ 2,816,334	$ 2,957,151	$ -	$ 2,957,151	$ 3,105,008	$ -	$ 3,105,008
Total	**$44,603,348**	**$ 2,194,684**	**$46,798,032**	**$54,896,629**	**$ 2,379,801**	**$57,276,430**	**$47,878,092**	**$ 2,254,418**	**$50,132,511**	**$46,251,601**	**$ 1,718,510**	**$47,970,112**
Budget	$46,091,803	$ 2,364,996	**$48,456,799**	$56,081,149	$ 2,482,835	**$58,563,984**	$47,830,302	$ 2,117,610	**$49,947,912**	$47,117,277	$ 1,806,110	**$48,923,387**
Surplus / (Deficit)	$ 1,488,455	$ 170,312	**$ 1,658,767**	$ 1,184,520	$ 103,034	**$ 1,287,554**	$ (47,790)	$ (136,808)	**$ (184,599)**	$ 865,676	$ 87,599	**$ 953,275**

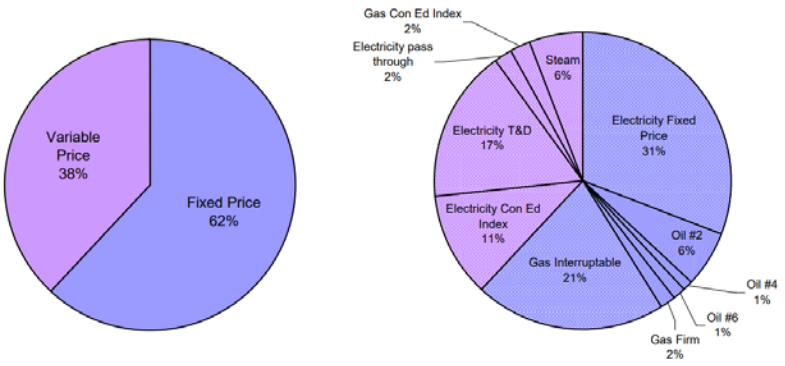
Decreasing overall costs due to better pricing and savings from CoGen



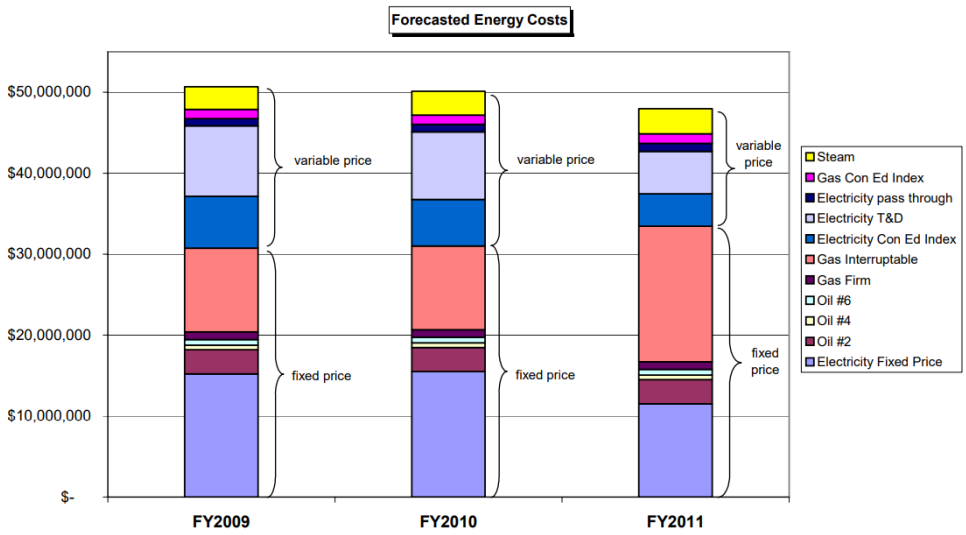
Decreasing cost per square foot due to better pricing and savings from CoGen



62% of FY2010 forecasted costs are associated with fixed price contracts



Overall costs decreasing with greater reliance on fixed price cost elements



Market Overview

Crude oil has plunged 75% since a high of $147 in June 2008 and currently trading at $45. NYMEX gas futures are trading at 1% of lifetime ranges. Future pricing beyond 12 months have significant premiums built in due to market uncertainty.

- Crude oil futures (Sept 10 – Aug 11) at $57.5 per barrel or 29% premium to current 1 year strip.
- Natural gas strip is trading at a 36.2% premium to current 1 year strip.

Energy Information Agency expects power prices to climb slowly by 2% in both 2009 and 2010. Nationally, power consumers paid 6.5% more for power in 2008 vs 2007 Opportunities (Electric) - Due to higher working capital and operational costs.

Energy Procurement Update

Electric: Converted the Pepco hybrid (block & index) contract to a fixed price contract thru August 2010

- Fixed price for FY2010 was $ 710,000 lower than the hedged block deal,
- Fossil Fuel: Hess contracts extended thru August 2011, FY 2009 and FY2010 savings of $1.1 million.

Future Buying Opportunities (Electric)

Due to extreme volatility suppliers are reluctant to offer pricing that extends into 2011

- Pepco will not blend &extend contract beyond August 2010
- Hess will not offer 2011 fixed price contracts
- Con Ed Solutions will but with premiums at 8% above market

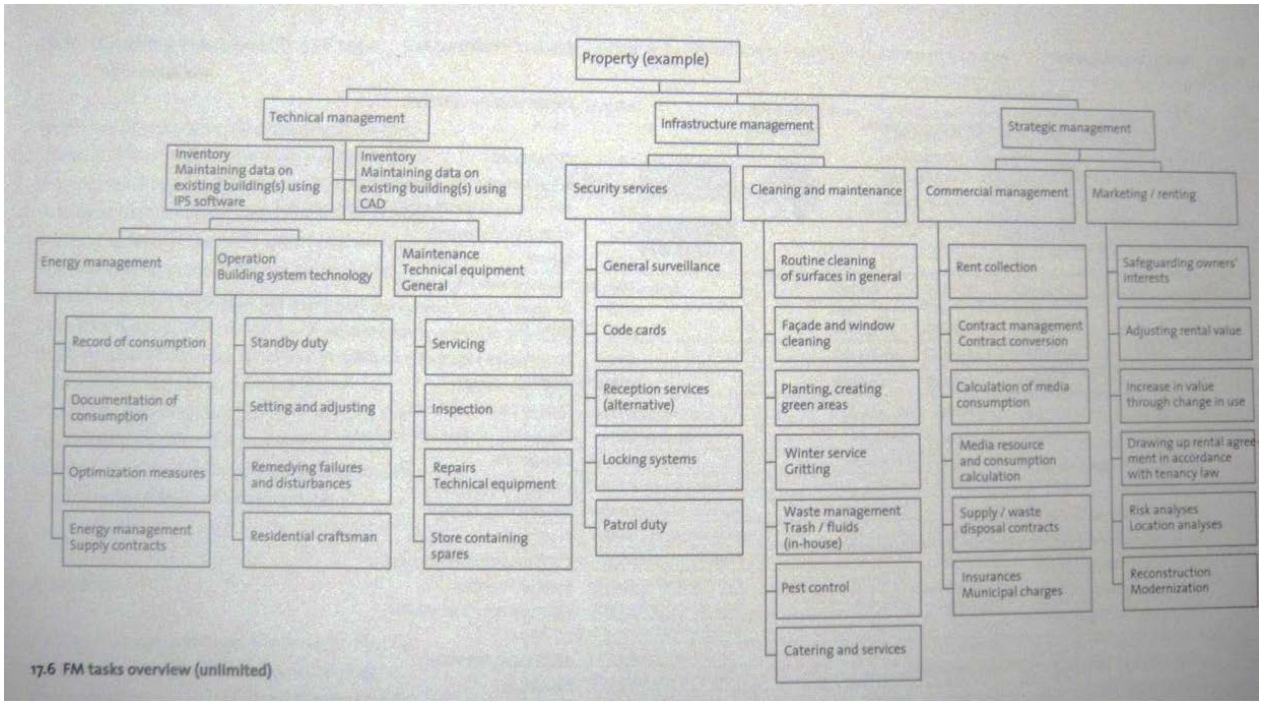
Future Energy Procurement Strategies

Electric: Lack of suppliers and pricing for a reverse auction past Sept. 2010, staging our electric purchase for FY 2011 on a rolling basis perhaps quarterly as suppliers provide pricing and associated risk premium drop presenting buying opportunities

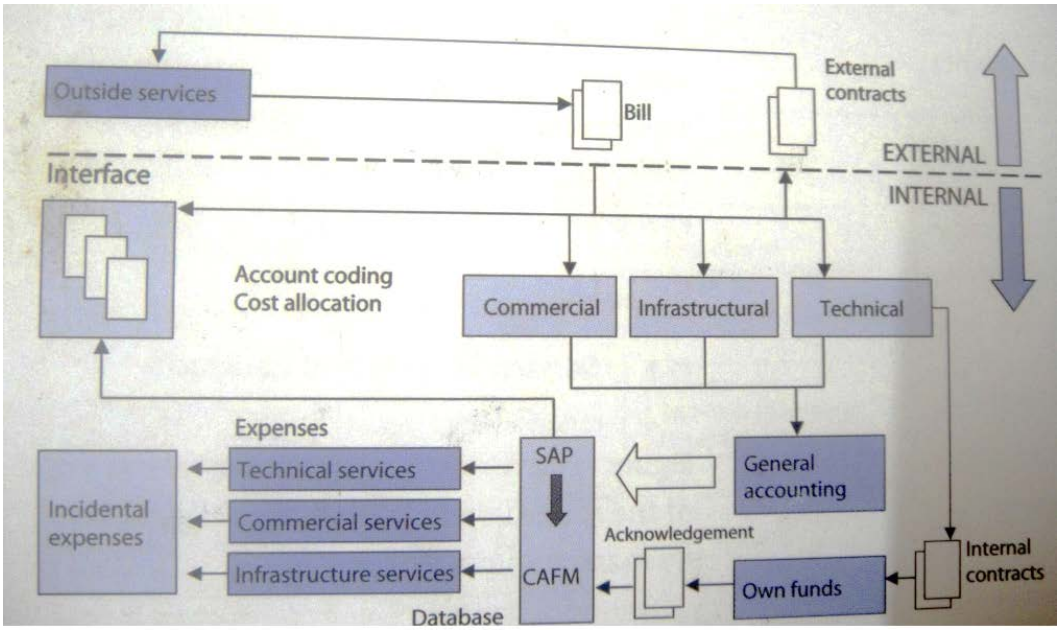
Fossil Fuels: Beyond August 2011 active monitoring of the markets for buying opportunities, tracking/trending of:

- Future strip premiums to current 1 year strip
- Trading ranges as a % of lifetime range

Facilities management for High rise Projects



17.6 FM tasks overview (unlimited)



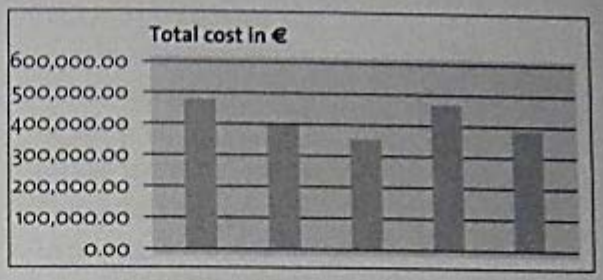
e-sub Electronic Submission for Facility Management Services

Time window
From to

14 Aug. 2000 | 12 Oct. 2002

2 p.m.

Remaining time in minutes



Price Comparison List Property	Date of last change	Date of last change	Date of last change	Date of last change	Date of last change
	Date/time	Date/time	Date/time	Date/time	Date/time
Name of bidder:	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**	**Bidder 5**
Item 2.1 Technical services	50,680.00	68,796.00	63,789.00	55,000.00	66,467.00
Item 2.2 Technical services	21,542.00	14,776.00	16,789.00	20,010.00	16,872.00
Item 2.3 Technical services	10,299.00	6,709.00	6,045.00	7,800.00	6,135.00
Item 3.1 Infrastructure services	33,446.00	22,842.00	28,805.00	35,500.00	39,369.00
Item 3.2 Infrastructure services	133,446.00	61,434.00	117,597.00	130,890.00	107,371.00
Item 3.3 Infrastructure services	125,452.00	134,191.00	31,004.00	129,677.00	36,006.00
Item 3.4 Infrastructure services	29,116.00	30,880.00	26,719.00	30,097.00	22,654.00
Item 3.5 Infrastructure services	6,098.00	7,231.00	5,833.00	4,331.00	8,840.00
Item 3.6 Infrastructure services	6,237.00	3,894.00	6,028.00	7,626.00	3,961.00
Item 3.7 Infrastructure services	484.00	515.00	333.00	920.00	374.00
Item 4.1 Commercial services	14,258.00	29,677.00	14,677.00	18,447.00	35,000.00
Item 4.2 Commercial services	22,064.00	3,956.00	11,560.00	12,098.00	19,129.00
Item 5.1 Strategic services	677.00	5,967.00	3,580.00	9,503.00	6,376.00
Item 5.2 Strategic services	20,236.00	9,892.00	20,306.00	7,000.00	19,129.00
Total price	**477,035.00**	**400,760.00**	**353,065.00**	**468,899.00**	**387,683.00**
Deviation from lowest value	230,248.00	153,973.00	106,278.00	222,112.00	140,896.00
Deviation from highest value	59,546.60	-16,728.40	-64,426.40	51,410.60	-29,805.40
Ranking	5	3	1	4	2

17.9 Practical example of an electronic submission procedure

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

UNIT – IV – FACILITIES PLANNING AND MANAGEMENT– SARA7306

IV. FACILITY MANAGEMENT DURING CONSTRUCTION PHASE AND HANDOVER

Facilities Management considers these factors Real Estate values, Feasibility Studies, Sale price, Fixed Budget, Inflation, Time-management, Off-site utilities, Land value, Material cost, Items of work, Items of development budget, Land cost, On-site development, Off-site development, Building cost, Predevelopment cost, Cost of financing - Architects budget overlay construction cost, Site development, Building material, Labour and On-site work.

The types of facilities from - Federal Construction Council Technical Report No. 50 (Publication 1235), Classification of Building Areas, National Academy of Sciences, Building Research Advisory Board.

Building Services / Infrastructure

Areas of the institution that are not assignable to a specific area of control and are used to maintain service to the building. These areas are circulation spaces (e.g., corridors, elevators, lobbies and stairways).

Classroom Facilities

This category combines classroom facilities as a facility wide resource, even if these spaces fall under different levels of control throughout the organization. The term ‘classroom’ refers to general purpose classrooms as well as lecture halls, recitation rooms, seminar rooms and other rooms used for other scheduled non-laboratory instruction. Total classroom facilities refer to any support rooms that serve the ‘classroom’ activity. A classroom may contain various types of equipment (e.g., telecommunications, multimedia, etc.) as long as the type of equipment does not tie the room to a specific type of discipline or subject.

Laboratory Facilities

A laboratory is a facility distinguished by special purpose equipment or a specific room configuration which links instructional or research activities to a specific discipline or a closely related group of disciplines. Laboratory facilities can be subdivided into three categories: class, open, and research laboratory. A class laboratory is used for scheduled instruction. An open laboratory is not scheduled but supports instruction. A research laboratory is used for research, experimentation, observation, research training or structured creative activity that supports the extension of a field of knowledge. Research laboratory is further subdivided into wet and dry. The distinction is the presence of running water within the laboratory for use in experiments. Research activities are categorized by effort codes and are represented by the percentage of a particular activity performed (e.g., sponsored research, instruction, etc.).

Office Facilities

Office facilities are space resources specifically assigned to each of the various academic, administrative and service functions. These consist of individual, multi-person or workstation spaces used to carry out desk-based activities and the support of these spaces.

Study Facilities

Study space is divided into five categories: study room, study service, library, processing room, and open-stack study room. A study room may contain equipment or materials that aid the study or learning process but do not restrict the room to a specific academic discipline or area of study.

Special Use Facilities
This category includes room use categories that are sufficiently specialized in their primary activity or function to warrant a unique room code. This classification includes areas for security, media production, demonstration, animal quarters, equipment rooms, and banking facilities.

General Use Facilities
These areas are categorized by their broader availability for use by the general public, staff, students and faculty than are the spaces in the Special Use Facilities group. These areas include assembly, lounges, food facilities, merchandising, day care, and exhibitions.

Support Facilities
Support facilities, which provide centralized space for various auxiliary support systems and services of a campus, help keep all institutional programs and activities operational. These areas are not directly accessible by the general public, staff, students or faculty but indirectly serve these areas with continuous support. These areas are centralized in that they generally serve the entire facility from a controlled location. Areas included are data processing, shops, central storage, laundry, mailroom, mechanical rooms, mechanical shafts, electrical rooms/closets and telecommunications room/closets.

Health Care Facilities
Facilities used to provide patient care, both human and animal. These would include patient bedrooms and baths, operating rooms (OR), treatment/examination rooms, nurse stations, diagnostic service laboratory and staff on-call rooms.

Residential Facilities - Areas provided as housing facilities, either long or short term, to faculty, staff or visitors. These areas include sleep/study rooms.

Building Infrastructure
Corridor: An area used as major circulation within a building.
Elevator: The area on each floor that represents the vertical shaft used for the elevator.
Elevator Lobby: The area directly adjacent to the doors of the elevators and bounded by major circulation spaces.
Lobby: The main entrance to a building and the area that serves the entrance for circulation purposes only.
Stairway: The area on each floor that represents the vertical shaft that is used by the stairs. Each floor is assigned the area that leads directly from the landing for that floor.

Special Use Facilities
Media Production: A room used for the production or distribution of multimedia materials or signals.
Media Production Service: A room that directly serves a media production or distribution room as an extension of the activities in that facility.
Demonstration: A room or group of rooms used to practice, within an instructional program, the principles of certain disciplines such as teaching, childcare or development, and home management or economics. The key criterion here is practice activity within an instructional program that closely simulates a real world or occupational setting.
Demonstration Service: A room that directly serves a demonstration facility as an extension of the activities in that facility.

Animal Quarters: A room that houses laboratory animals used for research or instructional purposes. Includes animal rooms, cage rooms, stalls, and wards. This code is exclusive to Animal Medicine Facilities.
Animal Quarters Service: A room that directly serves an animal quarters facility as an extension of the activities in that facility. Includes feed storage rooms, feed mixing rooms, cage-washing rooms, non-patient surgery rooms, casting rooms, or instrument rooms. This code is exclusive to Animal Medicine Facilities.

General Use Facilities

Assembly: A room designed and equipped for the assembly of many persons for such events as dramatic, musical, devotional, or commencement activities. Includes theaters, auditoria, concert halls and arenas that are used primarily for general presentations (speakers), performances (dramatic, musical, dance). Seating areas, orchestra pits, chancels, arenas, aisles, and stages (if not used primarily for instruction) are included in and usually aggregated into the assembly space.
Assembly Service: A room or area that directly serves an assembly facility as an extension of the activities in that facility.
Food Facility: A room used for eating. Includes dining hall, cafeterias, snack bars, restaurants, and similar eating areas, including such areas in residence halls, faculty clubs, etc. This category includes facilities open to students, faculty, staff, or the public at large.
Food Facility Service: A room that directly serves a food facility as an extension of the activities in that facility.
Day Care: A room used to provide day or night, child or elderly adult care as a non-medical service to members of the institutional community.
Day Care Service: A room that directly serves a primary activity room in a day care facility as an extension of the activities in that room.
Lounge: A room used for rest and relaxation that is not restricted to a specific group of people, unit or area. A lounge facility is typically equipped with upholstered furniture, draperies, or carpeting, and may include vending machines.
Lounge Service: A room that directly serves a general use lounge facility.
Merchandising: A room used to sell products or services.
Merchandising Service: A room that directly serves a merchandising facility as an extension of the activities in that facility.
Locker Room: A room designated for changing of clothes that may also provide restrooms and showering facilities.

Support Facilities

Data Processing/Computer Center: A room used as a computer-based data processing or telecommunications center with applications that are broad enough to serve the overall administrative or academic primary equipment needs of a central group of users, department, college, school, or entire institution. A Central Computer or Telecommunications room may be one of a group of rooms that constitute a center for delivering computer-based data processing or telecommunications services to various levels of user groups. Although the ongoing primary activity of this category is tied more closely to equipment than human activity, these areas require technical support staff, and physical access may be restricted to these personnel. These central equipment rooms appear most frequently at the campus-wide and large organizational unit levels and are generally subject to environmental and security controls and procedures limiting users to electronic terminals, telephone or modem access.
Data Processing/Computer Center Service: A room that directly serves a central computer or telecommunications facility as an extension of the activities in that facility.

Shop: A room used for the manufacture, repair, or maintenance of products or equipment. Includes carpenter, plumbing, HVAC, electrical and painting shops, and similar physical plant maintenance facilities. This category also includes centralized shops for construction or repair of research or instructional equipment, and repair and maintenance of multimedia equipment and devices.
Shop Service: A room that directly serves a shop facility as an extension of the activities in that facility.
Central Storage: A room or building that is used to store equipment or materials and that serve multiple room use categories, organizational units, or buildings. The concept of central or general is key to applying this code correctly. The vast majority of storage rooms on a campus are service rooms (e.g., 115, 215, 355, 615, etc.) that directly support a primary activity room or room group; for example, a paper storage room can serve several offices in an area. Service storage rooms are somewhat close to the areas they serve and are used more than occasionally. Central storage service rooms are typically limited to support rooms associated with the transporting of materials in and out of large central storage facilities and warehouses, storage rooms for hand trucks and other moving equipment, shelving storage, and other rooms supporting the central storage function.
Central Storage Service: A room that directly serves a central storage facility as an extension of the activities in that facility. Central storage service rooms are typically limited to support rooms associated with the transporting of materials in and out of large central storage facilities and warehouses. Storage rooms for hand trucks and other moving equipment, shelving storage, and other rooms supporting the central storage function are included.
Vehicle Storage: A room or structure that is used to house or store state vehicles. The definition of "vehicle" is broadly interpreted here to include forklifts, moving equipment, and other powered transport devices or equipment.
Vehicle Storage Service: A room that directly serves a vehicle storage facility as an extension of the activities in that facility.
Central Service: A room or area that is used for the processing, preparation, testing, or delivery of a complex-central or campus-wide support service. The central service delivery may be provided by special equipment, human activity, the special availability of space, or any combination of these elements.
Central Service Support: A room that directly serves a central service facility as an extension of the activities in that facility.
Hazardous Materials: A centralized facility used for the storage, treatment, or disposal of hazardous or toxic waste materials. Hazardous or toxic materials include any materials that have been designated for specific or formal regulation or controls on the basis of a potential harm to plant or animal life.
Hazardous Materials Service: A facility that serves a centralized facility used for the storage, treatment, or disposal of hazardous or toxic waste materials.

Healthcare Facilities
Patient Bedroom: A room equipped with a bed and used for patient care.
Patient Bedroom Service: A room that directly serves one or more patient bedrooms as an extension of the activities in those rooms.
Patient Bath: A room containing patient bath and toilet facilities. Included in this category are toilet and bath facilities adjoining or in conjunction with patient bedrooms.
Nurse Station: A room or area used by nurses or other patient care staff that are supervising or administering health care services. This is the primary workstation area used by nurses and other patient care staff.
Nurse Station Service: A room that directly serves one or more nurse station rooms as an extension of the activities in those rooms.

Surgery: Operating rooms.
Surgery Service: A room that directly serves one or more operating rooms as an extension of the activities in those rooms.
Treatment/Examination: A room used for diagnostic and therapeutic treatment.
Treatment/Examination Service: A room that directly serves a treatment/examination room as an extension of the activities in that facility.
Diagnostic Service Laboratory: A room used to provide diagnostic support services to an entire health care facility.
Diagnostic Service Laboratory Support Service: A room that directly serves a diagnostic service laboratory as an extension of the activities in that facility.
Central Supplies: A room used centrally to store health care supplies in a health care facility.
Public Waiting: A room used by the public to await admission, treatment or information within a health care facility.
Staff On-call Facility: A room or quarters used by health care staff to rest or sleep while on-call to assigned duties within a health care facility.
Staff On-call Facility Service: A room that directly serves a staff on-call room as an extension of the activities in that facility.

Facility Engineering & Maintenance in Hotels

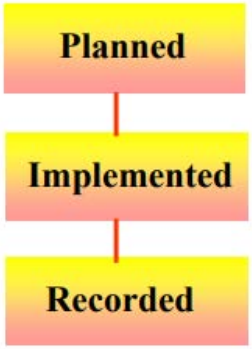
Role of E&M Department - Goals of E&M department

- Protecting and enhancing financial value of building and grounds for hotel's owners
- Supporting efforts of all other hotel departments through timely attention to their E&M needs
- Controlling maintenance and repair costs
- Controlling energy usage Increasing pride & morale of hotel staff
- Ensuring safety of those working and visiting the hotel

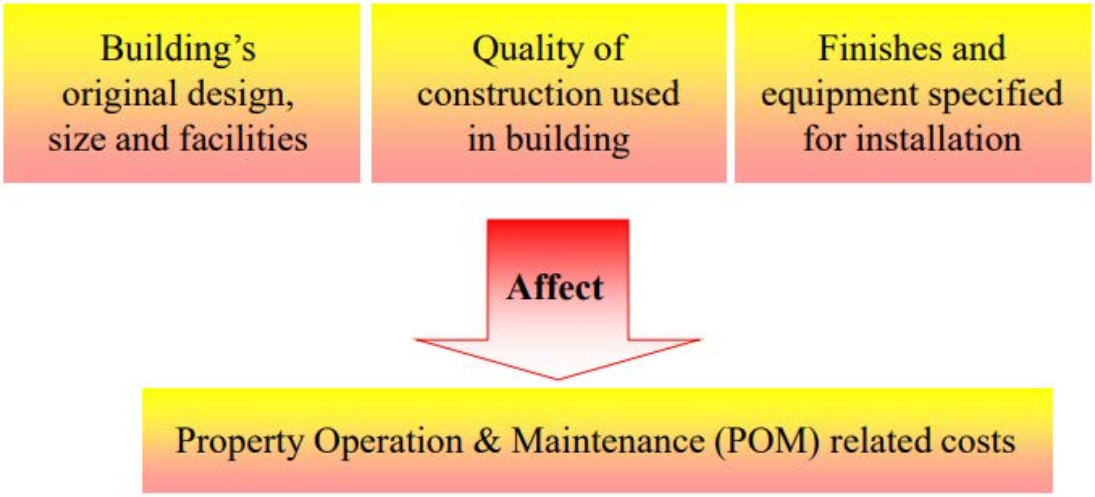
Engineering - Designing and operating the building to ensure safe and comfortable atmosphere. Goals of E&M department (Engineering) - Underpowered (or overpowered) equipment, Increased building deterioration, Excessive energy usage, Higher-than-necessary operating costs

Maintenance - Activities required to keep a building (physical property) & its contents in good repair.

Effective hotel maintenance must be:



Role of E&M department – Design and Renovation



Renovation and refurbishment normally one via establishment of an FF&E reserve

Building age	Building characteristics and requirements
1-3 years	Low maintenance costs incurred
3-6 years	Maintenance costs increase
6-8 years	Refurbishment required; average maintenance costs incurred
8-15 years	Minor renovation and refurbishment required
15-22 years	Major renovation as well as refurbishment required
22+ years	Restoration required; high-maintenance costs incurred

Restoration: returning a hotel to its original (or better than original) condition

Facts: Refurbishment and minor renovation is ongoing process in most hotels, Major renovation should occur every six to ten years, Restoration every 25 to 50 years, typically, If restoration is not undertaken when needed, the hotel's revenue-producing potential will likely decline.

Staffing the Department

Chief engineer - Head of E&M, In smaller hotels - hands on role in the maintenance effort, In larger hotels - more administrative role

Maintenance Assistants - Individuals with varying degrees of skills in: engineering / mechanics / plumbing / electricity / carpentry / water treatment / landscaping / grounds maintenance

Managing Maintenance: Routine Maintenance

Day-to-day upkeep of both exterior and interior of buildings

Exterior	Lawn care, landscaping, leaf and snow removal, window cleaning, and painting Maintaining hotel's exterior impacts curb appeal, operating costs, & ultimately the building's value
Interior	Indoor plants, interior window washing, floor and carpet cleaning Guestroom and public space related items

Two ways for implementation

"Replace as needed"	Replacement plan that delays until the original part fails or is near failure e.g., maintenance of refrigeration compressors
Systematic total replacement	Replacement is based on a predetermined schedule e.g., maintenance of light bulbs in high-rise exterior highway signs

Work order

Waldo Hotel Work Order

Work Order Number: ____*(Preassigned)*____ Initiated By: _____

Date: _____ Time: _____ Room or Location: _____

Problem Observed: _____

Received On: _____ Assigned To: _____

Date Corrected: _____ Time Spent: _____

E&M Employee Comments: _____

Chief Engineer Comments: _____

In a well-managed hotel - any staff seeing an area of concern can initiate a work order, chief engineer keeps a room-by-room record of replacements or repairs made.

Managing Maintenance: Preventative Maintenance

Effective preventative maintenance can reduce: Long-term repair costs by prolonging equipment life, Replacement parts costs because purchases of these can be planned, Labour costs by allowing PM to be performed in otherwise slow periods, Dollar amount of refunds and charge-backs due to guest dissatisfaction, Costs of emergency repairs by minimizing their occurrence.

Preventive Maintenance (PM) is not a repair program!

Sample PM task list for laundry area dryer

Daily	Clean lint trap Wipe down inside chamber with mild detergent Clean and wipe dry the outside dryer shell
Monthly	Vacuum the inside of dryer (upper and lower chambers) Tighten, if needed, the bolts holding dryer to floor Check all electrical connections Check fan belt for wear, replace if needed Lubricate moving parts
Daily	Check pulley alignment Adjust rotating basket if needed Lubricate motor bearings Lubricate drum bearings if needed

Preventative Maintenance

Public space - Windows, HVAC units, furniture, lights, elevators, carpets, Carpet care is one of the most challenging PM areas

Guest room - Most important and most extensive areas for PM, Critical to sales effort, to retain guests, and to maintain the asset's monetary value

Food Service - Back-of-house equipment - ovens, ranges, griddles, fryers, other production equipment, Dining space used by guests - chairs and booths, self-serve salad or buffet areas, lighting fixtures, guest check processing equipment, Meeting and conference rooms and equipment

Landry - Washers, dryers, folding equipment, water supply lines, drains, lighting fixtures, temperature control units, Chemical dispenser maintenance should be an important part of the laundry PM program.

Other equipment - Pools and spas, front desk equipment, electronic locks, exterior door locks, motor vehicles, and in-hotel transportation equipment.

Managing Maintenance: Emergency Maintenance

Emergency maintenance - is unexpected, threaten to negatively impact hotel revenue, require immediate attention to minimize damage, require labor and parts that may need to be purchased at a premium

The stronger the routine and PM programs, the fewer dollars spent on emergency repairs!

Managing Utilities - 80% of total utility costs for hotel are actually fixed, Energy costs present 3 - 10% of total operational costs, depending on hotel's location, E&M department should be concerned with conserving energy and controlling utility costs

Energy management: specific policies and engineering, maintenance, and facility design activities intended to control and reduce energy usage.

1. **Managing Utilities: Electricity**

Electricity is most common and usually most expensive form of energy used in hotels.

Lighting

- Light levels measured in foot-candle
  -The more foot-candles, the greater the illumination
- In candescent lights
  -Inefficient, short-life, but easy to replace
- Electric discharge lights
  -Longer lives, higher efficiency and low operating costs

Lighting maintenance (lamp repair, bulb change, and fixture cleansing) must be an integral part in PM program

Heating, ventilation, & air conditioning (HVAC)

- Heating components
  -Electricity is not cost-effective in cold climates
  -Use natural gas, LPG, steam, or fuel oil
- Cooling components
  - Effectiveness of cooling system dependent on
  - Original air temperature & humidity of room to be cooled
  - Temperature & humidity of chilled air entering room from HVAC
  - Quantity of chilled air entering room
  - Operational efficiency of air-conditioning equipment

2. **Managing Utilities: Natural Gas**

Usages of natural gas - Heating water for guest rooms, Powering laundry area clothes dryers, Powering plants to provide heat to guest rooms and public space, Cooking (rapid heat production and great degree of temperature control).

Managed properly, natural gas is an extremely safe source of energy

3. **Managing Utilities: Water / Waste**

Conserving water: Reduces the number of gallon of water purchased, Reduces the amount the hotel will pay for sewage, In the case of hot water, reduces water-heating costs because less hot water must be produced

Waste - Hotels encourage manufacturers to practice source reduction & to implement creative programs to reduce solid waste, Reduce waste disposal costs by: recycling minimizing waste generation & wise purchasing