Before we begin:

- Turn on the sound on your computer. There is audio to accompany this presentation.

Week 7
The Design-Build Cycle
Reading: Text Chapters 11-13

PULSE POINTS – Chapter 11
Programming and Project Development:

- The facility manager should program for maintainability as well as functionality and place emphasis on support areas.
- Project planning integrates information from the facility plan with requirement gathered through programming.
- The facility manager plans with care but always retains flexibility.
- Planning for major projects nearly always understates engineering requirements.
PROGRAMMING

What is Programming?

- Programming is the analysis of a specific function that contributes to the improved execution of a function.
- Programming is a problem-seeking process that precedes problem-solving.
- Programming and design are distinct functions. Good programming precedes good design.

(continued on next slide)

BASIC CONCEPTS of FACILITIES PLANNING

Facilities Planning = Programming + Space Planning + Facility Management

Programming = Management Consulting
+ Strategic Planning
+ Organization Structure
+ Physical Space & Equipment
+ Relationships
+ Project Management

PROGRAMMING – VALUE

Value of programming:

- Logical process
- Separate from design
- Leads to designs that meet needs
- Facility designed from inside out
- Controls decision making process
- Involvement of FM in the information chain
- Result usable by all involved in facility
- Eases incorporating future changes
PROGRAMMING

Feasibility Analysis Stage:

- Technological Feasibility – organizational resources including people and equipment
- Operational Aspects – employee and organizational
- Economic Aspects – return on investment
- Communication Aspects – location of functional areas
- Maintainability – effect on life-cycle costs
- Sustainability – approach and goals
- Political Aspects – involve senior leadership

PROGRAMMING – SOURCES

Information Sources:

- Top Management
- Operating Staff
- Support Staff
- Regulations and Codes

What is Project Planning?

- Project planning is a procedural step in project management, where required documentation is created to ensure successful project completion.
- Documentation includes all actions required to define, prepare, integrate, and coordinate additional plans.
- The project plan clearly defines how the project is executed, monitored, controlled, and closed.

(continued on next slide)
What is Project Planning?

- The project planning stage requires several inputs, including conceptual proposals, project schedules, resource requirements/limitations and success metrics.
- Project planning begins by setting the scope of a project and eventually working through each level of dependent actions, tasks, checkpoints and deadlines.
- All of this information is integrated into Gantt charts, or other types of scheduling charts, to provide a project overview for all involved parties.

(continued on next slide)

https://www.techopedia.com/definition/14005/project-planning

What is Project Planning?

- The culmination of the project planning stage identifies:
  - Road blocks in the project
  - Work required for project completion
  - People involved in the project and their key responsibilities
  - Minimum project completion time
  - Major project deliverables
  - Required project milestones

(continued on next slide)

https://www.techopedia.com/definition/14005/project-planning

What is Project Planning?

- Project planning is never truly finished until a project is completed.
- The project plan may return to the planning stage multiple times prior to project completion, or even abandoned.
- Generally, project complexity determines the length of the project planning stage.

(continued on next slide)

https://www.techopedia.com/definition/14005/project-planning
PROJECT PLAN – GANTT CHART


PROJECT PLAN – RESOURCES

Resources:
- Mid-Range Facility Plan
- Annual Work Plan
- Facility Standards
- Sustainability Plan
- Information on Similar Projects
- Project Evaluation Calculations for Capital Project
- Buy or Lease Decisions
- Concept Design, Budget and Schedule
- Serviceability Study

PULSE POINTS – Chapter 12

Design Process:
- Even when design is outsourced, the facility manager must control the design process.
- Good design starts with a good concept and a good program.
- Complex projects are best designed by a team.
- Use elevations, physical models and Building Information Modeling (BIM) to sell the project.
DESIGN

- Facility managers don’t do design.
- Design is done by design firms:
  - Architects
  - Interior Architects and Designers
  - Engineers
  - Consultants

[Image: https://ujenzibora.files.wordpress.com/2010/09/the-design-team.jpg]

DESIGN TEAM SELECTION

- Design teams may be selected by the FM in small-firms.
- Design teams may be selected by an evaluation committee in medium- to large-sized firms. Members typically include:
  - Corporate project manager
  - In-house design representative
  - In-house sustainability experts
  - In-house engineering representative
  - In-house safety and security representatives
  - In-house communications representative
  - User representative
  - Purchasing/contracting

DESIGN REVIEWS

- Formal design reviews are an important step.
- Operation and maintenance staff must be included since they will operate the building after commissioning.
- Typical reviews:
  - Feasibility study
  - Concept from design firm
  - Program
  - 25-35% design – last chance for substantive changes
  - 80-85% design
  - Final design

Building Information Modeling

- Building Information Modeling (BIM) is the process of generating and managing building data during its life cycle.
- Typically it uses three-dimensional, real-time, dynamic building modeling software to increase productivity in building design and construction.
- The process produces the Building Information Model (also abbreviated BIM), which encompasses building geometry, spatial relationships, geographic information, and quantities and properties of building components.

http://en.wikipedia.org/wiki/Building_Information_Modeling

BIM includes building characteristics such as:

- Geometry and spatial relationships
- Geographic information
- Building components and their properties
BUILDING COMMISSIONING

- Building commissioning is the process of verifying construction and subsystems achieve the building owner’s requirements as designed by the building architects and engineers.
- Commissioning authority is the qualified person, company, or agency that plans, coordinates, and oversees the entire commissioning process.
- The commissioning authority may also be known as the commissioning agent.

BUILDING COMMISSIONING (continued)

- Retro-commissioning is the application of the commissioning process to existing buildings that seeks to improve how building equipment and systems function together.
- Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction, or address problems that have developed throughout the building’s life.
- In all, retro-commissioning improves a building's operations and maintenance (O&M) procedures to enhance overall building performance.

BUILDING COMMISSIONING (continued)

- Recommissioning occurs when a building that has already been commissioned undergoes another commissioning process.
- The decision to recommission may be triggered by a change in building use or ownership, the onset of operational problems, or some other need.
- Ideally, a plan for recommissioning is established as part of a new building's original commissioning process or an existing building's retro-commissioning process.
**DOCUMENTATION**

- Good documentation throughout the project is essential.
- BIM is an important documentation tool.
- End of project documentation typically includes:
  - Attic stock recommendations – excess construction materials
  - Punch-list procedures – list of remaining work
  - BIM and other facility intelligence instructions
  - Operational testing procedures
  - Furnishing and finish boards
  - Training on equipment
  - Warranty turnover

**DESIGN PRACTICES**

**Design Outputs may include:**

- Base plan – permanent and structural aspects

**DESIGN PRACTICES**

**Design Outputs may include:**

- Demolition plan – used for remodeling
DESIGN PRACTICES
Design Outputs may include:

- Installation plan – location of modular panels

[Diagram of installation plan]


Week 7 - 31

DESIGN PRACTICES
Design Outputs may include:

- Component plan – second overlay of installation plan with installed components or plan for other permanent components.

[Diagram of component plan]


Week 7 - 32

DESIGN PRACTICES
Design Outputs may include:

- Floor plan – furniture location

[Diagram of floor plan]


Week 7 - 33
DESIGN PRACTICES

Design Outputs may include:

- Reflected ceiling plan – lighting plan

http://docs.autodesk.com/errors/404.htm

Week 7 - 34

DESIGN PRACTICES

Design Outputs may include:

- Information and communications technology plan – telecommunications cabling and equipment location

http://www.etny.net/wp-content/uploads/2012/08/Cropped-300x275.jpg

Week 7 - 35

DESIGN PRACTICES

Design Outputs may include:

- Floor covering plan – type and extent


Week 7 - 36
DESIGN PRACTICES

Design Outputs may include:

- Wall covering / finish plan – type and extent

http://static.wixstatic.com/media/102c5639d1fd298d0a6480fa6f2a760a.wix_mp_1024.12cb7.jpg

DESIGN PRACTICES

Design Outputs may include:

- Details and joinery plans – custom cabinetry and built-ins.


STANDARDS and SYSTEMS

- Standards influence the design of the interior.

- Interior related systems:
  - Building systems
  - Floor systems
  - Wall systems
  - Ceiling systems
  - Furniture systems
  - Fenestration systems - design, construction, or presence of windows and doors in a building
STANDARDS and SYSTEMS

| Exhibit 12.2. Design factors covered by policy or standards (percentage of respondents). |
|---------------------------------|-----------------|-----------------|-----------------|
| Office types                     | Percentage | Percentage | Percentage | Note |
| Writer                           | 54          | 30            | 16            |      |
| Space allocation                 | 55          | 29            | 16            |      |
| Network points                   | 26          | 41            | 33            |      |
| Furniture arrangement            | 46          | 33            | 23            |      |
| Office location                  | 31          | 37            | 32            |      |


SPACE ALLOCATION

- Objective is to provide maximum employee support in the minimum amount of space.
- Effective use of space implies the work space is provided with the maximum functional support for the activity.
- Efficient use of space is to achieve maximum density / ft²
- CAD and BIM modeling is used to optimize effective and efficient use of space.

http://eypaedesign.com/features/science-on-display/photos/space-allocation.jpg

SPACE ALLOCATION

- Space allocation configuration:
  - Traditional office – permanent walls

http://www.schoolfurnishings.com/products/office/
SPACE ALLOCATION

- Space allocation configuration:
  - Conventional panel-hung systems

http://www.stamfordofficefurniture.com/images/Prospects2.jpg

Week 7 - 43

SPACE ALLOCATION

- Space allocation configuration:
  - Circular radiating clusters


Week 7 - 44

SPACE ALLOCATION

- Space allocation configuration:
  - Clustered panel systems


Week 7 - 45
SPACE ALLOCATION

- Space allocation configuration:
  - Benching systems

PULSE POINTS – Chapter 13

Project Management and Construction:
- Project management is not facility management.
- The facility manager must control, if not manage, all large capital projects for which the facility manager will become responsible.
- Life cycle costing should be used for project decisions.
- Partnering provides an opportunity to avoid litigation during major projects.

(continued on next slide)

PULSE POINTS – Chapter 13 (continued)

Project Management and Construction:
- Both design-build and fast-tracking offer opportunities for cost savings but put greater pressure on the design team.
- New contracting methods should be considered in light of their benefits to all stakeholders within a project.
- Costs can be minimized by selecting the correct method of contracting and the correct construction process for major projects.
- Prequalify design firms and builders.
- Award good performers; drop nonperformers.
BASIC CONCEPTS of FACILITIES PLANNING

Facilities Planning = Programming + Space Planning + Facility Management

Programming = Management Consulting + Strategic Planning + Organization Structure + Physical Space & Equipment + Relationships + Project Management

PROJECTS

What is a project?
- Temporary in that it has a defined beginning and end in time, and therefore defined scope and resources.
- Unique in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal.
- Project team often includes people who don’t usually work together – sometimes from different organizations and across multiple geographies.
- Must be expertly managed to deliver on-time and on-budget.

http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx

PROJECTS (continued)

What is a project?
- Capital projects are developed, justified and executed as projects.
- Annual budget expenditures that are typically handled as projects include:
  - Discretionary
  - Design is involved
  - Cost exceed a certain value
  - Multidisciplinary
  - Requires high user involvement
What is project management?

- The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.
- It has always been practiced informally, but began to emerge as a distinct profession in the mid-20th century.

http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx

---

What is project management? (continued)

- Project management processes fall into five groups:
  - Initiating (Feasibility Analysis)
  - Planning
  - Executing
  - Monitoring and Controlling
  - Closing

http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx

---

What is project management? (continued)

- Project management knowledge draws on ten areas:
  - Integration
  - Cost
  - Human Resources
  - Stakeholder Management
  - Scope
  - Quality
  - Communications
  - Time
  - Procurement
  - Risk Management

http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx
ORGANIZATIONAL ASPECTS
Organizational Aspects of Project Management:
- Large capital projects are typically managed by a separate project team reporting to the FM.
- Project team:
  - Staff from the organization
  - Hired development team
  - Hybrid – both internal and contracted
- Project teams typically include: contracting officer, architect, engineer, interior designer and project accountant.

PROJECT MANAGEMENT
- Facility management departments typically handle projects over a threshold value.
  - Smaller projects may fall under the maintenance function.
- Large organizations may have hundreds of projects annually.
- Projects can be organized by:
  - Type – new construction, renovation, alteration
  - Customer – department or function
  - Location – within facility or geographic region

CONSTRUCTION PHASE
Common methods for contracting for construction:
- Lump Sum – Sequential Design and Construction
- Construction Management (Cost-Plus-Fixed-Fee)
- Guaranteed Maximum Price
- Turnkey
CONSTRUCTION CONTRACTING

Problems can be minimized by avoiding the following pitfalls:

- Not contracting with experience architecture / engineering firm.
- Fail to provide important requirements initially.
- Not determining sustainable content prior to design.
- Allowing architecture / engineering firm to select consultants without approval.
- Using builder without experience for project complexity or location.

(continued on next slide)
CONSTRUCTION PHASE PITFALL (continued)

Problems can be minimized by avoiding the following pitfalls:

- Failure to use a commissioning authority
- Failure to establish budget, controls and accounting procedures
- Approving changes before design and cost determined.
- Failure to schedule review / progress meetings.
- Not observing work of builder’s subcontractors.

(continued on next slide)

CONSTRUCTION PHASE PITFALL (continued)

Problems can be minimized by avoiding the following pitfalls:

- Failure to agree on punch-list procedure, operational testing, beneficial occupancy, training, warranties and project turnover.
- Failure to determine documentation required at turnover.
- Failure to budget for contingencies.
- Failure to schedule training for operation and maintenance staff prior to occupancy.

PARTNERING

Construction partnering:

- A commitment between a project’s owner, the consulting engineers and/or architects, the contractor(s), and other key project stakeholders to create a cooperative project environment with a team committed to understanding one another.
- The team works together to develop and follow processes and procedures which will optimize the successful completion of the project.

http://allanlowe.com/construction/partnering/
PARTNERING

Construction partnering:

- Partnering will improve communications and avoid disputes by developing mutual Project and Partnership Success Goals and by monitoring the achievement of these goals for the duration of the project.
- Partnering builds goodwill and trust, encourages open communication, and helps the parties eliminate surprises and adversarial relationships. It enables the parties to anticipate and resolve problems, and minimize disputes through development and use of Issue Resolution processes.

http://allanlowe.com/construction-partnering/what-is-construction-partnering/

---

PARTNERING

Construction partnering:

- Partnering is often called dispute prevention.
- Partnering is:
  - Working together instead of against each other
  - A process for relationship building
  - A philosophy of teamwork and understanding the other parties' needs
  - A commitment to cooperate and communicate
  - An attitude of goodwill and trust
  - Sharing risks with a “win-win-win” attitude

http://allanlowe.com/construction-partnering/what-is-construction-partnering/

---

PARTNERING

Construction partnering:

- Partnering is not:
  - Relaxing contract terms
  - Circumventing the processes
  - Expecting extra work for free
  - An excuse for poor performance
  - A cure-all
  - Easy to achieve!

http://allanlowe.com/construction-partnering/what-is-construction-partnering/
PROJECT MANAGEMENT

- Methods:
  - Critical Path Method (CPM)
  - Program Evaluation and Review Technique (PERT)
  - Precedence Method (PM)
  - Resource Constrained Scheduling

CONSTRUCTION MANAGEMENT

Variations:

- Construction Managers are involved in the overall planning, coordination, and control of a project from beginning to completion. Typically employed on large projects.
- General Contractors are responsible for the day-to-day oversight of a construction site, management of vendors and trades, and communication of information to involved parties throughout the course of a building project. Typically used for smaller projects.

CONSTRUCTION PROCESS

Common alternatives include:

- Design-Bid-Build
- Design-Build
- Fast-Track (CM)
- Turnkey
DESIGN-BUILD

- Design-Build is a method of project delivery in which one entity – the design-build team – works under a single contract with the project owner to provide design and construction services.

- Design-build is an alternative to the traditional design-bid-build project delivery method. Under this approach, design and construction services are split into separate entities, separate contracts, separate work.

http://www.dbia.org/ABOUT/Pages/What-is-Design-Build.aspx

---

DESIGN-BUILD

![Diagram](http://www.buildwithjck.com/the-design-build-advantage)

---

FAST-TRACK

- Fast-track construction is a project delivery strategy to start construction before the design is complete. The purpose is to shorten the time to completion.

- Shorter schedules are desirable for reasons that vary with building owners. Shorter schedules may reduce the cost of construction financing and reduce overhead costs for the design and construction organizations. Shorter schedules may also reduce the impact of inflation during construction.

- Fast-Track is more difficult to. It requires detailed knowledge of the process, effective planning, integrity and close coordination among the organizations executing the work.
TURNKEY

- Turnkey construction is a type of project that is constructed so that it could be sold to any buyer as a completed product.
- Turnkey construction contract requires the construction firm to complete the project with pre-specified criteria for a price that is fixed at the time the contract is signed.
- Turnkey construction contracts reduce the risk to the buyer of the construction services and provide an incentive for the construction company to stay within budget.
SELECTING a BUILDER

Selection criteria:
- Successful completion of multiple projects at the location selected.
- Successful completion of multiple similar projects.
- Financial stability
- Qualified and capable manager.
- Current project load accommodates a new project.

CONSTRUCTION CONTRACTS

Common contract alternatives:
- Guaranteed Maximum Price – protects buyer placing cost control responsibility on contractor.
- Cost Plus Percentage - buyer pays actual cost plus fixed percentage for contractor overhead and profit.
- Cost Plus Fixed Fee – offsets some of the issues with cost plus percentage.
- Cost Plus Fixed Fee with Upset Figure – established fixed maximum cost for project.
- Multiple Prime Contracts – buyer uses a construction manager who engages multiple prime contractors.

COST CONTROL

- Payments – periodic / progress payments to contractors and/or construction manager required. Payments triggered by project milestones.
- Schedule – detailed schedules are used to coordinate work of subcontractors. Allow assessment of progress.
- Change Orders – both pending and approved change orders affect the price and schedule of a project. Timing of change orders can have a significant impact.
QUALITY CONTROL

- A project quality plan is a written plan that details how you will manage quality on a specific construction project.
- Project Quality Plan should include:
  - Organization chart, pertinent personnel information, licenses, bonding, etc.
  - Communications Plan
  - Project specific standards and codes
  - Project specific inspections and tests
  - Project purchasing policies and procedures

TURNOVER PROCEDURES

- Example contractor check list items:
  - Certificate of Occupancy
  - Warrantee Certificates
  - Operation and Maintenance Manuals
  - Training for Maintenance Personnel
  - Spare parts and attic stock turned over to owner
  - As-Built drawings and BIM changes sent to Architect
  - List of warrantee agents
  - Keys returned
  - All claims and change orders settled
  - Test and balance reports for HVAC sent to Architect
  - All punch list work complete
  - Submit final pay request with release of liens

TURNOVER PROCEDURES

- Example architect check list items:
  - Record drawings and BIM changes prepared from As-Built.
  - All change orders and claims settled
  - Approval of test and balance reports
- Example owner check list items:
  - Notify O&M and Security of acceptance of facility
  - Provide copies of Maintenance Manuals
  - Provide copies of Warrantee and Agents
  - Forward spare parts, keys, and As-Built
  - Verify all changes and claims are settled
  - Process final payment
POTENTIAL PROBLEMS

- Construction projects due to their size and cost often result in lawsuits.
- Alternative Dispute Resolution (ADR) is a dispute resolution process that act as a means for disagreeing parties to come to an agreement short of litigation.
- ADR methods include:
  - Negotiation: The most direct method for resolving disputes is for the parties to work out their own differences through skillful negotiation.
  - Mediation: Mediation is similar in many respects to negotiation. Both are generally private, voluntary, and informal. The focus in both is on problem-solving rather than on determining who is right and who is wrong, and the parties themselves decide the outcome. In mediation, however, a neutral third party is chosen by agreement to help the parties resolve the dispute. The mediator listens to each side’s version of the problem in an informal setting and helps the parties come up with ideas for resolving the dispute.
  - Arbitration: In arbitration, a dispute is submitted to one or more impartial persons, usually experts in the construction field, who decide the outcome. The arbitrator’s decision is private. The arbitrator’s decision may be appealed to court, but an arbitrator’s decision can be reversed only in exceptional circumstances. Although arbitration is more structured than negotiation or mediation, it is more flexible, and less costly, than litigation.
POTENTIAL PROBLEMS

ADR methods include (continued):

- Private Judging: Private judging involves employing a retired judge to hear a dispute. As with arbitration, private judging is done by consent of the parties, and typically the parties agree that the private judge’s decision will be binding. Private judges are usually given most of the powers of a court, and the hearing resembles a typical court trial. The main advantage to private judging over the public courts is the shorter time it takes to get the matter brought to trial.

http://www.frostbrowntodd.com/resources-01-22-20071.html

Week 7 Deliverable: None