



Project Management (Construction Projects) Part 3

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Preliminary Engineering

- The following needs to be considered for technical and cost information:
 - Layout Refinement
 - Available Utility Service Analysis
 - Architectural and Engineering systems definition
 - Preliminary Plans, Elevations, Sections, Schedules
 - Discipline Coordination
 - Outline Technical Specifications
 - Preliminary Analysis and Calculations

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Preliminary Engineering

- Preliminary Construction Schedules
- Preliminary Cost Estimate
- Completion of Site Surveys
- Finalize Geotechnical Investigations
- Finalize Environmental Investigations
- PM to oversee that merits of all sound configuration and design have been investigated
- In-depth analysis of all components, their interrelationships and their costs has to be done

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Final Design

- The final design team will develop:
 - Construction bid package
 - Final drawings and specifications
- The PM will oversee all the stages including the various design reviews leading to development of final design
- Design team develops testing requirements, O & M Manuals and acceptance criteria for the safety and functionality of all subsystems

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Design Management

- The Project Manager is responsible to oversee the design development process
- Depending on the in-house capacity available, this can be done by:
 - either the PM himself,
 - by an in-house person or
 - by a hired Project Management Consultant
- This is a key role to take the project to a successful completion
- Whoever does it, the PM remains responsible and has to take the lead role

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Design Management

- The responsibilities of the PM are as under:
 - Finalize project scope of work and budget
 - To see that the Design team is working within the scope
 - Provide assistance and guidance to the design consultant
 - Prepare and monitor the project schedule
 - Monitor project cost including cost of design
 - Evaluate quality of deliverables
 - Coordinate between the Client/Owner and involved 3rd parties like environmental agencies, municipal officials, utility providers
 - Coordinate and oversee design review meetings

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Design Review

- The PM coordinates and oversees reviews at the following stages:
 - Design Criteria
 - Conceptual
 - Preliminary Engineering
 - At various design completion stages e.g. 30, 60, 90 and 100 percentage stages
 - Bid document stage
- Peer Review
 - To be done at early stages adding an external perspective
 - This will enhance the functionality of the design, construction and operation
- Constructability Review

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Constructability Review

- This review should be carried out when the design is more than half completed.
- The purpose of this review is to:
 - Eliminate requirements which are impossible or impractical to build
 - Availability and suitability of materials, capability of labour resources and standards of practice of construction resources
 - Considerations based on site condition, access, utilities and general configuration
 - QA and QC requirements
 - Ensure construction is possible using methods, materials, and equipment availability

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Risk Assessment

- During the design phase the PM should facilitate doing risk assessment
- The aim is to determine whether there are events that can have direct impact on project cost and schedule
- To determine probable risks, a meeting or workshop to be held with other stakeholders
- Following needs to be identified:

•Each Project Risk	•Probability of occurrence
•Description of Risk	•Potential cost impact
•Activity affected	•Potential schedule impact

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Risk Assessment

- Examples of Risks:
 - Budget Risks
 - Risk of Deviation of budget estimate (Price, quantity)
 - Event Risks
 - internal and external events like extreme weather, contractor non-performance, strikes
 - These forces the project team to work beyond the estimate to meet the project scope
 - Scope Risks – risk of significant change in project scope due to external pressure (community pressure)

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Quality control and quality assurance

- PM is to see that funds are used prudently
- QC procedures to include:
 - Calculations, drawings, and specifications are checked by qualified personnel
 - The design is verified against scope
 - Design conforms to requirement of its intended use.
 - Application of sound principles are followed
- PM to ensure that the design achieves the quality objectives

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Construction

- Projects highest level of activity in terms of number of personnel and costs incurred per day occur in this phase
- Has most opportunities for deviation for:
 - Cost overruns
 - Due to changes and delays
 - Dispute with contractors
- To deliver the project on time, within budget and with required quality, the PM
 - Must take timely and decisive decisions
 - The PMP must have clear lines of authority
 - The PM should be free from other duties
 - The key PM staff is the Site Engineer who is the main point of contact with the contractor

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Role of Design Consultant

- Receive and responds to contractor's RFI
- Review change requests and estimate costs for change order
- Make periodic visits to the site to assure
 - Design compliance
 - Provide help and advise for obtaining certificates from the permitting Client/Owner

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Role of Contractor in construction

- Perform construction work as per drawings and specifications
- Develop and implement a quality control plan for testing and inspection of works
- Develop and implement a safety plan to ensure safe work site
- Deliver submittals defined by contract drawings and specifications:
 - Shop drawings, manufacturer's drawing, calculations and data and product information

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Role of Contractor in construction

- Contract schedule updated monthly noting progress and looking ahead to upcoming work
- Request for payment supported by reports as called for in the contract
- Record drawings of the as-built work
- O & M Manuals and training of Client/Owner staff called for in the contract specifications
- Submit RFIs to the Design Consultant through PM to obtain clarification of the design intent
- Submit Requests for change (RFC)

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Contract Management and administration

- The site engineer oversees the contractor's work as per the contract specification
- The SE is the contractor's single point of contact
- RE receives and processes the contractor's RFI and submittals
- RE receives and processes RFCs
- The PM ensures that the contractors fulfill their contractual obligations

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Schedule Control

- Contractors control their own detailed schedule progress.
- The project manager has to look at the overall master project schedule
- For larger project, scheduling software is used
- For smaller project, hand drawn bar chart should be adequate

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Schedule Control

- The Project Manager should:
 - Create a high level master schedule with limited details necessary to control interfaces
 - Focus on the Critical Path Activities
 - See that each contractor submits:
 - A baseline contract schedule following award for PM's review and approval
 - Monthly updates of progress against approved baseline
 - A revised baseline schedule for Client/Owner approved contract changes
 - Use contractor submissions to update the master schedule and focus management effort on:
 - Changes to the Critical Path through construction

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Schedule Control (contd.)

- Contractor activities forecast to be late that affects the Critical Path
- Interface activities forecast to be late that impact a contractor's progress
- Validation of progress on activities that control contract milestone payments
- Incorporate into contract conditions:
 - schedule milestones for work critical to project completion
 - interfaces with other contractor and
 - liquidated damages for late performance

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Causes of Delay

- The causes of delay in delivery of project are many
- These can be attributed to
 - The Client
 - The Consultants
 - The Contractor
 - The Contract Form
 - Project Conditions
 - External factors
 - Student's Syndrome
 - Parkinson's Law

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Causes of Delay (Factors Pertinent to Client)

- Financial ability / cash flow management
- Previous working relationship with the client.
 - Too much familiarity with the client may hinder implementation of professionalism
- Red tapism tends to delay
- Priority on construction time
 - Multitasking tends to delay
- Specified sequence of completion
 - Some work cannot start before completion of another
- Possible changes to initial design
- High expectation and too restricted time schedule
- Delay in decision making

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Causes of Delay (Factors Pertinent to Consultants)

- Completeness and timeliness of project information
- Build-ability of design
 - Some design features may not be executable
- Provision for ease of communication
 - Free and timely flow of information between all is essential to avoid delay in completion
- Previous working relationship
- Priority on construction time
- Delay in responding to RFI by architects and engineers

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Causes of Delay (Factors Pertinent to Contractors)

- Availability of suitable, experienced and knowledgeable management team
- Programming construction work
- Previous performance of site management team
- Number of sub-contractors
 - With more numbers, coordination, monitoring and control become more complex
- Non-adherence to quality standards and designs
 - These may lead to re-do, causing delay

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Causes of Delay

- Factors Pertinent to Contract Form
 - Suitability to project time
 - Use of standard form of contract
- Factors Pertinent to Project Condition
 - Function or end use
 - The form of construction must follow function and follow the required norms and standards
 - Complexity
 - A complex project with many subproject tends to be delayed
 - each must be congruent to ultimate final project deliverable
 - Location
 - Difficult location may pose problems of logistics

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Cost and change control

- The objective of cost control is to deliver the project within the budgeted cost
- In a lump sum fixed price contract, the contractor is responsible to complete the project at the fixed price
- If a change has been approved, its effect on cost and time has to be included in the contract
- In a fixed price contract, cost control comes down to managing changes of the contract
- Then cost can be within original plus changed price
- All changes must be managed promptly.
- RFCs must be managed in a timely, decisive and equitable manner
- Backlog of RFCs will divert attention of PM from project activities

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Changes During Construction

Type of Change	Description
Client/Owner Action	<ul style="list-style-type: none"> • Changing the plan and specification • Altering the time to complete the work • Changing the contractor's means and methods • Regulatory changes • Third party delays where it is due to Client/Owner
Differing site condition	<ul style="list-style-type: none"> • Subsurface condition is different than original • Unanticipated unusual conditions occurred
Errors or Omissions	Occurred in design and specifications
Contractor Action	<ul style="list-style-type: none"> • Contractor changes means and methods • Delays project due to non performance • Third party delay where contractor is responsible

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Document control

- It is management of records generated during construction besides RFI, RFCs
- Site records:
 - Daily log of site activities,
 - Occurrences,
 - Weather
 - Equipment
 - Personnel
 - Communications
- Inspection report of contractor's work and practices observed by the PM.
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Document control

- Inspection report includes:
 - Construction work performed
 - Instruction given or received
 - Unsatisfactory conditions
 - Delay's encountered
 - Manpower and equipment and other problems
- Site Engineer's weekly Construction Report:
 - All items of importance,
 - Conferences with contractor or other parties,
 - Agreements made,
 - Special notes regarding equipment or organization
 - Labour conditions
 - Weather or other causes of possible delays
 - Other matters that have a bearing on the job
- Safety management and accident reports
- QA/QC reports

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Progress payment

- Contract specification should clearly state:
 - How the contractor's work progress to be measured
 - How payments are determined based on the measured progress
 - What documents and reports are required to be submitted by the contractor to justify payment request
- The PM should authorize payment only when:
 - Request is in full compliance with the contract requirement
 - Progress claimed has been independently verified

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Role of Project Manager

- Management of construction project requires knowledge of modern management as well as an understanding of the design and construction process
- Projects execution is planned and controlled by Project Manager (PM)
- PM Must have authority commensurate with responsibility to form and manage a team for support of the project
- Should be experienced in similar projects
- He plans, organizes, directs, coordinates and controls the activities and interactions of a large number of functionaries

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Thank You