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AN OVERVIEW OF HOW TO EXECUTE ENGINEERING PROCUREMENT CONSTRUCTION COMMISSIONING (EPCC) PROJECTS

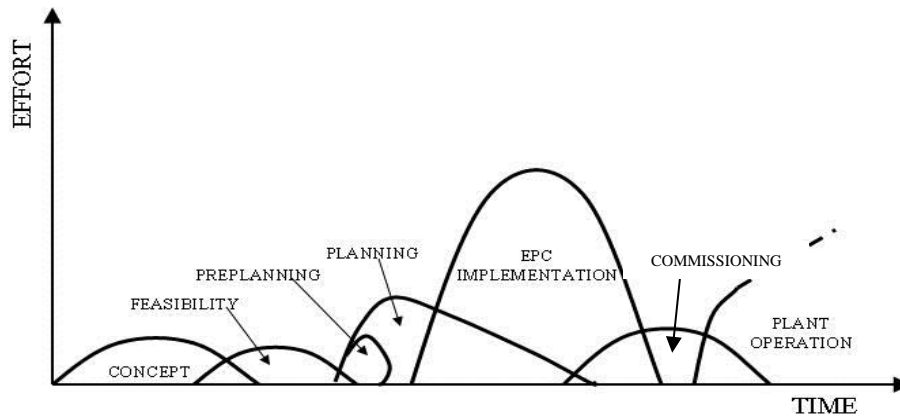
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HOW TO EXECUTE ENGINEERING PROCUREMENT CONSTRUCTION COMMISSIONING (EPCC) PROJECTS

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PROJECT PHASES



1. THE PROJECT PHASES AND MANAGEMENT APPROACH

1.1 The Life of a Project

The life of a project starts with the gleam in the eye of a top corporate or governmental executive, when the realism of research or development activities takes hold or the marketing force strikes hard enough or the public out-cry becomes a challenge to satisfy or to forecast. From this gleam to completion, at satisfactory operation, wherein the project achieves its stated objectives of operations and output is the project life cycle.

The illustration shows this life cycle; it is not necessarily determinate. All of the project work illustrated needs to be done but not necessarily by the engineer-constructor; certain phases may be performed by the owner-client or his independently appointed conceptual/process phase consultants. Throughout the project life there are a number of start-stop decision points; it may go into suspension, remain alive but dormant for a while then die completely or spring into life again with an even more vigorous force. The many external influences under which the project life has little control may guide or shape its pattern to a somewhat different form without real change to its basic configuration. There are always the considerations to make changes to use the latest technology or to improve for consideration of plant operation, maintenance or quality of product which may be completely disruptive of the project life. When these are proven to be necessary, due to long-term considerations, that is the plant life, the project rhythm may be broken, but with disastrous results to the satisfaction of the Project Task Force of the engineer- constructor.

The maintenance of the logic sequence of the project life and the planned deployment of resources is all important for the performance criteria in evaluation of the project and its execution. As an incidental to this, one can visualize the project as a live, dynamic force, which may be controlled or not, which may be driven or not, which may be satisfying in its success or depressing in its final outcome. The only reality is that, big or small, there are never two alike, as are human beings.

For all projects, great or small, throughout their life as defined earlier, there are four distinct phases. The first phase is Conceptual and in North America is often performed by the client's organization or may be contracted out to engineer-constructor companies or specialty process supply organizations or may be handled in combination without commitment for the next phases. The second phase is one of Definition that is the fixing of the project scope and configuration with final appropriation of funds for commitment and the general organization, the planning Phase and to be that, this includes a subphase "Plan the Planning". The third is the mass Production phase of the project, the E, P and C. The final and fourth phase is the Reduction and turning down of the work, the mechanical acceptance testing, start-up, commissioning and make good. The above mentioned chart indicates for a typical project, the relative magnitudes of such effort, excepting manual Construction labour and equipment or material supply cost. The facility operation phase is usually the owner-client responsibility.

1.2 **Conceptual Phase**

The Conceptual Phase starts upon realization by the authority, public or private, that the investment of capital in the creation of a structure, physical system, resource development, infra-structure, treatment plant, production facility or however it may be described, will be for the common, specific or particular good.

Even so, the work of the Conceptual Phase, carried out by the small team, is composed of the same attention to detail, thorough checking of facts, compilation of data, analysis techniques, planning, setting of objectives, forecasting results and comparison of Scope, Cost and Time to agreed standards of performance as in the other phase of project work. It is specialized work composed of as many varying disciplines or functions, with many of the same demands of project management such as the responsibility for the interfaces between each function.

1.3 **Feasibility**

This phase starts when the client's criteria or supervisor's satisfaction is achieved. The project appears to be viable, it is in the interest of the good, but it is necessary to check, to review. The client's C.E.O. needs this for directors' approval, to fund the project; all of this is to be sure. This phase of project life is the most important for the ensuing work if it passes this inspection at all. The work at this time is to be done well in a most professional manner; it will have to respond faithfully to the scrutiny of the highest echelon of management and perhaps third party funding organizations.

This Phase comprises a review of feasibility; review of the marketing study and the plant location study; sufficient preliminary engineering, an almost fix of the process or layout, the almost decision for standard criteria; a plan and milestone schedule for the project, a preliminary project instruction manual for the Planning & EPC Phase; a preliminary or even a definitive cost estimate; risk and sensitivity analysis; contingency evaluation; escalation and finance cost parameters and an organization structure design to do the work of the following Phases. This is the time during which the major decisions of the project are confirmed.

1.4 THE PLANNING PHASE AND THE PROJECT MANAGEMENT APPROACH

PLAN THE PLANNING

THE PRELIMINARY PROJECT PLAN

THE PROJECT PLAN

GENERAL SUBPHASE DESCRIPTION

This is the phase during which the Project Manager prepares the project Assignment Sheet (Project Charter), reviews available information and the contract, establishes objectives, policies, etc. He/She reviews these with the Chiefs of Disciplines, and the Project Key Managers. He plans how he wants to accomplish the two following sub phases, establishes a budget for it, selects key people for the project and arranges for the project Panel Review.

This is the phase during which a relatively “rough” plan is developed for the project, so that we have a “rough” idea what it is we have to plan. The preliminary Project Planning phase includes activities to establish the Scope, Quality, Cost, Time, Resources, but as said before, in a “rough” or preliminary way. Preliminary Engineering has to be done.

If the resulting Preliminary Project Plan shows that any of the Project Objectives or Resources required are not acceptable we have to re-do our preliminary planning until we are “in the ball park”. After the necessary approvals we can go to the next sub-phase, to the actual project planning

This is the phase during which we establish in detail, the EPCC Objectives and basic for control (Scope, Quality, Cost and Time) and resources. The details are “detailed enough” to have “good” planning information. (Example: Work and Manpower control planning is come from the “second level” on upwards during this phase. The “first level” details, like listing each drawing, or each specification can be done to a large degree “just before” the actual design and crafting activities start).

The degree of detail required depends on the size of the project, the importance of the portion under consideration, the depth of information available, and most important, the degree of the control required. The closer the control of any portion, the greater the detail required for planning and subsequent monitoring.

ESSENTIAL ACTIVITIES

1. PREREQUISITES
2. BASICS
3. FAMILIARIZATION
4. PRELIMINARY BUDGET FOR PLANNING PHASES
5. SELECTION OF KEY PEOPLE, STAFFING
6. DATA COLLECTION AND PLANNING FOR PLANNING MEETING
7. DEVELOPING THE PLAN
8. PROJECT PANEL REVIEW

1. PRELIMINARY SCOPE DEFINITION
 - Scope of the work (facility)
 - Scope of the services
2. PRELIMINARY ENGINEERING PART 1
3. INITIAL SITE INVESTIGATION
4. INITIAL LOCAL INVESTIGATION
5. PRELIMINARY DESIGN CRITERIA
6. ESTABLISH CONTROL SYSTEMS TO BE USED
7. PROJECT INSTRUCTIONS – Initial issue/updates
8. ESTABLISH RESOURCES REQUIRED AND SOURCES
9. INTIAL PROJECT ORGANIZATION CHART
10. UPDATE PRELIMINARY SCOPE
11. PRELIMINARY PROJECT WORK BREAKDOWN STRUCTURE AND PACKAGES
12. PRELIKMINARY MILESTONE SCHEDULE
13. PRELIMINARY MASTER NETWORK AND SCHEDULE
14. PRELIMINARY CAPITAL COST ESTIMATE

1. EVALUATING THE PROJECT PANEL REVIEW
2. COMPLETE SCOPE DEFINITION
3. COMPLETE PRELIMINARY DESIGN
4. COMPLETE PROJECT INSTRUCTIONS (PROJECT PLAN)
5. FINALIZE PROJECT ORGANIZATION
6. FINALIZE PROJECT WORK BREAKDOWN
7. FINALIZE PACKAGES
8. FINALIZE PROJECT CODING
9. UPDATE WORK AND MANPOWER CONTROL
10. DEFINITIVE ESTIMATE ASSEMBLY
11. SITE MANPOWER AND LEVELING
12. UPDATE NETWORK PLAN
13. DEFINITIVE ESTIMATE REVIEWS
14. UPDATE SERVICE BUDGET
15. CASH FLOW PLAN
16. DEFINITIVE CAPITAL AND COMMISSIONING ESTIMATES
17. PROJECT PANEL REVIEW

15. PRELIMINARY SERVICE COST ESTIMATE
16. PRELIMINARY ENGINEERING PART 11
17. ASSEMBLE DATA FOR PANEL PROJECT REVIEW
18. PRELIMINARY PROJECT CHANGE NOTICE PROCEDURE
19. PROJECT PANEL REVIEW

Project Instructions are an essential element of project planning, as it will comprise sufficient principles or details of the execution planning of control procedures, procurement, expediting, shipping, warehousing, inspection, construction management procedures, arrangements for personnel, insurances, travel taxes, coding, time charges, etc.. to allow for estimating of cost/duration/manpower of these activities.

THE “PROJECT MANAGEMENT” APPROACH:

1. PROJECT MANAGERS’ FUNCTIONS

EXECUTIVE

- Must not be delegated, but worked out with client and parent company
- Policies and Objectives
- Decision Making/Getting
- Course of Action

LEADERSHIP

- Get team members to contribute at their optimum

PLAN & CONTROL

- We cannot control what we did not plan.
- We can not plan and control anything.
- We have to plan what we have to control.
- We phase our planning

AREAS OF MANAGEMENT CONCERN

Objectives

- Scope
- Quality
- Cost
- Time
- Relationships
- Profit

Resources

- Manpower
- Money
- Machines/Facilities
- Methods/Systems
- Information
- Relationships

PLAN AND CONTROL

PLAN: Plan, Organize, Staff, Direct:

CONTROL: Coordinate, Control, Forecast, Measure Progress, Production & Productivity, Performance, and Appraise, Re-Plan.

2. SKILLS FOR FUNCTIONS

EXECUTIVE

- Innovate
- Anticipate
- Organize
- Big Picture
- No Abrupt Changes
- Decision/Action Time Lag
- Balance Objectives/Resources
- Delegate/Follow Up

LEADERSHIP

- Team Builder
- Communicate (team members understand their tasks)
- Motivation
- Get Willing & Able People on Team
- Personal Relationship
- Empathy

PLAN & CONTROL

- In House Method
- Planning Orientation
- Analytical
- Organize
- Integrate/Evaluate Control Information
- Smoothen Information Flow

3. LEVELS OF PROJECT ENVIRONMENT

CLIENT

- In-Line:
 - Project Manager & his Staff
 - Division Manager
 - Executive Sponsor
- Staff:
 - Operation
 - Finance
 - Services
 - Personnel
 - System
 - Legal

PARENT COMPANY

- Management:
 - Director
 - Division Manager
 - Executive Sponsor
- Corporate Services:
 - Marketing
 - Public Relations
 - Support Staff
 - Finance
 - Services
 - Personnel
 - Systems
 - Legal

PROJECT TEAM

- The Project Management Team:
 - Project Manager
 - Project Controls Manager
 - Engineering Manager
 - Project Construction Management Manager
 - Project Commissioning Manager
 - Including all Quality Assurance Senior Staff

EXTERIOR PARTIES

- Utilities
- Regulatory Agencies
- Governmental Authorities & Judiciary
 - Federal
 - Province/State
 - Municipal
- Labour Unions/Associations
- Media
- Banking
- Insurance
- Finance

SUPPLIERS/CONTRACTORS

- Suppliers
- Contractors

4. STRATEGIES OF EACH LEVEL

CLIENT

- Openness
- Close Working Relationship, no Meddling
- No Arms-Length Relationships
- Simple Reporting Schemes
- Establish Relative Importance of Objectives
- Prompt Decisions
- Minimize Public Involvement
- Effective Lines of Communication
- Appropriate Authority of Principal Client Contract

PARENT COMPANY

- Select Project Manager Early
- Close Working Relationship
 - No Meddling with Project Manager
- Enthusiasm
- Simple Reporting Scheme
- Guide Lines for Project Manager
- Project Decisions
- Effective Lines of Communication with Project Manager
- Appropriate Authority of Project Manager

PROJECT MANAGER

- Select Project Team Key Members Early
- Participative Style
- Commitment/Mission Feeling in Team
- Authority/Organization Structure
- Emphasize Coordination & Relationships
- Public Image
- Plan the Plan, then Plan, then Control
- Balance Project Manager Skills/Tools
- Emphasize Quality of End-Item
- Project Change Control
- Plan Completion/Close-Out

1.5 THE EPC PHASE (ENGINEERING, PROCUREMENT, CONSTRUCTION) .

This is the phase during which the bulk of the project work is done – It may represent 80 per cent of the skilled engineering, procurement and construction management and supervision man-hours and 95 per cent of manual construction man-hours. This is the phase wherein the big money of the project life is consumed. The efficiency of its consumption is all important. This is where it shows whether the Project Team has come up with good project planning, and whether the Project Management Approach planned in the plan phase is good.

The Project Manager must be alert, to delegate properly, sometimes in massive amounts but retain his assistant, the P.C.O. people, to analyze and evaluate. He/She must know the people of the Project Management Team, and encourage them all, forecast their deficiencies, know intimately the methodology, nomenclature, procedures and policy of the company as it applies to the project, prevent fires, achieve results through people. He should listen to and rely upon the functional chiefs and the specialists of the product divisions of the company, in their independent review and analysis and recommendation for project operations. The other major qualification for the Project Manager requires that he be a team builder and support his people for success. He needs some experience and background in the technology of the industry of the client he/she serves.

He is a quick decision maker based upon the best advice available; decisions based upon production efficiency not specialization of technology, he must understand the rhythm intricacies and inter dependencies of the progress of the work in terms of daily decision-making; the excess costs of disruption of his large team many times over-rides the requests of the specialists, or the functional chiefs.

Much of the Project Manager's time with the Project Team must be spend in Planning and Control whereas activities are developed and come of Project Engineering and go into Project Procurement, become whole packages, and full under the responsibility of Project Construction Management. The Project Manager may need assistance, as he may delegate this expediting – interoperation and coordination really – but this is still his responsibility, and he follows up on his assistants.

1.6 THE COMMISIONNING PHASE

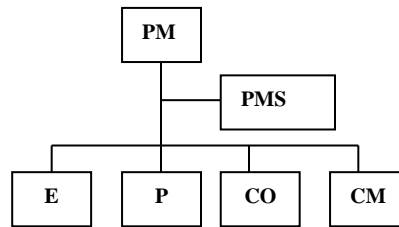
This Phase starts at a time, normally, when the EPC Phase is between 80 and 90 percent complete. In some cases, for example, the prototype plant will start much earlier. The commissioning team of the client or of the project manager's company is assembled and started its activities of familiarization some month before.

The action of the Commissioning team is based upon the planning of their phase, which has been done during the EPC Phase really, always involving with the Project Team. And of course should the Commissioning Manager contributes during the other phases also – his life becomes so much easier now, and the facility operation is so much better and attained faster.

2. SUMMARY OF PROJECT SERVICES & PHASES

CODE	PHASE		CONCEPT	FEASIBILITY	PLANNING
	NAME	SUB PHASE	PHASE 1	PHASE 2	PHASE 3
10	CLIENT		Concept policies	Meeting/Reviews, Decisions/Approvals, Environment Certification	Plan the Planning, Prelim Planning, Project Plan
20	SENIOR MG'T & CORPORATE SERVICES		Concept reviews, decisions, policies.	Meetings/Reviews, Approval.	Legal, Personnel, Accounting, Insurance, Financing, Panel Reviews, Public Relations.
30	PROJECT MANAGEMENT		Manage concept, Development, Order of Magnitude Estimate.	Scope, Planning, Schedule, Cost, Economic Studies, Organization, Delivery System, Assemble Report	Master Schedule, Definitive Estimate, Project Coding, Risk Identification and Analysis, External Approvals, Project Instructions (Project Plan).
40	ENGINEERING		Basic Data, Conceptual Process & Layouts.	Scope, Planning, Process, Preliminary Engineering, Technical Studies	Design Scope, Criteria, P & I.D's, Single Line Diagram, Soil Invest., Major Specs, Bid Packages, Prel. Eng'g., approx 30% of Detail Eng'g., Value Eng'g.
50	PROCUREMENT		Prel. Plan & Review, Check Market, Logistics	Major Equipment Inquiries	Logistics, Master Schedule, Conditions, Equipment List, Bid Packages, Contracts, Overseas Strategy, Sources.
60	CONSTRUCTION MANAGEMENT		Orientation.	Site-Study, Constructability, Identify Major Risks.	Planning, Strategy, Construction Work Packages, Temporary Facilities, Key Staff, Manpower Needs, Labor Relations, Constr. Procedures, Major Eq't, Early Work Schedule, Constructability, Quality Contractors.
70	COMMISSIONING MANAGEMENT		Preliminary Scope, Order of Magnitude Estimate.	Commissioning Estimate, Prel. Plan, Scope, Assess Facility Operator's Capability, Manpower Schedule.	Reviews/Meeting Monitoring, Key People, Final Manpower Plan, Definitive Estimate, and Budget for Commissioning.

80	OUTSIDE: AUTHORITIES REGULATORY BODIES, & OTHERS	Preliminary Approvals, Agreements	Consult, Advise, Approve, Agree
S	SUPPLIERS, VENDORS		- Technical Information - Budget Price Quotations
C	CONTRACTORS		- Technical Information - Budget Price Quotations
D	TYPICAL PROJECT ORGANIZATION CHART		



ENGINEER – PROCURE – CONSTRUCT

COMMISSIONING & START-UP

FACILITY OPERATION

PHASE 4

PHASE 5

PHASE 6

Engineering, Procurement, Construction

Organize operations & maintenance, recruitment, training, facilities monitoring, inspection, approvals,

Hands-on training, Plant Services, Procurement Inspection, Approvals,

Operate & Maintain, Performance Tests, Acceptance.

Reviews, monitoring, support (Finance, Legal, Public Relations), site visit, approvals.
Panel Reviews, Financial & Contract Services.

Quality Checks, Panel Reviews.

Final Review with client.

Detail Networks, Worksheets, Bid and Construction Packages, Control Scope, Quality, Cost, Time, Resources.

Final Project Report, Commissioning Field Mgt., Historical Data Gathering.

Cost Close-out.
Final client's operations Acceptance.

Detail Engineering for Work Packages, Final Specs, Design (all disciplines), Model, Requisitions for Bidding, Bid Analysis, P.O. Requests Manuals, Vendor Print, Approvals, Document Control.

Field Assistance, Design Corrections.

Final Follow-up, Design Updates.

Construction Contracts, Bid Evaluations, Material Procurement, Expediting (Mat., Eq't., etc.) logistics, Material/Quality Control, Inspection.

Commissioning Materials, Field Procurement Services, Close-out Report.

Constructability, Site Visits, Tender Reviews, Construction Equipment, Temp. Facilities, Reports, Productivity, Receive, Warehouse, Resident Eng'g., Labor Relations, Mechanical Completion.

Follow-up, Support Commissioning, Hold-back Release, Close-out Report.

Turnover Documents.

Panel/Design Reviews, Operability/Maintainability Reviews, Safety Audits, Recruitment/Training Supervision, Client's Start-up and other Personnel.

Field Management, Administrative Services, Personnel/Union Affairs, Monitor Commissioning, Laboratory, Services, Etc.

Turnover to Client, Final Report.

Underwriters' Tests, Inspections, Dept. of Labour Inspection,
Power & Utility Tests, Environmental Tests

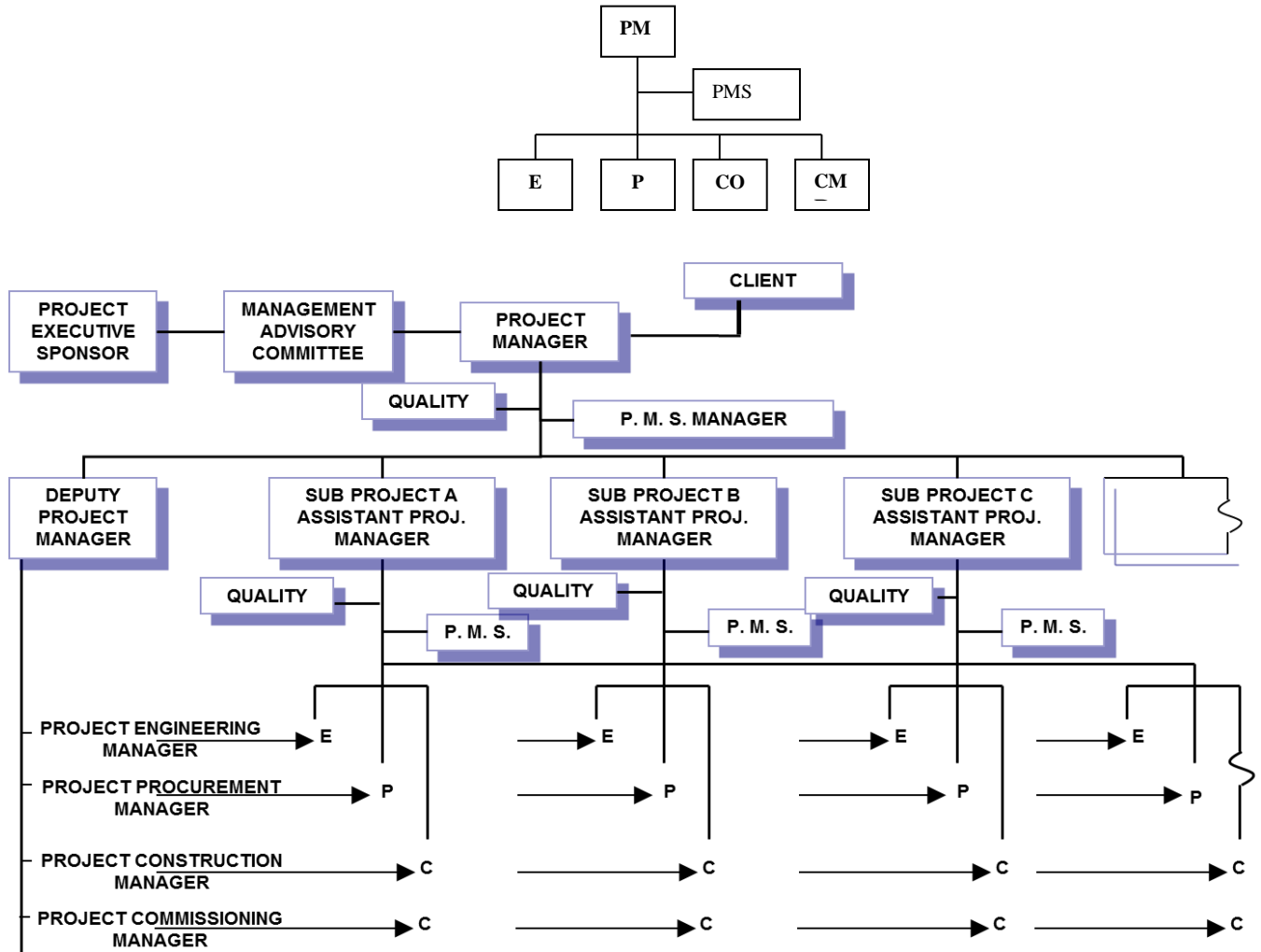
Final Field Certification & Approvals
to Operate

Safety & Hazard Audits

Bid, Vendor Data, Manufacture, Pack, Ship, Deliver, Install

Technical Supervision Assistance

Site Visit, Bid, Mobilize, Shop Drawings, Order Materials,
Construct



MEGA PROJECT TEAM

3. PROJECT MANAGEMENT SERVICES & PHASES

SERVICES	PHASES	CONCEPT	FEASIBILITY	PLANNING		
	NAME	PHASE 1	PHASE 2	PHASE 3		
CODE	NAME			Plan the planning	Prelim. Planning	Project Plan
32	PLANNING & SCHEDULING	Preliminary Schedule	Plan this Phase Milestone Schedule for Planning and E-P-C Phase	Plan the Planning, Scope, Master Schedule, Project Work Breakdown Structure (WBS), Bid Packages, Coding, Network Schedule.		
33	ESTIMATING	Order of Magnitude Estimate	Prel./Definitive Estimate, Return on Investment (ROD), Risk Analysis, Contingency, Evaluation Study, Prel. Cash Flow	Plan the Planning, Scope, Coding, Bid Packages, Definitive Estimate (Target), Cash Flow, Value Engineering (Assist), Change Control.		
34	COST CONTROL, ACCOUNTING	Preliminary Financial Planning		Plan the Planning, Scope, Coding, Finance Planning		
31A	PROJECT SERVICES CONTROL		Delivery System & Preliminary, Project Instructions for Planning and EPC Phase	Project Controls, Project Services Cost.		
ENGINEER – PROCURE – CONSTRUCT			COMMISSIONING & START-UP		FACILITY OPERATION	
PHASE 4			PHASE 5		PHASE 6	
Larger Detail Network, Bar Charts, Construction Worksheets, Commissioning Worksheets, Monitor Progress Updates, Progress Reporting.						
Value Engineering (Assist), Control Estimates, Tender Check Estimates, Claims & Change Order Estimates, Forecasts to Complete, Project Historical Data.						
Cost Control, Accounting & Reports, Forecasts to Complete, Cash Flow, Change Control, Plant Ledger.						
Work and Manpower Control, Meeting Control, Project Progress Reporting						

4. PROJECT ENGINEERING & PHASES

CONCEPT & FEASIBILITY

- Basic Data
- Conceptual Process
- Scope, Feasibility, Marketing Study, Plant Location,
- Environmental Study
- Preliminary Engineering, Process, Plot Plan, Layout, Report Draft.

PLANNING

ALL:

Plan the Planning (Preliminary Eng'g and Beginning of Final Design, +30%)

Key Staff

Scope of Facilities
Scope of Services (EPC Phase).

Assist in Work breakdown

- Facilities
- Packages

Plan Information for Estimating.

Assist in Scheduling.
Prepare EPC Phase Budget with 2nd level Work and Manpower Control

Initial Project Instructions (Project Plan).

Prepare for Panel Review.
Preliminary Change Order System.

Freeze Design at End of Planning Phase

PROCESS SYSTEMS & AUTOMATION:

Reviews of Requirements and Regulations

Design Criteria

Flow Sheet

Description

Data Sheet/Design Briefs

P & I Diagrams

Main Requirements List

Requirement Design Criteria

List of Authorization Instruments

Long Delivery Items Requests to Issue Inquires

PLANT SERVICES & UTILITIES:

Services/Utilities Investigation

Design Criteria

Flow Sheets

ENGINEER – PROCURE – CONSTRUCT

ALL:

- Remainder of final design and detail engineering and design to suit schedule: by bid packages, to suit estimated costs.
- Value Engineering
- Discipline, work as shown below, review, monitoring & control of Engineering documents, interface coordination
- Request to issue inquiry/tender call, technical bid comparison, purchase recommendation/requisitions. Vendors' and shop drawing approvals/reviews process reporting
- Project Change Control

PROCESS

Final required engineering documents such as: Process design criteria, process design brief, process flow sheets, process description, equipment, process data sheets, for the process and the environment systems.

MECHANICAL (including layout, piping and equipment)

Final required engineering documents such as: Design criteria, plot plan, P & I diagram, area layouts, piping specifications, process and utilities equipment specifications, material handling equipment specifications, equipment arrangement drawings, piping arrangement drawings or model, equipment lists, bid evaluation reports, design briefs, maintenance manuals.

AUTOMATION AND INSTRUMENTATION

Final required engineering documents such as : Automation scope of work and design criteria, P & I diagrams, instrumentation loop diagrams and lists, equipment specifications, control wiring diagrams, design briefs control system bid evaluation reports.

CIVIL

Final required engineering documents such as: Design criteria for site grading, roads, railroads, fencing, underground piping, cables, sewers, drain layouts, design briefs.

STRUCTURAL

Final required engineering documents such as: Design criteria for buildings and structures, concrete foundation and structure drawings, steel structure and platform drawings, pipe rack and pipe bridge drawings, equipment and machine support drawings, specifications, design briefs.

ELECTRICAL

Final required engineering documents such as: Plant power requirement report, electrical design criteria, single line diagrams, wiring diagrams, electrical layouts, motor list, electrical equipment and material specifications, motor and electrical equipment bid evaluation reports, design briefs.

Concept of Mechanical Systems

Piping Diagram

Electrical Single Line diagram

Main Equipment List

Long Delivery Items Requests to Issue
Inquiries

ARCHITECTURAL

Final plans and specifications working plans for all floors and roofing, sections, evaluations, and certain essential details; detailed drawings furnished with the working drawings or when construction is in progress; descriptive specifications for all materials and their use, and other documents required for the tender documents.

BUILDINGS & STRUCTURES & SITE:

Local & Site Investigations

Site Survey/Soil Investigation/Data Plot
Plan

Layouts, Sections

Configurations

Design Criteria

Preliminary Engineering

Architectural Features

Foundation Features

Structural Features

5. PROJECT PROCUREMENT & PHASES

	CONCEPT & FEASIBILITY	PLANNING
NAME		
PROJECT PROCUREMENT MANAGEMENT.	Approach, Conceptual, Estimates, Schedules.	Plan the Planning, Bid Packages, Planning, Project Instruction Manual, Work & Manpower Planning.
CONSTRUCTION CONTRACT ADMINISTRATION	Source & Availability Contracting Policies	Bid Packages, Selection of Bidders, Contract Conditions and Documents.
PURCHASING	Source & Availability, Purchasing Policies.	Bid Packages, Selection of Bidders, Purchase Conditions.
EXPEDITING	Expediting Concepts & Policies	Expediting Criteria, Expediting Programs
MATERIAL CONTROL	Material Control Concepts	Material Control Criteria, Material Control Program
LOGISTICS	Logistics' Concepts and Evaluation	Logistics Criteria, Logistics Packages & Program Estimates
INSPECTION	Inspection Concepts	Inspection Criteria, Inspection & Quality Assurance Program

**ENGINEER - PROCURE –
CONSTRUCT (EPC)**

COMMISSIONING

Big Packages Coordination and control

Tender Calls, Tender Openings, Commercial
Evaluation and Recommendations, Pre-
Contract Negotiations, Methods of Payment,
Insurance, Bonding.

Enquiries, Tender, Openings, Commercial
Evaluation and Recommendations,
Negotiation with Vendors, Warranties, Term
of Payments, Bonding, Place Orders.

Vendors Date Index, Vendor Data,
Fabrication Schedules, Plant Visits, Maintain
Delivery Dates, Sub-vendors, Progress
Reporting, Inspection Liaison.

Status Reporting by Package, Item or
Material, Receiving, Warehousing, Inventory
Control, Issue to Construction.

Traffic, Packaging, Customs, Carrier
Selection, Freight Rate Negotiations,
International Freight, Insurance.

Shop Visits, Dimensional Checks, Test
Witnessing, Non Destructive Testing,
Packaging, Release; Field Inspection.

6. CONSTRUCTION MANAGEMENT AND PHASES

CONCEPT & FEASIBILITY	PLANNING	EPC	COMMISSIONING	FACILITY OPS
<ul style="list-style-type: none"> • Develop Order of Magnitude Estimate • Develop Preliminary Schedule • Provide Input to Risk Management 	<ul style="list-style-type: none"> • Identify and understand Client's needs, requirements, and expectation • Provide Constructability Analysis • Identify Potential Major Construction Problems/Risks • Identify and develop Resource Requirements • Develop Preliminary Estimate • Update Preliminary Schedule • Develop Definitive Estimate • Finalize Project Schedule • Develop the Project Budget • Develop Cash Flow Projections • Develop Project Control System • Develop Project Safety Program • Develop Insurance Program • Develop the Project Plan 	<ul style="list-style-type: none"> • Develop the Project Life Cycle Cost • Evaluate Cost Trade-offs • Provide Value Engineering • Qualify Potential Bidders • Procure Long-Lead Items • Finalize Bid Work Packages • Finalize Pre-Qualified Contractors List • Finalize Physical Lay-Out • Finalize Project Control System • Enforce Project Safety Program • Coordinate Labor Relations • Receive/Evaluate Bids and Award Contracts • Implement Project Control System • Manage Daily Construction Activities • Administer Prime Contracts • Manage Contractor's Request for Progress Payments • Administer Contract Changes and Claims • Perform QA/QC • Perform Control Estimates • Perform Tender Check Estimates 	<ul style="list-style-type: none"> • Project Close-Out • System Validation, Testing, and Start-up 	

Note: This section will be refined at a later date

7. COMMISSIONING SERVICES AND PROJECT PHASES

		CONCEPT	FEASIBILITY	PLANNING
CODE	NAME			
70	COMMISSIONING MANAGEMENT	Preliminary Scope, Proposal Negotiations, Key-People, Order of Magnitude, Estimate.	Commissioning Estimate, Prel. Plan, Scope, Access Client Capability, Manpower Schedules.	Reviews/Meeting Monitoring, Final Manpower Plan, Definitive Budget, Schedule.
71	TECHNICAL SERVICES			Process Services, Laboratory Services, Planning, Commissioning Brief, Budget.
72	OPERATIONS SERVICES			Commissioning Schedule, Manpower Planning, Budget.
73	TRAINING SERVICES		Assess Client Capability, Training Strategy, and Use of Aids/Simulators.	Training Plan, Final Training Aids/Facilities, Manpower Plan, Budget.
74	CONSTRUCTION SERVICES (During Commissioning)			
75	MAINTENANCE SERVICES			Organize and Plan Maintenance, Manpower Plan, Facilities, Tools, and Equipment, Budget

ENGINEER – PROCURE – CONSTRUCT (EPC)

**PRE-COMMISSIONING &
COMMISSIONING**

**FACILITY
OPERATION**

Panel/Design Review, Operability/Maintainability Reviews, Safety Audits, Recruitment/Training supervision, Client's Start-Up and Other Personnel.

Field Management, Administrative Services, Personnel/Union Affairs, Monitor Commissioning, Laboratory, Services, Etc.

Turnover to Client, Final Report.

Laboratory Procedures, Manpower Recruitment, Commissioning Specs., Manuals (Commissioning, Safety, Operating, Maintenance, Laboratory, Procedures, Etc.)

Production Monitoring, Development, Lab. Services, Trouble Shooting Reports, Trial Run Supervision.

Final Operating Review, Performance Test, Final Report, Turnover Documents.

Production Plan, Start-Up Schedule, Commissioning Manual, Recruitment, Start-up Materials, Utilities, Safety Program, Log Sheets.

Inspection, Pre-Commissioning, Clean & Flush, Temporary Hook-ups, Preparation of Equipment, Trial Runs/Tagging, Start-up, Corrections, Training.

Production Monitoring, Operation & Performance Runs/Tests, Final Corrections, Audit of Start-up Results and Deficiencies, Turnover Procedures.

Set-Up Training Program, Training Materials, Recruitment, Operate Facilities, conduct Training Program, Monitor Progress, Reports.

Hands-on Training, Field Inspections, Monitor Results, Assure all Shifts Learn from Others.

Start-up Reviews, Audit of Results.

Construction Follow-Up, Final Checkouts, Dry Runs, Corrections, Pre-Commissioning Activities.

Turnover Documents.

Spare Parts, Interchange-ability, Work-Order System, Maintenance Manuals, Inspections, Recruitment, Training, Files & Records.

Pre-Commissioning, Trial Runs, Tests, Cleaning, Flushing, Trouble Shoot, Corrections, Maintenance, Tagging.

Running Maintenance, Shutdown for Corrections, Performance Tests, Turnover Documents.