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

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HOW TO EXECUTE ENGINEERING CONSTRUCTION PROJECTS

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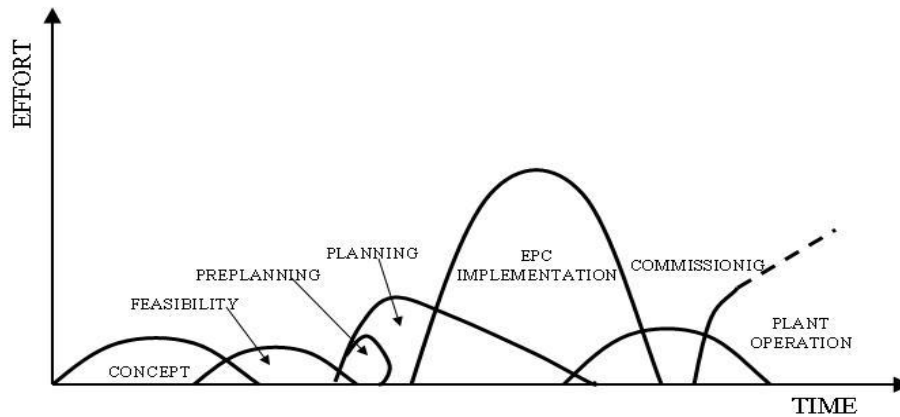
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PROJECT PHASES



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, where in the project achieves 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 from without real change to its 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 project life and the planned development 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 being.

For all projects, great or small, throughout their life as defined earlier, there are four distinct phases. The first phase is Conceptual are 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 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 chart indicates for a typical project, the relative magnitudes of such effort, the relative magnitude 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; 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, 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, reviews available information and the contract, establishes objectives, policies, etc. The review 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.

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 towards during this phase. The “first level” details, like listing each drawing, or each specification can be done to a large degrees “just before” the actual design and crafting activities start.

If the result Preliminary Project Plan shows that any of the Project Objectives or Resources requires 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

The degree of detail required depends on the size of the project, the importance of the portion under consideration, the depth of the 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
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 RESOURCES
9. INITIAL PROJECT ORGANIZATION CHART
10. UPDATE PRELIMINARY SCOPE
11. PRELIMINARY PROJECT WORK BREAKDOWN STRUCTURE AND PACKAGES
12. PRELIMINARY 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 INSTRUCTURE
5. FINALIZE PROJECT ORGANIZATION
6. FINALIZE PROJECT WORK BREAKDOWN
7. FINALIZE PACKAGES
8. FINALIZE PACKAGES
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 Instruction are an essential element of project planning, as it will comprise sufficient principles or details of the execution planning 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.

PLAN THE “PROJECT MANAGEMENT” APPROACH:

1. PROJECT MANAGERS’ FUNCTIONS

EXECUTIVE

- Must not be delegated, but worked out with client and parent
- 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
- Method/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
(change 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
 - President
- Staff:
 - Operation
 - Finance
 - Services
 - Personnel
 - System
 - Legal

PARENT COMPANY

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

PROJECT TEAM

- The Project Management Team:
 - Project Manager
 - Project Control Manager
 - Engineering Manager
 - Project Controls 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 management must be alert, to delegate properly, sometimes in massive amounts but retain his assistant, the P.C.O. people, to analyze and evaluate. The 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 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 and in vigorous relentless, Expenditure they 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 skill 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, for example the prototype plant, it 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.

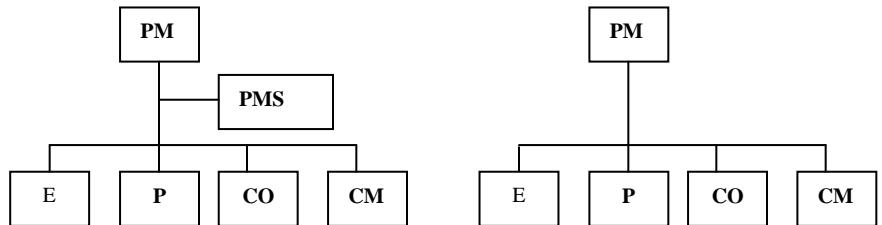
The action of the Commissioning team is based upon the planning of their phase, which has been done during the EPC Phase really, involving with the Project Team. And of course did the commissioning Manager contribute during the other phases also – his life becomes so much easier now, and the facility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

2. SUMMARY OF PROJECT SERVICES & PHASES

CODE	NAME	PHASE	CONCEPT	FEASIBILITY	PLANNING
		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 MGT & CORPORATE SERVICES		Concept reviews, decisions, Policies.	Meeting/Reviews, Approval.	Meetings/Reviews, Monitoring/Finance Monitoring/financing, Approvals.
30	PROJECT MANAGEMENT		Manage concept, Development, Order of magnitude Estimate.	Scope, Planning, schedule, Cost, Economic Studies, Organization, delivery System, Assemble Report	Legal, Personnel, Accounting, Insurance, Financing, Panel Reviews, Public Relations.
40	ENGINEERING		Basic Data, Conceptual Process & Layouts.	Scope, Planning, process, Preliminary, Engineering. Technical Studies	Master Schedule, Definitive Estimate, Project Coding, Risk Analysis, Alternates, External Approvals, Project Instruction.
50	PROCUREMENT		Prel. Plan & Review, Check Market, Logistics	Major Equipment Inquiries	Design Scope, criteria, P & I.D'S, Single Lines, Soil Invest., Major Specs, Bid Packages, Prel. Eng'g., approx 20% of Detail Eng'g., Value Eng'g.
60	CONSTRUCTION MANAGEMENT		Orientation.	Site-Study, Constructability, Identify, Major Difficulties.	Logistics, Master Schedule, Conditions, Equipment Lists, Bid Packages, Contracts, Overseas Strategy, Sources.
70	COMMISSIONING MANAGEMENT		Preliminary Scope, Order of Magnitude Estimate.	Commissioning Estimate, Prel. Plan, Scope, Assess Facility Operator's Capability, Manpower Schedule.	Planning, Strategy, Conditions Packages, Temporary Facilities, Key Staff, Manpower needs, Labor Relations, Constr. Procedures, Major Eq't, Early Work Schedule, Constructability, Quality Contractors.
					Reviews/Meeting Monitoring, Key People, Final Manpower Plan, Definitive budget, and Cost Estimate 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 Packages, Final specs, Design (all disciplines), Model, Requisitions for Bidding, Bid Analysis, P.O. Requests Manuals, Vendor Print, Approvals, Material/Quality Document Control..

Field Assistance, Design Corrections.

Final Follow-up, Design Updates.

Construction Contracts, Bid Evaluations, Material Procurement, Expediting (Mat., Eq't., V.P.'S) 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, Mech. 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,

Turnover to Client, Final Report.

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

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

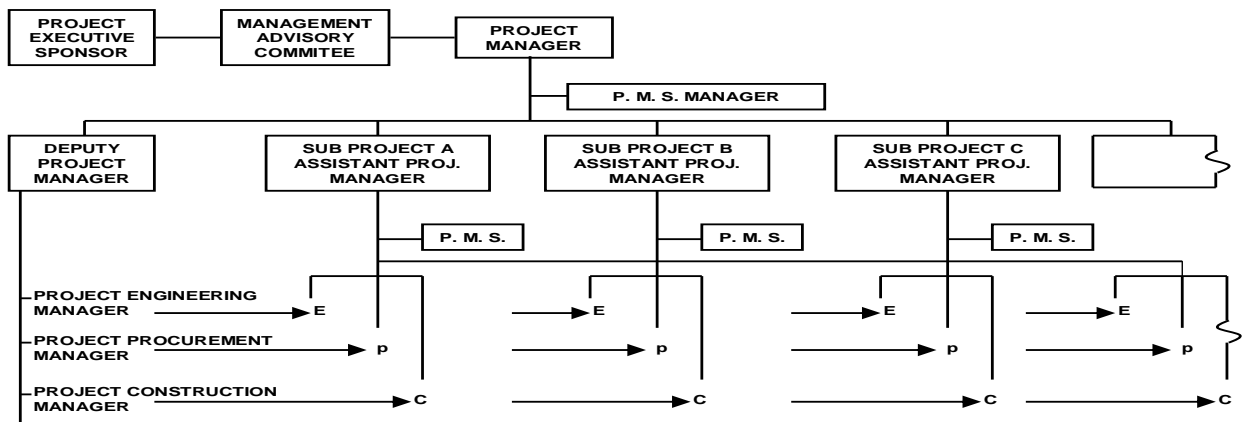
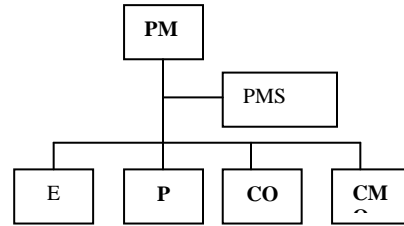
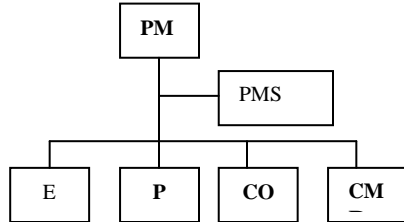
Site visit, Bid, Mobilize, Shop Drawings, Order Materials,
Construct

Services, Etc.

Final Field Certification & Approvals
to Operate

Safety & Hazard Audits

Technical Supervision Assistance



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 Breakdowns, Bid Packages, Coding, Network Schedule.	

33	ESTIMATING	Order of Magnitude Estimate	Prel./Definitive Estimate, Return on Investment, 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 E-P-C 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, Alternates, Progress Reporting.

Value Engineering (Assist), Control Estimates, Tender Check Estimate, Claims & change Order Estimate, Forecast to complete, Project Historical Data.

Cost Control, Accounting & Reports, Forecasts to Complete, Change Control, Plan Ledger.

Work and Manpower, Meeting Control, Project Progress Reporting

4. PROJECT ENGINEERING & PHASES

FEASIBILITY

Scope, Feasibility, Marketing Study, Plant Location, Environmental Preliminary Engineering, Process, Hot Plan, Layout, Report Draft.

PLANNING

ALL:

Plan the Planning (Preliminary Eng'g and Beginning of Final Design, +20%

Key Staff

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.

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 Rq't List

Rq't Design Criteria

List of Authorization Instruments

Long Delivery Items Request to Issue Inquires

PLANT SERVICES & UTILITIES:

Services/Utilities Investigation

Design Criteria

Flow Sheets

Concept of Mechanical Systems

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. Vendor' 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, railroads, fencing, underground piping, cables, sewers, drain layouts, design briefs.

STRUCTURAL

Final required engineering documents such as: Design criteria for building 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 evaluation reports, design briefs.

Piping Diagram

Electr. Single Line diagram
Main Equipment List
Long Delivery Items Requests to Issue
Inquiries

BUILDINGS & STRUCTURES & SITE:

Local & site Investigations

Survey/Sole Investigation/Data Plot Plan

Layouts, Sections

Configurations

Design Criteria

Preliminary Engineering

Architectural Features

Foundation Features

Structural Features

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.

5. PROJECT PROCUREMENT & PHASES

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

**ENGINEER - PROCURE –
CONSTRUCT**

COMMISIONING

Big Packages Coordination and

Tender Calls, Tender Openings, Commercial
Evaluation and Recommendations, Pre-
Contract Negotiation, 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 SERVICES 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 need, requirements, and expectation • Provide Constructability Analysis • Identify Potential Major Construction Problems • 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 		

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

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., Manual (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.

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

Production Monitoring, Operation & Performance Runs/Tests, Final Corrections, Audit of Start-up Results/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, Procurement, Stores.

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