Contract / Construction Management

November 2006

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Presentation Outline

I. Introduction

Project Management

II. Contract / Construction Management

Stage 1: Construction Period

Stage 2: Defects Liability Period

III. Project Controls

Schedule Control

Cost Control

Quality Control

Document Control

IV. Related and Arising Issues - IRAQ

I. Introduction

- Project Management services for all project phases should be provided through well established procedures/processes

- Project Management activities span the life of projects beginning with the conceptual design phase and ending with the defects liability and occupancy phase

Project Management Approach

Major Stakeholders

Communication Chart

Project Manager's Organisation Chart

Contractor's Organisation Chart

PM scope can cover:

- Project Initiation & Studies Period
- Design Period
- Tender & Contracting Period
- Construction Period
- Defects Liability Period

Dar PMC Process

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Manage the Construction

II. Contract/Construction Management

Stage 1: CONSTRUCTION PERIOD

Stage 2: DEFECTS LIABILITY PERIOD (DLP)

II. Contract/Construction Management

stage 1: construction period

Activity 1
Organization and Mobilization

- **Insurance Policies**
- **Performance Security**
- **Advance Payment Guarantee**
- **Notice to Commence**
- **Communication Procedures**

II. Contract/Construction Management

stage 1: construction period

Activity 1
Organization and Mobilization

Activity 2
Planning and Program

- Monitoring Progress
- Evaluating Performance
- Project Management Software
- Logic Network (CPM)
- Short Construction Activities
- Shop Drawings and Materials Submissions
- Procurement Schedules
- Quantity, Duration, Cost, Manpower and
- Equipment
- Resources Schedules and Histograms
- Work Breakdown Structures (WBS)
- Subcontractors' Schedules

II. Contract/Construction Management

stage 1: construction period

Activity 1 Organization and Mobilization	Activity 2 Planning and Program	Activity 3 Survey Check and Material Information

- **Verify Staked-Out Centerline, Traverse Points, Control Points and Bench Marks**
- **Adequacy of Borrow Pits and Quarries**
- **Planned Sources, Supply and Testing of Construction Materials**

II. Contract/Construction Management

stage 1: construction period

Activity 1 Organization and Mobilization	Activity 2 Planning and Program	Activity 3 Survey Check and Material Information	Activity 4 Plan for Site Organization

- **Site Facilities Adequacy and Organization**
- **Layout Plan for all Temporary Site Facilities**
- **Check Site Accesses, Temporary Structures, Site Office, Accommodation, Laboratory, Stocking Yards, Plant Facilities, Safety Measures, Service Roads, Parking Areas**
- **Sufficiency, Adaptability, Interconnectivity, Suitability, Organization, Quality, Performance, Non-Interference with Permanent Works**

II. Contract/Construction Management

stage 1: construction period

- **Clearly Formulated, Well-Documented Method Statement: Method of Construction, Resources, Safety Precautions, Operation's Duration**
- **Submission and Approval before Occurrence of Planned Early Start of Activities**

II. Contract/Construction Management

stage 1: construction period

Activity 6
Time Control

- Monitor Program, Construction Activities, Resources
- Update and Revise Program
- Periodic Co-Ordination Meetings
- Timely Shop Drawings and Samples Submission
- Schedules of Materials and Shop Drawings Submissions and Approvals tied to Program
- Monitor Labor and Plant Productivity, Materials Deliveries (Long-Lead Items), Identify Shortages
- Labor, Plant or Materials Deficiencies
- Identify Potential Variance: Scheduled v/s Actual Progress

II. Contract/Construction Management

stage 1: construction period

- Interim Payments
- Cash-Flow Estimate
- Implement Variation Orders
- Control & Monitor Quantities and Variation Orders w.r.t. Contract Price

II. Contract/Construction Management

stage 1: construction period

- Project Quality Assurance / Quality Control Plan
- Compliance with Safety and Environment Protection
- Review and Approval of Materials and Shop Drawings
- Inspection of Operations
- Inspection and Testing of Materials and Plant

II. Contract/Construction Management

stage 1: construction period

- Inspection of Work before Covering-Up
- "As-Built" Drawings and "Operation and Maintenance Manuals"
- List of Outstanding Works prior to Taking-Over
- Completion of Outstanding Works and Performance during Defects Liability Period

II. Contract/Construction Management

stage 1: construction period

- **Daily Record of Progress of Works**
- **Kick-off Site Meeting: Procedures, Means of Communication, Methods for giving Approvals, Instructions, Variation Orders, etc.**
- **Regular Site Meetings: Monitor Performance and Progress based on Program, Discuss Problems, Coordination Issues, etc.**

II. Contract/Construction Management

stage 1: construction period

- Daily Diary
- Maintain Up-To-Date Information Relevant to Progress, Performance, Quality, Quantities, Resources & Cost
- Maintain Project Records in Classified and Retrievable Form

II. Contract/Construction Management

stage 1: construction period

- Executive Summary
- Section One: General Information
- Section Two: Progress Outline
- Section Three: Schedules
- Section Four: Resource Control

II. Contract/Construction Management

stage 1: construction period

- Section Five: Cost Control
- Section Six: Quality Control
- Section Seven: Contract Records
- Section Eight: Progress Photographs

II. Contract/Construction Management

stage 1: construction period

- Identify Potential Claims
- Settle Disputes or Differences

II. Contract/Construction Management

stage 1: construction period

- Implementation of Methods and Procedures to Minimize the Potential Financial and Time Impact of Claims
- Settlement of time/cost claims

II. Contract/Construction Management

stage 1: construction period

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- Establish schedule for Testing and Commissioning
- Witness Tests
- Prepare List of Outstanding Works
- Obtain Written Undertaking to Complete any Outstanding Work during DLP

II. Contract/Construction Management

stage 1: construction period

- Issue Taking-Over Certificate
- Check Progressively "As-built Drawings"
- Review "Operations and Maintenance Manuals"

II. Contract/Construction Management

stage 2: defects liability period

Activity 13
Inspection of Works

- **Inspect and Verify that the Outstanding Works have been Satisfactorily Completed**
- **Remedy Detected Defects**
- **Final Taking-Over of Project at End of Defects Liability Period**

II. Contract/Construction Management

stage 2: defects liability period

Activity 13 Inspection of Works	Activity 14 Defects Liability Certificate

- **Issuance of Defects Liability Certificate**

II. Contract/Construction Management

stage 2: defects liability period

- **Final Statement submittal after Issuance of Defects Liability Certificate**
- **Issuance of Final Certificate**
- **Final Report**

III. PROJECT CONTROLS

Scope

- Continuous monitoring of actual project performance (**Time, Cost, Quality**).
- Assessing performance and any needed corrective/preventive action.
- Maintaining accurate and updated information base through the project's cycle.

Project Controls
Time & Cost

- Review time schedule/cash-flow estimate.
- Review material submittals/shop drawings schedules.
- Record delays and advise on recovery measures.

Project Controls
Time & Cost - BENEFITS

Project Controls of the project schedule will enable:

Baseline

- Identifying Project WBS and Baseline Schedule
- Identifying Critical Activities
- Resources Requirements
- Anticipated Cash Flow (S-Curve)

Progress and Update

- Measuring Progress/Performance
- Identifying delays and sources of delay (through further side analysis)
- Assessing the need for rescheduling and determining which activities need to be rescheduled

Changes

- Potential effect of Variation Orders
- Analyzing Contractors' Claims for Extension of Time

PLANNING & SCHEDULING

- Critical Path Method (CPM)
- Critical Path Activities
- Logical Relationships
- Total Float (TF)
- Free Float (FF)
- Constraints
- Resources

REPORTS

Resources - Histograms

Activity ID	Activity Name	Original Duration	At Completion	Earned Value
	Sample Project 1	**690**	**€3,642,000**	**€0**
	Start	**0**	**€0**	**€0**
A	Start	0	€0	€0
	Design	**240**	**€120,000**	**€0**
B	Design	240	€120,000	€0
	Tendering	**135**	**€22,000**	**€0**
C	Prequalification	45	€8,000	€0
D	Tender for Package A	90	€8,000	€0
E	Tender for Package B	60	€6,000	€0
	Construction	**375**	**€3,500,000**	**€0**
F	Construction Package A	360	€2,000,000	€0
G	Construction Package B	240	€1,500,000	€0
	End	**0**	**€0**	**€0**
H	End	0	€0	€0

PLANNING & SCHEDULING

SCHEDULE COMPRESSION

- Shortening the Project Schedule duration without reducing the project scope which might increase the project cost.

SCHEDULE UPDATE

- Starts with monitoring of the project activities, collecting key progress information that would be translated into the following at the end of the reporting period (data date, time now or as of date):

  Actual Start of progressing / completed activities
  Actual Finish for completed activities
  % complete / remaining duration / expected completion date for progressing activities

  The above information is entered into the Update Schedule and the schedule calculation performed.

- The Updated Schedule is compared to the Baseline Schedule

  The Critical Path may change.

Progress Monitoring & Control

Baseline Vs. Updated Schedule

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	% Comp
General Activities					
01-General Requirements					
EG0001000	All Project management activities	525	07DEC04A	28MAY08	68
EG0001000	Insurance	180	07DEC04A	15FEB05A	100
EG0001010	Mobilization	180	07DEC04A	08SEP05A	100
EG0001020	Demobilization	120	01FEB06*	31MAY08	0
EG0001030	Safety Measures	525	07DEC04A	28MAY08	68
EG0001040	Accomodation and Camp	525	07DEC04A	28MAY08	68
Construction					
Terminal Building					
Site Construction					
CT0002300	Excavation and Earth works	90	31DEC04A	30APR05A	100
CT0002584	Underground Ducts And Utility	45	01APR05A	31JUL05A	100
CT0002830	Fence And Gate	90	09DEC05	12MAR06	0
Concrete Works					
CT0008300	Plain Concrete	90	12JAN05A	10MAY05A	100
CT0008300	RC. Footings	125	01FEB05A	12MAY05A	100
CT0008300	Troughed Slab	125	16MAR05A	31AUG05A	100
CT0008300	Super Structure Concrete	250	10FEB05A	02DEC05	99
CT0008410	Plant Precast Structural Concrete	30	16SEP05A	02DEC05	90
Masonry					
CTAB04000	Masonry (Hammock)	329*	02APR05A	14MAR08	71
CTAB04001	Start Of Finishishing & E/M Activities	0	02APR05A		100
CTAB04010	Conc.Blocks(Hollow&Solid)	270	02APR05A	04FEB08	79

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ESSENTIAL FACTORS

Construction Contract Documents to specify clearly the requirements for the construction schedule:

- Category of Software (by name or of similar capabilities)
- Phasing
- Milestones
- WBS
- Interface with other construction projects
- Level of detail
- Short activities duration, quantities and cost (based on BOQ), resources (labor and equipment)
- Activities to include submittal , approval and procurement of materials
- Frequency of schedule update and reporting
- Type of reports to be submitted (Logic Network, Bar Charts, Tabular, Labor Histograms per trade and total, Equipment Histograms per equipment and total, Cost in tabular, histogram and S-Curve formats, Earned Value)
- Calendar

ESSENTIAL FACTORS

Project Calendars

A calendar of working days or shifts that establishes those dates on which activities are worked, and nonworking days.
Nonworking days include holidays.

A project can have a unique calendar or multi-calendars.

Example: Activity with duration of 18 working days.

Progress Reporting

MONTHLY PROGRESS REPORT

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Cost Control

- Review and process interim payments applications
- Monitor quantities and variation orders
- Monitor cash flow
- Evaluate change/variations impact
- Develop cost forecasts
- Calculate the earned value
- Develop, implement, update project cost
- Monitor/Identify variances between actual/budgeted costs

Report

Cost (Value)
Histogram and S – Curve

Earned Value

Specific technique for measuring performance of work based on activities' costs

BCWS: Budgeted cost of work scheduled (Planned Value)

BCWP: Budgeted cost of work performed (Earned Value)

ACWP: Actual cost of work performed (Actual Cost)

Schedule Variance (SV) = BCWP – BCWS

Cost Variance (CV) = BCWP – ACWP

- Schedule Index (SI) = BCWP/BCWS
- Cost Index (CI) = BCWP/ACWP

Earned Value

Variation Order - Form

VARIATION ORDER

Serial No. : VO
Date :
Project No :

Project Name :
Employer :
Engineer : DAR AL-HANDASAH (Shair & Partners)
Contractor :

To : **The Contractor**

Subject :

Reference : Our Letter
Your Letter

Description of varied work :

Estimated cost of this variation is:

Estimated time impact of this variation is :

For : The Engineer

c.c. The Employer
The Engineer's Representative

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Quality Control

Quality is controlled through the following:

- Timely inspections and testing of works, materials and production plants
- Review and monitoring of Health, Safety and Environment (HSE) plan
- Inspection of material sources and list of suppliers
- Review and Approval of Materials and Shop Drawings
- Review of As-Built drawings and O&M manuals
- Submittal of certificates of guarantee
- Involvement of third party for laboratory testing
- Snag lists implementation

Submittal for approval of materials - Form

Proj. No.:	*EMPLOYER:*	**Request No.** ----------
ENGINEER : dar al-handasah shair and partners	*CONTRACTOR :*	**Date** / /

SUBMITTAL FOR APPROVAL OF MATERIALS ✓

1. **MATERIAL DESCRIPTION** (one item only on this form) :

Area of Application :
Drawing Ref. : B.O.Q. Ref. No. :
Specification Ref. : Standards :

Attach all relevant technical literature marked to identify relevant description, current Test Certificates, samples as appropriate.

2. **MANUFACTURER/SUPPLIER** :

Company Name :
Address :
Local Agent :

3. **DELIVERY** :

Country of Origin :

Availability: ○ Locally Manufactured ○ Overseas

Delivery : Ex-works/ Total Duration [ ] [ ]
Estimated Time of Arrival on Site [ ]

Program : Date Material Required on Site [ ]
Latest Date for Order [ ]

We certify that the above submitted items have been reviewed in detail and are correct and in strict conformity with the contract drawings and specifications except as otherwise stated; also that the material sources indicated above have been reviewed in detail and that they will supply the submitted items in conformity with the above and deliver same timely.

Submitted by : _____ Signature _____

4. **ENGINEER'S REPRESENTATIVE'S COMMENTS** :

☐ Approved
☐ Approved As Noted
☐ Revise and Resubmit
☐ Rejected
☐ Sample Required
☐ Tests Required
☐ Additional Information Required
☐ Manufacturer's Guarantee Required

Signature _____ DATE : / /

Approval shall not relieve Contractor of his liabilities under the Contract or constitute authorization of any change to Contract Documents.

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Request for Inspection - Form

Proj. No. :	Employer:	Request No. ----------
Engineer: dar al-handasah shair and partners s.a.l	Contractor:	Date / /

Request for inspection

We request your attendance to inspect the following works :

1. **Type** : Viaducts, Tunnels & Structures

2. **Inspection time** : **Date** : / /

3. **Location** :	Zone	Road	Stations	Other

4. Inspection ◯ First ◯ Second ◯ Third

5. Purpose of the inspection

- ☐ Setting out
- ☐ Excavation & Shoring
- ☐ Formwork
- ☐ Reinforcement
- ☐ Concreting
- ☐ Waterproofing
- ☐ Wearing Course
- ☐ Bearing
- ☐ Prestressing
- ☐ Grouting
- ☐ Removal of Falsework
- ☐ Cladding & Finishes
- ☐ Parapets
- ☐ Joints
- ☐ Road Furnishing

Others (specify) .....

Particular Details .....

.....

Submitted by : _____ Signature _____

6. **Inspection report**		**Signature**
☐ Surveyor		
☐ Geot. Eng.		
☐ Mat. Eng.		
☐ Bridge/Struc. Eng.		
☐		

Date/Time of Inspection : / / :

7. Engineer's representative's comments

.....

.....

The works are : ☐ Approved ☐ Approved as Noted ☐ Rejected

Signature _____ DATE : / /

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QA/QC Auditing

- Oversee QA/QC implementation
- Oversee inspection/ testing process
- Issue periodic audit reports

Document Control

Document Control in construction projects is the management of contract documents and the incoming and outgoing correspondence and their attachments and their flow to the members of the management team for action or information.

Parties involved are commonly:

- Client
- Funding Agency
- Consultant
- Contractor
- Authorities
- Stakeholders
- Other

Document Control

Develop/Implement/Maintain Document Control system to cover:

- Contract Documents
- Correspondence/Minutes of Meetings
- Site Correspondence/Reports
- Drawings Logs
- Submittals

Document Control

Primavera Expedition

Global Report

Actions edit

High	0
Normal	0
Low	0

View All Actions

Alerts update subscriptions edit

High	0
Normal	0
Low	0

View All Alerts

Inbox edit

High	0
Normal	4
Low	0

View All Inbox Items

Request for Information (3) edit

Issues (3) edit

Submittals (26) edit

All Types

Project Documentation

- A referencing system for all project documents is necessary to achieve proper document control and archiving.

- Referencing system applies to all documents and correspondences.

Referencing System

Example of Drawings Numbering System

Project IT Network

The project network should be prepared and maintained to serve as a Common Operating Platform that will facilitate and expedite management and flow of project documents/information among the project parties.

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IV. Related and Arising Issues - IRAQ

Contract

- Definition of Employer/Engineer/Contractor relationships, especially that the independent role of the Engineer is not quite common in Iraq. Resolution needed through policy and exposure through seminars and workshops.
- Respect of design review phase in design-build contracts to avert problems that hinder the project's progress during construction.
- Respect of the maximum share of works that can be subcontracted as in the Conditions of Contract.
- Adherence to Contract requirements for approval of sub-contracts.
- Familiarity with FIDIC/World Bank Contracts.

IV. Related and Arising Issues - IRAQ

Progress & Cost

- Project schedule to be properly established and regularly updated by experienced planners.
- Response to fast track of construction projects is needed.
- Adequate human resources and experienced staff to cover projects' needs.
- Delays in procurement of long-lead items.
- Delays in possession of parts of Site that fall within sensitive areas.
- Expediency to obtain permits.

IV. Related and Arising Issues - IRAQ

Progress & Cost

- Centralization of decision-making on government construction projects.
- Delays in processing certified payments.
- Monthly submittal of progress reports.
- Long procedures for approval of variation orders.
- Financial back-up from Contractors' head offices.
- Cash Flow regular updates.

IV. Related and Arising Issues - IRAQ

Quality

- Institution of comprehensive quality plan.

- Application of Quality Control procedures:

  - adherence to quality procedures

  - materials conformity to Specifications

  - difficulties associated with testing (central versus site laboratories)

- Technical back-up from Contractors' head offices.

IV. Related and Arising Issues - IRAQ

Document Control

- Institution of integrated project document control.
- Systematic use of proper forms.

THANK YOU

50 years of
engineering excellence

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