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Project Engineering Tracking Procedure

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1.0 PURPOSE

This procedure describes how Engineering progress and productivity is to be measured. It includes the establishment of an Engineering Tracker consisting of a matrix of Engineering tasks, deliverables and the process used for earning progress and productivity against each item.

This document is intended to be used by Consultants, A/E (Architect/Engineer) and Contractors working for Government Entities.

2.0 SCOPE

This document covers the approach, development, maintenance, updating/statusing, distribution of responsibilities of Engineering disciplines and performance tracking relevant to Basic and Detailed Engineering.

3.0 DEFINITIONS

Definitions	Description
Actual Hours	Total number of hours actually worked for certain period (day, week, month or year)
A/E (Architect/Engineer)	Architect & Engineer organization that undertakes studies and/or design of projects.
AFU (Approved for Use)	Control point that signifies the deliverable was approved by the reviewer and can be used for specific purpose.
Budget Hours	Estimated jobhours for each deliverable
Contractor	Refers to the Prime Contractor.
CPI (Cost Performance Index)	Measures the efficiency of Engineering in terms of cost. A ratio of budget earned cost divided by the actual Engineering cost spent.
CS (Control Schedule)	A Level 3 schedule in the Schedule Hierarchy.
Deliverables	Refers to drawings, specifications, reports, design criteria, etc. produced by Engineering
Deliverable Types	Identified category which classify deliverables depending on the document requirement or purpose.
Actual Earned Hours	Total number of hours derived from physical progress completed multiplied with the budget or estimated hours
Engineering CS (Control Schedule)	This schedule is the extract of Engineering activities from the Overall Project Schedule.
CP (Control Point)	Individual milestone that are set for every deliverable to identify the progress achieved.
Engineering Tracker	A comprehensive reporting system that utilizes the information from the Control Schedule for every deliverables, tabled with control points, summarized with progress completion and performance.
Entity	Includes Government Ministry, EPMO, Engineering Management Company or any other agency authorized by the Government Ministry to work on its behalf.
EP	Engineering Procurement

Definitions	Description
JHP (Job Hour Performance)	Measures the efficiency of Engineering in terms of man-hours. Others refer this as Performance Factor. A numerical ratio (earned hours divided by the actual hours spent) used to measure the actual performance of an individual or team while completing a task Good performance => 1.0 Bad performance < 1.0
IFA (Issued for Approval)	Control point that signifies the deliverable was submitted for reviewer's approval.
IFC (Issued for Construction)	Control point that signifies the deliverable was approved by the reviewer and can be used for Construction purpose.
IFD (Issued for Design)	Control point that signifies the deliverable can be used for design purpose.
IFR (Issued for Review)	Control point that signifies the deliverable was submitted for review.
IFF (Issued for Fabrication)	Control point that signifies the deliverable can be used for fabrication purpose.
IFH (Issued for HAZOP)	Control point that signifies the deliverable can be used for hazard and operability study.
IFP (Issued for Purchase)	Control point that signifies the deliverable can be used for purchasing purpose.
IFQ (Issued for Quote)	Control point that signifies the deliverable can be used for quotation purpose.
MRP (Material Requisition for Purchase)	A procurement document that engineering discipline prepares and uses to request materials for purchase requirements (data sheet, quantity, applicable codes and specifications, etc.).
MRQ (Material Requisition for Quote)	A procurement document that engineering discipline prepares and uses to request materials for quotation requirements (data sheet, quantity, applicable codes and specifications, etc.).
MS (Management Schedule)	A one (1) page summary schedule including baseline, current forecast, risk items, critical path, and key events.
Performance Curve	Graphical presentation of the series of Performance Index (PI) values plotted along time periods.
PEM	Project Engineering Manager
PM	Project Manager
PFD (Process Flow Diagram)	A diagram commonly used in process engineering to indicate the general flow of plant processes and equipment. The PFD displays the relationship between major equipment of a plant facility and does not show minor details such as piping details and designations.
PMC (Project Management Company)	An external consultant engaged by the Entity to deliver capital expenditure infrastructure projects.
PO (Purchase Order)	A commercial document and official offer issued by a buyer to a seller indicating types, quantities and agreed prices for products or services.
P&ID	Piping and Instrumentation Diagram
QP (Quality Performance)	Measures the categorization of the design deliverables received on a period and cumulative basis.
SPI (Schedule Performance Index)	Is a ratio of the earned value (EV) to the planned value (PV). If the SPI is less than one, it indicates that the project is potentially behind schedule to-date whereas an SPI greater than one, indicates the project is running ahead of schedule.
TQP (Total Quantity Performance)	Factor developed by comparing estimates from A/E during the initial stage of Design phase with the current budget quantities from Project Controls for selected commodity groups and sub-commodity details.

4.0 REFERENCES

1. EPM-KPP-PR-000001 - Project Planning and Scheduling Definitions and Concepts Procedure
2. EPM-KPP-PR-000002 - Project Schedule Development Procedure
3. EPM-KPP-PR-000003 - Project Schedule Curves Procedure
4. EPM-KPP-PR-000005 - Project Contractor Requirements for Planning & Scheduling Procedure
5. EPM-KPP-PR-000006 - Project Schedule Standards and Quality Procedure
6. EPM-KPC-PR-000006 - Project Quantity Tracking Procedure
7. EPM-KPE-PR-000002 - Project Estimating Coding Procedure
8. EPM-KPC-PR-000001 - Project Cost Coding Structures Procedure
9. EPM-KPC-PR-000007 - Project Trend Program Procedure
10. EPM-KPC-PR-000004 - Project Forecasting Procedure
11. EPM-KPC-PR-000011 - Project Weekly Quantities Report Procedure
12. EPM-EQ0-PR-000001 - Project Stage Gate Procedure

5.0 RESPONSIBILITIES

The responsibilities outlined below are applicable tasks whether the scope is Basic or Detailed Engineering to be performed by Consultant, A/E or Contractor. The positions listed below are within the organization that will execute the scope.

5.1 Project Manager (PM)

The Project Manager shall be responsible for progress achieved.

5.2 Project Engineering Manager (PEM)

The Project Engineering Manager (PEM) is responsible for the planning, development and implementation of Engineering Tracker with the support of Engineering Discipline Leads, Engineering Planner and Project Controls.

Project Engineering Manager (PEM) and Project Controls agree on a plan for establishing time frame for the Engineering Tracker deliverables. Usually the Management Schedule (MS) is the initial source of discipline planning, with the Control Schedule (CS) contributing more information as it is developed.

The Project Engineering Manager shall be responsible for assigning the tasks with the Engineering Discipline Leads in completing, timely assessment and reporting the progress at deliverable and/or discipline level for Engineering activities, overall development and maintenance of this document. Project Controls will provide assistance to the Engineering Manager in the development of Engineering tracking (including progress and performance) which is developed based on deliverables/tasks indices.

5.3 Engineering Planner (EP)

The Engineering Planner functions as part of Project Controls who is assigned in Engineering department. Engineering Planner is responsible for preparing the Engineering Tracker, coordinates with Project Controls, synchronizes the Engineering Tracker with the Control Schedule, and analyzes status. The EP reports to the Project Engineering Manager (PEM) and is instrumental in interacting with Engineering Discipline Leads, Project Management and Project Controls.

5.4 Engineering Discipline Leads

Engineering Discipline Leads are responsible for implementing the Engineering Tracker plan including developing detailed content, budget, and schedules based on required dates provided by Scheduling, and assigning the document identification numbers per Engineering Department Procedures.

Each Engineering Discipline Lead develops deliverable list for his or her discipline, allocates job hour budgets to perform the work, ensure that sufficient personnel are assigned to meet the deliverable submission dates.

After the Engineering deliverables have been defined, the following are to be developed by Engineering discipline leads:

- Deliverable types and codes,
- Control points for each type,
- Control point completion percentage values,
- Codes for time charge Activity, Area, Locator, and Discipline with the assistance of Project Controls.

5.5 Project Engineer

In certain instances that smaller scale of project has to be executed and the position of Project Engineering Manager is not necessary, the Project Engineer assumes the responsibility of the PEM in this procedure.

6.0 PROCESS

6.1 Approach

Engineering owns and is responsible for the Engineering Tracker; maintains the Tracker file, interfaces with Project Controls on Control Schedule (CS) and performs status analyses.

Project Controls assists Engineering in work planning, phasing and timing, discipline interface conflict resolution, and assuring consistency across disciplines. Project Controls also establishes the Engineering Tracker / CS interface data and coordination of timing and dates.

Engineering scope is defined in terms of its deliverables, documents, model development, discrete or level-of-effort tasks, and entered into the Engineering Tracker with their allocated jobhour budgets.

Each deliverable has a number of event control points, and schedule dates for each control point are established by Engineering and Scheduling in support of the CS requirements, which are usually to support Construction early start dates. Progress and status of each deliverable is tracked and as each control point is achieved, actual dates are recorded (or forecast dates are input if schedule dates are not achieved). Significant schedule deviations and impacts are highlighted by Engineering Planner and corrective action has to be taken.

Progress is tracked by assigning a percent of budget hours to each deliverable control point, enabling scheduled and earned hours to be calculated. At any point in time, actual hours earned to date divided by total budget hours provides cumulative Engineering progress; and actual hours earned to date divided by actual hours expended to date provides Engineering budget performance.

The progress and performance measures are reviewed at various levels of detail to analyze deviations from plan and identify corrective actions. Figure 1 shows typical Engineering Progress & Performance Index curves.

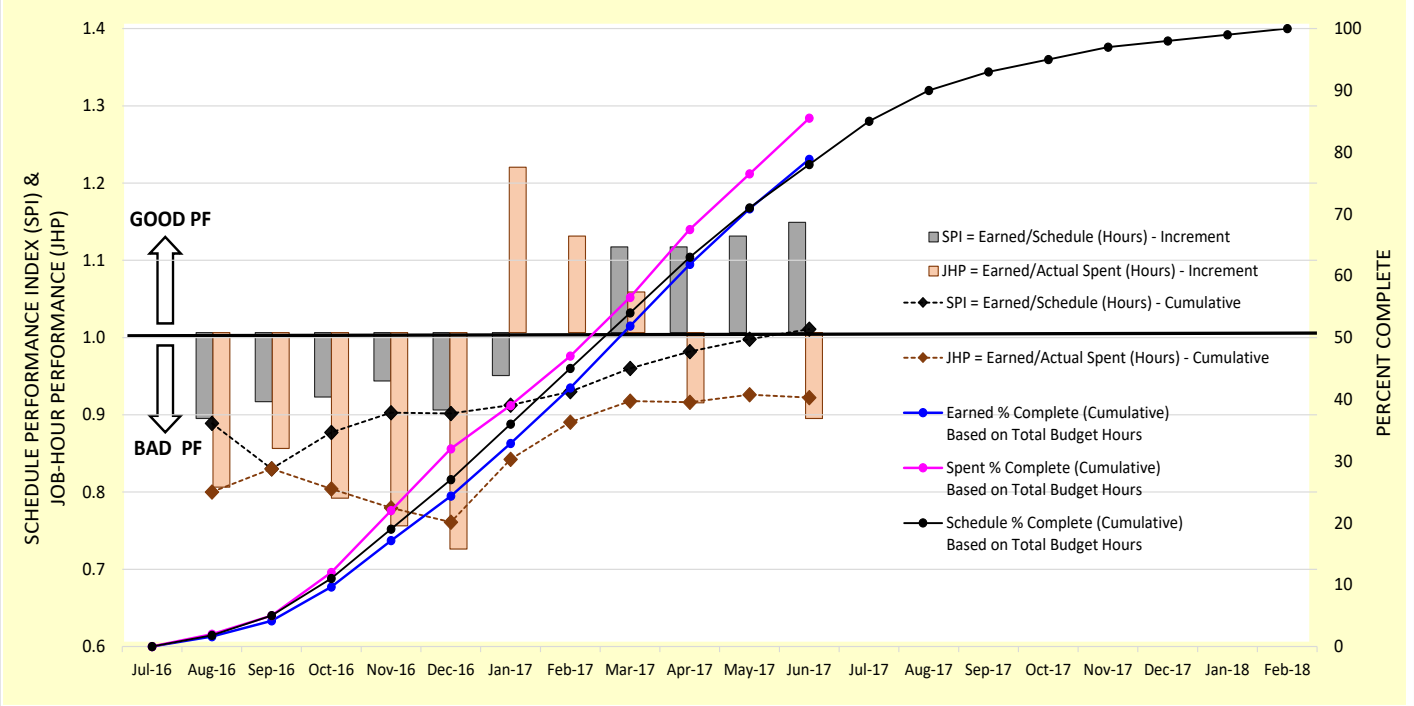


Figure 1 - Engineering Progress & Performance Index curves

6.1.1 Deliverables/Tasks Control Points

Detail scope items (e.g. drawing, calculation, specification, and material requisition) are listed as line item deliverables. Task logs list budgeted tasks for which a deliverable may not be generated (e.g. administration, document reviews, studies, and management). Depending on the scope of the project, additional logs such as 3D-model, subcontracts, and studies, etc. may be appropriate.

Each Engineering discipline develops logs for his or her discipline and every document and task is a uniquely identified line item. Common sets of log control points with percentage completion values are established for each type of log (Figure 2). The control point percentage values are used to calculate earned hours, percent complete (schedule and actual), and performance against the assigned budget for drawings, specifications and tasks grouped by work package, discipline, or work area.

Time record charge codes are assigned to track actual time charges. This can be managed by setting a Timekeeping system that records the actual hours spent by individual Engineering resource (discipline engineers, draftsmen, etc.) for a particular deliverable identified by a unique activity code with specified charge code. The activity code can be also referred to as activity ID which is unique from every deliverable & can be generated by combination of areas, facility, discipline, etc. depending on the project preference.
Manual timesheet and timekeeping automated system can be utilized.

SAMPLE PROJECT
MASTER LOG BY DISCIPLINE / FACILITY / LOG

Activity Code	Document Description	Deliverable Type	Charge Code	Rev. No. Rev. Date	Resp. Engr.	S F A	Start Drawing 10	IFA 60	IFC 90	Final Revision 100	Budget Forecast	Budget Fct To Go	% Comp.	Bud Earn Fct Earn
BP-ECMN20-E-001	00000-220-E1-0141-00111	D2	0141MRD1			S	18-Oct-17	28-Nov-17	17-Jan-18	18-Mar-18	60	18	70.0%	42
	METERING & RELAY DIAGRAM 11.5kV			B	BK	F			6-Dec-17	4-Feb-18	60	8	86.0%	52
				28-Aug-17		A	5-Aug-17	28-Aug-17						
			STATUS :	IFA										
			REMARKS :											
BP-ECMN20-E-002	00000-220-E1-0141-00112	D2	0141MRD1			S	18-Oct-17	28-Nov-17	17-Jan-18	18-Mar-18	60	18	70.0%	42
	METERING & RELAY DIAGRAM 11.5kV			B	BK	F			6-Dec-17	4-Feb-18	60	8	86.0%	52
				28-Aug-17		A	5-Aug-17	28-Aug-17						
			STATUS :	IFA										
			REMARKS :											
BP-ECMN20-E-003	00000-220-E1-0141-00113	D2	0141MRD1			S	18-Oct-17	28-Nov-17	17-Jan-18	18-Mar-18	60	18	70.0%	42
	METERING & RELAY DIAGRAM 23kV			B	BK	F			6-Dec-17	4-Feb-18	60	8	86.0%	52
				28-Aug-17		A	5-Aug-17	28-Aug-17						
			STATUS :	IFA										
			REMARKS :											
BP-ECMN20-E-004	00000-220-E1-0141-00114	D2	0141MRD1			S	18-Oct-17	28-Nov-17	17-Jan-18	18-Mar-18	12	0	100.0%	12
	METERING & RELAY DIAGRAM 23kV			A	BK	F					0	0	100.0%	0
				28-Aug-17		A	5-Aug-17	24-Aug-17	24-Aug-17	24-Aug-17				
			STATUS :	*CANCELLED ON AUG 24, 2017*										
			REMARKS :											

Figure 2 – Master Log

Typical control points are listed below (in no particular order):

- Started
- Issued for Discipline Check (IDC)
- Issued for Review (IFR)
- Issued for Approval (IFA)
- Issued for Design (IFD)
- Issued for Construction (IFC)
- Approved for Use (AFU)

Suggested control points are shown in Attachment 2 – Standard Control Points and Percent Complete Values. Project requirements shall decide what are the applicable control points to be used.

6.1.2 Jobhour Budgets

Engineering scope is defined in terms of its deliverables, documents, model development, level of effort tasks tabled in Engineering Tracker with allocated jobhour budgets.

Jobhour budgets reflect the current budget to perform the work, and are allocated to each discipline, each deliverable and control point. The following jobhour terms are used in Engineering tracking of progress and performance:

- Original Budget - Original budget is the baseline jobhours budget and remains unchanged until Engineering is completed.
- Scope Changes - Changes from the original contractual scope of work. Applies to the current budget and the total forecast.
- Trends (Non-Scope Changes) - Approved changes identified that do not add to the original contract scope of work. Used in total forecast only.
- Current Budget - The original budget plus all approved scope changes and approved budget adjustments. Trend hours are not included in the current budget hours.
- Total Forecast - Includes the original budget hours plus all approved scope and non-scope changes.

After a trend is approved, the Engineering discipline indicate whether these hours are to be added/deleted to/from the Engineering Tracker records or if new deliverables are to be added. Changes to control point

dates are input to the Engineering Tracker to assure alignment with the schedule status noted in the Trend Program and the CS.

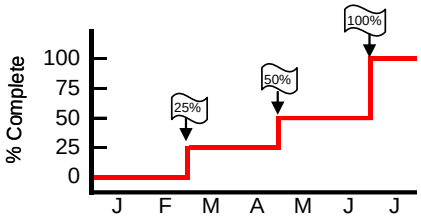
	BUDGET				FORECAST		EARNED				SPENT			PERCENT COMPLETE		
Code Discipline Description	Original Budget A	Scope Change B	Trends C	Current Budget D=A+B	Total Fct E=A+B+C	To Go Fct F=E-K	Schedule Hrs G	Earned Hrs H	Sched Var I=H-G	SPI J=H/G	Actual Hrs K	Cost Var L=H-K	JHP M=H/K	Sched (Bud) N=G/D	Actual (Bud) O=H/D	Actual (Fct) P=H/E
D Area D - Facilities																
Architectural	365			365	365	212	250	254	4	1.02	153	101	1.66	68.49	69.59	69.59
Eng'rg Management	7,717	0	160	7,717	7,877	6,710	1,233	1,233	0	1.00	1,167	66	1.06	15.98	15.98	15.65
Civil	13,909	225	0	14,134	14,134	7,123	11,009	10,856	-153	0.99	7,011	3,845	1.55	77.89	76.81	76.81
Electrical	3,485			3,485	3,485	533	2,815	2,862	47	1.02	2,952	-90	0.97	80.77	82.12	82.12
General	1,370			1,370	1,370	589	1,091	988	-103	0.91	781	207	1.27	79.64	72.12	72.12
Instrumentation	898			898	898	712	677	616	-61	0.91	186	430	3.31	75.39	68.60	68.60
Mechanical	1,252	300	0	1,552	1,552	1,215	940	982	42	1.04	337	645	2.91	60.57	63.27	63.27
Structural	1,650			1,650	1,650	809	1,255	1,179	-76	0.94	841	338	1.40	76.06	71.45	71.45
Area D Total	30,646	525	160	31,171	31,331	17,903	19,270	18,970	-300	0.98	13,428	5,542	1.41	61.82	60.86	60.55

Figure 3 – Engineering Tracker Jobhour Budgets

6.1.3 Progress and Performance Tracking Metrics

The scheduled, actual earned and actual spent hours are the bases for the Engineering progress and performance curves. The scheduled dates for control points support Control Schedule requirements. Earned hours are calculated by “step method” as agreed with Engineering management.

Step method - does not calculate earned hours between control points, earned hours = control point % x entered jobhour budget.



- Schedule Earned Hours - The scheduled earned hours are the budgeted hours for deliverables and task control points scheduled to be completed through the current time period (data date).

- Actual Earned Hours - The actual earned value is the total hours that have been earned for the work that was actually performed through the current time period.

- Actual Spent Hours - Actual hours expended to perform the work activities.

The following are Performance Tracking Metrics:

6.1.3.1 Schedule Performance Index (SPI)

The Schedule Performance Index (SPI) is used to measure the current status of the project to meet the baseline commitments on time.

- SPI = Actual Earned Hours / Scheduled Earned Hours
  Good performance => 1.0
  Bad performance < 1.0

Setup & Implementation – Reporting should be done for both cumulative performance to date, and the current period performance. Typical tracking is by discipline, phase, facility or area level. The schedule percent complete and the earned percentage complete for each discipline and execution unit shall be based on the current budget.

6.1.3.2 Job-hour Performance (JHP)

Job Hour Performance (JHP) measures the efficiency of the engineering effort in terms of man-hours.

- JHP = Actual Earned Hours / Actual Spent Hours
  Good performance => 1.0
  Bad performance < 1.0

Setup & Implementation – When the project is set up, the man-hour budget is estimated based on the tasks and deliverables to be done. The trend system will provide details of approved changes to hours in the current budget. Reporting should be done for both cumulative performance to date, and the current period. At the end of each reporting period, the engineering team will report their earned progress and record the hours spent on the tasks and deliverables they have been assigned through a system used by the A/E using the appropriate discipline, activity and facility codes. The level of sophistication regarding activity codes being assigned and adopted by the A/E shall be agreed with the Project Engineering Manager.

All performance data are derived from the project Engineering Tracker, from the trend system, and from the timesheet bookings as follows:

- Original budget – taken from approved estimates
- Scope changes – taken from the trend system (reviewed and updated for every report)
- Current budget – the sum of the original budget plus scope changes (reviewed and updated for every report).
- Actual spent hours – taken from the timekeeping system (reviewed and updated for every report, both cumulative and periodic).
- Actual earned hours – taken from the Engineering Tracker progress report (reviewed and updated for every report, both cumulative and periodic).

6.1.3.3 Total Quantity Performance (TQP)

The Total Quantity Performance (TQP) factor is developed by comparing estimates from A/E during the initial stage of Design phase with the current budget quantities from Project Controls for selected commodity groups and sub-commodity details.

- TQP = A/E Estimated Quantities / Current Budget Quantities

Setup – When a project develops a baseline of commodity quantities for tracking purposes, the Total Quantity Performance reporting metric will be implemented within 60 days of establishing such a baseline.

- Requires both quantity and cost baselines
- Requires baseline estimate – Typically implemented with either a “Proposal” or “Preliminary” baseline.
- Requires approved scope trends to calculate “current budget”
- All quantities are “neat line” without waste or installation allowances.
- To calculate the Total Quantity Performance (TQP) it is necessary to “weight” each of the individual commodity. To do this, it is necessary to obtain Total Installed Cost (TIC) values for each of the individual commodities.

Implementation - The project budget will be broken down in accordance with the standard code of accounts. Engineering are required to monitor selected commodities which will provide an indication of the overall performance of the design group, without placing unnecessary reporting burden on the team. Project team to propose minimum commodity groups and sub-commodity details which should be tracked given that each project will have its own unique requirements. It is the responsibility of the PEM to discuss and agree the level of reporting with both the Project Manager, on-project project controls group. Commodities are typically tracked at facility level before being rolled up to project level, this facilitates investigation of deviations as they occur.

Individual discipline engineers responsible for designs within a facility should be made aware of the budget quantity available and held accountable to design to that quantity and provide forecasts as required.

The Quantity Tracking is used to track quantities. It consists of a table where all data is stored and entered plus a database. The budget and trend quantities are controlled by Project Controls via the trend system, with the Engineering updating the forecast quantities at least monthly.

The records are unique for each combination of facility and commodity code. This is the minimum level of detail required, but the project can go down to lower level if the budget data is available.

6.1.3.4 Cost Performance Index (CPI)

Cost Performance Index (CPI) measures the efficiency of the engineering effort in terms of cost.

- CPI = Budget Cost Earned / Actual Engineering Cost Accrued
  Where:
  Budget Cost Earned = Budget Percent Complete x Budget Cost by Commodity
  Budget Percent Complete = Earned Hours / Total Current Budget Hours

Setup & Implementation – The PEM in collaboration with the Project Controls Manager (PCM) shall identify and document the elements of engineering services cost which will be reported. Typical performance tracking shall be by Engineering discipline level with Budget Cost assigned. Actual Engineering Cost Expended has to be generated with the input from Timekeeping and Accounting/Finance. As a minimum requirement, report engineering labor costs. However, engineering labor costs should match the same scope of work as is reported in the Job hour metric.

Implementation by new projects or projects in the planning stage should establish an implementation plan that includes cost of labor services from other sources.

Data Sources – The following services cost data should be reported:

- Engineering labor
  - Report will be by engineering discipline, and by execution unit where applicable
  - Cost data to coincide with timekeeping & Engineering tracker reporting
  - Cost will exclude OH, G&A (general & administrative), and profit
  - The report will be based upon an average SAR/JH/discipline
  - JHs may be compiled from timekeeping

- Cost of Agency Personnel
  - Report should be a single line entry encompassing all disciplines, reported by execution unit where applicable
  - Report as “all-in-cost” as submitted by the Agency or Agencies
  - It is recognized the cost data will not coincide with the reporting cycle and may lag by a month or more

- Subcontracted Services
  - Reporting requirements must be written into the services contract
  - Report as “all-in-cost” as submitted by each Subcontractor
  - Breakout at the discipline level is required
  - It is recognized the cost data should coincide with the reporting cycle
  - Subcontractors to perform a significant portion of engineering service should track and report the cost data to a similar detail as Engineering Tracker
  - Approval must be received from on the final level of detail to be used for these services prior to implementation

In conjunction with Project Controls, establish the expenditure budget rate for each line item to be reported and document the basis. The budget shall be based upon the approved baseline including approved scope trends/changes.

6.1.3.5 Quality Performance (QP)

Quality Performance (QP) measures the categorization of the design deliverables received on a period and cumulative basis. The deliverable coding system applies with the following weightings:

Code 1 – value of "1.0" applied to deliverable
Code 2 – value of "0.83" applied to deliverable
Code 3 – value of "0.5" applied to deliverable
Code 4 – not included in the overall QP

- QP = (summation of each reviewed deliverable multiplied by the deliverable code weightings) / (Total No. of deliverables reviewed)

Setup & Implementation – The PEM shall ensure that the team record the 'coding' of documents accurately and within the tool.

The data (awarded quality code) will be kept within the Engineering Tracker deliverables tab and recorded upon completion of the review. Each deliverable will be coded at each CP submission. The 1st submission at each CP shall contribute to the QP.

NOTE: These five (5) Performance Tracking Metrics are to be included in the Project Dashboards if deemed to be applicable.

6.1.4 Schedule Percent Complete Status

Physical progress is represented by percent complete based on the earned value of the quantity of the work performed. Monitoring the percent complete is an additional indicator of a project's ability to meet the schedule requirements.

- Schedule Percent Complete (Budget) - The scheduled earned hours divided by the current budget hours, including the scope change hours.
- Actual Percent Complete (Budget) - The actual earned hours divided by the current budget hours indicate the project's accomplishment based on the to-date progress.
- Actual Percent Complete (Forecast) - The actual earned hours divided by the total forecast hours based on the original budget plus all scope changes and non-scope changes.

	BUDGET				FORECAST		EARNED				SPENT			PERCENT COMPLETE		
Code Discipline Description	Original Budget A	Scope Change B	Trends C	Current Budget D=A+B	Total Fct E=A+B+C	To Go Fct F=E-K	Schedule Hrs G	Earned Hrs H	Sched Var I=H-G	SPI J=H/G	Actual Hrs K	Cost Var L=H-K	JHP M=H/K	Sched (Bud) N=G/D	Actual (Bud) O=H/D	Actual (Fct) P=H/E
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Eng'rg Management	7,717	0	160	7,717	7,877	6,710	1,233	1,233	0	1.00	1,167	66	1.06	15.98	15.98	15.65
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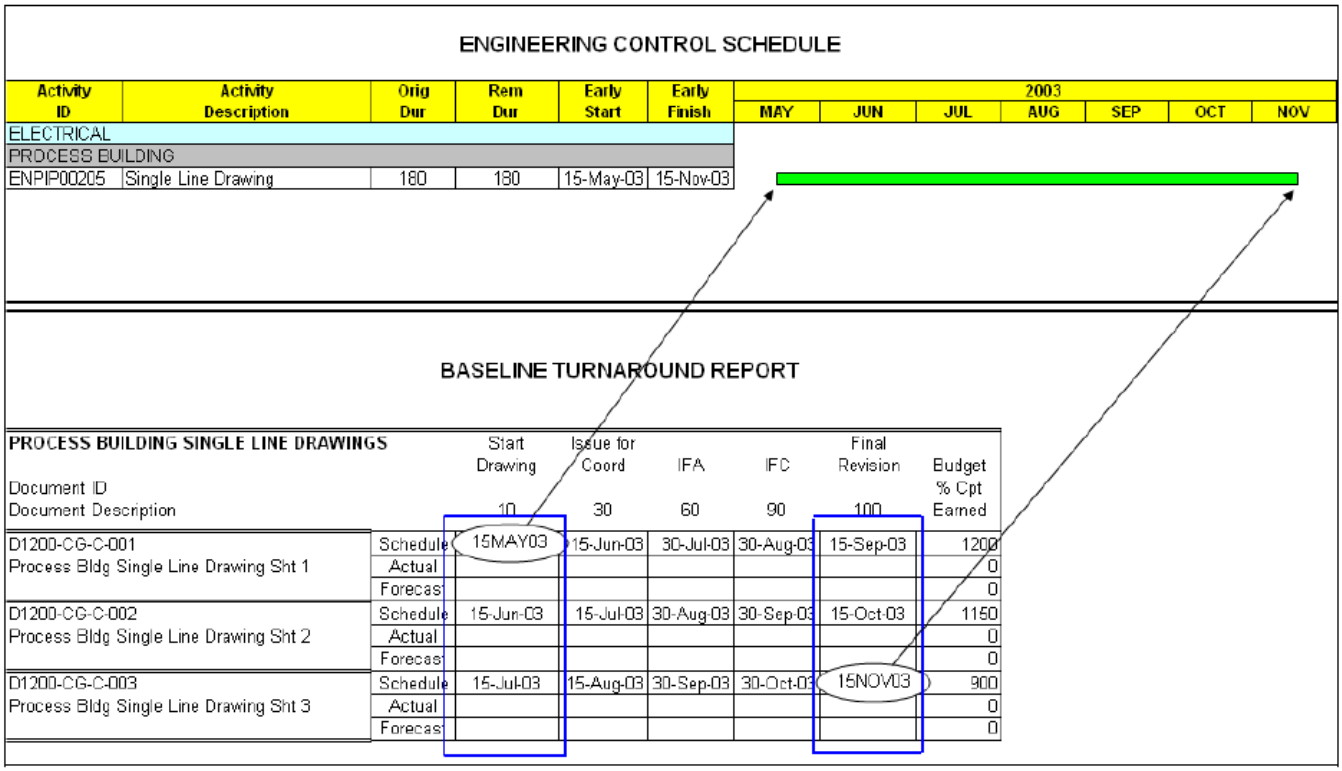
Electrical	3,485			3,485	3,485	533	2,815	2,862	47	1.02	2,952	-90	0.97	80.77	82.12	82.12
General	1,370			1,370	1,370	589	1,091	988	-103	0.91	781	207	1.27	79.64	72.12	72.12
Instrumentation	898			898	898	712	677	616	-61	0.91	186	430	3.31	75.39	68.60	68.60
Mechanical	1,252	300	0	1,552	1,552	1,215	940	982	42	1.04	337	645	2.91	60.57	63.27	63.27
Structural	1,650			1,650	1,650	809	1,255	1,179	-76	0.94	841	338	1.40	76.06	71.45	71.45
Area D Total	30,646	525	160	31,171	31,331	17,903	19,270	18,970	-300	0.98	13,428	5,542	1.41	61.82	60.86	60.55

Figure 4 – Engineering Tracker Percent Complete

6.1.5 Control Schedule Interface

The Engineering Tracker /CS interfaces convey Project Schedule requirements from the CS to the Engineering Tracker at the optimum CS level of detail (PFD/P&ID/system, major equipment, work package, etc.), and return status to update the CS. This process allows for automatic data exchange while ensuring the step by step manual analysis, which is the key to effective progress measurement. The electronic link is facilitated by coding each Engineering Tracker record with a CS activity ID code. Control Schedule activities can be linked to the Engineering Tracker at one of two levels of detail.

The preferred level in many Engineering Tracker records to one CS activity. This allows for a more manageable CS, containing activities that represent a corresponding Engineering Tracker record's entire life-span from start to finish.



ENGINEERING CONTROL SCHEDULE

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish	2003 MAY	JUN	JUL	AUG	SEP	OCT	NOV
ELECTRICAL												
PROCESS BUILDING												
ENPIP00205	Single Line Drawing	180	180	15-May-03	15-Nov-03							

BASELINE TURNAROUND REPORT

PROCESS BUILDING SINGLE LINE DRAWINGS Document ID Document Description		Start Drawing 10	Issue for Coord 30	IFA 60	IFC 90	Final Revision 100	Budget % Cpt Earned
D1200-CG-C-001	Schedule	15MAY03	15-Jun-03	30-Jul-03	30-Aug-03	15-Sep-03	1200
Process Bldg Single Line Drawing Sht 1	Actual						0
	Forecast						0
D1200-CG-C-002	Schedule	15-Jun-03	15-Jul-03	30-Aug-03	30-Sep-03	15-Oct-03	1150
Process Bldg Single Line Drawing Sht 2	Actual						0
	Forecast						0
D1200-CG-C-003	Schedule	15-Jul-03	15-Aug-03	30-Sep-03	30-Oct-03	15NOV03	900
Process Bldg Single Line Drawing Sht 3	Actual						0
	Forecast						0

Figure 5 - Engineering Tracker Record to CS Activity Interface

6.1.6 Engineering Staffing Requirements

The information in the Engineering Tracker can provide Engineering with a staffing plan (Figure 7) whether by discipline, facility, and/or by total Engineering based on the Engineering Tracker master log details and the control point budget spread of job hours. Scheduling reviews the staffing requirements with the Engineering discipline leads to ensure that sufficient personnel are assigned to the project to meet the contractual milestone requirements.

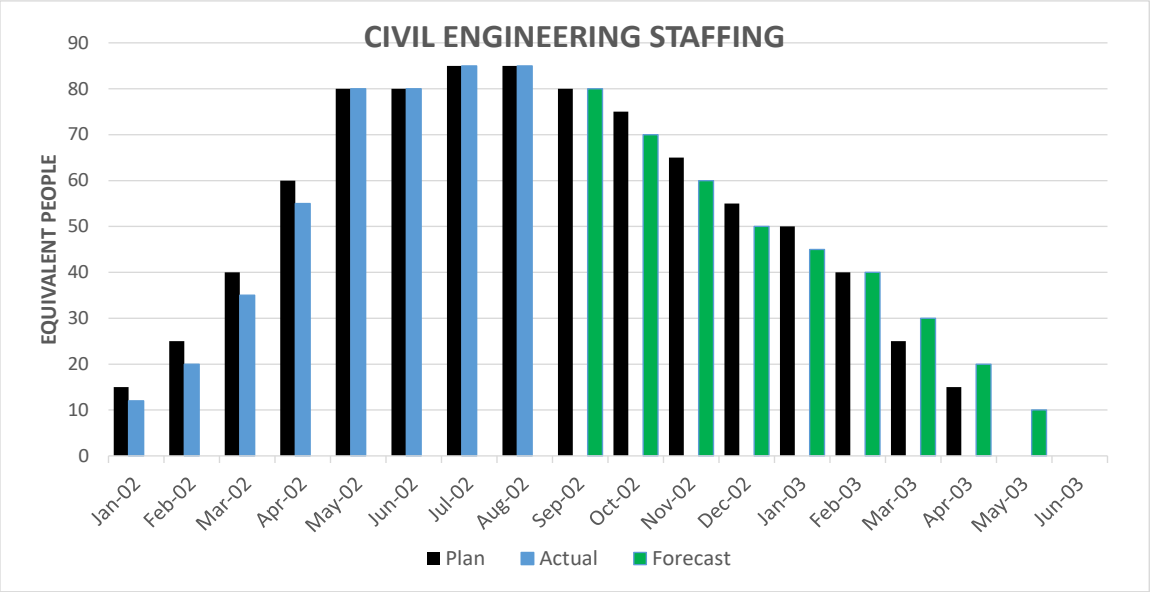


Figure 7 - Staffing Plan

6.1.7 Monthly Look-ahead Schedule

The Engineering Tracker "Monthly Look-ahead Schedule" (Figure 8) is updated and re-issued monthly as Engineering's short term schedule, the MLS. Engineering's forecast control point completion dates for the month ahead to produce an attainable schedule based on known data and personnel availability.

The Monthly Look Ahead Schedule is the agenda for the weekly project engineering progress review meeting chaired by the Project Engineer Manager (PEM), but during which Project Controls lead the discussion on schedule issues. Scheduling coordinates the Project Team's efforts in support of Engineering, maintaining a current assessment of status, actions, and anticipating the month-end status against the CS.

Scheduling assures the forecast dates satisfy the CS requirements in terms of:

- Critical activity completion: Engineering Planner maintains continuous surveillance of critical and sub-critical engineering deliverables and their restraints on progress and completion, anticipating the Engineering month-end status/forecast markup of the MLS, so that it is a confirmation of already known status.
- Monthly volume of work: The Engineering Tracker progress curve (Figure 1) provides monthly percentage of work to be accomplished by Engineering, and this same data is available for each discipline and type of product (e.g. MR's). Scheduling compares this to the percentage scheduled for the month ahead in the MLS, and discusses any shortfall, or lack of any recovery required overall or by individual discipline with the Project Engineer and Engineering discipline leads.

Facility D22 - Midfield Area Drainage Facilities
Civil

Activity CB9 - Area D Civil Drawings

Document ID / Document Description		Start Drawing 10	Issue for Coord 30	Design Review 1 50	Design Review 2 75	IFC 90	Final Revision 100	Budget % Cpt Earned
D2200-CD-C-010 Drainage Details - Sheet 1 of 2	Schedule	02-Aug-04	20-Sep-04	15-Oct-04	22-Nov-04	15-Dec-04	10-Jan-05	80
	Actual	8/2/2004A						10%
	Forecast							8
D2200-CD-C-011 Drainage Details - Sheet 2 of 2	Schedule	02-Aug-04	25-Sep-04	15-Oct-04	22-Nov-04	15-Dec-04	10-Jan-05	50
	Actual	8/2/2004A						10%
	Forecast							5
D2200-CD-C-020 Retention Pond Plan	Schedule	01-Jul-04	30-Jul-04	30-Aug-04	22-Sep-04	30-Oct-04	15-Nov-04	75
	Actual	7/5/04A	8/1/04A					30%
	Forecast							23
D2200-CD-C-021 South Retention Pond Plan	Schedule	01-Jul-04	30-Jul-04	30-Aug-04	22-Sep-04	30-Oct-04	15-Nov-04	60
	Actual	7/10/04A	04-Aug-04					30%
	Forecast							18
D2200-CD-C-022 Retention Ponds Plan - Sheet 1 of 1	Schedule	15-Jul-04	05-Aug-04	05-Sep-04	10-Oct-04	30-Oct-04	15-Nov-04	45
	Actual	7/20/04A	06-Aug-04					30%
	Forecast							14
D2200-CD-C-030 Retention Ponds Sections and Details	Schedule	15-Jul-04	30-Jul-04	05-Sep-04	10-Oct-04	30-Oct-04	15-Nov-04	50
	Actual	7/20/04A	09-Aug-04					30%
	Forecast							15

Figure 8 – Engineering Tracker Monthly Look-ahead Schedule

6.2 Development

Development of the Engineering Tracker is the responsibility of Engineering with support provided by Project Controls.

- Project Engineering Manager (PEM) is responsible for Engineering Tracker implementation.
- Engineering discipline leads are responsible for implementing the Engineering Tracker plan including developing detailed content, budget, and schedules based on required IFC dates provided by Scheduling, and assigning the document identification numbers per Engineering Department Procedures.

Projects are set up using the respective Engineering Tracker coding structure. Due to unique project requirements, some projects may have to develop new logs, activities, and control points suited to the project requirements. Set up includes manual input of data or direct importing data from the Engineering Tracker data entry templates in Microsoft Excel format. Project database can be created in Spreadsheet format, which Engineering has to prepare (Figure 9). Typical project database can contain organization, area, facility, discipline, log type, deliverables description, control points with dates, etc. Engineering with the assistance of Project Controls has to decide what parameters are necessary for the Project.

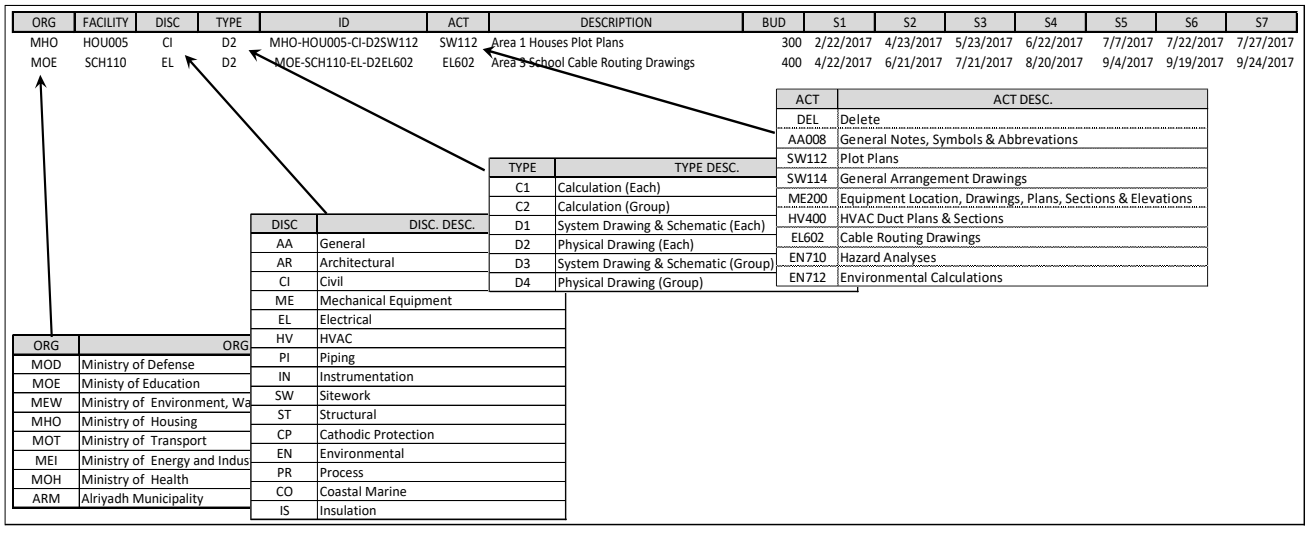


Figure 9 – Sample Engineering Tracker Database

6.2.1 Engineering Tracker

Engineering and Scheduling agree on a plan for establishing time frame for the Engineering Tracker deliverables. Usually the Management Schedule (MS) is the initial source of discipline planning, with the CS contributing more information as it is developed. The CS engineering logic is either based on previous similar projects; or fragnets based on standard engineering process flow as generic scheduling logic.

After the Engineering deliverables have been defined, the following are to be developed by Engineering discipline leads:

- Deliverable types – defined below (also refer to Attachment 1)
- Control points for each log type (refer to Attachment 2)
- Control point completion percentage values
- Codes for time charge Activity, Area, Locator, and Discipline
- Control point earning method

Engineering provides the above data, review inputs, validates it for completeness, and inputs it to the Engineering Tracker.

Deliverable Types

- All detailed-scope deliverables (e.g., supplier document reviews, subcontracts), baseline or low-volume deliverables (e.g., Piping and Instrumentation Diagram (P&IDs), calculations, specifications, material requisitions) and tasks (e.g., supervision, studies) are uniquely identified line items. High-volume deliverables (e.g., isometrics, steel fabrication drawings, instrument loop diagrams) may be grouped together at a higher level (facility, system, design area). Where multiple deliverables are included in one log line item (e.g., isometrics, steel drawings), progress is determined by the Engineering discipline leads evaluation of individual document progress within the log item.

- Task logs list budgeted tasks for which a discrete deliverable may not be generated (e.g., supervision, studies, unplanned document revisions, construction support). Depending on the scope of the project, additional logs such as 3D model reviews would be appropriate.

- Each Engineering discipline lead develops the tracker list for his or her discipline, using standard templates from Attachment 2. All deliverables, individual and grouped, are included in these logs. Common sets of log control points with percentage completion values are established for each type of log.

Separate tracker has to be prepared for every supplier/vendor with identified Purchase Orders (PO). Supplier documents are grouped by Purchase Order with a unique line item and all deliverables are to be listed and tracked. Control points listed in Attachment 2 has to be utilized as well. Overall Engineering progress performed by Consultant, A/E or Contractor shall be tracked separately from supplier/vendor deliverables.

Refer to Attachment 3 - EPM-KPC-TP-000023 Engineering Tracking Report template and Attachment 4 - EPM-KPC-TP-000024 Typical Engineering Tracking Set-up template.

Deliverables Count is also a necessary report that has to be produced by A/E. The A/E firms should create a spreadsheet that can show the report output with sub-items for Discipline, Areas, Location, Facility or System as required. Control points deliverables count should be also manageable in the spreadsheet. Refer to Attachment 5 – EPM-KPC-TP-000025 Engineering Tracker Deliverables Count Template.

6.2.2 Project Schedule Integration

Engineering discipline leads to establish start, finish, and intermediate control point schedule dates for each deliverable, using the Milestone Schedule and guidance from Scheduling in lieu of a completed CS.

Scheduling reviews the dates for consistency with contract milestones, required IFC schedule dates and the MS or the CS when it is sufficiently developed, and discusses necessary revisions with Engineering.

Scheduling reviews early start and early finish dates from the CS for each work package and Engineering identifies the intermediate dates for each control point. For activity control points such as reviews and approvals, standard or contractually specified durations are used after agreement with the project team.

The Engineering Tracker development process is iterative. Engineering working with Scheduling, adjusting dates to properly sequence work within the Engineering Tracker. Engineering and Scheduling to coordinate disciplines to resolve conflicts and meet the requirements of the CS. Key commodity release curves and resource profiles are initially developed from quantities and hours to facilitate manpower leveling and schedule adjustments made to optimize the Engineering schedule, while affording maximum support to the Construction schedule.

6.2.3 Jobhour Budget Allocation

Engineering assign budgets to each deliverable and task. Summary level one line entries are made for deliverables where details are not initially identified. In addition, a percentage of the budget hours are reserved from the allocation process and retained for future allocation for deliverable/tasks that are likely missed during the initial set up of the project. It is Engineering practice that each discipline reserve 5% to 10% of budget hours to this purpose.

The budgets are approved by the Project Engineering Manager.

6.2.4 Review and Approval

After all the adjustments and changes in the Engineering Tracker are completed, Engineering runs the Engineering Tracker logs and summary reports and reviews them with the Project Controls. The review is an iterative process to assure complete alignment of the Engineering Tracker with the requirements of the CS. In addition, approval from the Project Engineering Manager is obtained to confirm consistency with the project budget baseline jobhours and schedule.

6.3 Maintenance

6.3.1 Engineering Tracker Update

Utilizing the MLS, the Engineering Tracker is updated with current and forecast dates against each control point schedule date.

Every week an Engineering Progress and Status Review Meeting is held that includes in its agenda review of the MLS status, the Percent Completion Curves, and agrees actions and responsibility for recovery of delays. Any major delays are analyzed by Scheduling against the CS requirements.

Engineering Planner maintain continuous surveillance throughout the month of critical engineering deliverables and their restraints on the progress and completion anticipating Engineering's month-end status/forecast markups of the MLS so the status review of key activities are not a once a month event. Monthly update of Engineering Tracker files is adequate because deviations are to be identified and addressed as they occur during the month using previous month ends Engineering Tracker and CS reports.

The Monthly Engineering Tracker update is performed as follows:

- Scheduling provides Engineering with MLS for the next update cycle, including the percent progress required to meet project schedule requirement.
- Engineering returns the MLS marked-up with actual dates or forecast dates for each deliverable control point within the update period and identify any new or deleted deliverables (as trended) etc., and Scheduling reviews and inputs the data.

- Engineering provides actual IFC design quantities to Project Controls for updating of the quantity curves.
- Timekeeping provides actual jobhours collected by activity code through the time card system. Engineering reviews the time charges for accuracy, and Scheduling reviews the data for importing into the Engineering Tracker.
- Scheduling runs the draft Engineering Tracker reports, reviews the data and highlights any conflicting data or errors and omissions and coordinates the data with Engineering supervisors/leads.
- Engineering supervisors/leads review errors, performance and schedule status, and achievable forecast for the following month and beyond to recover any schedule delays. Engineering provides hard copy data corrections to Scheduling.
- Scheduling runs the final reports from which Engineering prepares the Project Monthly Progress Report.

6.3.2 Analysis

Project Controls compiles the data received from Engineering and other functions to produce Monthly Progress Report which is the agenda for a monthly progress review meeting convened by the Project Manager to discuss progress, deviations from the plan, suggested corrective actions, critical items, and concerns. Attendees include all project department supervisors. The following engineering analyses are prepared for this meeting:

- Exception Report

  Following update of the Engineering Tracker, Scheduling generates an Exception Log (Figure 10). This log identifies all late activities as of the data date with corresponding forecast dates. After determining the criticality of the late items based on the CS, the Exception Log is reviewed at the weekly Engineering progress and status review meeting with the Project Engineer and Engineering leads. Corrective actions, including responsibilities, are identified and initiated as appropriate. Items that impact the critical paths of Construction or Pre-Operation phases are added to the SIR (Figure 11).

Sample Project

Exception Report

Plant Design Standards / Forms Log

Document Description	Resp Engr.		Start Drawing 10	Issue for Review 60	Issue for Publication 90	Publish 100	Budget Forecast	Forecast To Go	% Cpt	Sched Earned
3DDPH02 00001										
Remote Facility Layout & Design	AC	S	10-Feb-03	10-Mar-03	07-Apr-03	15-May-03	120	0		188
		F		10-May-03	07-Jun-03	15-Jul-03	120	114		0
		A	4/15/03A					114	10	12
Comments:										
SDT P33G-00002S 3.2.5 - 22										
Head Loss Coefficients for Pipe Fittings	AC	S	18-Mar-03	25-Mar-03	15-Apr-03	14-May-03	20	0	0	20
		F	25-May-03	20-Jun-03	21-Jul-03	28-Jul-03	20	20	0	0
		A						20		0
Comments:										
SDT P33G-00002S 3.2.5 - 23										
Friction Loss in Ducts	AC	S	18-Mar-03	30-Mar-03	25-Apr-03	18-May-03	20	0	0	20
		F	25-May-03	20-Jun-03	21-Jul-03	28-Jul-03	20	20	0	0
		A						20		0
Comments:										
SDT P33G-00002S 3.2.6 - 2										
Safety Valve Drip Pans & Drains	AC	S	31-Mar-03	23-Apr-03	15-May-03	02-Jun-03	65	0	0	65
		F	25-May-03	02-Jun-03	21-Jul-03	28-Jul-03	65	65	0	0
		A						65		0
Comments:										

Figure 10 - Exception Log by Discipline

SCHEDULE IMPACT REPORT

Project: Infrastructure Project Name 1, Riyadh

Project Number: 12345 – Status Through: Aug 22, 2009

Impact #	Impacted Work/Activity Description, Cause and Effect	Weeks Impact	Actions	Dates		Action By
				Schedule	Actual	
3	WORK/ACTIVITY: Utility Area 7 Layout approval by Owner. – Utility Area 7 Pipe Installation. CAUSE: Large pipe layout drwgs IFC delay - delayed installation 5 weeks beyond Large Pipe Impact curve due to Owner non-approval of layouts. EFFECT: Construction works for Piping in Area 7 will be delayed and consequently the succeeding works for Vessel V-101 setting will also be delayed. This delay will have potential impact of Project completion date. MITIGATION: Additional Engineering resources are necessary to recover the delay in production of pipe layout drawings. One piping Engineering and 2 draftsmen are needed within a week timeframe. REFERENCES: FG34-9-5-01: AA-055223 AB-115437	5	Send notice of schedule delay to Owner.	8/16/99	8/22/99	J.R.Morton
			Complete evaluation.	8/22/99		B.Bolden
			Provide time extension details to Contracts	8/24/99		L.Hardin
			Confirm contractual basis with project attorney.	8/24/99		J.R.Morton
			Time extension request to Owner.	8/30/99		H.Ledbetter
			Project review of recovery plan.	9/3/99		K.Oliver
			Submit priced Change Request	9/7/99		H.Ledbetter

Figure 11 - Schedule Impact Report (SIR) Entry

- Engineering Tracker Status Review

  Project Controls review status of the Engineering Deliverables, requests corrective actions from the Engineering leads for any significant delays. Scheduling reviews the Engineering Tracker to confirm any short-term demands from Construction are addressed. Scheduling will occasionally encounter anomalies where the CS dates are not supported. In such instances Scheduling works with the Engineering, Procurement, Construction and Pre-Operation phases to determine the best way to resolve the issue.

- Progress Performance Review

  Project Controls review the Engineering Progress and Performance Summary Report (Figure 4) for each discipline showing deviations from plan that require Engineering leads' attention. Shortfalls in cumulative progress are addressed by checking to-date performance versus to-go staffing plans to verify adequacy of resources.

- Engineering Schedule Status Report

  This report monitors the monthly and cumulative progress reflected in the MLS to assure that the quantity of work scheduled each month satisfies the overall schedule requirement. It highlights to-date and monthly shortfalls, and progress towards recovering the schedule if required, by discipline and total engineering.

Engineering Schedule Status

Discipline Schedule % Completions	August [past month]							September [current month]						
	Actual	Schedule	To Attain	Month		Variance		Actual	Schedule	To Attain	Month		Variance	
	Mth.Beg. (A)	Mth.End (B)	Schedule (B-A)	F/C (C)	Act. (D)	Mth. (C-D)	To Date (A+D-B)	Mth.Beg. (A') = (A+D)	Mth.End (B)	Schedule (B-A')	F/C (C)	Act. (D)	Mth. (C-D)	To Date (A'+D-B)
Architecture	60.4	80.0	19.6	12.0	9.6	(2.4)	(10.0)	70.0	85.8	15.8	9.8			
Civil	49.9	59.8	9.9	7.4	7.6	0.2	(2.3)	57.5	68.4	10.9	8.8			
Process	89.7	90.3	0.6	3.2	4.5	1.3	3.9	94.2	93.0	ahead of sched	3.0			
Electrical	40.3	49.3	9.0	7.6	6.1	(1.5)	(2.9)	46.4	55.0	8.6	5.6			
Control System	39.9	47.8	7.9	8.0	6.0	(2.0)	(1.9)	45.9	52.3	6.4	7.0			
Mechanical	57.8	70.0	12.2	9.8	11.0	1.2	(1.2)	68.8	74.1	5.3	5.4			
Plant Design	61.1	68.2	7.1	6.2	5.8	(0.4)	(1.3)	66.9	73.0	6.1	5.9			
Structural	40.0	48.4	8.4	4.3	4.7	0.4	(3.7)	44.7	53.6	8.9	6.7			
Environmental	60.7	74.6	13.9	7.7	8.2	0.5	(5.7)	68.9	80.9	12.0	12.0			
Total	55.5	64.4	8.9	6.4	5.7	(0.7)	(3.2)	61.2	70.6	9.4	6.6			

Figure 12 - Engineering Status Schedule

- Bulk Material Quantity Curves Review

  Engineering is responsible for statusing the quantity release for commodity curves. In addition to reviewing these to-date planned vs. actual numbers, Scheduling verifies the quantities released reflect the priorities required by Procurement and Construction. Scheduling also monitors the duration between design releases and construction installation for each commodity, to ensure enough time is available for detailing, fabrication, and on-site delivery.

- Subcontracted / Third Party Engineering

  Engineering deliverables from third parties need to be monitored to ensure that all interfacing issue dates support the overall project schedule.

6.3.3 Engineering Tracker / CS Update

Engineering status is reported by the CS activities grouped by Discipline or Area package, etc. and is based on the remaining duration to complete the deliverable.

The projected completion date of the Engineering Tracker grouping comprising a CS activity is the latest schedule, forecast, or actual completion date for the deliverables in that group. A listing of the projected completion dates for each grouping is reported from the Engineering Tracker and the remaining duration is calculated based on the data date (Figure 13). After Scheduling and Engineering review exceptions and analyze schedule impacts, new forecast dates are input to a duplicate or test CS file. This file is used to perform "what if" analyses, solve anomalies, and identify work around as needed. Judgment is used to assess cases where activities may need to be added (e.g., to reflect partial issue) or to allow schedule slippage of intermediate dates within a Work Package. As a last resort, the option exists to modify the CS (for example, for late documents that do not impact issue of a bid package); however, Engineering must track these exceptions to any standard logic assumptions for eventual closure. The Engineering Tracker has fields for such manual tracking, which Scheduling monitors for compliance.

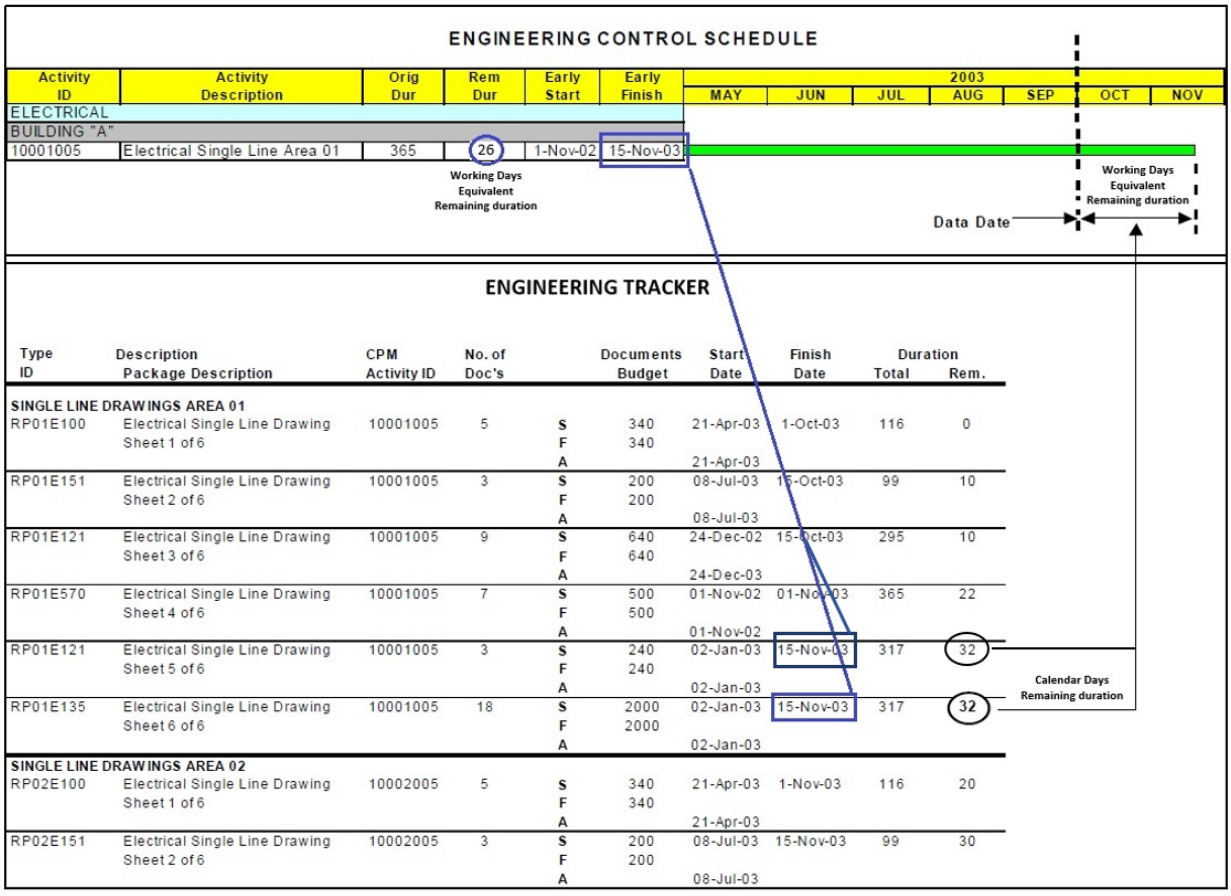


Figure 13 – Progressing Control Schedule with Engineering Tracker's Remaining Durations

6.3.4 Forecasts

During the course of a project, it is necessary for the project team to review the overall project schedule on a regular interval. Major issues result in a re-forecast to the plan and require Engineering to develop schedule work-around. In such cases original schedule dates are still the baseline and re-forecast dates will serve to monitor and expedite the work.

When overall project schedule is re-baselined, then Engineering Tracker control points schedule dates will be re-cast to the new forecast schedule. Usually scheduled re-cast will take place when a definitive estimate or forecast estimate is undertaken on the project.

7.0 ATTACHMENTS

1. Standard Deliverable Types
2. Standard Control Points and Percent Complete Values
3. EPM-KPC-TP-000023 - Engineering Tracking Report Template
4. EPM-KPC-TP-000024 - Typical Engineering Tracking Set-up Template
5. EPM-KPC-TP-000025 - Engineering Tracker Deliverables Count Template

Attachment 1 - Standard Deliverable Types

Guide for selecting deliverable types:

D	Drawings
C	Calculations
L	Lists (including, but not limited to, line lists, spare parts lists, specialty items lists, equipment lists, Instrument Indexes, etc.)
E	Datasheets
M	Material Requisitions
T	Tasks
F	Design Criteria/Design Bases
S	Specifications
X	Design documents (including, but not limited to, process descriptions, relief load summaries, utility balances, flare systems, waste/effluent summaries, etc.)
V	Vendor document reviews

Notes

a) Each deliverable type can be combined with a digit and a discipline code to create a unique log.

b) Deliverable type line items should be identified by facility, system, design area, or tracked individually.

c) Depending on Project requirements, the above Deliverable types can be modified.

Attachment 2 - Standard Control Points and Percent Complete Values

Standard Logs (for all disciplines)

	Start	IFR*	MRQ	MRP	MR Revisions Complete
Material Requisition	5%	30%	60%	90%	100%

	Start	IFA/IFQ	IFD/IFP	Vendor Print Code 1/4#
Datasheet∞	5%	50%	90%	100%

	Start	IFR	IFA	IFD/IFQ*	IFC/IFP	Spec. Revisions Complete
Specification	5%	40%	50%	70%	90%	100%

	Start	IFR	IFA*	IFH*	IFD	IFC	Database Complete◊	Revisions Complete
Lists	5%	20%	30%	50%	60%	80%◊	90%	100%

	Start	20% Complete	40% Complete	60% Complete	80% Complete	100% Complete
Task^	0%	20%	40%	60%	80%	100%

	Start	IFR	IFA/IFQ	IFP/IFC	Vendor Print Code 1/4#
Calculation	5%	30%	50%	90%	100%

	Start/ Receive VPs	Critical VPs Code 2/3	All VPs Code 2/3	All VPs Code 1/4	Supplier Completion Confirmed
Vendor Print Review (own discipline)	5%	35%	70%	90%	100%

	Start	20% Complete	40% Complete	60% Complete	Comments after Code 2/3	Review Complete
Vendor Print Review (other disciplines)	5%	20%	40%	60%	80%	100%

	Start	IFR	IFA	IFH*	IFD	IFC	Database Complete◊	Revisions Complete

Drawing (Type 1)	5%	20%	30%	50%	60%	80%◊	90%	100%

	Start	IFR	IFA	IFH*	IFD	Revisions Complete
Drawing (Type 2)	5%	30%	50%	70%	90%	100%

Civil

	Start	Conceptual Modeling	Initial Analysis Complete	IFH*	Design Complete	IFC	Database Complete◊	Revisions Complete
Drawing (Type 1, modified)	5%	20%	30%	50%	60%	80%◊	90%	100%

Plant Design

	Start	Equip. Layout Complete	Critical LB Piping Complete	30% Model Review + Comments Closed	LB Piping Complete	50% Model Review	Comments Closed
Large-Bore Modeling#	5%	20%	30%	40%	70%	80%	100%

	Start	Model SB Piping	SB Piping Complete	90% Model Review	Comments Closed	Clash Report Comments Closed
Small-bore Modeling#	5%	40%	70%	80%	90%	100%

	Start	Main Headers Complete	LB Laterals Complete	SB Laterals Complete	Clash Report Comments Closed
Underground Modeling	5%	40%	60%	80%	100%

	Start	Annotate Mains	Check Mains/1st IFC Complete	Annotate Laterals	Check Laterals/2nd IFC Complete	Revisions Complete
Underground Piping Dwg.	5%	30%	40%	60%	80%	100%

* If applicable.

◊ If no applicable database, IFC is 90%.

^ Step-earning method. Percent complete based on the control points % earned.

Vendor Print Code 1/4 implies that all relevant data from such vendor prints has been included in the design/documents.

∞Datasheets tracking may be by MR.

Notes

- IFR is equivalent to conceptual modeling or preliminary layout.
- IFA is equivalent to initial analysis or preliminary approval.
- IFD is equivalent to design complete or design check.
- Vendor print review is by PO, not individual documents.
- Code 1-Reviewed / Work may proceed, Code 2-Reviewed with comments / Work may proceed subject to incorporation of comments, Code 3-Revise and resubmit / Work may not proceed, Code 4 – Review not required / Work may proceed.
- Disciplines may identify specific vendor prints within a PO as “critical”; these are received and reviewed in priority.
- Drawing “types” are based on the milestones followed by the drawing, e.g., a drawing is Type 1 if it follows all eight milestones indicated under Type 1.
- The Control points specified in this Attachment-2 are reference only. Depending on the Project needs, the Control points can be adjusted.

Attachment 3 - EPM-KPC-TP-000023 - Engineering Tracking Report Template

ENGINEERING TRACKER REPORT

Project No. : _____
Project Descripton : _____
Project Location : _____
Entity : _____
A/E Firm : _____

Report Date : _____
Week Ending : _____

	BUDGET				FORECAST		EARNED				SPENT			PERCENT COMPLETE		
Code Discipline Description	Original Budget	Scope Change	Trends	Current Budget	Total Fct	To Go Fct	Schedule Hrs	Earned Hrs	Sched Var	SPI	Actual Hrs	Cost Var	JHP	Sched (Bud)	Actual (Bud)	Actual (Fct)
	A	B	C	D=A+B	E=A+B+C	F=E-K	G	H	I=H-G	J=H/G	K	L=H-K	M=H/K	N=G/D	O=H/D	P=H/E
D Area D - Facilities																
Architectural	365			365	365	212	250	254	4	1.02	153	101	1.66	68.49	69.59	69.59
Eng'rg Management	7,717	0	160	7,717	7,877	6,710	1,233	1,233	0	1.00	1,167	66	1.06	15.98	15.98	15.65
Civil	13,909	225	0	14,134	14,134	7,123	11,009	10,856	-153	0.99	7,011	3,845	1.55	77.89	76.81	76.81
Electrical	3,485			3,485	3,485	533	2,815	2,862	47	1.02	2,952	-90	0.97	80.77	82.12	82.12
General	1,370			1,370	1,370	589	1,091	988	-103	0.91	781	207	1.27	79.64	72.12	72.12
Instrumentation	898			898	898	712	677	616	-61	0.91	186	430	3.31	75.39	68.60	68.60
Mechanical	1,252	300	0	1,552	1,552	1,215	940	982	42	1.04	337	645	2.91	60.57	63.27	63.27
Structural	1,650			1,650	1,650	809	1,255	1,179	-76	0.94	841	338	1.40	76.06	71.45	71.45
Area D Total	30,646	525	160	31,171	31,331	17,903	19,270	18,970	-300	0.98	13,428	5,542	1.41	61.82	60.86	60.55

Attachment 4 - EPM-KPC-TP-000024 - Typical Engineering Tracking Set-up Template

TYPICAL ENGINEERING TRACKER SET-UP

LOG ID **DOCUMENT TYPE**

Log D1T	**Process Systems Drawings Log**									BUDGET F/C	TO GO	% COMP.	EARNED BUDGET
Activity Txxx - Drawings (Type 1)	AREA	Start CADD 5%	IFR 20%	IFA 30%	IFH 50%	IFD 60%	IFC 80%	Database Complete 90%	Revisisons Complete 100%				
Drawing # 1, Unit 1	S - Location 1 F - Location 1 A - Location 1												
Drawing # 2, Unit 1	S - Home Office F - Home Office A - Home Office												
Subtotal for Activity Txxx	S - Location 1 F - Location 1 A - Location 1												
	S - Home Office F - Home Office A - Home Office												

Activity Tzzz - Drawings (Type 1)	AREA	Start CADD 5%	IFR 20%	IFA 30%	IFH 50%	IFD 60%	IFC 80%	Database Complete 90%	Revisisons Complete 100%				
Drawing # 1, Unit 1	S - Location 1 F - Location 1 A - Location 1												
Drawing # 2, Unit 1	S - Home Office F - Home Office A - Home Office												
Subtotal for Activity Tzzz	S - Location 1 F - Location 1 A - Location 1												
	S - Home Office F - Home Office A - Home Office												

Attachment 4 - Continued

LOG ID **DOCUMENT TYPE**

Log HAS	**Process Systems Drawings Log**									BUDGET F/C	TO GO	% COMP.	EARNED BUDGET
Activity T@@@ - Drawings (Type 2)	AREA	Start CADD 5%	IFR 30%	IFA 50%	IFH 70%	IFD 90%	Revisisons Complete 100%						
Drawing # 1, Unit 1	S - Location 1 F - Location 1 A - Location 1												
Drawing # 2, Unit 1	S - Home Office F - Home Office A - Home Office												
Subtotal for Activity T@@@	S - Location 1 F - Location 1 A - Location 1												
	S - Home Office F - Home Office A - Home Office												

Activity T### - Drawings (Type 2)	AREA	Start CADD 5%	IFR 30%	IFA 50%	IFH 70%	IFD 90%	Revisisons Complete 100%						
Drawing # 1, Unit 1	S - Location 1 F - Location 1 A - Location 1												
Drawing # 2, Unit 1	S - Home Office F - Home Office A - Home Office												
Subtotal for Activity T###	S - Location 1 F - Location 1 A - Location 1												
	S - Home Office F - Home Office A - Home Office												

Attachment 4 - Continued

LOG ID **DOCUMENT TYPE**

Log CT	**Process Systems Calculations**									BUDGET F/C	TO GO	% COMP.	EARNED BUDGET
Activity T+++ - Calculation	AREA	Start 5%	IFR 30%	IFA/IFQ 50%	IFP/IFC 90%	Vendor Print Code 1/4# 100%							
Calculation # 1	S - Location 1 F - Location 1 A - Location 1												
Calculation # 2	S - Home Office F - Home Office A - Home Office												
Subtotal for Activity T+++	S - Location 1 F - Location 1 A - Location 1												
	S - Home Office F - Home Office A - Home Office												

LOG ID **DOCUMENT TYPE**

Log TT	**Process Systems Tasks**									BUDGET F/C	TO GO	% COMP.	EARNED BUDGET
Activity T$$$ - Supervision	AREA	0%	20%	40%	60%	80%	100%						
Engineering Discipline Lead	S - Location 1 F - Location 1 A - Location 1												
Engineering Discipline Lead	S - Home Office F - Home Office A - Home Office												
Subtotal for Activity T$$$	S - Location 1 F - Location 1 A - Location 1												
	S - Home Office F - Home Office A - Home Office												

Attachment 5 - EPM-KPC-TP-000025 - Engineering Tracker Deliverables Count Template

ENGINEERING TRACKER - DELIVERABLES COUNT

Project No. : _____
Project Descripton : _____
Project Location : _____
Entity : _____
A/E Firm : _____

Report Date : _____
Week Ending : _____

	TOTAL		LAST WEEK			THIS WEEK			TO DATE		
Code Discipline Description	Plan	Forecast	Plan	Actual	Variance	Plan	Actual	Variance	Plan	Actual	Variance
D Area D - Facilities											
Architectural	20	25	10	11	1	2	3	1	12	14	2
Eng'rg Management	30	30	15	17	2	1	1	0	16	18	2
Civil	25	30	12	10	-2	1	1	0	13	11	-2
Electrical	15	15	7	8	1	2	1	-1	9	9	0
General	18	18	9	10	1	1	1	0	10	11	1
Instrumentation	12	12	6	7	1	2	1	-1	8	8	0
Mechanical	12	15	6	5	-1	1	1	0	7	6	-1
Structural	10	12	5	5	0	1	1	0	6	6	0
Area D Total	**142**	**157**	**70**	**73**	**3**	**11**	**10**	**-1**	**81**	**83**	**2**

Attachment 5 - Continued

ENGINEERING TRACKER - DELIVERABLES COUNT

Project No. : _____
Project Descripton : _____
Project Location : _____
Entity : _____
A/E Firm : _____

Report Date : _____
Week Ending : _____

Code Discipline Description	TOTAL		LAST WEEK			THIS WEEK			TO DATE		
	Plan	Forecast	Plan	Actual	Variance	Plan	Actual	Variance	Plan	Actual	Variance
D Area D - Facilities											
1. Architectural	20	22									
1.1 Drawings	20	22									
1.1.1 Started			8	7	-1	1	1	0	9	8	-1
1.1.2 IFR			7	6	-1	1	1	0	8	7	-1
1.1.3 IFA			5	5	0	1	1	0	6	6	0
1.1.4 IFC / Rev. Comp			3	2	-1	1	1	0	4	3	-1
2. Civil	25	25									
2.1 Drawings	25	25									
2.1.1 Started			5	4	-1	1	2	1	6	6	0
2.1.2 IFR			4	3	-1	1	2	1	5	5	0
2.1.3 IFA			3	2	-1	1	2	1	4	4	0
2.1.4 IFC / Rev. Comp			2	1	-1	1	2	1	3	3	0
3. Electrical	37	42									
3.1 Specifications	7	7									
3.1.1 Started			3	3	0	1	1	0	4	4	0
3.1.2 IFR			2	2	0	1	1	0	3	3	0
3.1.3 IFA			2	2	0	1	1	0	3	3	0
3.1.4 IFC / Rev. Comp			1	1	0	1	1	0	2	2	0
3.2 Drawings	30	35									
3.1.1 Started			8	9	1	1	1	0	9	10	1
3.1.2 IFR			6	8	2	1	1	0	7	9	2
3.1.3 IFA			5	7	2	1	1	0	6	8	2
3.1.4 IFC / Rev. Comp			4	4	0	1	1	0	5	5	0