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1.0 PURPOSE

A project forecast is a periodic reassessment of a project's scope, cost, and schedule. The extent of the forecasting effort is dependent on project size, complexity, and scope. This applies to projects that fall into the categories of Large, Medium and Occasional. Requirements for project forecasting are established as part of the Project Controls Plan.

This procedure provides guidelines to the project team for the systematic and coordinated planning and development of project forecasts, including general information regarding their review and presentation.

The objectives of a project forecast are to:

- Provide a full re-evaluation of the project cost and project schedule status (to-date and to-go quantities)
- Determine critical items for Project Management review and action
- Provide a sound basis for future project control

This procedure applies to works performed under all Government construction projects executed throughout the Kingdom of Saudi Arabia.

2.0 SCOPE

The project forecast provides Project Management with the best current evaluation of the total cost and schedule information necessary to complete the specified scope of work and a consistent baseline to measure the status of the project relative to its budgeted goals. The project team should be able to take appropriate actions to maintain the most cost-effective methods for completing the assigned scope.

3.0 DEFINITIONS

Definitions	Description
BIM	Building Information Modeling
QURR	Quantity Unit Rate Report is weekly report to monitor hours worked and productivity rates achieved by manual labor
Payroll Benefits	Additional labor charges curried by employee
Bulk Materials	Those commodities, such as concrete, formwork, reinforcing steel, embedded metal, wire, cable, conduit, cable tray, pipe, fittings, valves, instruments, general building materials, etc., that, for the most part, are purchased in quantity and fabricated or assembled in the field. Generally, they are interpreted to mean all materials that are not defined as equipment. For the purpose of forecasting categories, bulk materials exclude materials that are supplied and installed by subcontractors.
Cash Flow	Cash flow is the schedule of anticipated cash requirements for capital expenditures over the life of a project.
CoCo	Cost and Commitment
Contingency	The amount of money, jobhours, and time that must be included in an estimate, forecast, and schedule to provide for uncertainties in quantity, pricing, productivity, activity duration, and timing that lie within the defined scope of the project. This funding is held separate from any specific direct or indirect accounts and should be released for use

	only by the Project Manager or Site Manager upon recognition of approved trends.
Cost contingency	Cost contingency is the cost and jobhour allowance needed to provide for uncertainties that are included in the defined scope of the project, schedule date, and Entity normal experience and control.
IFC	Issued for Construction
Schedule contingency	Schedule contingency is the amount of time and associated costs that should be included in certain elements of the project schedule to provide for uncertainties in the duration required to complete the project.
Current Budget	The current budget is the project original budget plus any subsequent scope changes that have been approved.
Current Forecast	The latest approved forecast data plus resolved trends. It is used to represent current project status to the Project Management. It is an estimate for a specific future period, based on given events or conditions.
Direct Labor	All direct-hire labor engaged in erecting or installing equipment and materials and performing improvements that form a permanent part of the finished plant. All direct labor is manual labor, including General Foremen, Foremen, Journeymen, and Apprentices.
Distributable Field Costs	Material and labor costs that cannot be identified with specific direct operations in the construction of a plant and are either supporting services by nature or apply in such a way to several direct operations that a logic allocation to each separate operation cannot readily be made. This includes the cost of construction equipment and the cost of materials and labor to construct temporary facilities and perform supporting services relating to the construction of a facility such as temporary utilities, sanitation, and cleanup services.
HS&E	Health, Safety and Environment
Entity	A Saudi Government organization which is responsible for the delivery of government funded infrastructure construction projects.
DOR	Division of Responsibilities
Escalation	Changes in the basic cost of materials and services that may occur from the base date of an estimate or forecast to the time when the material is purchased or delivered or the service is performed. Escalation generally relates to the price trends occurring in a given segment of the industry, while inflation is the aggregate average of a large number of changing prices and costs throughout the economy. The two are related but rarely equal to one another.
Forecast	The best current evaluation of total project costs, quantities, jobhours, and schedule, as determined from progressive evolution of the project. Some of the key elements are more definitive design and scope definition, pricing information, labor performance or productivity, cost and commitments

	to date, etc., that have evolved apart from the changes identified in the trend program.
HVAC	Heating Ventilation and Air-Conditioning
HCR	Historical Cost Report
Material Equipment	Those components completely shop-assembled before delivery to the jobsite and that provide storage such as HVAC systems.
PO	Purchase Order
SAR	Saudi Riyal
Subcontracts	Contracts with third parties to perform portions of the field construction work, often including necessary materials and sometimes engineering services.
Trends	Potential changes with respect to the budgeted scope and costs of work and schedule due to any causes that evolve as the work progresses. Early detection and analysis of trends are accomplished in the trend program through a system of continuous monitoring and monthly reporting of design and construction developments. The trend program is designed to alert Entity Management to the need for timely decisions and remedial action.
To-Go Quantities	Quantities defined as *to go* are materials not yet installed that are required to construct the designed facility.
Installed Quantities	Quantities reported as *installed* are materials that are required to construct the designed facility and do not include quantities installed for construction convenience, overage, error, or waste.
PCM	Project Controls Manager
SM	Site Manager
EPPR	Engineering Progress and Performance Reporting
Actuals	The costs or hours of work performed or incurred and recorded in accomplishing a scope of work which was performed within a given time.

4.0 REFERENCES

1. EPM-KPP-PR-000001 - Project Planning and Scheduling Definitions and Concepts Procedure
2. EPM-KPP-PR-000007 - Project Schedule Look-ahead Procedure
3. EPM-KPC-PR-000007 - Project Trend Program Procedure
4. EPM-KPC-PR-000003 - Project Cost and Commitment Procedure

5.0 RESPONSIBILITIES

Each project team member has assigned responsibilities for the production of forecasting information, including the responsibility for ensuring that all forecasts or areas of their jurisdictions are correctly and completely produced in accordance with the forecast plan and schedule; each member must provide input to and review the forecast.

The Project Controls Manager should develop a division of responsibility (DOR) for the project team to clearly show who is responsible for the various levels of activity within the forecast. The named individuals most likely will be supervisors or group leaders, but also should be specific to individuals doing the work, depending on the level of detail the project finds most useful. The responsible parties should consider off-project support from the Project Controls central groups to provide support and allow the project team to not lose focus on the progressing project during the forecast period. Generally, the following DOR guidelines is standard but should be specifically modelled for each project.

5.1 Project Manager

The Project Manager is ultimately the presenter of the results of the forecast when it comes time to review with Senior Management. They are responsible for the following:

- Maintaining overall responsibility for the forecast effort and for directing the planning and development of all project forecasts, including reviewing and approving the forecast for presentation to Senior Management and informing and/or obtaining approval from the Entity where applicable
- Supporting the necessary coordination among the staff team members to ensure that the forecast is being conducted in as accurate and timely a fashion as possible
- Interceding as needed for any off-project roadblocks that might be affecting the progress of the forecast

5.2 Project Controls

The Project Controls Manager is the principal person responsible for planning, implementing, and compiling the forecast within the project and for coordinating, preparing, and summarizing the results of the forecast for presentation. This includes preparing the forecast implementation plan/schedule and getting the concurrence and cooperation of the project team for implementation. In support of the Project Controls Manager

- Trend Engineer or a Senior Cost Engineer may be appointed as the Forecast Coordinator and given the task of executing the forecast in detail.
- Project Estimator may also be asked to participate in the forecast.
- PC team must ensure that the forecast effort is well coordinated, maintains schedule progress, and provides high-quality information that is well presented and with appropriate supporting detail
- Cost Engineering is responsible for the integrity of the cost/commitment register, including the cost coding of commitments and expenditures, and the overall cost and commitment (CoCo) program

5.3 Engineering

Engineering is responsible for developing all quantities for the project. It is recommended that all quantities are submitted and reviewed by the Project engineer for Project Manager approval early enough in the forecast cycle to be appropriately used by others as a baseline on their forecast.

- Project Engineer is primarily responsible for approval of all quantity projections. The Project Engineer is also responsible for providing Engineering staffing plans and remaining durations of personnel.
- Each discipline lead should provide supporting detail of the commodity evaluations with which they are responsible.

5.4 Subcontracts

The Subcontract Administrator is responsible for pricing and administrating all project subcontracts.

- Updating Subcontract Registers
- Updating Contract Assignment Schedule.

5.5 Site Manager (SM)

The Site Manager is responsible for the review and approval of the field portion of the forecast, including the detailed forecast of field labor, plant equipment, bulk materials, subcontracts, field distributable costs, and construction intermediate schedule. The SM, assisted by the Project Controls Manager and the Craft/Area Superintendents, is responsible to provide Project Controls with the following data:

- A detailed schedule of non-manual personnel by position and name is required to complete the project.
- A detailed plan of construction equipment utilization and availability over time
- A forecast of to-complete unit productivity factors by commodity

- A forecast of the total manual labor staffing level by craft with a schedule of anticipated premium overtime or shift time (includes labor hours to complete, by cost code)
- A detailed forecast for each of the major field distribs accounts

5.6 Testing and Commissioning Manager

The Testing and Commissioning Manager is responsible for all costs projected in the field for testing works. This includes craft productivity analysis, which takes into account any identified quantity changes, Testing staffing plans, craft/non-manual non-labor costs, distributable accounts, mobilization and demobilization costs, etc.

5.7 Project Field Engineer

The Project Field Engineer is responsible for providing Project Controls with the following information:

- A list, including description and cost, of pending vendor extra charges
- Quantities installed to-date by cost code
- Verification of quantity development for all commodities/activities

5.8 Project Field Accountant

The Project Field Accountant is responsible for providing Field Project Controls with the following information:

- The total to-date commitment and cost incurred by cost code for all materials, subcontracts, and distributable materials and services. [The responsibility for posting, maintenance, and reconciliation of the CoCo register is established on a project-by-project basis and may be assigned to either the Cost Engineer or to the Project Accountant.]
- The total inception-to-date and this-month field financial statement by accounting cost code
- Anticipated payroll taxes, insurance percentages, and project insurance rates (including notification of potential rate changes and coverage)
- Anticipated changes in craft wages and fringe benefits
- The total inception-to-date and this-month jobhours charged by cost code by craft
- The total inception-to-date manual labor cost by craft, including straight time and overtime
- A forecast of anticipated field office costs

5.9 Field Procurement Supervisor

The Field Procurement Supervisor is responsible for providing Project Controls with the following information:

- A copy of the Field Purchase Order Register
- A subcontract plan update
- Copies of all field subcontracts, POs, and amendments as they are issued
- A list of surplus direct materials, including description, quantity, and salvage value
- A list of pending field requisitions, and revisions to field requisitions, including description and cost, that have not been issued or posted in the CoCo Register
- Delivery status of long-lead items, including interim milestones attained
- Progress of shop fabrications and status of delivery dates
- Pending and potential claims

5.10 Human Resources

The Labor Relations Representative is responsible for providing Project Controls with the following information:

- Changes in work rules, including items necessary to support schedule
- Anticipated changes in craft wages and fringe benefits
- Possible shortages of critical skills

6.0 PROCEDURE

6.1 General

6.1.1 Timing

Project forecasts are to be performed according to the Stage Gate process for the cycle of the project, and each forecast can take up to 2 to 3 months to complete. For projects that have duration of 2 to 3 years, the following cycle will be typical:

- Forecast 1 is typically performed when the engineering design is approximately 50–60% complete. This allows the primary commodities to be re-evaluated against the original estimate, and any subsequent changes can be evaluated throughout the project scope. This forecast focuses on Engineering and Procurement, along with any follow-on impacts to Construction and testing.

- Forecast 2 takes place when construction is approximately 50–60% complete. At this point, engineering is complete or nearly complete and evaluating field performance is the primary focus. Emphasis is on construction and testing, with only minor adjustments to engineering and procurement.

Following the second forecast, projects with a 2 to 3 years duration do not need to do another project evaluation until the completion of the job, when the Historical Cost Report (HCR) becomes the final assessment. Projects whose duration is greater than 2 to 3 years will conduct forecasts annually.

All projects will use these guidelines, although there are sometimes special circumstances that can alter these dates or cause the need to undertake additional evaluations on the project.

6.1.2 Definitions

Quantity definitions are in Attachment 1 – Quantity Development Basis, the attachment describes the methods used to develop the to-go quantities.

6.2 Forecast Implementation Plan

6.2.1 Scope of Forecasting Effort

The preparation of a project forecast involves the development, collection, estimation, analysis, and consolidation of a large amount of information through the collective efforts of many people. This must be accomplished in a relatively short period of time (approximately 2-3 months) in order to minimize the disruptive influence that a forecast effort creates on project. Such an undertaking can be most effectively accomplished only by careful pre-planning and getting the team's complete cooperation. This pre-planning must be documented in standard form and enough detail so that all participants in the forecasting effort know what is expected of them and when it is completed.

Regardless of the scope of the project, project controls must have a thorough understanding of the development, practice and procedure of effective control systems; the raw data required to drive the systems, the products to be produced by the systems and the processes undertaken by each system in order to be able to interpret and forecast the probable course of a project in terms of cost and schedule.

This procedure includes a set of spreadsheets that standardizes the roll-up and presentation levels of the various component elements of the forecast. The relationship of the spreadsheets has been identified in Attachment 3 – Flowchart of Hierarchy File Tree, which has been broken down into the respective hierarchy levels:

- Levels 1 and 2 are management summaries
- Levels 3 and 4 and below are working levels of detail that roll-up to the management summaries

The lower level detail cost worksheets are linked to the appropriate cells in the summaries so that reporting of the results can be displayed consistently and with minimal difficulty by the Project Controls team.

The study of the flowchart, along with the linked templates, provides the methodology of how the forecast package is structured.

The templates have been designed to provide the basic standard model of presentation that includes all the necessary graphs and summary roll-ups that would be acceptable for the Entity Management review. It is recognized that some projects may wish to supplement the package or provide additional levels of detail to back up their forecast. These additions can be brought into the package by simply tying-in or linking into the appropriate summary level sheets.

The forecast implementation plan is the first effort that must be prepared and discussed during a kick-off meeting to ensure that all the participants are aware of their responsibilities (Attachment 4 – Forecast Implementation Plan*).* The Project Controls Manager, under the direction of the Project Manager, prepares this for each project forecast. After team reviews and modifications as applicable, the plan is issued by the Project Management for implementation. The forecast implementation plan covers the period from the project team kick-off meeting through presentation to the Entity Senior Management. Forecasts are to reflect meaningful progress rather than a rigid timetable.

The project forecasting process consists of the following phases:

- Planning
- Preparation
- Presentation and review

Each of these phases is discussed in following sections of this procedure.

6.2.2 Forecasting Milestone Schedule

A bar-chart-style milestone schedule that shows timing and duration of the major forecasting elements, reflecting the specific requirements for the project's forecast, should always be issued (Attachment 5. – Forecast Development Schedule). This plan should be at a high enough level to show the significant milestone events and scheduled reviews, yet detailed enough to be useful for depicting the implementation of the plan, advising participants of their assigned tasks, and identifying conflict areas. The Division of Responsibility assignment for the scheduled activities should be included so there is no question about who should do what.

The Project Controls Manager should status this schedule regularly to ensure that the overall timing is maintained and, if corrective action is necessary, inform the responsible parties. Significant deviations are reported to the Project Manager for any further action that may be required. More detailed schedules for activities performed within a given group may be prepared by that group. The Project Control's Manager or other appropriate coordinator of the related activities establishes dates for any necessary interface between groups.

The Project Controls Manager should allow sufficient time in the forecast schedule to provide for a number of reviews. It is recommended that major sections of the forecast be reviewed with key project personnel as each of these sections are completed. This would pertain to such items as quantity development, manual labor, sub/contracts, indirects, materials, etc. Conducting these intermediate reviews and approvals allows for positive feedback and concurrence to the Project Controls Manager as the forecast progresses, without waiting to the very end and potentially surprising the team. This also helps to keep the key participants involved in the critical decision-making points along the way, which is their responsibility.

6.2.3 Cut-off Date

The forecast is based on establishing a firm job-to-date baseline of actual data and then projecting what remains to be accomplished (the to-go). It is therefore important to be sure that the forecast cut-off is consistent across all project forecast team members and when selected, allows sufficient time for the project to remain focused on successfully completing the forecast with minimal interruptions. Care should be taken, for example, to be mindful of extended holiday periods when these lapses might inordinately interrupt the continuity of the forecast.

The official forecast cut-off date is the day as of which project scope definition is fixed as the basis for the forecast. Any subsequent scope evolution that departs from that defined scope is usually not incorporated into

the forecast detail although it may be reported as potential changes. Usually, the engineering cut-off date is designated as the day when all design information must be in the possession of those developing the cost forecast, in recognition of the fact that time to prepare the forecast is limited and late information may be unusable. This requirement should not be so strictly interpreted, however, as to preclude the use of later design developments that it would be prudent to include in the forecast. Caution must be exercised when changes past the cut-off date will have adverse effects on downstream evaluations by others and possibly adversely affect the forecast schedule completion.

The forecast cut-off date should also coincide with the accounting month-end cut-off of costs to-date. The to-date files of actuals should be as clean as possible for transfers and pending adjustments. Special care should be taken to recognize any reporting time-lags for remote jobsites or execution offices. Prior to the forecast cut-off date, the to-date information contained in all database files and reference curves must be reviewed to ensure that they are correct, up to date, and reconciled with other related data sources.

The forecast implementation plan should allow for a thorough clean-up period of records-to-date data such as cost and commitments; designed, received, and installed quantities; scope change status; etc., such that they may be accurately updated by the forecast cut-off date.

6.2.4 Establish Budget for Forecasting Effort

The Project Controls Manager should develop a budget by department for the entire forecasting effort reflecting all the members of the workforce that are expected to be employed in the forecasting process. This budget should be monitored by the Senior Cost Engineer along with the forecast schedule and key dates. Deviations from this budget should be brought to the attention of Project Management for corrective action, if necessary.

This budget and the feedback gained from an effective monitoring program provide a valuable tool for planning future forecasts.

6.2.5 Establish Requirements for Backup

The Project Controls Manager should review with each participant the type of backup to be required, including degree of detail necessary to explain, reconcile, and build up the quantity, material, contract, and labor amounts for the forecast.

The intent is to produce standard backup, consistent in appearance and format, to facilitate review and approval of the forecast.

Additional cost and schedule studies, personnel staffing and performance data, and progress curves may be required for supporting documentation. It is important to make these requirements clear during forecast planning to avoid last-minute issues.

6.2.6 Kick-off Meeting

The kick-off meeting is the occasion for all project team members to reach a final understanding and agreement on what is to be done, who will do it, and how and when it will be done, as represented in the forecast implementation plan. Although the plan has been prepared in consultation with the project team members, this kick-off meeting provides the members with their opportunity to review the plan as a whole. This joint discussion may reveal that modifications or refinements are necessary to correct possible prior misconceptions, to improve coordinated actions and activities through Division of Responsibilities clarification, etc. The objective is to have a plan with which all concur and to which all are committed.

The Project Controls Manager is responsible for scheduling the kick-off meeting and inviting all project team members and any others whose attendance enhances discussion on specific points. He/she also establishes the agenda for the meeting and presides over the discussion. The meeting is normally timed to take place about 2 weeks prior to the forecast cut-off date. The timing, length of meeting, agenda, etc., vary depending on the particular forecast requirements and whether it falls early or late in the project schedule. Following concurrence by the project team, the Project Manager issues the forecast implementation plan (Attachment 4 – Forecast Implementation Plan).

6.3 FORECAST DEVELOPMENT

6.3.1 Schedule Analysis

The Project Controls Manager reviews the project schedule basis to be used for the forecast with the Project Manager. The agreed-upon schedule and milestone data should be provided to the project team for use as the basis for their individual evaluations. During the forecast preparation, the project schedule basis is adjusted as needed and confirmed by the feedback from Engineering, Contracts, and Construction.

Engineering reviews the remaining design deliverables and staffing requirements, comparing them against the project schedule. Contracts reviews the delivery of major equipment and bulk materials. Construction reviews the productivity factors and installation rates, installation sequence, availability of craft and equipment resources, staffing requirements and peaks, and plants/site physical restraints.

The Project Planner must be tied into the quantity changes that would affect the bulk commodity curves and, ultimately, activity durations. After incorporating all forecasted changes, the Project Planner analyzes the schedule for critical paths and impacts on changes to project costs and milestones. Recommendations are made to the project team regarding the necessary actions required to support the new forecast project schedule. Once the project team is in agreement, the forecast should include a revised target schedule and revised bulk commodity curves.

6.3.2 Quantity Development

6.3.2.1 Preliminary Development

Accurately reflecting the project's quantities is usually the most critical element in presenting a successful cost and schedule forecast. Each discrete component or element within the project's systems/facilities must not only be identified for what it is, but also quantified for how much there is of it, in order to establish its final cost and installation schedule. A variety of databases and baselines must be reviewed in order to provide an accurate forecast of quantity scope with sufficient backup and comparisons to justify the results.

The forecast package contains templates to capture the changes in quantity. The Bulk Quantity Evaluation Worksheet is sorted by System (Attachment 6 – Bulk Quantities), which looks at each commodity at the detail level to evaluate the issued/installed to-date and project the remaining to be issued/installed. Bulk quantities are generally extracted from the 3D Model, and the various processes used to estimate the to-go quantities depend on the commodity.

There are four kinds of to-date quantities to consider:

- designed
- committed for purchase
- delivered
- installed

Most likely, these are all different values at the time of the cut-off. Understanding the status of each on the project is integral to developing a quality forecast projection.

The Project Controls Manager is responsible for verifying that all quantity ledgers or tracking logs and the Cost and Commitment (CoCo) ledgers have been updated accurately through the forecast cut-off date. They are also responsible for reconciling the to-date quantities to ensure that there are no duplications or omissions and that each is accurately recorded. The Trend Engineer is responsible for making sure that all approved changes in scope quantities in the current forecast have been properly identified and have been updated prior to starting the forecast evaluation. This includes Entity-approved scope changes, transfers, and project trends. The relationship of the costs and quantities committed to-date provides an insight to the pricing of the materials left to be committed. Similarly, the installed quantities and the corresponding to-date labor job hours together provide a guide to the labor productivity and cost that can be anticipated for similar work operations remaining to be performed
Quantities in the quantity-tracking database (3D Model, Building Information Modeling (BIM), etc.) should be checked and verified by the Engineering team and the Project Controls Manager to help determine the latest

and most qualified data. If a commodity has undergone little or no development by Engineering, and an appropriate relationship cannot be determined for reforecast purposes, then no change should be made to the current forecast until conclusive trends are available.

Engineering (either internal department or consultant) is responsible for validating the design status for all facilities, categories, commodities, and components as of the forecast cut-off date.

The Project Controls Manager is responsible for making sure the development of all forecast quantities is properly evaluated and substantiated, whether performed by Engineering or the field staff. They should obtain Project Manager and Engineering Manager concurrence for all forecast quantity totals before Project Controls can proceed with the pricing elements of the forecast.

6.3.2.2 Quantities – General Responsibilities

Quantities are made up of bulk commodities or purchases of specific equipment/unique items. The Material Assignment Schedule is the primary tool used by the project to designate the material Division of Responsibilities – Division of Responsibility (i.e., which Entity on the project is responsible for procuring the items to be purchased and installed). The Material Assignment Schedule is maintained by Contracts/Procurement in conjunction with support from Engineering and should be updated regularly.

Bulk materials comprise those commodities that, for the most part, are purchased in quantity and fabricated or assembled in the field. Generally, they are interpreted to mean all direct materials that are not defined as specific equipment, such as formwork, stock rebar, concrete, embedded metals, wire, cable, conduit, cable tray, stock pipe, fittings, valves, instruments, and building materials. They also include shop-fabricated items such as spools, hangers, reinforcing steel, etc.

For the purpose of tabulating quantities, bulk materials exclude those materials that are supplied and installed by sub/contractors. Thus, bulk materials include all direct materials purchased by the Contractor or the Entity for installation by the Contractor and/or sub/contractors.

Engineering develops forecasted quantities for bulk material commodities, including appropriate allowances for conceptual, preliminary, and detail design documents. Procurement tracks a field inventory of received and warehoused commodities. Cost Engineering verifies all to-date information, which should include a reconciliation of purchased, received, and installed quantities.

6.3.2.3 Civil, Concrete, and Structural Steel Quantities

For concrete/civil-related accounts, typically the Construction Field Engineering group has the responsibility of providing quantity take-offs or concurring in those take-offs performed by others for all work designed to-date Issued for Construction (IFC). This take-off should be sufficiently detailed to allow a crosscheck to be performed to make sure that all locations/areas have been included. This process also requires that changes from the previous estimate be clearly identified for use in the forecast reconciliation. Also, the planner must be involved in the change in quantities at a detail level so that the impact to the project schedule can be accurately evaluated.

Structural steel and miscellaneous steel are usually forecasted by take-offs of the steel detailing drawings. Typically, this would be provided by the vendor doing the detailing because it has the best available information from the issued drawings. Sufficient lead-time should be allowed to get vendors on board early in the forecast cycle to provide timely information and allow for follow-up questions.

6.3.2.4 Piping Bulk Quantities

For piping commodities, the process is dependent upon the information contained in the 3D/BIM model. The design discipline lead must have a confidence level regarding the completion status of what is represented in the model and that it is an accurate representation of the scope of work. This includes having a corresponding level of confidence that the locations of the mechanical equipment, so that pipe routings, sizes, and types are equally well defined.
This information from the design to-date should be downloaded into the quantity worksheets for each bulk commodity by system, size, and material type. From the data contained in this to-date analysis, the design

discipline lead should be able to accurately project the to-go quantities that would come from the list of drawings remaining. Pipe requiring insulation or painting requires quantification.

6.3.2.5 Electrical Bulk Quantities

Electrical bulk commodities are derived similarly to the piping quantities, only the designed to-date resides in the database. The derivation of forecasted quantities would follow the same design discipline lead evaluation of what is remaining to be identified. The Cost Engineer should tabulate the quantity relationship of the circuit count to wire and cable/terminations on a system evaluation in order to help validate the accuracy of the projections. These average-length relationships by system are meaningful in helping reconcile the quantities.

There are non-engineered commodities that are not contained in the database that must be evaluated similarly to the take-off method, like quantities such as unscheduled conduit, lighting wire and cable, fixtures, grounding, cathodic protection, etc. The Field Engineer should review the number of drawings which have been issued as IFC and to-go take-offs should be performed. The resultant quantities would constitute the design to-date, and the design discipline lead is responsible for evaluating the to-go based on the remaining drawings to be issued.

6.3.2.6 Mechanical and Electrical Equipment/Instrument Quantities

Mechanical and electrical equipment commodities that are designed to-date should also be updated for an understanding of what has been purchased or committed to-date in conjunction with the Purchase Order (PO) pricing evaluation. It is important to make sure that this evaluation is accurate relative to designed to-date and committed to-date, as the two may be distinctly different measurements. Allowance categories have been incorporated into the worksheets in order to account for engineering changes that may be in process and not included in the to-date.

6.3.2.7 Other Quantities

All other quantities not specifically addressed here may also be forecasted as determined by the Project Controls Manager. As stated earlier, the forecast worksheets require that all commodities contained in the cost control tool must be downloaded at the detail Work Breakdown Structure (WBS) level. Each commodity should be reviewed to determine the appropriate methodology for obtaining the correct to-date/to-go information and which Entity is most appropriately responsible.

6.3.3 Material Pricing

6.3.3.1 Material Equipment Pricing

Material equipment comprises of those components of the project that are shop fabricated and those delivered to the jobsite using the code of accounts and/or Purchase Order (PO's).

Prior to the forecast cut-off date, the Cost & Commitment Report ledgers or systems are updated to ensure that all authorized commitment amounts that have been received are accurately entered. Generally, by the time of the first forecast, most major permanent plant equipment has been committed.

The forecasted cost of permanent plant equipment is essentially the sum of the commitments to-date and the projected costs remaining to be committed. The pricing process is one of establishing what quantities have been committed to-date and what costs are associated with that commitment. Once the to-date has been established, it serves as a benchmark for determining what should be projected for the remaining to be committed.

The forecast worksheets have been set up to be able to provide to-date/to-go analysis for each PO. The materials analysis template provided (Attachment 7. – Material Pricing) should be used and first sorted by PO. The Cost Engineer should fully download the Cost & Commitment data contained in the cost control tool into these worksheets. Quantity information contained in the database should also be downloaded and evaluated with respect to committed to-date quantities that correspond to committed to-date costs. After the analysis is fully completed by PO, the template should be resorted by WBS to allow for rolling up to higher-level summaries.

The Cost Engineer should prepare a reconciliation of all changes to the current forecast/budget and review it with the responsible design discipline lead to justify the changes. The planner should review the latest equipment delivery dates from the procurement sheets to analyze the impact on the schedule and any change in quantities

If equipment costs are not available from procurement documents or Material Requisitions, pricing may be obtained from procurement price books or price lists for most standard items of equipment. In addition to bid tabulations accompanying procurement documents being processed, those for similar equipment from another project, or, in specific cases, informal vendor's quotations obtained through Procurement may be used as pricing guides where these methods are believed to be more accurate than current budget cost.

Considerations for pricing should take into account the following items:

- Base prices, as may be obtained from a Material Requisition, informal or formal vendor's quotations, price books, historical experience, etc.
- Freight from point of shipment to jobsite, if not Freight On Board jobsite
- Vendor's service representatives
- Sales and use taxes; import/foreign taxes if applicable
- Discounts, as may be currently quoted for price books
- Escalation in accordance with the probable price adjustment clauses or other pricing practices of prospective vendors. Collaborate with Procurement to compare the escalation rates used by the project to the Global Supply Trends.
- Vendor's engineering costs and drawings, shop fabrication, and testing for engineering items.
- Special consideration for international jobs, determined by the Project Controls Manager
- Miscellaneous material – The cost of material equipment also includes the cost of miscellaneous materials required for installation. The forecast of to-be-committed miscellaneous materials is based on charges experienced to-date and on previous experience with similar types of equipment from this or other projects.
- Allowances – both specific and general, as determined by the reviewing entities, i.e., Engineering, Procurement, and Project Controls. General allowances should be acknowledged and approved by the Project Manager.

6.3.3.2 Bulk Material Pricing

Overall pricing for bulk quantities is based on being able to accurately determine actual unit prices for the quantities billed to-date and, based on that determination, being able to project the unit price/costs to-go for the material remaining to be purchased. In this to-date/to-go analysis, it is important to have a good understanding of what is included in the to-date unit price before arbitrarily projecting the to-go. The pricing analysis must account for the specific mix of material that may have a bearing on pricing, such as size and type of material billed versus the overall quantity forecasted.

For pipe pricing, for example, it is likely that early billings do not include the costs for fittings that go along with the pipe. If this “fitting factor” is missing and therefore projecting an arbitrarily low unit price in the to-date, that needs to be compensated for in the to-go pricing. Also, on the to-go side consider unique items such as escalation, salvage and resale values for possible surplus materials, or added costs for demobilizing leftover material.
Fabricated materials may be priced in one of two methods. If they are identified by a unique account code, they may be priced by account, based on such factors as stage of design development and definition, trends, etc. Alternatively, they may be priced by PO using the terms of the procurement documents covering their purchase accounts; as design develops, installed quantities can be transferred to direct accounts. It is important that the shop-fabricated pipe commitment and forecast be based on a field-determined analysis. Budget figures should be used until design progress allows such an analysis.

6.3.4 Contracts/Subcontracts/Consultancy

For the purpose of forecasting, the most important factor to consider is the type of contract used. Depending on contract types, different techniques may be applied to achieve the required results.

6.3.4.1 General Responsibilities

The forecast worksheets used for the evaluation process of the Contracts/Consultancy/Subcontracts are a similar process to that performed on the materials costing, shown in Attachment 8 – Sub/contract Pricing. If there are quantity forecast issues to be addressed the responsible engineers identify and develop their values and include them against the appropriate Contracts/Consultancy/Subcontract's scope.

The Cost Engineer must make sure that the cost and commitment information has been accurately added into the cost control tool. This information can then be downloaded and entered into the detailed worksheets by pay item and account code.

With the assistance of the Cost Engineer, the Contracts Administrator develops the forecast for each of the sub/contractors. The forecasts should take into consideration such factors as types of contracts, special provisions, construction schedule, to-date labor performance, quantities remaining to be installed, special amendments (approved and pending claims, allowances for future claims over duration of remaining contract), future escalation, recoverable backcharges, etc.

The Cost Engineer combines the updated worksheets with other parts of the field forecast and forwards the information for consolidation into the total forecast.

6.3.4.2 Forecast Analysis of Basic Contract/Subcontract Types

The methodology and techniques used to forecast a subcontract are largely dependent on the contract/subcontract type. The following is an explanation of the basic types of contract/subcontracts and the key components that should be analyzed when forecasting. It should be noted that not all subcontracts are strictly one type, but may have different terms for different pay items or work operations. For this reason, one contract/subcontract may require more than one data analysis method or a combination.

6.3.4.3 Lump Sum

For a lump-sum item, the contractor/subcontractor is obligated to complete a fixed scope of work for a fixed price. The contractor/subcontractor does not normally report installed quantities but may be required to for progress payment purposes.

Any change to the original terms requires an amendment to the contract/subcontract. The total amount committed to-date should reflect the fixed price plus any subcontract amendments and any implied costs. An analysis should be made to determine the value of any changes currently being negotiated (specific allowances) plus potential changes that have not been negotiated (general allowances). The total of committed to-date plus to-be committed changes and allowances is the new forecast.

6.3.4.4 A Unit Price

For a unit-price item, the contractor/subcontractor is obligated to install an estimated number of units of a given commodity at a fixed unit price. The fixed unit price may or may not include the material price of the commodity. The basis for payment to the contractor/subcontractor is installed quantities. The basis for forecasting final cost is total forecast quantities.

An analysis of the contract/subcontract terms should be performed to determine if the unit price would vary depending on the total quantity. For example, some contracts/subcontracts state that if the final quantities vary more than a fixed percentage from the estimated quantities, those quantities are priced at a renegotiated rate. Such price adjustments are normally covered by contract amendments.

If forecast quantities are within contract tolerances, the forecast cost can be calculated by extending forecast quantity by contract unit price. If forecast quantities are not within contract tolerances, the to-be installed quantities must be priced at renegotiated unit rates, and reconciliation should be performed to determine the difference in quantity installed to-date and quantity paid to-date to assist in pricing the to-be paid quantity. This analysis must include approved and pending claims.

6.3.4.5 Reimbursable Cost/Cost Plus

For a cost-reimbursable item, the contractor/subcontractor is paid for actual (direct) material and labor cost expenditures to complete a given scope of work. In addition, compensation may also be paid for overhead expenses and fee. Some contracts/subcontracts include provisions for a guaranteed minimum, target job-hour incentive or bonus/penalty clauses.

Forecasting a cost-reimbursable contract/subcontract includes pricing several components, such as material and equipment quantities, labor job-hours, rental equipment, on and off expenses, overhead (may or may not include contract/subcontract non-manual), engineering, and fees.

An analysis should be made of the contractor/subcontractor's current scope of supply or services, including a detailed quantity take-off by pay-item account.

Contractor/Subcontractor job-hours may be determined from unit job-hour extensions of forecast quantities or from manpower schedules based on quantity installation curves. For most contracts/subcontracts, one or more of these documents are required for scheduling with other construction tasks.

6.3.4.6 Variations of the Basic Types

Most contracts/subcontracts are usually variations of the basic types listed above and may contain a combination of several factors. Variations that may be encountered include lump sum with add and deduct unit prices, cost plus percentage fee, cost plus fixed fee, guaranteed minimum, and target.

6.3.4.7 Sub/contract Evaluation Forms

The Sub/contract Administrator should maintain a sub/contract forecast data sheet, which is continuously updated with ongoing changes as they are being processed (Template 8.7 – Subcontract Pricing). These sheets should provide the evolutionary change in contract value from the original award through all approved and pending changes to get to the current contract value. At forecast time, these sheets are reviewed and checked for completeness. They then represent the detail backup for the analysis of each sub/contract. Each forecast usually includes allowances for the claims trending program (specific allowance). This analysis has significance on large sub/contracts. Claims trending and subsequent forecasting of various claims information (e.g., lack of accessibility, idle equipment due to late material, design discrepancy, weather, sub-vendors strikes, etc.), can ultimately affect claims negotiations and settlements.

6.3.4.8 Sub/contracts Forecast Worksheets

The data contained in the forecast data sheets is transferred to the forecast worksheets (Attachment 8 – Sub/contract Pricing), which rolls up the to-date/to-go information by sub/contractor by WBS. Specific and general allowances may be applied as appropriate for the remaining work. Rollups of this Level 4 information automatically summarize the sub/contract forecast.

6.3.5 Direct Labor

This section is intended to present some guidelines for the preparation, review, and approval of the field manual labor forecast. The Site Manager is responsible for the forecast of craft jobhours to be expended on a project. The Field Cost Engineer supports this effort by compiling and preparing the forecast with their support along with other departments, such as Field Engineering, Accounting, and Labor Relations. The manual labor forecast consists of evaluating the to-date and to-go labor performance to produce a jobhour forecast and then pricing the jobhours to develop a forecast of manual labor costs.

Manual labor performance is monitored and trended on a weekly basis using the Quantity and Unit Rate Report (QURR), which is produced by the cost control system. This weekly trend is based on the comparison of the approved quantities of the current forecast to the actual quantities installed. At forecast time, detailed updating of the total project scope, quantities, and productivity is evaluated. The following guidelines can be used for forecasting the manual jobhours to be expended.

6.3.5.1 Forecast Guidelines

Based on the project's unique forecast plan, the Field Cost Engineer should prepare a list of guidelines and assumptions to be used in the preparation of the manual labor forecast. Scope definition, responsibilities, areas of emphasis, project schedule (overtime, shift work, resource loading, etc.), techniques, and forms to be used are some of the considerations. The intent is to give the people working on the forecast a common set of instructions from which to project the work completion

6.3.5.2 Quantity and Scope Information

It is imperative that the total forecast quantities have been reviewed and approved and supplied to the Field Cost Engineer and the Planner as early as possible in the forecast cycle. These quantities should be listed by code of account, with all documentation backup and take-offs included. In connection with updating the quantity ledgers/tracking files, Field Engineering validates to the Cost Engineer all the installed to-date quantities by detail account (Attachment 9 – Direct Labor).

The Trend Engineer must make sure that all scope change and trend quantities approved prior to the forecast have been updated accurately within each WBS. Usually this update takes place in the cost control tool prior to conducting the download to the forecast worksheets.

6.3.5.3 Actual Costs To-date

After making any necessary changes to achieve the verified to-date quantities in the cost control tool, the Cost Engineer runs a revised Quantity Unit Rate Report showing the current budget and trend forecast. These reports are reviewed for obvious discrepancies as evidenced by inappropriate quantity/jobhour relationships. As an example, the following items may indicate improper jobhour reporting, which should be further investigated:

- Accounts with installed quantities reported but no jobhours
- Accounts with jobhours reported but no quantities
- Similar accounts with vastly different performance or unit rates
- Extremely high or low unit rates or productivity
- Overrunning distributable accounts

At this time, the Cost Engineer should also review the detailed printout of the craft labor distribution report for inappropriate craft charges to accounts; cement masons in the electrical bulk accounts or boilermakers in the instrumentation accounts may indicate that further investigation is necessary. Discrepancies should be minimal, as this report should have been reviewed regularly with supervision. Appropriate adjustments should be made and a final labor/Quantity Unit Rate Report set of reports rerun. Once a reasonable level of accuracy has been attained for the to-date quantities and jobhours by account, the data can be downloaded from the Quantity Unit Rate Report into an Excel format to conduct the craft performance to-date analysis.

6.3.5.4 To-Go Performance/Installation Rates

At this juncture, typically the to-date unit rates relative to current performance and percent complete can be reviewed with the responsible Superintendent to determine the to-go jobhours/unit rate. Once all the accounts have been reviewed in detail and either the to-go information (unit rates or jobhours) or the total forecast has been input to the worksheet, the new forecasted craft jobhours can be summarized and comparisons can be drawn. Close scrutiny and higher-level reviews should follow to make sure that the project team has accepted the overall change in jobhours before proceeding with the forecast. This evaluation and subsequent reviews can easily last a few weeks or more. This is usually the most significant outcome of the forecast that highlights that changes in quantities have consequential effects on the project schedule, installation curves, and labor costs.

6.3.5.5 To-go Craft Distribution and Manpower Resource Curves

The Cost Engineer/Planner, working along with the Craft Superintendent, confirms what the to-go resources need to be at either the account or stem account level. They should also make sure that the responsible Superintendent has adequately documented the basis and reasoning behind the forecast and has considered all applicable items. The Craft Superintendent then presents and explains the forecast that he/she and the

Cost Engineer have agreed on to the Lead Discipline Superintendent. The Cost Engineer maintains a file of all backup documentation to aid the Discipline Superintendents in their analysis of the forecast presented to them. Once agreement has been reached between the Cost Engineer and the Craft Superintendent, the labor worksheets are updated with the accepted forecast information. The Construction Manager and the Project Manager should be in agreement with the order of magnitude of any changes to craft resource levels at this point before proceeding.

6.3.5.6 Schedule Analysis

As soon as possible, all craft and quantity information gained from the installation reviews should be given to the Field Planner for completion of any revisions to the project target schedule. Bulk commodity curves should be fully updated to agree with the forecast quantities, and reasonable resource adjustments should be made to the remaining duration of primary schedule activities. It is incumbent on the Lead Planner to incorporate all resource changes approved by Supervision/Construction Management into the schedule and validate the project's ability to successfully execute the revised schedule. Although critical path analysis would be one of the key focal areas, the Lead Planner should also look at other concerns such as large changes in quantities and job-hours and near-critical-path items. The Site Manager should then review the preliminary analysis. If this analysis indicates that any additional changes are required to the cost forecast because of necessary craft peaks, interferences, schedule extensions, etc., the Cost Engineer incorporates the changes immediately into the forecast.

The Project Management approval level is made aware of any anticipated schedule deviations and the alternate recovery plans. At this time, Project Management must reach a decision as to the schedule or recovery plan to be accepted and used as the basis for preparation of the rest of the forecast. The decision must be reached at this stage of the forecast assembly so that needless time is not spent preparing a forecast based on parameters unacceptable to Project Management. Although it is true that the final schedule may vary somewhat once all detail is generated and calculated, the analysis submitted should be sufficient to allow Management to decide at this time. Also, if the monthly trend program has been adequately maintained, it should have prepared the managers for the schedule analysis being realized in the forecast.

6.3.5.7 Craft Labor Costs

In conjunction with the craft labor evaluation, an analysis of the current and future wage rates should be performed for each craft. Involve Labor Relations by requesting the latest wage bulletins showing base craft wages, fringe benefits, and taxes. The analysis should take into account payroll differences for Apprentices, Journeymen, Foremen, and General Foremen. Obtain assumptions on overtime, shift work, shift differential, special pay uplifts, crew makeup, etc., from the Field Construction Superintendent and the Field Planner. Appropriate escalation should be included beyond wage bulletin expiration dates. An analysis of Workers' Compensation and other insurances should be completed and included in the rates, if contractually required. The detailed forecast is typically created at the cost account level and then rolled up to higher levels. One method for determining craft wages is to develop an average, fully burdened, wage rate at the commodity detail level and then apply them at the cost account level. An appropriately weighted mix of carpenters, laborers, ironworkers, etc., should be established based on reviews with the responsible superintendent for each commodity detail and is then used to calculate a composite rate for the to-go jobhours for each commodity detail. Apply the calculated to-go wage rate to the to-go jobhours for the commodity detail's cost accounts. Summarize the total to-go costs on the forecast worksheets. These calculated to-go costs are added to the to-date actual costs to create the total forecast.

6.3.5.8 Review of Schedule Analysis

If major problems are identified during this phase of the forecast that differ from previously identified areas, the Site Manager should review it and resolve any questions he/she may have with the project team.

6.3.6 Distributable Costs

Distributable field costs comprise those activities and facilities that cannot be identified with any specific construction operation for the permanent plant facilities; that is, they cannot be allocated to a direct account. These costs are either support services by nature or apply in such a way to several direct operations that a logical allocation to each separate operation cannot readily be made. Sometimes this applies to activities that make more sense to charge to distributables rather than spend the time to allocate them to direct accounts.

For example, craft Foremen and General Foremen may be charged to distributables as a composite collection area rather than forcing them to allocate their time on timesheets (which is generally just an allocation method anyway).

Distributable manual jobhour development follows very closely those methods outlined in Section 5.3.5, Direct Labor. However, since distributables are generally not tracked in relation to quantities (linear meter of pipe, cubic meter of concrete, etc.), and due to the amount of jobhours involved and their unique characteristics, additional guidelines for the forecasting of these accounts are distinctive. The presentation of distributable costs has been included in the respective worksheets or summaries that are applicable to that commodity, i.e., materials, subcontracts, craft labor, etc. (Attachment 10 – Distributables).

6.3.6.1 Distributable Manual Labor Forecast

It must be remembered that distributable hours are those hours to be expended in support of direct jobhour expenditures. There is often a distinct relationship between particular distributable accounts and the direct jobhours expended. Also, many of the accounts are found to be dependent upon the duration of the schedule rather than on a unique scoping of work to be performed. It may also prove helpful for visibility and control to report and forecast distributable labor by area, depending on the project.

The forecasting of individual distributable accounts generally involves one or more of the following techniques. In all cases, backup sheets should be used to document the criteria used.

- Total Jobhours To-go or Percent Complete – Where possible, develop an estimate of to-go jobhours based on the scope of work still to be completed. Quantify the to-go scope (i.e., linear meter of fence), where possible, or estimate percent complete using best engineering/construction judgment.
- Level of Effort Analysis – Based on crews or number of people estimated to perform specific tasks, use a fair estimate of the number of people required to operate, maintain, and support various existing facilities and work operations over a scheduled duration. For example, it may require five people to maintain the temporary water and air systems. They are required weekly until the temporary facilities are removed. If the removal date is changed, the total jobhours for maintenance also changes.
- Analysis Based on Percent of Direct Labor - some distributable accounts may vary as the scopes of related direct accounts vary. For example, if the piping scope and related jobhours increase, generally the distributable jobhours for handling piping materials also increases. It may, therefore, be possible to establish a figure that would relate piping material handling as a percentage of piping direct operations.
- Manpower Curves – One of the most useful tools in the forecasting of distributable accounts is the periodic distributable manpower curves. These curves show how well the previous plan has been adhered to and what trends may be developing. The curves are also extremely useful for those accounts that are affected by schedule. In these cases, it is quite easy to extrapolate from the to-date curve to the project end date, making appropriate tail down or tail up adjustments to determine an appropriate forecast figure.

6.3.6.2 Distributable Materials Forecast

The forecasting of distributable materials differs from forecasting direct materials in that it is usually more difficult to define the total scope involved until late in the project. For this reason, it is advisable to forecast most distributable materials in two steps as described below

5.3.6.2.1 Forecast of Fixed Costs

This method of forecasting is independent of time (schedule). Using the techniques described in the previous sections for materials and subcontracts, the cost of those items for which scope can be readily defined is forecast accordingly. Material cost for erection of temporary office buildings or cost of piping materials used for temporary air, water, and gas systems is based on scope as shown on isometric or other drawings.

5.3.6.2.2 Forecast by Variable Costs

This portion of the forecasting effort is time (schedule) related and can be subject to many external factors. Allowances are projected for anticipated expenditures for maintenance, repair, operation, etc., over time and tied to the construction schedule.

6.3.6.3 Expenditure Curves

Expenditure curves are derived primarily from historical information and are then adjusted to the specific project based on scope information. They are maintained by the Field Cost Engineer for all major accounts, such as temporary construction facilities, miscellaneous construction services, construction equipment, and tools and supplies. A curve should be maintained for each account that is to be forecast separately. Historical curves are kept as backup for comparison and as source documentation. In addition to providing a basis for the distributable material forecast, the curves can be used to identify and document deviations from the projected expenditure rate for the field trend program. These curves are intended to serve as a worksheet to arrive at a time-phased forecast cost for the account, tied to a plan, and as such should be backed up with all pertinent information.

Specific Examples:

- Temporary Construction Facilities – It is possible to evaluate the total design scope for most of these accounts (buildings, roads, railroads, utilities, etc.) from engineering drawings and information furnished by Construction. The forecast are based on estimated cost to complete plus an allowance reflecting anticipated expenditures per month for maintenance and repair. Changing maintenance requirements at different times of the year and salvage values at the end of the job should be considered.
- Miscellaneous Construction Services – This category includes all materials that cannot be charged to direct accounts or temporary construction facilities. This can include materials for clean-up, scaffolding, warehousing, etc. Most accounts are difficult to scope or define. The budget and historical information should be used until definitive trends are established on an expenditure curve. Individual accounts should be evaluated on the basis of percent complete (referring to jobhours) or on an estimate of materials needed to complete, where possible. Using expenditure curves, results should be checked with a projection of costs that have recurred over prior months.
- Watchman and Guards – These accounts are evaluated on the basis of actual manpower/jobhour needs times the contracted hourly rates.
- Maintenance of Tools and Equipment – These accounts can be evaluated by checking the ratio of maintenance cost to direct equipment cost or total direct jobhours expended and using the budget until ratios or trends develop on the expenditure curves.
- Construction Equipment – These accounts include all equipment on the job, such as cranes, backhoes, and compressors. At forecast time, the Field Cost Engineer obtains from Field Procurement a listing of equipment committed or already on POs, as well as the latest information on prevailing rates. The Field Cost Engineer should review previous construction equipment lists with the Project Superintendent. This information is compiled on a detailed construction equipment worksheet similar to a cash-flow sheet in which each piece of equipment is projected monthly based on the construction schedule needs. The to-go periods for each piece of equipment are multiplied by the rental rate to project the to-go cost from the cut-off date.
- Small Tools and Rentals – The budget should be used for forecasting until a trend is indicated on the expenditure curves. A cumulative monthly plot of total tool cost spent per direct jobhour expended should be included on the expenditure curve. A cost-per-jobhour trend can then be used to forecast total cost. When the project is about 75% complete, an allowance should be included for the cost of surplus tools on hand. Field Procurement and Supervision can help on estimating the amount of the potential inventory.
- Consumables – The budget should be used for forecasting until a trend is indicated on expenditure curves. A cumulative monthly plot of the total consumable cost expended per total project jobhours expended should be included on an expenditure curve. A cost per jobhour trend can then be used to forecast total cost.
- Purchased Utilities – The budget should be used for forecasting until a trend is indicated on the expenditure curves. Field Engineering can supply a demand curve of forecasted utility needs. These are often required by the utilities to help them plan for supplying the project's needs.

6.3.6.4 Construction Equipment Analysis

During the pre-construction phase, the project should have developed a Construction Methods Plan, a Construction Equipment List, and an Equipment Utilization Schedule compatible with the overall construction schedule. The Construction Methods Plan details how each phase of construction will be undertaken. The Construction Equipment List details a list of all equipment required for each construction operation in accordance with the Construction Methods Plan. This list should identify the type, size, description, manufacturer, number of units of each piece of equipment, and the source of the equipment, whether purchased, rented, or third party-supplied. The Equipment Utilization Schedule is a bar chart that identifies the time frame and duration required for each piece of equipment listed on the Construction Equipment List.

(Equipment operation and maintenance budget, utilization, and costing formats; and typical equipment distribution reports by cost code are included as attachments).

Generally, the construction equipment forecast should be based on this Equipment Utilization Schedule. The forecast of to-go equipment requirements contained in this schedule should be reviewed and updated by the project superintendent assisted by the craft and area superintendents and provided to project controls. The field cost engineer should apply appropriate to-complete rental rates to all scheduled construction equipment to determine the to-go equipment costs for forecasting purposes. Salvage credit should be applied as applicable to purchased items.

6.3.7 Non-manual labor

The forecasting of non-manual labor (i.e. Professional Services) is made up of two key elements, the cost of labor (either Home Office or Field) and the cost of non-labor (related expenses for support of non-manuals and their offices). The first step is to start by updating the respective staffing plans that are developed by department and by position. This should be done for each area of responsibility, whether it is the Home Office or the jobsite for Construction and Testing. Following project approval of the staffing plans, the non-labor related accounts could be forecasted based on these revised manpower requirements. There are two templates that provide Non-manual forecast analysis; one for the Home Office (Attachment 11 – Home Office Services) and the other for the Field (Attachment 12 – Site Office Services). Both files contain separate tabs that provide staffing plans, cashflow of costs, wage rate analysis, jobhour analysis, material costs and summary comparisons

6.3.7.1 Staffing Plans

The Project Controls Manager is responsible for coordinating and consolidating the presentation of the services forecast for all entities and offices. The jobsite should at least include construction and testing.

The format for the staffing plan should include summary level milestones that are key to the project and to particular offices as an aid to the manager for projecting his/her needs. These milestones should identify significant and pertinent events that would have an impact on shifts in staffing or demobilization periods.

Project Controls typically prepares the staffing plans and distributes them to each responsible department head to project their personnel requirements. In some fashion, actual jobhours expended through forecast cut-off should be noted because the plan represents only the to-go. This plan most likely will be a continuation of the regular monthly plan that should already be in use. A standard staffing plan template has been included should one be needed.

The staffing plan, when completed by the department manager, provides the to-go headcount for each month remaining on the project and subsequently should calculate the to-go jobhours. The template is grouped by department and goes down to the position level. Additional fields should be addressed in order to help tabulate other items of information, such as, Permanent vs. Temporary vs. Local positions, Day shift vs. Night shift, Direct hire vs. Subcontractor personnel, Grade level (for pricing), etc.

The departments are responsible for evaluating their progress and identifying the work that has been accomplished to-date versus their remaining scope. In the case of Engineering, this progress and performance evaluation can be best analyzed by using the data in the Engineering Progress and Performance Report. Other departments are more likely to be defined as a level of effort in which their staffing levels support the project over a finite duration. Still others may be viewed as deliverable related. In the field for example, the supervision and field engineering durations would primarily follow the scheduled installation plan for their respective disciplines. The field scheduler assists each supervisor in the interpretation of the construction summary schedule, e. g., shift work and overtime must be in accordance with the scheduled work plan.

The to-go monthly periods should contain a standard factor of average jobhours available to be worked. This is determined by the published Controller standard that is distributed at the beginning of each year. This is based on the fiscal cut-off of each month deducting for any holidays. Specific considerations may be adjusted for the needs of the project or office customs. Allowances for overtime could also be included if that is an anticipated expectation of the project. The resultant factors applied should represent a reasonable standard of jobhours available to be charged for that project.

Once the staffing plan templates have been developed, the to-go calculated jobhours would be added to the actual jobhours expended to-date to make up the total forecast. As discussed above, the reforecast jobhours for certain performance related departments such as Engineering could be cross-checked against the Engineering Tracker for determining remaining durations.

Department managers compiling their forecast will be supported by Project Controls to make sure that the staffing guidelines are being used consistently and the timetable for completing the staffing plans are adhered to. Project Controls should provide a listing of all the approved scope changes and trends that would have any impact on the staffing levels. It is important that scope issues are clearly defined between departments and that nothing gets missed. Ideally, the revised field non-manual staffing plans would follow after the craft staffing resources have been determined so that the proper mix of support can be realized during installation. Similarly, the Construction and the Testing staffing plan must be checked against each other to insure an appropriate interface exists between the two.

Once the staffing plan is complete, it is the responsibility of the department managers to obtain approval from their functional managers and from the Site Manager and Project Manager. Any significant deviations from the approved Current Forecast must be well documented in order to support their change reconciliation.

6.3.7.2 Pricing of Work To-go

There are two types of pricing evaluations that will be applied in the forecast:

- Labor rates for salaries and payroll benefits and
- Charging rates established for material or non-labor cost classifications.

The rates for materials or non-labor costs are usually expressed as a ratio of an average Saudi Riyal (SAR) cost per jobhour relationship (costs for that account divided by the total non-manual jobhours for that Entity) for ease of comparison.

6.3.7.3 Salaries and Payroll Benefits

Salary rates can be determined in a variety of methods depending on the level of detail specified. An average department rate can be readily obtained by calculating the total actual costs for salaries, separating technical and non-technical personnel, by the corresponding jobhours for the most recent periods of time. This may be determined over a recent 3 to 6 month period of time as long as it is a sampling indicative of the overall population mix. This rate is then escalated as appropriate and applied to the forecasted to-go jobhours.

A more preferred method and with a greater degree of accuracy would be to evaluate the number of to-go jobhours there are for each specific grade level of the personnel identified on the staffing plans. The to-go jobhours by grade range could then be applied to the median salary rate for each grade level that can be obtained from the HR Department table of median pay ranges. This produces a weighted average labor cost using present day wage rates, which should be reviewed for applying an escalation calculation. A typical calculation would apply the accepted annual rate of increase (which could be obtained from Human Resources) against the centroid of the to-go jobhours.

The resultant weighted wage rate with escalation should be obtained for each respective Entity on the project, i.e., Home Office, Construction and Testing

6.3.7.4 Materials and Supplies

Each of the accounts that make up the non-labor component should be listed out and reviewed as to what method would be best for forecasting. For such accounts as office materials and supplies, it is appropriate to

use an average cost per non-manual jobhour rate based on actual costs to date. The forecast projection should be evaluated to see if the to-go rate should remain the same as the to-date or should it decline/increase based on the progress of the job.

For other accounts previously considered as Entity overheads, such as office spacing allocations, computer leasing costs, software licensing costs. These should be thoroughly referenced and incorporated into the forecast as applicable.

The accounts remaining, such as Business Travel and Entertainment, can be forecasted based on specifically estimated occurrences, or they could also be projected on a SAR per jobhour basis.

6.3.8 Other Costs

Certain forecast costs are routinely developed in parallel with or following the detailed forecast development and is normally displayed separately from the primary cost details of the forecast. These include contingency, escalation, non-reimbursable costs, cash flow and working capital analysis, taxes, insurances and bonds, warranties, fees and incentives, backcharges, and currency costs, if an international job. The more significant of these issues are discussed separately below. The others should be forecasted in any appropriate level of detail and backup format that is useful to the project. The results can be tied in to the hierarchy of summaries and rolled-up to higher presentation levels.

6.3.8.1 Contingency

Contingency is an allowance provided in the forecast to account for uncertainties, e.g. state of design completion, technological complexity, weather, schedule and other factors which will ultimately impact the cost of the project. This allowance can be based on past experience on similar projects to cover these real but difficult to quantify exposures.

After summarizing the cost changes included in the specific elements of the forecast, it is time to evaluate the amount of contingency that should be considered. A contingency template that has been used as a standard format has been included (Attachment 13 – Contingency Analysis). In this template, the projected forecast cost for each of the primary elements, i.e. Equipment, Materials, Subcontracts, Manual Labor, Non-manual Labor (Home Office and Field), etc. are posted for commitments to date and remaining to be committed. The next column shows an arbitrary percentage of contingency that should be applied on the forecast for each. The result of the percentage times the forecast amount equals the contingency value that should be allowed for both the committed and to-go commitments.

As stated above, the percentage of contingency applied to a cost element is the result of an evaluation of the amount of risk or unknown exposure that may exist in that cost element. Because the risk could be due to unrealized changes in quantity, pricing, performance or other changes that may affect the final cost, this evaluation should include Engineering, Construction, etc. The Project Controls Manager should evaluate the results of the contingency calculation very closely and make a recommendation to the Project Manager for his/her approval.

The contingency analysis is developed by breaking the project down into manageable pieces, such as specific commodity installations, facility or work operations. Each piece is then evaluated for the uncertainty in the development of the to-complete forecast in terms of the degree of available scope, pricing, productivity and quantity definition.

Depending on the complexity of the project, there are computerized risk analysis programs available to help the Project Controls Manager develop and quantify the recommended contingency allowance (i.e. Primavera Risk analysis, Active Risk Management [ARM], @RISK or similar products).

6.3.8.2 Escalation

Escalation is an amount provided to account for future cost variations beyond current pricing levels. These cost variations are caused by complex combinations of changes in market conditions, wage settlements, costs of materials and equipment, interest rates and world economics. The evaluation of escalation can be addressed in two ways. The preferable method is to include a specific percentage of escalation directly in the

detail pricing of the direct account. This relates to material and subcontract pricing, craft labor wage rates, and non-manual wage analysis.

The selection of escalation rates depends on the type of project, its stage of development, and its contractual terms and conditions. A conceptual estimate, for example, may require only one composite escalation rate to account for the combined fluctuations in labor, material and equipment components of the estimate. A definitive estimate may require each component to be evaluated separately for the purpose of developing an overall amount for escalation. Labor, for example, could be broken down by craft and each craft evaluated separately for future price fluctuations. Material could be evaluated by commodity, each commodity requiring its own, distinct escalation rate.

Escalation rates are normally expressed as compounded percentages per year. The amount of escalation is determined by applying this escalation rate to the to-complete value of a given element at current pricing levels over the time period to the centroid of the to-complete activity. Accuracy can be improved by compounding by periods more often than once-a-year and by applying appropriate rates to the detail cash flow projections for each element.

The following points should be considered during the process of estimating escalation rates and amounts:

- Fluctuations in currency exchange rates are a form of escalation. Impact on the forecast due to currency fluctuations should be evaluated separately.
- Quotations for products and services may or may not include escalation. Awarded POs and subcontracts should be checked to determine if the prices are firm for the life of the project.
- Contracts should be reviewed as there may be specific requirements regarding the manner in which escalation is to be calculated.

6.3.8.3 Cash Flow

The cash flow and working capital analysis should be done after the forecast has been compiled and summarized with a reasonable assurance that all costs are accurately characterized. A standard format should be already established for reporting monthly. The Cost Engineer should simply copy over the existing spreadsheet and supplement it with the changes presented in the forecast.

6.4 RECONCILIATION

The variances provided in the templates compare the new forecast against both the current budget and the previous forecast. Although these variances can be changed to accommodate the purpose of management presentations, it is the focus of the presentations to identify clearly the reasons for the changes. Significant differences must be summarized and explained in terms of not only what happened (effect), but also why it happened (cause). Those differences should also be categorized as either changes in scope or quantities, productivity, pricing, or others. Note that simply identifying that there is a change is not sufficient to reconciliation unless the cause for that change has been uncovered.

The templates used here all have columns available to categorize the change in costs between changes due to quantities or scope, performance, and pricing. It is intended to identify these breakdowns at the detail WBS level. The templates are then rolled up to each of the higher-level summaries in the package. This should be presented and discussed at length at the Entity Senior Management level and is useful for future estimates and models.

6.5 FORECAST REVIEWS AND PRESENTATIONS

As has been discussed earlier, it is important that the forecast schedule be strictly maintained without sacrificing quality information. Potential roadblocks that threaten to unnecessarily prolong the completion of a section of the forecast must be monitored and resolved. The Project Manager and the Project Controls Manager are important to this process such that the Project Controls Manager must be proactively monitoring the events of the forecast as outlined in the agreed-to execution plan. The Project Manager should be briefed regularly on the progress of the forecast and be ready to intercede to resolve any conflicts. Once the forecast is complete, a copy of the forecast is provided to the Estimating Department to use in comparing and reconciling to other projects.

6.5.1 Status Reviews

During the development of the forecast and prior to what are described as formal reviews by the project team and Senior Management, detail reviews are routinely performed as material is completed for various elements of the forecast or at logical checkpoints in the development process. Weekly progress review meetings should be scheduled for all forecast efforts. The purpose of these reviews is to ensure that the required material is being developed on schedule in the prescribed form and detail by those assigned the development responsibility, in accordance with the forecast implementation plan. These reviews may reveal unanticipated circumstances; incorrect assumptions; incorrect use of source data; improperly updated logs, files, and ledgers; etc., which dictate redirection of effort or corrective action. The Project Planners must be involved in all reviews covering matters that could have an impact on the project schedule and any changes pending. The Project Controls Manager is responsible for ensuring that all needed reviews take place. The Project Controls Manager also reports to the Project Manager any problems that they cannot resolve, including slippage in the forecast plan schedule.

Attendance at reviews and progress meetings should be limited to those who have something to contribute to the proceedings or have a need to know about the subject being covered.

6.5.2 Formal Reviews and Presentations

Formal reviews are those performed by the project team as a whole. These could include the PM, SM, Contracts Manager, and Project Controls Manager. The ultimate review and one that typically marks the conclusion of the forecast is with senior management. This affords the project team its opportunity to demonstrate to Senior Management how successful it expects to be in managing the project execution plan. The department managers and other senior managers should also participate in these reviews. The number of preliminary reviews should be ascertained, usually by conferring with the Entity senior management.

The format and content of presentations to senior managers must be uniform and consistent for all projects because each must review a continuing succession of presentations for several active projects. Consistent presentation of the material is becoming of paramount interest due to the need to compare and normalize the data for similar projects and draw meaningful conclusions. If the flowchart and the linked Excel files provided in this guideline are followed, forecast data developed at the lowest level of detail automatically rolls up easily to the presentation levels (Levels 1 and 2) and provides a consistently standardized review format that can minimize the amount of time in compilation.

Prior to formal reviews, the Project Controls Manager should thoroughly review the forecast to ensure:

- That the forecast reflects the most current definition of project scope
- That the elements of the forecast have been prepared in accordance with the planned forecast approach and requested level of detail
- That the project personnel have fulfilled their assigned responsibilities
- That the forecast elements are reasonable, taking into consideration:
- Consistency with Accounting, and schedule/personnel staffing data
- All to-date experience and trends
- All external influences (e.g., economic, government, environmental)
- That all major last-minute changes have been accounted for
- That the forecast is ready for review, including supporting worksheets and detail backup data
- That any math errors or formulas have been identified and corrected

6.5.2.1 Project Controls Department Review

6.5.2.1.1 Purpose

To enable Project Controls staff to evaluate the adequacy of the forecast effort and to provide guidance to Project Controls for completion of the forecast, including the forecast presentation package.

6.5.2.1.2 Agenda/Scope

Below is a typical agenda in order to highlight the focus areas;

- Method of preparation/areas of emphasis
- Job data, forecast basis, allowances, qualifications, and exclusions
- Basis of escalation and contingency evaluations
- Significant changes in project scope and/or quantities
- Summary of forecast cost and schedule
- Summary reconciliation of major changes since last forecast
- Problem areas, proposed action items, and items for Management attention
- Detail forecast presentation and backup
- Proposed timing, format, and participants for further reviews
- Proposed format for the Management summary presentation

6.5.2.1.3 Location of Review

This review is generally held prior to the project team review, either at the design office or field office.

6.5.2.1.4 Participants

Project Controls Manager, Senior Cost Engineer, Project Planner, Senior Estimator.

6.5.2.2 Project Team Review

6.5.2.2.1 Purpose

To enable the project team to evaluate the forecast, address major problem areas, and determine what specific actions are needed to correct them. This is essentially a working level review.

6.5.2.2.2 Agenda/Scope

- Method of preparation/areas of emphasis
- Job data, forecast basis, allowances, qualifications, and exclusions
- Basis of escalation and contingency evaluations
- Significant changes in project scope and/or quantities
- Summary of forecast cost and schedule
- Summary reconciliation of major changes since last forecast
- Problem areas, proposed action items, and items for Management attention
- Detail forecast presentation and backup
- Proposed timing, format, and participants for further reviews
- Proposed format for the Entity Management summary

6.5.2.2.3 Location of Review

This review is generally held at either the Home (design) office or Field office at Project Management's discretion considering the stage of the project, where most of the forecast participants are located, and where most of the action remains. Teleconferencing is encouraged over extensive travel, where available. Draft copies should be distributed before the meeting the meeting.

6.5.2.2.4 Participants

Responsible project team members, Project Controls Management, and other project team participation, as required.

6.5.2.3 Entity Management Review

6.5.2.3.1 Purpose

To enable the Entity senior management to review project status, contractual changes, scope, problems and proposed corrective action, staffing, and potential liabilities and exposures.

6.5.2.3.2 Agenda/Scope

Below is a typical agenda in order to highlight the focus areas;

- Changes in project scope and/or quantities
- Project progress
- Staffing problems
- Schedule status
- Labor problems
- Forecast cost increases or decreases
- Outstanding receivables
- Potential exposures and liability

6.5.2.3.3 Location of Review

This review is normally conducted at the Entities office.

6.5.2.3.4 Participants

Entity Senior Management, PM, Project Engineering Manager, Site Manager, Project Controls Manager, and other project team members as required.

6.5.3 Forecast Backup Requirements

The content of the forecast backup package, which supports the summary presentation, varies depending on the type and scope of the project. A list of typical contents might include the following:

- Copies of the engineering and construction intermediate schedules updated to show progress and forecast
- Copies of quantity installation curves by commodity updated to show progress and forecast along with quantity increases
- Copies of monitoring reports or major equipment and bulk material deliveries
- A complete set of CoCo reports (material, equipment, and subcontract)
- Copy of the subcontract monitoring report
- A complete set of labor and equipment productivity and performance reports
- Copies of manpower curves by craft updated to show progress and forecast
- Copy of the latest weekly labor cost report updated with new forecasts and most current to-date information
- Copy of the latest engineering progress and performance report and backup
- Copy of the construction equipment job requirements schedule updated to show on-site equipment, remaining durations, and future requirements
- Copy of the construction equipment unit cost report updated with current quantities, unit costs, and extensions
- Copy of any backup calculations for escalation and contingency
- Copy of pertinent estimates specifically prepared for this forecast
- Copy of the scope change/backcharge/claims registers
- Copy of the budget control log
- Copy of the latest trend rep, copies of the professional services report
- Copies of the project, field, and design organization charts
- Copy of the last published forecast (if applicable)

- Copy of detailed reconciliations
- Copy of the original budget
- Copies of pertinent correspondence, meeting minutes, reviews, and approvals
- Quantity and schedule comparisons with other similar projects

7.0 ATTACHMENTS

1. Quantity Development Basis
2. Forecast Development Flowchart Template
3. Flowchart Hierarchy File Tree Template
4. EPM-KPC-TP-000013 – Forecast Implementation Plan Template
5. EPM-KPC-TP-000014 – Forecast Development Schedule Template
6. EPM-KPC-TP-000015 – Bulk Quantities Template
7. EPM-KPC-TP-000016 – Material Pricing Template
8. EPM-KPC-TP-000017 – Subcontract Pricing Template
9. EPM-KPC-TP-000018 – Direct Labor Pricing Template
10. EPM-KPC-TP-000019 – Distributable Pricing Template
11. EPM-KPC-TP-000020 – Home Office Services Template
12. EPM-KPC-TP-000021 – Site Office Support Template
13. EPM-KPC-TP-000022 – Contingency Analysis Template

Attachment 1 - Quantity Development Basis

SITEWORK

Take-off

Excavation (Cubic Meters) – Take-offs are a measure of the required excavated volume based on rough grade elevation, bottom of concrete elevation and cross section dimensions. As a general rule, the excavation should be 0.5 meters per side larger than the foundation footer. The 0.5-meter dimension varies by project depending on site soil conditions. This dimension should be established early in the project and used consistently for all excavation take-offs thereafter. If the excavation is deeper than 1.5 meters, the cut should be calculated with a 45° angle slope beginning at a point 1.5 meters above bottom of concrete elevation. Excavation guidelines also apply to underground pipe, with the 0.5 meter added to the outside of the pipe wall on both sides. Verify excavation size requirements with Field Supervision and Environmental, Safety and Health (ES&H) prior to performing quantity take-off calculations.

Backfill (Cubic Meters) – Take-offs are a measure of volume to be backfilled based on the excavation take-off minus the below grade concrete volume. Backfill is not a measure of loose fill material placed to achieve compaction requirements.

Excavation and Backfill take-offs are done in conjunction with the foundation concrete take-offs. For excavation and backfill take-offs not associated with foundations, separate ledgers are typically maintained for recording take-off quantities.
Piping, electrical, architectural, and structural steel drawings should be reviewed for items that may require excavation and backfill such as underground pipe, underground duct bank, pipe supports, miscellaneous platforms, manholes, light stanchions, and guard posts.

CONCRETE

Take-off

General — Formwork, rebar, and concrete take-offs should be made in sufficient detail to permit reporting by pour sequence (i.e., identify footings and piers as separate items on small foundations and as pour sequences on major foundations such as turbine pedestals and compressor foundations). If the pour sequence is in question, do the take-offs in sufficient detail to avoid someone later having to interpret one line entries on the take-off. Where foundations are repetitive and likely to be worked simultaneously, such as pipe rack foundations, the foundation take-offs should be grouped together in a single take-off line by drawing number.
Take-offs should be organized to match the project code of accounts, which may divide the concrete into types such as structural steel foundations, equipment foundations, sumps and basins, precast, and paving. Questions on how to classify a particular take-off item should be addressed to Field Project Controls prior to the take-off being made.
Take-offs are typically recorded by drawing number and foundation number. If no foundation number applies, provide a description of the item, including location. Examples would include underground duct bank, piping thrust blocks, and other miscellaneous cast-in-place concrete.
Take-offs are performed manually since there is no electronic data transfer available from the 3D CAD Model. The type of quantity tracking system adopted for the project influences take-off methods.
Some systems (e.g., QRS) allow the user greater control by dividing work operations into smaller pieces and automatically calculating "Earned Significant Quantities" as the work operations are performed and claimed. To gain the best advantage from these systems, example take-off sheets and computer printouts should be reviewed before starting take-offs. The system's user guide can provide more information in this area.

Concrete (Cubic Meters) – The concrete take-off is a measure of the "engineered quantity" of concrete. Engineered quantity is a measure of concrete volume, rounded to the nearest tenth of a cubic yard, as defined by the formwork dimensions on the foundation drawings. This take-off should be "neat" with no allowances for waste or over pour. Takeoffs for quantity reporting are based on the engineered quantity only.
Formwork (Square Meters) – The formwork quantity takeoff is a measure of the formwork to concrete contact area as defined by the foundation drawings and are rounded up to the nearest square foot. On major pours, additional formwork square meters required for construction joints should be included in the take-off.

Rebar (Metric Tons) – Whenever possible, the rebar quantities are taken from the fabricator's bill of material by foundation. A detailed rebar take-off is generally not required, however, and can be estimated by the weight

of rebar per cubic meter of concrete basis if no vendor information is available. Rebar quantities are normally rounded to the nearest 50 Kilograms.
Note: If rebar is estimated by weight per cubic yard or cubic meter of concrete when no vendor information is available, checks shall be made to verify if the rate used is consistent with the evolving design.

Embeds (Kilograms) – When required for quantity reporting, embedded metal and anchor bolts are quantified in kilograms. The quantities should be taken from the fabricator's bill of material. Depending on the project, embeds may be reported as part of the formwork operation when the installation jobhours are also charged to formwork. Verify required reporting requirements with Project Field Controls.

Concrete Paving and Slabs (Square Meters) – All work associated with concrete paving and sidewalks, including forms, rebar, wire mesh, and expansion joints, is normally tracked under one account and reported as concrete cubic yards installed. If the QRS system is used, the take-off may be expanded to show the formwork and wire mesh quantities, but the work is still typically reported as cubic yards.

Manholes, Catch-Basins (Precast or Partially Precast) (Each) – Sitework drawings and underground pipe and electrical drawings are reviewed for manholes, catch-basins, and lift stations, which may be entirely precast or assembled from precast sections. These are taken off and reported as a single item with one manhole equaling one each.

Fireproofing (Cubic Meters) – Fireproofing quantities are taken off according to the needs of the project. When the fireproofing material is troweled on over an expanded metal base, it is taken off in square meters or linear meters of steel to be fireproofed. When the fireproofing consists of concrete encasement of steel by gunite or a combination of pre-casting and casting in place, the quantity is taken off in cubic yards or cubic meters.

Take-off Methods

A single take-off is made for each concrete drawing (and other discipline drawings that contain concrete items). This take-off should capture all quantity reporting requirements and field material requisitioning requirements in one effort. Rebar and embeds quantity information, however, may be obtained from vendor data at a later time.

As each drawing is reviewed, take-off dimensions, item count, calculations, and sketches should be recorded and saved for future reference. As take-offs are completed, the quantities selected for quantity reporting are entered by cost code into the quantity tracking system by the Field Engineer.

STRUCTURAL STEEL

Take-off

The take-off format for structural steel must follow the project code of accounts. The Quantity Reporting Plan should identify how items such as grating, handrail and toe plate, stair treads, etc., are quantified.
Structural Steel is taken off as tons or metric tons and is normally organized and compiled by cost code, drawing numbers, and structure.

In some cases, further information such as elevation and bay is used in the take-off and reporting of major multilevel structures such as boiler buildings.
The Field Engineer should maintain a complete set of fabricator erection drawings showing the fabricator's piece marks used for the take-off. The Field Engineer should also track the delivery status and installed status of each piece of steel. One method of doing this is to mark up the erection drawings using a color code.
BUILDINGS

Take-off

The take-off for buildings should be performed for each building for major work items such as brick/block, building structural steel, siding and roofing, doors and windows, plumbing, electrical, HVAC, and architectural finishes. Building foundations should be included with the concrete accounts.
It is important to clearly identify the boundaries of take-off responsibility between buildings and other disciplines, especially piping and electrical.

MATERIAL EQUIPMENT

Take-off

The material equipment take-off is developed by cost code from the project engineering equipment list. The Field Engineer is responsible for setting up the appropriate quantity reporting ledger.
The Field Engineer should review the vendor drawings to identify loose commodities supplied with the mechanical equipment that must be field installed. Depending on the project code of accounts, the Field Engineer may need to perform a separate take-off of these quantities.

In general, mechanical equipment may be reported as anywhere from 20 to 80 percent complete when set on foundations and 100 percent complete after final alignment and grouting. In developing the plan for reporting installed mechanical equipment quantities, however, a thorough review of the equipment installation schedule must be made by the Field Engineer to determine major milestones that can be used to monitor the installation process. The QRS application has significant direction on the identified milestones, activities, and related weightings.

Project milestones should be reviewed with Field Supervision to determine the approximate weighting to establish for each milestone. This weighting should take into consideration the job hours required to achieve the milestone. Based on these weighting factors, the installation is reported as a percent complete for the overall installation. When the weighting factors are developed, the installation of loose commodities and special work processes, such as alignment, must be taken into account as one of the basic milestones in completing the overall installation since this effort can represent a significant portion of the budgeted jobhours.

PIPING

Take-offs

Manual Take-offs

Piping quantities are generated by the 3D Model**.** However, since a significant amount of piping is field routed or not included in computer pipe tracking programs like**,** piping takeoffs by the Field Engineer are typically required on all projects to some extent.

ELECTRICAL

Take-off

Power and Control Conduit is taken off by drawing, size, and type. Individual conduit runs are listed by electrical device such as motor, panel, or control station.

Lighting and Instrument Conduit is taken off by drawing, size, and type. Conduit runs are listed by geographical area, junction box, elevation, or equipment number. Conduits should be numbered to provide easier quantity tracking.

Quantities are generated by the 3D model and electronically populated in the database. When a computerized quantity tracking program is not available at the project site, the Field Engineer should maintain a complete set of take-off drawings reflecting the take-off performed. Any allowances for omitted dimensions such as elevation changes should be indicated on the marked up take-off drawings.

Conduit Fitting take-off is normally estimated based on the linear meter of conduit by size. Area classification requirements are reviewed before fittings are purchased to ensure that special classes of fittings (e.g., explosion proof) are identified.

Cable Tray, Tray Hangers, and Tray Covers are taken off by drawing and size. The take-off should include fittings by type and size. The Field Engineer should maintain a set of marked-up drawings reflecting the take-off.

Wire and Cable take-offs are based on the project circuit and raceway schedule. The circuit schedule must be reviewed carefully to ensure that it includes all instrument wire circuits, special vendor wire requirements,

communication systems, lighting circuits, and electric heat tracing circuits. The takeoff boundaries between building accounts and electrical accounts must be clearly defined so that all building circuits are taken off.

Non-scheduled Wire and Cable (typically lighting circuits and instrument wiring from junction boxes to field mounted devices) is taken off or estimated by wire and cable type by lighting or instrument location drawings. The wire and cable take-off quantity is the "pulled" linear meter including tails. The tail length is 1.5 meters per end on 5 kV and larger cable, and 3 meters per end on all other wire and cable.

Terminations are normally taken off at the same time as the wire and cable. The termination takeoff equals the number of conductors in the cable times two, less spares. The termination takeoff should also include the ground wire as a conductor. Lighting system terminations are not normally included in the takeoff.

Power and Control Equipment such as pushbutton stations, junction boxes, distribution panels, and receptacles are normally taken off by drawing and grouped by device type. As with other takeoff activities, a set of marked up drawings should be maintained documenting the takeoff performed.

Lighting Equipment, including light fixtures, lighting contactors and switches, lighting panels, lighting transformers, and receptacles on lighting circuits, is normally taken off by drawing and grouped by device type.

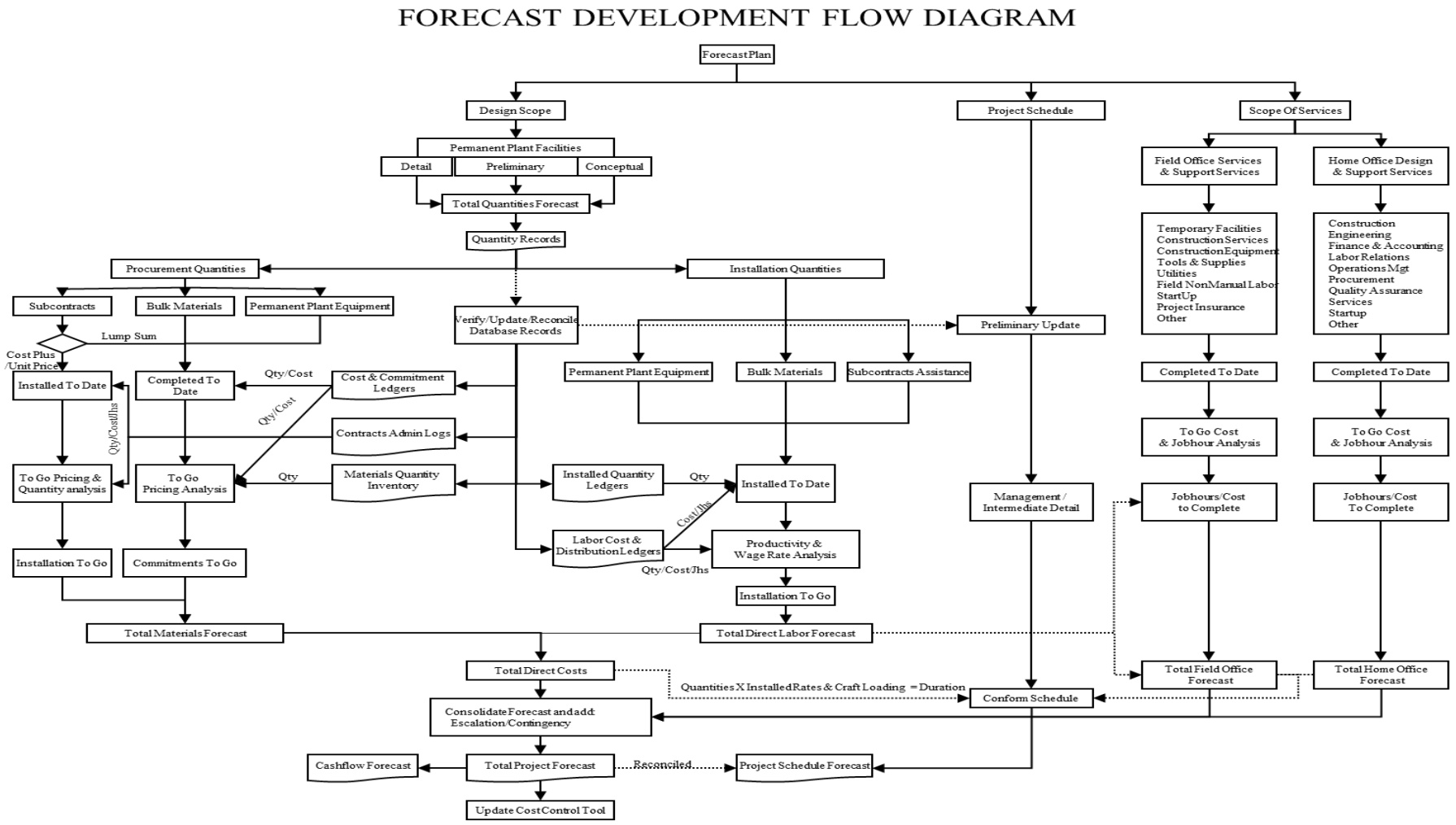
Grounding is taken off by drawing, conductor, size, and type. The grounding drawings are marked-up as takeoffs are done and maintained in the Field Engineer's file. Ground rods are taken off in linear meters and included in the takeoff. If they are not shown on the drawings, include allowances for pigtails to motors and electrical equipment.

INSTRUMENTATION

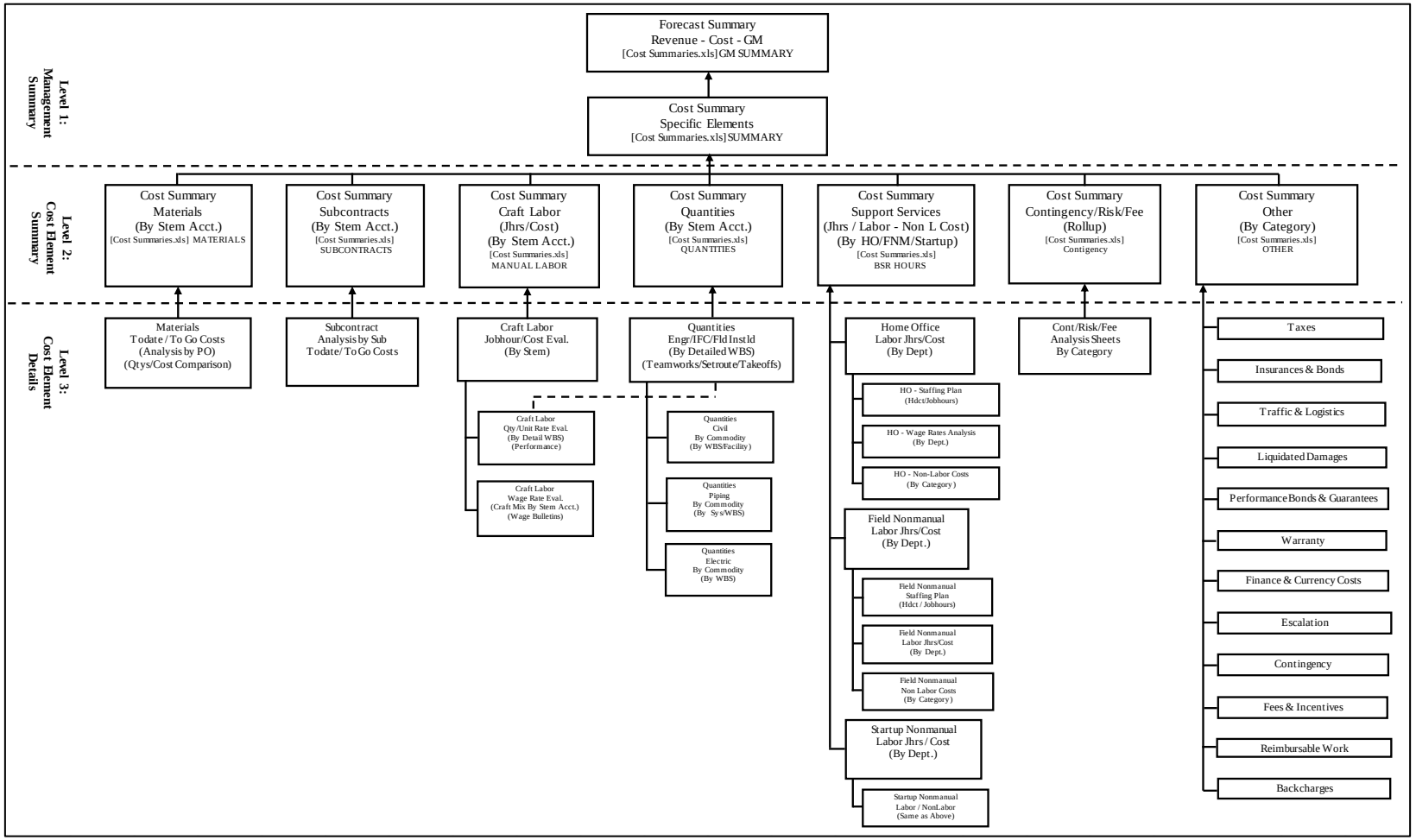
Take-off

As required

Attachment 2 - Forecast Development Flowchart Template



Attachment 3 - Flowchart Hierarchy File Tree Template



Attachment 4 - EPM-KPC-TP-000013 - Forecast Implementation Plan Template

1. IMPLEMENTATION PLAN SUMMARY

The planned approach for the development of Forecast for the Sample project needs to address all of the primary cost elements of the project which specifically includes:

- Home Office Labor and Non-labor materials
- Field Non-manual Labor and Non-labor materials
- Craft Labor
- Direct and Distributable Materials
- Subcontracts
- Contingency and Other Costs
- Scope Changes

2. COMPREHENSIVE APPROACH AND AREAS OF EMPHASIS

2.1. Forecast needs to address all aspects of the project costs in conjunction with the project's contract schedule with particular emphasis on:

- Field Non-manual staffing plans and related costs
- Craft Labor staffing and related costs

2.2. Particular emphasis will be placed on using experience gained from the lessons learned and comparative results received to date and similar projects.

2.3. The forecast presentation will summarize the total project based on actual costs reported to-date and projected to-go costs.

3. REQUIREMENTS FOR BACKUP DETAIL & FORMAT

3.1. The formats for the detailed backups can be summarized as follows:

3.1.1. **Home Office Labor –** This forecast will come from the detailed Home Office staffing plan which forecasts hours by department, by month for the life of the project. Analysis of this staffing plan is performed through the use of the Engineering Tracker and historical actuals to-date and evaluation of to-go activities.

3.1.2. **Field Non-manual Labor -** This forecast will come from the detailed Field Non-manual staffing plan which forecasts hours by department, by month for the life of the project. Analysis of this staffing plan is performed by the Site Mgr., Project Superintendent, and the appropriate department leads who will evaluate the to-go project needs.

3.1.3. **Non-manual Non-labor -** This forecast will come from the detailed monthly expenditure plan and cash flow maintained by Project Controls and based on the analysis of the to-go project needs. The analysis comes from reviewing standard reports from PC Works (COCO), the Controller system of CRS reports, and historical actuals to-date.

3.1.4. **Craft Labor -** This forecast will come from the Forecast Development Sheets which will summarize the detailed independent estimates performed by the project superintendents who will evaluate the to-go project needs and by detailed WBS and by resource optimization.

3.1.5. **Material -** This forecast will come from the Forecast Development Sheets for any identified material requirements and from detailed reviews of each Purchase Order needed on the project.

3.1.6. **Subcontracts –** This forecast will come from reviewing standard reports from the Cost Control Tool (COCO) and the detailed monthly expenditure plan based on awarded subcontracts payment schedules, reviewing the status of the subcontracts payment log, and evaluations of Current subcontractor claims.

4. **KEY FORECAST DATES** (reference attached schedule for detail)

   4.1. Forecast Kickoff Meeting DyMthYr

   4.2. Cutoff of actual data DyMthYr

   4.3. Complete On-Project Reviews DyMthYr

   4.4. Managent Review DyMthYr

5. ASSIGNMENT OF RESPONSIBILITIES

   5.1. Home Office Labor – Project Engr./PCM with support from Department leads.

   5.2. Field Non-manual Labor – Site Manager/Project Superintendent with support from Department Leads

   5.3. Home Office/Field Non-manual Non-labor – Project Controls Manager /Lead Cost Engr. with support from Project Manager

   5.4. Craft Labor – Site Manager/Project Superintendent with support from Department Leads

   5.5. Material – Procurement Manager /Project Superintendent with support from Department Leads

   5.6. Subcontracts – Subcontracts Administrator/ Project Controls Manager with support from Site Manager

   5.7. Forecast Presentation – Project Manager/ Project Controls Manager

Attachment 5 - EPM-KPC-TP-000014 - Forecast Development Schedule Template

EXPRO

Sample Project - Job # XXXXX
Forecast # 1, Mth-Yr
Forecast Development Schedule

	Resp.	Week: Person	1	2	3	4	5	6	7	8	9	10
MILESTONES												
Forecast Kickoff Meeting			▲									
Quantities Approved							▲					
Project Management Reviews								Directs ▲	Indirects ▲	Other ▲	Final ▲ ▲	
Present Forecast To Management												▲
SCHEDULE												
Review/Update Scope of Work			◆———	———◆								
Update Bulk Commodity Curves								◆———	———	———◆		
Revise Target Schedule								◆———	———	———◆		
DIRECT COSTS												
Quantity Development												
Sitework												
Concrete												
Steel												
Architectural												
Equipment												
Piping												
Electrical												
Instrumentation												
Paint												
Insulation												
Other												
Review Unit Rates/Jobhours/Productivity Analysis						◆———	———	———◆				
Develop/Review Material Pricing						◆———	———	———◆				
Develop/Review Subcontract Pricing						◆———	———	———◆				
Develop/Review Craft Wage Rates						◆———	———	———◆				
Prepare Total Direct Costs Package & Review								◆———	———◆			
DISTRIBUTABLE COSTS												
Temporary Construction Facilities							◆———	———	———◆			
Misc Construction Services							◆———	———	———◆			
Equipment, Tools & Supplies							◆———	———	———◆			
Construction Non-Manual							◆———	———	———◆			
Startup Non-Manual							◆———	———	———◆			
Prepare Distributable Costs Package & Review									◆———	———◆		
OTHER COSTS												
Engineering & Other Services Costs						To Go Staffing Plan ◆———	———◆	Labor & Non-Labor Pricing ◆———	———	———◆		
Freight									◆———	———◆		
Warranty									◆———	———◆		
Insurance									◆———	———◆		
Bonds									◆———	———◆		
Permits									◆———	———◆		
Taxes									◆———	———◆		
Misc Other Costs									◆———	———◆		
Escalation									◆———	———◆		
Contingency									◆———	———◆		
Cost of Working Capitol									◆———	———◆		
Backcharges									◆———	———◆		
Prepare Other cost package & Review										◆———		
PRESENTATION PACKAGE PREPARATION												
Cost Summaries										◆———	———◆	
Reconciliation						◆- - -	- - -	- - -	———◆	———	———	
Project Comparisions										◆———	———	
Services Report										◆———	———	
Cashflow										◆———	———	
GM Analysis										◆———	———	
Summary Level Schedule										◆———	———	
Narratives/Summaries										◆———	———	
Final Project Management Reviews and Changes										◆———	———	
Issue Package to Management												▲

"Typical Quantity Development Summary"

Update Information Databases
Update ToDate Design/Installed Quantities
Evaluate ECARSM/Progress Qtys/Allowances
PE/PM Review &
Sign-Off

Attachment 6 - EPM-KPC-TP-000015 - Bulk Quantities Template

Facility	UOM	Structural	Other	Mudmats	Ductbank	Comments
YARD/SITE						
SITE ACCESS ROAD	M3	-	-	-	-	
UNDERGROUND UTILITIES (Excl. Ductbank And Cw Pipe Trench)	M3	-	101	-	-	Pipeline Crossing
PIPE RACKS	M3	-	129	-	-	
UNSPECIFIED	M3	-	125	558	1,631	
YARD PIPE (STEEL AND SPECIAL)	M3	-	-	-	-	
BOILER / HRSG GROUP	M3	-	-	-	-	
BOILER / HRSG	M3	2,421	-	-	-	
AREA FOUNDATION	M3	750	-	-	-	
FOUNDATION	M3	-	-	-	-	
AREA/BLDG (Trenches)	M3	-	25	-	-	
CHEMICAL FEED AREA (incl. Unloading)	M3	-	180	-	-	
DUCT BURNER (MODULE)	M3	-	-	-	-	
CO (MODULE)	M3	-	-	-	-	
SCR ~~(MODULE)~~ Ammonia Flow Control Skid	M3	-	69	-	-	
BOILER FEED PUMP	M3	-	135	-	-	
BOILER BLOWDOWN	M3	-	15	-	-	
SUMPS	M3	-	-	-	-	
TANKS	M3	-	-	-	-	
COMBUSTION TURBINE	M3	1,425	-	-	-	
AREA/BUILDING	M3	-	1,074	-	-	
PEDESTAL	M3	-	-	-	-	
AIR INLET FILTER	M3	-	465	-	-	
EXHAUST GAS DIFFUSER	M3	-	120	-	-	
WATER WASH SKID	M3	-	-	-	-	
FALSE START DRAIN TANK	M3	-	-	-	-	
AUXILIARY BOILER	M3	-	156	-	-	
FOUNDATION	M3	-	-	-	-	
AREA SLAB	M3	-	-	-	-	
STACK/DUCT SUPPORT	M3	510	-	-	-	
UNSPECIFIED	M3	-	-	-	-	
STEAM TURBINE GROUP	M3	-	-	-	-	
STEAM TURBINE	M3	2,319	-	-	-	
AREA/BUILDING	M3	-	939	-	-	
PEDESTAL	M3	-	-	-	-	
CONDENSER AREA	M3	-	600	-	-	
UNSPECIFIED	M3	-	-	-	-	
ELECTRICAL FACILITIES	M3	-	-	-	-	
CONTROL BUILDING	M3	-	95	-	-	
FLUE GAS CONTROL	M3	-	-	-	-	
SWGR BUILDING (COMMON)	M3	-	45	-	-	
SWGR BUILDING (UNIT)		-	372	-	-	
MISC. ELECTRICAL BLDG	M3		34	-	-	
TRANSFORMERS	M3	1,146	-	-	-	
UNSPECIFIED	M3	-	-	-	-	
FUEL FACILITIES	M3	-	-	-	-	
GAS STORAGE/TANKS	M3	-	-	-	-	
FUEL HANDLING CONTROL BUILDING (Heater/Conditioning Skid)	M3	-	96	-	-	
PRESSURE REDUCING	M3	-	-	-	-	
WATER FACILITIES	M3	-	-	-	-	
WATER TREATMENT (Trenches)	M3	-	25	-	-	
AREA/BUILDING	M3	265	-	-	-	
MISC. REVERSE OSMOSIS EQUIPMENT	M3	-	-	-	-	
COOLING TOWER	M3	-	123	-	-	
BASIN	M3	2,100	-	-	-	
MECHANICAL DRAFT (CONCRETE)	M3	-	-	-	-	
CIRC WATER INTAKE	M3	15	-	-	-	
CIRC WATER PUMPHOUSE	M3	-	-	-	-	
CIRC WATER PUMP FOREBAY	M3	870	-	-	-	
CIRC WATER CHEMICAL STORAGE (& UNLOADING)	M3	231	-	-	-	
CHLORINE GENERATION BUILDING	M3	-	-	-	-	
FIRE WATER FACILITY	M3	-	20	-	-	
FIREWATER PUMPHOUSE	M3	-	-	-	-	
FOAM GENERATION	M3	-	-	-	-	
FIELD ERECTED TANKS (Aqueous Ammonia)	M3	-	110	-	-	
ASH CONDITIONING STORAGE	M3	-	-	-	-	
CONDENSATE	M3	-	-	-	-	
DEMIN WATER	M3	-	21	-	-	
FIRE WATER	M3	-	30	-	-	
FILTERED WATER/FIRE WATER	M3	-	18	-	-	
NEUTRALIZATION	M3	-	-	-	-	
RAW WATER (Treatment pumps)	M3	-	86	-	-	
SLUDGE HOLDING	M3	-	-	-	-	
WASTE WATER	M3	-	12	-	-	
DISCHARGE FACILITIES (EFFLUENT SUMPS)	M3	-	88	-	-	
MISCELLANEOUS FACILITIES	M3	-	-	-	-	
RAIL ROAD	M3	-	-	-	-	
SEWAGE TREATMENT	M3	-	15	-	-	
AMMONIA (Trenches)	M3	-	25	-	-	
AQUEOUS AMMONIA	M3	-	-	-	-	
ANHYDROUS AMMONIA	M3	-	-	-	-	
BULK CHEMICAL ~~STORAGE~~ UNLOADING	M3	-	58	-	-	
WASTE WATER DISCHARGE	M3	-	-	-	-	
UNSPECIFIED	M3	-	142	-	-	
MISC. YARD STRUCTURES	M3	-	150	-	-	
		12,052	**5,698**	**TOTAL =**	**17,750**	

Attachment 7 - EPM-KPC-TP-000016 - Material Pricing Template

Sample Project - Job # XXXXX
Forecast #1, Aug-02
Summary Material Pricing

Acct	Description	Current Data					Forecast Evaluation				Forecast Evaluation			
							Pricing Commitments (Purchase Orders)				Pricing Commitments (Purchase Orders)			
		Original Budget	Current Budget	Current Forecast	Paid To Date	Committed To Date	Outstanding Commitment	Commitments To Go	Vendor Reps	Specific Allowance	Forecast #1	Over/(Under) C. Budget	Over/(Under) C. Forecast	Commitments To Go
	S/T - SITEWORK													
	S/T - CONCRETE													
	S/T - STEEL													
	S/T - ARCHITECTURAL													
	S/T - PIPING													
	S/T - ELECTRICAL BULKS													
	S/T - INSTRUMENTATION													
	S/T - PAINT, FIREPROOFING & INSULATION													
	S /T - REWORK, SCAFFOLDING & MAINTENANCE													
	S/T - PUMPS & DRIVERS													
	S/T - COMPRESSORS, BLOWERS & FANS													
	S/T - HEATERS & EXCHANGERS													
	S/T - TANKS & STORAGE FACILITIES													
	S/T - MATERIAL HANDLING & PROCESSING													
	S/T - WATER TREATMENT													
	S/T - OTHER MECHANICAL													
	S/T - ELECTRICAL EQUIPMENT													
	S/T - EQUIPMENT DEMOLITION													
	S/T - CONBUSTION TURBINE GENERATOR													
	S/T - STEAM TURBINE GENERATOR													
	S/T - SWITCHYARD & OTHER SPECIALTY EQUIP													
	S/T - SPECIAL EQUIPMENT													
	S/T - STEAM GENERATION EQUIPMENT													
	TOTAL DIRECTS													
	S/T - TEMPORARY CONSTRUCTION FACILITIES													
	S/T - MISC CONSTRUCTION SERVICES													
	S/T - CONST EQUIP, TOOLS, SUPPLIES													
	S/T - STARTUP													
	S/T - OTHER													
	TOTAL DISTRIBUTABLES													

Attachment 8 - EPM-KPC-TP-000017 - Subcontract Pricing Template

Sample Project - Job # XXXXX
Forecast #1, Aug-02
Summary Subcontract Pricing

		Current Data ()					Pricing Commitments(Subcontracts)				Forecast Evaluation		
Stem Acc't	Description	Original Budget	Current Budget	Current Forecast	Paid To Date	Committed To Date	Outstanding Commitment	Commitments To Go	Vendor Reps	Specific Allowance	Forecast #1	Over/(Under) C. Budget	Over/(Under) C. Forecast	Commitments To Go
	S/T - SITEWORK													
	S/T - CONCRETE													
	S/T - STEEL													
	S/T - ARCHITECTURAL													
	S/T - PIPING													
	S/T - ELECTRICAL BULKS													
	S/T - INSTRUMENTATION													
	S/T - PAINT, FIREPROOFING & INSULATION													
	S /T - REWORK, SCAFFOLDING & MAINTENANCE													
	S/T - PUMPS & DRIVERS													
	S/T - COMPRESSORS, BLOWERS & FANS													
	S/T - HEATERS & EXCHANGERS													
	S/T - TANKS & STORAGE FACILITIES													
	S/T - MATERIAL HANDLING & PROCESSING													
	S/T - WATER TREATMENT													
	S/T - OTHER MECHANICAL													
	S/T - ELECTRICAL EQUIPMENT													
	S/T - EQUIPMENT DEMOLITION													
	S/T - COMBUSTION TURBINE GENERATOR													
	S/T - STEAM TURBINE GENERATOR													
	S/T - SWITCHYARD & OTHER SPECIALTY EQUIP S/T - SPECIAL EQUIPMENT													
	S/T - STEAM GENERATION EQUIPMENT													
	TOTAL DIRECTS													
	S/T - TEMPORARY CONST FACILITIES													
	S/T - MISC CONSTRUCTION SERVICES													
	S/T - CONST EQUIP, TOOLS & SUPPLIES													
	S/T - STARTUP													
	S/T - OTHER													
	TOTAL DISTRIBUTABLES													
	GRAND TOTAL													

Attachment 9 - EPM-KPC-TP-0000018 - Direct Labor Pricing Template

Sample Project - Job # XXXXX
Forecast #1, Jun-02
Manual Labor Pricing

Stem Acct	Description	Manual Jobhours									Manual Labor Pricing									
		Original Budget	Current Budget	Current Forecast	To Date	To Go	Forecast #1	F1 - CB	F1 - CF	Variance F1 - CF Qty	U/R	Original Budget	Current Budget	Current Forecast	To Date	To Go	Forecast #1	F1 - CB	F1 - CF	Variance F1 - CF Qty	U/R	WR
	S/T - SITEWORK																					
	S/T - CONCRETE																					
	S/T - STEEL																					
	S/T - ARCHITECTURAL																					
	S/T - PIPING																					
	S/T - ELECTRICAL BULKS																					
	S/T - INSTRUMENTATION																					
	S/T - PAINT, FIREPROOFING & INSULATION																					
	S /T - REWORK, SCAFFOLDING & MAINT.																					
	S/T - PUMPS & DRIVERS																					
	S/T - COMPRESSORS, BLOWERS & FANS																					
	S/T - HEATERS & EXCHANGERS																					
	S/T - TANKS & STORAGE FACILITIES																					
	S/T - MATERIAL HANDLING & PROCESSING																					
	S/T - WATER TREATMENT																					
	S/T - OTHER MECHANICAL																					
	S/T - ELECTRICAL EQUIPMENT																					
	S/T - EQUIPMENT DEMOLITION																					
	S/T - CONBUSTION TURBINE GENERATOR																					
	S/T - STEAM TURBINE GENERATOR																					
	S/T - SWITCHYARD & OTHER SPECIALTY EQUIP.																					
	S/T - SPECIAL EQUIPMENT																					
	S/T - STEAM GENERATION EQUIPMENT																					
	TOTAL DIRECTS																					
	S/T - TEMPORARY CONSTRUCTION FACILITIES																					
	S/T - MISC CONSTRUCTION SERVICES																					
	S/T - CONST EQUIP, TOOLS, SUPPLIES																					
	S/T - MANUAL P/R ADDITIVES																					
	S/T - STARTUP																					
	TOTAL DISTRIBS																					
	GRAND TOTAL																					

Attachment 10 - EPM-KPC-TP-000019 - Distributables Pricing Template

Sample Project - Job # XXXXX

Distributable Cost

			Quantities					Current Data					Forecast Evaluation						
													Pricing Commitments(Purchase Orders)						
Cost Code	Description	UOM	Original Budget	Current Budget	Current Forecast	Forecast #1	Over/(Under) C. Forecast	Original Budget	Current Budget	Current Forecast	Paid To Date	Committed To Date	Outstanding	Commitments To Go	Vendor Reps	Specific Allowance	Forecast #1	Over/(Under) C. Budget	Over/(Under) C. Forecast
							-												
							-												
							-												
							-												
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							-												

Attachment 11 - EPM-KPC-TP-000020 - Home Office Service Template

	Original Budget	Current Budget	Current Forecast	Act Thru	To Go	Forecast # 1	Change From C. Budget		Change From C. Forecast	
AREA "X" / FACILITY "X"										
Engineering										
Architectural	0	0	0	0	0	0	0	0.0%	0	0.0%
Civil/Structural	0	0	0	0	0	0	0	0.0%	0	0.0%
Mechanical	0	0	0	0	0	0	0	0.0%	0	0.0%
Plant Design	0	0	0	0	0	0	0	0.0%	0	0.0%
Controls	0	0	0	0	0	0	0	0.0%	0	0.0%
Electrical	0	0	0	0	0	0	0	0.0%	0	0.0%
Switchyard	0	0	0	0	0	0	0	0.0%	0	0.0%
Other Engineering/mgmt/reseer	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T Engineering	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Other Home Office										
Project Management	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	0	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	0	0.0%
Subcontracts	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Administration	0	0	0	0	0	0	0	0.0%	0	0.0%
Home Office Construction	0	0	0	0	0	0	0	0.0%	0	0.0%
Home Office Startup	0	0	0	0	0	0	0	0.0%	0	0.0%
Engineering Mgt	0	0	0	0	0	0	0	0.0%	0	0.0%
Environmental	0	0	0	0	0	0	0	0.0%	0	0.0%
Other/Concord	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T OHO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Total X Hours	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
AREA "Y" / FACILITY "Y"										
Engineering										
Architectural	0	0	0	0	0	0	0	0.0%	0	0.0%
Civil/Structural	0	0	0	0	0	0	0	0.0%	0	0.0%
Mechanical	0	0	0	0	0	0	0	0.0%	0	0.0%
Plant Design	0	0	0	0	0	0	0	0.0%	0	0.0%
Instrumentation	0	0	0	0	0	0	0	0.0%	0	0.0%
Electrical	0	0	0	0	0	0	0	0.0%	0	0.0%
Switchyard	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Engineering	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T Engineering	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Other Home Office										
Project Management	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	0	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	0	0.0%
Subcontracts	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Administration	0	0	0	0	0	0	0	0.0%	0	0.0%
Home Office Construction	0	0	0	0	0	0	0	0.0%	0	0.0%
Home Office Startup	0	0	0	0	0	0	0	0.0%	0	0.0%
Engineering Mgt NDEU Expat	0	0	0	0	0	0	0	0.0%	0	0.0%
Environmental	0	0	0	0	0	0	0	0.0%	0	0.0%
Other/ IS &T/Eng. Assur./Const	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T OHO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Total "Y" Hours	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
TOTAL										
Engineering										
Architectural	0	0	0	0	0	0	0	0.0%	0	0.0%
Civil/Structural	0	0	0	0	0	0	0	0.0%	0	0.0%
Mechanical	0	0	0	0	0	0	0	0.0%	0	0.0%
Plant Design	0	0	0	0	0	0	0	0.0%	0	0.0%
Instrumentation	0	0	0	0	0	0	0	0.0%	0	0.0%
Electrical	0	0	0	0	0	0	0	0.0%	0	0.0%
Switchyard	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Engineering	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T Engineering	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Other Home Office										
Project Management	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	0	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	0	0.0%
Subcontracts	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Administration	0	0	0	0	0	0	0	0.0%	0	0.0%
Home Office Construction	0	0	0	0	0	0	0	0.0%	0	0.0%
Home Office Startup	0	0	0	0	0	0	0	0.0%	0	0.0%
Engineering Mgt	0	0	0	0	0	0	0	0.0%	0	0.0%
Environmental	0	0	0	0	0	0	0	0.0%	0	0.0%
Other	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T OHO	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Total Hours	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**

Attachment 12 - EPM-KPC-TP-000021 - Site Office Support Template

	Original Budget	Current Budget	Current Forecast	Act Thru Mth-Yr	To Go	Forecast # 1	Change From C. Budget		Change From C. Forecast	
AREA "X" / FACILITY "X"										
Construction										
Site Management	0	0	0	0	0	0	0	0.0%	-	0.0%
Project Superintendents	0	0	0	0	0	0	0	0.0%	-	0.0%
Field Engineering	0	0	0	0	0	0	0	0.0%	-	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	-	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	-	0.0%
Subcontracts	0	0	0	0	0	0	0	0.0%	-	0.0%
Camp Management	0	0	0	0	0	0	0	0.0%	-	0.0%
Safety & Security	0	0	0	0	0	0	0	0.0%	-	0.0%
Finance & Accounting	0	0	0	0	0	0	0	0.0%	-	0.0%
S/T Construction	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**-**	**0.0%**
Startup										
Startup Management	0	0	0	0	0	0	0	0.0%	-	0.0%
Startup Engineering	0	0	0	0	0	0	0	0.0%	-	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	-	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	-	0.0%
Subcontract	0	0	0	0	0	0	0	0.0%	-	0.0%
Turnover Coordination	0	0	0	0	0	0	0	0.0%	-	0.0%
Training Instructors	0	0	0	0	0	0	0	0.0%	-	0.0%
Warranty Engineers	0	0	0	0	0	0	0	0.0%	-	0.0%
Other	0	0	0	0	0	0	0	0.0%	-	0.0%
S/T Startup	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**-**	**0.0%**
Total "X" Hours	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
AREA "Y" / FACILITY "Y"										
Construction										
Site Management	0	0	0	0	0	0	0	0.0%	-	0.0%
Project Superintendents	0	0	0	0	0	0	0	0.0%	-	0.0%
Field Engineering	0	0	0	0	0	0	0	0.0%	-	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	-	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	-	0.0%
Subcontracts	0	0	0	0	0	0	0	0.0%	-	0.0%
Camp Management	0	0	0	0	0	0	0	0.0%	-	0.0%
Safety & Security	0	0	0	0	0	0	0	0.0%	-	0.0%
Finance & Accounting	0	0	0	0	0	0	0	0.0%	-	0.0%
S/T Construction	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**-**	**0.0%**
Startup										
Startup Management	0	0	0	0	0	0	0	0.0%	-	0.0%
Startup Engineering	0	0	0	0	0	0	0	0.0%	-	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	-	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	-	0.0%
Subcontract	0	0	0	0	0	0	0	0.0%	-	0.0%
Turnover Coordination	0	0	0	0	0	0	0	0.0%	-	0.0%
Training Instructors	0	0	0	0	0	0	0	0.0%	-	0.0%
Warranty Engineers	0	0	0	0	0	0	0	0.0%	-	0.0%
Other	0	0	0	0	0	0	0	0.0%	-	0.0%
S/T Startup	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**-**	**0.0%**
Total "Y" Hours	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
TOTAL										
Construction										
Site Management	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Superintendents	0	0	0	0	0	0	0	0.0%	0	0.0%
Field Engineering	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	0	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	0	0.0%
Subcontracts Administration	0	0	0	0	0	0	0	0.0%	0	0.0%
Camp Management	0	0	0	0	0	0	0	0.0%	0	0.0%
Safety & Security	0	0	0	0	0	0	0	0.0%	0	0.0%
Finance & Accounting	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T Construction	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Startup										
Startup Management	0	0	0	0	0	0	0	0.0%	0	0.0%
Startup Engineering	0	0	0	0	0	0	0	0.0%	0	0.0%
Project Controls	0	0	0	0	0	0	0	0.0%	0	0.0%
Procurement	0	0	0	0	0	0	0	0.0%	0	0.0%
Subcontract	0	0	0	0	0	0	0	0.0%	0	0.0%
Turnover Coordination	0	0	0	0	0	0	0	0.0%	0	0.0%
Training Instructors	0	0	0	0	0	0	0	0.0%	0	0.0%
Warranty Engineers	0	0	0	0	0	0	0	0.0%	0	0.0%
Other	0	0	0	0	0	0	0	0.0%	0	0.0%
S/T Startup	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**
Total Hours	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**0.0%**

Attachment 13 - EPM-KPC-TP-000022 - Contingency Analysis Template

Power Project - Job # XXXXX
Forecast #1, Mth-Yr
Contingency Analysis

	Current Forecast	Contingency Rate	Fcst # 1 Contingency	Total Forecast
PLANT EQUIPMENT				
Committed	$0	0.0%	$0	$0
To be Committed	$0	0.0%	$0	$0
TOTAL	$0		$0	$0
BULK MATERIALS				
Committed	$0	0.0%	$0	$0
To be Committed	$0	0.0%	$0	$0
TOTAL	$0		$0	$0
SUBCONTRACTS				
Committed	$0	0.0%	$0	$0
To be Committed	$0	0.0%	$0	$0
TOTAL	$0		$0	$0
MANUAL LABOR				
Expended to Date	$0	0.0%	$0	$0
Firm Agreements to Go	$0	0.0%	$0	$0
Estimated to Complete	0	0.0%	$0	$0
TOTAL	$0		$0	$0
DISTRIBUTABLE MATERIAL & S/C				
Committed	$0	0.0%	$0	$0
To be Committed	$0	0.0%	$0	$0
TOTAL	$0		$0	$0
NONMANUAL LABOR				
Expended to Date	$0	0.0%	$0	$0
Estimated to Complete	$0	0.0%	$0	$0
TOTAL	$0		$0	$0
DESIGN OFFICE				
Expended to Date	$0	0.0%	$0	$0
Estimated to Complete	$0	0.0%	$0	$0
TOTAL	$0		$0	$0
GRAND TOTAL	**$0**		**$0**	**$0**