



Jefferson Science Associates, LLC

Project Control System Manual

Revision 4

1 July 08

Jefferson Lab

The logo for Jefferson Lab features the text 'Jefferson Lab' in a bold, sans-serif font. A red swoosh underline is positioned beneath the word 'Jefferson', starting under the 'J' and ending under the 'n'.

Thomas Jefferson National Accelerator Facility



Jefferson Science Associates, LLC

Project Control System Manual

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Project Control System Manual

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Jefferson Science Associates, LLC

100 Introduction

**Project Control System Manual
Revision 4**



100 Introduction

- A. Jefferson Science Associates, LLC (JSA) is a Southeastern Universities Research Association-Computer Sciences Corporation limited liability corporation created specifically to manage and operate Jefferson Laboratory for the Department of Energy. This JSA Project Control System Manual describes the processes and procedures for implementing an Earned Value Management System on projects conducted by Jefferson Science Associates at the Jefferson Lab. All Jefferson Lab projects with a total budget of \$5 million or more will employ an Earned Value Management process as described in this manual. The JSA Project Control System Manual supports the Jefferson Lab mission by facilitating the achievement of project success regardless of project size or complexity. Earned Value Management is an acknowledged management process for the organization, planning, performance measurement, and controlling of projects. A project's technical scope of work is integrated logically with its schedule and budget to form an approved project baseline. Accomplished work and accrued costs during project execution provide essential earned value information to measure performance for comparison to this baseline. Project management gains valuable insight into the health of the project by examining the earned value indicators.
- B. Earned Value Management is a systematic framework to communicate project progress and performance across all levels of the project management team and to the project customer. The Earned Value Management System is more than just a method to report the status of a project. It is a vital management tool that allows project leadership to “manage by exception” and focus on the critical issues of a project. The earned value indicators provide quantifiable project data for identifying, analyzing, understanding, and resolving problems. The project management team can be proactive in engaging potential problems before they have a major impact to the project and thus prevent surprises that cost the project time and money.
- C. The JSA Project Control System Manual is organized along the Earned Value Management Systems guidelines established in the American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA) Standard-748-A-1998. This project management standard defines 32 “best practice” criteria for implementing the Earned Value Management process. By implementing the Earned Value Management processes and procedures documented in this manual, the project management team can:
- establish a standard approach to organizing the various elements of a project.
 - facilitate the formation of a comprehensive time-phased budget by thorough schedule planning and cost estimating.



- control project activity flow by defining how work is formally authorized.
- capture actual costs on the project via the Lab accounting system.
- determine specific work progress on the project at a detail level.
- perform variance analysis on the resultant earned value data to measure performance against the approved project baseline.
- establish a consistent process for controlling changes to the project baseline.

D. Successful implementation of the Earned Value Management System at Jefferson Lab will result in numerous benefits to the organization and to the project management team.

- Detailed planning at the beginning of a project often addresses problems that may surface later in the effort, preventing schedule slips, increased costs, and/or technical rework. Project leaders can easily identify problem areas and pin down the specific sources of the problems with detailed planning.
- Better visibility into the performance of the project is gained due to the integrated method of extensive planning, earned value analysis, and baseline control.
- Project accountability is fostered and overall project quality is enhanced by the identification of a responsible person/organization at each work level.
- Project risk reduction is enhanced by the availability of earned value metrics allowing project management to mitigate impacts by making early adjustments to the project. Accurate estimates of schedule completion and projected final costs can be produced.
- A single, integrated management control system provides reliable data for analysis. Integrity of the project performance data will be enhanced and informed decisions can be made based on objective data collected by the project.
- The level of information overload experienced can be reduced by employing the principle of “management by exception.”

E. Tailoring: The guidelines and procedures described in the JSA Project Control System Manual are not directive in nature, but represent the standard approach to controlling projects undertaken at the Jefferson Lab. Certain customers (e.g., Department of Energy) will require the implementation of an Earned Value Management System based on the dollar threshold of the project’s anticipated cost. Other projects are highly encouraged to avail themselves of the tools and processes highlighted in this manual to establish a proactive



project management environment. Depending on the size, complexity and risk of the project, the processes can be tailored to best facilitate the successful achievement of the project goals. Projects with low complexity and risk factors may not require the same level of insight, management and control associated with a more complex project requiring significant planning and resources. Implementation of the JSA Project Control System Manual should be addressed specifically in all Project Execution Plans. All plans should identify those Earned Value Management elements deemed not applicable and provide a rationale for their exclusion.

- F. Training: The Jefferson Lab Project Management Qualification curriculum includes a course on Earned Value Management and its implementation using the JSA Project Control System Manual.

101 Roles and Responsibilities

The following roles are the key management elements responsible for implementing the processes delineated in the JSA Project Control System Manual.

- Project Customer
The ultimate stakeholder with a vested interest in the positive outcome of the project. Responsible for project funding and the establishment of project requirements.
- Project Manager
The senior leader of the project management team. Responsible for all aspects of project control from planning and budgeting to analysis and reporting.
- Associate Project Manager
The next level down from the Project Manager. There may be multiple Associate Project Managers with responsibility for managing top-level system elements of the project.
- Control Account Manager
The key person responsible at the detail level of project planning and execution. Manages one or more control accounts representing the lowest level where project performance is measured.



- Manager, Project Management & Integration Division (PM&I)
The PM&I Manager and staff are responsible for the JSA Project Control System Manual and the implementation of the Earned Value Management System process at Jefferson Lab.
- Chief Financial Office
Responsible for the financial system where accounting for project costs occurs.

102 References

The following documents were used as guidance in the development of the Project Control System Manual.

- DOE Order 413.3A, *Program And Project Management For The Acquisition Of Capital Assets* (7-28-06)
- DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets* (3-28-03)
- DOE *Earned Value Management Application Guide*, Version 1.6 (January 1, 2005)
- DOE *Work Breakdown Structure Project Management Practices* (Rev E, June 2003)
- DOE *Scheduling and Cost Estimating Project Management Practices* (Rev E, June 2003)
- DOE *Performance Baseline Development and Validation Project Management Practices* (Rev E, June 2003)
- American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA) Standard - 748-A-1998, *Earned Value Management Systems (EVMS)* approved May 19, 1998, reaffirmed August 28, 2002
- Project Management Institute *Practice Standard of Earned Value Management* (2005)
- National Defense Industrial Association *ANSI/EIA-748-A Standard for Earned Value Management Systems Intent Guide* (November 2006 Edition)
- National Defense Industrial Association *Surveillance Guide* (October 2004 Edition)



103 Revision of the JSA Project Control System Manual

The JSA Project Control System Manual is maintained by the Jefferson Lab Project Management & Integration Division. Questions, comments, and suggested revisions concerning this manual can be addressed to the PM&I staff. The Project Management & Integration Division will review the JSA Project Control System Manual annually to assess the need for revisions to this document. Proposed changes to the manual will be evaluated for impacts to the Earned Value Management process that could potentially affect system certification. All revisions will be approved by the Manager, Project Management & Integration Division. Approved revisions to the manual will be annotated in the Document Revision Log. The completed JSA Project Control System Manual document is then posted to the Jefferson Lab website and relevant organizations notified of the new updated version.



Jefferson Science Associates, LLC

200 Organization

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200 Organization

This section of the JSA Project Control System Manual describes the organizational elements of the Project Control System process. Data for Jefferson Lab projects are organized in three main databases and managed by an integrated software suite. Project work to be performed is organized by developing a Work Breakdown Structure (WBS). A functional organization, composed of Jefferson Lab personnel and possibly outside contractors, is formed to assign project work activities to groups or individuals who will be responsible for performing the work. Using the WBS structure, control accounts are established to facilitate the preparation of accurate project cost and schedule estimates, and the collection and development of data for project control.

201 Project Control System Integration

There are three JSA system components that are integrated to form the prime management tool for the Project Control System. All of the projects at Jefferson Lab are organized under the JSA Enterprise Project Structure. This enterprise structure is a master project database containing information on projects under development and those in the execution phase. The Schedule Management System is the core software for this master project database. It is used extensively during project schedule planning, development and monitoring. The second component of the Project Control System is the Lab's financial system. This accounting database of fiscal transactions provides actual project costs to the third component, the Cost Management System. This software system integrates the project's resource-loaded schedule with the accounting system data to generate and analyze a project's cost and schedule performance. By linking the various project databases, the Schedule and Cost Management Systems can provide the project management team with the requisite earned value data to determine the current project status and to forecast cost and schedule estimates at project completion.

202 Work Breakdown Structure

- A. Each Jefferson Lab project using an Earned Value Management System will be assigned a JSA Enterprise Project Structure code. This code will represent the Level 1 WBS number element for the project.
- B. The Work Breakdown Structure (Exhibit 1) with its associated WBS dictionary is the key element for organizing a project. Its purpose is to divide the project into manageable segments of work to facilitate planning and control of technical scope, schedule and cost. A well designed WBS will



ensure all required work is incorporated in the project and that no unnecessary work is included.

- C. The WBS is a structural organization of related elements that defines the total work scope required to accomplish project objectives. It takes the form of a multi-level hierarchical framework depicting the overall project deliverable down to the smallest system component. Each descending level represents an increasingly detailed definition of a project component. The project WBS describes the technical content of the project, and is the basis for project management, cost estimating and budgeting, schedule management, cost and schedule control, and reporting of cost and schedule performance. A high-level WBS is developed early in the conceptual stage of the project with more detail added as the project definition is refined. The level of detail in a WBS is a function of the size of the project and a balance between complexity, risk, and the Project Manager's need for control.
- D. Early and accurate WBS planning is essential to getting a project off to a good start. If project requirements change however, the WBS will evolve with the project. Revisions to the WBS may be required due to the expansion or contraction of project scope and/or the movement of a project through its various stages (i.e., design, engineering, development, production/installation, and operation). Modifications to the WBS are implemented by means of the Change Control process.

202.1 WBS Development

- A. The project WBS is a decomposition of the project (Exhibit 2) and is organized in multiple levels of increasing detail. The first four levels of the WBS are defined to facilitate overall assignment of project management responsibilities and the logical aggregation of cost data. WBS Level 1 is the entire project and represents the total responsibility assigned to the Project Manager. For WBS Level 2, the overall project is divided into segments that depend upon the reporting requirements of the Project Customer. For DOE projects, these Level 2 segments will normally be funding types [Budget and Reporting (B&R) Classification Codes] while DOD projects will normally have product-oriented elements. WBS Level 3/4 elements are definable product-oriented components of Level 2 segments that accomplish a specific purpose.
- B. Additional levels of the WBS (Levels 5, 6, etc.) can be included as needed to extend the WBS to a level of detail necessary to reflect the complexity of the work scope. Not all legs of the WBS must be composed of the same number of levels.



- C. Each WBS element is assigned a unique WBS number (see Exhibit 1). The WBS number is used to accumulate and report performance measurement data (cost estimates, budgets, earned value, and actual costs) and to summarize data at higher WBS levels. Performance measurement data are derived directly from entry-level data collected or prepared at the appropriate level of the WBS.

202.2 WBS Dictionary

A complete Work Breakdown Structure requires an associated dictionary (Exhibit 3) to provide descriptive information for each WBS element. The WBS dictionary thoroughly describes the scope of each work element (including deliverables) identified in the WBS. It also outlines the resources and processes required to produce each element. As with the WBS itself, the WBS dictionary is revised to reflect project changes via the Change Control process and is kept up to date during the life of the project.

203 Project Organization

A complementary arrangement to the WBS is the organizational structure (Exhibit 4) that will provide the resources required to perform the project work activities. Project leadership can design a hierarchical framework where unique work responsibilities can be established for each part of a project. The framework establishes the formal authority relationships that exist among the various organizational team elements. This can take the form of a standard organization chart with the structure progressively detailed downward to the lowest levels of management.

204 WBS and Organization Integration

- A. Integrating Jefferson Lab organizations with the Work Breakdown Structure ensures that all project work is accounted for and that each element of work is assigned to the level of responsibility necessary for planning, execution, tracking progress, accumulating costs, and reporting. At selected levels of the WBS, the Project Manager establishes the project control accounts. A control account is comprised of a WBS work element and a Control Account Manager assigned from a Jefferson Lab organization with the responsibility and authority to accomplish this work. Control accounts represent a management control point where work performance can be measured via Earned Value Management methods.



- B. Control accounts are made up of one or more work packages and planning packages.
- Work packages constitute the basic building blocks used in planning, execution, measuring, and controlling project work. Work packages consist of a series of discrete, apportioned, or level of effort activities that have been planned, scheduled and budgeted in detail. Work packages are a subdivision of a control account and normally reside at the lowest level of a WBS branch. This may not necessarily be at the lowest level of the project WBS. Once work for a control account is authorized, a charge code is assigned to work packages allowing costs to be accumulated in the Jefferson Lab financial system.
 - Planning packages are created during initial baseline planning when work scope within a control account is identified, scheduled and budgeted, but not defined in enough detail for proper execution. They reside at similar levels in the WBS as work packages and are normally developed for far-term work scope where precise estimates of work, schedule or budget are not possible. Planning packages must be refined with more detail to become work packages before work can be authorized and charge codes assigned. In certain situations, a work package may have a “planning activity” that gets refined at a later date. This usually involves a project procurement where the subcontract details have not yet been finalized. Procurement pegpoints, as described in Section 600, are an example of a planning activity.
 - It is possible for there to be intermediate roll-up WBS levels between where the control account is established and the level where the work/planning packages for that control account are developed.

205 Responsibility Assignment Matrix

The Responsibility Assignment Matrix (RAM) (Exhibit 5) is developed to correlate the relationship between the project work scope and an appointed authority responsible for accomplishing this work. The matrix is created such that the intersection of a WBS element and a project organization identifies the control account. The RAM is “dollarized” by annotating the control account cell with the amount of project budget (derived from the Cost Management System) that is allocated to the control account. The RAM is updated when baseline changes are made to the control account.



206 Exhibits

1. WBS Example
2. WBS Diagram Example
3. WBS Dictionary Example
4. Project Organization Example
5. Responsibility Assignment Matrix Example



Exhibit 1. WBS Example

- WBS Level
1 2 3
- 1. 12 GeV Upgrade Project
 - 1.0. CDR
 - 1.1. R&D
 - 1.2. PED
 - 1.3. Accelerator Systems
 - 1.3.1. Cryomodules
 - 1.3.2. Power Systems
 - 1.3.3. Cryogenics
 - 1.3.4. Beam Transport
 - 1.3.5. Extraction
 - 1.3.6. I&C / Safety Systems
 - 1.4. Upgrade Hall A, B & C
 - 1.4.1. Hall A
 - 1.4.2. Hall B
 - 1.4.3. Hall C
 - 1.5. Hall D
 - 1.5.1. Solenoid
 - 1.5.2. Detectors
 - 1.5.3. Computing
 - 1.5.4. Electronics
 - 1.5.5. Beamline
 - 1.5.6. Infrastructure
 - 1.6. Civil
 - 1.6.1. Accelerator
 - 1.6.2. CHL
 - 1.6.3. Hall D
 - 1.7. Project Management
 - 1.8. Pre-Ops

Exhibit 3. WBS Dictionary Example

1.3	Construction Accelerator Systems	This summary WBS covers the development of the cryomodules, power systems, cryogenic systems, beam transport systems, extraction systems, and instrumentation, controls, & safety systems of the 12 GeV Upgrade accelerator.
1.3.1	Construction Accelerator Systems Cryomodules	This summary WBS covers the procurement, assembly, testing and installation of the 10 new accelerator cryomodules.
1.3.1.1	Construction Accelerator Systems Cryomodules Procurements	This summary WBS covers the procurement of the material and equipment needed for the 10 new accelerator cryomodules.
1.3.1.1.1	Construction Accelerator Systems Cryomodules Procurements Cavity String	This summary WBS covers the component and management costs for procuring 10 cavity strings. Components include Cavities 84 each, Niobium material for the cavities, Fundamental Power Coupler warm to cold waveguides 88 each, Miscellaneous Cavity String Components, HOM/Field Probes 90 each, Helium Vessels 88 each.
1.3.1.1.1.1	Construction Accelerator Systems Cryomodules Procurements Cavity String Niobium Procurement	This WBS element includes the component and management costs for procuring niobium material for 10 cavity strings.
1.3.1.1.1.2	Construction Accelerator Systems Cryomodules Procurements Cavity String Cavity Fabrication Procurement	This WBS element includes the component and management costs for procuring fabricated cavities for 10 cavity strings.
1.3.1.1.1.3	Construction Accelerator Systems Cryomodules Procurements Cavity String Waveguide Procurement	This WBS element includes the component and management costs for procuring fabricated waveguides for 10 cavity strings.
1.3.1.1.1.4	Construction Accelerator Systems Cryomodules Procurements Cavity String Helium Vessel Procurement	This WBS element includes the component and management costs for procuring fabricated Helium Vessels for 10 cavity strings.
1.3.1.1.1.5	Construction Accelerator Systems Cryomodules Procurements Cavity String Hardware Procurement	This WBS element includes the component and management costs for procuring Hardware for 10 cavity strings.
1.3.1.1.1.6	Construction Accelerator Systems Cryomodules Procurements Cavity String Miscellaneous Procurement	This WBS element includes the component and management costs for procuring Miscellaneous assembly items for 10 cavity strings.
1.3.1.1.2	Construction Accelerator Systems Cryomodules Procurements Space Frame	This summary WBS covers the component and management costs for procuring 10 assemblies: 84 Tuner Assemblies, 10 Header Assemblies (Supply and Return), 10 Magnetic Shield Assembly, 10 Thermal Shield Assembly, 10 sets MLI Blankets, Seals & Miscellaneous Spare.
1.3.1.1.2.1	Construction Accelerator Systems Cryomodules Procurements Space Frame Space Frame Procurement	This WBS element includes the component and management costs for procuring fabricated Space Frames for 10 cavity strings.
1.3.1.1.2.2	Construction Accelerator Systems Cryomodules Procurements Space Frame Tuner Procurement	This WBS element includes the component and management costs for procuring fabricated Tuners for 10 cavity strings.

Exhibit 4. Project Organization Example

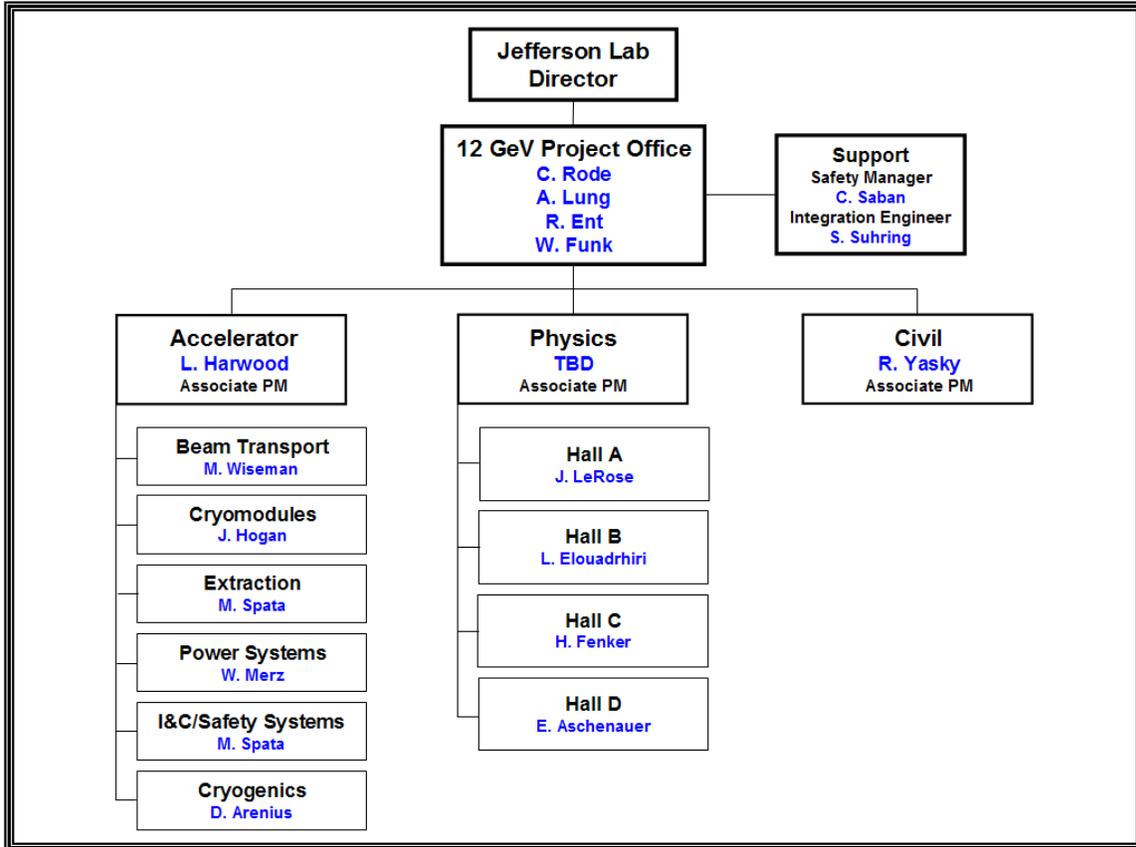




Exhibit 5. Responsibility Assignment Matrix Example

VBS	Description	\$K	ORGANIZATION										TOTAL		
			JLab Institute for SRF Science & Technology	JLab Engineering Division Electrical Systems Support	JLab Engineering Division Mechanical Engineering	JLab Engineering Division Cryogenics	JLab Center for Advanced Studies of Accelerators	JLab Experimental Hall A	12 GeV Project Office	12 GeV Accelerator	12 GeV Physics	12 GeV Civil		12 GeV Hall B	12 GeV Hall C
ACD/CDR			J. Hogan	B. Merz	M. Wiseman	D. Arenius	M. Spata	J. LeFosse	C. Rode	L. Harwood	R. Yasky	E. Elouadrhiri	A. Bruell	E. Aschenauer	
10															
R&D															
11.11	R&D Accel Systems Cryomodules														
11.12	R&D Accel Systems Power Systems														
11.13	Not Used														
11.14	R&D Accel Systems Beam Transport														
11.15	Not Used														
11.16	Not Used														
11.2	R&D Hall A														
11.3	R&D Hall B														
11.4	R&D Hall C														
11.5	R&D Hall D														
11.6	R&D Civil														
11.7	R&D Project Management														
PED															
12.11	PED Accel Systems Cavity String Assembly Cavities														
12.12	PED Accel Systems PF Power Klystrons														
12.13	PED Accel Systems Cryogenics Accelerator CHL Building Layout and Utilities Req														
12.14	PED Accel Systems Beam Transport Spreaders & Recombiners Dipoles														
12.15	PED Accel Systems Extraction Cavities														
12.16	PED Accel Systems Instrumentation, Controls, and Safety Systems Beam Diagnostics BPMs														
12.21	PED Upgrade Hall A Computing DAQ Upgrade for HRS														
12.22	PED Upgrade Hall B Magnet														
12.23	PED Upgrade Hall C Magnet Quadrupoles														
12.3	PED Hall D														
12.4	PED Conventional Facilities														
12.5	PED Project Management														
12.6	Planning														



Jefferson Science Associates, LLC

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Scheduling and Budgeting

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300 Scheduling and Budgeting

This chapter of the JSA Project Control System Manual describes the planning processes required to develop a practical project plan that can be implemented by the designated project team. The major goal of this planning effort is an integrated project schedule and budget. Schedule planning results in a schedule that describes the sequence of technical work and the task interdependencies necessary for a successful project outcome. Cost planning begins with the development of a cost estimate for all authorized work that eventually leads to the establishment of the project budget. Proper project planning ensures the amount of work to be accomplished, the time allotted to accomplish the project activities, and the resources required to complete the work scope are evenly balanced. Once the schedule and cost planning are concluded, the resultant plans can be merged to form a time-phased project budget that is seamlessly integrated with the network schedule. This resource loaded schedule and initial project budget are validated and approved as the Integrated Project Baseline which is endorsed by the project team as the Performance Measurement Baseline, a foundational element of earned value management. Meaningful earned value performance metrics enable better management insight and decision making to help keep the project on track.

301 Schedule Planning

The objectives of schedule planning are to generate a reasonable schedule of work that leads to project completion, and to establish a schedule baseline that, when integrated with a cost baseline using resource loading techniques, will result in an Integrated Project Baseline for the project. The core of the schedule planning process is the Schedule Management System and its associated scheduling software. This system provides the requisite project management tools to plan and sequence project milestones and work activities, to assign resources to the activities, to monitor progress of activities toward project objectives, to forecast future schedule performance, and to provide the basis for earned value and performance calculations.

301.1 Schedule Management System

- A. The Enterprise Suite consists of schedule and cost software packages that are part of the overall JSA Enterprise Project Structure. The central component to the Schedule Management System is the Enterprise Suite scheduling software. It is a powerful and flexible scheduling tool that is used to perform time analyses of logic network, maintain baseline and status information, prepare standard reports at regular intervals and special custom reports as needed, and provide the basis for earned value and performance calculations by seamless connectivity to the Cost Management System.



- Time analysis is the process of calculating the earliest start and finish dates and the latest start and finish dates of each activity, based on the duration of the activities, the logical relationships between them and the desired completion date of the project. In addition to these calculations, the scheduling software also determines free float (the amount of time an activity can be delayed without delaying subsequent activities), total float (the amount of time an activity can be delayed without delaying project completion as a whole), and the critical path (the longest path from the logic network start to finish and the sequence of activities with the least total float). Any delay in a critical path activity will extend the total project schedule.
 - For each work activity in the project schedule, the scheduling software maintains the early start, early finish, late start, late finish, and, after they occur, the actual start and the actual finish dates. Actual start and finish dates affect the remainder of the logic network by changing the early and late start and finishes of subsequent activities. Therefore, a time analysis is conducted after each status update. The scheduling software also maintains a separate file of baseline start dates, baseline finish dates and other baseline data in the schedule baseline. These baseline dates are not affected by actual starts and finishes. Instead they are retained for comparisons between planned and actual dates.
 - The scheduling software produces reports in three different formats (Gantt chart, logic diagram or in tabular format), and has flexible report generation routines. The use of relational databases and the manner in which the information is coded permit the creation of special reports. These are useful to assess the effects of various schedule alternatives, to extract portions of the project, or to select categories of milestones/activities for review.
- B. The scheduling group within the Project Management & Integration Division is responsible for administration of the Schedule Management System. This includes schedule preparation, horizontal and vertical integration of elements of the scheduling system, maintenance of schedule baselines, status reporting, and programming enhancements to the scheduling system. Information is obtained from all levels of project management in carrying out these responsibilities.



301.2 Schedule Development

A. Baseline Milestones (Exhibit 6)

The schedule planning process begins with the determination of the baseline milestones. These level 1 and 2 milestones with their planned dates form a master schedule for the project. This top-level schedule contains significant events and critical decision points that could affect the technical, schedule, and/or cost performance of the project. The baseline milestones and their associated definitions are mutually developed by the Jefferson Lab Project Manager and the Project Customer. They are re-examined and rescheduled, if necessary, during customer reviews. Based on the decisions by the Project Customer and the Project Manager, PM&I develops the baseline milestones schedule of planned and proposed dates for each milestone.

B. Intermediate Milestones (Exhibit 7)

Once the baseline milestones schedule has been created, the next level of detail can be incorporated by designating the project's intermediate milestones. The intermediate milestones are level 3 and 4 elements and provide a secondary level of scheduling. These intermediate milestones are selected by the Project Manager and the Associate Project Managers.

C. Detail Milestones

To complete the milestone schedule development, the Control Account Managers generate level 5 and 6 detail milestones, as needed.

D. Detail Schedule (Exhibit 8)

The baseline milestones schedule, populated with the intermediate and detail milestones, serves as the framework to add work activities to the project schedule. The detail schedule is developed from the Control Account Plans created by the Control Account Managers (see section 303 Integrated Project Baseline Development). PM&I incorporates the schedule information contained in the Control Account Plans and builds a comprehensive schedule logic sequence within the Schedule Management System that includes the sequence, start and finish dates and duration of every work activity required to complete the project. The resulting detail schedule contains all project milestones, the work activities, and the logical ties between the various schedule elements. After subsequent refinement, this then becomes the schedule baseline of the project.



E. Working Detail Schedule

While the schedule baseline constitutes the performance standard against which actual progress is compared, the Working Detail Schedule is a working tool for evaluating schedule plans and projecting future progress. In order to preserve its value as a baseline, changes to the schedule baseline are carefully controlled and documented. On the other hand, the Working Detail Schedule is continuously revised as actual work activity status and completion dates are entered and their effects on future scheduled work activities are calculated. Consequently, this results in changes to early and late, start and finish dates that may no longer be consistent with the schedule baseline. These revised dates are used to forecast when detail, intermediate and baseline milestones will actually be accomplished, and to guide management corrective action.

302 Cost Planning

- A. Cost planning is the other major planning activity required to develop an Integrated Project Baseline. The purpose of cost planning is to identify the resources needed to accomplish the scope of work and estimate the associated costs. Cost represents the dollar value required to accomplish the technical work scope within schedule and programmatic constraints. A preliminary cost estimate can be started after an initial Work Breakdown Structure is developed. Cost estimate integration with the WBS occurs when the work scope in each project work and planning package has a definitive cost/resource estimate associated with it. Once the cost estimate is approved at all management levels, it becomes the cost baseline, i.e., the project's budget.
- B. Elements of the cost estimate include both direct charges and indirect charges. Direct charges are costs applicable to, and identified specifically with, the project work scope. Examples of these types of costs include labor, travel, material, subcontractor costs, etc. Indirect charges are costs that cannot be consistently or economically identified against a specific Jefferson Lab project and are spread over the total laboratory project portfolio based on the JSA/JLab Cost Accounting Standards Disclosure Statement.

302.1 Cost Management System

The Cost Management System is an integral element of the Enterprise Suite software package used at Jefferson Lab. Initial budget data enters the Cost Management System via its link to the Schedule Management System. Direct and indirect actual costs are imported from the Lab's financial system. The Cost Management System, together with the Schedule Management System, forms an



integrated cost/schedule database that enables the project management team to understand a project's costs at the transaction level.

302.2 Funding Guidance

At the start of project cost planning, the Project Customer may provide funding guidance to the Project Manager that may include a fiscal year breakout. The Project Manager can use the funding guidance to establish a project budget profile across the WBS Level 2. Target budgets are developed and distributed to the Associate Project Managers and Control Account Managers. This represents the Project Manager's guidance to Associate Project Managers and Control Account Managers when they develop the details of the cost estimate for their portion of the project. The Project Customer may elect to hold in reserve some funding from the total project cost as contingency funds. The Project Manager may withhold management reserve funds at the project level to account for any risk uncertainty that may arise during the execution of the project plan.

302.3 Cost Estimating

A disciplined and systematic cost estimating process will promote integrity in a new project. As project performance will be measured against the project baselines, it is important that an accurate cost estimate be determined prior to the establishment of the cost baseline. This necessitates an extensive project management evaluation of the proposed project cost be accomplished. Multi-level dialogue among the Project Manager, the Project Management & Integration Division, Associate Project Managers, and the Control Account Managers will be required to reach consensus on a final cost estimate for the project. Areas can be identified where actions must be taken to restructure work scope or reassess resource requirements to meet anticipated fiscal year and total project funding constraints. Through validation of the cost estimate, a cost baseline can be established for the project. However, cost estimating is a continuous process conducted throughout project execution for refining future work costs.

303 Integrated Project Baseline Development

- A. With any budget targets provided by the Project Manager, the Control Account Manager can start to develop his/her Control Account Plan. While the initial cost estimate for the control account may be a rough order of magnitude, the Control Account Manager will eventually make use of the Control Account Plan (CAP) sheet (Exhibit 9) to refine his schedule and cost estimate. As a control account will normally consist of multiple work packages, the Control Account Manager will use the CAP sheet to produce a



detailed plan for the work packages. Once completed, these series of CAP sheets will form the initial Control Account Plan.

- B. The Control Account Manager develops work activities to divide the work package into discrete manageable and measurable segments of work for the purpose of developing plans and determining progress. Each activity is sequenced in a manner that provides logical support for the project schedule. Work activities are at or below the reporting requirements such that earned value performance measurement takes place at the control account level.
- C. With the work activities identified in the Control Account Plan, the Control Account Manager estimates the resources (labor, expenses, and procurements) and the quantity (hours, dollars) required to accomplish the work activities. Labor resources are estimated according to various cost element categories, such as Plant Engineer, Mechanical Engineer, and Scientist, etc. Expense estimates are prepared for such items as supplies and materials, travel, and consulting. Labor and expense estimates are assigned to the month/fiscal year during which they will be used or expended. Estimates for procurements are also made and are assigned to the month/fiscal year in which payment is anticipated to occur. Dollar amounts for all cost estimates are entered in current year direct dollars. Once the resources have been identified and their costs estimated, a schedule of the work activities is developed with start dates, activity durations, and activity predecessors. Data from the Control Account Plan sheet is used to develop the initial Detail Schedule within the Schedule Management System as discussed in section 301.2 Schedule Development. Once this initial resource-loaded Detail Schedule is created using the Control Account Plan sheets, the Detail Schedule then becomes the basis for future development of the Control Account Plans.
- D. One essential product of the Control Account Plan is the identification of the types and levels of labor resources that must be provided by each functional organization supplying labor to the project. Summary reports showing labor requirements in support of work scope as documented in the Control Account Plans are prepared by Project Management & Integration and used by senior project management to assure the availability of such personnel when needed.
- E. At this stage in the planning process, three project baselines have been established: the technical baseline, the schedule baseline, and the cost baseline. The technical baseline, organized around a WBS framework, describes the desired configuration, performance, and characteristics of the project and establishes the project's mission, technical objectives, and functional requirements. The required work activities to satisfy the project's mission need are logically linked in a schedule baseline integrating the entire work scope while reflecting all programmatic constraints. The cost baseline is based on validated cost estimates developed for the project work scope and



ensures resources for labor, services, subcontracts, and materials are established at the requisite levels. In total, these three baselines produce the Integrated Project Baseline. The approved Control Account Plans that form the Integrated Project Baseline represent the life-cycle budget plan for accomplishing all of the project work scope.

- F. The Integrated Project Baseline lays the foundation through which project objectives can be achieved and progress can be managed and monitored during project execution. Data that form the Integrated Project Baseline are recorded in an integrated cost/schedule database using the Cost and Schedule Management Systems. These systems share the data to produce a resource-loaded schedule and time-phased budget plan.

303.1 Performance Measurement Baseline

- A. After an in-depth review, the project management team validates the Integrated Project Baseline thereby establishing the Performance Measurement Baseline. This time-phased budget plan encompasses all the individual work activities of the control accounts with the dollars and resources necessary to accomplish them. Within the Performance Measurement Baseline, any budget not yet specifically identified with a control account may be held in the short term holding account Undistributed Budget. Undistributed Budget is a transient amount and should be allocated in a reasonably timely manner. The Performance Measurement Baseline sets the criteria against which actual performance is measured during project execution. This comparison process helps identify problem areas early and aids the development of a recovery plan.
- B. Earned Value Management employs three sets of project data to provide project management with insight into the progress of the project. From the Performance Measurement Baseline, the Budgeted Cost of Work Scheduled (BCWS) can be established. This metric represents the sum of the time-phased budgets established for all effort scheduled to be accomplished within a given time period. BCWS can be called “Planned Value.” At the project completion time point, the BCWS should equal the Budget At Completion (BAC). BAC is the budgetary goal for accomplishing all of the authorized work contained in the control accounts. While BCWS is derived from project planning, Budgeted Cost of Work Performed (BCWP, the second set of data) is determined during project execution. BCWP, or “Earned Value,” is the sum of the time-phased budgets for work completed during a specified time period; i.e., the value of the work accomplished. The third set of data, also collected during project execution, is Actual Cost of Work Performed (ACWP) or “Actual Costs.” Actual Costs are the project costs incurred and recorded in accomplishing the work performed (i.e., Earned Value) within a given time period. With these three earned value metrics, project



management can evaluate the status of the project in relation to the technical, schedule, and cost baselines established for the project. An Estimate At Completion (EAC) can be calculated that sums the actual costs incurred to date plus the estimate of costs for all authorized work remaining. Additional detail on Earned Value Management is provided in chapters 600 Progress Status and 700 Analysis and Reporting of the JSA Project Control System Manual.

304 Exhibits

6. Baseline Milestones Example
7. Intermediate Milestones Example
8. Detail Schedule Example
9. Control Account Plan Sheet



Exhibit 6. Baseline Milestones Schedule Example

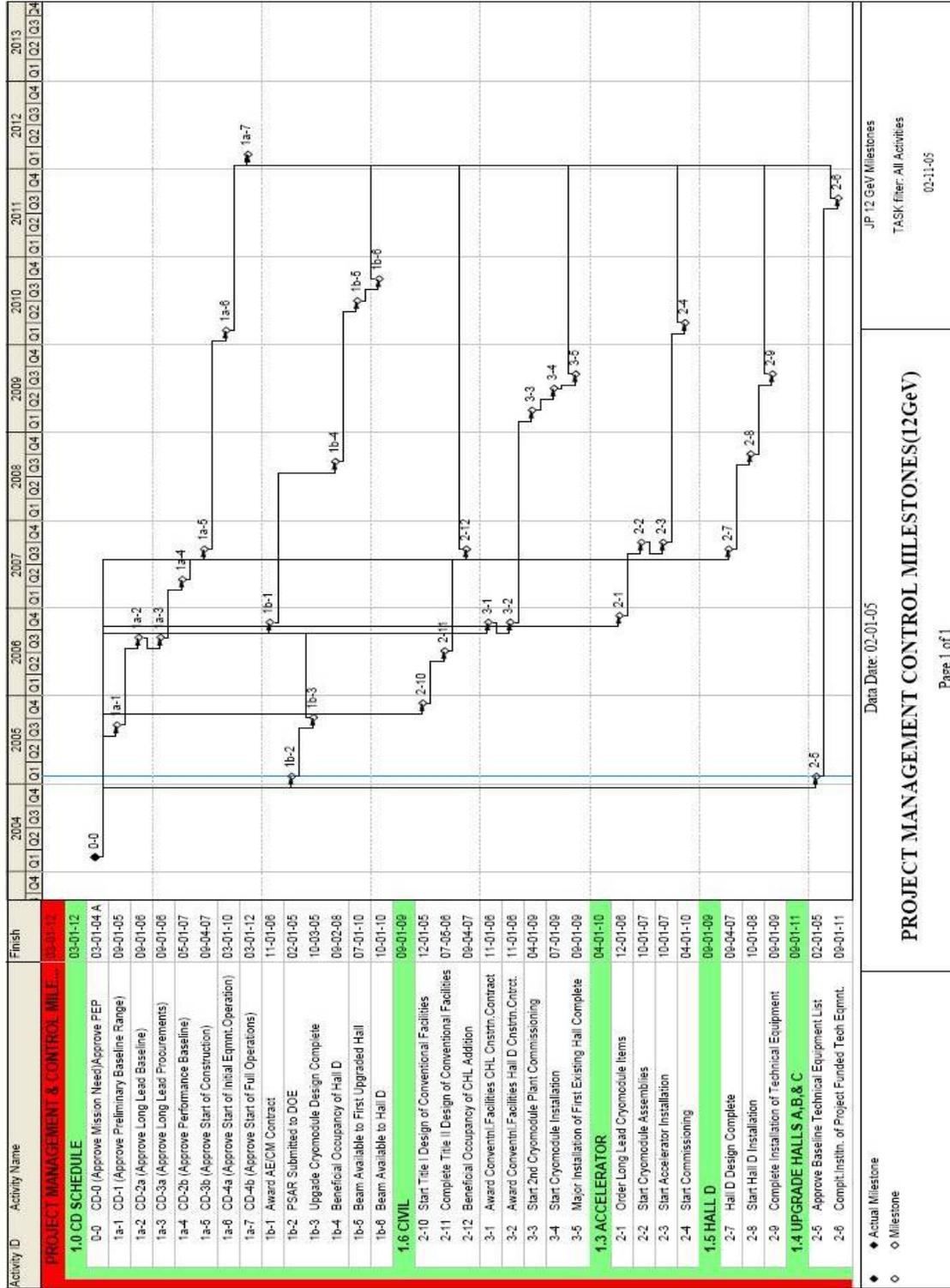




Exhibit 7. Intermediate Milestones Schedule Example

Activity ID	Activity Name	Year																								
		2001			2002			2003			2004			2005												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
SNS LAB Intermediate Milestones																										
Spallation Neutron Source Project																										
1.1 Research and Development																										
1.1.1.1 Superconducting Linac R&D																										
1.1.1.1.1 Medium Beta Cryomodule R&D																										
SL1101RD16	M-B CM Procurement Package Complete																									
SL1101SC10	M-B SC - Design Complete SC10 Finish																									
SL1101SC21	Initiate Testing of Proto Cryomodule SC21 Finish																									
1.1.1.1.2 High Beta Cryomodule R&D																										
SL1101RD25	H-B CM Procurement Package Complete																									
1.1.1.1.3 RF Skid R&D																										
SL1101RD40	IPL - 10 kW RF Skid																									
SL1101RD41	IPL - 1 MW RF Skid Operational																									
1.4 Linac Systems																										
1.4.10 Medium Beta Cryomodule																										
1.4.10.4 Cavity/Cryomodule Assembly Labor																										
SL10040007	START PRODUCTION Mech/Beta CM																									
1.4.12 Cryogenic System																										
SL1200SC22	IPL - BOD Cryo Building																									
SL1200SC36	IPL - Cryosystem Cooldown (SC35 Finish)																									
SL1200SC86	IPL - BOD 600 MeV Linac Tunnel																									
SL1205CRFE	IPL - RFE Cryo Building																									
1.4.12.3 Control, Refrigerator & Cryomodule																										
SL12030006	IPL - Refrig Controls Operational																									
SL12030008	IPL - CM Controls Operational																									
1.4.13 SC Assembly Facility																										
SL1300SC40	IPL - BOD SRF Assembly Bldg SC40 Finish																									
SL1300SC66	IPL - SRF Facility Operational SC66 Finish																									
1.4.15 High Gradient																										
1.4.15.6 Process Development																										
SL15060100	805MHz Cavity Electropolishing Sys Operational...																									

JP SNS Intermediate Milestones
TASK filter: Milestone Level X
03-23-05

Intermediate Milestones

- ◆ Actual Milestone
- ◇ Milestone



Exhibit 8. Detail Schedule Example

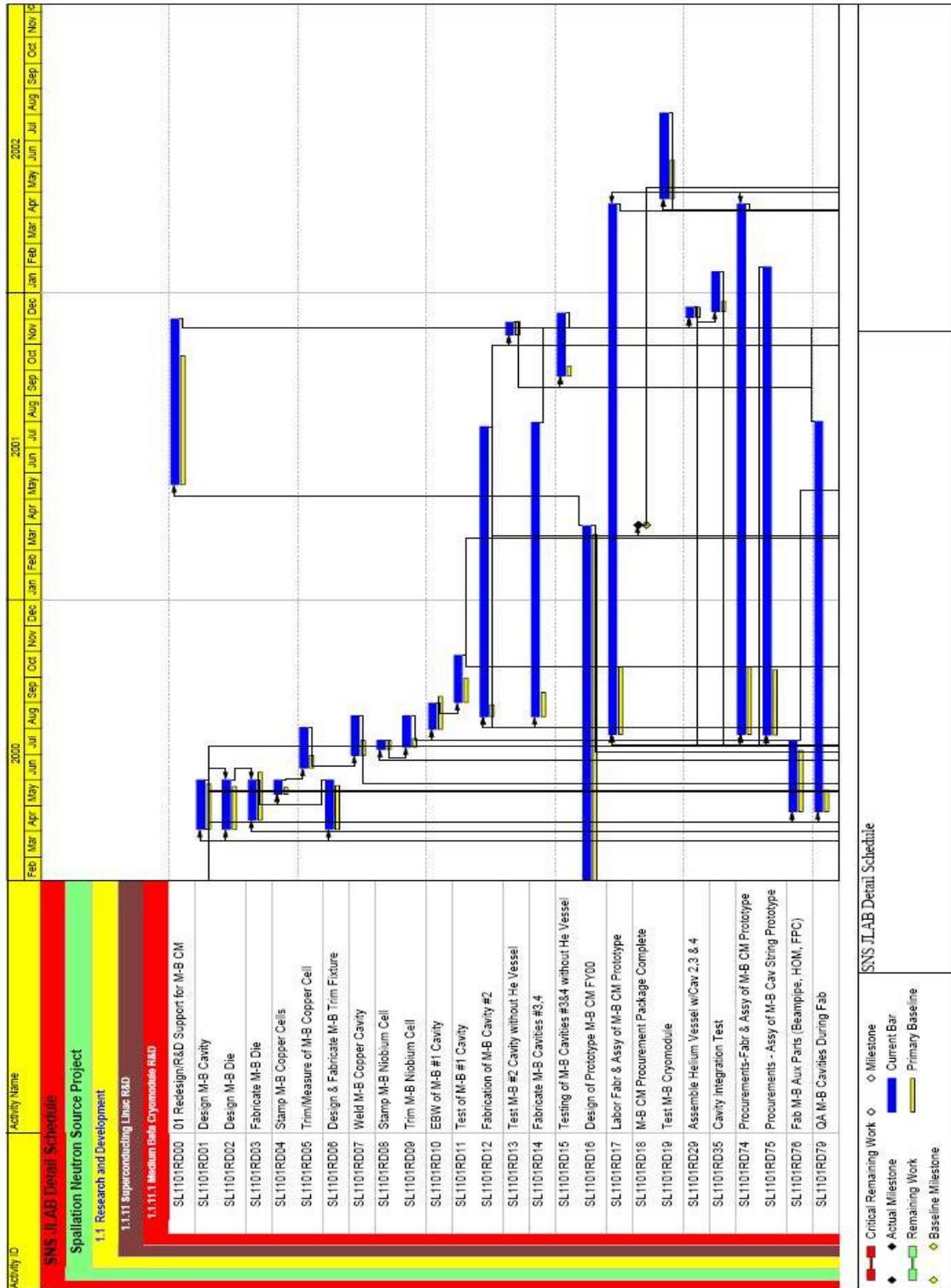




Exhibit 9. Control Account Plan Sheet

A	B	C	D	E	F	G	H	I	J	K	L	M
Control Account Plan (CAP)												SAVE Buttons
1	Project		Cost Account Manager	Business								SAVE CAP
2	WBS		Uploaded to Schedule	Not selected								SAVE / SUBMIT CAP
3	CAM											SAVE OFF NETWORK
4	Description:											
5			Cost Sheet Total \$: Budgeted For	Labor	CAP Total \$: Budgeted For	Labor						
6			Expenses	Expenses								
7			Procurements < \$50K	Procurements < \$50K								
8			Procurements > \$50K	Procurements > \$50K								
9			Cost Sheet Grand Total Cost	Cost Sheet Grand Total Cost								
10												
11												
12												
13												
14												
15												
16												
17												
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36												
37	STEP #1	Activity Description										
38	STEP #2	Enter Duration in Calendar Weeks										
39	STEP #3	Select Resources										
40	STEP #4	Budgeted Labor Person Weeks										
41	STEP #5	Budgeted Expenses / Procurement \$										
42	STEP #6	Predecessor										
43	STEP #7	Planned Start Date										
44	STEP #8	Finish By Date										
45	STEP #9	External Predecessor Link										
46	STEP #10	External Predecessor Link										
47												
48												
49												
50												
51												
52												
53												
54												
55												
56												
57												

CALCULATE Planned Start Date

VIEW Gantt Chart

EXPORT to Primavera



Jefferson Science Associates, LLC

400 Work Authorization System

**Project Control System Manual
Revision 4**



400 Work Authorization System

A work authorization system is required during the project execution phase to control the flow of work to be accomplished within the authorized project budget. This formal procedure is used to sanction project work ensuring all activities are performed at the correct time and in the proper sequence. Limits are imposed on managers in their authority to commit and expend resources that will be charged to the project. These limitations provide assurance to the Project Manager that no work is authorized unless it has been properly planned and budgeted. Work authorization is the specific mechanism where Control Account Managers receive the authority to begin the work defined in their validated and approved Control Account Plans.

401 Work Authorization Process

- A. After the Project Customer has given the project team official authority to commence work and funding has been provided, the work authorization process is employed to initiate project execution. The authorization process is a key communication link between senior project management and the Control Account Managers because it confirms the cost, schedule, and the scope of work required to meet project objectives. Control Account Managers are formally delegated the responsibility for their work scope and the schedule and budget performance parameters.
- B. To authorize the expenditure of effort and budget for a control account, the Project Manager will issue a Work Authorization Document (Exhibit 10) to the Control Account Manager at the appropriate period in the project schedule. The Work Authorization Document contains the control account information, a list of associated work packages, approval signatures, and acceptance signature of the Control Account Manager. The signed Work Authorization Document empowers the Control Account Manager to implement the Control Account Plan.
- C. Once a Work Authorization Document has been signed by all relevant parties, Project Management & Integration will open control account numbers through the Jefferson Laboratory Chief Financial Office allowing charges to the control account's work packages.



402 Specific Authorizations

402.1 Control Account Labor Authority

Authority for a Control Account Manager to apply labor resources to work scope contained within the control account is contingent upon:

- the Control Account Manager receiving delegation of signature authority according to procedures established in the Jefferson Lab Administrative Manual,
- the Control Account Manager receiving approval from the Associate Project Manager and the Project Manager to accomplish the applicable work scope (i.e., the Work Authorization Document), and
- the Chief Financial Office receiving notification from the Project Manager directing the appropriate Project ID Number(s) to be opened that are associated with the applicable work scope.

402.2 Procurement Authority

Authority for any individual to commit project funds to outside vendors for delivery of products or services is limited to only those persons defined in the JSA/JLab Acquisition Policy Manual.

403 Exhibits

10. Work Authorization Document



Jefferson Science Associates, LLC

500 Accounting

**Project Control System Manual
Revision 4**



500 Accounting

- A. The Jefferson Lab Financial Management System is a key component of the Earned Value Management System. The purpose of the accounting system is to collect the actual costs incurred by a project, which when compared with Earned Value data, can provide project management with the status of a project's budget. Labor (in-house and contracted) and purchased material/equipment represent the bulk of a project's expenses. Accurate accounting for both expense categories is essential to gaining a true understanding of how a project is performing with regards to the Performance Measurement Baseline.
- B. There are five paths for project costs to enter the accounting system:
- Labor (payroll) via time sheets
 - Accounts payable via purchase order (PO) voucher
 - Travel via expense report
 - Accounts Payable via A/P voucher
 - Journal Entry
- C. All costs are assigned a Project/Organization/Account (POA) number which provides identification to the proper cost objective.

501 Cost Collection and Control

501.1 Cost Reporting and Collection

- A. The Projects module of the accounting system is used for cost reporting. The Project/Organization/Account alphanumeric numbering convention, shown below, makes reporting labor and material costs easy for tracking. The costs are reported by project and/or organization and account combination.

Project Code: XXXXXX.XX.XX.XXX.XXX.XXX.XX.XX

Organization Code: X.XX.XXX.XXXX.XX

General Ledger
Account Code: XXXX - XXX



- B. The Projects module in the Financial Management System and the MIS web Project Status Report permit Finance and Project Management & Integration to track costs for the life of the project.

501.2 Labor

- A. The accounting system source data for labor entries is the time sheet for each individual. Time sheets must be signed electronically by the individual employee attesting to the time worked or by a supervisor or division coordinator in their absence. The time sheets are then electronically counter-signed by an individual authorized to approve labor charges. In some cases, an additional project signoff is required based on project requirements.
- B. Completed time sheets are received electronically in the Payroll Department. Costs are not entered into the payroll system directly. They are first captured in the timesheet module which allocates the cost to the cost accounts. Because Jefferson Lab is on a semi-monthly payroll system, the number of hours a person works in a pay period will vary.
- C. The Project Status report (Exhibit 11) provides a breakout of labor costs for each POA. This report is available on the Jefferson Lab MIS web portal to Control Account Managers, Associate Project Managers, and the Project Manager for review and verification.

501.3 Accounts Payable via Purchase Order Voucher

- A. Processing of Purchase Requisitions

A Purchase Requisition (PR) is required for the acquisition of all Jefferson Lab goods and services except items purchased via a JSA P-Card or non-PO related items such as utilities, honorariums, etc. The PR is generated online via the Lab's requisition system by the requesting project office and must include a description of the goods/services required, the appropriate Project/Organization/Account (POA) number, and a cost estimate. The PR is routed electronically for signature approval based on the value of the request and on other Lab required verifications.

- B. Procurement Objectives and Constraints

In processing PRs and placing Purchase Orders (PO) with vendors, the Procurement Department (PD) must provide timely support to requisitioners in accordance with JSA's Acquisition Policy Manual, which is approved by the Department of Energy. Procurement guidance is available on the Lab's website to assist requisitioners in processing their requirements.



C. Processing of Purchase Orders

- When the PD reaches agreement with a vendor to provide the goods or services requested, a formal purchase order/subcontract is awarded/generated. At this time, the requisition becomes a PO/subcontract and is entered into the laboratory's Financial Management System. Status of the PO is available through the Lab's requisition system.
- The accounting system tracks these commitments by the POA number and reports the commitment information until the goods or services are received. A commitment can be reviewed in the Outstanding Commitment Detail report (Exhibit 12) via the Jefferson Lab MIS web portal. The total commitment for a POA can be viewed in the Project Status Report in the column labeled 'Open PO Commits'. For multi-year procurements, only the dollar amount actually obligated to the vendor in the approved phase of the contract is included in the commitment listings. (For example, a phased subcontract with a total value of \$10,000,000 might only reflect a current-year commitment of \$300,000. According to a schedule stated in the subcontract, the remainder will become a commitment shortly after the beginning of each new fiscal year upon written notice to the vendor via a contract modification.)
- When goods are received by Jefferson Lab, they are entered into the accounting system by Shipping and Receiving, and both a receiving report and the goods are forwarded to the requisitioner for acceptance. At this time, the goods are classified as "received but not booked," but are still recognized as commitments in the laboratory reporting mechanism. At month end, commitments that have been received but not yet invoiced are accrued as costs and are not reported as commitments. This entry is reversed immediately in the next period and received items are recognized as open commitments.
- When an invoice is received and approved for payment, it is entered into the accounting system. Once there is a line-by-line match between the purchase order, the receiving report, and the invoice, the amount is removed from the commitment list and added to the Non-labor Detail report. It also moves the amount from the commitment column to the current, year-to-date and cumulative cost columns on the Project Status Report. These amounts are used by the Project Management & Integration Division at the end of the accounting period as part of the Earned Value reporting.



- Actual payment of the invoice is a financial function and depends on the terms and conditions of the Purchase Order.
- For large service subcontracts, the process described above may result in understated actual costs if the vendor/subcontractor delays the submittal of an invoice or if the submittal falls just after the normal close of the accounting period. To assure these actual costs are not understated, service subcontracts are accrued at month end as delineated by the Procedure for Procurement Accruals in the Jefferson Lab Subcontract Purchase Order Process document.
- Each month, the Project Status Report lists material and service expenses and commitments by POA.

501.4 Travel

- A. Travel is initiated by a Travel Authorization Request. This form includes a total estimate of the trip cost, the proper POA number, a list of any prepayments (e.g. for registration) needed, and the signature of a person authorized to approve travel on that POA. Travel arrangements are coordinated through the Jefferson Lab travel agent by travel coordinators in the divisions. The Travel Authorization Request is sent to Travel Services.
- B. After completion of the trip, a Travel Expense Voucher is prepared in accordance with the Administrative Manual - Travel Section and matched up with the corresponding Travel Authorization Request. The completed forms are sent to Travel Services for processing. Based on the Travel Expense Voucher, actual costs are recorded in the accounting system to the approved POA.
- C. An accrual of travel costs is prepared at month end based on any open Travel Authorization Requests for the end of the month and prior. This entry is reversed out the following month and is offset by the actual Travel Expense Voucher. Any differences fall in the month the Travel Expense Voucher is processed.

501.5 Accounts Payable via A/P Vouchers

A/P Vouchers are used to pay for non-purchase order expenses (e.g., utilities, honorariums, petty cash reimbursements, Job Related Training registration, etc.). Since there is no PO or receiving report entered into the system, these vouchers require approval by appropriate division personnel prior to data entry. Project cost is identified at time of voucher distribution posting.



501.6 Procurement Credit Cards (P-Card)

- A. The P-Card is used by authorized users to purchase items in lieu of preparing a requisition or issuing a purchase order in accordance with JSA's Acquisition Policy. Purchased items are recorded in a credit card log by the card holder noting the date ordered, POA, vendor, item description, and amount. These entries are reflected on the MIS web Project Status Report.

- B. An accrual of P-Card costs is prepared at month end based on any unbilled/un-reconciled credit card log items for the end of the month and prior. This entry is reversed out the following month and is offset by the actual P-Card invoice. Any differences fall in the month the P-Card invoice is processed.

501.7 Journal Entry

A Journal Entry is used to accrue and/or record various types of costs. Examples are materials received not yet vouched, credit card accruals, estimated travel expenditures, stockroom inventory withdrawals, etc. Journal entries are also used for adjusting/correcting the classification of costs to the proper POA.

501.8 Inventories

Jefferson Lab maintains a stock supply inventory. Monthly distribution of these costs is based on actual withdrawals and charged to the using POA.

501.9 Machine Shop Service Center Costs

The Machine Shop Service Center performs in-house machining services (jobs) at Jefferson Lab for various Projects/Organizations as requested. The in-house machining costs include salaries, fringe benefits, statutory payroll expenses, and other direct costs associated with operating the machine shop. These costs are allocated based on the actual number of machine shop labor hours used for each job. A target hourly rate is developed, monitored, and charged throughout the year. At year end, the target rate is replaced with the actual rate which is applied retroactively to all jobs for the fiscal year.

501.10 Indirect Costs

The Chief Financial Office is responsible for managing all indirect costs at Jefferson Lab. Target indirect rates are calculated at the beginning of the fiscal year and monitored monthly. If there is a major deviation from the target, the rate is changed in the accounting system and retroactively adjusted back to the beginning of the fiscal year. At the end of the fiscal year, the target rate is



changed to equal the actual rate in order to reflect the year-to-date adjustment in the current month. Reference the JSA/JLab Cost Accounting Standards Disclosure Statement for details.

501.11 Interface of Accounting System and Project Control System

Each month, Project Management & Integration downloads actual cost data and commitments by POA from the Financial Management System. This file is then imported into the Cost Management System. Data from the Schedule Management System is then uploaded into the Cost Management System to measure the actual costs against the schedule and planned costs to provide Cost and Performance Reports.

501.12 Correction of Mischarges

Control Account Managers identify incorrect charges and submit corrections to Finance for appropriate action.

501.13 Closing of Control Accounts

The Project Management & Integration Division identifies project control accounts for which work has been completed (i.e., cumulative BCWP equals BAC) or for which there is no work scheduled during the year. They then meet with affected Control Account Managers and determine if the control accounts should be closed. PM&I takes appropriate action when deemed necessary.

502 Material Accounting System

- A. The Material Accounting System provides full accountability of all material procurements. Material items purchased for Jefferson Lab projects are managed in accordance with the Jefferson Lab Property Management Manual to ensure that all property is properly acquired, inventoried, utilized and disposed. Cost accumulation for material procurement and assignment to the appropriate accounts (POA) are handled by the Lab's Financial Management System.
- B. This accounting system also provides for effective performance measurement of material acquisition effort. Planned purchases of material items are listed as activities in a project's Control Account Plans. Projected procurement dates are assigned to these activities, thus integrating material acquisition into the project's time-phased budget. Earned value for materials is normally credited when the item arrives at the Jefferson Lab Shipping and Receiving Office and is accepted. As with direct labor, actual costs for material items are charged to the appropriate account by use of the Project-Organization-Account number. Actual costs for material should be reported in the same



accounting period that earned value is taken. This practice prevents distortions in the performance measurement data that would reflect incorrect progress status. In situations where earned value is claimed but the invoice has not been paid, estimated actual costs (accruals) are incorporated into the actual cost database from purchase order information, P-Card logs, and Travel Requisitions.

503 Exhibits

11. Project Status Report Example
12. Outstanding Commitment Detail Report Example



Exhibit 11. Project Status Report Example



MIS | STAFF SEARCH | CC HELP | MY PAGE | JLAB

[Download this file to Excel](#)

Status Report

For Fiscal Year 2005 Period 1

PROJ: SNS840
 PROJ ID: SNSXXX.8202010000.408.400
 PROJ NAME: ES&H & QA/QC Support
 PROJ MANAGER:

	CURRENT PERIOD INCURRED	TOTAL YTD INCURRED	OPEN PO COMMITS	PENDING (Credit Cards, PR, Stock, Travel)*	FY05 SPENDING	TOTAL BUDGET (-% OF DIRECT BUDGET SPENT)	REMAINING BUDGET	TOTAL CTD INCURRED
LABOR								
Direct Labor	0	0	0	0	0	0	0	0
Statutory Fringe(0.000%)	0	0	0	0	0	0	0	0
Fringe Benefits(0.000%)	0	0	0	0	0	0	0	0
TOTAL LABOR	0	0	0	0	0	0	0	0
EXPENSES								
Supplies & Materials(6043)	0	0	0	0	0	0	0	0
TOTAL EXPENSES	0	0	0	0	0	0	0	0
TOTAL DIRECT	0	0	0	0	0	0	0	0
OVERHEAD								
G&A(30.000%)	0	0	0	0	0	0	0	0
TOTAL WITH OVERHEAD	0	0	0	0	0	0	0	0



Exhibit 12. Outstanding Commitment Detail Report Example



MIS STAFF SEARCH CC-HELP MY PAGE JLAB

SURAJEFFERSON LAB - DOE FUND
PURCHASE COMMITMENTS DETAIL REPORT
Fiscal Year: 2005 Period: 7

Project Abrv : 12CDR

Project Name : 12 GeV CDR

Owning Org : DIRGEN

PROJ	ORG	ACCT	PO ID	PO LINE NUM	PO LINE DESCRIPTION	PO OPEN AMOUNT
12CDR	DIRGEN	8046-003	04A1614006	2	TASK ORDER 4: REIMBURSABLE ESTIMATED-NOT TO EXCEED	\$1,000.00
12CDR	DIRGEN	8046-003	04A1614006	3	TASK ORDER 4: PROVIDE AE SERVICES AS DESCRIBED	\$31,437.21
12CDR	DIRGEN	8046-003	04A1614006	3	TASK ORDER 4: PROVIDE AE SERVICES AS DESCRIBED	\$6.29
Total PO 04A1614006						\$32,443.50
Total						\$32,443.50



Jefferson Science Associates, LLC

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Progress Status

Project Control System Manual
Revision 4



600 Progress Status

This chapter of the JSA Project Control System Manual explains how the status of the project is determined during the execution of the project plan. On a monthly basis, actual project work, schedule and cost data are collected and then compared to the Performance Measurement Baseline using an Earned Value Management methodology. Ensuring the collected data are valid and accurate is crucial to producing credible progress status reports. This knowledge of the project status aids all levels of project management in taking proper corrective action when deviations to the project plan surface.

601 Earned Value Management Indicators

There are three basic sets of indicators in an Earned Value Management System. It is through these metrics that a project's current schedule and cost status can be established and a final completion date and cost for the project can be estimated. Data for these indicators are normally measured in dollars (\$).

601.1 Planned Value

The first data set generated by a project is the Budgeted Cost of Work Scheduled (BCWS) or Planned Value. Planned Value is that segment of the total cost estimate planned to be spent on a project activity. This data set is derived from the Performance Measurement Baseline established during the project's planning phase where the work scope is scheduled and budget levels are assigned to the scheduled work. It is calculated cumulative to date by summing the monthly budgeted value of control accounts from the start of the project to the end of the current accounting period.

601.2 Earned Value

A. Data for Budgeted Cost of Work Performed (BCWP) or Earned Value are collected during project execution by measuring the progress of the control account work activities. When measuring Earned Value for a project, there are many methods available to assess the status of each work activity.

Projects at Jefferson Lab normally make use of these methods:

- **50 /50:** In using this earned value method, the Control Account Managers get credit for 50% of the Planned Value when work on an activity has started, and the remaining 50% when work on an activity has been completed. This method is used for activities with less than \$50K budget or less than two months duration.



- **Level of Effort (LOE):** A Level of Effort activity is work that does not readily lend itself to measurement of discrete accomplishment and normally has a duration of one fiscal year. LOE is measured only in terms of resources actually consumed within a given time period. It is generally characterized by a uniform rate of activity over a specific period of time and thus Earned Value is always equal to Planned Value. Earned Value for project management activities is usually determined in this manner.
- **Procurement Pegpoints:** For large procurements, pegpoints are established to assess progress on project procurement activities. Major procurements will use 12-month phased contract place holders and then be replaced with the actual procurement pegpoints at time of award. These pegpoints are a 0/100 Earned Value method; credit is not taken until the pegpoint is accomplished.
- **Percent Delivered:** This method is used for procurement activities where contracted items are delivered.
- **Percent Units Complete:** This method is used for activities where fabrication, receiving, installation, testing, or checkout of multiple units is taking place.
- **Percent Effort Civil Construction:** Civil construction contracts require submission of cost-loaded schedules from the construction contractor prior to the start of on-site work. Each activity on the schedule will be a definable portion of work measurable in the field and the total of the activities will equal the contract value. The approved construction contractor's schedule will be incorporated by change request as the baseline schedule. With monthly payment requests, the construction contractor will provide an updated schedule with the percentage complete of each activity.
- **Special (Percent Complete):** The Control Account Managers assess the progress of each activity in their control accounts and provide a percentage of the work in that activity that has been completed. Objective measurements are used to establish percent complete. Before work starts on a particular work activity, Control Account Managers must develop an objective criteria list for determining percent complete. This list will be approved by the Project Manager.
- **Milestone:** As milestone activities have zero duration and zero budget, there is no earned value claimed for these schedule elements.



- **Zero Budget:** Used for activities that currently have zero budget. As such, there is no earned value claimed for these schedule elements.

B. Effort Codes, as described in the table below, are used for each activity in the Schedule Management System to identify the Earned Value method used.

Code	Earned Value Method
H	50/50
E	Level of Effort
P	Procurement Pegpoints (0/100)
D	% Delivered
U	% Units Complete
C	% Effort Civil Construction
S	Special (Percent Complete)
M	Milestone
Z	Zero Budget

C. Earned Value is the cost originally budgeted to accomplish the work activities that have been completed and can include a percent complete of work activities that are still open. Earned Value is calculated both for the current status period and cumulative to date. When compared to Planned Value and Actual Cost, the Earned Value data provide an assessment of a project’s schedule and cost performance.

601.3 Actual Costs

During project execution, costs are incurred for work accomplished. These transaction data are recorded as Actual Cost of Work Performed (ACWP) or Actual Costs. Actual Costs are determined for the current period and cumulative from the start of the project.

602 Remaining Duration

Another important data item for measuring progress on a project is remaining duration. Remaining duration is a Control Account Manager’s estimate (independent of the percent complete assessment) of the number of working days (or weeks) required to complete the work remaining on an activity. Remaining duration is used by the Schedule Management System in determining the project’s schedule status.



603 Collection of Project Data

- A. Schedule and cost data are collected each month from the Control Account Managers and the Jefferson Lab financial system, respectively, to establish the performance of the project. The Project Management & Integration Division will schedule a status update session with each project Control Account Manager or identified responsible person to review the progress made on each relevant activity. Project schedule data may be collected via e-mail from the Control Account Managers using the Status Update Report (Exhibit 13). This MS Excel spreadsheet is available for use by the Control Account Managers to update their control account progress. The report contains a list of the work package activities within a control account. Control Account Managers annotate in the report those activities that have started with the start date; those activities that have been completed with the finish date; and those activities that are still ongoing with a percent complete (or Level of Effort) and remaining duration assessment. Alternate status input methods, compatible with the Scheduling Management System such as Primavera “Contractor,” may be used.

- B. After the Status Update Reports for all control accounts are completed, PM&I updates the Working Detail Schedule in the Schedule Management System and conducts a time analysis of the logic network. New early/late start and finish dates, float and the critical path are calculated. Additionally, the project’s incurred costs are imported from the accounting system into the Cost Management System. With this collected project data, the PM&I generates monthly reports that highlight important Earned Value Management indications of the project’s schedule and cost health.

604 Exhibits

- 13. Status Update Report Example



Exhibit 13. Status Update Report Example

12 GeV JUNE 2007 STATUS UPDATE												
WBS Name	Activity ID	Activity Name	BL Project Start Date	Calc Start Date	Actual Start Date	Expect to Start Date	BL Project Finish date	Calc Finish Date	Actual Finish Date	Expect To Finish Date	Prev Status % Comp	New Status % Comp
1.15.2 DETECTOR	1152005	Drit chamber prototyping (DTCTR)	2-Oct-06	1-Nov-06	1-Nov-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.2 DETECTOR	1152005A	Drit chamber prototyping (DTCTR)	2-Feb-07	1-Feb-07	1-Feb-07		28-Sep-07	28-Sep-07			50%	
1.15.2 DETECTOR	1152010	BCAL prototyping (DTCTR)	2-Oct-06	1-Nov-06	1-Nov-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.2 DETECTOR	1152010A	BCAL prototyping (DTCTR)	2-Feb-07	1-Feb-07	1-Feb-07		28-Sep-07	28-Sep-07			50%	
1.15.2 DETECTOR	1152010E	BCAL postdoc (DTCTR)	2-Oct-06	2-Oct-06	2-Oct-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.2 DETECTOR	1152015LOEA	BCAL postdoc (DTCTR)	2-Feb-07	1-Feb-07	1-Feb-07		30-Mar-07	1-May-07	1-May-07		100%	
1.15.2 DETECTOR	1152020	UPV prototyping (DTCTR)	2-Oct-06	1-Dec-06	1-Dec-06		28-Sep-07	28-Sep-07			0%	
1.15.2 DETECTOR	1152025	CER prototyping (DTCTR)	2-Oct-06	1-Dec-06	1-Dec-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.2 DETECTOR	1152025A	CER prototyping (DTCTR)	2-Feb-07	1-Feb-07	1-Feb-07		28-Sep-07	1-May-08			0%	
1.15.4 ELECTRONICS	1154005	FADC development (ELECTRONICS)	2-Oct-06	1-Nov-06	1-Nov-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.4 ELECTRONICS	1154005A	FADC development (ELECTRONICS)	2-Feb-07	1-Feb-07	1-Feb-07		28-Sep-07	28-Sep-07			0%	
1.15.4 ELECTRONICS	1154010	Trigger development (ELECTRONICS)	2-Oct-06	2-Oct-06	2-Oct-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.4 ELECTRONICS	1154010A	Trigger development (ELECTRONICS)	2-Feb-07	1-Mar-07	1-Mar-07		28-Sep-07	28-Sep-07			60%	
1.15.5 BEAMLINE	1155005	Hodoscope prototyping (BEAMLINE)	2-Oct-06	2-Oct-06	2-Oct-06		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.5 BEAMLINE	1155005A	Hodoscope prototyping (BEAMLINE)	2-Feb-07	30-Mar-07	30-Mar-07		28-Sep-07	1-May-08	1-May-08		15%	
1.15.5 BEAMLINE	1155010	Conduct Diamond studies (BEAMLINE)	2-Oct-06	15-Jan-07	15-Jan-07		1-Feb-07	1-Feb-07	1-Feb-07		100%	
1.15.5 BEAMLINE	1155010A	Conduct Diamond studies (BEAMLINE)	2-Feb-07	2-Feb-07	2-Feb-07		28-Sep-07	1-May-08			20%	



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Analysis and Reporting

Project Control System Manual
Revision 4

700 Analysis and Reporting

This chapter of the JSA Project Control System Manual explains how the performance status is determined, analyzed and documented during the execution of the project plan. The Performance Management Baseline is the basis for performance analysis and reporting. Analysis provides the project team an understanding and assessment of the project and its progress. Reporting is the communication means to ensure managers comprehend the Earned Value Management information. Schedule and cost variances from the Performance Measurement Baseline are derived by analyzing a project's earned value metrics. Variance thresholds are established to enable project management to focus attention and resources on those variances with the most significance to the project. Results from the variance analyses provide the stimulus for management action to resolve project issues before they become substantial problems.

701 Variance Analysis

The purpose of variance analysis is to identify problems early so that prompt corrective action can be taken to minimize cost and schedule impacts, cost overruns, and schedule delays to the project. Variance analysis quantifies the deviations from the timed-phased budget based on the work accomplished and cost data collected. Variance within Earned Value Management is described by two metrics: Cost Variance and Schedule Variance. Other project performance measurements are obtained from these two expressions. Variances and other performance measurements (current period and cumulative) are calculated monthly at the project work package level and summarized for each individual control account. Variances can be aggregated at higher WBS and organizational levels to include the total project.

701.1 Variance and Performance Indicators (Exhibit 14)

- A. Schedule Variance (SV): The difference between the Budgeted Cost of Work Performed (BCWP, Earned Value) and the Budgeted Cost of Work Scheduled (BCWS, Planned Value).

$$SV = BCWP - BCWS$$

If the result is a zero (0), it is an indication that the project is on schedule.

If the result is a positive (+) value, it is an indication that the project is ahead of schedule.

If the result is a negative (-) value, it is an indication that the project is behind schedule.



While Schedule Variance indicates the dollar value difference between accomplished and planned work activities, it does not specify the amount of time the project is ahead or behind schedule. Analysis of the project schedule in the Schedule Management System will reveal the status of specific activities, milestones, and critical events. It is important that both schedule and performance measurement analysis be performed to accurately monitor schedule performance.

- B. Cost Variance (CV): The difference between the Budgeted Cost of Work Performed (BCWP, Earned Value) and the Actual Cost of Work Performed (ACWP, Actual Cost).

$$CV = BCWP - ACWP$$

If the result is zero (0), it is an indication that the project is on budget.

If the result is a positive (+) value, it is an indication that the project is underrunning its budget.

If the result is a negative (-) value, it is an indication that the project is overrunning its budget.

- C. Schedule Performance Index (SPI): The ratio of the Budgeted Cost of Work Performed to the Budgeted Cost of Work Scheduled and represents the schedule efficiency of the project.

$$SPI = BCWP / BCWS$$

If the result is equal to 1.0, it is an indication that the project is on schedule.

If the result is greater than 1.0, it is an indication that the project is ahead of schedule, accomplishing more work than planned for the considered time period.

If the result is less than 1.0, it is an indication that the project is behind schedule, accomplishing less work than planned for the considered time period.

Note: SPI will trend toward 1.0 as the project nears completion. Earned Value equals Planned Value at the end of the project, i.e., the work you planned to do is finally accomplished.



- D. Cost Performance Index (CPI): The ratio of the Budgeted Cost of Work Performed to the Actual Cost of Work Performed and represents the cost efficiency of the project.

$$\text{CPI} = \text{BCWP} / \text{ACWP}$$

If the result is equal to 1.0, it is an indication that the project is on budget.

If the result is greater than 1.0, it is an indication that the project is running under budget, spending less for the accomplished work than planned for that work.

If the result is less than 1.0, it is an indication that the project is running over budget, spending more for the accomplished work than planned for that work.

- E. Calculated Earned Value Management performance indicators will provide an early warning that the project is not executing to plan. To get to the root causes of the variances, the affected control account schedule and cost reports must be thoroughly examined. Once the causal analysis has been completed, then a corrective action plan can be formulated and implemented.

701.2 Estimate at Completion

- A. The next step in the analysis is to evaluate the earned value data and develop a projection for the future of the project based on the progress made to date. An estimate of when the project will be completed and the cost to complete can be established.
- B. For schedule projections, there are approximation methods to arrive at an estimate of the completion date. The most common method is to divide the Schedule Variance (SV) by the average monthly budgeted cost of work scheduled (BCWS). This method provides an approximate duration in months of how far a project is ahead or behind schedule, but assumes current and future work will be accomplished at the same average monthly rate. A more accurate forecast can be made by analyzing the schedule data (e.g., critical path) in the Schedule Management System.
- C. For cost projections, an Estimate at Completion (EAC) can be derived using a number of methods. The EAC is the actual cost to date on the project plus an estimate of costs for the remaining authorized work (referred to as Estimate to Complete, ETC).

$$\text{EAC} = \text{ACWP} + \text{ETC}$$



An objective ETC can be generated by a detailed “bottoms up” approach where the Control Account Managers provide a description of the remaining activities in their accounts and an update to the estimated resources or cost for completing these activities. This comprehensive EAC method represents the best estimate of the total cost at the completion of the project and is required to be formulated at least once a year. Another approach is to declare the current Planned Value for the remaining work represents the ETC. This method for estimating the EAC assumes that all remaining work is independent of the dollar burn-rate established for the project to date.

D. For calculating an Independent Estimate at Completion (IEAC) based solely on performance factors, there are multiple methods that can be used.

- The first IEAC formula uses the Budget at Completion (BAC) and the Cost Performance Index (CPI) to calculate IEAC:

$$\text{IEAC} = \text{BAC} / \text{CPI},$$

where BAC is the sum of all project control accounts (and equal to a project’s total BCWS, Planned Value).

This formula assumes that the project dollar burn-rate remains constant for the remainder of the project.

- Another IEAC formula uses the Actual Cost, Budget at Completion, Earned Value and the Cost Performance Index to calculate IEAC:

$$\text{IEAC} = \text{AC} + [(\text{BAC} - \text{BCWP}) / \text{CPI}]$$

This formula is the same as formula 1 as long as a rebaselining that sets cost and/or schedule variances to zero has not occurred. If such an occurrence has happened, this equation should be used with the CPI being based on performance subsequent to the rebaselining.

- Finally, the following formula considers the potential cost impact of a schedule variance:

$$\text{IEAC} = \text{BAC} / [0.8 (\text{CPI}) + 0.2 (\text{SPI})]$$

In this formula, the EAC is weighted by 80% of the CPI and 20% of the SPI.

E. As no single technique consistently provides the best answer, the Project Manager will decide which EAC method or group of methods represents the



best approach for the project. An EAC will be generated each month for each control account and for the total project, and for other WBS levels as required for reporting to the Project Customer. The EAC for each control account will be reviewed at the monthly progress meeting.

701.3 Variance at Completion

EAC (or IEAC) is used to determine the Variance at Completion (VAC) for the project. The VAC is calculated as follows:

$$VAC = BAC - (I)EAC$$

If VAC is positive, the project is projecting an underrun; negative, an overrun.

701.4 Contingency

For certain Jefferson Lab projects, part of the Total Project Cost is carried as contingency to cover any unanticipated project costs.

$$TPC = BAC + Contingency$$

The contingency percentage (on a cost-to-go basis) for a project is calculated by dividing the contingency dollars by the Obligation Estimate To Complete dollars:

$$\text{Contingency Percentage (\%)} = \text{Contingency (\$)} / \text{ETC}_{ob} (\$)$$

$$\text{where Contingency} = \text{Funds remaining} - \text{ETC}_{ob},$$

$$\text{and Funds remaining} = \text{TPC} - \text{ACWP} - \text{Obligations},$$

$$\text{and ETC}_{ob} = \text{BAC} - \text{BCWP}_{cum} - \text{Obligations}$$

702 Project Reports

Formal project reports are an integral part of the Earned Value Management System. Summarized project data from the control account to the senior management reporting level provide the project management team with the insight into how the project is performing compared to the baseline project plan. Reports are generated by the Financial, Schedule and Cost Management Systems. The Financial Management System provides various cost reports and these can be found on the Jefferson Lab MIS web portal (Web Applications/Finance Related Applications). Project performance reports with Earned Value Management data will be produced by the Project Management & Integration Division from the Schedule and Cost Management Systems. The following list of reports is the



nominal set appropriate for all levels of projects at Jefferson Lab. Other management and Project Customer-specified reports can be generated by the Schedule and Cost Management Systems and tailored to the particular needs of the project.

702.1 Financial Management System Reports

A. Open Commitments Report (Exhibit 15)

The Open Commitments Report lists those procurement items for a project that have been ordered but have not been delivered or completed.

B. Project Status Report (Exhibit 16)

The Project Status Report details the incurred costs and open Purchase Order commitments on the project including labor, expenses, and overhead (indirect cost).

C. 12 Month Report (Exhibit 17)

The 12 Month Report breaks the project costs down to a monthly level. Previous fiscal year totals are provided for labor and expenses and then for each month of the current fiscal year.

D. Spending by Month Report (Exhibit 18)

The Spending by Month Report is similar to the 12 Month Report but also provides a breakout of indirect costs (fringe benefits and G&A).

702.2 Schedule and Cost Management Systems Reports

A. Project Analysis Report (Exhibit 19)

The Project Analysis Report is the primary earned value report for the project. These reports are normally provided at WBS Level 2, but can be produced down to WBS Level 4. The report displays the BCWS (Planned Value), BCWP (Earned Value), and ACWP (Actual Costs) for the current period and as a cumulative to date. The Schedule and Cost Variances, along with the associated performance index, are provided as well as the Budget at Completion, Estimate at Completion and Variance at Completion data.

B. Red Flag Report (Exhibit 20)

The Red Flag Report is the core of the variance reporting system. This monthly report summarizes cumulative performance data as of the end of the accounting period and identifies those control accounts with cost or schedule



variances exceeding thresholds established by the Project Manager. Variance thresholds are established for the value of the variance as well as the associated performance index (see Exhibit 21). Unless specified otherwise in a project's Project Execution Plan, the thresholds listed in Exhibit 22 will be the standard for all Jefferson Lab projects. Based on these thresholds, control accounts with a significant negative variance are identified by a color-coded flag on the Red Flag Report. Depending on the variance level, a yellow or red flag highlights the control account. A yellow flag is a warning and indicates a slightly unfavorable variance. A red flag indicates an unfavorable variance and initiates a Variance Analysis Report.

C. Variance Analysis Report (Exhibit 22)

Those control accounts identified with a red flag require the initiation of a Variance Analysis Report. (Note: While Variance Analysis Reports are normally generated at the control account level, these reports can be produced for other WBS levels at the discretion of the Project Manager.) The purpose of this report is to provide project management with an understanding of the nature of the problem causing the variance and its impact to the overall project. The Project Management & Integration Division will issue the Variance Analysis Report form to the appropriate Control Account Manager. After being completed by the Control Account Manager, the Associate Project Manager and the Project Manager will review the form to confirm accurate variance causes are identified and adequate corrective plans are established. Variance Analysis Reports will be evaluated monthly to monitor the implementation of current action plans.

D. Earned Value Management Performance Chart (Exhibit 23)

Earned Value Management Performance Charts are prepared each month summarizing cost performance and obligation status for the project as a whole and for each Level 2 WBS system. The cost performance graphs show BCWS (Planned Value), BCWP (Earned Value), and ACWP (Actual Cost) as a function of time. The obligation status graph shows commitments and pending obligations for the same period.

E. Performance Indicator Charts (Exhibit 24)

Performance Indicator Charts are prepared each month for the project as a whole and for each Level 2 WBS system. These graphs show the schedule and cost performance data and are useful for tracking variance trends.



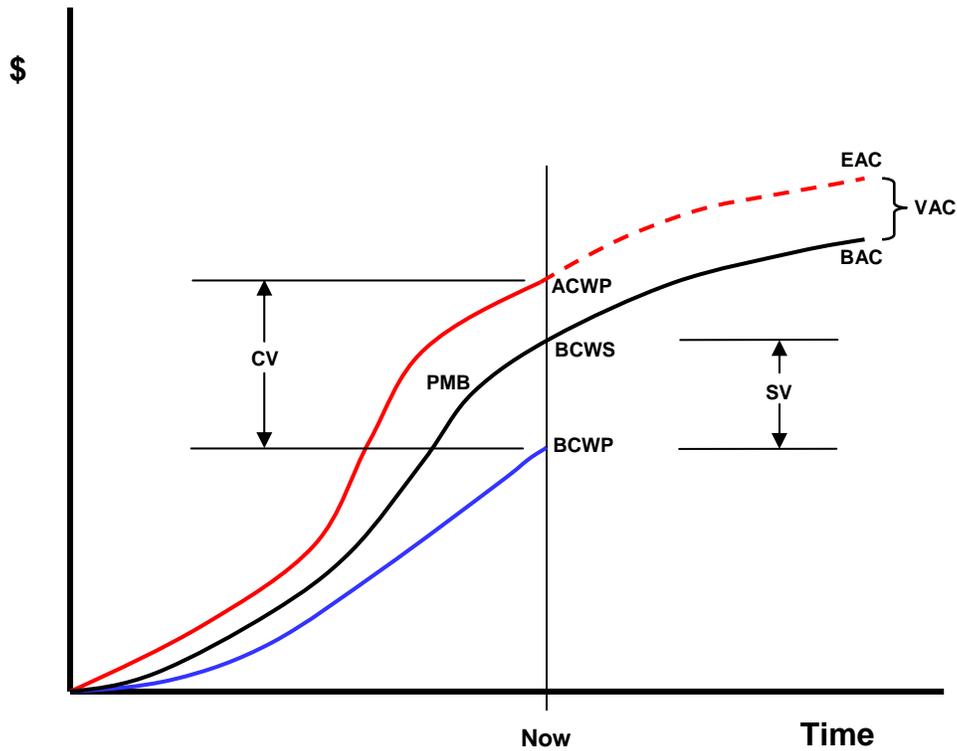
703 Meetings and Reviews

Project management initiates regularly scheduled meetings and reviews to determine project status. Early detection of technical, schedule, and cost difficulties is imperative to maintaining good project performance. The status of a project at the 15 to 20 percent completion point is an accurate indicator of the final success of the project. Depending on a project's size and complexity, the Project Manager and his staff will decide on the appropriate meeting types, frequency, and required attendees. Types of meetings include executive management meetings, project staff meetings, technical and design reviews, project performance reviews, and of course, customer meetings. Open discussion at these forums will reveal specific project technical, schedule, and cost issues requiring management attention and/or decision. Addressing programmatic issues in a timely manner will help prevent greater problems in the future.

704 Exhibits

14. Earned Value Chart
15. Open Commitments Report Example
16. Project Status Report Example
17. 12 Month Report Example
18. Spending by Month Report Example
19. Project Analysis Report Example
20. Red Flag Report Example
21. Variance Threshold Flags Example
22. Variance Analysis Report Example
23. Earned Value Management Performance Chart Example
24. Performance Indicator Chart Examples

Exhibit 14. Earned Value Chart



PMB	Performance Measurement Baseline
BCWS	Budgeted Cost of Work Scheduled (or Planned Value)
BCWP	Budgeted Cost of Work Performed (or Earned Value)
ACWP	Actual Cost of Work Performed (or Actual Cost)
SV	Schedule Variance
CV	Cost Variance
BAC	Budget at Completion
EAC	Estimate at Completion
VAC	Variance at Completion



Exhibit 15. Open Commitments Report Example



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SURA/JEFFERSON LAB - DOE FUND
PURCHASE COMMITMENTS DETAIL REPORT
Fiscal Year: 2005 Period: 7

Project Abrv : 12CDR

Project Name : 12 GeV CDR

Owning Org : DIRGEN

PROJ	ORG	ACCT	PO ID	PO LINE NUM	PO LINE DESCRIPTION	PO OPEN AMOUNT
12CDR	DIRGEN	8046-003	0441614006	2	TASK ORDER 4: REIMBURSABLE ESTIMATED-NOT TO EXCEED	\$1,000.00
12CDR	DIRGEN	8046-003	0441614006	3	TASK ORDER 4: PROVIDE AE SERVICES AS DESCRIBED	\$31,437.21
12CDR	DIRGEN	8046-003	0441614006	3	TASK ORDER 4: PROVIDE AE SERVICES AS DESCRIBED	\$6.29
Total PO 0441614006						\$32,443.50
Total						\$32,443.50



Exhibit 16. Project Status Report Example



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Status Report

For Fiscal Year 2005 Period 1

PROJ: SNS840
 PROJ ID: SNSXXX.8202010000.408.400
 PROJ NAME: ES&H & QA/QC Support
 PROJ MANAGER:

	CURRENT PERIOD INCURRED	TOTAL YTD INCURRED	OPEN PO COMMITS	PENDING (Credit Cards, PR, Stock, Travel)*	FY05 SPENDING	TOTAL BUDGET (-% OF DIRECT BUDGET SPENT)	REMAINING BUDGET	TOTAL CTD INCURRED
LABOR								
Direct Labor	0	0	0	0	0	0	0	0
Statutory Fringe(0.000%)	0	0	0	0	0	0	0	0
Fringe Benefits(0.000%)	0	0	0	0	0	0	0	0
TOTAL LABOR	0	0	0	0	0	0	0	0
EXPENSES								
Supplies & Materials(6043)	0	0	0	0	0	0	0	0
TOTAL EXPENSES	0	0	0	0	0	0	0	0
TOTAL DIRECT	0	0	0	0	0	0	0	0
OVERHEAD								
G&A(30.000%)	0	0	0	0	0	0	0	0
TOTAL WITH OVERHEAD	0	0	0	0	0	0	0	0



Exhibit 17. 12 Month Report Example



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12 Month Report

In K \$'s

For Fiscal Year 2005

Project: SNSS20
 Project Name: Proj Control/Bus/Ofc Supp
 Project Manager: Cothren, Richard

	FY04	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	PEND- ING	TOTAL OBLGTD	TOTAL BDGT	RMING BDGT
LABOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6043 (Supplies & Materials)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6044 (Training & Development)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6045 (Travel)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6046 (Purch Serv/Labor/Consult)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6047 (EDP)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6048 (Capital Procurements)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6049 (R&M)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6050 (Utilities)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6053 (Svc Center Chrgs)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6054 (Other)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6055 (Stipend/Reloc/Reg Fees)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6948 (Capital Procurements>50K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6999 (PY Dir Cost Alloc Exempt)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0													



Exhibit 18. Spending by Month Report Example

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Spending by Month
For Fiscal Year 2005

Project: SNS820
Project Name: Proj Control/Bus/Ofc Supp
Project Manager: Cotliren, Richard

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YTD INCUR	OPEN COMMITS	PEND-ING	TOTAL OBLGTD	TOTAL RMING
Labor																	
Statutory Fringe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fringe Benefits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Labor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Expenses																	
Supplies & Materials (6043)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EDP (6047)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utilities (6050)	130	50	0	0	0	0	0	0	0	0	0	0	179	0	0	179	(179)
Total Expenses	130	50	0	0	0	0	0	0	0	0	0	0	179	0	0	179	(179)
Total Direct	130	50	0	0	0	0	0	0	0	0	0	0	179	0	0	179	(179)
G&A	39	15	0	0	0	0	4	0	0	0	0	(1)	58	0	0	(254)	254
Total With Overhead	168	64	0	0	0	0	4	0	0	0	0	(1)	236	0	0	(76)	76

Exhibit 21. Standard Variance Threshold Flags

Variance Reporting Thresholds

Cost or Schedule Variance >\$25K
OR CPI or SPI < 0.9 or >1.1

Warning

Cost or Schedule Variance >\$50K
AND CPI or SPI < 0.8 or >1.2

Variance Report



Exhibit 22. Variance Analysis Report Example



12 GeV Upgrade
VARIANCE ANALYSIS REPORT

WBS:
Control Account Manager:
For Period Ending: 30 Apr 08

Values are in \$K Dollars (other than SPI & CPI)	SCHEDULE FLAG				COST FLAG			
	(A)	(B)	(B-A)	(B/A)	(C)	(D)	(C-D)	(C/D)
	Planned Value	Earned Value	Schedule Variance	Schedule Perform Index	Earned Value	Actual Cost	Cost Variance	Cost Perform Index
	BCWS	BCWP	SV	SPI	BCWP	ACWP	CV	CPI
Month of Apr-08	34	14	-19	0.43	14	27	-12	0.54
Cumulative	353	259	-94	0.73	259	292	-33	0.89

1. Cause (Address Variances Individually)
SV:

2. Proposed Solutions (Corrective Actions)
SV:

Estimated Resolution By (Date):

3. Impact on Project Cost/ Schedules

4. Comments

Control Account Manager:	Project Manager:
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Exhibit 23. Earned Value Management Performance Chart Example

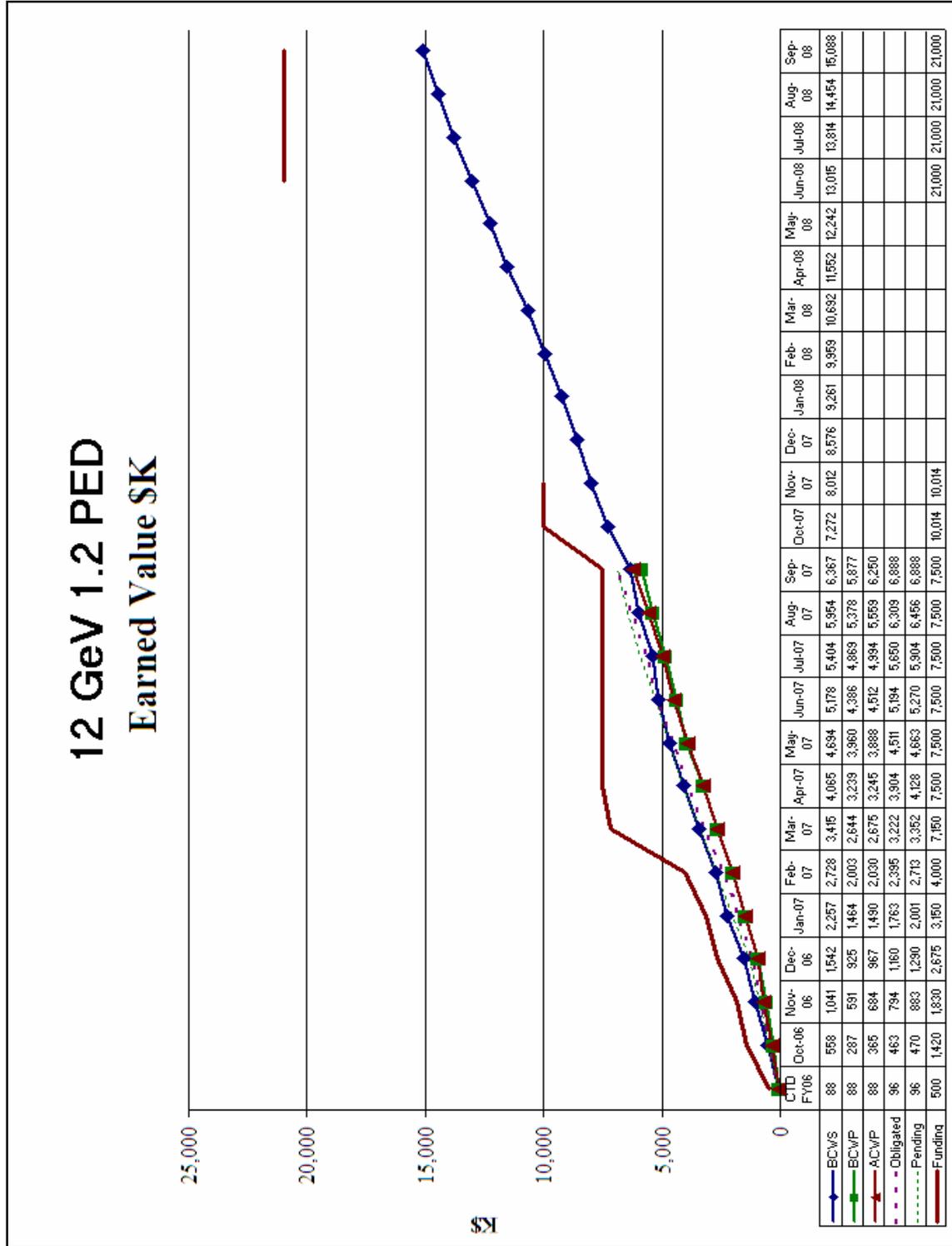
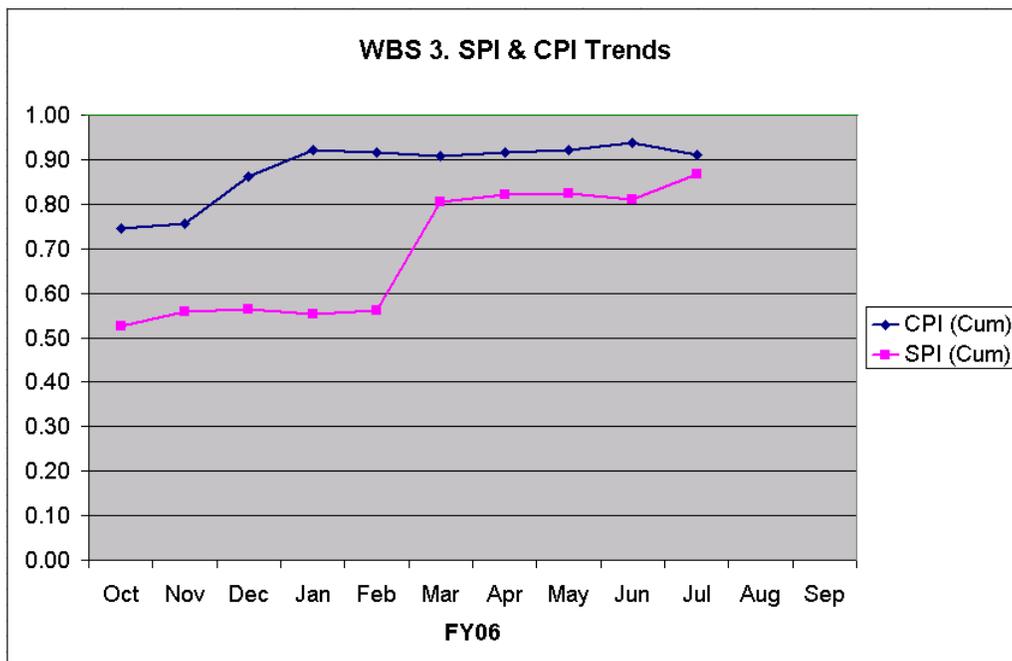
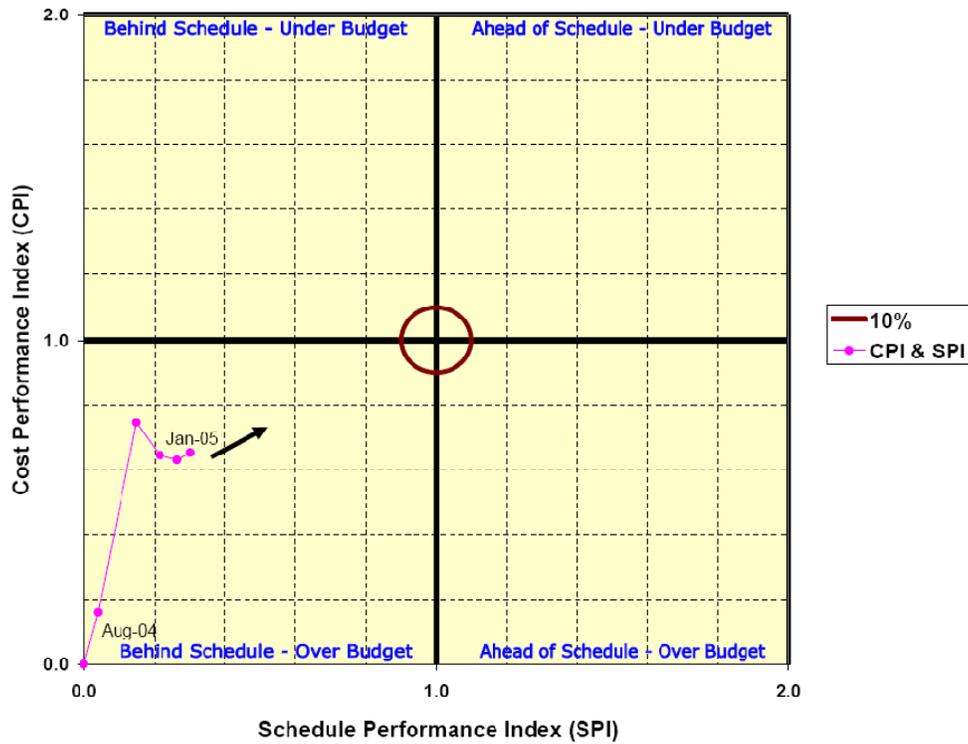


Exhibit 24. Performance Indicator Chart Examples

Hunt for Red October





Jefferson Science Associates, LLC

800 Change Control

**Project Control System Manual
Revision 4**



800 Change Control

- A. The Change Control process delineated in this section is to be used for requesting, reviewing, and documenting changes to the approved project baseline for projects conducted at the Jefferson Laboratory. Baseline changes may occur as a result of contractual modifications, application of undistributed budget, use of contingency/management reserve funds, replanning, or formal reprogramming. Managing change to the project baseline is crucial to ensure the project's work scope, schedule, and cost do not spiral out of control. Changes to baseline documents should be minimized and are normally approved only in the interest of work scope changes, design adequacy, reliability, performance, cost reduction, or safety/environmental considerations.
- B. The purpose of the Change Control process is to ensure that:
- The cost, schedule, and technical impacts of the proposed changes are developed and considered by all affected parties.
 - The collected evaluations are considered in the approval or rejection of the proposed changes.
 - All affected parties are informed of proposed changes and their dispositions.
 - Baseline documentation is controlled and updated as appropriate to reflect approved changes.
 - Action on proposed changes occurs deliberately, but without undue delay and without interfering disproportionately with project progress.
- C. The stated goals of the Change Control process are:
- To anticipate, recognize, and predict changes to the approved project baseline
 - To prevent unauthorized or unintended deviations from the approved project baseline
 - To evaluate and understand the technical, schedule, cost and safety/quality assurance impacts of each change to the approved project baseline
 - To identify, understand, and control the consequences of changes to the approved project baseline
 - To ensure each change is evaluated, reviewed, and dispositioned at the proper authority level

801 Change Control Process

- A. The Change Control process allows the project team to identify, evaluate, approve, and document proposed changes to the project baseline. The process



is initiated with the generation of a Change Request. The Change Request is the formal mechanism for proposing and assessing a change, waiver, or deviation to the project. After an evaluation of the Change Request, an approval is granted at an appropriate level and the Change Request becomes a Change Order for implementation. The Change Order is expeditiously communicated to affected parties and incorporated in the project baseline documentation. The Change Control process is accomplished in three phases: the Request Phase, the Review Phase, and the Documentation Phase. The Request Phase is where the Change Request originates and appropriate classification is determined. For the Review Phase, an assessment of the proposed Change Request is accomplished and approval is obtained from the appropriate authority level. Approved changes are implemented and Integrated project baseline documents are revised in the Documentation Phase.

- B. During the course of project execution, errors in accounting and cost/schedule databases can occur. Integrity of the Performance Measurement Baseline is vital to a clear understanding of project status. Retroactive changes to the performance measurement data are to be avoided. Action should be taken promptly when errors are identified and will be controlled by the Project Management & Integration Division (PM&I). Adjustments can be made to correct accounting and data entry errors and do not require instituting the formal change request process. These adjustments will not be made to historical project data, only for the current and future accounting periods.

801.1 Request Phase

- A. The Change Control process begins with the generation of a Change Request form (Exhibit 25). Any project team member can initiate a change to the project technical, schedule, and cost baselines by completing the Change Request form in electronic format. (Project changes as a result of customer direction, such as a change in funding levels or project scope, are called directed changes. These directed changes will be initiated by the Project Manager and approved by the Project Customer before implementation). The originator fills out the Identification, and Description and Justification, sections of the Change Request. The Change Request is then submitted to a member of the project Change Control Board (normally the one most affected) for consideration. Upon concurrence, the Change Control Board member signs the Change Request and assigns an appropriate person(s) to accomplish the Change Impact Assessment. The Change Impact Assessment section records the potential impacts of the proposed change to the project baseline and addresses safety/quality concerns. The impacts of not approving the change are also included. The assessment is to be all-inclusive and thorough to ensure the consequences of implementing (or not implementing) the proposed change are fully understood.



- B. After the Change Control Board member has concurred with the Change Request, PM&I enters the Change Request into the Change Request Log (Exhibit 26). Change Requests are numbered sequentially (scheme: FY - sequence #, e.g., 08-001) in order of receipt for tracking purposes. Any budget changes with an impact to project contingency are categorized as either “In-Scope” or “New Scope.” The Change Request Log is updated each time there is a change to the status of a Change Request. When the status of a Change Request is updated, PM&I will notify all Associate Project Managers and Control Account Managers connected with that WBS level and send a notice to each member of the project Change Control Board for informational purposes only. The affected Control Account Manager will coordinate inputs to the Change Request form and, if appropriate, draft a revised Control Account Plan reflecting impacts due to the proposed change.
- C. If PM&I concurs with the classification level assigned by the Control Account Manager, the Change Request form is signed and the Change Request Log is updated. PM&I also produces the Change Request Summary Report (Exhibit 27). For Class 1-2 and Class 3 Change Requests (see the next section for Class definitions), PM&I distributes the Change Request to members of the Change Control Board. The Change Request is placed on the agenda for the next board meeting. The Change Request then enters the Review Phase of the Change Control process.

801.2 Review Phase

- A. The Review Phase is dictated by the Classification level of the Change Request. Changes are classified according to the extent that they impact the project baseline. The Classification and Approval Authority levels are determined by use of the criteria listed in Exhibit 28.
- B. Class 1-2 Change Request: This classification of Change Request requires the approval of the Project Customer. The Change Control Board evaluates the Change Request and provides a recommendation to the Project Manager. The Project Manager reviews the Change Request before forwarding to the customer for approval which may include a Baseline Change Control Board review. After receiving the customer approval, the Project Manager reviews the action directed by the customer. PM&I updates the Change Request Log and the Change Request process enters into the Documentation Phase.
- C. Class 3 Change Request: This classification of Change Request requires the approval of the Project Manager. The Change Control Board evaluates the Change Request and provides a recommendation to the Project Manager. Based on the recommendation, the Project Manager approves/disapproves the Change Request. Upon approval, PM&I updates the Change Request Log and the Change Request process enters into the Documentation Phase.



- D. Class 4 Change Request: This classification of Change Request requires the approval of the Associate Project Manager. Once PM&I concurs with the Classification level, the Change Request goes to the Associate Project Manager for approval. Upon approval, PM&I updates the Change Request Log and the Change Request process enters into the Documentation Phase.
- E. Class 5 Change Request: This classification of Change Request only requires the approval of the Control Account Manager. Once PM&I concurs with the Classification level, the Change Request goes to the Control Account Manager for approval. Upon approval, PM&I updates the Change Request Log and the Change Request process enters into the Documentation Phase.
- F. During the review process, any disapproved Change Request is sent back to the affected Control Account Manager who will consult with the originator to determine any further action.

801.3 Documentation Phase

- A. The Documentation Phase is where the project baseline is revised and the approved change is implemented. Once the Change Request documents have been signed by the proper level of authority, the Change Request becomes a Change Order. For changes to the project's technical design or scope, the Associate Project Manager is responsible for ensuring the relevant technical documentation is revised to reflect the change. PM&I is responsible for revising cost/schedule baseline documents for changes impacting these project baselines. When appropriate, a new project baseline will be generated for each approved Change Request. This action will improve traceability between the Change Request and the Schedule and Cost Management Systems.
- B. Once the baseline documents are revised, PM&I updates the Change Request Log and the appropriate Control Account Manager implements the Change Order.

802 Exhibits

- 25. Change Request Form
- 26. Change Request Log
- 27. Change Request Summary Report
- 28. Change Request Classifications



Exhibit 25. Change Request Form

Jefferson Lab

Change Request Form
12 GeV Upgrade
Project Name

Identification

Change Request # █	Title █	
WBS # █	Date (m/d/yy) █	Date Required (m/d/yy) █
Originator Name █		
Item Name █		Drawing/Spec # █
Vendor Name █		Purchase Order # █

Status

Change Request Status (Drop Down List) New

Description and Justification

Description of Proposed Change
(Note: Show costs as both direct and burdened values.)
█

Justification of Proposed Change
█

Change Control Board Member Concurrence █	Impact Assessment Assigned To █
--	------------------------------------

M:\12GeVUpgrade\12GeVcostbook\APM Input\12 GeV Upgrade Change Requests\12 GeV Upgrade Change Request Form (BLANK)-1.doc



Change Impact Assessment

<u>Technical Impacts</u> █
Name(s) █
<u>Schedule Impacts</u> █
Name(s) █
<u>Cost Impacts</u> █
Name(s) █
<u>Quality/Safety Impacts</u> █
Name(s) █

Classification Level

Classification (Drop Down List) Class 5	
Control Account Manager █	Associate Project Manager █
PM&I Approval █	

Recommendation and Disposition

--

Change Control Board Review (if required)

CCB <input style="width: 20px;" type="text"/>	Date (m/d/yy) <input style="width: 20px;" type="text"/>
---	---

Final Approval

Class 5

Control Account Manager <input style="width: 20px;" type="text"/>	Date (m/d/yy) <input style="width: 20px;" type="text"/>
---	---

Class 4

Associate Project Manager <input style="width: 20px;" type="text"/>	Date (m/d/yy) <input style="width: 20px;" type="text"/>
---	---

Class 3

Project Manager <input style="width: 20px;" type="text"/>	Date (m/d/yy) <input style="width: 20px;" type="text"/>
---	---

Class 1-2

Project Customer <input style="width: 20px;" type="text"/>	Date (m/d/yy) <input style="width: 20px;" type="text"/>
--	---



Continuation Page

A large, empty rectangular box with a thin black border, intended for a continuation of text or content. In the top-left corner of this box, there is a small, solid grey square.



Exhibit 25. Change Request Form (cont.)

Instructions for Change Request Form

(Note: Use the Continuation Page on last page of the Change Request form if more space is required. Label with section reference for any input to this page.)

Project Name: Self-explanatory.

Change Request #: This number will be filled in by PM&I. The forms will be numbered consecutively as they are received and will be entered into the Change Request Log.

Title: A brief descriptive title.

WBS #: Work Breakdown Structure Number(s) affected by the change.

Date: Originator enters the date for the submission of the Change Request.

Date Required: Originator enters the estimated date approval is needed to avoid adverse impacts on technical performance, schedule, cost or quality/safety.

Originator Name: Name of individual submitting the Change Request.

Item Name: Enter name of item or procedure (component, subassembly, assembly, system, test, etc.) to be changed.

Drawing/ Spec #: The drawing/specification number(s) of the drawing/specification (s) affected by the change.

Vendor Name: If the item has been purchased, or a subcontract issued, enter the vendor's name(s) here.

Purchase Order #: If a purchase order(s) has been issued for the item, enter the number(s) here.

Change Request Status: This field in the Change Request form is a drop-down list (New / Open / Deferred / Duplicate / Approved / Disapproved / Withdrawn). PM&I will update the status of the Change Request as it progresses through the procedure.

Description of Proposed Change: Describe the change requested. Use the continuation page, as required.



Justification for Proposed Change: Justify the proposed change. Describe the problem or defect that will be corrected by the proposed change. Indicate the experience that dictates the need for the change. Summarize the capability to make the change. Use the continuation page, as required.

Change Control Board Member Concurrence: The Change Control Board member who concurs with the proposed change signs this block. Note: A Change Control Board member may not concur on a Change Request originated by him/herself.

Impact Assessment Assigned To: The individual assigned to coordinate inputs to the Change Impact Assessment section of the Change Request is identified in this block.

Change Impact Assessment: Provide a statement of impact to technical performance, schedule, cost, quality/safety, and environment. Include the impact if the change is not approved. Use the continuation page, as required.

Name(s): Add the names of individual(s) who contributed and concurred to the pertinent assessment section.

Classification Level: The Classification field in the Change Request form is a drop-down list. Select Class 1, 2, 3, 4, or 5. The Control Account Manager, Associate Project Manager, and PM&I sign in the appropriate block.

Recommendation and Disposition: Recommendations and decisions concerning the Change Request are documented in this section. Use the continuation page, as required.

Change Control Board Review: Names of the board members in attendance are inserted in this block after review and recommendation by the board.

Final Approval: Based on the Change Request classification, the project customer or appropriate project member will sign in the designated signature block.



Exhibit 27. Change Request Summary Report

 FY 08 Change Request Summary Report Project Name _____ FY _____								
Classification	New	Open	Deferred	Duplicate	Approved	Disapproved	Withdrawn	Total
1-2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
%	0%	0%	0%	0%	0%	0%	0%	



Exhibit 28. Change Request Classifications

Classification*	Class 1-2	Class 3	Class 4	Class 5
Approval Authority	Project Customer Approval Required	Project Manager Approval Required	Assoc Project Manager Approval Required	Control Account Manager Approval Required
Technical Work Scope	Changes to work scope or performance requirements specified by the customer or included in the Mission Need approved by the customer	Changes to work scope or performance requirements that affect multiple APMs, but do not require customer approval	Changes to work scope or performance requirements that affect multiple CAMs, but do not affect other APMs	Changes to work scope or performance requirements that do not affect other CAMS
Schedule/ Milestones	Changes to Level 1-2 milestones that are under customer control	Changes to Level 3 milestones	Changes to Level 4 milestones	Changes to Level 5 milestones
Cost	Changes to the customer-approved Project Budget Base (TPC & TEC)	Changes that involve a transfer of work scope and its associated budget between APMs	Changes that affect multiple CAMs, do not affect other APMs	Changes that do not affect other CAMs

* Unless superseded by the Project Execution Plan



Jefferson Science Associates, LLC

900 Glossary

**Project Control System Manual
Revision 4**



900 Glossary

- **Actual Cost of Work Performed (ACWP)**
The direct costs incurred in accomplishing the project work activities, including labor, expenses, and procurement, plus indirect costs.
- **Actual Cost**
See ACWP.
- **Authorized Work**
Work effort that has been defined, funded, and for which authorization has been received.
- **Baseline Milestones**
Top-level schedule events, deliverables and critical decision points of the project that signify completion of a planned effort.
- **Budget at Completion (BAC)**
The total authorized budget for accomplishing the work scope of a control account, summary account, reporting element, or project.
- **Budgeted Cost of Work Performed (BCWP)**
The sum of the budgets for completed work activities and completed portions of open work activities, plus the applicable portion of the budgets for Level of Effort activities.
- **Budgeted Cost of Work Scheduled (BCWS)**
The sum of the budgets for all project work activities scheduled to be accomplished within a given time period.
- **Change Control**
The management process for requesting, reviewing, approving, and implementing changes to the project technical, schedule, or cost baselines.
- **Change Order**
An approved Change Request.
- **Change Request**
A form used to initiate a change to the Integrated Project Baseline.
- **Change Impact Assessment**
A section of the Change Request form used to document the technical, schedule, cost, and quality assurance/safety impacts of a proposed change.



- **Class 1-2 Change**
A change to a project baseline that affects elements reserved by the Project Customer for its change authority.
- **Class 3 Change**
A change to the project baseline approved by the Project Manager that affects multiple Associate Project Managers, but does not require customer approval.
- **Class 4 Change**
A change to the project baseline approved by an Associate Project Manager that does not affect any factors relevant to Class 1-3 changes.
- **Class 5 Change**
A change to the project baseline approved by a Control Account Manager that does not affect any factors relevant to Class 1-4 changes.
- **Change Control Board (CCB)**
Senior project management team members who are responsible for evaluating and approving or disapproving proposed changes to the project baselines and for ensuring implementation of approved changes.
- **Chart of Accounts**
The list of all accounting elements for a particular project.
- **Contingency**
Reserve project funding held for possible changes in project work scope and to cover potential cost overruns. Contingency is not associated with project work scope and is not part of the Performance Measurement Baseline. Contingency is normally held by the project customer.
- **Control Account**
The Work Breakdown Structure levels where organizational responsibility is assigned, cost estimates are developed, Control Account Plans are prepared, actual costs are accumulated and earned value is assessed. Control accounts can have one or more work/planning packages.
- **Control Account Plan (CAP)**
The Enterprise Suite project baseline document that contains the detailed schedule and budget information for the control account.
- **Cost Baseline**
The approved project budget as documented by the project Control Account Plans.



- **Cost Management System**
An Enterprise Suite software package where the project budget is managed. Linked with its counterpart, the Schedule Management System, to form an integrated cost/schedule database that is the heart of the Earned Value Management System.
- **Cost Variance (CV)**
The Earned Value Management metric for measuring the cost performance on the project. It is the difference between BCWP and ACWP, and can be calculated at all WBS levels (Working package to control account to project level).
- **Cost Performance Index (CPI)**
An efficiency measurement defined by the work accomplished for the resources expended. Calculated by dividing BCWP by ACWP for a given time period.
- **Critical Path**
The series of project activities that must be finished per the schedule plan in order for the entire project to finish on schedule. It represents the activity path with the longest duration and all activities on the critical path are critical activities.
- **Detail Milestones**
A tertiary level of project milestones established after the Intermediate Milestones have been determined providing greater detail to the project schedule.
- **Detail Schedule**
The final phase of project schedule development with all milestones (Baseline, Intermediate, and Detail) and activities defined and appropriately linked.
- **Direct Costs**
Any costs (labor, expenses, procurement) that may be identified specifically with a particular project activity.
- **Earned Value**
See BCWP.
- **Earned Value Management System (EVMS)**
An integrated management process where all work is planned, budgeted, and scheduled in time-phased increments resulting in a cost and schedule baseline against which project performance is measured.
- **Estimate at Completion (EAC)**
Actual project costs to date plus the forecast of costs to complete unfinished work.



- **Estimate to Complete (ETC)**
The current estimated cost to accomplish the remaining project work scope.
- **Indirect Costs**
Costs not identifiable to a specific project or work element, but are shared among an organization's units. Usually includes supervisory and administrative labor, and expendable type materials.
- **Integrated Project Baseline**
The validated and approved project plan consisting of the technical baseline, the cost baseline, and the schedule baseline.
- **Intermediate Milestones**
A secondary level of project milestones established after the Baseline Milestones have been determined providing more detail to the project schedule.
- **Level of Effort (LOE)**
A sustained level of effort on a project that is general or supportive in nature and does not produce a definite end product. Examples include supervision, project management and administration activities.
- **Management Reserve (MR)**
An amount of the total project budget set aside for project management control purposes rather than being allocated for the accomplishment of specific activities. MR is not associated with project work scope and is not part of the Performance Measurement Baseline. MR is normally held by the project manager.
- **Organizational Structure**
The functional depiction of the project organization indicating the hierarchical relationships of the organizational elements and designating the project work responsibilities when integrated with the Work Breakdown Structure.
- **Percent Complete**
For an activity or group of activities, a ratio, expressed as a percentage, of the amount of work that has been completed to the total planned work.
- **Performance Measurement Baseline (PMB)**
The approved time-phased budget plan for accomplishing scheduled project activities as documented in the Control Account Plans and maintained in the integrated cost/schedule database. Contingency and Management Reserve are not included in the Performance Measurement Baseline.
- **Planned Value**
See BCWS.

- **Planning Package**
Planning packages are project work scope within a control account that is identified, scheduled and budgeted, but not defined in enough detail for proper execution. They are normally developed for far-term work scope where precise estimates of work, schedule or budget are not possible. Planning packages are refined with more detail to become work packages.
- **Project-Organization-Account (POA) Number**
An accounting numbering system established for the accumulation and collection of project costs.
- **Responsibility Assignment Matrix**
A summary of the project WBS elements and the management elements of the project team that identifies work effort with the organizational entity responsible for its accomplishment.
- **Schedule Baseline**
The validated and approved dates for starting and completing project work activities and achieving the project baseline, intermediate, and detail milestones.
- **Schedule Management System**
An Enterprise Suite software package where the project schedule is managed. Linked with its counterpart, the Cost Management System, to form an integrated cost/schedule database that is the heart of the Earned Value Management System.
- **Schedule Variance (SV)**
The Earned Value Management metric for measuring the schedule performance on the project. It is the difference between BCWP and BCWS, and can be calculated at all WBS levels (Working package to control account level to project level).
- **Schedule Performance Index (SPI)**
An efficiency measurement defined by the work performed compared to the work that was planned to be accomplished. Calculated by dividing BCWP by BCWS for a given time period.
- **Technical Baseline**
Organized by the approved Work Breakdown Structure, the performance criteria and design specifications for systems and components as described in the project's technical documentation.
- **Undistributed Budget (UB)**
Project budget that has not yet been allocated to specific control accounts.



- **Variance at Completion (VAC)**
The difference between the Budget at Completion and the Estimate at Completion. It represents the amount of expected project cost overrun or underrun, before the allocation of Management Reserve or Contingency.
- **Variance Analysis**
The analytical examination of Cost Variances, Schedule Variances, and At Complete Variances to determine the cause for the variance, any impact the variance may have, and any corrective action necessary to meet project objectives.
- **Variance Threshold**
Established by the Project Customer and Project Manager, the cost and schedule variance criteria that will require the generation of a formal Variance Analysis Report.
- **Work Activity**
A discrete effort that includes the work to be accomplished, the schedule of expenditures and use of resources, and that serves as a vehicle for monitoring and reporting progress.
- **Work Authorization**
The process of sanctioning specified project work to be performed during a specified time period. Implemented through the Work Authorization Document.
- **Work Breakdown Structure (WBS)**
The hierarchical framework that defines the technical work scope of the project and is the basis for project management, cost estimating, scheduling, project cost/schedule control and performance measurement.
- **Working Detail Schedule**
A working tool of the Schedule Management System for evaluating project schedule plans and forecasting future progress.
- **Work Package**
Work packages are a subdivision of a control account and constitute the basic building blocks used in planning, execution, measuring, and controlling project work. Work packages consist of a series of discrete, apportioned, or level of effort activities that have been planned, scheduled and budgeted in detail.



Jefferson Science Associates, LLC

1000 EVMS Guidelines Compliance

**Project Control System Manual
Revision 4**



1000 Earned Value Management System Guidelines Compliance

This chapter of the JSA Project Control System Manual identifies the chapters and sections that address the 32 Earned Value Management System guidelines established in the ANSI/EIA Standard-748-A-1998.

1001 Organization

- A. Define the authorized work elements for the program. A work breakdown structure, tailored for effective internal management control, is commonly used in this process.
 - 202 Work Breakdown Structure
- B. Identify the program organizational structure, including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.
 - 203 Project Organization
- C. Provide for the integration of the company's planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.
 - 300 Scheduling and Budgeting
 - 400 Work Authorization System
 - 500 Accounting
 - 204 WBS and Organization Integration
 - 205 Responsibility Assignment Matrix
- D. Identify the company organization or function responsible for controlling overhead (indirect costs).
 - 501.10 Indirect Costs
- E. Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures as needed.
 - 204 WBS and Organization Integration
 - 701 Variance Analysis



1002 Planning, Scheduling and Budgeting

- A. Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.
 - 301 Schedule Planning
 - PCS-01 Schedule Planning Procedure

- B. Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.
 - 301.2 Schedule Development

- C. Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Budget for far-term efforts may be held in higher level accounts until an appropriate time for allocation at the control account level. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost, including estimates for authorized but undefinitized work. On government contracts, if an over-target baseline is used for performance measurement reporting purposes, prior notification must be provided to the customer.
 - 303 Integrated Project Baseline Development
 - 303.1 Performance Measurement Baseline

- D. Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.
 - 302 Cost Planning
 - PCS-02 Cost Planning Procedure

- E. To the extent it is practical to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.
 - 204 WBS and Organization Integration
 - 303 Integrated Project Baseline Development



- F. Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.
 - 303 Integrated Project Baseline Development
- G. Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is unmeasurable or for which measurement is impractical may be classified as level of effort.
 - 601.2 Earned Value
- H. Establish overhead budgets for each significant organizational component of the company for expenses which will become indirect costs. Reflect in the program budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.
 - 501.10 Indirect Costs
- I. Identify management reserves and undistributed budget.
 - 302.2 Funding Guidance
 - 303.1 Performance Measurement Baseline
- J. Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.
 - 303 Integrated Project Baseline Development
 - 303.1 Performance Measurement Baseline

1003 Accounting Considerations

- A. Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.
 - 501 Cost Collection and Control
- B. When a work breakdown structure is used, summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements.
 - 501.1 Cost Reporting and Collection



- C. Summarize direct costs from the control accounts into the contractor's organizational elements without allocation of a single control account to two or more organizational elements.
 - 501.1 Cost Reporting and Collection
- D. Record all indirect costs which will be allocated to the contract.
 - 501.10 Indirect Costs
- E. Identify unit costs, equivalent unit costs, or lot costs when needed.
 - 501.1 Cost Reporting and Collection
 - 501.3 Accounts Payable via Purchase Order (PO) Voucher
- F. For EVMS, the material accounting system will provide for:
 - accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques;
 - cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material; and
 - full accountability of all material purchased for the program including the residual inventory.
 - 502 Material Accounting System

1004 Analysis and Management Reports

- A. At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system.
 - Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.
 - Comparison of the amount of the budget earned and the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.
 - 702.2 Schedule and Cost Management Systems Reports
 - PCS-03 Performance Reporting Procedure



- B. Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.
 - 702.2 Schedule and Cost Management Systems Reports
 - PCS-03 Performance Reporting Procedure

- C. Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.
 - 702.1 Financial Management System Reports

- D. Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the contract.
 - 702.2 Schedule and Cost Management Systems Reports
 - PCS-03 Performance Reporting Procedure

- E. Implement managerial actions taken as the result of earned value information.
 - 700 Analysis and Reporting
 - 703 Meetings and Reviews

- F. Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.
 - 701.2 Estimate at Completion
 - 702 Project Reports

1005 Revisions and Data Management

- A. Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.
 - 801 Change Control Process



- PCS-04 Change Control Procedure

- B. Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control.
 - 801 Change Control Process

- C. Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.
 - 801 Change Control Process

- D. Prevent revisions to the program budget except for authorized changes.
 - 801 Change Control Process

- E. Document changes to the performance measurement baseline.
 - 801.3 Documentation Phase



Jefferson Science Associates, LLC

1100 System Surveillance

**Project Control System Manual
Revision 4**



1100 EVMS Surveillance

A. The JSA Project Control System Manual defines the processes and procedures for implementing an Earned Value Management System on projects conducted at the Jefferson Lab. Once an Earned Value Management System has been implemented, it is essential that an ongoing surveillance process be initiated to evaluate the effectiveness of this management tool in communicating to project management a project's cost, schedule, and technical performance. The Project Management & Integration Division is responsible for conducting the Earned Value Management System surveillance program at Jefferson Lab. Results from this assessment are used by the Project Management & Integration Division and on-site project management teams to make process corrections and improvements where needed. The Earned Value Management System surveillance accomplishes two goals: First, it determines if the processes and procedures described in the JSA Project Control System Manual are working as intended; second, it ascertains whether these processes and procedures continue to comply with the guidelines set forth in the American National Standards Institute/Electronic Industry Alliance (ANSI/EIA) 748-A Standard for Earned Value Management Systems. The primary focus of the surveillance process is on insight into the Earned Value Management System for Jefferson Lab projects. Its use is to identify problem areas with the implementation of the JSA Project Control System Manual and not as a project audit. Solutions to any issues are proposed and action is taken. With regular surveillance reviews, the Lab's process for the Earned Value Management System will provide the following benefits:

- Project performance information will depict actual conditions and trends.
- Earned Value Management data will be timely, accurate, and reliable.
- Actual or potential problems will be indicated soon enough for corrective action.
- Integrity of the Integrated Project Baseline will be maintained.

B. The Project Management & Integration Division will ensure that an annual surveillance review of its Earned Value Management System is conducted. A list of all potential candidate projects to be surveyed will be generated and one or two of them will be selected for review. The procedures for this review are as follows:

- A small team will be established to accomplish the review. The members of the team will be acquainted with the Earned Value Management process as described in the JSA Project Control System



Manual and the ANSI/EIA 748-A Earned Value Management Systems standard.

- A surveillance plan will be produced that will describe the approach of the review including the responsibilities, the evaluation methods, and the schedule.
- The surveillance team will conduct interviews of selected Control Account Managers and other project management leaders, as appropriate. The main focus of the interviews is to gain an understanding of how the JSA Project Control System Manual is being used and how the 32 ANSI-748 Earned Value Management guidelines are implemented on the selected project.
- For each reviewed project, a list of findings will be generated from the results of the interviews and a corrective action plan established. Action to resolve identified problems may be required for the project itself and/or the Project Control System Manual.
- When the surveillance reviews have been completed, the results are documented in a surveillance database. The overall health of the Lab's Earned Value Management System can be tracked using this data and systemic problems across multiple projects identified. With these results, system training can be updated and process improvements can be initiated. Lessons learned from the surveillance reviews will be shared with all project teams.



Jefferson Science Associates, LLC

1200 Project Control System Procedures

**Project Control System Manual
Revision 4**



**Project Control System
Procedure
PCS-01
Schedule Planning**



PCS-01 Schedule Planning Procedure

CONTENTS

1.0 General

2.0 Procedures

3.0 Process Flow Diagrams

3.1 Schedule Baseline Development Flow Diagram



PCS-01 Schedule Planning Procedure

1.0 General

This document defines the procedures and responsibilities for developing a project baseline schedule. In cooperation with the Project Customer, all levels of the project management team are involved in the process of establishing a timetable of milestones and activities that will lead to a successful project outcome.

2.0 Procedures

The following Schedule Planning procedures are graphically displayed in Diagram 3.1.

- 1 - The Project Customer and the Project Manager jointly determine the Baseline Milestones.

The Project Manager, collaborating with the Project Customer, selects the project key events and decision points that constitute the master schedule. Titles, definitions and planned dates are determined for each Baseline Milestone.

- 2 - The Project Management & Integration Division (PM&I) develops the Baseline Milestones Schedule.

PM&I loads the Baseline Milestones (Level 1 and 2) with their associated planned dates into the Schedule Management System forming a Baseline Milestones Schedule.

- 3 - The Project Management & Integration Division, the Associate Project Manager, and the Control Account Manager identify the Intermediate Milestones.

Based on the defined Baseline Milestones, PM&I, the Associate Project Manager(s), and the Control Account Manager(s) identify the important Level 3 and 4 milestones of the project.

- 4 - The Project Management & Integration Division develops the Intermediate Milestone Schedule.

PM&I loads the Intermediate Milestones with their associated planned dates into the Schedule Management System forming an Intermediate Milestones Schedule.



- 5 - The Control Account Managers develop the Detail Milestones.
Appropriate Detail Milestones are identified by the Control Account Managers for their control accounts.

- 6 - The Project Management & Integration Division develops the Detail Schedule.
With the schedule data from the Control Account Plans, PM&I develops the project Detail Schedule. Start dates, duration, preceding activities, and succeeding activities are entered for each activity. Resources and budgets allocated to the Control Account Plan activities are also integrated into the Detail Schedule.

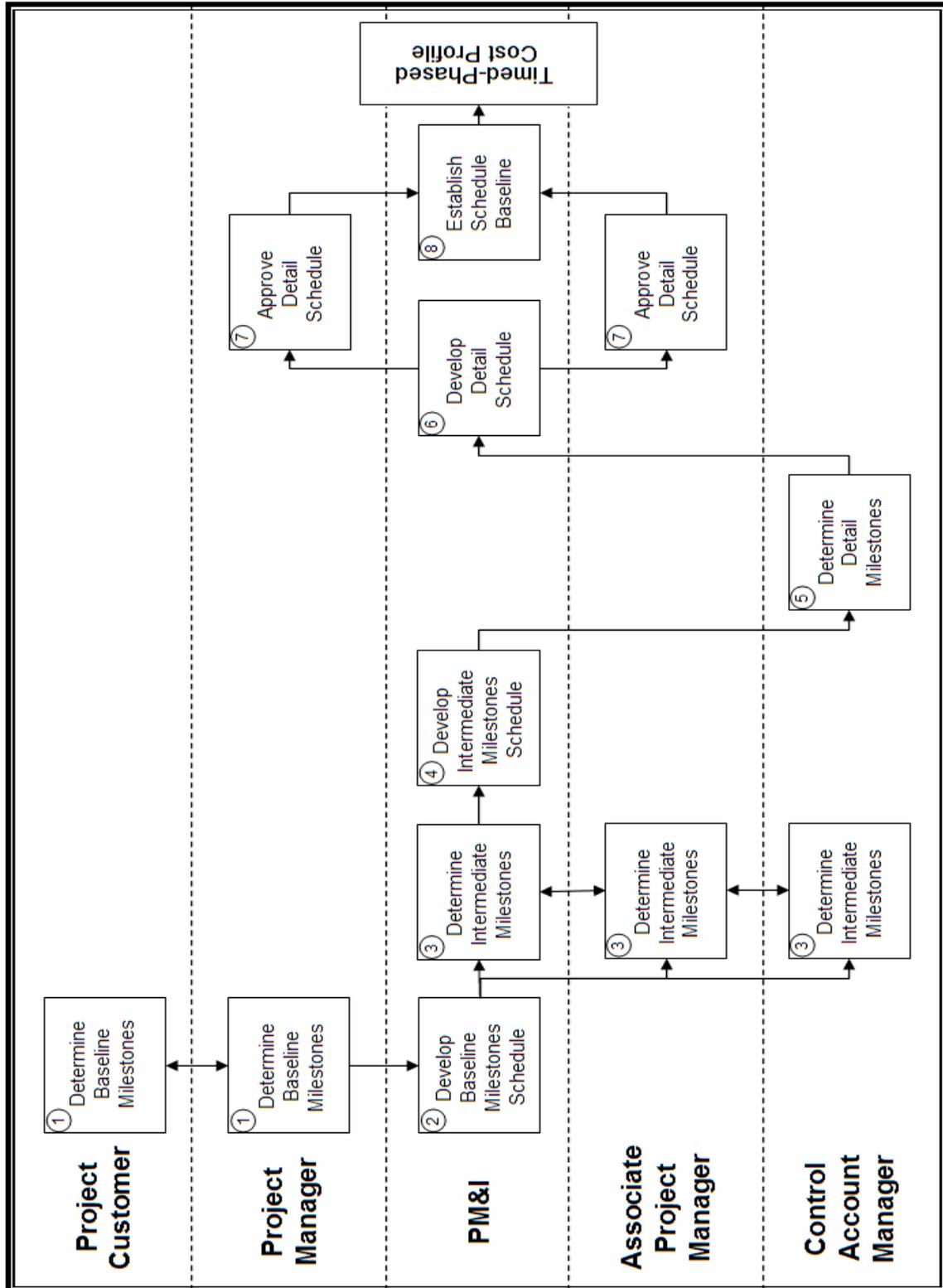
- 7 – The Associate Project Manager and Project Manager approve the Detail Schedule.
After PM&I integrates the information from the Control Account Plans into the Detail Schedule, the Associate Project Manager and Project Manager review and approve the Detail Schedule.

- 8 - The Project Management & Integration Division establishes the schedule baseline.
After the Detail Schedule has been approved, this schedule becomes the schedule baseline. With the resources and budgets identified in the cost baseline integrated with the activity schedule in the schedule baseline, the project Time-Phased Cost Profile is established. PM&I also generates a Working Detail Schedule.

3.0 Process Flow Diagrams

3.1 Schedule Baseline Development Flow Diagram

3.1 Schedule Baseline Development Flow Diagram





**Project Control System
Procedure
PCS-02
Cost Planning**



PCS-02 Cost Planning Procedure

CONTENTS

1.0 General

2.0 Procedures

3.0 Process Flow Diagrams

3.1 Cost Baseline Development Flow Diagram



PCS-02 Cost Planning Procedure

1.0 General

This document defines the procedures and responsibilities for developing a project cost baseline. With funding guidance from the Project Customer, all levels of the project management team are involved in the process of producing a project cost estimate. When combined with the project schedule, a timed-phase budget will be established against which project performance can be measured.

2.0 Procedures

The following Cost Planning procedures are graphically displayed in Diagram 3.1.

- 1 - The Project Customer provides funding guidance.
Based on the desired final product and the expected funding availability, the Project Customer will usually provide the Project Manager with a funding profile for the project.
- 2 - The Project Manager determines an initial project budget target.
Taking the funding guidance provided by the Project Customer, the Project Manager establishes initial budget targets for the project. With a preliminary WBS framework, proposed budgets may be prescribed as well as a fiscal year breakouts.
- 3 - The Control Account Manager develops the Control Account Plan.
The Control Account Manager develops an initial Control Account Plan that will be used to establish the initial cost estimate.
- 4 - The Associate Project Manager reviews the Control Account Plan.
The Associate Project Manager reviews the Control Account Plan(s) within his area of responsibility. Plans that are not complete are returned to the appropriate Control Account Manager for revision. Once satisfactory, the Control Account Plan(s) is/are forwarded to the Project Management & Integration Division.
- 5 - The Project Management & Integration Division reviews the Control Account Plans.
PM&I reviews the Control Account Plans to ensure that the project cost estimate does not exceed any pre-established funding constraints.



- 6 - The Project Management & Integration Division establishes the initial cost estimate.
The costs from each Control Account Plan are summarized to establish an initial cost estimate.

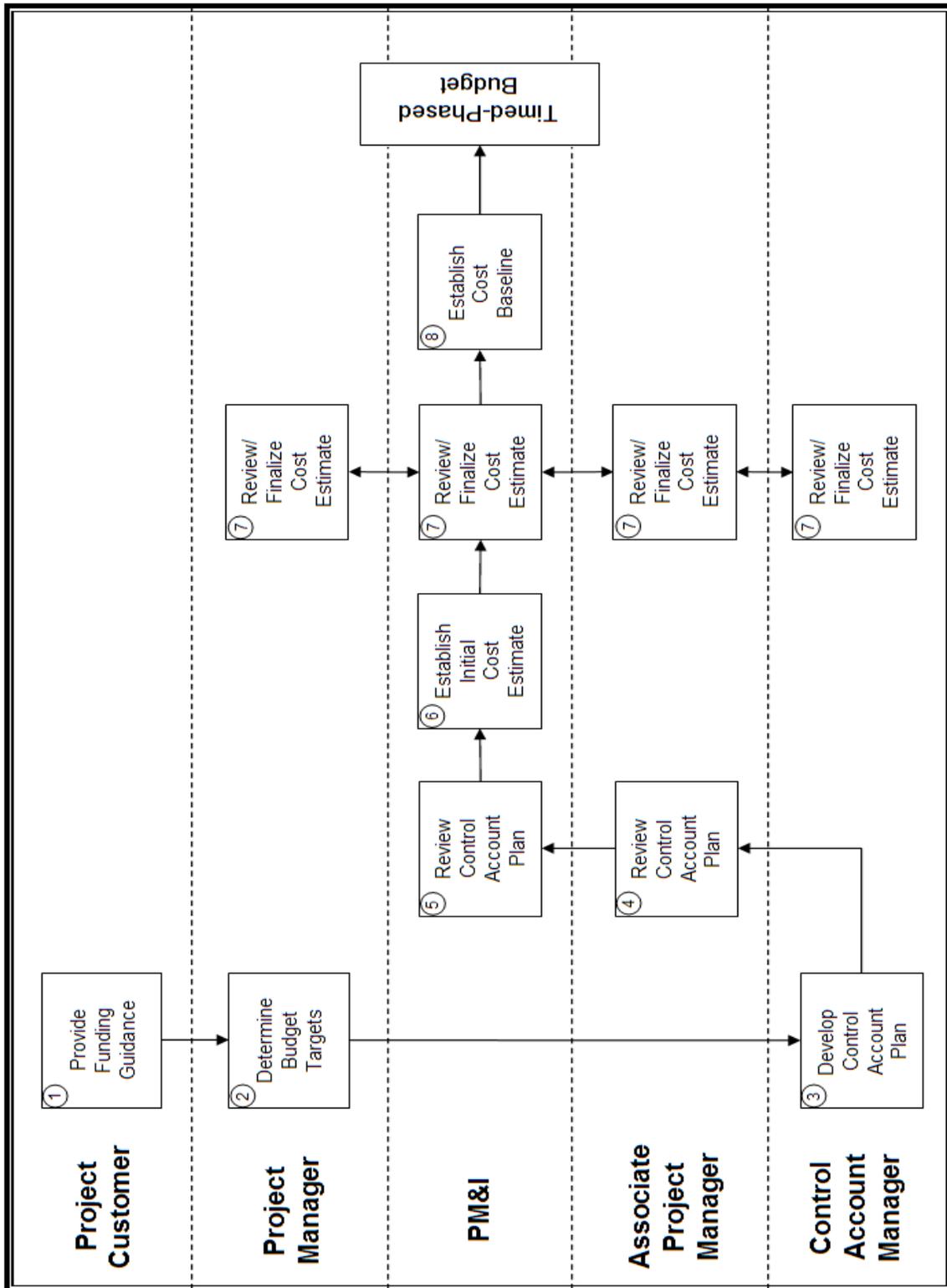
- 7 - The Project Management team reviews and finalizes the cost estimate.
The Project Management team reviews the consolidated cost estimate for the project, and through negotiation, finalize the estimate. The Control Account Manager revises the Control Account Plan for each relevant control account based on the final negotiated cost estimate for the project.

- 8 - The Project Management & Integration Division establishes the cost baseline.
With approved Control Account Plans, the project cost baseline is established. This cost baseline is then integrated with the schedule baseline to produce the project Time-Phased Budget.

3.0 Process Flow Diagrams

3.1 Cost Baseline Development Flow Diagram

3.1 Cost Baseline Development Flow Diagram





**Project Control System
Procedure
PCS-03
Performance Reporting**



PCS-03 Performance Reporting Procedure

CONTENTS

1.0 General

2.0 Procedures

3.0 Process Flow Diagrams

3.1 Performance Reporting Flow Diagram



PCS-03 Performance Reporting Procedure

1.0 General

This document defines the procedures and responsibilities for collecting and reporting cost and schedule performance data and analyzing these data to assess current and projected future project status. Cost and schedule performance is measured and reported monthly for each control account and WBS element, as appropriate.

2.0 Procedures

The following Performance Reporting procedures are graphically displayed in Diagram 3.1.

- 1 - The Project Manager determines the variance thresholds.
The Project Manager determines the thresholds used to flag variances for each control account and WBS element, as appropriate.
- 2 - The Control Account Manager prepares the Status Update Report.
At the end of the accounting period, the Control Account Manager reports the control account work progress and accomplishments by providing input on the Status Update Report.
- 3 - The Associate Project Manager reviews the Status Update Report.
The Associate Project Manager validates work activity completions and makes assessment of interim progress.
- 4 - The Project Management & Integration Division determines the Budgeted Cost of Work Performed.
Exporting the data from the Status Update Reports to the Scheduling Management System, PM&I calculates BCWP (Earned Value) by summing the budgets of work accomplished and completed portions of work in progress for each control account.
- 5 - The performing organizations report expenses incurred.
Performing organizations charge actual costs incurred throughout the reporting period using the Jefferson Lab accounting system.
- 6 - The Chief Financial Office prepares the cost reports.
The Chief Financial Office converts time sheets, purchase orders, receipts and invoices, travel expense vouchers, and other entry documents into costs and commitments for each control account. Labor and cost reports



are prepared by the Chief Financial Office and are available to the Control Account Managers and Associate Project Managers for review and to PM&I for entering into the performance database.

- 7 - The Control Account Manager reviews the cost reports.
The Control Account Manager reviews the cost reports for accuracy and control of costs. Unusual or excessive charges are investigated and errors are reported to the Chief Financial Office.
- 8 - The Associate Project Manager reviews the cost reports.
Each Associate Project Manager reviews actual costs with the Control Account Manager directing the effort.
- 9 - The Project Management & Integration Division prepares the performance reports.
PM&I combines ACWP (Actual Costs) data from accounting, BCWS (Planned Value), and Budget At Completion from the Performance Measurement Baseline, BCWP (Earned Value) as determined in step 4 above, and Estimate At Completion to calculate cost, schedule, and at-completion variances. Results are published in monthly performance reports (Project Analysis Reports) and charts (Earned Value Management Performance Charts/Performance Indicator Charts). The Red Flag Report is also generated where significant variances are flagged in accordance with the thresholds established by the Project Manager.
- 10 - The Project Management team reviews the Control Account Performance Report.
The Control Account Performance Report consists of those combined performance reports available to the Control Account Manager from the financial management system and the schedule/cost management systems. Each Control Account Manager reviews the Control Account Performance Report, notes variances, and determines reasons for above or below planned performance. Each Associate Project Manager reviews the Control Account Performance Reports and the technical progress for their area of responsibility and discusses the work, cost, and schedule status with the responsible Control Account Manager. The Project Manager reviews the all reports and identifies reporting elements of the WBS for which formal Variance Analysis Reports are required.
- 11 - The Project Management & Integration Division issues the Variance Analysis Report form.
PM&I issues a Variance Analysis Report form for each reporting element requiring a Variance Analysis Report.



- 12 - The Control Account Manager completes the Variance Analysis Report.
The Control Account Manager conducts a variance analysis to include the reasons for the variances, the anticipated effect on the project cost, schedule or technical parameters, and proposed corrective action.

- 13 - The Project Manager reviews the Variance Analysis Reports with the Control Account Managers and Associate Project Managers.
The Project Manager reviews the Variance Analysis Reports with the Control Account Managers and Associate Project Managers to ensure accurate variance causes are identified and adequate corrective plans are established. The Variance Analysis Report form is signed by the Control Account Manager and the Associate Project Manager/Project Manager.

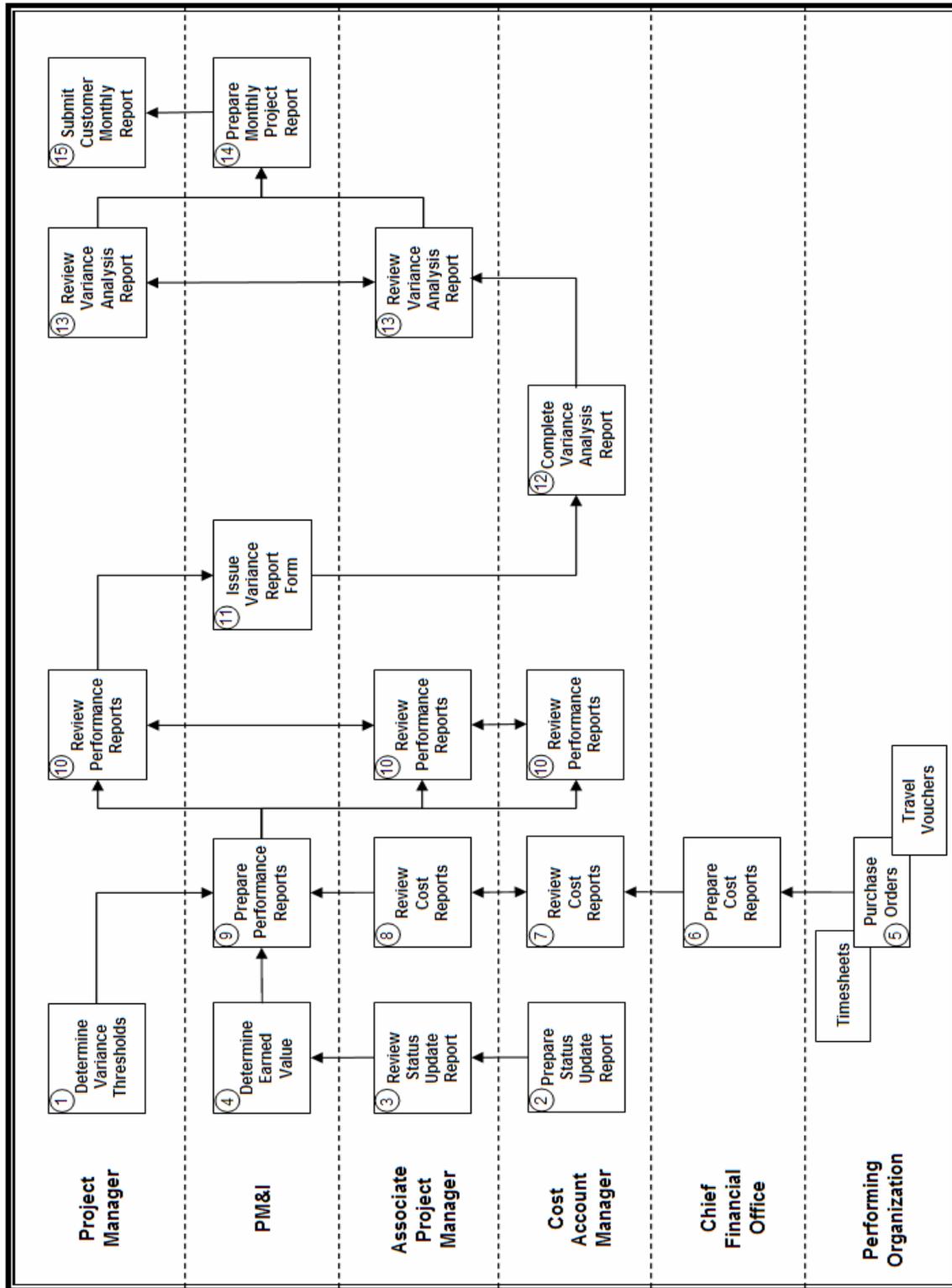
- 14 - The Project Management & Integration Division prepares the monthly project report.
PM&I collects all pertinent project performance data and summarizes it for the monthly report. PM&I forwards the monthly report, including the revised Estimates At Completion, to the Project Manager.

- 15 - The Project Manager submits the monthly report to the Project Customer.
The Project Manager reviews the monthly report and submits it to the Project Customer.

3.0 Process Flow Diagrams

3.1 Performance Reporting Flow Diagram

3.1 Performance Reporting Flow Diagram





**Project Control System
Procedure
PCS-04
Change Control**



PCS-04 Change Control Procedure

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1.0 General

2.0 Procedures

2.1 Request Phase

2.2 Review Phase

2.3 Documentation Phase

3.0 Process Flow Diagrams

3.1 Request Phase Flow Diagram

3.2 Review Phase Flow Diagrams

- **External Approval**
- **Internal Approval**

3.3 Documentation Phase Flow Diagram



PCS-04 Change Control Procedure

1.0 General

The Integrated Project Baseline is the approved technical, schedule and cost plan for accomplishing all project activities. As the project progresses, this baseline may change due to Project Customer redirection, internal replanning, or redesign. Changes are classified according to the extent that they impact the Integrated Project Baseline. The review process and the approval authority required for a proposed change depend upon its classification. This document defines the procedures and responsibilities for requesting, reviewing, and documenting changes to the Integrated Project Baseline, and to assure timely implementation of changes once they are approved.

2.0 Procedures

The following procedures for requesting, reviewing and documenting change requests are keyed to the Change Control process flow diagrams (Section 3.0).

2.1 Request Phase (See Diagram 3.1)

Any project team member may request a change to the technical, schedule, and cost baselines by generating a Change Request form and submitting it to a member of the Change Control Board for concurrence.

- 1 - The Originator prepares the Change Request.
The originator prepares the Change Request form in accordance with the document instructions. Change Request status at this stage is "New."
- 2 - The Change Control Board member concurs with the Change Request.
The originator must then obtain the concurrence of one member of the Change Control Board in order for the request to be accepted for consideration. The concurring member signs the Change Request in the 'Concurrence' block.
- 3 - The Change Control Board member initiates the Change Impact Assessment process.
If the Change Impact Assessment has not been completed on the Change Request form, the Change Control Board member assigns actions for analyses of potential technical, schedule, cost and quality/safety effects of the proposed change. Primary responsibility is typically assigned to a Control Account Manager.



- 4 - The Project Management & Integration Division enters the Change Request in the Change Request Log.

After Change Control Board member concurrence is obtained, PM&I assigns a number (scheme: FY - sequence #, e.g., 05-001) to the Change Request and enters it in the Change Request Log as “Open.” PM&I maintains this log as a database, updating information each time there is a change to the status of a Change Request. For Class 1-2 and Class 3 changes, PM&I distributes the Change Request to members of the Change Control Board, and places the Change Request on the agenda for the next Change Control Board meeting.

- 5 - The Control Account Manager coordinates inputs to the Change Impact Assessment.

The assigned Control Account Manager completes the Change Impact Assessment. The Change Impact Assessment records the potential impacts of the proposed change to the technical, schedule and cost baselines and also to safety and quality. The impacts of not approving the change are also documented. The Control Account Manager coordinates inputs from relevant parties, such as scientists, engineers, contractors, and quality and safety personnel, to document these potential impacts. Continuation pages are attached to the Change Request form where space is insufficient. Where drawings, specifications, purchase orders, Control Account Plans, etc., are affected, changes are marked on copies and attached.

- 6 - The Control Account Manager establishes the classification of the Change Request.

After reviewing the Change Impact Assessment and exhibits, the Control Account Manager establishes the Change Request classification. The Control Account Manager selects the appropriate class and signs the appropriate block on the Change Request form.

- 7 - The Associate Project Manager concurs with the classification of the Change Request.

The Associate Project Manager reviews the classification assigned by the Control Account Manager and, if he concurs, signs the adjacent block.

- 8 - The Project Management & Integration Division approves the classification of the Change Request.

The PM&I Manager reviews the classification assigned by the Control Account Manager and, if he concurs, signs the next block on the Change Request form. The classification may also be reviewed and changed by the Change Control Board.



2.2 Review Phase (See Diagram 3.2)

After the Change Request has been generated, impacts have been assessed, and an approved classification level has been established, it enters the Review Phase where the proposed change is evaluated and approved by an appropriate authority. For Class 1-2 Change Requests that will go to the Project Customer, this will be an external approval process. Class 3-5 Change Requests follow an internal approval process.

- External Approval

9 - The Project Management & Integration Division updates the Change Request Log.

Once PM&I has approved the classification level, the Change Request enters the Review Phase. PM&I monitors the status of Change Requests awaiting action.

10 - The Change Control Board evaluates the Class 1-2 Change Request.

For Class 1-2 Change Requests, PM&I distributes the Change Request to members of the Change Control Board and places the Change Request on the agenda for the next board meeting. The Change Control Board evaluates the Class 1-2 Change Request package and recommends action to the Project Manager.

11 - The Project Manager reviews the Class 1-2 Change Request.

The Project Manager reviews the Class 1-2 Change Request package and Change Control Board recommendations. The Project Manager prepares a submission to the Project Customer in accordance with customer procedures which may include a Baseline Change Control Board. This may include the Change Request as received, with some or all of the exhibits, or it may be a letter extracted from the Change Request material with additional amplification where necessary.

12 - The Project Customer approves/disapproves the Class 1-2 Change Request.

For Class 1-2 Change Requests, the Project Customer is the final approving authority. Approval is indicated by signature in the appropriate 'Final Approval' block on the Change Request form. The approved Class 1-2 Change Request package is then returned to the Project Manager.

13 - The Project Manager reviews the Project Customer Change Request actions.

The Project Manager reviews the decisions of the Project Customer and documents any impacts to the project plans in the Recommendation and Disposition section of the Change Request.



- 14 - The Project Management & Integration Division determines the approval status of the Change Request.
PM&I updates the Change Request Log after the review process has been completed. At this stage, the Change Request can be deferred, approved, disapproved or determined to be a duplicate of a previously submitted Change Request. Any disapproved CR is sent back to the affected Control Account Manager who will consult with the originator to determine any further action.
- **Internal Approval**
- 9 - The Project Management & Integration Division updates the Change Request Log.
Once PM&I has approved the classification level, the Change Request enters the Review Phase. PM&I monitors the status of Change Requests awaiting action.
- 10 - The Change Control Board evaluates the Class 3 Change Request.
For Class 3 Change Requests, PM&I distributes the Change Request to members of the Change Control Board and places the Change Request on the agenda for the next board meeting. The Change Control Board evaluates the Class 3 Change Request package and recommends action to the Project Manager.
- 11 - The Project Manager reviews the Class 3 Change Request.
The Project Manager reviews the Class 3 Change Request package and Change Control Board recommendations.
- 12 - The Project Manager approves/disapproves the Class 3 Change Requests.
For Class 3 Change Requests, the Project Manager is the final approving authority. Approval is indicated by signature in the appropriate 'Final Approval' block on the Change Request form. The approved Class 3 Change Request package is forwarded to PM&I.
- 13 - The Associate Project Manager evaluates the Class 4 Change Request.
The Associate Project Manager evaluates Class 4 Change Requests.
- 14 - The Associate Project Manager approves/disapproves the Class 4 Change Request.
For Class 4 Change Requests, the Associate Project Manager is the final approving authority. Approval is indicated by signature in the appropriate 'Final Approval' block on the Change Request form. The approved Class 4 Change Request package is forwarded to PM&I.



- 15 - The Control Account Manager evaluates the Class 5 Change Request.
The Control Account Manager evaluates Class 5 Change Requests.
- 16 - The Control Account Manager approves/disapproves the Class 5 Change Request.
For Class 5 Change Requests, the Control Account Manager is the final approving authority. Approval is indicated by signature in the appropriate 'Final Approval' block on the Change Request form. The approved Class 5 Change Request package is forwarded to PM&I.
- 17 - The Project Management & Integration Division determines the approval status of the Change Request.
PM&I updates the Change Request Log after the review process has been completed. At this stage, the Change Request can be deferred, approved, disapproved or determined to be a duplicate of a previously submitted Change Request. Any disapproved CR is sent back to the affected Control Account Manager who will consult with the originator to determine any further action.

2.3 Documentation Phase (See Diagram 3.3)

After the Change Request has been reviewed and approved by the appropriate authority, it enters the Documentation Phase where the proposed change is fully documented and implemented.

- 18 - The Project Management & Integration Division issues the Change Order.
PM&I issues a Change Order for the approved Change Request. The Change Order is a completed, approved Change Request.
- 19 - The Associate Project Manager updates the technical documentation.
Upon receipt of a Change Order, the affected Associate Project Manager ensures any relevant technical documentation (drawings, specifications, etc.) is revised.
- 20 - The Project Management & Integration Division updates the Performance Measurement Baseline and Working Detail Schedule.
PM&I updates the Performance Measurement Baseline, the Working Detail Schedule and the associated Earned Value data. Historical EV data will not be revised. To improve document traceability, a new project baseline will be generated for each approved Change Request.



21 - The Control Account Manager implements the approved Control Account Plan.

The Control Account Manager performs the effort in accordance with the updated Control Account Plan.

3.0 Process Flow Diagrams

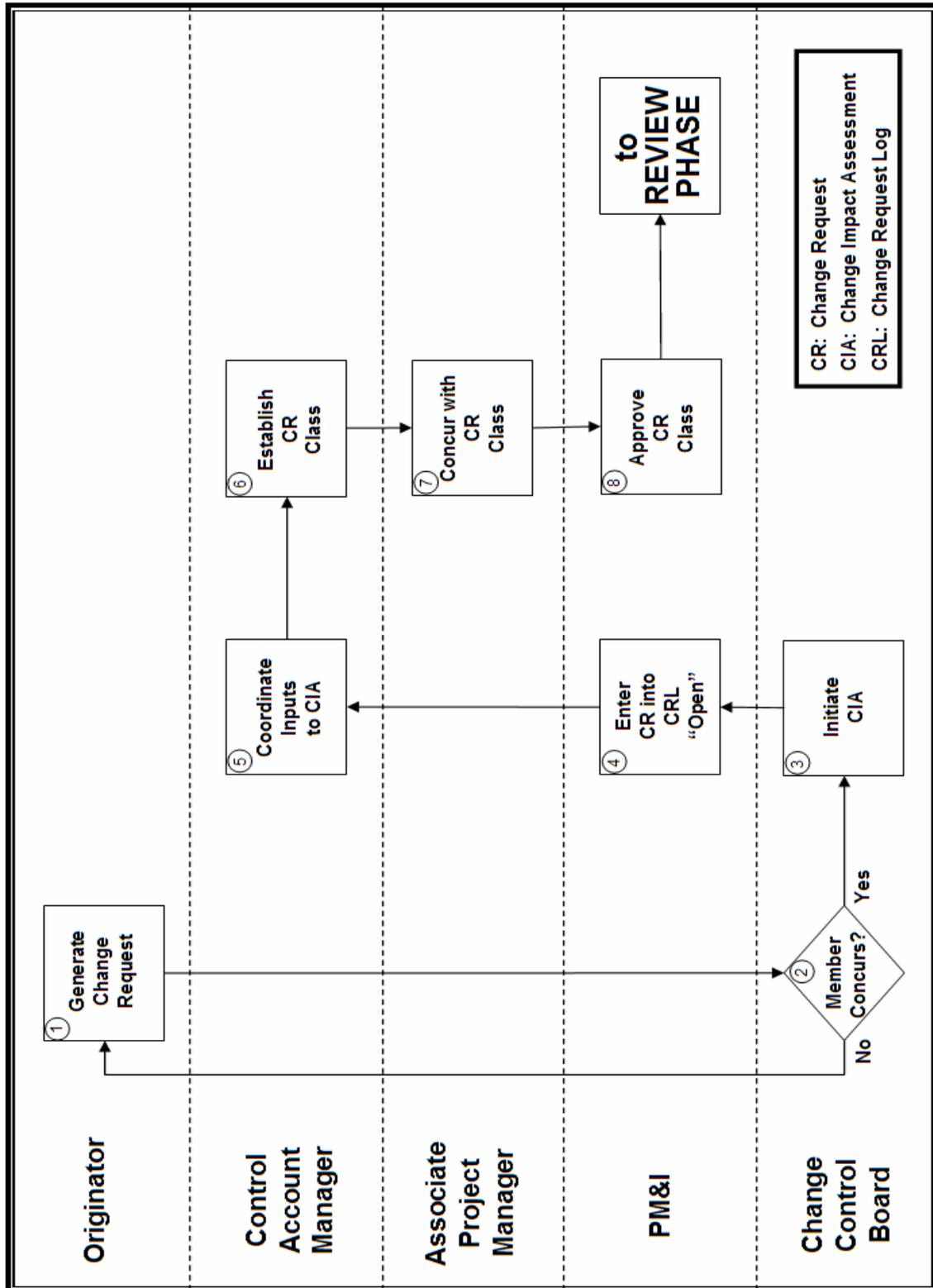
3.1 Request Phase Flow Diagram

3.2 Review Phase Flow Diagrams

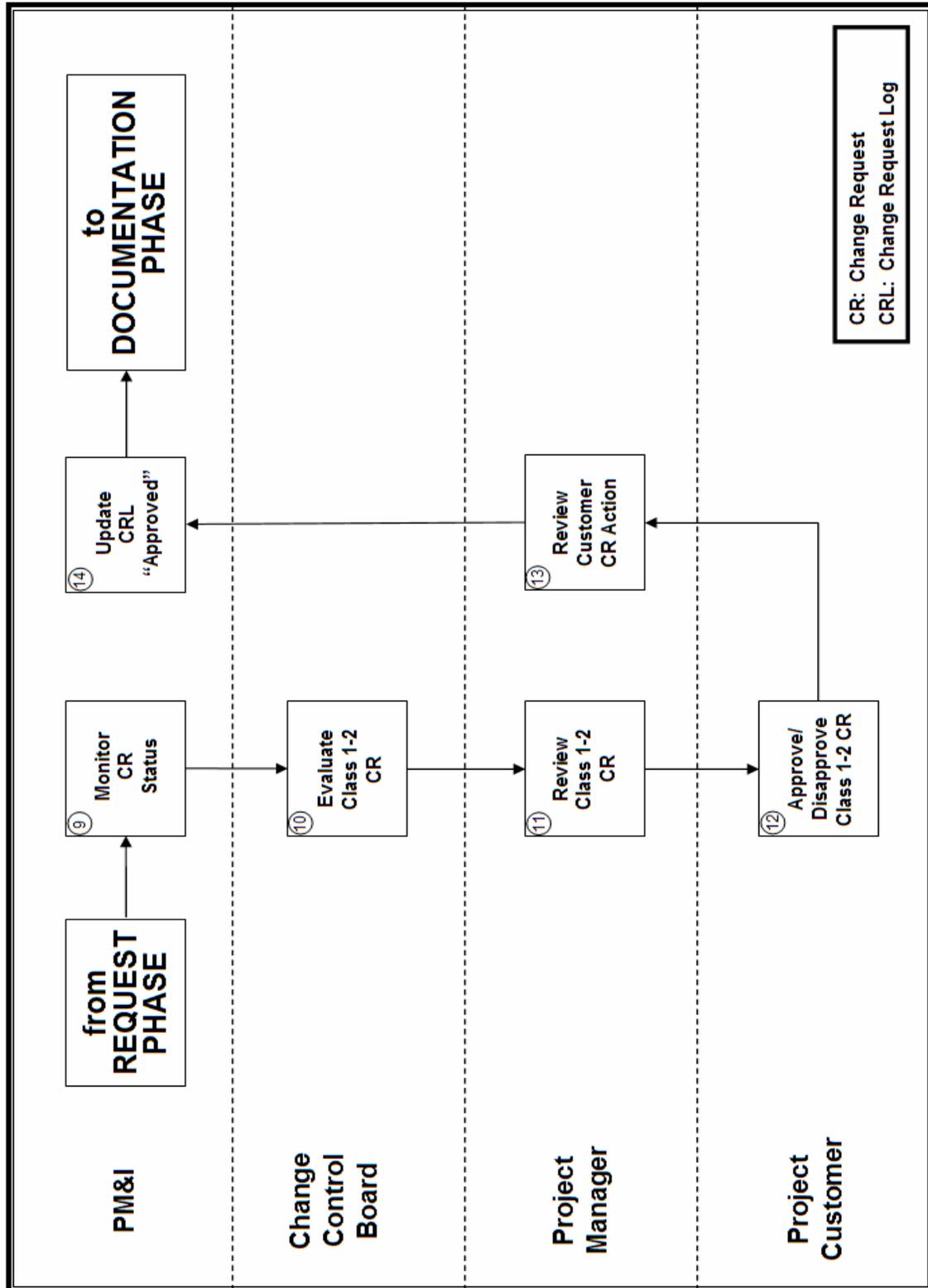
- **External Approval**
- **Internal Approval**

3.3 Documentation Phase Flow Diagram

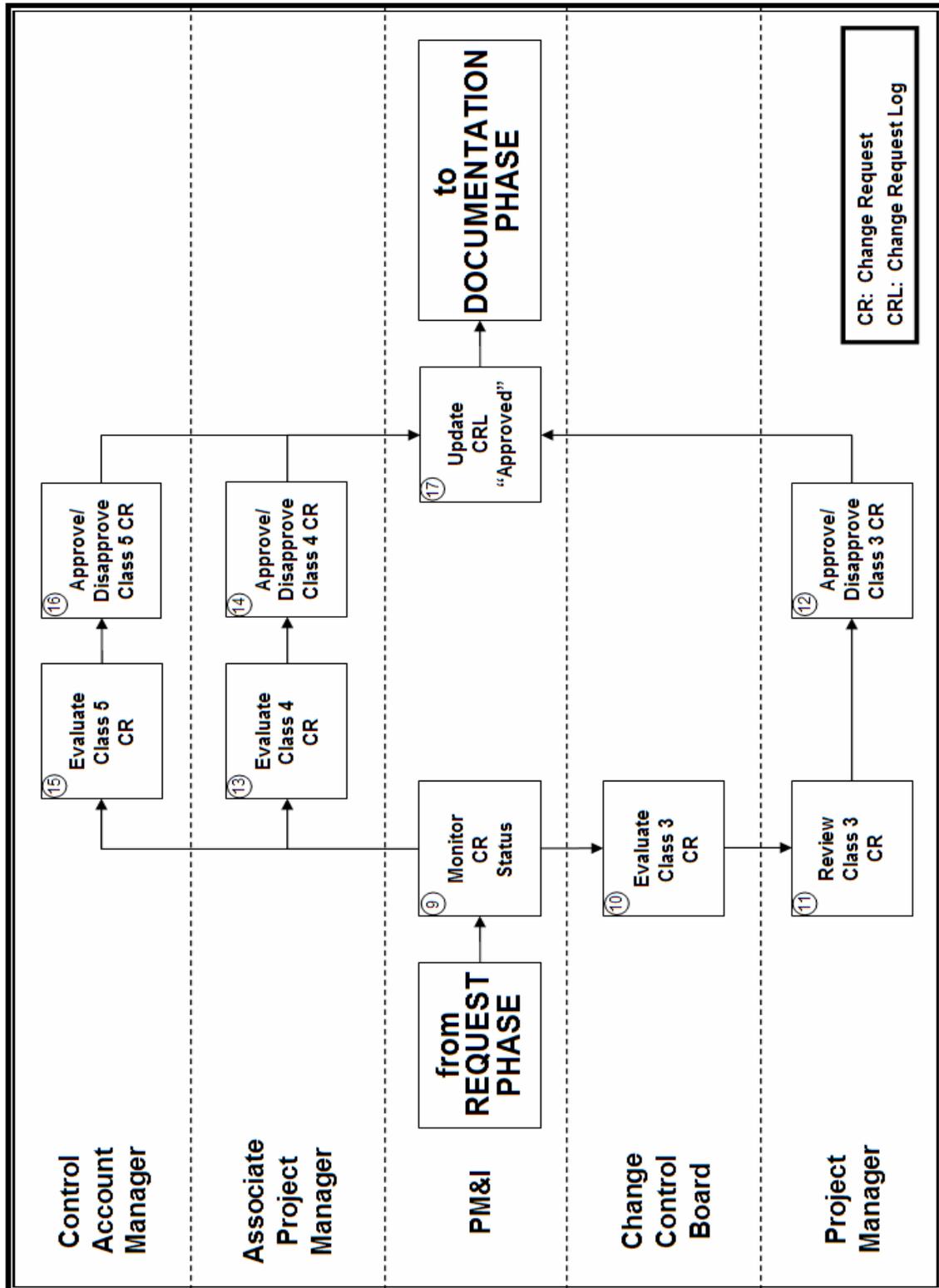
3.1 Request Phase Flow Diagram



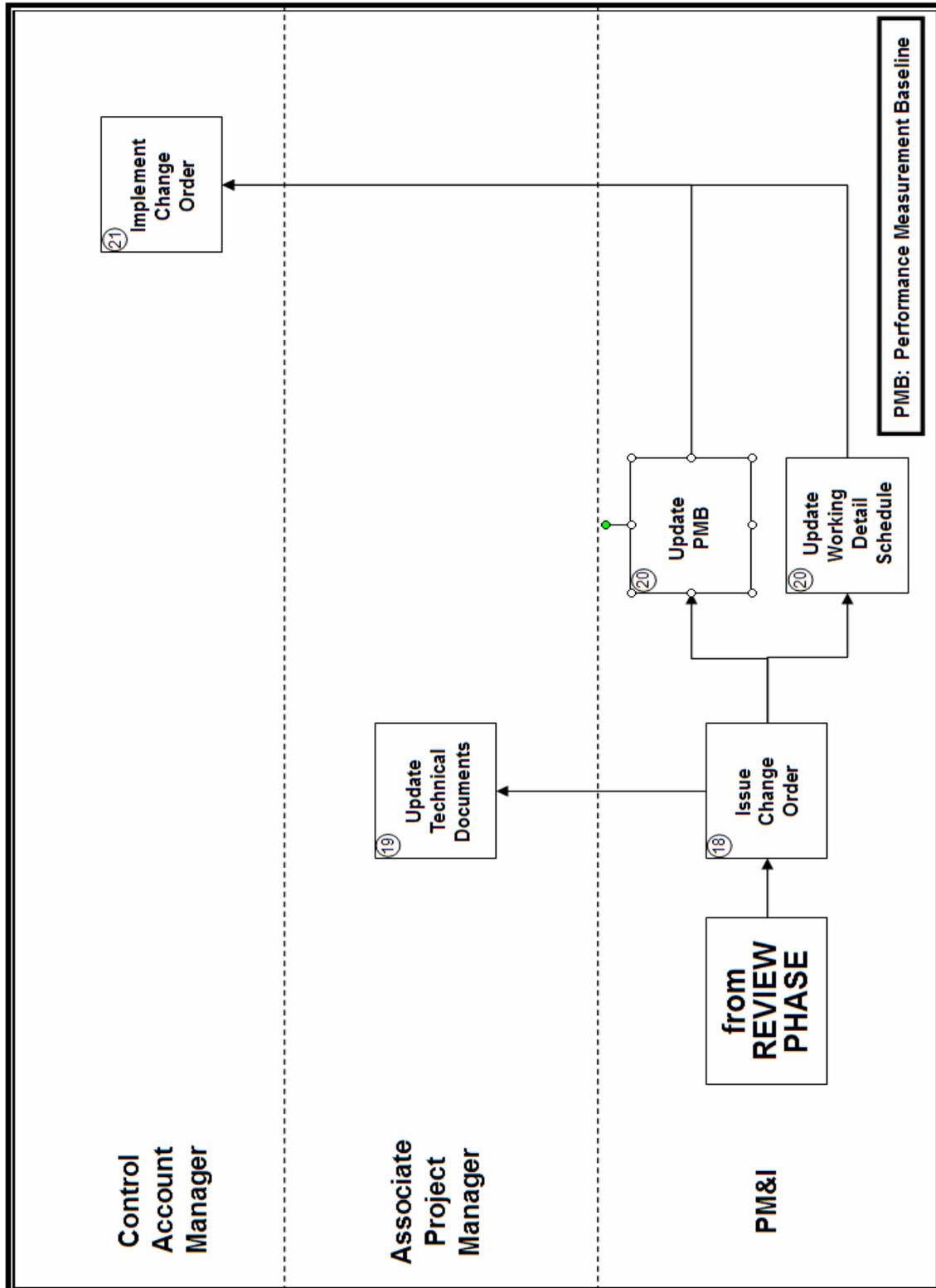
3.2 Review Phase Flow Diagram (External Approval)



3.2 Review Phase Flow Diagram (Internal Approval)



3.3 Documentation Phase Flow Diagram





End of Document