

UNITED STATES DEPARTMENT OF ENERGY



EARNED VALUE MANAGEMENT APPLICATION GUIDE

VERSION 1.6
JANUARY 1, 2005

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FORWARD

Standards seldom can stand alone and always require interpretation and discussion. ANSI/EIA 748-1998, Earned Value Management Systems is no exception. There are several sources for expert guidance on EVM; some of these sources are listed below. The DOE Earned Value Management Application Guide adds to that body of knowledge by providing a context and interpretation of the guidelines in the standard for implementing Earned Value Management on DOE programs and projects by DOE contractors. This guide was adapted from various sources including the Defense Contract Management Agency Earned Value Implementation Guide, which focused on procedures for government use of Earned Value. The DCMA guidance remains a valuable resource in comprehending using Earned Value Management. The reader is encouraged to avail themselves of these sources of information because they represent many years of experience in implementing and using Earned Value Management and are authoritative. If you have any comments or questions please contact David Treacy, U.S. Department of Energy at david.treacy@hq.doe.gov or post your comments on the DOE Earned Value Management Community of Practices at: <http://projects.energy.gov/>

- [ANSI EIA 748 Intent Guide Revision 9a](#) (PDF)
Created by the NDIA Program Management Systems Committee to promote a clearer understanding of the Standard. For each of the 32 guidelines, the Intent Guide provides: the value to management, an intent statement, typical attributes, and examples of objective evidence.
- [NDIA Surveillance Guide](#) (PDF)
Contractors and the government are encouraged to use this guide for the implementation of EVMS surveillance in accordance with the American National Standards Institute/Electronic Industry Alliance (ANSI/EIA) 748, latest revision.
- [NDIA Program Managers' Guide to the Integrated Baseline Review Process](#) (PDF)
A guide to conducting an effective Integrated Baseline Review for a clearer understanding of program risks.
- [Earned Value Management System Standard Equivalence Agreement](#) (PDF)
The NDIA Program Management Systems Committee has signed an equivalence agreement with its counterpart in Great Britain, the Association for Project Management. In this agreement, the two organizations recognize the equivalence of their respective EVMS documents in contracts, partnering agreements, and other applicable business transactions. The agreement, which took effect on July 1, 2004, remains in effect until either group provides written notification to the other of an intention to withdraw.

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PART I

EARNED VALUE MANAGEMENT

SYSTEM CONCEPTS

The purpose of this Part of the guide is to provide guidance for understanding earned value management concepts, define objective guidelines for earned value management systems and provide guidance in interpreting those guidelines for use on DOE programs.

EARNED VALUE MANAGEMENT DEFINITIONS

There are three definitional aspects of Earned Value that provide a context for this guide. Each definition logically follows from and is dependent on the other.

Earned Value Management. Earned Value Management is a methodology that allows both Government and Contractor Program Managers to have visibility into cost, schedule, and technical progress on their contracts to measure and manage performance. ANSI/EIA 748, Earned Value Management System contains the industry guidelines, which establish the framework within which an adequate integrated cost, schedule, and technical performance management system will be effective.

Earned Value Management System is the integrated set of processes, which implements ANSI/EIA 748. In its simplest form, EVMS can be implemented without any software. Software simply enhances productivity, allows the implementation of EVM more economically and facilitates managing complex projects. EVMS is not software.

Earned Value is the budgeted value of the work actually accomplished. When compared to the planned (scheduled) work and to the actual cost of that work, performance and progress can be determined.

The three terms cannot be used interchangeably. Each has a different meaning, however, slight. When discussing Earned Value Management, the guide makes deliberate distinctions and the terms are consistently employed.

FUNDAMENTAL PRINCIPLES OF EARNED VALUE MANAGEMENT

Earned Value Management originated in industry, was adopted and further developed by the Department of Defense and spread throughout the U.S. Government, industry and other countries because the management concept embodied fundamentally sound principles for managing performance of projects and programs. These principles are:

- All work is planned to completion
- The work is broken down into finite product-oriented components that can be assigned to a responsible organization
- The scope, schedule and cost objectives are integrated into a plan by which progress can be measured.

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- Actual costs are recorded.
- Performance is objectively measured
- Variances and deviations are analyzed, impacts are forecasted and estimates at completion are based on the actual performance to date.
- Changes to the performance measurement baseline are controlled.
- Earned Value information is employed in the organization's management processes.

ESSENTIAL CHARACTERISTICS

The 32 guidelines contained in the standard do not describe a system; rather they state the qualities and operational considerations of an integrated management system without mandating detailed system characteristics. In designing, implementing and improving the earned value management system, the objective should be effective management and control. A system that meets the letter of the guidelines but not their intent will not support management needs. Earned value management systems that meet the intent of the guidelines will feature:

- Thorough planning;
- Timely baseline establishment and control;
- Information broken down by product as well as by organization or function;
- Objective measures of progress and performance against the plan at levels where the work is being performed;
- Consistent reporting to higher management for use in decision-making;
- Analysis of significant variances; and,
- The implementation of management actions to mitigate risk and manage cost and schedule performance.

The standard and its guidelines do not address all of an organization's needs for day-to-day or week-to-week internal control, such as status reports, reviews, and communications (formal and informal). These also are characteristics of good management and are equally important. They should be used in conjunction with Earned Value Management to provide the insight and information necessary to make informed decisions.

THE VALUE OF EARNED VALUE MANAGEMENT

While all projects need effective management, projects which are complex or on the leading edge of technology or have other parameters which make it difficult and risky must have greater insight, control, and performance indicators to be successful. An Earned Value Management System implementing the ANSI/EIA 748 32 EVMS Guidelines provides that control and insight because it:

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- Relates time-phased budgets to specific tasks to requirements contained in a statement of work;
- Provides accurate, reliable and timely data;
- Measures project progress and performance;
- Accurately relates cost, schedule and technical accomplishment;
- Provides Federal managers with information at a practical level because the data originates from the same systems used by the contractor to manage the project.

RISK-BASED APPLICATION

The application of Earned Value Management must consider the nature and characteristics of the project. The size, complexity, risks, type of contract and other characteristics will influence both the management methods for a project and the systems that support the management. The requirements for control, insight, management structure, etc. become critical success factors when one or more significant risks are present. In considering these factors it does not become a question of how many or which guidelines to apply or whether to employ Earned Value Management at all. It is in the implementation of the system, which considers all the guidelines, that the level or degree of application is influenced by the risks.

For instance, guidelines 2.3 d requires the project to record all indirect costs that will be allocated to the contract. Yet, many projects are fixed-price contracts where there may be no government access to indirect costs. When the indirect costs are not identifiable or do not exist, those guidelines pertaining to indirect costs would be not applicable in that specific instance. The guidelines do not require you to have indirect costs. It merely requires you to record indirect costs if they exist. If the costs were not normally segregated on a particular type of contract, then no indirect costs would be recorded.

The requirement and necessity to implement Earned Value Management is principally governed by five factors.

- A. The system or investment has one or more of the following characteristics: integration or technical complexity, high risk, cost driven, or schedule driven. When the characteristics of the project are such that a high degree of control, insight and action are necessary to manage the effort, then Earned Value Management is warranted. This is especially true when the project is highly complex with many components, involving both research and development. It is also true when the project is constrained by cost or schedule objectives.
- B. The work can be discretely defined in terms of the technical components, resources and schedule. Earned Value Management is of value to the manager when the work is primarily defined in specific terms of cost, schedule and work. Implementing Earned Value Management on a project, where the work is primarily categorized as Level of Effort (LOE), may not be of any significant value for managing the project because Earned Value on LOE simply measures the passage of time. There is no relationship to the actual performance on a project because value is earned as it was planned. That is, there is no schedule variance because BCWP (Earned Value) is always equal to BCWS (Planned Value) and is not tied to specific deliverables. However, using LOE when the tasks are clearly discrete and measurable is an unacceptable practice.

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- C. The execution of the project is of sufficient duration to allow management to analyze information and take effective corrective action such as projects which cross multiple years. One valuable function of Earned Value Management is the availability of information to determine trends and provide early warning. For short duration projects, the time lag in the reconciliation and reporting process as well as the time needed to develop a trend could result in delays of several months before data is available which would inform a manager that there are problems on a project. For a project with duration of about a year, a delay in the availability of status information could prevent needed trend information from reaching management in time to prevent a non-recoverable condition. Consequently, unless the project is of longer duration or the EVMS is able to provide real time, accurate information EVM may not be suitable for such projects. Of course, information is only one benefit to employing Earned Value Management. Value is also obtained through the implementation of a management system that employs proven techniques and processes such as is used in EVM. The more institutionalized the system is for the contractor, the easier it is to implement for even smaller short duration projects.
- D. When there is a significant investment of funds or effort, there must be a mechanism for measuring performance to ensure that outcomes, performance, and budget are integrated. Without this mechanism, budget is expended without regard to specific events, products or other deliverables.
- E. When the breadth of EVM employment encompasses multiple projects under the same system. Some companies employ Earned Value Management as a standard business practice for all contracts and work. When a company has a corporate policy and a common system for managing, they often employ EVM on all projects regardless of the size. The company is not likely to employ a different management system simply because the other factors are not present.

The factors to consider are usually complementary. That is, there is seldom only one factor present. When a project has a small budget, it is likely to not be very complex. Nor is it likely to be accomplished over multiple years. It is also likely that the project will have few deliverables or events that would support defining the work more discretely. Because of these factors, the Department has a threshold for implementing Earned Value Management on projects where the total cost is \$20 million or greater.

THE PROJECT LIFECYCLE AND EARNED VALUE MANAGEMENT IMPLEMENTATION

The point in the project or program lifecycle that Earned Value Management is implemented should not depend on the DOE requirement for implementation at a specific point. Rather it depends on the ability to discretely define the work that must be accomplished; a defined deliverable (data, products, or services) and the need that both the contractor and the government have for insight into the progress and performance.

The requirement to have an EVMS in place at the point at which the project has defined and seeks a decision on the performance baseline was selected specifically to create a common implementation point for all projects regardless of type. This was done even though it is recognized that many projects can and should implement EVMS very early in the project lifecycle. Selecting the performance baseline point for implementation creates an unintentional relationship between the Performance Baseline, which is the overall cost schedule and performance goals for each project, and the Performance Measurement Baseline. Establishing a PMB does not depend on establishing a Performance Baseline. Consequently, for the purposes of timing, there is no absolute dependency of the PMB on the PB or vice versa.

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It cannot be overemphasized that the timing for the implementation of the EVMS depends on the need for insight and the ability to define the near term work. Many complex projects and programs are spending considerable funds early in the system concept and definition stage. This work, although often characterized as research and development, is often more development than research. The objective of basic research is the pursuit of knowledge rather than the creation of products. The objective of applied research is development of viable processes, solutions, materials and components that are necessary for success of the project and program. These types of efforts should employ EVMS and should integrate that effort with the effort on the entire program or project. In these cases, the organization and the government both must be diligent in monitoring progress and performance so that the development work is in sync with the objectives of the program or project and will result in a technically viable and affordable solution. Earned Value Management is especially important in these types of projects because the outcome (or output) in the early phases is generally technical information. These products are often difficult to measure when completed as well as when they are in progress.

Yet, even though early implementation is often important, much of the early R&D and other conceptual work is difficult to define in discrete terms. Consequently, while it may be very important to implement Earned Value Management as early as possible, it is often difficult to implement effectively. Much of this difficulty is caused by the lack of specific requirements and the tendency to operate in a level-of-effort mode. However, when a site or company has a site-wide or company-wide system, early employment for specific projects decreases in difficulty. Applying a system that has proven to be capable to a new project is the most effective way of implementing Earned Value Management. Program and project managers must balance these competing elements to find the optimum point for implementation. This is generally before establishing the performance baseline, but following the alternative selection.

At the other end of the spectrum, some projects may involve a relatively small amount of effort prior to alternative selection and even prior to establishing the performance baseline. A project to construct an administrative support building is an example where the work, after selecting the alternative, may be completed in less than 18 months and while it may be easier to implement EVMS early, there may be marginal benefit to be gained. In other cases, a decision to establish EVMS very early when the early design and development work is risky and difficult could provide significant value in controlling risk and costs early on. Again, sound judgments should be made after careful analysis of the appropriate systems and structure necessary to effectively manage the project, not because there is specific requirement for compliance.

SYSTEM DESIGN AND DEVELOPMENT.

The responsibility for developing and applying the specific procedures for complying with these guidelines is vested in the contractor organization. The proposed earned value management system is subject to government acceptance, which will include evaluation by a joint government and organization/contractor team. In cases where the system does not meet the intent of the guidelines, adjustments may necessary to achieve conformance, and must be made by the organization.

Contractors have flexibility under the guidelines to develop a system optimized for its management needs. This approach allows contractors to use systems of their choice, provided they meet the guidelines. Earned value management systems may range from documented, fully manual processes to totally automated (paperless) systems. All are acceptable, provided the system conforms to the standard. Contractors are encouraged to establish and maintain innovative, cost effective processes, and to improve them continuously.

The degree of compliance is not in the number of guidelines met, but in the form and substance of meeting the guidelines. In some cases certain guidelines may not be applicable or feasible. For projects

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where this is the case, the plan should identify those guidelines and discuss the rationale for not complying with specific guidelines. Projects for which there is a low level of complexity and risk, such as construction of a building may not require the same level of insight, management and control associated with a more complex project requiring significant research, development, and engineering.

When the request for proposal or other form of solicitation specifies application of the guidelines, an element in the evaluation of proposals should be the prospective contractor's proposed system for planning, controlling and reporting contract performance. The prospective contractor should describe the systems to be used in sufficient detail to permit its evaluation for compliance with the guidelines.

If the company proposes to use a system that does not meet the standard or has not been recognized by a federal agency as compliant with the standard, the contractor should prepare and submit a comprehensive plan for conformance with the EVMS guidelines. This plan should discuss any guidelines, which may not be applicable.

The plan should—

- Describe the EVMS the contractor intends to use in performance of the contract;
- Distinguish between the contractor's existing management system and modifications proposed to meet the guidelines;
- Describe the management system and its application in terms of the guidelines;
- Describe the proposed procedure for administration of the guidelines as applied to subcontractors; and
- Provide documentation describing the process and results of any independent assessment or self-evaluation of the system's compliance with EVMS guidelines. (Note: Other assessments and evaluations will influence the agency's confidence in the company's system. However, at this point, it does not substitute for a government-led review.)

SYSTEM DESCRIPTION

There is no specific requirement for an Earned Value Management System Description. Where a company has documented processes in place and compliance with the guidelines in these processes is clearly identified, a summarizing document may suffice. The requirement is simply that the contractor or company must demonstrate compliance. Generally companies choose to do this in a form that provides a description of the system and the contractor's comprehensive plan for meeting the guidelines in ANSI/EIA 748-1998. The System Description provides an understanding of each activity required to meet the EVMS standard and functions as the coordinating document for the processes involved in the EVMS. It also serves a purpose of communicating the process within the contractor's organization.

The document should comprehensively, present the contractor's approach and internal activities demonstrating that the system meets the guidelines in the standard. The description should include the contractor's plan for implementation of any activities leading up to an evaluation by the government. Contractor format is acceptable. Changes as a result of a review should be incorporated by change page or complete reissue.

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Upon award of the task order, contract or other authorizing mechanism, the earned value management system description will be the basis upon which the contractor will demonstrate its application in planning and controlling the work. The government will rely on the contractors' systems when they have been accepted by another federal agency and will not impose duplicative planning and control systems. Contractors having systems that were previously accepted are encouraged to maintain and improve the essential elements and disciplines of the systems. The proposed system description should describe the contractor's management processes as they relate to the guidelines. A sample outline is contained in Appendix A.

Federal managers should recognize that there many ways for the contractor to effectively manage and often the contractor may determine that it needs to manage by organization and activity rather than products. Contractors must recognize that the government has a need for product-oriented information. Differences arising from these divergent needs, such as the level of reporting detail required, should be discussed during negotiations. While the guidelines are not subject to negotiation, many problems concerning timing of Earned Value Management implementation and related reporting requirements can be mitigated through effective negotiation.

THE USE OF EARNED VALUE MANAGEMENT TERMINOLOGY

Contrary to many popular notions, the EVMS standard does not require, nor advocate the use of specific language or terms. In fact, the term Budgeted Cost of Work Scheduled (BCWS) is not even contained in the standard. While it is true that a common language facilitates communication, there is no requirement to employ specific terms. In many companies, the titles of personnel may be Engineering Division Manager, Procurement Manager, Site Superintendent, Design Engineer and a host of other titles. Many or all of these individuals are performing the function of a Control Account Manager (CAM). However, neither the standard nor the government require that term "Control Account Manager" to be employed. Nor is there a requirement for those performing the functions to even know the term. The requirement is that each person performing the functions of a CAM must understand those functions and be performing those functions. Too often contractors and government program and project offices are focusing on the terminology rather than the functions. EVM is concerned less with form than the substance of the system that the company has put in place. If project members cannot perform the functions of a CAM to control cost, scope and schedule, they should be trained. If the project members can and do perform those functions, but do not know the term "CAM" training is not required. The use of a common set of terms should be employed when performance and progress are being discussed, measured or analyzed. These terms, such as EAC, CPI, SPI, VAC (which are all discussed later) are important to use to ensure communication between all parties can be conducted. Companies should not modify work processes, titles and other artifacts of an organization merely to ensure agreement in form. Modification is only necessary when processes and functions do not comply with the standard in substance.

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PART II

DEPARTMENT OF ENERGY EARNED VALUE MANAGEMENT PROGRAM

REQUIREMENT FOR EARNED VALUE MANAGEMENT

The Department's policy on Earned Value Management can be found in DOE Order 413-1, Program and Project Management for the Acquisition of Capital Assets. The policy states that Earned Value Management is to be applied to all projects with total project cost of greater than \$20 million. The definition of a capital asset can be found in the *Office of Management and Budget Circular, A-11 Part 7, Planning, Budgeting, Acquisition and Management of Capital Assets*, which includes information technology, structures, environmental remediation, land, equipment and systems. In implementing Earned Value Management, the Department does not make a distinction by the type of contract, rather by the need for insight into progress and performance. The need for government insight is the greatest when the risks, costs, and complexity are high and the implementation threshold was influenced by those factors.

SYSTEM CERTIFICATION

The Department is required to verify that their suppliers have implemented EVMS as required by *OMB Circular A-11, Planning, Budgeting, Acquisition, and Management of Capital Assets* and the FAR. This verification consists of a system capability analysis, which verifies that the system complies with the standard and a review of a project or projects that verifies that the system is being used on projects. Upon completion of the review and correction of non-compliant areas, the Department will certify that the contractor is in compliance with the standard. The Defense Contract Management Agency (DCMA) under a memorandum of agreement with DOE leads the certification process. The review process is discussed in detail later in this guide.

CERTIFICATION SCOPE

When the contractor has a broad range of responsibilities that encompass multiple projects and programs that require the use of EVM, certification may be accomplished on a project basis, program basis or on all the scope for which EVM is required. The scope of a review and subsequent certification depends on the extent to which EVM has been deployed by the contractor and the maturity of the projects or programs to which EVM is applied and can be demonstrated. The level of confidence in the company's system is partially dependent on the scope of the review that demonstrates the system and its use. If a review is limited to inordinately small subset of the scope of work for which EVMS is applicable the confidence in the system may be affected and the subsequent certification limited to only the scope that was included in the review. Consequently when the company intends to seek a site-wide, company-wide or other certification that encompasses multiple projects, they should ensure that the scope of the review adequately demonstrates that the system encompasses the stated scope.

CERTIFICATION THRESHOLD

The Department recognizes that projects with a cost near the lower end of the threshold (\$20M) are likely to be completed much sooner than much larger projects. As a result, the benefit of reviewing compliance with the standard may be limited. The Department will assess the maturity of the contractor's EVMS and determine the most effective manner to achieve certification.

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CORPORATE EARNED VALUE MANAGEMENT POLICY

When a corporation or entity has a contract with the Department and employs their corporate system that has been formally accepted by another government agency as compliant with the standard, the DOE will also recognize the system as compliant. Though the system may be deemed compliant, it remains the responsibility of the Department to verify and the company's responsibility to demonstrate that the system is being used. This verification and demonstration may be accomplished in many ways and depends on the company or entity, the characteristics of the project and the past performance of company in EVM. While many corporations have a corporate EVM policy the implementation within all business units is not always complete or often does not comply with corporate policy. The Department's acceptance of the system for other projects will be highly dependent upon the entity's surveillance policy and process. Because management systems are dynamic due to personnel and other changes, surveillance plays a key role in ensuring the continued compliance of the system. Without an effective surveillance policy and process, the Department may not unconditionally accept the system.

CORPORATE PARTNERSHIPS AND EVMS CERTIFICATION

Many corporations that are under contract to DOE and other agencies are partnerships between several contractors. For purposes of EVMS certification it is always the corporate entity under contract to DOE that is subject to review and certification rather than the individual partners. However, when the partners plan to employ the EVMS belonging to one of the corporate partners, the Department is prepared to accept the statement that the system they intend to use is compliant when the corporate system has previously been determined to be compliant. For example, organizations A and B enter into a limited liability arrangement (LLC) and have decided to implement the organization B's EVMS. If B's EVMS was previously certified, the Department will accept the system as compliant and it remains only for the LLC to demonstrate that it has fully implemented and is using the corporate system.

CONTRACTOR SELF-ASSESSMENTS

Regardless of the efficiency of the process, for non-major system projects below \$50 Million the time and effort required to plan and conduct compliance reviews may be greater than the benefit gained. The government's interests are better served when it is focused on high risk, complex and expensive projects and smaller projects. Smaller projects often have lower risk and many can be accomplished in short span of time. When some or all of these conditions are present, self-assessments with government oversight are preferred as the means to gain confidence in the contractor's EVMS implementation. The form of self-assessment employed by the contractor should be tailored to the type of project, the risks, and the organizational EVM maturity. When the contractor's organizational EVM maturity is high, the contractor may elect to perform a self-assessment using its own internal resources. When their EVM maturity is low, the contractor should consider external resources that have the expertise to assess the system and its use by the contractor. Whether external or in-house resources are employed for such a purpose, the contractor should ensure that the assessment team is free to objectively assess the contractor's system to eliminate the possibility of bias in the assessment process. Self-assessments have credibility only when it is evident that the team was unconstrained in both their approach and their conclusions.

In performing a self-assessment, there is no specific template, process or structure. The contractor is free to design a process that supports the primary objective of obtaining confidence in their EVMS using a credible system. While EVMS standard and its guidelines is the foundation for the system, the basis for a self-assessment is the [NDIA ANSI 748 Intent Guide](#), which should be employed by both the contractor in implementing an EVMS and the review team in assessing that implementation.

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Even though the government may have had some oversight role in the contractor's self assessment, the EVMS may not be recognized by the government as a certified system because the review was not accomplished by a government process, which was consistent and repeatable. The government may recognize and have some confidence in the contractor's EVMS. However, this recognition will not automatically extend to other projects and efforts by the contractor without demonstrating that the system continues to comply and is being used on other projects. Only the formal government certification process will result in a formal government acceptance and certification of a contractor's EVMS.

CERTIFICATION REVIEW PROCESS

The DOE will conduct EVMS compliance reviews on programs and projects when the contractor does not already have a system in place and in use, which has been previously accepted by a Federal agency. The government-led reviews are joint reviews and include the contractor when the contractor desires to participate. Compliance reviews will assess the management systems integration and its application. The compliance review does not determine the adequacy of the Contract Work Breakdown Structure and its relationship to the requirements. Rather it assesses the capability of the management system and use of that system by the contractor.

INTEGRATED PROJECT TEAM

The IPT for a review will typically be comprised of DCMA, who leads the team, the Contractor, OECM, the DOE program office, and DOE project office. The contractor team members should not be members from the specific programs or projects involved in the review. The contractor's team members may come from another location, division, or business unit. The level of experience of all the team members must be commensurate with the need. For some projects or programs, the complexity of the effort or its size will require not only a larger team, but also a team that has greater depth in EVMS than other teams on a project that has little complexity or cost. Each team is selected specifically for each review with consideration of these factors. The selection also considers the level to which each guideline must be reviewed or is applicable. For example, when the contractor complies with the Cost Accounting Standards and the disclosure requirements, a team member who is familiar both with the CAS and the contractor's disclosure statement as well as the contractor's accounting system may be necessary. Since the contractor complies with the CAS a review in depth of this area may not be as necessary as it would be for other guidelines.

REVIEW PROCESS.

The detailed process used to conduct a compliance review will vary by the scope of project(s), the scope of the review, the team, the location and other factors. While there is a common framework, each review is planned specifically for that event. The process may be tailored; however, the conduct of the review is consistent and repeatable. The process follows.

1. The necessity for a review is identified by direction, request or other means.
2. An initial planning session is conducted at the performing location. The purpose of the planning session is to identify the DOE, DCMA, and contractor organizations; understand the project, program or area of interest; team members/participants; and develop a planning schedule for completing the review.
3. The contractor will typically prepare a dollarized responsibility assignment matrix (RAM), the EVM system description (or equivalent documentation), project(s) description and compliance map (Appendices A, B and C). These items are generally submitted during the planning meeting for the review. This initial set of products facilitates the review planning.

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4. The team is finalized and allocated to one of the five areas of the standard by DCMA. The team, led by DCMA, will be composed of DCMA, DOE, contractor personnel (if desired by the contractor), and other Federal Government personnel as necessary. Team members from the Government or contractor performing organizations should be avoided not only to ensure independence but because the contractor personnel are the operators and users of the system under review.
5. DCMA determines, in conjunction with the contractor and the team, the documentation necessary to conduct the review. The contractor delivers the documentation to DCMA who then provides the documentation to the team for review.
6. The team reviews the documents to gain understanding of the program or project, scope of work, the methodologies and processes that comprise the contractor's EVMS and to determine logical areas of examination. These areas are identified to the contractor and related documentation is requested (see Appendix B)
7. The team is trained by DCMA to conduct the review. Training is conducted prior to every review. Training provides the means to build a team and to understand the scope of the review as well as reviewing the standard and its application.
8. The review is conducted at the performing location and is structured as a series of interviews followed by team discussion and resolution. The team is broken into sub teams and assigned specific areas for which to interview Control Account Managers, Project Managers and other contractor project personnel. The contractor's work does not stop during the review as it is conducted on a non-interference basis. Interviews are conducted with individuals (and sometimes with one or two other individuals simultaneously). Each sub-team may be conducting an interview at the same time as the other sub-teams. At the end of each day, the entire team meets together to share observations and conclusions.
9. During the review Corrective Action Requests (CARs) and Continuous Improvement Opportunities (CIOs) are generated. A CAR is used when the team has determined that the system does not comply with a specific guideline in the standard. CIOs are employed when the team identifies that a specific practice could be improved to be more effective. CARs are further categorized as major and minor.
 - a. Major Corrective Action Requests are systemic non-compliances, or have major impact upon the baseline, the data or other aspects of the project.
 - b. Minor Corrective Action Requests are non-systemic and of little impact to the project.
10. The results of the review are presented to the contractor. The results will include the documented CARs and CIOs identified by the team. The contractor must respond to DCMA with a corrective action plan for each CAR. The contractor may choose to respond to CIOs as desired. DCMA reviews and accepts the corrective action plan. The contractor takes action as identified in the corrective action plan and the corrective actions are verified by DCMA.
11. DCMA prepares the final report recommends acceptance of the contractor's system to the DOE.
12. DOE Chief Acquisition Officer issues a letter to the contractor notifying them that the Department has accepted the system.

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13. The contractor follows up the review with a surveillance plan to maintain the system, conducts and annual assessment of the system and issues a status report to the DOE regarding the continued maintenance of the system.

PRIOR SYSTEM ACCEPTANCE

When a system has been previously accepted, the Department will assess the surveillance program being used to maintain the system. Reviewing a surveillance system does not imply a separate review that replaces a compliance review. A surveillance system assessment may involve reviewing the processes or system description, the surveillance plan and the results of the contractor's periodic assessments. When it is evident that the contractor has maintained the EVMS, the Department will accept the system.

SYSTEM SURVEILLANCE.

Having achieved compliance, the contractor is responsible for implementing and maintaining a surveillance program to ensure the continued compliance of the system. While achieving certification is a significant event, maintaining the system is equally critical. For without a process in place to achieve surveillance, the EVMS will readily deteriorate. The surveillance process is also critical for extending EVMS across multiple project types and programs.

The DOE will assess the results of the surveillance program to determine if additional action is necessary once certification has been achieved. The DOE accepts the standard industry surveillance approach as identified by the [*National Defense Industrial Association, Program Management Systems Subcommittee, Surveillance Guide*](#) as the preferred resource for developing and implement a surveillance program.

If it becomes evident that the contractor's system has not been maintained, the DOE will require demonstration that the system continues to remain compliant or that the contractor has brought the system back in to compliance. Some indications of a system that has become non-compliant include excessive closing of variances (point adjustments) or a lengthy period of no variances; excluding parts of the project from the WBS and EVMS and excessive replanning of work packages. Others might be unauthorized work being performed or moving scope without moving the corresponding budget. The program and project IPT's should be watchful for any other indications that the system is not being used to effectively manage the work effort.

Even though surveillance follows a system capability review, surveillance must be considered during the process development and the plan for surveillance immediately following certification.

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PART III

EARNED VALUE MANAGEMENT SYSTEM GUIDELINES

The guidelines are grouped into five areas. Some could easily fit under more than a single area. However, each guideline is listed only in the group where it is primarily applicable. This organization is merely a vehicle used to facilitate understanding. Organization focuses on the performing organization and integration of the Work Breakdown Structure and the Organization Breakdown Structure of the project or program. Planning and Budgeting is concerned about the definition, resources and scheduling of the work. Accounting Considerations concentrates on budget and funds management as well the actual costs. Analysis and Management Reports establishes the processes for performance and status information, analysis and actions to be taken. Revisions and Data Maintenance organizes the guidelines, which pertain to controlling change in the baseline and budgets.

ORGANIZATION

- Define the authorized work elements for the program. A work breakdown structure (WBS), tailored for effective internal management control, is commonly used in this process.
- 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.
- 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.
- Identify the company organization or function responsible for controlling overhead (indirect costs).
- 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.

PLANNING AND BUDGETING

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

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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.

- Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.
- 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.
- Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.
- 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.
- Establish overhead budgets for each significant organizational component of the company for expenses that 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.
- Identify management reserves and undistributed budget.
- Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.

ACCOUNTING CONSIDERATIONS

- Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.
- 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.
- 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.
- Record all indirect costs that will be allocated to the contract.
- Identify unit costs, equivalent unit costs, or lot costs when needed.
- For EVMS, the material accounting system will provide for:

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- 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.
- Full accountability of all material purchased for the program including the residual inventory

ANALYSIS AND MANAGEMENT REPORTS

- 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 the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.
- 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.
- 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.
- 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.
- Implement managerial actions taken as the result of earned value information.
- 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.

REVISIONS AND DATA MAINTENANCE

- 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.

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- 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.
- 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.
- Prevent revisions to the program budget except for authorized changes.
- Document changes to the performance measurement baseline.

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PART IV

INTERPRETING THE GUIDELINES

The guidelines provided in the previous section established the basic characteristics of a good Earned Value Management System. This section is topical and discusses the application of the guidelines. The organization of this section loosely follows the organization of the guidelines.

ORGANIZATION.

The organizing process is concerned principally with: ensuring that each part of the earned value management system is properly established; defining the work required to be performed; assigning the tasks to organizations responsible for performing the work, including major subcontractors; facilitating the collection and development of information for management purposes; and identifying organizational resources that facilitate the preparation of accurate and timely estimates of project cost and schedule completion.

WORK DEFINITION (WORK BREAKDOWN STRUCTURE).

The statement of work, work authorization, or other form of direction to the contractor should reflect all the work to be performed. A critical component in defining the work is to establish organizational responsibility for segments of the work and to define in-house effort versus subcontracted effort. The Work Breakdown Structure (WBS) is the most common manner in which the work is described. The WBS is a product-oriented decomposition of the end item, product, or outcome. This decomposition process identifies key components, sub-systems, assemblies or other complete elements of the entire product and continues until there are no more components that can be identified.

There is a predisposition to create a WBS by describing the activities necessary to produce the product, such as, *design, engineer, procure, construct, and develop* or to segment the work by source or type (color) of funds. While the required effort and resources are important, they are not a representation of the product and consequently do not belong in the WBS. What is often defined as the WBS is actually the Organizational Breakdown Structure (OBS) that is used to assign responsibility for each element of the WBS. This error produces an inadequate and non-useable definition of the work. When the prime item (Level 1) is removed or hidden, the viewer should be able to still identify the end product. This test generally applies to every level of the WBS. Work Breakdown Structures must always describe deliverables, which consist of data, products, and services.

The Work Breakdown Structure established for the project should not be extended to unreasonably low levels, because it may affect management flexibility. Organizations should be careful that they are describing the product, end item or outcome in the work breakdown structure and not the organizations and activities that are assigned to the work package. Generally, the Work Breakdown Structure has been extended too far when the definition of an element describes activities or piece parts and material rather than a component.

When the EVMS requirement is applied to subcontracted efforts, the subcontract WBS decomposition level is dependent on the needs of program and project management. The key discriminator for subcontracts is the level of insight into progress and performance at the subcontract level that is necessary. In some subcontracts a single WBS element may be adequate.

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RESPONSIBILITY ASSIGNMENT (ORGANIZATION BREAKDOWN STRUCTURE).

The Organizational Breakdown Structure (OBS) reflects the way the project is functionally organized. To assign work responsibility to appropriate organizational elements, any WBS and organizational structure must be integrated; that is, organizational responsibility must be established for identified units of work. The assignment of lower level work segments to responsible lower level managers provides a key control point for management purposes and cost collection. This is called the control account (CA). In Figure 1 the project can be defined both by its product components (the WBS) and the organizations responsible for each component (OBS).

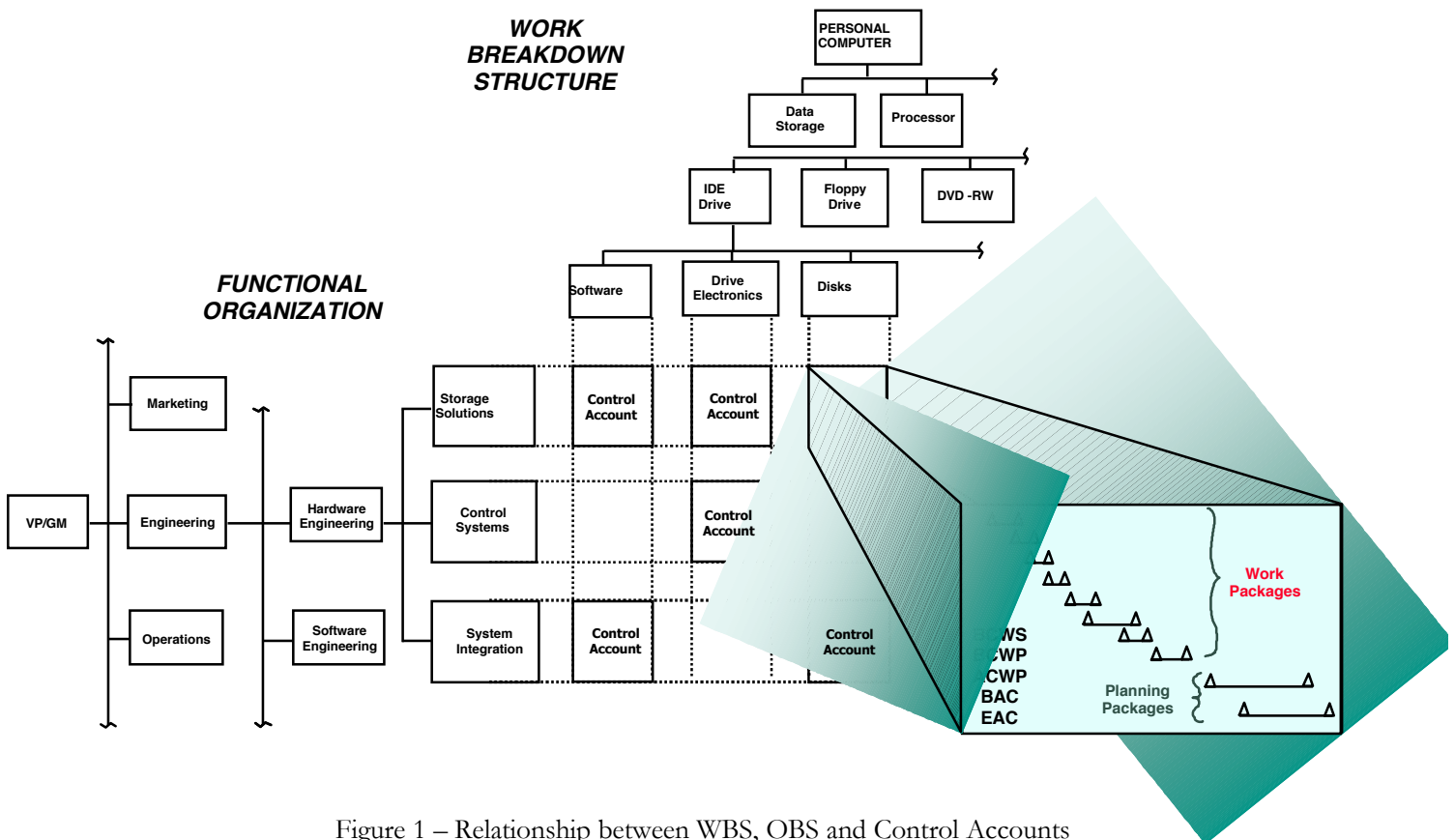


Figure 1 – Relationship between WBS, OBS and Control Accounts

When subcontracts are employed, the subcontractor should be identified and correlated with the WBS element and the organization responsible for that element. If the subcontractor functions as a member of the Integrated Project Team, they must be shown on the OBS.

OBSs should not be used as a substitute for an effective Work Breakdown Structure. The WBS provides visibility for management on progress and performance with a focus on the product. The OBS provides a horizontal view of progress and performance at the organizational level. Both views are essential for effective management.

Control Accounts.

The control account is the primary point for planning and control. All elements of the system come together at this point including budgets, schedules, work assignments, cost collection, progress assessment,

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problem identification, and corrective actions. The control account levels should be determined by the scope of the tasks. The proper levels should not simply be an arbitrary determination or the result of a standard that is applied organization-wide. Control accounts are usually located at levels consistent with the project's management process and the necessity for control and insight. Consequently, the control account in an earned value management system is the lowest level in the structure at which the comparison of actual costs to planned budgets and earned value are required. The cost collection point must be at a level where cost elements and factors contributing to variances can be identified. Control accounts at too high of a level will not provide adequate insight into the actual work being performed to be able to analyze problems and take corrective action. The responsibility and authority for corrective action should exist at the control account level. Control account managers must have the ability to make decisions if they are expected to manage at this level.

Control Account Managers

Control Account Managers (CAMs) are the designated individuals who are responsible for managing the Control Account. Their primary responsibility is to execute the work scope identified in their Control Account. Assigning individuals as a Control Account Manager does not require them to employ the title. However, it is essential that they understand and execute the responsibilities as a Control Account Manager.

The question often asked is whether a single individual is responsible for executing all the responsibilities of a CAM or can some functions be executed by another functional group. In a management structure that employs Integrated Project Teams, the actual conduct of a specific function may be assigned to team members while the ultimate responsibility remains with the Control Account Manager. Responsibility should not be misconstrued to imply physical execution. CAMs are permitted to delegate and assign functions provided they remain ultimately responsible.

Control Account Manager Responsibilities

As previously stated, the chief responsibility of the Control Account Manager is to execute their assigned work scope. A list of the key responsibilities follows. This list is obviously not all-inclusive.

Define deliverables and plan the work required to achieve the deliverable

Determine the method for earning value for assigned work packages and ensure there is adequate visibility into the performance of discrete effort.

Manage assigned resources (budget and staff) and resolve schedule, scope and resource conflicts including the exercise of authority over subcontractors to ensure they perform to the terms of the contract.

Analyze Earned Value and other progress and performance information to determine the cause of variances.

Devise mitigation plans and perform replanning to overcome variances

Periodically conduct estimates at completion to ensure work package budgets are adequate.

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PLANNING, SCHEDULING AND BUDGETING.

Planning, scheduling and budgeting involves organizing the work packages based on dependencies, interdependencies, constraints and other factors into a time-phased sequence that will fit within the boundaries established by mission dates and available budget.

INTEGRATED PROGRAM/PROJECT SCHEDULE.

Effective management requires the integration of the technical, schedule, and cost elements of the program. Schedules that result from this integration show the planned time required to accomplish the technical scope of the contract. The planned time constrained by the available resources necessary to execute the work scope; dependencies upon other work packages; and other factors. Not all work can be accomplished serially. Concurrency is inherent in all projects. However, resources are finite and the same resource cannot execute multiple work packages simultaneously. Consequently, the schedule will be adjusted by leveling the resources to conform to the available budget, resource constraints and capacity of the work site among other factors. Schedules that presume the unrealistic availability of budget and resources are not executable.

The scheduling system should cover all specified work and incorporate milestones that are meaningful in terms of the technical requirements of the contract. The schedule must also be derived from the plan and contain forecasts of expected future progress. Such schedules should identify key milestones and activities; incorporate the effects of resources constraints and interrelationships between work packages, which will permit the program or project to identify the critical paths when analyzing the resultant network. A key feature of the scheduling system is that it establishes and maintains the relationship between technical achievement and progress.

The scheduling system should contain a master schedule and related subordinate schedules that provide a logical sequence from the detail to the summary level related to and constrained by external milestones assigned by appropriate authority. Intermediate schedules may be established if needed to provide a logical sequence from the detail level schedules to the master program schedule. The scheduling system must also provide for the identification of interdependencies between organizations and WBS elements at the level appropriate for efficient program management. Control Account Managers (CAMs) must be aware of the inputs and deliverables their work packages need to be executed. These interdependencies must also be very visible to the program or project manager, who is the primary resolver of schedule, resources or scope conflicts. An effective scheduling system will depict the plan to accomplish the technical scope and the actual technical progress.

The schedule system provides information on progress against the plan, along with estimates of the time required to complete the remaining technical scope. The schedule baseline, progress, and estimated time to complete, should be integrated with the financial view (budgets, earned value, and estimated cost to complete) of the technical scope. Scheduling should interface with other elements of the EVMS to the extent necessary for measurement and evaluation of project status. The scheduling system should provide current status and forecasts of completion dates for all authorized work. The summary and detailed schedules should enable a comparison of planned and actual status of project accomplishment based on milestones or other indicators used for control purposes. The ability to obtain financial data coincident with the schedule data from a specific period directly affects the currency of the information and the quality and timeliness of analysis and assessments. When the financial data excessively lags schedule information, accurate performance measurement information will not be available quickly enough to take effective action to mitigate variances. When this situation is present, managers should implement a process to estimate actual costs as a means to increase the currency of the performance information.

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CONTROL ACCOUNTS BUDGETS.

Since control account budgets and schedules also establish the constraints required for Performance Measurement Baseline (PMB) control, care should be exercised in the establishing control account budgets to ensure the scope and effort necessary to achieve that scope are correlated and prevent front-loading of the baseline. When establishing control accounts, factors to consider should include:

- The natural flow of work and specific management control point;
- Significant contract events that will be supported by completion of the effort within the control account;
- The need to ensure objective measurement of progress by establishing shorter assessment periods
- The rate structures to be applied to the control account resources.

Each control account must contain resources necessary to complete the assigned effort and budgets reflecting these resources. Budgets established at the control account level must be planned by the cost element not the type or color of funds or other factors.

- Budgets may be stated either in dollars, hours, or other measurable units. Dollars are most often used because it provides a common unit of measurement between the system components (actual cost, budgets, etc)
- It is necessary to use rates that will provide a valid performance measurement baseline. When there are significant changes in the anticipated labor, overhead, or other rates, internal replanning of remaining portions of the PMB may be necessary. Replanning of prior work in this event is not acceptable, because prior work that has been completed cannot be replanned.
- In general, the budget process should provide for the following:

Direct budgets allocated to organizations performing the planned work;

Indirect budgets allocated to specific organizations having responsibility for controlling indirect costs; and

Identification of any management reserves or undistributed budget.

Effort contained within a control account is distributed into either work packages or planning packages. “Work package” is the term used to identify discrete tasks that have definable results. It may also be used for defined components of level-of-effort or apportioned effort work. Work packages should be natural subdivisions of the activities and effort required to execute the scope that is contained in the work breakdown structure. Each work package should result in a definable product or event. Work package descriptions must clearly distinguish one work package effort from another. A key characteristic of a good work package is the inclusion of frequent, objective indicators of progress. When work packages are relatively short, little or no assessment of work-in-process is required. As work package length increases, progress measurement

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becomes more subjective, unless work packages are subdivided by objective indicators, such as discrete milestones with preassigned budget values or completion percentages.

Work for a given control account which cannot be planned in detail at the outset, should be divided into larger segments and placed into planning packages within the control account. Planning packages are aggregates of future tasks and budgets, beyond the detail plan, which will be divided into work packages at the earliest practical point in time. Time-phased budgets assigned to planning packages must be supported by a specified scope of work and this relationship must be maintained when detailed planning of the effort occurs.

All control accounts must contain a budget, schedule, and scope of work and should realistically represent the manner in which work is assigned and budgeted to the organizational units. In all cases, the value of the budget assigned to individual work packages and planning packages within the Control Account must sum to the total value authorized for that Control Account.

Work Packages.

A work package is a task or job assignment. The work package describes the work and identifies the resources managed by a specific performing organization and serves as a vehicle for monitoring and reporting work progress. Work packages are the natural subdivisions of control accounts and constitute the basic building blocks used in planning, controlling, and measuring project performance. Effective control and completion of the work requires that each work package be assigned to only one performing organization. Establishing and maintaining control at the control account level permits flexibility in the management of resources at the lower detail levels through work package replanning. Work packages are characterized by the identification of all resources necessary to execute the work package. Work packages must be realistic. Resources and work must be fully defined for the package to be considered a work package. The only scope that should be “earning value” is scope in work packages. Excessive replanning of work packages should lead to questions about the level of detail and realism in the work packages. Work packages should not be artificially constrained. That is, work packages must be governed by the work necessary to produce a complete unit or event that has value. Sub-dividing software development, for example, should result in work packages that contain complete and useful modules.

Planning Packages.

When effort at the control account level cannot be adequately defined into work packages, the contractor may retain budget and scope in a planning package. This package must be assigned to an organization for control and for detail planning into work packages at the earliest possible time. An excessive number of planning packages compared to work packages are indicative of an immature project or program. While a “rolling wave” concept is a tempting methodology it contains significant risk of both cost and schedule overruns. That is not to say that rolling wave should not be employed however. Rolling wave is an accepted methodology and can be effectively employed as long as the definitization of planning packages into work packages is not taking place any later than 3 to 6 months prior to the start of work. The progress in identifying project scope at the work package level is also effective means of determining the readiness of the project to proceed. Planning packages do not earn value because the resources necessary to execute the work scope has not been defined or scheduled.

Summary Level Planning Packages.

When it is clearly impractical to plan authorized work in control accounts, budget and work should be identified to a higher Work Breakdown Structure element and organizational level for subdivision into control accounts at the earliest opportunity. The budget for this effort must be identified specifically to the

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work for which it is intended, be time-phased, have its value periodically assessed, and have controls established to ensure this budget is not used in performance of other work. Eventually, all the work will be planned by specific organizational elements to the control account level. Planning horizons can be used to establish reasonable control account level assignments of work and budget.

Summary level planning is not a substitute for early and definitive detail planning. Programs and projects that span many years, such as environmental remediation projects, may only have the near-term work definitized. The long-term budget may be held in a summary account until the program is able to define the work to the work package and planning package level. This has been referred to as the rolling wave planning and while it remains a legitimate tool, any project with an excessive number of planning packages compared with work packages is an immature project, which may not have had an adequate planning window in which to complete its definition. In these situations, the government and contractor must be cognizant of the risks that is an inherent component of insufficient planning and must assess the readiness of the project for the next phase.

Work Authorization.

Before work can proceed, scope and budget must be allocated to the responsible organizations. The contractor program or project manager or program manager is given authorization to proceed with contract work. Budgets and work scope are then divided among the organizational elements. The contractor's internal work authorization processes must be in place and functioning. No work is authorized without allocated budget and no work is permitted to exceed the allocated budget scope authorized. Work on a project that is outside of the contractor's work authorization process is an early indication of the lack of effective management and control systems. Work authorization is not merely a budget allocated or approval. Work authorization is the specific and mechanism where individuals and teams receive the authority to begin the work defined in the work package. Every organizational unit has a work authorization process and within a company different functions may have different work authorization processes. The government's authorization to the company/contractor to proceed does not constitute a blanket work authorization within the company. For example, in an engineering function, the engineering division manager has a mechanism by which individual engineers are assigned to work and the work is authorized to begin. There may be varying degrees of formality associated with that authorization. However, in most companies with mature business operations, that authorization will be documented. It is this work authorization that is fundamental to EVM. In some cases, award of a subcontract with a defined schedule could constitute work authorization. Regardless of the nature of the mechanism or how many process exist, they must be documented and used.

Resource Control.

Organizations engaged in the performance of the project effort (execution of work packages) must periodically perform a comprehensive estimate of costs for the effort remaining. As the project progresses, these estimates have greater importance and must have greater fidelity. Project managers must periodically assess the sufficiency of resources versus the amount of work remaining. Responsibility for resource assignment to support program objectives must be clearly identified. Valid schedules are not possible without the allocation of resources to work packages and the reconciliation of the resource obligation versus the resource assigned.

EARNING VALUE.

At the heart of the system is the methodology employed for earning value. Each and every work package must have some defined technique of earning value in relation to the resources expended. The greatest difficulty in determining value earned is evaluation of in-process work that has not been completed within a single accounting period. Using discrete milestones within work packages will significantly reduce this

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subjective analysis. The technique used to earn value will largely depend on the work package content, size, and duration. Earning value means that a work package has earned the budget assigned for that portion of work that was planned and then accomplished. This predetermined amount of budget is earned, when the corresponding work is accomplished. Value is earned in one of the following ways:

- The work package is either complete or uncompleted (only earns value when complete, also known as the 0/100 technique). This most often applies when a commercial end item is being procured that is immediately able to be used without assembly, test, modification or installation. It also may be applicable when there is no logical incremental milestone that can be discretely measured such as when the work scope is so small that it either is complete or incomplete and there is no value without the work completed.
- Completion Ratio or Equal divisions (25/75, 40/60, 50/50). When a ratio can be identified where there is value in incremental progress or where there are logical steps to the work, such as – design (25), engineering (25) fabrication (25), and test (25). The technique is often used for nonrecurring work.
- Milestones. Milestone events earn 100% of their value when the event has occurred when there are no incremental milestones that can be divided.
- Weighted Milestones. Values are assigned to milestones as a function of the work required to attain that milestone. That is, the weights are correlated with the work packages. It is the close connection to the work (packages) that makes Weighted Milestones an accurate method of measuring progress.
- Percent Complete. Unless percent complete is calculated then the measure itself is subjective and given to significant error. Even a calculate percent complete is prone to inaccuracy because the work is not averaged over time. For example. When a project consists of significant costs for procurement of material, calculating percent complete may provide an erroneous measure because the size of procurement would slew the measure towards a greater percent complete than is actually true. Percent complete can be effectively used when there are no spikes in the planned work that would inaccurately convey more progress than was actually completed. Percent complete requires well-defined work packages. It also requires guidance on assessing percent complete in a consistent manner.
- Completed Units. When the work is of longer duration and repetitive such as in a production environment, the project is divided in to completed units with the planned value that is based on the cost of the units. Earned Value is determined by summing the completed units. Completed units are an example of an objective measure.
- Apportioned Effort. As discussed in the standard and elsewhere in this guide, apportioned effort is measured by the value earned for the work to which it is related. The schedule variances in the apportioned work are normally identical to schedule variances in its related work. However, the cost variance is not a function of the related work. Rather it is governed by the actual cost of the apportioned effort that is applied to the work.

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- Level of Effort (LOE). LOE earns value in accordance with the plan (BCWS). That is $BCWP = BCWS$ for LOE regardless of the actual work accomplished. LOE is employed only when absolutely necessary because a task cannot be broken down into discrete elements. This measure of value provides no visibility or accountability. LOE also de-sensitizes the EV information much the same way that large cumulative values will mask significant trends.

No single technique is appropriate for an entire project and most projects will utilize several of the above techniques for determining value. The key is to ensure that the techniques employed are meaningful.

Finally, every effort should be made to discretely identify work and to objectively assign values to that work and portions of the work. Projects that define the work in general terms primarily by level of effort will simply be tracking budget execution without an objective measure of the value obtained for the cost incurred. Not only does this not comply with the standard, it also prevents visibility into progress and performance, resulting in a lack of credible information that can be used to manage progress, take action and make decisions.

In order to perform effective analysis of variances, earned value must be objectively assessed using the same basis upon which the budget was planned and actual costs accumulated. In addition, labor, overhead, and other rates used to calculate earned value must be the same as for the associated budget.

A direct relationship between the performance standards established for the effort and the budget for the associated effort must be established. The contractor must establish a baseline plan for work that includes time-phased budgets that are consistent with the schedules for the performance of the work. The performance measurement indicators (milestones, earned value standards, scheduled output etc.) must be clearly identified and directly related to control accounts. They must be scheduled in a sequence supporting the achievement of project and contract objectives. These indicators must clearly represent the accomplishment of an identifiable quantity of work within the control account and be assigned a value reflecting the planned cost of that work. These values must summarize to or reconcile with the total budget for the control account.

LEVEL-OF-EFFORT (LOE).

For discrete work packages, accomplishment can be measured based on the completed pieces of work but LOE is work that cannot be measured or otherwise quantified. As a result, LOE is “measured” through the passage of time. LOE activity should be separately identified from discrete work packages to avoid distorting that which is measurable. Because LOE is directly related to time and may only be indirectly related to physical progress there is no information content such as trends or other predictive aids to alert managers. Nor does it support accurate forecasting of costs and EACs. At its best, LOE has no impact. At its worse, LOE can offset negative performance thereby masking the true project performance. Large values of LOE in a project are another indicator that the planning is inadequate and the work packages are not well defined. Some general guidelines for LOE are:

- The amount of LOE activity will vary but should be minimized to the greatest practical extent.
- LOE budgets should be separately substantiated and planned as direct labor, material/subcontract, or other direct costs. LOE activity should be budgeted on a time-phased basis for control and reporting purposes.

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- LOE should not be mixed in the same control account if possible. Additionally, you should consider isolating LOE into a separate WBS as you would with project management.
- When LOE and discrete effort are mixed within the same control account, the control account manager must ensure visibility into the performance of the discrete effort.
- LOE should be limited to cross cutting and support functions that do not directly affect project performance.
- LOE that is assigned to a specific work package should be analyzed to determine if it is actually LOE. When a work package has a specific and discrete output, it is not LOE.

APPORTIONED EFFORT.

Apportioned effort are activities that cannot be discretely defined or measured and are dependent on (and linked to) the progress and performance of other work packages. Apportioned effort is not readily organized into work packages because there is no specific outcome or output directly through those activities. The factors established for the application of apportioned effort should be documented and applied in a formal, consistent manner. Apportioned effort should be limited to that which is genuinely related to discrete effort but cannot itself be discretely defined or measured. An example of apportioned effort is required quality assurance inspections after some portion of work is completed.

These efforts earn value in proportion to the value earned by the tasks to which they are linked. That is, if the production task had a schedule variance, the apportioned effort activity also has a schedule variance. While there is a schedule relationship between the apportioned effort and the discrete effort, this correspondence does not extend to the cost. The apportioned effort cost corresponds only to the cost of the resources for the apportioned effort.

THE PERFORMANCE MEASUREMENT BASELINE (PMB).

The work package definition, resource allocation (assignment of budgets) and subsequent schedule result in a time-phased plan for execution. This time-phased plan is the Performance Measurement Baseline. Budget At Completion (BAC) and the PMB are often mistakenly thought of as equivalent. The difference between the BAC and the PMB is that the PMB is the time-phased plan, while the BAC is the cumulative budget that results from the plan. That is, the BAC is a single value, while the PMB is consists of multiple values over time. The PMB can be thought of as the time-phased curve that results from the cumulative values of the planned work (Budgeted Cost of the Work Scheduled).

Establishing the baseline.

The assignment of budgets to scheduled segments of work produces the Performance Measurement Baseline (PMB), against which actual performance can be compared. The establishment, maintenance, and use of the PMB are indispensable to effective performance measurement. The PMB should be in place as early as possible in a project or program and should be planned to project completion. In complex programs and projects the PMB will consist of work packages containing resources, planning packages containing budget and some summary level planning packages that also contain budget. This relationship of individual work tasks with the time-phased resources necessary to accomplish them is established at the control account level. All control accounts should be planned, at least at a summary level, to the end of the project or contract. Any control accounts that cannot be established in the initial planning effort should have

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identified the critical events necessary for planning the work packages within that control account. Planning packages should be an item of continuing management interest.

When the greater part of the budget is in planning packages or summary level planning packages because the project completion is so far in the future, the maturity of the PMB is questionable. It is likely that many point adjustments will be necessary to as work is planned and replanned for future periods. The result will be to invalidate the PMB and cause the EV data to become unreliable. The greater the difference between the original PMB and the current PMB, the less reliable the information. For this reason, projects that have a long lifecycle must be broken down into useful segments for which individual PMBs can be established and controlled. Projects become more likely to be executed within cost and schedule when they are divided into the executable segments.

Composition of the Performance Measurement Baseline.

The PMB can only contain budget that is identified to a work package, planning package, or undistributed budget. Work packages and planning packages only contain work that directly affects the product or outcome. Work packages and planning packages cannot contain budget or resources that are not required to execute a specific WBS element. Project costs not included in the total cost that are not associated with specific work accomplishment, such as profit, fee, payment-in-lieu of taxes, management reserve, contingency and other similar items, do not belong in the PMB. The PMB must be valid for the progress and performance measures to be valid. When the PMB is summed to arrive at a Budget At Completion (BAC) and the BAC equals the total project cost (TPC) the validity of the PMB is suspect and should be analyzed to identify and correct the problem. The most common error affecting the validity of the PMB is the inclusion of budget that contains no work in the PMB. Management Reserve and Contingency cannot be in the PMB because there is no defined work associated with them. When a work package or planning package requires additional resources, the additional budget may be assigned from Management Reserve or Contingency. In that event, that assigned portion of the budget would no longer be Management Reserve or Contingency. In Figure 2 you can see the relationships between the various elements.

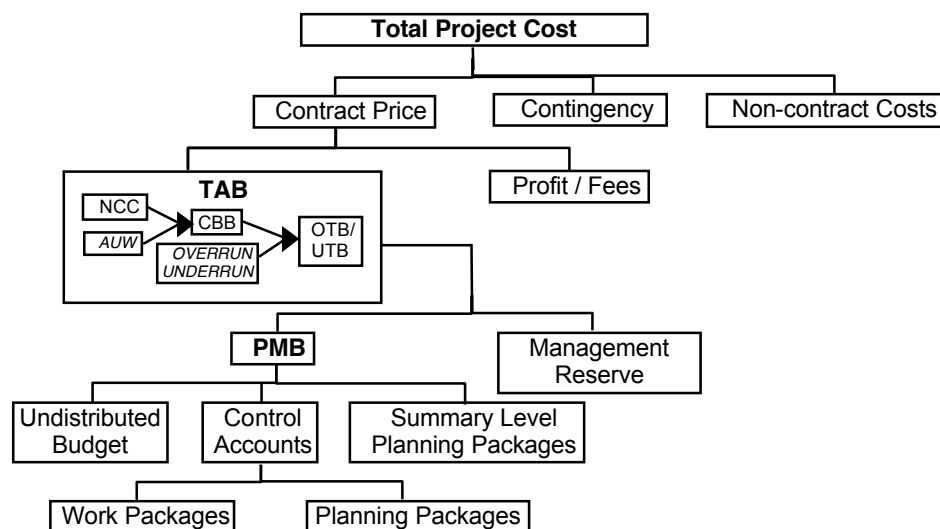


FIGURE 2, PERFORMANCE MEASUREMENT BASELINE RELATIONSHIPS

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	Total Project Cost	Sum of all costs for a given project
	Contract Price	Total price for a specific contract
	Contingency	Budget withheld by the government for management control
	Non-contract costs	Project costs outside the scope of the contract
	Profit/Fees	Self explanatory
TAB	Total Allocated Budget	Sum of all contract budgets (includes MR)
NCC	Negotiated Contract Cost	Contract price minus profit/fee
AUW	Authorized Unpriced Work	Work contractually approved but not yet definitized
CBB	Contract Budget Base	Sum of NCC and AUW
	Overrun/Underrun	Sum of recognized budgets <> the CBB
OTB	Over Target Baseline	Sum of recognized overrun and CBB
UTB	Under Target Baseline	Sum of recognized underrun and CBB
MR	Management Reserve	Budget withheld by contractor for uncertainty
CA	Control Account	Lowest CWBS element assigned to single manager for planning and control
WP	Work Package	Near-term, detail-planned activities within a CA
PP	Planning Package	Far-term CA activities not yet defined into detail work packages
SLP	Summary Level Planning Package	Sum of planning packages
PMB	Performance Measurement Baseline	Contract time-phased, budgeted work plan (excludes MR)

TABLE 1, TERMINOLOGY USED IN FIGURE 2

Management Reserve (MR).

In most projects, particularly developmental activities, there may be considerable uncertainty in the schedule, cost estimate, technical scope or other aspects of the project or program. The use of management reserve provides the contractor project manager with the flexibility to adjust for these uncertainties. Identification and control of management reserve is necessary as it would be with all assigned budget. Management reserve budget and its use should always be accounted for at the total project level. Normally, it is retained and controlled at this level. In some more complex projects, contractor manager may choose to allocate management reserve to specific subsystem managers to increase their flexibility. Regardless of the chosen method, management reserve is maintained separately from undistributed budget. There is no recognition, employment or understanding of the term "negative management reserve."

- Management reserve is not contingency funds.
- It is not used to absorb the cost of contract changes.
- The contractor must not be required to use existing management reserve to provide budget for authorized, but undefinitized, work or other modifications.
- Management reserve is not an element of expense in a cost estimate and is not estimated as it if it were a sub-system, component, or specific scope.
- Management reserve is derived by establishing cost targets for control accounts that are lower than the original estimate. That is, management reserve is normally arrived at by establishing realistic goals to accomplish work under cost.

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Undistributed Budget (UB).

Budgets applicable to contract effort, which cannot be specifically identified to the WBS or organizational elements in a timely manner, are referred to as UB. The establishment of UB may be necessary when project changes are authorized too late in an accounting month to be distributed in that month. The budget should be distributed to appropriate WBS or organizational elements and control accounts as quickly as possible. For authorized work that has not been negotiated, the project may maintain budgets in the UB account until negotiations have been concluded, allocating budget only to that work which will start in the interim. After negotiations, the remaining budget should be allocated appropriately. Undistributed Budget is usually distributed within two accounting periods. Undistributed Budget is not required. It is simply a type of budget with certain attributes.

Total Allocated Budget. And the Contract Budget Base

The total allocated budget should equal the target cost for the contract minus profit or fee. Contained within the total allocated budget is all scope authorized under the contract included negotiated and also unpriced efforts. The contract budget base (CBB) does not include profit or fees because progress and performance is never measured based on the amount of profit or fee earned because profit or fee are not used to perform work scope.

The total allocated budget (TAB) must always represent the contract budget base (CBB) (or an Over Target Baseline (OTB, if one has been implemented). The total allocated budget does not necessarily equal the total project cost. The total allocated budget is simply the budget allocated to the contract because there often is budget allocated to non-contract requirements such as payment in lieu of taxes. Refer to Figure 2 for a graphical representation of these relationships.

Unpriced efforts are part of the Contract Budget Base. These efforts may also be part of the Performance Measurement Baseline when budget has been assigned and work must begin, even when some of the work has yet to be definitized. Undefinitized contract actions are an example of work that is authorized but unpriced. Unpriced efforts can be distributed between Work Packages, Planning Packages and Undistributed Budget within the PMB. Work definition and budget allocation are the key discriminators for determining how unpriced efforts are accounted for in the PMB.

Over Target Baselines.

During the life of a project, situations may arise whereby available budgets for the remaining work are insufficient to reach the projects objectives. Under these circumstances, a requirement may exist for the total budget allocated to work to exceed the recognized Contract Budget Base (CBB). The resulting value is referred to as an Over-target Baseline (OTB). Establishment of an OTB may entail replanning future work, replanning in-process work, and/or adjusting variances (cost, schedule or both). This allows the project to increase the amount of budget for the remaining work to a more realistic amount to adequately provide for reasonable budget objectives, work control, and performance measurement.

A thorough analysis of contract status is necessary before the implementation of an OTB. The contractor should perform a detailed estimate of all costs necessary to complete the remaining effort. If the remaining budget is insufficient to accomplish the remaining work, the contractor will notify the appropriate parties of the need to increase the remaining budgets. It is imperative that the contractor consult with the federal managers prior to implementing an over target baseline. This consultation should include a discussion regarding project cost, schedule, funding and technical implications expected as a result of implementing the proposed OTB.

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When the project managers are satisfied that the new PMB represents a reasonable plan for completing the contract, the new PMB may become the basis for future performance measurement. However, establishing an OTB must be formally accomplished within the change control processes established for the program or project. In implementing an OTB, the changes to baseline budgets must be fully documented and traceable. If variances are adjusted, their cumulative values before adjustment will be retained to ensure traceability. OTBs or changes to OTBs should be limited to situations where it is needed to improve the quality of future cost and schedule performance management.

An OTB condition is not a change in the actual amount of work remaining, nor is it a change in the total cost of the project. An OTB is simply a PMB whose sum (BAC) exceeds the contract value. This situation could arise as a result of a replanning effort where additional effort is applied to the project at no cost in order to recover from a problem or variance.

Under Target Baselines

A requirement in many contracts is for the contractor to establish stretch goals for completing the work. These stretch goals are often heavily incentivized and attempt to focus the contractor on completing work ahead of schedule or perhaps with greater capability than originally planned. The contractor's response to these goals and incentives should be to develop a PMB that less than the negotiated contract cost to ensure that the goals can be met and the incentives for meeting the goals are earned. When a PMB is developed that represents a reasonable (though aggressive) plan, this PMB becomes the basis for performance measurement and variance analysis. When the contractor's performance against their plan indicates problems in either the plan or the performance, those problems do not disappear or become negated merely because the PMB is under the target cost. Consequently, variance analysis should always be conducted against the PMB that the contractor is managing to.

The difference between the target cost and the BAC may be considered management reserve if held by the contractor, or contingency if held by the government. In either case, variances in the actual PMB must be analyzed and not ignored. When reporting against an under target baseline, variance analysis should focus on the variance within the PMB. Because there is no validated PMB for the target cost, there is no purpose or point to analyzing variances for the target cost. That does not mean the contractor or the government ignores the target. Rather they must not mistakenly measure performance against a point that is not relevant for work being conducted. See Variance Analysis later in the guide for further information.

MANAGING MATERIAL.

This discussion expands on the application of performance measurement to material that is used in the development, fabrication or production work packages.

MATERIAL ITEM BUDGETS.

The control account budget should include all direct costs for the authorized work with separate identification of cost elements (labor, material, and other direct costs). Budgets should be based on defined and expected quantities of material items necessary to meet the requirements of the project. The bill of material for a project is normally the basis for establishing material budgets. Material control and budgets become an important consideration in EVMS when the required material comprises a significant portion of the project budget.

MATERIAL ITEMS WORK PACKAGES.

Establishing material work packages for developmental material and production material can differ significantly. In a developmental effort, most of the material is consumed by the development and

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engineering organization in the development and testing rather than the completion of an end item of equipment. For facilities, the material is consumed in the building process. For Information Technology, the hardware and software is consumed in the building a network. These work packages should be established within the same control account as the labor that will consume the material.

Planning packages should be established for development material when design work has not progressed sufficiently to permit adequate definition of the material required. The budgets for these planning packages should be substantiated and segregated in some manner in order to ensure that budget designated for material procurement is not inadvertently used for other requirements.

In a production environment, material work packages may be established in separate control accounts. These accounts are summarized into the appropriate WBS and organizational elements that are associated with the items being produced. The planning of production and material work packages can be flexible as long as the budgets accurately represents the manner in which material is planned to be received, accepted, issued, or consumed. Planning of material budgets for both development and production should be coincident with the occurrence of events that show physical progress.

MATERIAL EARNED VALUE METHODOLOGIES

There are various methods that may be used to “earn value” for material. There is no single correct method and multiple methods may be employed within a project. The following table provides some suggest approaches to material earned value. This is not all inclusive and other may be more suitable.

CATEGORY	DEFINITION	EV APPROACH
Material	Raw materials, piece parts, not complete and useable end items	Percent complete against total project purchase. Milestones by order
Complete and Useable End Items	Items which are standard, off-the-shelf and usually complete and useable without additional engineering, modification, or integration	Represented by milestones except when the process to acquire the items requires significant preparation, fabrication, or other non-routine production effort.
Cost Plus Subcontracts	Items defined, negotiated, procured and fabricated against a specification or drawing. Requires management.	Should use integrated cost and schedule reporting, similar to that employed by the prime, with consideration of the item cost.
Fixed Price Subcontract Fabrication	Items defined, negotiated, procured and fabricated against a specification or drawing. Requires management.	Percent complete or specific milestones. Should be tied to progress payments integrated with incremental deliveries if possible.

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MATERIAL ITEM ACCOUNTING.

Acceptable costing techniques should be used to fully account for all material purchased for the project. To ensure effective performance measurement of material takes place, the contractor's accounting system should have the following characteristics:

- An accurate cost accumulation system that assigns material cost to appropriate control accounts in a manner consistent with the budget. The cost accumulation system must be able to accommodate allocation of costs for bulk material purchases that are applicable to more than a single work package or project.
- Actual costs for material items should be reported in the same accounting period that earned value is taken for the material to facilitate management analysis.
- Where actual costs are not available in a timely manner, assign estimated costs to the material item and make adjustments when actuals are recorded in the accounting system. This may be done outside of the accounting system as long as the project is able to reconcile this value to the accounting system actuals.
- Account for all material and purchased parts in a manner appropriate to their value and significance. This includes material that is provided rather than purchased. See the following consideration.
- When material is contributed in lieu of budget, the agreed upon value of the material should be included the Total Authorized Budget, assigned to the appropriate work packages, and value earned. This ensures that the PMB represents the entire project and that all work, material and resources necessary to achieve the desired capability have been integrated into the PMB. Government furnished equipment and material falls into this category. If the government were to not provide this equipment or material, the contractor would be required to purchase the necessary material out of the Total Allocated Budget. Because government furnished material is routinely included in the contract it effectively become part of the Total Allocated Budget or resources allocated to the project. In considering whether to include or exclude government furnished equipment, services and material, you should refer to the Work Breakdown Structure to determine if the provided equipment, etc is significant within the project. Note that as defined by the Office of Management and Budget, government effort (where it can be defined as part of a work package or planning package) should be included in the performance measurement.

MATERIAL VARIANCES.

Budgets should be scheduled in accordance with project events and earned when a specific event occurs. To avoid distortion, actuals must be recorded when the budget is earned regardless of the timing, receipt, and processing of payments. For the program and project manager, who are concerned with progress and performance and the currency of this information outweighs the precision necessary in accounting. Analysis of variances for material accounts should focus on significant concerns. This may include usage incurred above or below the normal or exact quantities plus normal attrition amounts, as well as variances in the expected price of the material.

Material usage variance is an important cost factor on repetitive large volume, production-type jobs. Acceptable techniques for analyzing and determining current and projected usage variances provide continuing internal measurement when the value and nature of the material warrant. Material systems plan

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and track material usage. Purchasing material in excess of requirements is standard practice to allow for scrap, rejections, unanticipated quantities, differing yield rates, etc. is a practical necessity, and the project should maintain documentation of such decisions. The more uncertain the expected usage, the more important it is to have a good plan and to keep track of performance against it, particularly for project peculiar materials or materials, which require long procurement lead-times. The identification of excess usage that is expected to continue for future units is essential in validating project material quantities and requirements. Based on this analysis, appropriate action should be taken to ensure sufficient material is on hand/on order to complete contractual requirements.

On production contracts, the evaluation of material usage supports identification of material requirements necessary to maintain the production line at optimum capacity to meet requirements.

SUBCONTRACT MANAGEMENT.

This discussion concerns the application of performance measurement to subcontracted efforts. When the bulk of a program or project is subcontracted, the design and implementation of the EVM system must be carefully thought out to ensure that the system provides the intended benefits. The fact that a subcontract may be fixed price does not reduce or eliminate the requirement to manage effectively on both the part of the contractor and subcontractor. When the primary objective becomes the elimination of cost risk through the use of fixed price, mission requirements are often compromised. It is essential that the contractor remember that the subcontractor has a deliverable that is vital to capability being developed and while the cost risk may be the responsibility of the subcontractor, the performance risk remains with the prime contractor. This is true for the government when they award a fixed-price contract. Consequently, the design and implementation of the performance management system for subcontracts has as much importance as it does for the prime contract.

SUBCONTRACT MANAGEMENT ORGANIZATIONS.

When designating the internal organization responsible for managing subcontracted efforts, the prime contractor must assign a manager with sufficient authority and responsibility to be able to ensure the subcontractor will perform to the terms and conditions of the project. Regardless of the contractual arrangement with the subcontractor, the assigned control account manager should have all of the same responsibilities as other control account managers within the prime contractor's organization. In cases where there the subcontractor organization or personnel are integrated with the prime contractor organization, the control account manager function may be assigned to the subcontractor personnel.

SUBCONTRACT BUDGETS.

When a subcontract requires performance rather than merely delivery of end items, budgets are developed in alignment with the work package development for prime contract work. This involves identification of the subcontractor, the establishing the estimated value for the subcontract, and ultimately, negotiating the scope, schedule and budget. During this process, the prime contractor establishes a baseline for the effort at the control account level. Normally during negotiations, the PMB values (BCWS) will be based on the prime contractor's estimate for the work as opposed to the subcontractor's proposal values. Once negotiations are complete, budgets (BCWS) are normally adjusted to reflect the negotiated value of the subcontract. This is not considered closing a variance. The prime contractor's estimate is effectively a planning package. Prior to beginning work, the planning package must be definitized into a work package. That takes place during the acquisition process that results in the work being definitized, scheduled, priced or fixed through negotiation. When, a result of negotiation, the cost is different the assigned planning budget, the excess budget is shifted to Management Reserve or budget is applied from Management Reserve to ensure adequate budget is applied to the work package.

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SUBCONTRACT WORK PACKAGES.

Work packages should be established within subcontract control accounts to provide for separation of subcontract activities for performance measurement purposes. The prime contractor must be able to support the values established within each work package using either subcontractor supplied information or internal documentation. These work packages must be related to the plan established by the subcontractor to complete efforts on the subcontracted items.

SUBCONTRACT SCHEDULES.

Integrating the subcontractor schedule information into the prime contract schedule should be accomplished so that it accurately depicts the impact of the subcontractor performance on the project schedules. That is, the subcontract schedule information must be at a level of detail that provides adequate actual progress information not merely contractual compliance.

SUBCONTRACT ACTUALS COLLECTION AND REPORTING.

The prime contractor's accounting systems should provide accurate cost accumulation, which assigns subcontract costs to appropriate control accounts in a manner consistent with the budget. Actual costs for subcontract items should be reported in the same accounting period that earned value is taken. Where actual costs are not available in a timely manner, assign estimated subcontract costs, which will be adjusted when actuals are recorded and reconcile the account when actual data becomes available. The accounting system should also have the ability to account for all subcontracted items.

SUBCONTRACTOR PERFORMANCE ANALYSIS.

Procedures established by the prime contractor for measuring the performance of the subcontractor must consider

- A process whereby the prime contractor evaluates the management processes established by the subcontractor to perform the cost, schedule and technical requirements of the subcontract when earned value reporting is required.
- The requirement to review the subcontractor's performance report for accuracy and adequacy. This includes an analysis of the performance measurement information contained in the data formats of the report, an evaluation of the variance analysis information contained in the report, and an evaluation of management reserve usage, baseline changes and manpower changes.
- The capability to incorporate the subcontractor's management information, including analysis of significant variances, into the information submitted to the customer.

During the time period between subcontract authorization to proceed and definitization, the prime contractor must make provisions to perform the above actions based on best available information.

SUBCONTRACT ESTIMATES AT COMPLETIONS.

The procedures relative to subcontract EACs should focus on two aspects. First, the requirement that the subcontractor will generate an EAC as necessary to support program requirements and reporting to the customer and second, the responsibility of the prime contractor to evaluate the subcontractor's EAC for adequacy and accuracy. When a variance indicates an overrun condition, it should not be ignored merely because the subcontract is fixed price. Regardless of the contract type, when a variance exists it indicates that

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the work will not be completed as planned and that some action on the part of the contractor or subcontractor will be necessary to recover either cost or schedule. For example, if the subcontractor commits to completing the work at no additional cost, then the required value will be earned (BCWP) (EV) with no subsequent increase in actual cost (ACWP). Of course, if the contractor claims that the variance is the result of a change on the part of the customer, then a change order may be necessary.

CHANGE ORDERS.

Subcontracts are often fixed price contracts because the work and deliverables are usually specific, well defined, and easily quantifiable. For many projects, change orders are anticipated as a consequence of a lack of definition in the beginning of the subcontract effort. Differing site conditions and other events are often anticipated, expected or planned. When specific change orders are expected they should be allocated to the Excessive change orders may be an indication that the work was not well defined or that the requirements were not well understood. Both may be cause for review.

When a subcontractor is required to provide an external performance measurement report, subcontractor data will be provided to the prime contractor for performance measurement purposes. If a subcontractor is not required to provide earned value information to the prime, the prime contractor should establish procedures that provides accurate and reliable schedule and technical plans and progress reports as needed for overall project management.

ACCOUNTING CONSIDERATIONS.

The accounting system structure is defined by the contractor's internal process descriptions and operating procedures. Similar information is available in the contractor's Cost Accounting Standards Disclosure Statement when the nature of their contract requires compliance with the Cost Accounting Standards. The intent of this discussion is to ensure there is a timely and accurate transfer of actual cost information from the accounting system into the Earned Value Management System.

ACCRUALS.

The accounting system must be capable of accounting for all resource expenditures on an accrual basis (as-used or as-consumed). Actual costs for direct labor, whose time is routinely recorded daily or weekly, is readily available in most company accounting systems. Other direct charges for services, which are rendered or consumed on a per unit basis, can also, be readily measured. There is considerable variation in accounting for material cost and consumption. This lack of uniformity may cause difficulty in accounting for material as it is used. Where a company has a policy on accounting for material, this policy should be consistently applied to the project or program. Where no company policy exists, the contractor should define the methodology to be used in the project and ensure that is it applied consistently. In most cases, material should earn value and accrue cost as it is consumed. This may require estimating the actual costs because actual consumption most often is not the basis for invoicing and payment transactions. The system must also account for and properly allocate indirect and apportioned effort costs.

WORK BREAKDOWN STRUCTURE SUMMARIZATION.

Allowable costs collected within the control account by element of expense must summarize from the control account level through the WBS to the top level without being allocated to two or more higher-level elements. When it is necessary to allocate control account costs to more than a single higher WBS element, it is indicative of an inadequate WBS. A carefully developed WBS and a corresponding cost collection structure should prevent any single element's data from being summarized to multiple higher-level elements. This does

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not preclude the allocation of costs from a control account, which acquires common items or provides common services to the appropriate control accounts in order to make valid comparisons to the plans and budgets.

ORGANIZATION BREAKDOWN STRUCTURE SUMMARIZATION.

As costs are summarized within the WBS structure they are also summarized within the Organization Breakdown Structure. The data summarization begins at the control account through the project structure to the highest-level organizational element without costs being allocated to two or more higher-level elements. This does not preclude the allocation of costs from a control account acquiring common items or services to the appropriate control accounts. A carefully developed project organization and cost collection structure will ensure accurate data summarization.

UNIT COSTS.

The contractor may be required to account for the production of material items in a manner that allows development of unit costs, equivalent unit costs, or lot costs. This is normally a requirement of contracts where multiple units are being produced or used in a manufacturing, processing, production or production-like environment. Unit control accounts may be found in isotope production or vitrification production where glass logs are produced. Unit control accounts are also found in construction where large quantities of material are procured in bulk for multiple work packages. There are also acceptable alternatives to unit cost for specific circumstances unique to the production environment. When production effort occurs on an accelerated assembly line basis, it may not be practical to determine the cost of individual units. In such situations, it is sufficient to accumulate lot costs, where a lot is an aggregate of a specified and consistent number of units.

When material control accounts are employed for bulk ordered or planned material that is used in multiple work packages, unit rates must be consistently applied across all work packages. Additionally, unit rate changes should be equally applied across the all users of the material in a project. However, unit rate changes for large complex projects could cause excessive revisions of performance data when the unit deliveries are too far in the past. A method for accommodating unit rate changes which would mitigate the effect of unit rate changes over a long period of time may be to employ lots (aggregating units) and assign unit rate changes by lots. Again, regardless of the method employed, it should be consistently applied by the company.

ACTUAL COSTS FOR VARIANCE ANALYSIS.

It is essential that all actual costs used for variance analysis come directly from, or be reconcilable with, the accounting system. In some cases, it may be necessary to use estimated actuals to avoid artificial variances, which might be created by the time lag of costs being recognized by the accounting system. This is especially true when the lag time for acquiring actual cost data is significant. This may often be the case when other large institutions are involved in an effort and their accounting process result in a lag of one or more accounting cycles before actuals are available. This condition may be exacerbated when there are multiple partners in an effort. When the actual data becomes available it must be reconciled with the estimated actuals and corrections made to ensure that the Earned Value information remains accurate and reliable. The use of estimated actuals should be minimized but should be employed where necessary to ensure the most current information is being used in managing the effort. If a project has excessive cases where estimated actuals are required, the accounting processes should be re-examined to ensure that they are engineered properly and are capable of performing the intended function.

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RETROACTIVE CHANGES TO ACTUAL COSTS.

Retroactive adjustments to costs should only be made for routine accounting adjustments or for correction of errors such as in the case of estimated actuals. Any direct or indirect cost adjustments must be made in a timely manner in accordance with Generally Accepted Accounting Principles (GAAP). Adjustments to the plan should only be accomplished for future work. All budgeted cost of work scheduled, which has already been completed must remain as first established. That is, history cannot be modified. All future budgeted cost of work scheduled may be replanned. Modifying planned work (BCWS) in order to reconcile the plan with the Earned Value or actual cost is incorrect.

INDIRECT COST MANAGEMENT.

Indirect costs are expenses, which often benefit more than a single program or project. The accounting process should record all allocable indirect costs consistent with the provisions of the contractor's disclosure statement. The contractor's procedures and EVMS description should specify the level at which indirect cost information will be allocated to individual contracts and individual projects and programs. The description should also specify the methodology for rate determination and the actual indirect rates.

The most current information should be used in preparing indirect rates, including historic experience, contemplated management improvements, projected economic escalation, and anticipated business volume. The use of these rates to generate indirect cost estimates will ensure a valid projection of project costs. Comparing indirect budgets to estimates of final indirect costs will reveal where significant differences occur. These variances must be analyzed to determine the causes and appropriate corrective actions.

Since indirect costs are normally handled in organizations that are not project peculiar, there should be some method for assigning the appropriate values for indirect budgets and actuals to all affected projects. The contractor establishes an indirect budgeting process that includes the formal assignment of duties and limits of responsibility, a description of the indirect system, and policies and procedures applicable to the establishment and control of indirect costs. Assignment and control of the indirect resources must be clearly defined and should be commensurate with the authority to approve or to avoid the expenditure of resources.

Realistic time-phased budgets and forecasts for indirect costs must be established by organization. The contractor should apply the most appropriate indirect rates so that a valid PMB can be established. Indirect budgets should be reviewed at least annually or when major changes are identified in factors affecting indirect costs. These budgets must be included in the PMB (control account budgets, Summary Level Planning Packages (SLPP) budgets, or Undistributed Budget (UB)). When assigning these budgets an average is often used to spread the indirects equally across the applicable control accounts. Care must be taken to ensure that indirects are not burdened for those work packages that do not employ the services represented by the indirect budget. Indirects must not be spread equally merely because it is convenient. Just as in Level of Effort work, indirect costs can distort Earned Value data and should be subtracted out from the reported performance measures when analysis has shown that distortion occurs.

The contractor establishes controls to ensure actual indirect costs are compared to indirect budgets and this information should be shared with all affected programs. Specific control procedures should be implemented to ensure variances are identified, reported, and addressed by the appropriate level of management. Such controls increase the likelihood that potentially significant variances are communicated and considered in the development of the project Estimate At Completion (EAC). Because indirect costs are overhead, variances may indicate accruing debt to the project or excessive indirect allocations to the contract or project.

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COST ACCOUNTING STANDARDS CONSIDERATIONS FOR EARNED VALUE MANAGEMENT

Accounting is a key element in all Earned Value Management Systems. At its most basic level, accounting provides the information necessary to determine actual versus planned cost. Accounting provides the capability to accumulate costs at the control account level, allocate indirect costs, and account for material among other functions. Consequently, cost accounting practices are a consideration when implementing EVMS and evaluating conformance with the standard. Public Law 100-679 (41 U.S.C. 422) requires certain government contractors and subcontractors to comply with Cost Accounting Standards (CAS) that are promulgated by the Cost Accounting Standards Board (CASB). Note that compliance with the Cost Accounting Standards does not depend on a requirement to implement EVMS and the costs of complying with the CAS cannot be attributed to an EVMS requirement.

Certain contracts and subcontract types are exempt from Cost Accounting Standards such as contracts and subcontracts with foreign governments. Exemptions may present a challenge when implementing EVMS. However, there are methods of structuring the system without creating a burden where there would otherwise be none. Negotiated contracts not exempt may be subject to full, modified or other types of CAS coverage.

When a contractor or supplier is not required to comply with Cost Accounting Standards, the application of Earned Value Management requires consideration of the guidelines in context of the availability of actual data. Work must still be apportioned and values must still be assigned to the work and an understanding of the resources necessary to execute the work is required to be able to develop a coherent integrated schedule. Suppliers must still develop an integrated schedule based on the required sequence of work and their associated interdependencies. This schedule and its defined values must also be related to the government Work Breakdown Structure. If the government Work Breakdown Structure defines a product being developed (not the project activities), then the relationships between the WBS, the schedule and values assigned permit the measuring of progress and performance.

ANALYSIS, REPORTING AND MANAGEMENT

Reporting is the mechanism employed to communicate Earned Value information to managers. Analysis is activity performed by managers to understand, evaluate and assess the project and its performance and progress. Management action should be an outcome of the analysis function. As corrective actions are implemented, their impact is reflected in performance causing a resultant change in the cost and schedule. This in turn causes a change in the data set, which is then analyzed and acted upon. This feedback and control loop continues throughout the life of the project.

VARIANCE ANALYSIS.

In every project and program the PMB represents the agreed to execution plan for the project or program. The team's objective is to execute the plan precisely as defined in PMB. Because neither the plan (PMB) nor the execution will be perfect, variances will develop. The objective therefore, is not to prevent variances, rather it is to expect them and act on them when they do appear. Analysis of the variances begins at the control account level of the Contract Work Breakdown Structure and continues to lower levels until all the impacts understood and can be acted upon. Variance analysis focuses on three key areas in which to gain insight.

- Cause and effect - How and why did the variance happen?
- Consequence - What is the impact to this control account, work packages and summary WBS elements, other controls accounts and their respective WBS elements?

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- Correction - Is it possible to recover? What is the recovery mechanism? Do other control accounts have to be dealt with to mitigate the impact? If it is not possible to recover and get back on plan, what must be done to replan the effort?

While an overall (summary) analysis may be adequate when variances are insignificant, detailed analysis must be performed for all significant variances at the Control Account level. How do you know when a variance is significant? When it exceeds a threshold that must be reported to higher authority or an external organization or when it has an impact on another WBS or other control accounts. The cascading effects of a variance must be resolved expeditiously to avoid multiplying the effect a variance.

Schedule Variance (SV).

Comparing the value of work completed (Budget Cost of Work Performed) (Earned Value) to the value of work scheduled (Budgeted Cost of Work Scheduled) during a given period of time provides a valuable indication of progress in dollars worth of work accomplished. This variance does not clearly indicate whether or not scheduled milestones are being met since some work may have been performed out of sequence or ahead of schedule. Schedule variance also does not indicate whether a completed activity is a critical event or if delays in an activity's completion will affect the completion date of the contract. Therefore, a formal time-phased scheduling system is used to provide the means of determining the status of specific activities, milestones, and critical events.

Translating Schedule Variance To Time.

A schedule variance does not translate to an absolute value of time behind schedule because the planned work (BCWS) normally is not a constant from month to month. There are methods that provide managers with the ability to arrive at an approximation of the delay. The most common method is to divide the schedule variance (SV) by the average monthly budgeted cost of work scheduled (BCWS). This is only an approximation because recovering the schedule may require different methods or working arrangements to perform both the work that is behind as well as the current and future work. Because of the inherent inaccuracy in calculation using averages, schedule variance should be treated as a performance indicator rather than a multiplier or divisor. To determine the amount of schedule to recover from a variance, the work must be replanned. Scheduling the work is part of the replanning process and not a result of calculations. A schedule variance may also be written as an index that is effectively a performance index. Managers should not expect a project to sustain performance efficiency greater than recent experience in order to recover schedule. That is, if an organization is working at less than 1.0 efficiency a variance will result. To eliminate the variance, the organization must now work greater than 100% efficiency for the period of time necessary to do the work that is behind schedule, as well as performing the current work, on schedule. Organizations that propose to work for extended periods of time at efficiencies greater than their recent history, should examine the underlying assumptions that lead them to assert that they will work to that level.

Cost Variance.

Comparison of the cost of completed work (Actual Cost of Work Performed) with the value planned for that work (BCWP or Earned Value) provides a cost variance. Analysis of this difference reveals the factors contributing to the variances. Examples include poor initial estimate for the task, technology issues that required additional resources, the cost of labor or materials different than planned, differences between planned and actual rates, and personnel efficiency different than planned.

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Variance at Completion.

Comparisons of the total budget with the Estimate At Completion (EAC) at the control account level provide a variance expected at the completion (Variance At Completion) of the control account. Authority and responsibility for corrective action should exist at the control account level, within the bounds of the total budget for that specific control account.

REQUIRED ANALYSIS.

Analysis of these variances is required at the control account level. Budgeting, measuring performance, and collecting costs by element of cost facilitates reporting and analysis of the reasons for significant variances in both the progress reviews and in the narrative portion of the external performance measurement variance analysis report. The analysis provides the stimulus for management action. Significant variances are those that if not understood and mitigated would keep the project from returning to the plan. Thresholds should be carefully established by the various levels in the organization, with lower level organizations setting thresholds that are more stringent than higher threshold. Reasonable thresholds should be defined to ensure proper analysis of all significant problems and not cause an excessive burden on the control account and mid-level managers. Other project data should be employed to support the analysis.

TECHNICAL PROGRESS.

Because technical issues often cause unfavorable cost or schedule conditions, technical performance status should be presented in quantifiable terms, when possible, in narrative reports. The adequacy and quality of the work performed is assessed through inspections, tests, or other types of technical measurements. When the results are satisfactory, no corrective action is required. If deficiencies are found, consider alternatives for corrective action; for example, redesign, scrap and remake, rework, etc. When considering these alternatives, the impact on cost and schedule must be weighed in addition to the technical considerations. After an alternative is selected, it may become necessary to plan the additional work in terms of new work packages or additions to existing unopened work packages and to change the schedules affected. In some cases the project manager may choose to provide additional budget to the responsible organization. Thus, there is a close relationship between technical achievement and its impact on cost and schedule.

SUMMARIZE PERFORMANCE DATA FOR MANAGEMENT EVALUATION.

Performance measurement information should be summarized directly at the control account or below to provide both project status and organizational performance at all levels of management. This process supports an overall capability for managers to analyze available information and identify problem areas in sufficient time to take action. Because favorable variances in some areas are offset by unfavorable variances in other areas, senior managers would normally see only the most significant variances at their level. The accumulation of many small variances that may add up to a large overall cost problem not attributable to any single major difficulty will also be evident. Summarization is not meant to mask significant variances, which must always be identified to senior management.

EFFECTIVE MANAGEMENT ACTION AS A RESULT OF ANALYSIS.

Performance measurement is only one of the management tools available to project managers. Many major problems are disclosed through methods other than monthly performance measurement reports. The project's internal reports and the reports forwarded to their customer, however, should indicate the overall cost and schedule impacts of such problems on the project. Because of this, the data produced by the earned value management system must be available to managers on a timely basis and must be of sufficient quality to ensure that effective management decisions can be made as a result of its analysis. Procedures should exist to

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monitor decisions to the point of resolution including the impact on risk management plans and other program plans.

PERIODIC ESTIMATES AT COMPLETION.

Periodically develop a comprehensive Estimate At Completion at the control account level using all available information to arrive at the best possible estimate. All of the following should be employed to derive the Estimate At Completion.

- A. Evaluating the efficiency achieved by performing organizations for completed work and comparing it to remaining budgets
- B. Establishing a schedule forecast that reflects the expected time-frame for completing the remaining work
- C. Considering all remaining risk areas on the project versus cost avoidance possibilities
- D. Ensuring the most current direct and indirect rate structure is used to value the projected resources
- E. Applying this analysis to future efforts to derive the most accurate estimate.

Comparisons of this estimate to the budgets authorized for the associated effort must be made frequently enough for management to ensure project performance and resource availability will not be adversely impacted. Monthly maintenance of the Control Account level EAC by the control account manager ensures that the EAC continuously reflects a valid projection of project costs. Applying the current cost performance factor to the remaining work has been shown to provide the more accurate results than other methods because performance is not likely to improve significantly for the remaining work. However, the formulas employed must be chosen because they best represent the project. Developing estimates at completion should involve multiple methods. No single method consistently provides the “best answer.” Some of the more common formulas for EACs are presented in the appendices.

REVISIONS AND DATA MAINTENANCE

Changes in major projects are inevitable. This discussion addresses the controlled process whereby projects incorporate formal changes, conduct internal replanning, and adjust past, present and future information to accommodate changes. Close control must be exercised to minimize changes to prior periods. The only acceptable retroactive changes are those that correct errors, make routine accounting adjustments, or improve the accuracy of the performance measurement data and all such changes must be documented, justified, and explained. The primary reason for this prohibition is to avoid a moving or “rubber” baseline. The only measures that provide the essential performance measures that can be used to take action by managers is that which is compared to fixed point – a set baseline. When the so-called fixed point is constantly moving, no measures based on this moving point have any validity.

CHANGE CONTROL

The change control process must be able to accommodate both the routine changes and changes of more significant impact. The Contract Budget Base, established based on the agreed-to value of authorized work, must be strictly controlled in order to maintain a valid basis for project performance. Changes to the CBB may only be made as a result of contractual changes. Procedures should ensure controls are in place to

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prevent inadvertent implementation of a baseline in excess of contract value. When contracts with broad responsibilities are in place, the CBB is established through development of work authorizations and contract modifications. While contractual changes may not be consistently employed, agreements must be established through some mechanism to delineate the CBB.

DIRECTED CHANGES.

Directed changes are changes that are “directed” by the customer to the scope, schedule or budget. Directed Changes are most often the result of budgetary pressures causing a project to stretch out, impacting both cost and schedule. Directed changes to the project will impact virtually all aspects of the internal planning and control system, including organization structures, work authorizations, budgets, schedules, and EACs. The incorporation of authorized changes should be made in a timely manner and strictly controlled. This will ensure the PMB can be accurately maintained. When directed change is a result of changes in the requirements, the impact is often much greater in that work packages not yet started may have to be reaccomplished and new work packages may be required to execute the rework or new work that is caused by the requirement change.

TRACEABILITY OF CHANGES

It is absolutely paramount to maintain the validity of the PMB. Without discipline the meaningfulness of the performance measures is significantly reduced and even eliminated. This discipline must be applied, throughout the organization, particularly in controlling the budget. Internal procedures should ensure:

- Budgets are assigned to specific segments of work.
- Work responsibility should not be transferred without transferring the associated budget.
- A budget assigned to a future specific task should not be used to perform another task.
- When management reserve is used, records should clearly indicate when and where it is applied.
- When undistributed budgets exist, records should clearly identify their amount, purpose, and to which efforts budgets are issued.
- Budgets that are assigned to work packages should not be changed once effort is started unless the scope of work is affected by contractual change or project internal adjustments that enhance management of the effort.
- Retroactive changes to budgets or costs for completed work or to schedules are not made except for correction of errors, normal accounting adjustments, revisions to budgets to reflect the formal negotiated value of completed tasks, or to improve the integrity and accuracy of the baseline.

The original budget established for the project should constitute a traceable basis against which project growth can be measured. The starting point or base on which these original budgets are built is the project’s target cost. This value increases or decreases only as a result of authorized changes. The target cost may not necessarily represent the entire appropriated budget for the project, but the target cost for a specific contract.

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For definitized changes, the target cost changes by the negotiated amount. For authorized unpriced work that has not been negotiated, the estimated amount is the target cost plus the authorized unpriced work. Where a specified Not-to-Exceed (NTE) amount has been established, the target cost will only increase by this amount unless both parties mutually agree to a different amount for performance measurement purposes. After negotiations, the target cost is adjusted to reflect the negotiation results. Adequate records of all changes should be maintained to provide the basis for reconciliation back to the original budgets assigned during the baselining process.

PERFORMANCE MEASUREMENT BASELINE STABILITY (RUBBER BASELINE)

Plans, which articulate the original baseline, will always be influenced by changes in budget as well requirements. It will be necessary realign scope, schedule, or budget to accommodate these changes. Some examples of appropriate replanning (i.e., within the project target cost or approved total allocated budget) include:

- Changes resulting from a design reviews that modify requirements;
- A major shift to the resource profile to accomplish the remaining effort;
- Funding restrictions or modifications that affect future resource availability;
- Rate changes (including overhead rates), which are significant enough to warrant replanning.

Where the origin of rate changes is ambiguous and cannot be accurately traced to analysis and computations which validate the rate changes, the organization responsible for determining overhead and indirect rates should be required to demonstrate the validity of those rates before they are incorporate into the PMB.

Replanning is intended for in-scope changes to future budgets. The objective of replanning is to reflect a revised project plan. Changes to near term effort (scheduled to start in the next accounting period) must be minimized. When the objective of replanning becomes the elimination of variances or to attain a specific index, the EVMS has lost its value for objective performance measurement. A rubber baseline can exist even in an EVMS that complies with the standard when the DOE directs or allows the contractor to make changes that result in the loss of information and credible performance information. An EVMS that exhibits evidence of a rubber baseline will lose its status as a compliant system. Excessive replanning is evidence of inadequate initial planning. This is often a symptom of projects where planning packages are masquerading as work packages. A constantly shifting PMB is also evidence of inadequate baseline definition at the work package level during planning. Extreme care must be taken that work packages are adequately definitized. Measuring progress against a package that has no detail is not only incorrect, but also pointless.

SINGLE POINT ADJUSTMENTS.

A Single Point Adjustment (SPA) (also known as Point Adjustment) is the elimination of cumulative variances at the control account or work package level. The single purpose of an SPA is to improve the value of the performance information generated by the system. The usual cause for an SPA is the current plan against which performance is measured is no longer valid and a new plan is either required or essentially in effect. A new plan can be essentially in effect when the original plan is no longer realistic and the work is continuing to be accomplished. Regardless of whether this is due to performance against plan thus far or because conditions have changed which cause the plan to no longer be realistic, it remains that all work must be planned and the plans must be realistic. The obvious risk of working without a plan is the loss of

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management insight and control over the work. Large cumulative variances can also inhibit effective insight into recent performance. However, SPA's are not routine and are not to be accomplished to simply to improve performance measures. Improving the performance measures is merely a side effect of the need to develop an executable plan and gain better insight.

The two conditions, which must be present to consider performing adjustments.

COST AND/OR SCHEDULE CANNOT BE RECOVERED.

and

THE VARIANCE IS SO GREAT THAT MANAGEMENT INSIGHT IS INHIBITED.

Point adjusts can eliminate schedule variance or both cost and schedule variance. The elimination of the schedule variance may be done to move budget, which has not been earned, to a new work package during replanning. When a point adjust is performed on the schedule variance, the cost variance is retained. The net result is that the plan for the work is now realistic and can be executed, but the cost performance information is retained. Elimination of both cost and schedule variances is allowed when existing variances are very large and inhibit management efforts to effectively use EVM information to manage the project.

Point adjustments are accomplished at the Control Account level, NOT at the CWBS Level 1 or the PWBS Level 1. A single point adjustment is generally performed as follows:

1. Close the work package(s) and control account(s) with variances
2. To eliminate the schedule variance only: Set the BCWS equal to the BCWP
3. To eliminate both schedule and cost variances: Set BCWS and BCWP equal to the ACWP.
4. Transfer the remaining work (and budget if any) to a new work package and plan the work package. Management reserve budget can be used to replan the remaining work.

Note: The changes at the work package level must be tracked from the original plan to the latest revised plan.

The following table provides some context for the process of accomplishing a point adjustment and the consequences that result from it. Note that consequences included the loss of information on performance and progress. When routine point adjustments are performed, at the project's end it would appear that the project performed flawlessly. Valuable information for future projects of the same type will have been lost. The potential for using the performance information to create more accurate cost and schedule estimates will be erased.

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Variance Type	Management Action	Result	Impact on Overall PMB and EV Metrics
Schedule (Recoverable)	Reflect recovery plan in the current schedule and continue to measure EV performance against the existing PMB.	Schedule variance decreases to zero as recovery proceeds. Cost remains within original PMB.	Overall schedule performance improves.
Schedule (Non-recoverable)	Close non-recoverable work package. Open new work package and plan remaining work. Add sufficient budget from MR to execute the work if required. (If MR does not exist or insufficient, the agency must resolve)	Schedule variance is zeroed (BCWS is set equal to BCWP). Cost variance for closed work package is retained. Cost variance for the new work package is indeterminate (depends on performance).	BAC may increase. Overall schedule variance is reduced. Overall cost variance remains (and could be increased or reduced depending on performance under new work package). Results in false indication of schedule improvement.
Cost (Recoverable)	Replan to recover within current PMB cost and schedule. Revise the ETC to reflect that future actual costs are less than or equal to the budgeted cost of the remaining work.	Cost variance decreases to zero as recovery proceeds. Schedule remains within existing PMB.	Overall cost performance improves.
Cost (Non-recoverable)	Cost non-recoverable work package. Open new work package and plan with remaining work and budget. Add sufficient budget from MR to execute the work. (If MR does not exist or insufficient, the agency must resolve)	Schedule and cost variance are zeroed (BCWS is set equal to ACWP, BCWP is set equal to ACWP)	BAC increases. Overall cost and schedule variance is reduced. Results in false indication of cost performance improvement.

Table 3 - Impact of PMB Adjustments

It is often difficult to accomplish a point adjustment within a single accounting period. Typical SPAs will usually take two accounting period to complete. During this period, the data from the affected control accounts (and WBS levels of which the affected control accounts are components) will be invalid. Adequate time must be allowed for the adjustment process to be completed.

Why allow point adjustments when the negative effects would suggest that it is not a wise action to take? Because point adjusts are sometimes necessary and can improve the performance information. However, point adjusts must be accomplished in a thoughtful, controlled manner with full appreciation that the act will degrade the utility and validity of the performance information.

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CONTROL ACCOUNT REPLANNING

Replanning of work packages within control accounts is sometimes necessary to compensate for internal conditions that affect the planning and scheduling of remaining work. Such replanning should be accomplished within the constraints of the previously established control account schedule and budget. When more extensive replanning of future work is necessary and the total control account budget must be changed, management reserve may be used to increase or decrease the control account budgets. If replanning requires that work and associated budget be transferred between control accounts, this transfer must also be controlled. Work that has already taken place cannot be replanned. This is true regardless of whether the work package remains open or is closed. Only future work can be replanned.

Replanning actions designed to reduce costs, improve or reflect improved efficiency of operations, or otherwise enhance the completion of the project, are encouraged. Internal replanning may involve changes to work-in-process. The replanning of open work packages or Level of Effort should be accomplished in such a way to maintain valid performance measurement information while minimizing the administrative burden. Except for correction of errors and accounting adjustments, no retroactive changes will be made to budgets for completed work even when the work package remains open because work still remains to be accomplished.

PRODUCTION WORK PACKAGE REPLANNING

A certain amount of rescheduling of open production work packages is appropriate and acceptable providing procedures exist which prevent the inadvertent invalidation of baseline schedules and budgets. The substance of such procedures should be to limit the range of rescheduling so as to maintain consistency with key production schedule dates. Key production schedule dates define the required completion dates for key elements of the manufacturing plan and are normally found on internal production schedules.

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APPENDIX A

SAMPLE CONTRACTOR'S SYSTEM DESCRIPTION DOCUMENT

The EVM System Description provides a description of the system and the contractor's comprehensive plan for meeting the guidelines in ANSI/EIA 748-1998.

The EVM System Description provides an understanding of each activity required to meet the EVMS standard. The document should briefly, but comprehensively, present the contractor's approach and schedule of internal activities to demonstrating that the system meets the guidelines in the standard. The description should include the contractor's plan for implementation of and activities leading up to a demonstration review by DCMA. Contractor format is acceptable. Changes should be incorporated by change page or complete reissue.

Because system descriptions encompass information on internal company processes, the descriptions are usually not released for general public use. The following is an outline that has been used by a large government contractor with mature processes in place. This format or any other format may be employed. There is no preferred format or content list.

TABLE OF CONTENTS

1. Executive Summary
2. Proposal preparation
3. Organizing for Program Management.
 - a. Establishing the Work Breakdown Structure.
 - b. Assigning program organizational responsibility.
 - c. Identifying/Distributing the Scope of Work.
 - d. Integrating subsidiary processes.
 - e. Modify the program for major changes.
4. Establishing and Maintaining an Integrated Schedule for Program Management.
 - a. Identifying Master Schedule contents/requirements.
 - b. Integrating schedules with the WBS and company control systems.
 - c. Structuring schedules for progress status and forecasting.
 - d. Adjusting schedules for program changes.
5. Authorizing Program Work Scope, Schedule, and Resources.
 - a. Authorizing scope and resources to the working level.
 - b. Scheduling resources in the control account.
 - c. Providing schedule and resources for future effort.
 - d. Establishing objective measures of work progress.
 - e. Maintaining control of the performance measurement baseline.
6. Interfacing the PMCS with Actual Cost Processes.
 - a. Ensuring that actual costs are comparable to program budgets.
 - b. Establishing a cost collection structure to support management requirements.
 - c. Providing appropriate allocation of indirect costs to programs.

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7. Managing using Program Performance Information.
 - a. Providing performance and cost variances for program analysis.
 - b. Preparing summarized information for management evaluation.
 - c. Determining and implementing appropriate corrective actions.
 - d. Evaluating and updating estimates of program costs.

8. Incorporating Approved Changes to Program Information.
 - a. Ensuring documentation reflects the impact of scope, schedule, and resource changes.
 - b. Maintaining correlation to approved program values.
 - c. Establishing procedures for baseline values in excess of program cost.

9. Managing Program Material And Subcontracted Items.
 - a. Identifying all material and subcontract items required to execute the SOW.
 - b. Scheduling material requirements.
 - c. Establishing budget values for procured items.
 - d. Ensuring accounting system interface supports program management needs.
 - e. Providing performance and cost variances for program analysis.
 - f. Preparing summarized information for management evaluation.
 - g. Determining and implementing appropriate corrective actions.
 - h. Evaluating and updating estimates of program costs for material and subcontracts.

10. PMCS Maintenance.
 - a. Implementation Responsibilities.
 - b. Continuing Surveillance.
 - c. PMCS Training.
 - d. Subcontractor Surveillance.
 - e. PMCS Improvement Initiatives and Implementation.

APPENDICES

11. Compliance Matrix
12. Acronyms and Definitions
13. Mandatory Directives

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APPENDIX B TYPICAL DOCUMENTATION USED IN EVMS CERTIFICATION REVIEWS

This list is not intended to be a minimum or maximum list. It is merely typical. Other documentation can and does serve similar purposes. Many times the documentation may be combined into a program or project plan. This list merely serves as a starting point for the contractor and the review team to consider what is relevant.

These 3 documents are the typically provided in initial stages of planning for a compliance review

- 32 Guidelines cross reference to EVMS description (compliance map)
- Dollarized Responsibility Assignment Matrix (Dollarized RAM)
- System Description or EV procedures/regulations

The following are typically provided during the final stages of the planning for the review.

- Contract and changes/modifications
- Data Item Descriptions (DID)
- Cost Performance Reports (CPR)
- Contract Data Requirements List (CDRL)
- Contract Funds Status Report (CFSR)

- Control Account Manager Notebooks
- Organizational Chart & Organizational Breakdown Structure
- Contract Work Breakdown Structure (CWBS)
- CWBS Dictionary
- Control Account Plans (specify)
- Program Schedules
- Variance Analysis Reports (specify)
- Variance Analysis Corrective Action Log
- Management Reserve Log
- Undistributed Budget Log
- Baseline Change Log
- Estimates At Completion Procedures and Supporting Document
- Bill of Materials
- Material Requirement Reports
- Overhead Budget Policies and Procedures
- Indirect Cost Pool Listing
- Charge Number Structure Explanation
- Rate Tables, Rationale for Projected Rates
- Accounting Manual
- Disclosure Statement
- Copies of any DCAA, IG or other Audit Reports
- List of Subcontractors
- Subcontractor Scope of Work
- Subcontractor Program Schedule
- Subcontractor Control Account Plans
- Subcontractor EAC Procedures and Supporting Document
- Other Supplier Internal EV Reports
- Cost Accounting Standards Disclosure Statement

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APPENDIX C COMPLIANCE MAP TEMPLATE

This template is a tool that contractors may employ in assessing the implementation of EVMS. The value of the template lies in identification of gaps in the system. The template is not intended to determine whether the policies and procedures comply with the standard, only that they exist. Compliance with the standard requires further assessment (review).

ANSI/EIA-748-A Guidelines	Implementing Policies & Procedures	Applicable Sections
ORGANIZATION		
Guideline 1: Define the authorized work elements for the program. A Work Breakdown Structure (WBS), tailored for effective internal management control, is commonly used in this process.		
Guideline 2: 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.		
Guideline 3: 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.		
Guideline 4: Identify the company organization or function responsible for controlling overhead (indirect costs).		
Guideline 5: 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.		

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PLANNING & BUDGETING		
Guideline 6: 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.		
Guideline 7: Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.		
Guideline 8: 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.		
Guideline 9: Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.		
Guideline 10: 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.		
Guideline 11: Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account		

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budget.		
Guideline 12: 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.		
Guideline 13: 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.		
Guideline 14: Identify management reserves and undistributed budget.		
Guideline 15: Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.		

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ACCOUNTING CONSIDERATIONS		
Guideline 16: Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.		
Guideline 17: <i>(When a work breakdown structure is used)</i> 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.		
Guideline 18: 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.		
Guideline 19: Record all indirect costs, which will be allocated to the contract.		
Guideline 21: For EVMS, the material accounting system will provide for: <ol style="list-style-type: none"> 1. Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques. 2. 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. 3. Full accountability of all material purchased for the program including the residual inventory. 		

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ANALYSIS & MANAGEMENT		
<p>Guideline 22: 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:</p> <p>(1) Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.</p> <p>(2) Comparison of the amount of the budget earned the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.</p>		
<p>Guideline 23: 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.</p>		
<p>Guideline 24: 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.</p>		
<p>Guideline 25: 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.</p>		
<p>Guideline 26: Implement managerial actions</p>		

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taken as the result of earned value information.		
Guideline 27: 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.		

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REVISIONS & DATA MANAGEMENT		
Guideline 28: 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.		
Guideline 29: Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal re-planning in the detail needed by management for effective control.		
Guideline 30: 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.		
Guideline 31: Prevent revisions to the program budget except for authorized changes.		
Guideline 32: Document changes to the performance measurement baseline.		

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APPENDIX D

DRAFT FAR CLAUSE TO REQUIRE IMPLEMENTATION OF EARNED VALUE

When information on contract performance status is needed, contracting officers should require contractors to submit contract performance reports to report Earned Value information. When compliance with the standard is required, contracting officers should use a clause substantially like the following clause in solicitations.

NOTICE OF EARNED VALUE MANAGEMENT SYSTEM

The offeror shall provide documentation that the cognizant Administrative Contracting Officer (ACO) or a Federal Department or Agency has recognized that the proposed earned value management system (EVMS) complies with the EVMS guidelines in ANSI/EIA Standard – 748 – A – 1998, as reaffirmed.

If the offeror proposes to use a system that does not meet the requirements of paragraph (a) of this provision, the offeror shall submit a comprehensive plan for compliance with the EVMS guidelines.

The plan shall –

Describe the EVMS the offeror intends to use in performance of the contracts;

Distinguish between the offeror’s existing management system and modifications proposed to meet the guidelines;

Describe the management system and its application in terms of the 32 EVMS guidelines;

Describe the proposed procedure for administration of the guidelines, as applied to subcontractors: and

Provide documentation describing the process and results of any independent party or self-evaluation of the system’s compliance with the EVMS guidelines.

The offeror shall provide information and assistance as required by the Contracting officer to support review of the plan.

The Government will review the offeror’s plan for EVMS before contract award.

Offerors shall identify the major subcontractors, or major subcontracted effort if major subcontractors have not been selected, planned for application of the guidelines. The prime contractor and the Government shall agree to subcontractors selected for application of the EVMS guidelines.

(End of provision)

As prescribed in 42.1107©(2), use the following clause:

EARNED VALUE MANAGEMENT SYSTEM

“Earned Value Management (EVM) as used in this clause, means a project management system used by the contractor that effectively integrates the project technical scope of work with schedule and cost elements for optimum project planning and control. The qualities and operating characteristics of earned value management systems are described in American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA) Standard-748- A-1998, *Earned Value Management Systems, approved: May 19, 1998, Reaffirmed: August 28, 2002*. A copy of the standard is available from Global Engineering Documents (1-800-854-7179).

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In the performance of this contract the contractor shall use an earned value management system (EVMS) to manage the contract that –

- (1) At the time of contract award has been recognized by the contracting officer or her/his authorized representative as compliant with the guidelines in ANSI/EIA Standard -748-A. If, at the time of award, the contractor's EVMS has not been recognized by the Contracting Officer as complying with EVMS guidelines, the contractor shall apply the system to the contract and shall be prepared to demonstrate to the contracting officer that the EVMS complies with the EVMS guidelines referenced in paragraph (a) of this clause
- (2) Provides, in a format prescribed by the Contracting Officer, (XML, direct on-line access, or other) on a monthly basis, or more often as negotiated by the contracting officer, the following project status information at WBS level 3, with capability to report at any lower level at the request of the Contracting Officer:

(a) Budgeted (planned) cost for work scheduled (BCWS); = Planned Value

(b) Budgeted cost for work performed (BCWP); = Earned Value

(c) Actual cost of work performed (ACWP); = Actual Cost,

(d) Budget at completion (BAC);

(e) Estimate at completion (EAC): and

(f) Provide a performance curve graph plotting cumulative BCWS, BCWP, and ACWP on a monthly basis from inception of the contract, with BCWS plotted to completion and projecting the ACWP curve to the estimate at completion (EAC) value.

(g) In addition, provide the following EVMS variance analysis:

Cost variance = (BCWP minus ACWP);

Cost Variance % = (CV/BCWP X 100%);

Cost Performance Index (CPI) = (BCWP/ACWP);

Schedule Variance = (BCWP minus BCWS);

Schedule Variance % = (SV/BCWS X 100%);

Schedule Performance Index (SPI) = (BCWP/BCWS);

Two independent Estimates at Completion (EAC);

ACWP cum + 1/CPI X (BAC minus BCWP cum);

ACWP cum + 1/CPI X SPI X (BAC minus BCWP cum):

Variance at Completion (VAC) = (BAC minus EAC) for the EAC and both independent EACs above;

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Variance at Completion % = (VAC/BAC X 100%) for both the EAC and both independent EAC's above; and

Expected Completion Date.

- (3) Explain the reasons for all variances that exceed the statutory threshold of 10 percent or a lower threshold specified in the contract.
 - (4) Define technical performance variance. Explain, based on work accomplished as of the date of the report, whether the performance goals will be achieved, and the impact to the cost and schedule goals.
 - (5) Discuss the contractor EAC and the differences with the two independent EAC's calculated as above.
 - (6) Discuss the corrective actions that will be taken to mitigate all variances identified, the risk associated with the actions, and how close these actions will bring the project to the original baseline. Define proposed baseline changes, if necessary.
- (c) The Government may require an integrated baseline review (IBR) at (1) contract award, (2) exercise of significant options, or (3) incorporation of major modifications. Such reviews will normally be scheduled before award of the contract action. If the contracting officer determines that the urgency of the award does not allow time to conduct the IBR before award, the IBR shall be scheduled as early as practicable, but not later than 180 days after the award action. The objective of the integrated baseline review is for the Government and the Contractor to jointly assess technical areas, such as the Contractor's planning, to ensure complete coverage of the statement of work, logical scheduling of the work activities, adequate resources, methodologies for claiming BCWP, and identification of inherent risks.
 - (d) Contractor-proposed EVMS changes require approval of the contracting officer prior to implementation. The Contracting Officer shall advise the contractor of the acceptability of such changes within 30 calendar days after receipt of the notice of proposed changes from the contractor.
 - (e) The Contractor agrees to provide access to all pertinent records and data requested by the contracting officer or a duly authorized representative. Access is to permit Government surveillance to ensure that the EVMS conforms, and continues to conform, with the performance guidelines referenced in paragraph (a) of this clause.
 - (f) The contractor shall require the subcontractors specified below to comply with the performance guidelines of this clause, and allow an authorized representative of the Contracting Officer to perform surveillance and monitor monthly EV performance. The contractor shall conduct IBR's with government participation for the subcontractors specifically identified. (Insert list of applicable subcontractors).

(End of Clause)

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APPENDIX E

A CONTRACT PERFORMANCE REPORT DESCRIPTION

1.0 Description and Purpose.

This report consists of five formats containing data for measuring contractors' cost and schedule performance on Department of Energy acquisitions projects and programs. Format 1 (Sample Format 1) provides data to measure cost and schedule performance by summary level product-oriented Work Breakdown Structure (WBS) elements, the hardware, software and services the Government is buying. Format 2 (Sample Format 2) provides the same data by the contractor's organization. Format 3 (Sample Format 3) provides the budget baseline plan against which performance is measured. Format 4 (Sample Format 4) provides staffing forecasts for correlation with the budget plan and cost estimates. Format 5 (Sample Format 5) is a narrative report used to explain significant cost and schedule variances and other identified contract problems and topics.

CPR data is used by DOE managers to: (a) integrate cost and schedule performance data with technical performance measures, (b) identify the magnitude and impact of actual and potential problem areas causing significant cost and schedule variances, and (c) provide valid, timely program status information to higher management.

The CPR is a management report. It should provide timely, reliable summary-level data with which to assess current and projected contract performance. The CPR's primary value to government program management is its ability to reasonably reflect current contract status. If the CPR contains excessively detailed or outdated information, management's ability to make informed, timely decisions may be impaired. It is important that the CPR be as accurate as possible so it can be used for its intended purpose. It should be used by the DOE staff, including program managers, engineers, cost estimators and financial management personnel, to confirm, quantify and track known or emerging contract problems and as a basis for communicating with the contractor. The contractor should ensure that CPR data accurately reflect how work is being performed and is consistent with the actual contract status.

This description contains the format and content preparation instructions for the data product generated by the specific and discrete task requirements as delineated in the contract. The CPR should be used in conjunction with the Integrated Master Schedule, Contract Funds Status Report, Contract Work Breakdown Structure, Cost Data Summary Report and Functional Cost-Hour and.

The CPR is used to obtain cost and schedule performance information on contracts requiring compliance with the American National Standards Institute/Electronic Industries Alliance (ANSI/EIA) Standard 748 Earned Value Management Systems. The CPR data elements shall reflect the output of the contractor's ANSI/EIA Standard 748 compliant integrated management system.

2.0 Frequency

Unless otherwise provided in the contract, the CPR is required on a monthly basis. Formats 1, 2, 3 and 4 should be submitted to the government activity no later than 8 calendar days following the reporting cutoff date and Format 5 should be submitted no later than 15

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calendar days following the reporting cutoff date. Reports may reflect data either as of the end of the calendar month or as of the contractor's accounting period cutoff date, provided it is consistent with the Integrated Master Schedule. (Note: An alternative to requiring Formats 1, 2, 3 and 4 to be submitted is for the contractor to provide the procuring activity with online access to the Format 1, 2, 3 and 4 data. This will provide the procuring activity with immediate access as of the reporting cutoff date. Under this approach, the contractor will be required to notify the procuring activity that a validity (i.e. accuracy) check of the Format 1, 2, 3 and 4 data has been conducted and errors corrected, no later than 8 calendar days following the reporting cutoff date. Format 5 will still need to be submitted no later than 15 days following the reporting cutoff date).

Unless otherwise provided in the contract, data reported in the CPR will pertain to all authorized contract work, including both priced and unpriced effort.

3.0 Scope of Submission

Submission of Format 1 using a product-oriented WBS. The level of detail to be reported on Format 1 normally will be at level three of the Contract WBS, but lower levels may be specified for high-cost or -risk items. The Government and the contractor should periodically review and adjust as necessary WBS reporting levels on Format 1 to ensure they continue to provide appropriate visibility without requiring excessive information. If there is a significant problem at a lower level, detailed reporting for that WBS element may be required until the problem is resolved.

The formats that are specified for regular reporting. The Government and the contractor may agree to exclude formats 2 to 5 from regular reporting, but a Format 1 is required. Formats 2 to 5 may be deleted entirely, or they may be submitted on a less frequent basis. If the contractor is organized by product, Format 2 may not be required because it may resemble Format 1. The decision to exclude a format(s) should be based on an assessment of minimum management information needs. The Government should require only the information it plans to use.

The variance analysis thresholds, which, if exceeded, require problem analysis and narrative explanations in Format 5. If the contract does not specify variance analysis thresholds, the contractor will provide appropriate variance analyses. Variance analysis thresholds should be reviewed periodically and adjusted as necessary to ensure they continue to provide appropriate visibility.

The reporting provisions which apply to the Cost of Money line on Formats 1 and 2.

Organizational categories for Format 4, if different from Format 2. The Government may request that different organizational categories be used for reporting staffing in Format 4. If so, the Government and the contractor will negotiate the Format 4 categories. The Format 2 categories shall reflect the contractor's internal organization being used to perform the contract at hand.

The CPR may be tailored to obtain the level of information necessary to manage the program or project. Tailoring is not defined as requiring more information in the CPR than specified in this appendix.

4.0 Forms.

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Sample forms are available and will be used to submit (or provide online access to) required formats as follows:

<u>CPR Format</u>	<u>Sample Format No.</u>
Work Breakdown Structure	1
Organizational Categories	2
Baseline	3
Staffing	4
Explanations and Problem Analyses	5

A schema for the Extensible Markup Language (XML) data exchange is currently under development. Once this schema is finalized it will be used for data exchange. Until it is finalized, the American National Standards Institute (ANSI) X12 standards (transaction sets 839 for cost and 806 for schedule), or the United Nations Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT) equivalent, will be used for Electronic Data Interchange. Where Formats 1 to 4 require information that are not catered for in current EDI standards (i.e. Blocks 3.c, 5.i and Column 12(b) of Block 8 of Format 1; Block 9 and Columns 10 to 14 of Block 6 of Format 3; and Columns 10 to 14 of Block 5 of Format 4), that information will be required to be reported in Format 5 (or an attachment to Format 5). (Note: This interim approach is required because current policy is not to modify current EDI standards, but rather to develop a schema for XML data exchange as soon as possible.) All formats must be in a readable digital format (i.e. PDF files are not acceptable).

5.0 Format. The Contract Performance Report should be prepared and submitted using the relevant forms as shown at the end of this appendix and should contain the following content

5.1 Heading Information - Formats 1 - 5. Preparation instructions for Heading Information (Blocks 1 through 4) apply to Formats 1 through 5.

5.1.1 Contractor. Enter in Block 1.a the contractor's name and division, if applicable. Enter in Block 1.b the plant location and mailing address of the reporting contractor.

5.1.2 Contract. Enter the contract name in Block 2.a, the contract number in Block 2.b, the contract type in Block 2.c and the contract share ratio, if applicable, in Block 2.d.

5.1.3 Program. Enter in Block 3.a the program name, number, acronym and/or type, model, and series, or other designation of the prime item(s) purchased under the contract. Indicate the program phase, RDT&E or Procurement/O&M, in Block 3.b. Indicate whether the contractor EVMS is currently validated or not, in Block 3.c.

5.1.4 Report Period. Enter the beginning date in Block 4.a and the ending date in Block 4.b of the period covered by the report.

5.1.5 Security Classification. Enter the appropriate security classification at the top and bottom of each page. (Continued on page 3)

5.1.6 Dollars in _____. If reported dollar amounts have been factored down by a thousand, a million or a billion, enter the factor at the top of each page.

5.2 Format 1 - Work Breakdown Structure.

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5.2.1 Contract Data.

- 5.2.1.1 Quantity. Enter in Block 5.a the number of prime items to be procured on this contract.
- 5.2.1.2 Negotiated Cost. Enter in Block 5.b the dollar value (excluding fee or profit) on which contractual agreement has been reached as of the cutoff date of the report. For an incentive contract, enter the definitized contract target cost. Amounts for changes will not be included in this item until they have been priced and incorporated in the contract through contract change order or supplemental agreement. For a cost plus fixed fee or award fee contract, enter the estimated cost negotiated. Changes to the estimated cost will consist only of amounts for changes in the contract scope of work, not for cost growth (“overrun”) from the original estimated cost.
- 5.2.1.3 Estimated Cost of Authorized, Unpriced Work. Enter in Block 5.c the amount (excluding fee or profit) estimated for that work for which written authorization has been received, but for which definitized contract prices have not been incorporated in the contract through contract change order or supplemental agreement.
- 5.2.1.4 Target Profit/Fee. Enter in Block 5.d the fee or percentage of profit which will apply if the negotiated cost of the contract (see 5.2.1.2, above) is met.
- 5.2.1.5 Target Price. Enter in Block 5.e the target price (negotiated contract cost plus profit/fee) applicable to the definitized contract effort.
- 5.2.1.6 Estimated Price. Based on the most likely estimate of cost at completion for all authorized contract work and the appropriate profit/fee, incentive, and cost sharing provisions, enter in Block 5.f the estimated final contract price (total estimated cost to the Government). This number will be based on the most likely management estimate at completion in Block 6.c.1 and normally will change whenever the management estimate or the contract is revised.
- 5.2.1.7 Contract Ceiling. Enter in Block 5.g the contract ceiling price applicable to the definitized effort.
- 5.2.1.8 Estimated Contract Ceiling. Enter in Block 5.h the estimated ceiling price applicable to all authorized contract effort including both definitized and undefinitized effort.
- 5.2.1.9 Over Target Baseline. Enter in Block 5.i the date the last over target baseline was implemented (if applicable).
- 5.2.2 Estimated Cost at Completion. These blocks will present the contractor’s range of estimated costs at completion. The range of estimates is intended to allow contractor management flexibility to express possible cost outcomes. Contractors will provide the most accurate EACs possible through program-level assessments of factors that may affect the cost, schedule or technical outcome of the contract. Such program-level assessments will include consideration of known or anticipated risk areas, and planned risk reductions or cost containment measures. EACs will be reported without regard to contract ceiling, if applicable.

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- 5.2.2.1 Management Estimate at Completion - Best Case. Enter in Block 6.a.1 the contractor's best case estimate at completion. The best case estimate is the one that results in the lowest cost to the Government. This estimate should be based on the outcome of the most favorable set of circumstances. If this estimate is different from the most likely estimate at completion (Block 6.c.1), the assumptions, conditions and methodology underlying this estimate will be explained briefly in Format 5. This estimate is for informational purposes only; it is not an official company estimate. There is no requirement for the contractor to prepare and maintain backup data beyond the explanation provided in Format 5.
- 5.2.2.2 Management Estimate at Completion - Worst Case. Enter in Block 6.b.1 the contractor's worst case estimate at completion. The worst case estimate is the one that results in the highest cost to the Government. This estimate should be based on the outcome of the least favorable set of circumstances. If this estimate is different from the most likely estimate at completion (Block 6.c.1), the assumptions, conditions and methodology underlying this estimate will be explained briefly in Format 5. This estimate is for informational purposes only; it is not an official company estimate. There is no requirement for the contractor to prepare and maintain backup data beyond the explanation provided in Format 5.
- 5.2.2.3 Management Estimate at Completion - Most Likely. Enter in Block 6.c.1 the contractor's most likely estimate at completion. This estimate is the contractor's official contract EAC and, as such, takes precedence over the estimates presented in Column (15) of Formats 1 and 2 and Blocks 6.a.1 and 6.b.1. This EAC is the value that the contractor's management believes is the most likely outcome based on a knowledgeable estimate of all authorized work, known risks and probable future conditions. This value need not agree with the total of Column (15) (Block 8.e). However, any difference will be explained in Format 5 in such terms as risk, use of management reserve, or higher management knowledge of current or future contract conditions. The assumptions, conditions and methodology underlying this estimate will be explained briefly in Format 5. This EAC need not agree with EACs contained in the contractor's internal data, but must be reconcilable to them. The most likely EAC also will be reconcilable to the contractor's latest statement of funds required as reported in the Contract Funds Status Report, or its equivalent, if this report is a contractual requirement.
- 5.2.2.4 Contract Budget Base. Enter in Block 6.c.2 the total of negotiated cost (Block 5.b) and estimated cost of authorized, unpriced work (5.c).
- 5.2.2.5 Variance. Enter in Block 6.c.3 the Contract Budget Base (Block 6.c.2) minus the most likely estimate at complete (Block 6.c.1). This value will be explained in Format 5 according to applicable contractual requirements.
- 5.2.3 Authorized Contractor Representative. Enter in Block 7.a the name of the authorized person signing the report. Enter that person's title in Block 7.b. The authorized person will sign in Block 7.c. Enter the date signed in Block 7.d.
- 5.2.4 Performance Data.

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- 5.2.4.1 Work Breakdown Structure Element. Enter in Column (1) of Block 8.a the noun description of the WBS items for which cost information is being reported. WBS items or levels reported will be those specified in the contract. (See 7.6.1 above.)
- 5.2.4.2 Cost of Money. Enter in Columns (2) through (16) of Block 8.b the Facilities Capital Cost of Money applicable to the contract.
- 5.2.4.3 General and Administrative (G&A). Enter in Columns (2) through (16) of Block 8.c the appropriate G&A costs. G&A must not be included in the total costs reported in Block 8.a above. G&A will be shown as an add entry on this line. If a G&A classification is not used, no entry will be made other than an appropriate notation to that effect.
- 5.2.4.4 Undistributed Budget. Enter the amount of budget applicable to contract effort which has not yet been identified to WBS elements at or below the reporting level. For example, contract changes which were authorized late in the reporting period should have received a total budget; however, assignment of work and allocation of budgets to individual WBS elements may not have been accomplished as of the end of the period. Budgets which can be identified to WBS elements at or below the specified reporting level will be included in the total budgets shown for the WBS elements in Block 8.a and will not be shown as undistributed budget. Enter in Column (15) of Block 8.d the estimate at completion for the scope of work represented by the undistributed budget in Column (14) of Block 8.d. Enter in Column (16) of Block 8.d the variance, if any, and fully explain it in Format 5. All undistributed budget will be fully explained in Format 5.
- 5.2.4.4.1 Use of Undistributed Budget. The provisions made in this report for undistributed budget are primarily to accommodate temporary situations where time constraints prevent adequate budget planning or where contract effort can only be defined in very general terms. Undistributed budget will not be used as a substitute for adequate contract planning. Formal budgets should be allocated to contract effort and responsible organizations at the earliest possible time, preferably within the next reporting period.
- 5.2.4.5 Subtotal (Performance Measurement Baseline). Enter the sum of the direct, indirect, Cost of Money, and G&A costs and budgets in Columns (2) through (16) of Block 8.a through e. This subtotal is also referred to as the Performance Measurement Baseline because it represents the allocated budget baseline (less management reserve) against which performance is actually measured.
- 5.2.4.6 Management Reserve. Management reserve is an amount of the overall contract budget withheld for management control purposes rather than for the accomplishment of a specific task or set of tasks. It is not a contingency fund, and may not be eliminated from contract prices by the Government during subsequent negotiations nor used to absorb the cost of contract changes. In Column (14) of Block 8.f enter the total amount of budget identified as management reserve as of the end of the current reporting period. The amounts shown as management reserve in Formats 1, 2 and 3 will agree. Amounts of management reserve applied to WBS elements during the reporting period will be listed in Block 6.b of Format 3 and explained in Format 5.

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5.2.4.6.1 Negative Management Reserve. Negative entries will not be made in Management Reserve (Column (14) of Block 8.f). There is no such thing as “negative management reserve.” If the contract is budgeted in excess of the Contract Budget Base (the negotiated contract cost plus the estimated cost for authorized, unpriced work), the provisions applicable to formal reprogramming and the instructions in paragraphs 5.2.5.1, 5.2.6.6, 5.2.6.7 and 5.4.1.7 apply.

5.2.4.7 Total. Enter the sum of all direct, indirect, Cost of Money, G&A cost, undistributed budgets and management reserves, if applicable, in Columns (2) through (14) of Block 8.g. The Total lines of Format 1 (Block 8.g) and Format 2 (Block 5.g) will agree. The total of Column (14), Block 8.g, will equal the Total Allocated Budget shown in Block 5.f on Format 3.

5.2.5 Reconciliation to Contract Budget Base.

5.2.5.1 Formal Reprogramming. In exceptional cases, the procuring agency may authorize the contractor to establish performance measurement budgets that in total exceed the Contract Budget Base. This process is called formal reprogramming. The contractor and the Government will agree on how the results of a formal reprogramming will be reported in the Contract Performance Report before the formal reprogramming is initiated. This agreement and any other pertinent details on the reporting of the formal reprogramming will be included in Format 5. Blocks 9.a and 9.b provide the contractor the opportunity to reconcile the higher performance measurement budgets, also called an “Over Target Baseline,” to the Contract Budget Base. (See 5.2.6.6, 5.2.6.7, 5.4.1.7, and 5.6.5 below for more information on reporting Over Target Baselines.)

5.2.5.2 Variance Adjustment. In reporting the results of a formal reprogramming (Over Target Baseline) the contractor may 1) apply the additional budget to completed work, thereby eliminating some or all of the existing cost or schedule variances, 2) apply the additional budget to remaining work, 3) apply some of the additional budget to completed work and some to remaining work, or 4) apply some of the additional budget to management reserve. If the contractor uses a portion of the additional budget to eliminate variances applicable to completed work, the total adjustments made to the cost and schedule variances will be shown in Columns (10) and (11) of Block 9.a. The total cost variance adjustment entered in Column (11) of Block 9.a will be the sum of the individual cost variance adjustments shown in Column (12) of Blocks 8.a through g.

5.2.5.3 Total Contract Variance. In Columns (10) and (11) of Block 9.b, enter the sum of the cost and schedule variances shown on the Total line (Block 8.g) and on the Variance Adjustment line (Block 9.a). In Column (14) enter the Contract Budget Base from Block 6.c.2. In Column (15) enter the management estimate at completion from Block 6.c.1. In Column (16) of Block 9.b enter the difference between Columns (14) and (15) of Block 9.b.

5.2.6 Columns (2) Through (16). When compliance with the ANSI/EIA Standard 748 is contractually required, the data in Columns (2) through (16) shall reflect the output of the contractor’s ANSI/EIA Standard 748 compliant integrated management system (refer to DFARS 252.234-7001).

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- 5.2.6.1 Column (2) and Column (7) - Budgeted Cost - Work Scheduled. For the time period indicated, enter the Budgeted Cost for Work Scheduled (BCWS) in these columns.
- 5.2.6.2 Column (3) and Column (8) - Budgeted Cost - Work Performed. For the time period indicated, enter the Budgeted Cost for Work Performed (BCWP) in these columns.
- 5.2.6.3 Column (4) and Column (9) - Actual Cost - Work Performed (ACWP). For the time period indicated, enter the Actual Cost of Work Performed without regard to ceiling. In all cases, costs and budgets will be reported on a comparable basis.
- 5.2.6.4 Column (5) and Column (10) - Variance - Schedule. For the time period indicated, these columns reflect the differences between BCWS and BCWP. For the current period, Column (5) (schedule variance) is derived by subtracting Column (2) (BCWS) from Column (3) (BCWP). For the cumulative to date, Column (10) (schedule variance) is derived by subtracting Column (7) (BCWS) from Column (8) (BCWP). A positive figure indicates a favorable variance. A negative figure (indicated by parentheses) indicates an unfavorable variance. Significant variances as specified in the contract will be fully explained in Format 5. If the contract does not specify variance analysis thresholds, the contractor will provide appropriate variance analyses. (See 5.6.3.2.4 below.)
- 5.2.6.5 Column (6) and Column (11) - Variance - Cost. For the time period indicated, these columns reflect the difference between BCWP and ACWP. For the current period, Column (6) (cost variance) is derived by subtracting Column (4) (ACWP) from Column (3) (BCWP). For cumulative to date, Column (11) (cost variance) is derived by subtracting Column (9) (ACWP) from Column (8) (BCWP). A positive figure indicates a favorable variance. A negative figure (indicated by parentheses) indicates an unfavorable variance. Significant variances as specified in the contract will be fully explained in Format 5. If the contract does not specify variance analysis thresholds, the contractor will provide appropriate variance analyses. (See 5.6.3.2.4 below.)
- 5.2.6.6 Column (12a) and Column (12b) Reprogramming Adjustments - Cost Variance and Schedule Variance. Formal reprogramming (Over Target Baseline) results in budget allocations in excess of the Contract Budget Base and, in some instances, adjustments to previously reported variances. If previously reported variances are being adjusted, the adjustment applicable to each reporting line item affected will be entered in Column (12a) and Column (12b). The total of Column (12a) and Column (12b) will equal the amount shown on the Variance Adjustment line (Block 9.a) in Column (10) and Column (11).
- 5.2.6.7 Column (13) Reprogramming Adjustments - Budget. Enter the total amounts added to the budget for each reporting line item as the result of formal reprogramming (Over Target Baseline). The amounts shown will consist of the sum of the budgets used to adjust cost variances (Column (12)) plus the additional budget added to the WBS element for remaining work. Enter the amount of budget added to management reserve in the space provided on the management reserve line (Block 8.f). The total of Column (13) will equal the amount the Total Allocated Budget has been budgeted in excess of the Contract Budget Base as shown in Block 5.g of Format 3. An explanation of the reprogramming will be provided in Format 5.

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5.2.6.7.1 Formal Reprogramming Reporting. Columns (12) and (13) are intended for use only in situations involving formal reprogramming (Over Target Baseline). Internal replanning actions within the Contract Budget Base do not require entries in these columns. Where contractors are submitting CPR data directly from automated systems, the addition of Columns (12) and (13) as shown may not be practical due to computer reprogramming problems or space limitations. In such cases, the information may be provided on a separate sheet and attached as Format 1a to each subsequent report. Contractors will not be required to abandon or modify existing automated reporting systems to include Columns (12) and (13) if significant costs will be associated with such change. Nor will contractors be required to prepare the report manually solely to include this information.

5.2.6.7.2. Formal Reprogramming Timeliness. Formal reprogramming (Over Target Baseline) can be a significant undertaking that may require more than a month to implement. To preclude a disruption of management visibility caused by a reporting hiatus, the contractor should implement the formal reprogramming expeditiously. If a reporting hiatus is needed, the contractor and the Government will agree on the date and duration of the hiatus before the formal reprogramming is initiated.

5.2.6.8 Column (14) - At Completion - Budgeted. Enter the budgeted cost at completion for the items listed in Column (1). This entry will consist of the sum of the original budgets plus or minus budget changes resulting from contract changes, internal replanning, and application of management reserves. The total (Block 8.g) will equal the Total Allocated Budget shown in Block 5.f on Format 3.

5.2.6.9 Column (15) - At Completion - Estimated. Enter the latest revised estimate of cost at completion including estimated overrun/underrun for all authorized work. If the subtotal (Block 8.e) does not agree with the most likely management estimate at completion (Block 6.c.1), the difference will be explained in Format 5. (See 5.2.2.3 above.)

5.2.6.10 Column (16) - At Completion - Variance. Enter the difference between the Budgeted - At Completion (Column (14)) and the Estimated - At Completion (Column (15)) by subtracting Column (15) from Column (14). A negative figure (indicated by parentheses) reflects an unfavorable variance. Significant variances as specified in the contract will be fully explained in Format 5. If the contract does not specify variance analysis thresholds, the contractor will provide appropriate variance analyses. (See 5.6.3.2.4 below.)

5.3 Format 2 - Organizational Categories.

5.3.1 Performance Data.

5.3.1.1 Column (1) - Organizational Category. In Block 5.a list the organizational categories which reflect the contractor's internal management structure. This format will be used to collect organizational cost information at the total contract level rather than for individual WBS elements. The structure shall identify each major subcontractor separately as an add item. Except for material included in the add item for each major subcontractor, the structure shall also identify material separately as an add item. The level of detail to be

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reported will normally be limited to the organizational level immediately under the operating head of the facility. The contractor shall be given flexibility to report this information according to its own internal management structure. If the contractor is organized by product teams, this format may not be needed because it may resemble Format 1.

- 5.3.1.2 Cost of Money. Enter in Columns (2) through (16) of Block 5.b the Facilities Capital Cost of Money applicable to the contract.
- 5.3.1.3 General and Administrative. Enter in Columns (2) through (16) of Block 5.c the appropriate G&A costs. G&A must not be included in the total costs reported in Block 5.a above. G&A will be shown as an add entry on this line. If a G&A classification is not used, no entry will be made other than an appropriate notation to that effect. (See 5.2.4.3 above.)
- 5.3.1.4 Undistributed Budget. Enter in Column (14) of Block 5.d the budget applicable to contract effort which cannot be planned in sufficient detail to be assigned to a responsible organizational area at the reporting level. The amount shown on this format may exceed the amount shown as undistributed budget on Format 1 if budget is identified to a task at or below the WBS reporting level but organizational identification has not been made; or may be less than the amount on Format 1 where budgets have been assigned to organizations but not to WBS elements. Enter in Column (15) of Block 5.d the estimate at completion for the scope of work represented by the undistributed budget in Column (14) of Block 5.d. Enter in Column (16) of Block 5.d the variance, if any, and fully explain it in Format 5. (See 5.2.4.4 above.)
- 5.3.1.5 Subtotal (Performance Measurement Baseline). Enter the sum of the direct, indirect, Cost of Money, and G&A costs and budgets in Columns (2) through (16) of Block 5.a through e. (See 5.2.4.5 above.)
- 5.3.1.6 Management Reserve. In Column (14) of Block 5.f enter the amount of budget identified as management reserve. The Management Reserve entry will agree with the amounts shown in Format 1 and 3. (See 5.2.4.6 above.)
- 5.3.1.7 Total. Enter the sum of all direct, indirect, Cost of Money, and G&A costs and budgets, undistributed budgets and management reserves, if applicable, in Columns (2) through (14) of Block 5.g. The totals on this page will equal the Total line on Format 1. The total of Column (14) will equal the Total Allocated Budget shown in Block 5.f on Format 3.
- 5.3.2 Columns (2) Through (16). The instructions applicable to these columns are the same as the instructions for corresponding columns on Format 1. (See 5.2.6 and 5.2.6.1 through 5.2.6.10 above.)

5.4 Format 3 - Baseline.

5.4.1 Contract Data.

- 5.4.1.1 Original Negotiated Cost. Enter in Block 5.a the dollar value (excluding fee or profit) negotiated in the original contract. For a cost plus fixed fee or award fee contract,

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enter the estimated cost negotiated. For an incentive contract, enter the definitized contract target cost.

- 5.4.1.2 Negotiated Contract Changes. Enter in Block 5.b the cumulative cost (excluding fee or profit) applicable to definitized contract changes which have occurred since the beginning of the contract.
- 5.4.1.3 Current Negotiated Cost. Enter in Block 5.c the sum of Blocks 5.a and 5.b. The amount shown should equal the current dollar value (excluding fee or profit) on which contractual agreement has been reached and should be the same as the amount in Negotiated Cost (Block 5.b) on Format 1.
- 5.4.1.4 Estimated Cost of Authorized, Unpriced Work. Enter in Block 5.d the estimated cost (excluding fee or profit) for contract changes for which written authorizations have been received, but for which contract prices have not been incorporated in the contract, as shown in Block 5.c of Format 1.
- 5.4.1.5 Contract Budget Base. Enter in Block 5.e the sum of Blocks 5.c and 5.d.
- 5.4.1.6 Total Allocated Budget. Enter in Block 5.f the sum of all budgets allocated to the performance of the contractual effort. The amount shown will include all management reserves and undistributed budgets. This amount will be the same as that shown on the Total line in Column (14) on Format 1 (Block 8.g) and Format 2 (Block 5.g).
- 5.4.1.7 Difference. Enter in Block 5.g the difference between Blocks 5.e and 5.f. In most cases, the amounts shown in Blocks 5.e and 5.f will be identical. If the amount shown in Blocks 5.f exceeds that shown in Block 5.e, it usually is an indication of a formal reprogramming (Over Target Baseline). The difference will be explained in Format 5 at the time the negative value appears and subsequently for any change in the value.
- 5.4.1.8 Contract Start Date. Enter in Block 5.h the date the contractor was authorized to start work on the contract, regardless of the date of contract definitization. (Long lead procurement efforts authorized under prior contracts are not to be considered.)
- 5.4.1.9 Contract Definitization Date. Enter in Block 5.i the date the contract was definitized.
- 5.4.1.10 Planned Completion Date. Enter in Block 5.j the completion date to which the budgets allocated in the Performance Measurement Baseline have been planned. This date should represent the planned completion of all significant effort on the contract. The cost associated with the schedule from which this date is taken is the Total Allocated Budget (Block 5.f of Format 3).
- 5.4.1.10.1 Performance Measurement Schedule Inconsistent With Contractual Schedule. In exceptional cases, the contractor may determine that the existing contract schedule cannot be achieved and no longer represents a reasonable basis for management control. With Government approval, the contractor may rephase its performance measurement schedule to new dates which exceed the contractual milestones, a condition known as "Over Target Schedule." These new dates are for performance measurement purposes only and do not represent an agreement to modify the contract terms and conditions. The Government and the contractor will agree on

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the new performance measurement schedule prior to reporting it in the Contract Performance Report. The contractor will provide pertinent information in Format 5 on any schedule milestones that are inconsistent with contractual milestones, beginning the month the schedule is implemented and each month thereafter.

5.4.1.10.2 Indicators of a Performance Measurement Schedule Inconsistent With the Contractual Schedule. Formal reprogramming or internal replanning may result in performance measurement milestones that are inconsistent with the contractual milestones (Over Target Schedule). A difference between the planned completion date (Block 5.j) and the contract completion date (Block 5.k) indicates that some or all of the performance measurement milestones are inconsistent with the contractual milestones. However, some performance measurement milestones may be inconsistent with contractual milestones even if these dates are the same.

5.4.1.11 Contract Completion Date. Enter in Block 5.k the contract scheduled completion date in accordance with the latest contract modification. The cost associated with the schedule from which this date is taken is the Contract Budget Base (Block 5.e of Format 3).

5.4.1.12 Estimated Completion Date. Enter the contractor's latest revised estimated completion date. This date should represent the estimated completion of all significant effort on the contract. The cost associated with the schedule from which this date is taken is the most likely management estimate at completion (Block 6.c.1 of Format 1).

5.4.2 Column (1) - Item.

5.4.2.1 Performance Measurement Baseline (Beginning of Period). Enter in Block 6.a the time-phased Performance Measurement Baseline (PMB) (including G&A) which existed at the beginning of the current reporting period. Most of the entries on this line are taken directly from the PMB (End of Period) line on the previous report. For example, the number in Column (4) on the PMB (End of Period) line from last month's report becomes the number in Column (3) on the PMB (Beginning of Period) line on this report. The number in Column (5) (end of period) last report becomes Column (4) (beginning of period) on this report, etc.

5.4.2.2 Baseline Changes. List by number in Block 6.b, the contract changes and supplemental agreements authorized during the reporting period. All authorized baseline changes should be listed whether priced or unpriced. The amount of management reserve applied during the period should also be listed.

5.4.2.3 Performance Measurement Baseline (End of Period). Enter in Block 6.c the time-phased PMB as it exists at the end of the reporting period. The difference between this line and the PMB (Beginning of Period) should represent the effects of the authorized changes and allocations of management reserves made during the period. Significant differences will be explained in Format 5 in terms of reasons for necessary changes to time-phasing due to internal replanning or formal reprogramming, and reasons for the application of management reserve.

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- 5.4.2.4 Management Reserve. Enter in Block 7 the total amount of management reserve remaining as of the end of the reporting period. This figure will agree with the amounts shown as management reserve in Formats 1 and 2.
- 5.4.2.5 Total. Enter in Column (16) of Block 8 the sum of Column (16) of Block 6.c (PMB (End of Period)) and Column (16) of Block 7 (Management Reserve). This amount should be the same as that shown on the Total line (Block 8.g) in Column (14) on Format 1.
- 5.4.2.6 Estimate at Completion. Enter in Block 9 the time-phased estimate at completion as it exists at the end of the reporting period. Significant differences from the previous CPR will be explained in Format 5 in terms of reasons for changes to time-phasing. The total value in Column (16) should agree with the total of Column (15) of Block 8.e of Format 1.
- 5.4.3 Column (2) - BCWS - Cum To Date. On the PMB (Beginning of Period) line (Block 6.a), enter the cumulative BCWS as of the first day of the reporting period. This should be the same number reported as BCWS - Cum To Date on the Total line (Column (7) of Block 8.g) of Format 1 of the previous CPR. On the PMB (End of Period) line (Block 6.c), enter the cumulative BCWS as of the last day of the reporting period. This should be the same number reported as BCWS - Cum to Date on the Total line (Column (7) of Block 8.g) of Format 1 for this CPR.
- 5.4.4 Column (3) - BCWS For Report Period. On the PMB (Beginning of Period) line (Block 6.a), enter the BCWS planned for the reporting period. This should be the number in Column (4) on the PMB (End of Period) line (Block 6.c) on the preceding month's report.
- 5.4.5 Columns (4) Through (14). (Note: For the purposes of illustration, Sample Format 3 has Columns (4) through (14) for reporting BCWS. The actual number of columns will vary from contract to contract.) Enter the names of the months in the headings of Columns (4) through (14) of Block 6. In the PMB (Beginning of Period) line (Block 6.a), enter the BCWS projection reported in the previous CPR as PMB (End of Period) (Block 6.c). In the PMB (End of Period) line (Block 6.c) of this report, enter the projected BCWS by month for the remainder of the contract. The time-phasing of each item listed in Column (1) of Block 6.b need not be shown in Columns (4) through (14).
- 5.4.6 Column (15) - Undistributed Budget. On the PMB (Beginning of Period) line (Block 6.a), enter the number from Column (15) on the PMB (End of Period) line (Block 6.c) from the preceding report. On the PMB (End of Period) line, enter the undistributed budget shown in Column (14) of Block 8.d on Format 1 of this report.
- 5.4.7 Column (16) - Total Budget. On the PMB (Beginning of Period) line (Block 6.a) enter the number from Column (16) on the PMB (End of Period) line (Block 6.c) from the preceding report. In the section where baseline changes that occurred during the period are listed (Column (1) of Block 6.b), enter the amount of each of the changes listed. On the PMB (End of Period) line (Block 6.c), enter the sum of the amounts in the preceding columns on this line. On the Management Reserve line (Block 7), enter the amount of management reserve available at the end of the period. On the Total line (Block 8) enter the sum of the amounts in this column on the PMB (End of Period) line and the Management Reserve line. (This should equal the amount in Block 5.f on this format and also the amount of the Total line in Column (14), Block 8.g, of Format 1.)

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5.5 Format 4 - Staffing.

- 5.5.1 Performance Data. For those organizational categories shown in Column (1) of Block 5, equivalent months will be indicated for the current reporting period, cumulative through the current period, and forecast to completion. Direct equivalent months will be shown for each organizational category for the contract. An equivalent month is defined as the effort equal to that of one person for one month. Figures should be reported in whole numbers. (Partial months, .5 and above, will be rounded to 1; below .5 to 0.) When the Government and the contractor agree, staffing may be reported in equivalent days or hours.
- 5.5.1.1 Organizational Category. List the organizational categories that reflect the contractor's internal management structure in Block 5. Format 4 categories may differ from those reported in Format 2. If the Government needs different categories in Formats 2 and 4, the Format 4 categories will be addressed during negotiations. (See 7.6.5 above.)
- 5.5.1.2 Total Direct. In Block 6, Columns (2) through (15), enter the sum of all direct equivalent months for the organizational categories shown in Column (1).
- 5.5.2 Column (2) - Actual - Current Period. Enter the actual equivalent months incurred during the current reporting period.
- 5.5.3 Column (3) - Actual End of Current Period (Cum). Enter the actual equivalent months incurred to date (cumulative) as of the end of the report period.
- 5.5.4 Columns (4) Through (14) - Forecast (Non Cumulative). (Note: For the purposes of illustration, Sample Format 4 has Columns (4) through (14) for reporting staffing forecast. The actual number of columns will vary from contract to contract.) Enter the names of the months in the headings of Columns (4) through (14) of Block 5. Enter a staffing forecast by month for the remainder of the contract. The forecast will be updated at least quarterly unless a major revision to the plan or schedule has taken place, in which case forecasts will be changed in the report submitted at the end of the month in which the change occurred.
- 5.5.5 Column (15) - Forecast at Completion. Enter the estimate of equivalent months necessary for the total contract in Column (15) by organizational category. This estimate should be consistent with the most likely management estimate at completion shown in Column (15) of Block 8.e of Format 1. Any significant change in the total number of equivalent months at completion of the contract (i.e., Column (15) Total) will be explained in Format 5.

5.6 Format 5 - Explanations and Problem Analyses.

- 5.6.1 General. Format 5, Explanations and Problem Analyses, is a narrative report prepared to supplement the other CPR formats. Format 5 will normally address 1) contractually required cost, schedule and estimate at completion variance analyses, 2) management reserve changes and usage, 3) undistributed budget contents, 4) differences between the best case, worst case, and most likely management estimate at completion, if any, 5) the difference between the most likely management estimate at completion and the estimate in Block 8.e of Column (15), if any, 6) significant differences between beginning of period PMB time phasing and end of period PMB

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time phasing in Format 3, 7) performance measurement milestones that are inconsistent with contractual milestones (Over Target Schedule), 8) formal reprogramming (Over Target Baseline) implementation details, and 9) significant staffing estimate changes in Format 4. However, any topic relevant to contract cost, schedule or technical performance can be addressed in this format.

- 5.6.2 Total Contract. Provide a summary analysis, identifying significant problems affecting performance. Indicate corrective actions required, including Government action where applicable. Significant changes since the previous report should be highlighted. Discuss any other issues affecting successful attainment of contract cost, schedule or technical objectives which the contractor deems significant or noteworthy. This section should be brief, normally one page.
- 5.6.3 Cost and Schedule Variances. Explain all variances which exceed specified variance thresholds. Explanations of variances must clearly identify the nature of the problem, significant reasons for cost or schedule variance, effect on the immediate task, impact on the total contract, the corrective action taken or planned, and the expected outcome of the corrective action. Explanations of cost variances should identify amounts attributable to rate changes separately from amounts applicable to hours worked; amounts attributable to material price changes separately from amounts applicable to material usage; and amounts attributable to overhead rate changes separately from amounts applicable to overhead base changes or changes in the overhead allocation basis. To reduce the volume of variance analysis, the Government may allow the contractor to refer to a prior CPR's variance analysis explanations if the explanation for the current CPR's variance has not changed significantly. Explanations of schedule variances and the impact to the contract must be informed by the schedule analysis of the Integrated Master Schedule (IMS).
- 5.6.3.1 Setting Variance Analysis Thresholds. The Government should require the minimum amount of variance analysis in Format 5 which satisfies its management information needs. Excessive variance analysis is burdensome and costly, and detracts from the CPR's usefulness, while too little information is equally undesirable. The contract should include a provision to review cost and schedule variance analysis thresholds periodically, normally semiannually, to determine if they continue to meet the Government's information needs. If they do not, the thresholds should be changed at no cost to the Government.
- 5.6.3.2 Identifying Significant Variances. There is no prescribed basis for identifying which cost and schedule variances are to be explained in Format 5. The Government may specify any one of several ways to identify such variances, including, but not limited to the following:
- 5.6.3.2.1 Fixed Number of Variances. Specify a number of significant variances. These variances can be either current month, cumulative, or at-completion. Any number of significant variances may be selected, but the Government should be careful to select only the number that it feels are necessary.
- 5.6.3.2.2 Percentage or Dollar Thresholds. Select variances based on percentage or dollar thresholds. Significant schedule variances are identified based on their size or percentage to Budgeted Cost for Work Scheduled, and significant cost variances are identified based on their size or percentage to Budgeted Cost for Work Performed. For example, all current month, cumulative or at-completion variances greater than 10% or

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\$500K may be selected for analysis. This method usually results in a larger number of variances requiring reporting. Consequently, the thresholds should be reviewed periodically to ensure they continue to provide a reasonable amount of useful information. (Note: A variation to this method is to select variances based on percentage and dollar thresholds. For example, all current month, cumulative or at-completion variances greater than 10% and \$500K may be selected for analysis).

5.6.3.2.3 Specific Variances. Select variances for analysis only after reviewing Formats 1 or 2. Under this method, the CPR is delivered promptly after the contractor's accounting period ends with all required information in Formats 1 through 5 except variance analyses. Once the Government has reviewed this performance data, it selects specific variances for analysis. This method may be the most efficient in that the Government can pinpoint areas to be analyzed. It is also the most flexible because there may be some months where a review of the performance data yields few or no variance analysis candidates. However, this method should only be used if the Government is certain it has sufficient resources to review the CPR early and select variances each month.

5.6.3.2.4 No Variance Analysis Thresholds Specified. If the contract does not specify variance analysis thresholds, the contractor will determine what significant variance explanations are reported. These explanations should focus on 1) areas where the Government should be informed of developing issues or problems, 2) areas of identified program risk or management interest, or 3) areas of significantly unfavorable cost or schedule performance.

5.6.4 Other Analyses. In addition to variance explanations, the following analyses are mandatory:

5.6.4.1. Management Estimate at Completion. If the best or worst case management estimates at completion differ from the most likely estimate, the contractor must provide a brief explanation of the difference. Also, if the most likely management estimate at completion differs from the total entered in Column 15 of Format 1 or 2, the contractor must explain the difference. The explanations should focus on such areas as a knowledgeable, realistic risk assessment; projected use of management reserve; estimate for undistributed budget; and higher management knowledge of current or future contract conditions. The assumptions, conditions and methodology underlying all management estimates at completion must be explained. (See 5.2.2 to 5.2.2.3, 5.2.2.5, 5.2.6.9 and 5.2.6.10 above.) The contractor must also explain the reasons for significant shifts in time-phasing of the estimate at completion. (See 5.4.2.6 above.)

5.6.4.2 Undistributed Budget. Identify the effort to which the undistributed budget applies. Also, explain any variance between the undistributed budget and the estimate for undistributed budget in Formats 1 and 2. (See 5.2.4.4 and 5.3.1.4 above.)

5.6.4.3 Management Reserve Changes. Identify the sources and uses of management reserve changes during the reporting period. For management reserve uses, identify the WBS and organizational elements to which applied, and the reasons for application. (See 5.2.4.6 above.)

5.6.4.4 Baseline Changes. Explain reasons for significant shifts in time-phasing of the PMB shown on Format 3. (See 5.4.2.3 above.)

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- 5.6.4.5 Staffing Level Changes. Explain significant changes in the total staffing estimate at completion shown on Format 4. Also, explain reasons for significant shifts in time-phasing of planned staffing. (See 5.5.5 above.)
- 5.6.5 Formal Reprogramming (Over Target Baseline). If the difference shown in Block 5.g on Format 3 becomes a negative value or changes in value, provide information on the following:
- 5.6.5.1 Authorization. Procuring activity authorization for the baseline change which resulted in negative value or change.
- 5.6.5.2 Reason. A discussion of the reason(s) for the change.
- 5.6.5.3 CPR Reporting. A discussion of how the change affected CPR reporting (i.e., amount allocated to management reserve, adjustments to cost or schedule variances, etc.).
- (See 5.4.1.7, 5.2.5.1 and 5.2.6.7 above.)
- 5.6.5.4 Schedule. Indicate whether the contract schedule was retained for performance measurement or was replaced with a schedule that exceeds the contractual schedule (Over Target Schedule).
- 5.6.6 Over Target Schedule. If a performance measurement schedule exceeding the contractual schedule (Over Target Schedule) has been implemented, provide a discussion of the pertinent information, such as authorization, reasons and significant dates.

(See 5.4.1.10.1 above.)

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COST PERFORMANCE REPORT FORMAT 1 - WORK BREAKDOWN STRUCTURE										DOLLARS IN _____					
1. CONTRACTOR			2. CONTRACT			3. PROGRAM			4. REPORT PERIOD						
a. NAME			a. NAME			a. NAME			a. FROM (YYYYMMDD)						
b. LOCATION (Address and ZIP Code)			b. NUMBER						b. TO (YYYYMMDD)						
			c. TYPE	d. SHARE RATIO		b. PHASE (X one)									
						<input type="checkbox"/> R&D	<input type="checkbox"/> Execution								
5. CONTRACT DATA															
a. QUANTITY		b. NEGOTIATED COST	c. EST. COST AUTHORIZED UNPRICED WORK		d. TARGET PROFIT/FEE	e. TARGET PRICE		f. ESTIMATED PRICE	g. CONTRACT CEILING	h. ESTIMATED CONTRACT CEILING					
6. ESTIMATED COST AT COMPLETION						7. AUTHORIZED CONTRACTOR REPRESENTATIVE									
	MANAGEMENT ESTIMATE AT COMPLETION (1)		CONTRACT BUDGET BASE (2)		VARIANCE (3)	a. NAME (Last, First, Middle Initial)			b. TITLE						
a. BEST CASE						c. SIGNATURE						d. DATE SIGNED (YYYYMMDD)			
b. WORST CASE															
c. MOST LIKELY															
8. PERFORMANCE DATA															
ITEM (1)	CURRENT PERIOD					CUMULATIVE TO DATE					REPROGRAMMING ADJUSTMENTS		AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		COST VARIANCE	BUDGET	BUDGETED	ESTIMATED	VARIANCE
	WORK SCHEDULED (2)	WORK PERFORMED (3)	PERFORMED (4)	SCHEDULE (5)	COST (6)	WORK SCHEDULED (7)	WORK PERFORMED (8)	PERFORMED (9)	SCHEDULE (10)	COST (11)	(12)	(13)	(14)	(15)	(16)
a. WORK BREAKDOWN STRUCTURE ELEMENT															
b. COST OF MONEY															
c. GENERAL & ADMINISTRATIVE															
d. UNDISTRIBUTED BUDGET															
e. SUBTOTAL (Performance Measurement Baseline)															
f. MANAGEMENT RESERVE															
g. TOTAL															
9. RECONCILIATION TO CONTRACT BUDGET BASE															
a. VARIANCE ADJUSTMENT															
b. TOTAL CONTRACT VARIANCE															

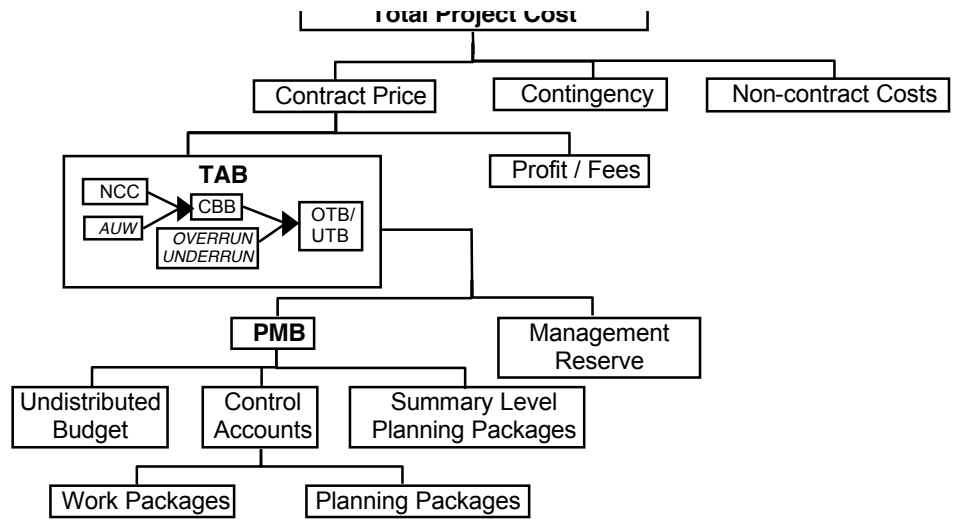
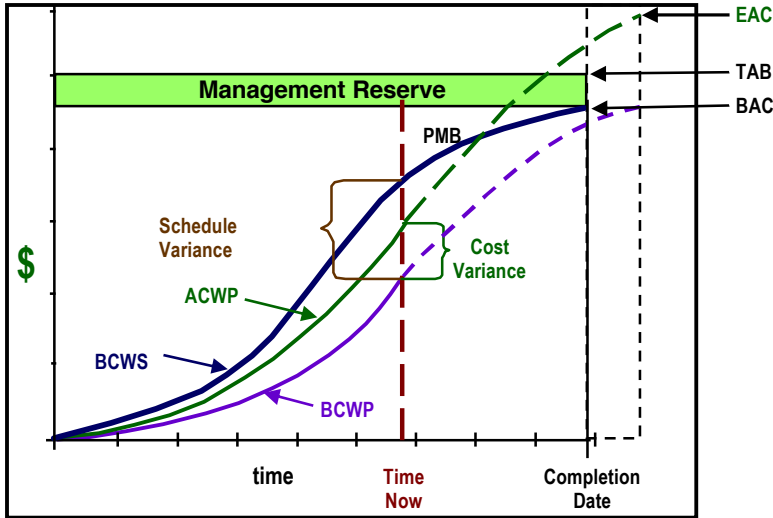
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COST PERFORMANCE REPORT FORMAT 2 - ORGANIZATIONAL CATEGORIES												DOLLARS IN _____			
1. CONTRACTOR				2. CONTRACT				3. PROGRAM				4. REPORT PERIOD			
a. NAME				a. NAME				a. NAME				a. FROM (YYYYMMDD)			
b. LOCATION (Address and ZIP Code)				b. NUMBER								b. TO (YYYYMMDD)			
				c. TYPE		d. SHARE RATIO		b. PHASE (X one)							
								R&D		Execution					
5. PERFORMANCE DATA															
ITEM (1)	CURRENT PERIOD					CUMULATIVE TO DATE					REPROGRAMMING ADJUSTMENTS		AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED (4)	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED (9)	VARIANCE		COST VARIANCE (12)	BUDGET (13)	BUDGETED (14)	ESTIMATED (15)	VARIANCE (16)
	WORK SCHEDULED (2)	WORK PERFORMED (3)		SCHEDULE (5)	COST (6)	WORK SCHEDULED (7)	WORK PERFORMED (8)		SCHEDULE (10)	COST (11)					
a. ORGANIZATIONAL CATEGORY															
b. COST OF MONEY															
c. GENERAL & ADMINISTRATIVE															
d. UNDISTRIBUTED BUDGET															
e. SUBTOTAL (Performance Measurement Baseline)															
f. MANAGEMENT RESERVE															
g. TOTAL															

COST PERFORMANCE REPORT FORMAT 3 - BASELINE										DOLLARS IN _____					
1. CONTRACTOR			2. CONTRACT				3. PROGRAM			4. REPORT PERIOD					
a. NAME			a. NAME				a. NAME			a. FROM (YYYYMMDD)					
b. LOCATION (Address and ZIP Code)			b. NUMBER							b. TO (YYYYMMDD)					
			c. TYPE		d. SHARE RATIO		b. PHASE (X one)								
							<input type="checkbox"/> R&D			<input type="checkbox"/> Execution					
5. CONTRACT DATA															
a. ORIGINAL NEGOTIATED COST		b. NEGOTIATED CONTRACT CHANGES		c. CURRENT NEGOTIATED COST (a. + b.)		d. ESTIMATED COST OF AUTHORIZED UNPRICED WORK		e. CONTRACT BUDGET BASE (c. + d.)		f. TOTAL ALLOCATED BUDGET		g. DIFFERENCE (e. - f.)			
h. CONTRACT START DATE (YYYYMMDD)		i. CONTRACT DEFINITIZATION DATE (YYYYMMDD)		j. PLANNED COMPLETION DATE (YYYYMMDD)		k. CONTRACT COMPLETION DATE (YYYYMMDD)		l. ESTIMATED COMPLETION DATE (YYYYMMDD)							
6. PERFORMANCE DATA															
ITEM (1)	BCWS CUMULATIVE TO DATE (2)	BCWS FOR REPORT PERIOD (3)	BUDGETED COST FOR WORK SCHEDULED (BCWS) (Non-Cumulative)						UNDIS-TRIBUTED BUDGET (15)	TOTAL BUDGET (16)					
			SIX MONTH FORECAST								ENTER SPECIFIED PERIODS				
			+ 1 (4)	+ 2 (5)	+ 3 (6)	+ 4 (7)	+ 5 (8)	+ 6 (9)			(10)	(11)	(12)	(13)	(14)
a. PERFORMANCE MEASUREMENT BASELINE (Beginning of Period)															
b. BASELINE CHANGES AUTHORIZED DURING REPORT PERIOD															
c. PERFORMANCE MEASUREMENT BASELINE (End of Period)															
7. MANAGEMENT RESERVE															
8. TOTAL															



Department of Energy Earned Value Management Gold Card*



TERMINOLOGY

TPC	Total Project Cost	Total budget authorized for the project; the sum of all budgets
Ccc	Contingency	Amount withheld by the government for management control purposes
NCC	Negotiated Contract Cost	Contract price less profit / fee(s)
AUW	Authorized Unpriced Work	Work contractually approved, but not yet negotiated / definitized
CBB	Contract Budget Base	Sum of NCC and AUW
OTB/UTB	Over Target Baseline	Sum of CBB and recognized overrun/underrun
TAB	Total Allocated Budget	Sum of all budgets for work on contract = NCC, CBB, or OTB
BAC	Budget At Completion	Total budget for total contract thru any given level
PMB	Performance Measurement Baseline	Contract time-phased budget plan
MR	Management Reserve	Budget withheld by Ktr PM for unknowns / risk management
UB	Undistributed Budget	Broadly defined activities not yet distributed to CAs
CA	Control Account	Lowest CWBS element assigned to a single focal point to plan & control scope / schedule/ budget
WP	Work Package	Near-term, detail-planned activities within a CA
PP	Planning Package	Far-term CA activities not yet defined into WPs
SLPP	Summary Level Planning Package	Far-term activities not yet defined into CAs
BCWS	Budgeted Cost for Work Scheduled	Value of work planned to be accomplished = PLANNED VALUE
BCWP	Budgeted Cost for Work Performed	Value of work accomplished = EARNED VALUE
ACWP	Actual Cost of Work Performed	Cost of work accomplished = ACTUAL COST
EAC	Estimate At Completion	Estimate of total cost for total contract thru any given level; may be generated by Ktr, MO, et al. = $EAC_{Ktr} / PMO / et al$
LRE	Latest Revised Estimate	Ktr's EAC or EAC_{Ktr}
TCPI	To Complete Performance Index	Efficiency needed from 'time now' to achieve an EAC

PERFORMANCE REPORTING OF CONTRACTOR EVM INFORMATION

- Format 1 - Work Breakdown Structure normally at Level 3 of the Contract Work Breakdown Structure (CWBS)
 - Format 2 - Organization Breakdown Structure at the Control Account level reflecting contractor's internal organization established to execute contract.
 - Format 3 - Baseline changes from project inception
 - Format 4 - Staffing forecast
 - Format 5 - Analysis of variances
- (Format 1, 2, 5 are the formats routinely used for most projects)

*This chart is a adaptation of the original Defense Acquisition University's Gold Card. This adaptation includes relationships to the Performance Baseline and deletes reference to DoD guidelines. Credit for the Gold Card and all its forms should be given to DAU not to DOE.

VARIANCES

Favorable is Positive, Unfavorable is Negative

Cost Variance $CV = BCWP - ACWP$ $CV \% = (CV / BCWP) * 100$
 Schedule Variance $SV = BCWP - BCWS$ $SV \% = (SV / BCWS) * 100$
 Variance at Completion $VAC = BAC - EAC$

PERFORMANCE INDICES

Favorable is > 1.0, Unfavorable is < 1.0

Cost Efficiency $CPI = BCWP / ACWP$
 Schedule Efficiency $SPI = BCWP / BCWS$

OVERALL STATUS

% Schedule $= (BCWS_{cum} / BAC) * 100$
 % Complete $= (BCWP_{cum} / BAC) * 100$
 % Spent $= (ACWP_{cum} / BAC) * 100$

ESTIMATE AT COMPLETION

$EAC = Actuals\ to\ Date + [(Remaining\ Work) / (Efficiency\ Factor)]$
 $EAC_{CPI} = ACWP_{cum} + [(BAC - BCWP_{cum}) / CPI_{cum}] = BAC / CPI_{cum}$
 $EAC_{Composite} = ACWP_{cum} + [(BAC - BCWP_{cum}) / (CPI_{cum} * SPI_{cum})]$

TO COMPLETE PERFORMANCE INDEX (TCPI)

$TCPI_{EAC} = Work\ Remaining / Cost\ Remaining = (BAC - BCWP_{cum}) / (EAC - ACWP_{cum})$

ESTIMATE TO COMPLETE

$ETC = Remaining\ Work / Earned\ Value$

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