Planning, Scheduling, and Budgeting

David R. Kester
Project Management Policy and Systems (PM-30)
Office of Project Management Oversight & Assessments (PM)

March 24, 2016

Topics to be Covered

- Overview of EVMS Requirements and Expectations
- Characteristics of a Compliant EVMS (Guidelines 6-10)
- Planning, Scheduling, and Budgeting (PSB) Topics, Techniques, and Quality Checks
  - Vertical and Horizontal Schedule Integration
  - Levels of Detail
  - Time Phasing the Budget Baseline
  - Authorizing Work by Cost Element
  - Objective Measures tied to Accomplishment
  - Baseline Control
  - Management Reserve Usage
- Data Driven Decision Making

Overview of EVMS Requirements

Enduring Wisdom . . .

“Management is a practice like medicine, results are not in theory but in what happens.”

» Peter F. Drucker

Overview of EVMS Requirements

Increased Pressure to use EVMS and Certified Internal Controls

- OMB Circular A-11, Part 7 Capital Programming Guide
- DOE Order 413.3B
- Employ EVMS Assessment Tools and Techniques for Multiple Mission Purposes

EVMS Tenants

Proactive Decision Making

- Manage cost, schedule, and performance within constraints
- Initiate effective cost, schedule, and performance tradeoffs when constraints are not achievable
- Continually evaluate progress and predict and mitigate problems

EVMS Tenants

EIA-748 Guideline 6 ‘Schedule Work’

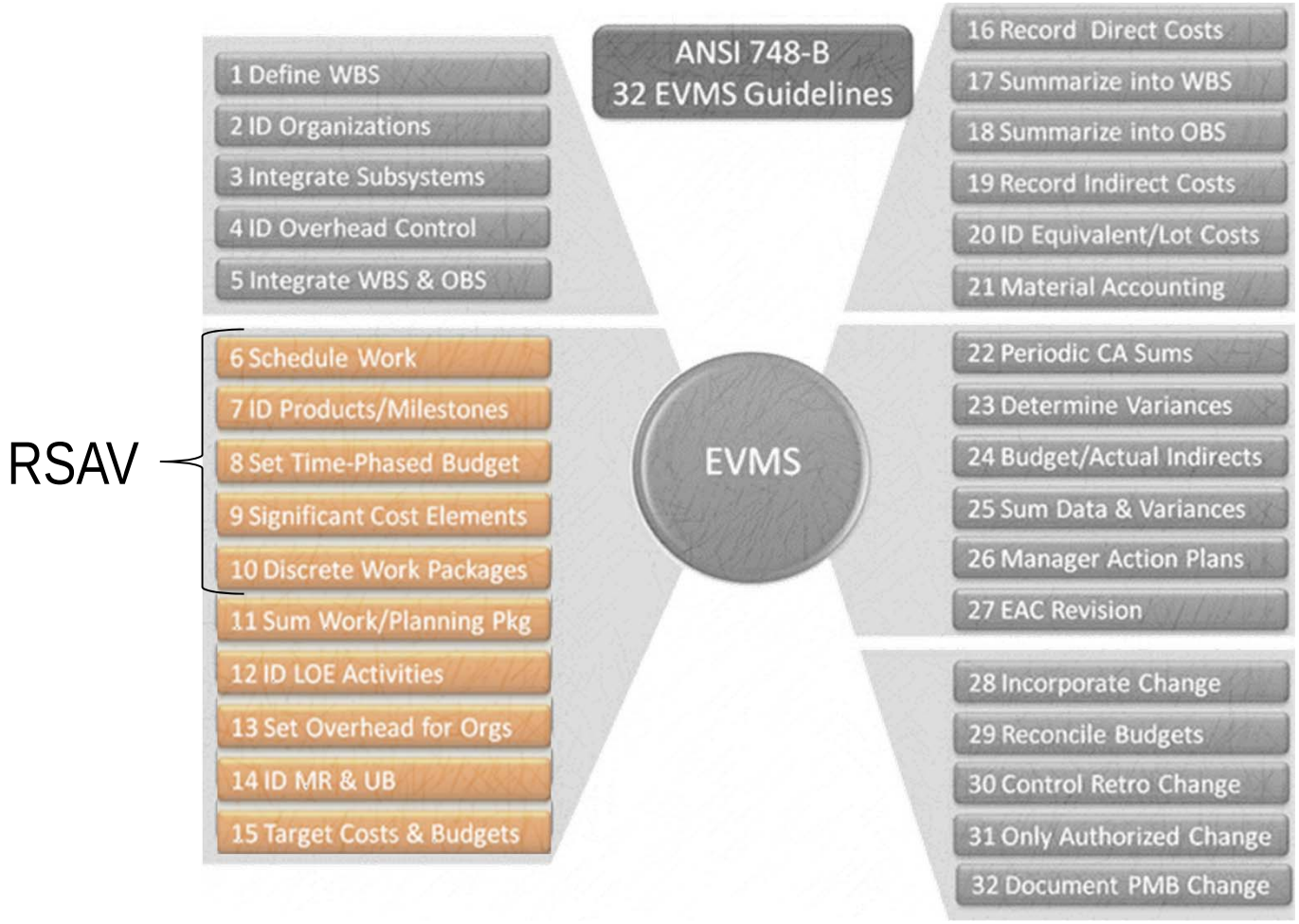
- Did the development of the schedule validate a top-down, bottom-up (hierarchical planning) approach to determine the overall project pace and completion date requirements?
- Does the schedule include the major milestones, key events, significant accomplishments or other key decision points to measure actual project progress?

EVMS Tenants

EIA-748 Guideline 6 ‘Schedule Work’

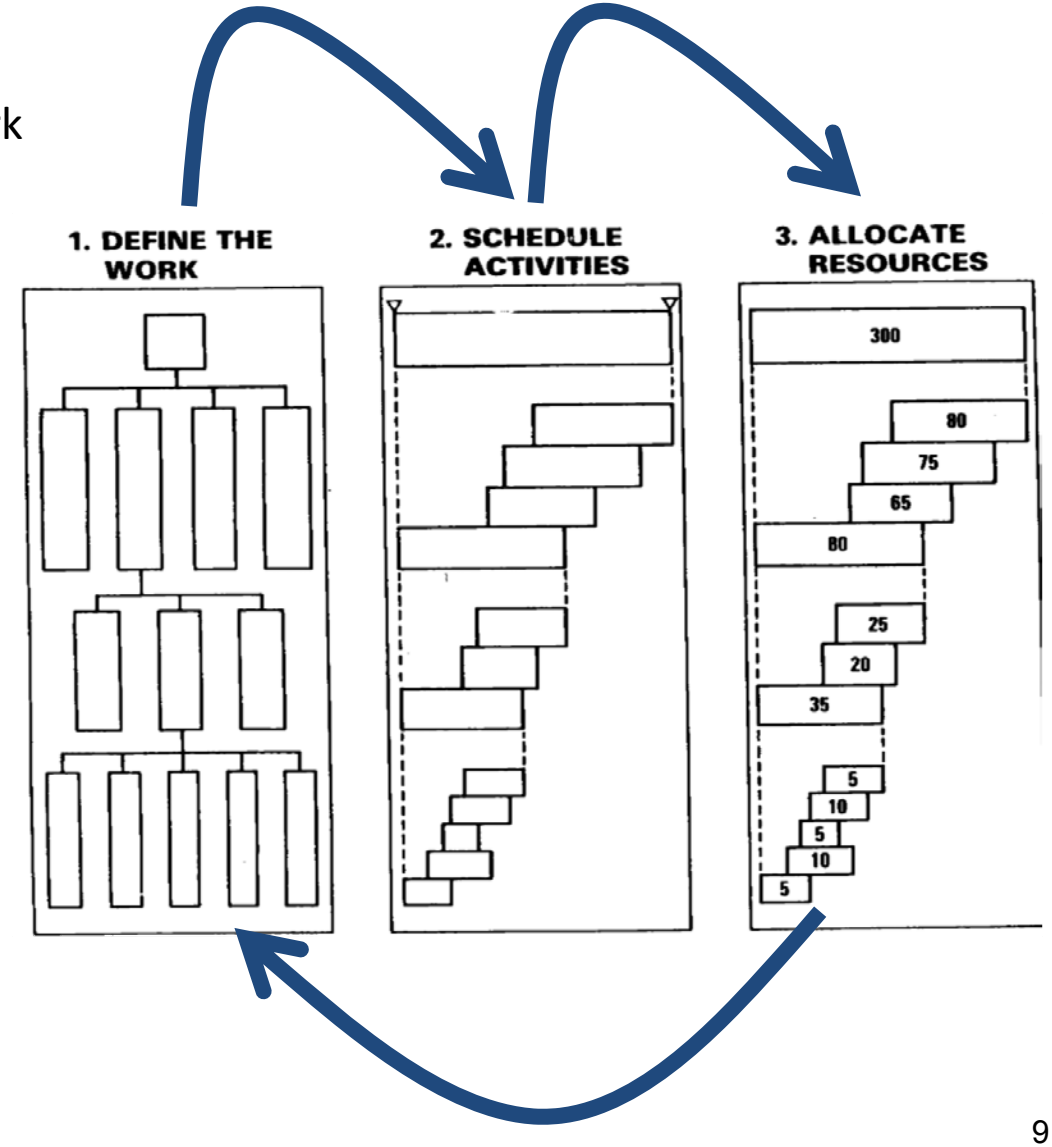
- Are physical and technical performance parameters including quantity, size, and functions used to develop the schedule?
- Asks and answers the question what does ‘done’ look like rather than what work has been ‘done’

Planning, Scheduling, and Budgeting



Integrated Parameters Illustrated

- **Technical**
  - Clear understanding of scope
  - Good technical definition of work
- **Schedule**
  - Completeness of the schedule
  - Realism of the schedule
  - Reasonableness of the schedule
- **Resources**
  - Realism of the resource plan, including staffing availability and usage, equipment, and materials
- **Cost**
  - Realism of the cost estimate
  - Time phasing of the costs
  - Funding requirements



Planning, Scheduling, and Budgeting

Time-Phased Budget Baseline

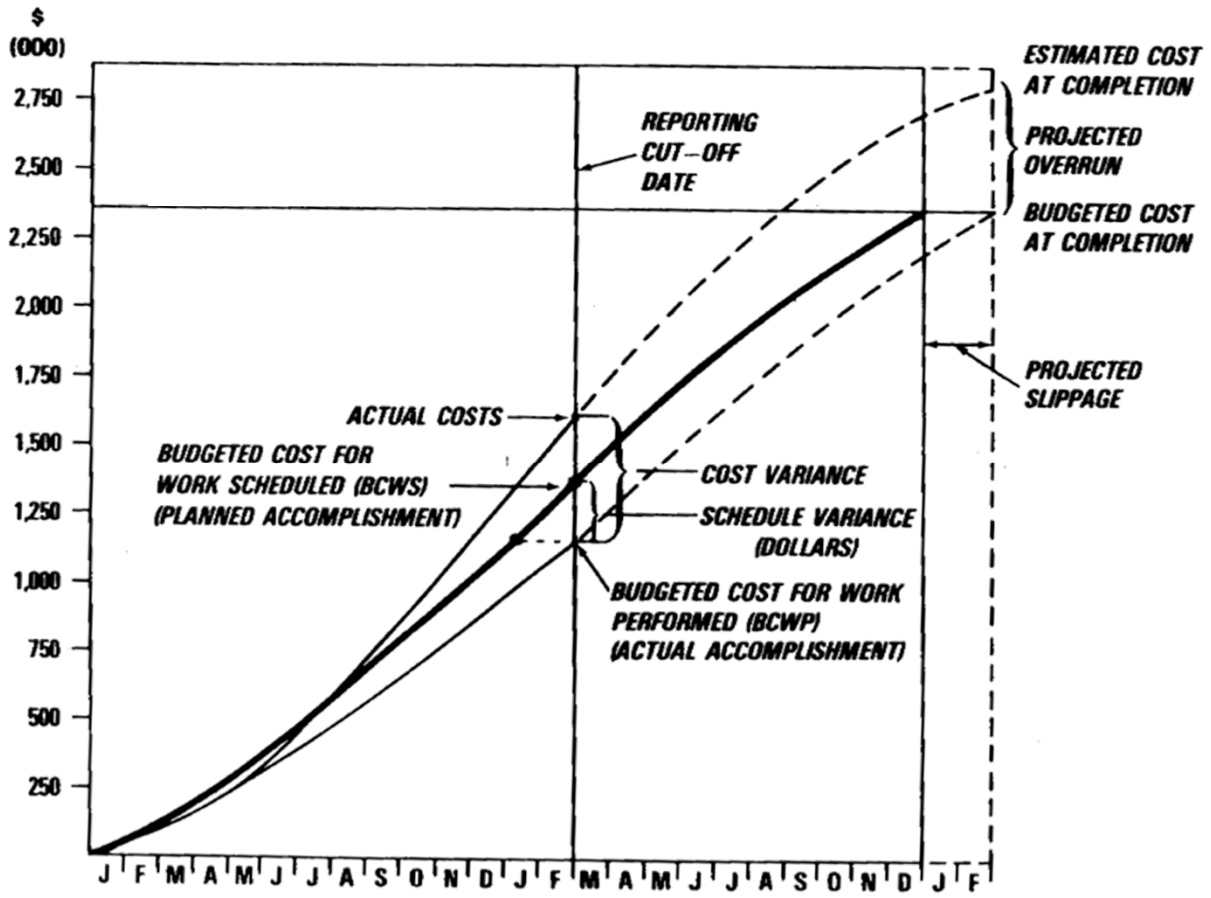
- Assignment of budgets to scheduled work produces the baseline (S Curve)
- Valid cost and schedule data depend on developing a meaningful baseline
- Enable managers to assess performance, and to better understand inherent risks

Planning, Scheduling, and Budgeting

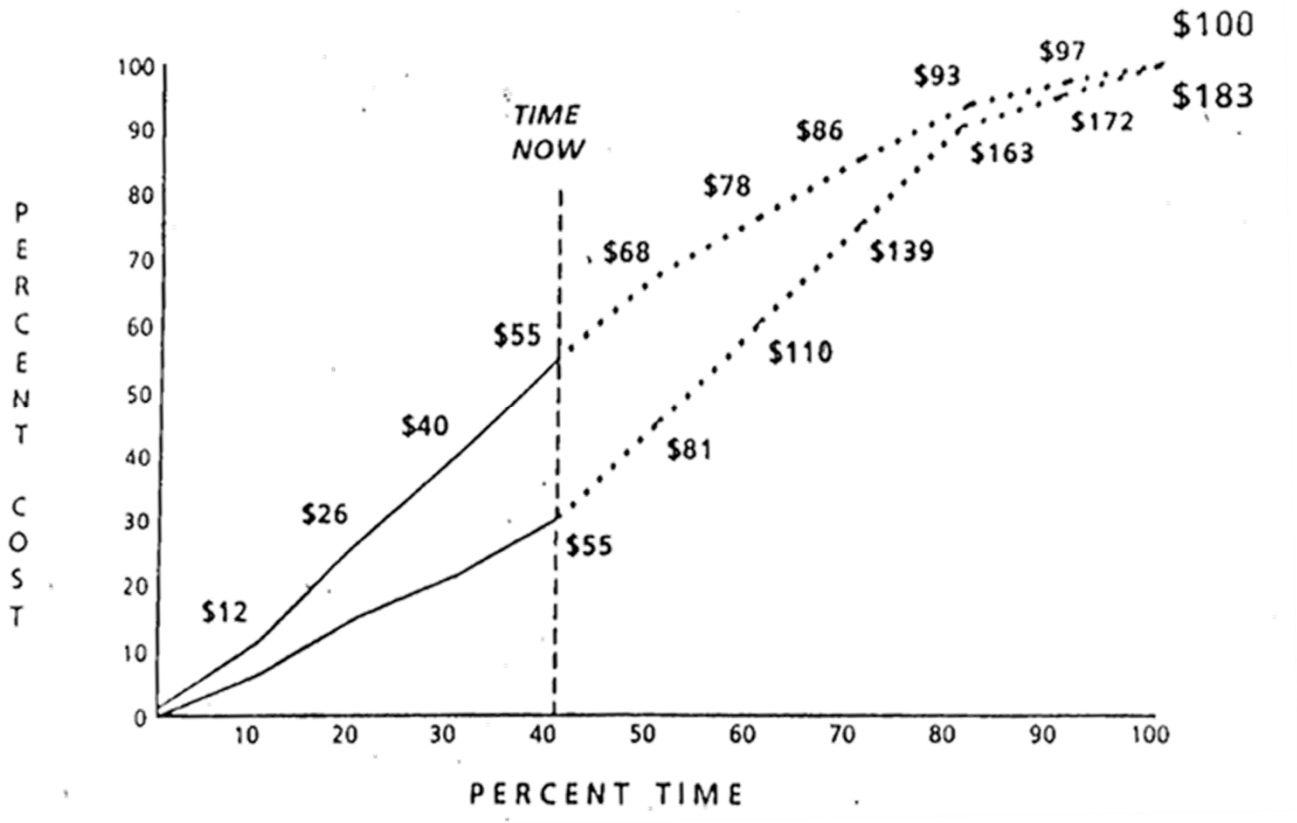
What is the 'S' Curve?

- Why is it an important management tool?
- How can it be use to analyze a project?
- How is it generated?
- Types:
  - Baseline
  - Target (Forecast)
  - Actual

Budget Baseline S Curve Illustrated



S Curve EAC Forecast Illustrated

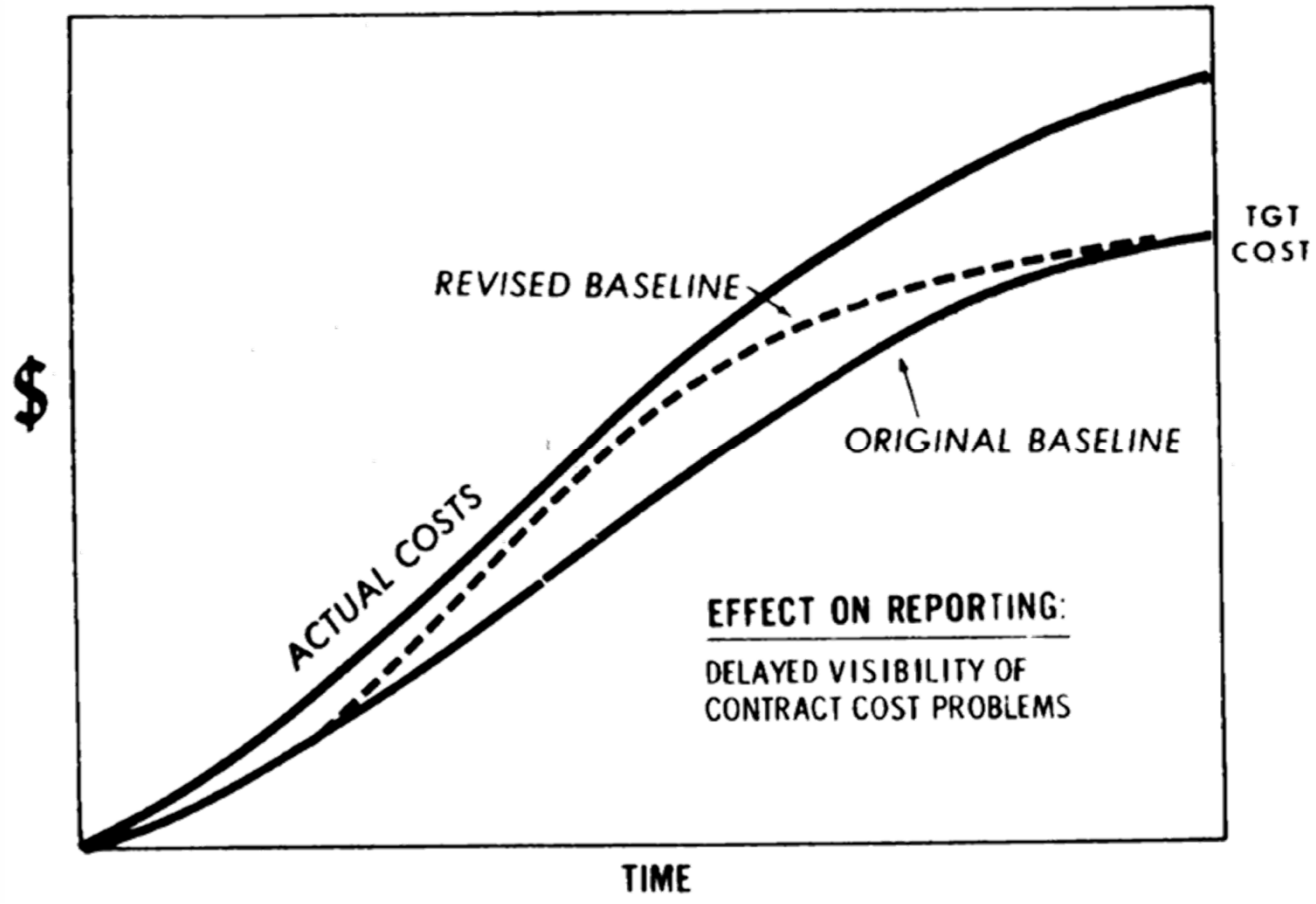


Planning, Scheduling, and Budgeting

Red Flags!

- Rubber Baseline
  - Changes to the Performance Measurement Baseline (PMB) meant to generate favorable cost or schedule variances to mask poor performance
- Application of significant MR early on in the project

Rubber Baseline Illustrated



Planning, Scheduling, and Budgeting (PSB) Topics, Techniques, and Quality Checks

- Vertical and Horizontal Schedule Integration
- Levels of Detail – Durations, Relationships, and Planning Horizons
- Time Phasing the Budget Baseline
- Authorizing Work by Cost Element
- Objective Measures tied to Accomplishment
- Baseline Control
- Management Reserve Usage

Planning, Scheduling, and Budgeting

Baselining the Project

- Schedule activities "as late as possible" leaving the entire float at the front end of the project
- Schedule activities "as early as possible" leaving float at the back end of the project
- ***What's the right thing to do?***

Planning, Scheduling, and Budgeting

Integrated Master Schedule (IMS)

- Integrates the planned work, the resources necessary to accomplish that work, and the associated budget
- Includes the entire required scope of effort, including the effort necessary from all government, contractor, and other key parties
- Connects all the scheduled work in a network, or collection of logically linked sequences of activities

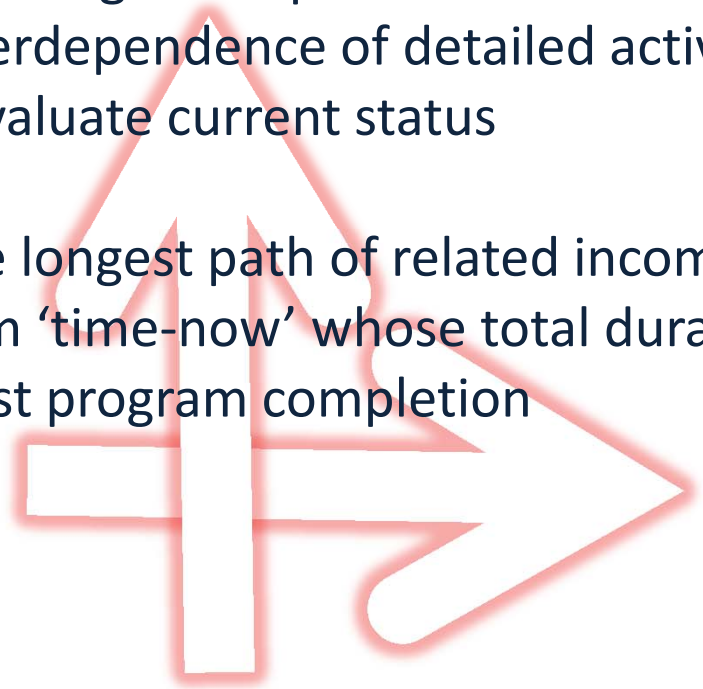
Planning, Scheduling, and Budgeting

Integrated Master Schedule (IMS)

- Sequences clearly show how related portions of work depend on one another
- Consist of forecasted dates are automatically recalculated upon taking status
- Should be the focal point of project management

Planning, Scheduling, and Budgeting

- **Verifying That the Schedule Can Be Traced Horizontally and Vertically**
  - Horizontal and vertical traceability demonstrates:
    - the schedule is rational
    - has been planned in a logical sequence
    - accounts for the interdependence of detailed activities
    - provides a way to evaluate current status
  - The Critical Path is the longest path of related incomplete tasks in the logic network from ‘time-now’ whose total duration determines the earliest program completion



Planning, Scheduling, and Budgeting

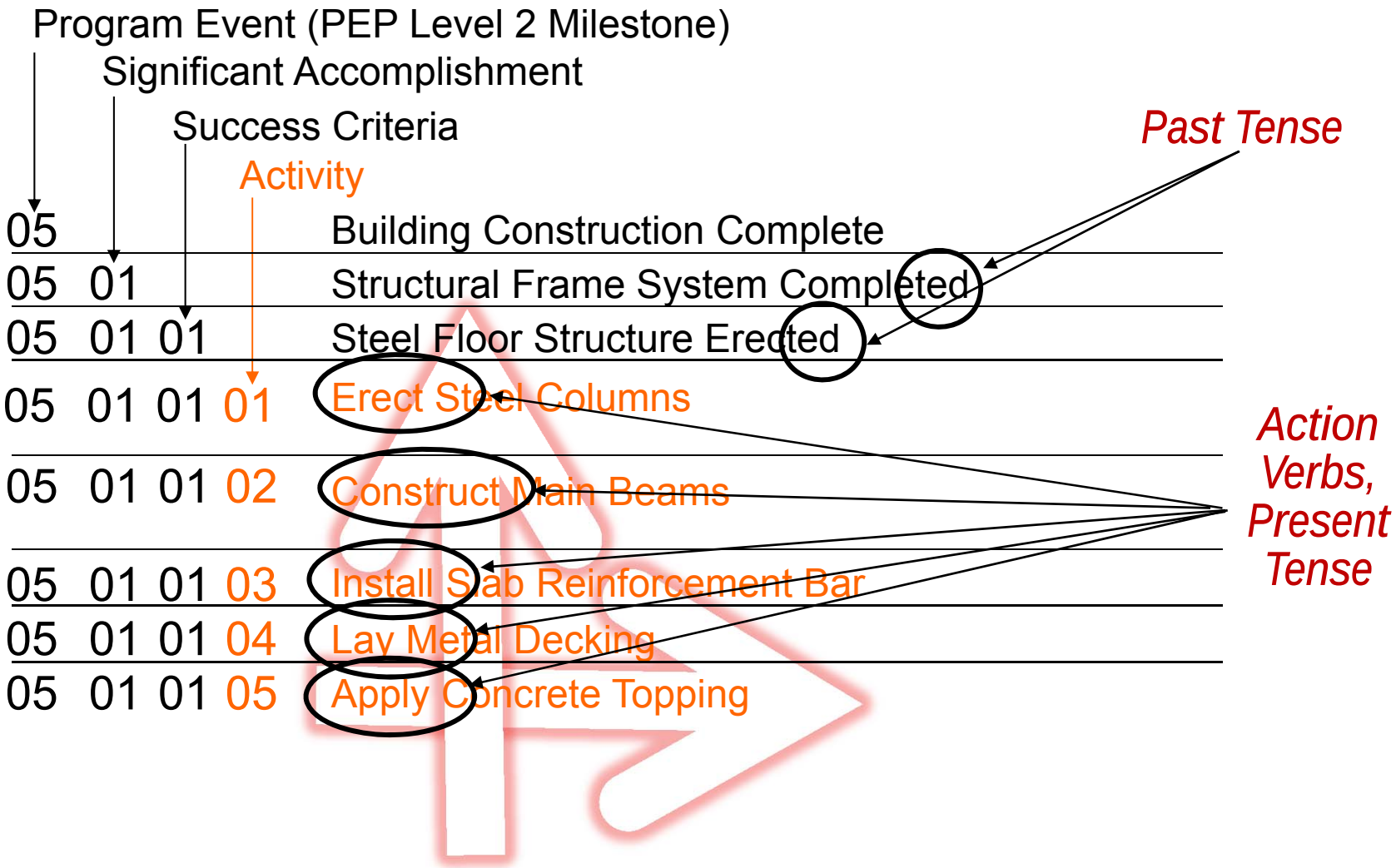
- **The Integrated Master Plan (IMP) and IMS Concept**
  - IMP is a top down, event-driven plan that documents the key events, accomplishments, and criteria in the design and construction of a project
    - IMP is the 'What'
  - IMP is expanded in Integrated Master Schedule (IMS) to incorporate all detailed activities required to accomplish individual IMP criteria
    - IMS is the 'When'
  - The event driven plan answers the question: 'what does done look like, rather than what work has been done'

Planning, Scheduling, and Budgeting

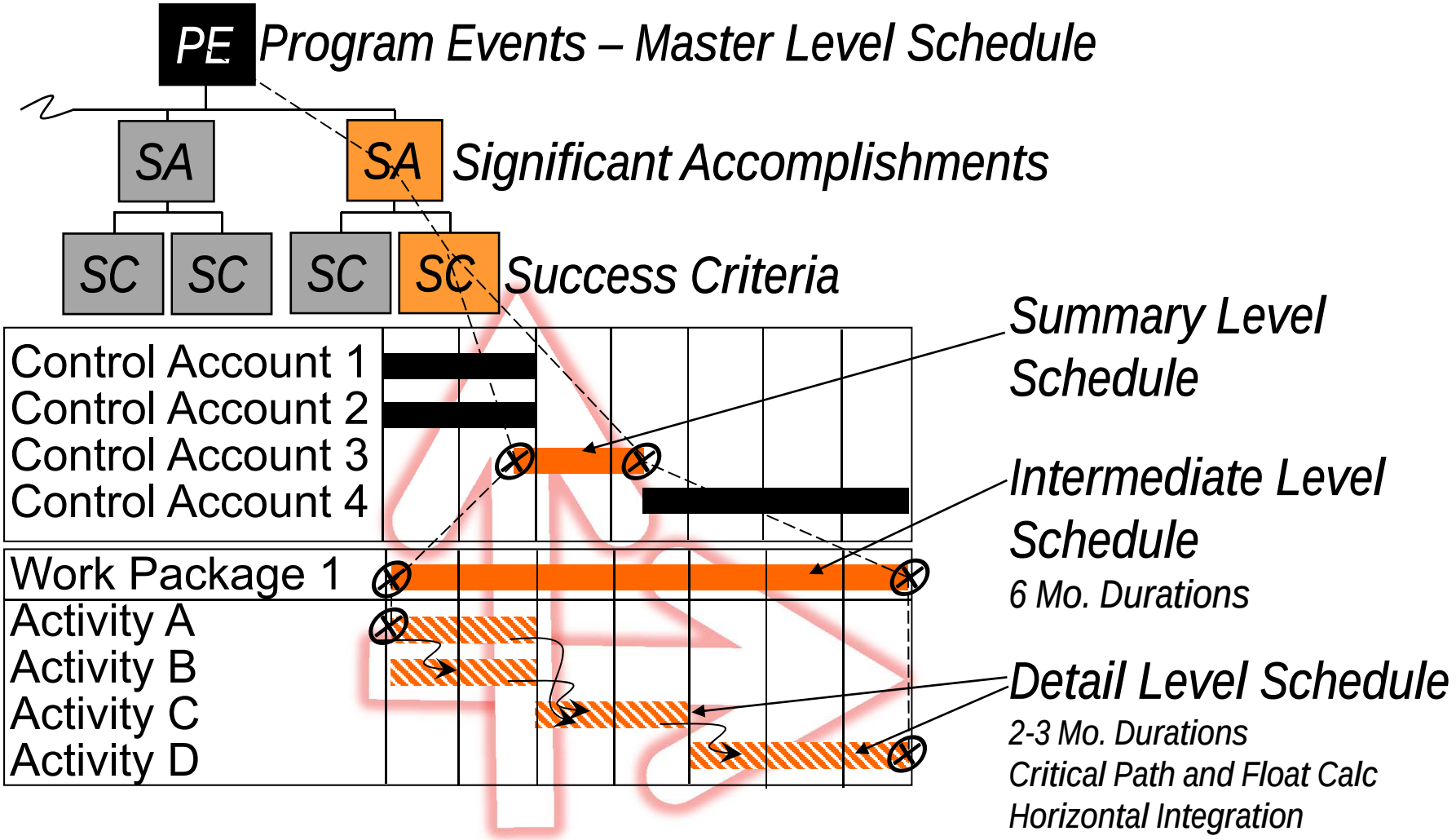
Integrated Master Plan (IMP)

- Scope Specifications and Requirements
- Work Breakdown Structure (WBS)
- Functionality and quality attributes

IMP and IMS Illustrated



IMP and IMS Illustrated



Levels of Detail – Durations

Levels of Detail (Durations)

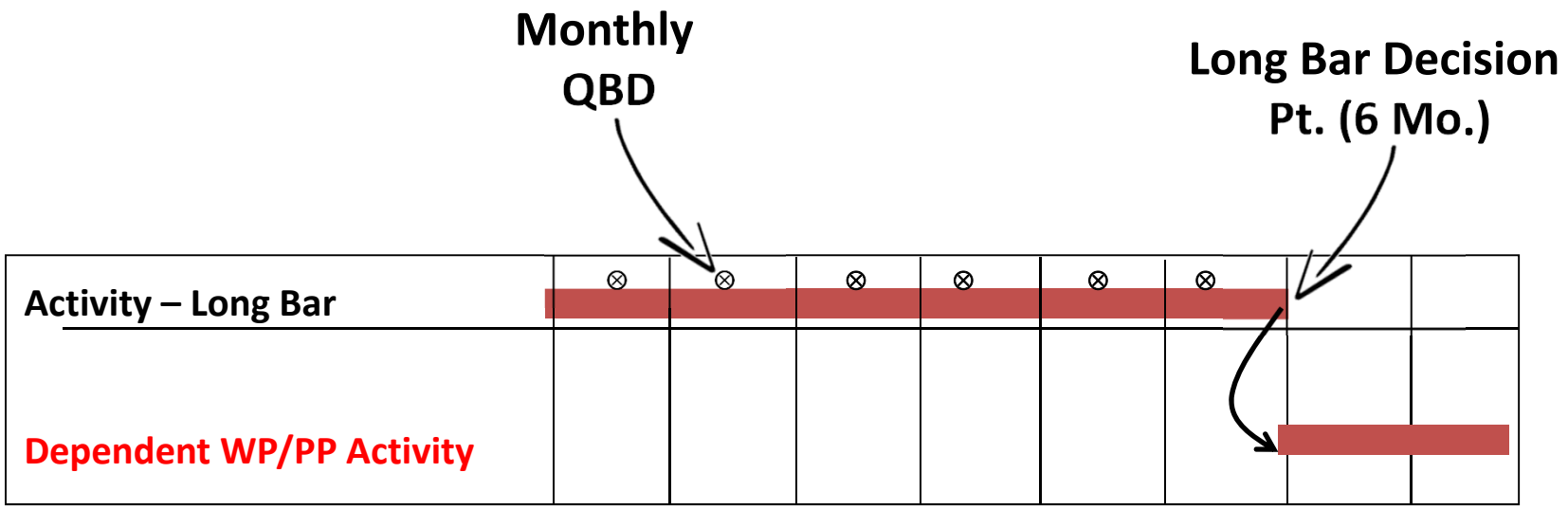
- Keeping a work package duration short and consistent with the status cycle will provide a greater degree of visibility and understanding
- The intent is not to force contractors to make arbitrary cutoff points simply to have short-span activities, but to plan according to the way the work will be done

Levels of Detail – Durations

Levels of Detail (Durations)

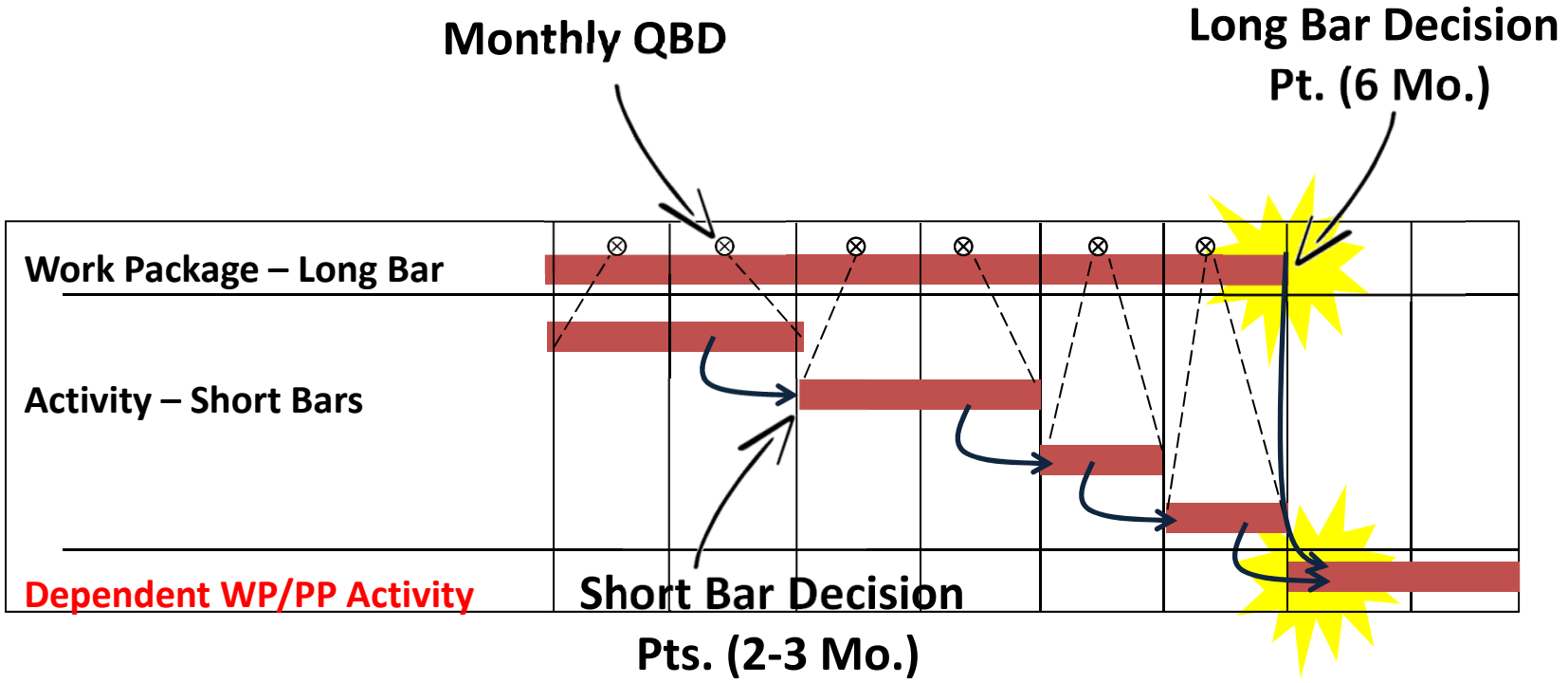
- The work package level is the lowest level of a work breakdown structure (WBS)
- Preferably 6 months in length to correspond with the rolling wave period
- Earned Value Technique (EVT) is assigned at the work package level
- Durations are related to the assigned resources and estimated work being performed

Levels of Detail – Durations Illustrated



Typical finding – Creating very long work packages. This high level scheduling approach results in leads and lags to simulate lower-level detailed connections. Impacts of delays are difficult to accurately assess and translate into updated completion dates.

Levels of Detail – Durations Illustrated

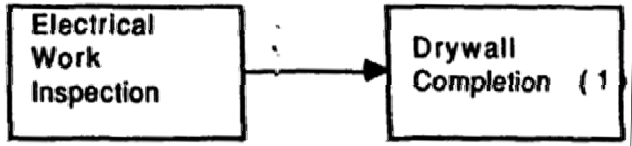


Levels of Detail – Relationships

Levels of Detail (Relationships and Sequencing)

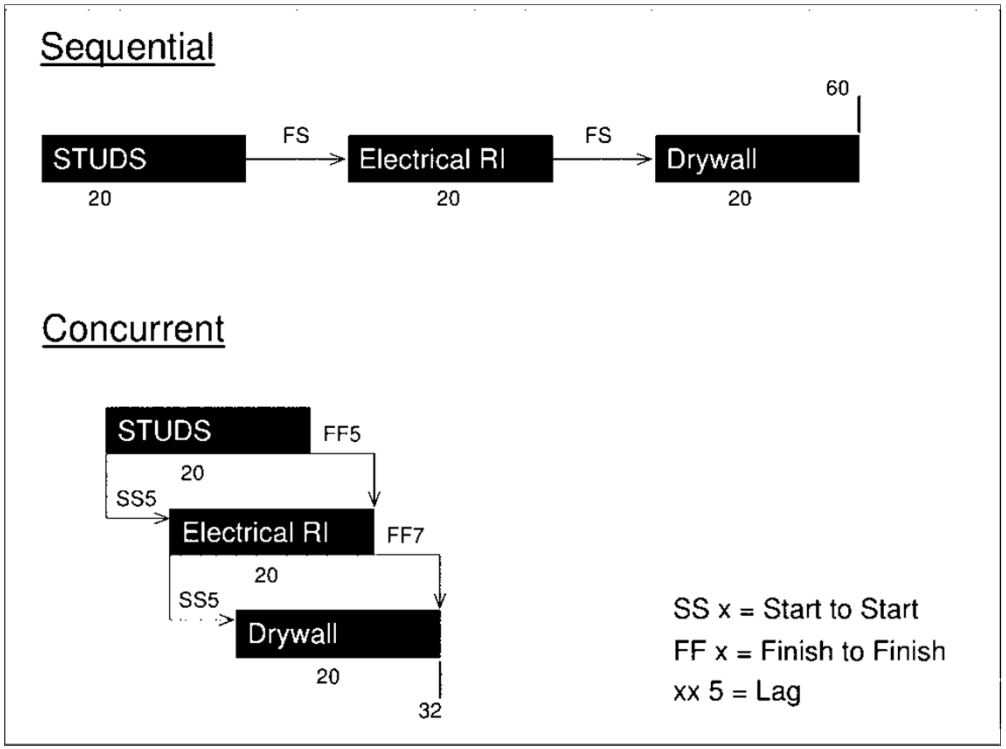
- Logical sequence of design and construction work package activities and planning packages in the project schedule from start to finish
- Capable of meeting the scope specifications and requirements and indicative of how the project will be built and cost
- Interdependencies (key hand-offs) are identified between prime and subcontract work

Activity Sequencing Illustrated

FACTOR	EXAMPLE CASE	DERIVED ACTIVITY SEQUENCE
Code Regulations (Inspection)	*Work in connection with an electric system shall not be covered or concealed until such work has been inspected and permission to conceal such work has been approved* (From [BOCA 90])	

(1) The drywall installation cannot have progressed to the point of hiding electrical work to be inspected.

Activity Sequencing Illustrated



Typical finding – Large percentage of the project schedule is sequenced concurrently increasing the complexities of the Critical Path and Near Critical Path calculation

Levels of Detail – Resource Allocation

Levels of Detail (Resourcing)

- Keeping a work package duration short and consistent with the status cycle will provide a greater degree of visibility and understanding
- The intent is not to force contractors to make arbitrary cutoff points simply to have short-span activities, but to plan according to the way the work will be done

Levels of Detail – Horizons

Levels of Detail (Phasing - Rolling Wave and Block Planning)

- Resource requirements, availability, and hours should be considered in the determination of activity durations
- Ensure the type (i.e., trade group) and quantity of resources are identified and understood and not over allocated to avoid delays
- Resource conflicts (over/under allocations) influences the project critical path and near critical path(s)

Levels of Detail – Horizons

Levels of Detail (Phasing - Rolling Wave and Block Planning)

- The transfer of planning package (or far-term) budgets into precise work package (or short-term) budgets
- Typically starts 30-45 days prior to the beginning of the next 6 month rolling wave planning period
- This process is followed until all long term budgets have been incorporated into a detailed plan

Authorization of Work

Authorized Work with Identification of Cost Elements

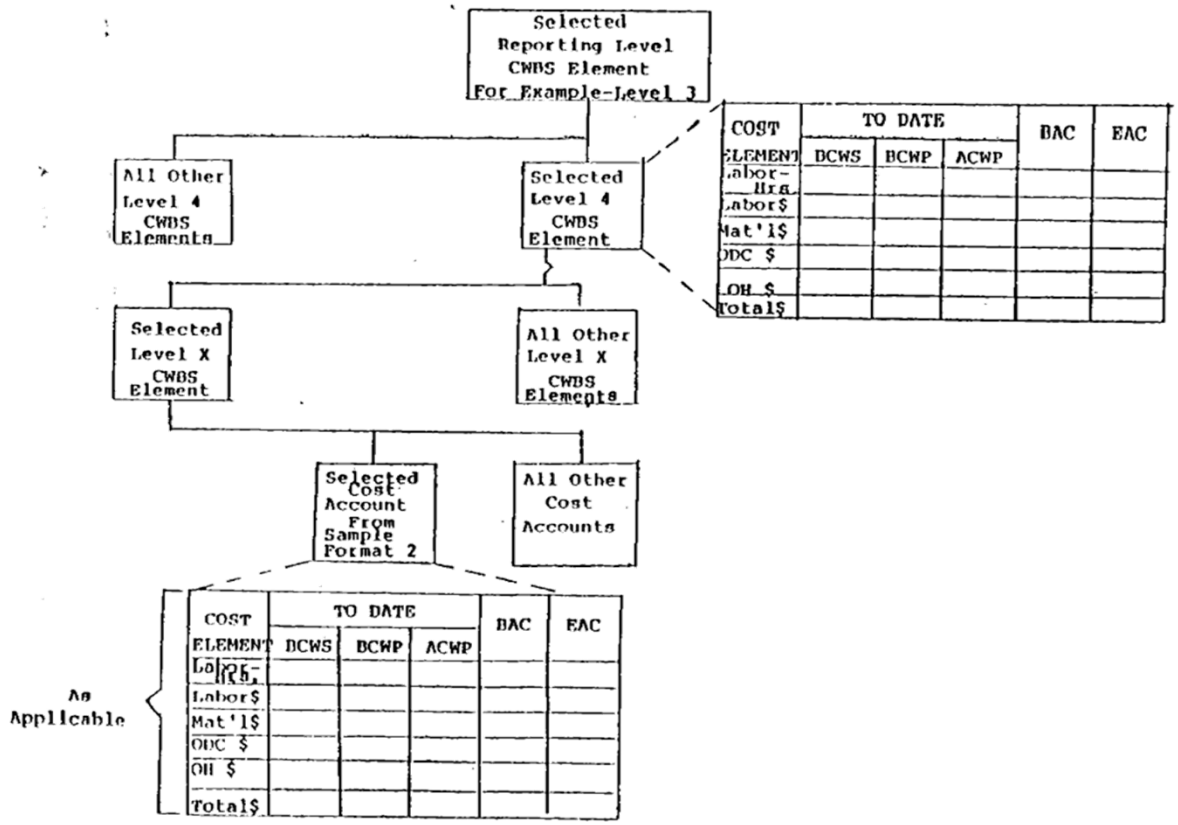
- Work authorization includes the control account relationship to the WBS element and responsible organization
- Approved control account is the project manager's vehicle to delegate responsibility for budget, schedule, and scope requirements to the control account manager

Authorization of Work

Authorized Work with Identification of Cost Elements

- Tie between the negotiated contract dollar value and the various work authorization documents to ensure contract target costs are properly translated into the PMB
- Budgets for Direct costs are those chargeable to a specific work package and include labor, materials, equipment, and any other resources defined by the project

Authorized Work by EOC Illustrated



Measure Accomplishments

Objective Measures of Progress

- Planning the work in small, manageable segments provides for a more accurate objective measurement of progress at the activity level
- It is important that BCWP is calculated in a manner consistent with the way work is planned (BCWS)

Measure Accomplishments

Objective Measures of Progress

- Earned value techniques are selected based on key attributes of the work, primarily the duration of the effort and the tangibility of its product
- The performance of work that should result in distinct, tangible products can be measured directly
- At each measurement period, the responsible manager makes an assessment of work completed

Baseline Change Control

Baseline Changes

- Replanning, or the realignment of scope, schedule, and budget within the Contract Budget Base (CBB), must be limited to preserve a stable baseline upon which performance is measured
  - Internally driven
  - Externally driven

Baseline Change Control

Baseline Changes

- The need may arise to use an Over Target Baseline (OTB) when project performance deviates from the plan to such an extent that the original plan no longer serves as a reasonable measurement device
- Any increase which results in a Total Allocated Budget (TAB) in excess of the Contract Budget Base (CBB) constitutes formal replanning or Over Target Baseline (OTB)
- An OTB requires customer approval

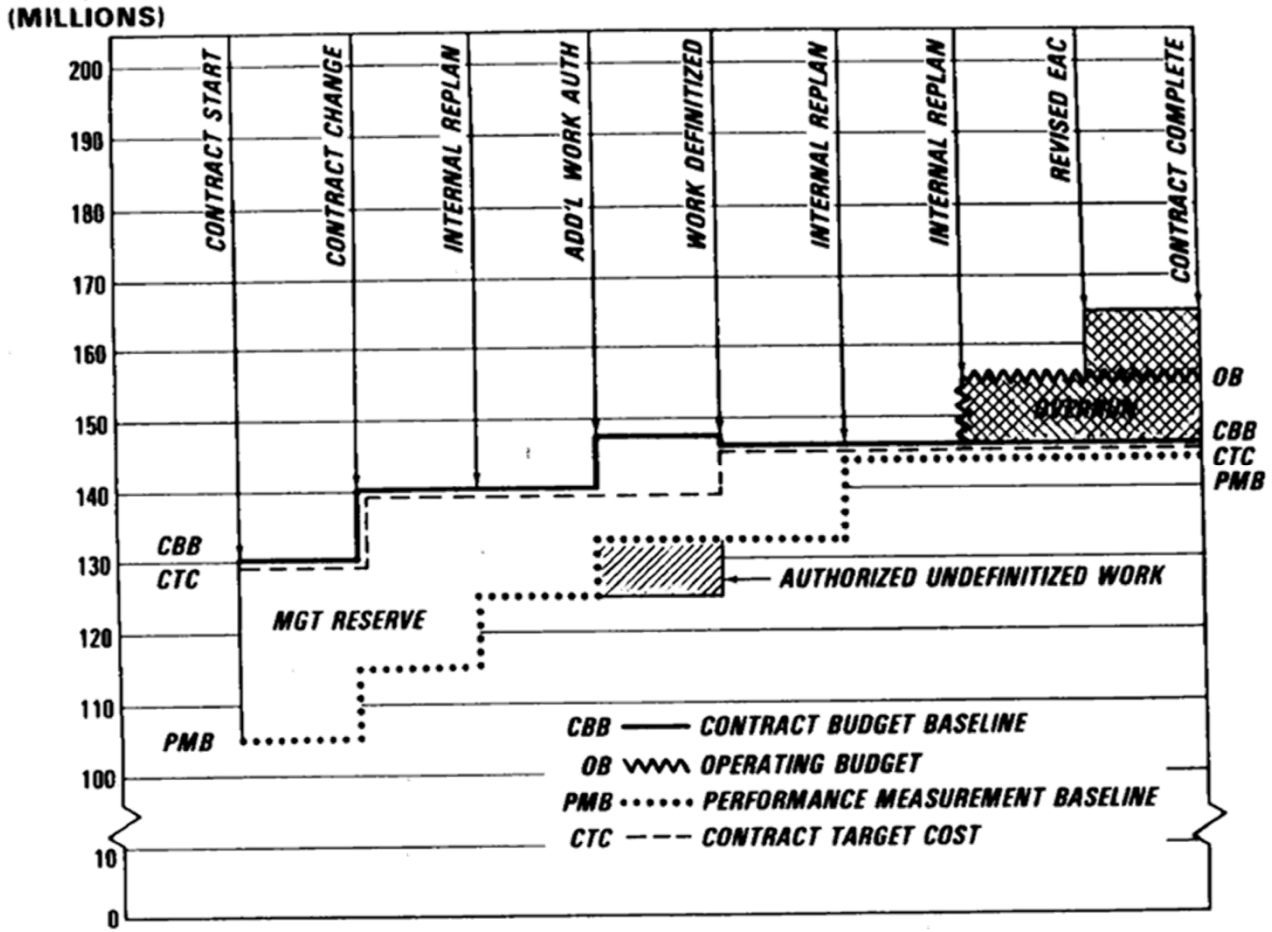
Baseline Change Control

Baseline Changes

- OTB may entail:
  - Replanning future work or work in process
  - Adjusting cost and/or schedule variances (single point adjustment)

- Rules of thumb
  - At least nine to twelve months work remaining
  - Minimum 15% cost overrun to remaining budgets
  - No more frequently than annually and preferably no more than once during the life of a contract

Baseline Changes Illustrated



Management Reserve Usage

MR Usage

- An amount of the total contract or project budget set aside for management control purposes by the contractor
- Management Reserve is the contractor's budget
- For unexpected growth within the currently authorized work scope, rate changes, risk and opportunity handling, and other project unknowns
- Cannot be used to offset accumulated overruns or under runs

Management Reserve Usage

MR Usage (Examples)

- Previously unrecognized tasks or realized risks consistent with the general scope of work of the contract
- Change in execution strategy (e.g., make/buy decisions)
- Direct and indirect rate changes and currency fluctuations
- Work that needs to be repeated (not the result of inaccurately reported progress)

Budget Execution and Funding

Funds v. Budget

- Management Reserve is BUDGET
  - Part of the Contract Budget Baseline and traces to the Performance Measurement Baseline
- Contingency is FUNDS
  - Can be applied to fund contractual changes, such as additional scope

For more information please reference Snippet 4.3: Management Reserve Versus Contingency and Budget Versus Funds

Best Practices for Project Schedules

- **A project's success depends in large part on the quality of its schedule**
  - Did the development of the schedule validate a top-down, bottom-up (hierarchical planning) approach to determine the overall project pace and completion date requirements?
  - Does the schedule include the major milestones, key events, significant accomplishments or other key decision points to measure actual project progress?
  - Are physical and technical performance parameters including quantity, size, and functions used to develop the schedule?

PSB in Review

A project's success depends in large part on the quality of its schedule

1. Define and display work using a WBS
2. Avoid the "get on with it" mentality
3. Develop a plan then schedule
4. Plan and manage in small increments
5. Networks are needed to manage workflow
6. Keep scope, cost and schedule integrated
7. Don't mistake PM methodologies with tools
8. Combining the analysis of the schedule with EVM
9. Don't measure progress to the wrong things
10. Keep information and data in real time

Data Driven Decision Making

- Methods for analyzing design and construction PMB risks primarily focus on schedule precedence diagramming and critical path techniques
- Developing numerical (or quantitative) techniques for the analysis and verification of system properties such as reliability (trustworthiness) and relevance (usefulness) of data
- Asking the right questions requires looking at the right data in the right way
- Diagnostic Testing (It's about the Data!)
  - A drop of blood (i.e., data), an instant diagnosis – Early Detection
  - Predictor for the likelihood of an issue
  - Reduce of the costs of operation!

Any Questions, Comments?