PDHonline Course P218 (3 PDH)

Introduction to Earned Value Management

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2020

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Introduction to Earned Value Management

Lawrence P. Duss, P.E

Course Content

EVM and its Principles can be defined in simple terms. EVM is universally used to track actual work put-in-place against a planned baseline of project costs.

An early predecessor to EVM was a Navy generated program by Admiral Rickover and his team called Planning Evaluation and Review Technique (PERT).

The accomplishment of work placed at any given time is called "Earned Value" or "Budgeted Cost of Work Performed (BCWP)".

The "Budgeted Cost of Work Scheduled (BCWS)" and "Actual Costs (ACWP)" are compared to "Earned Value" to provide several key reportable and, hopefully, correctable "Variances".

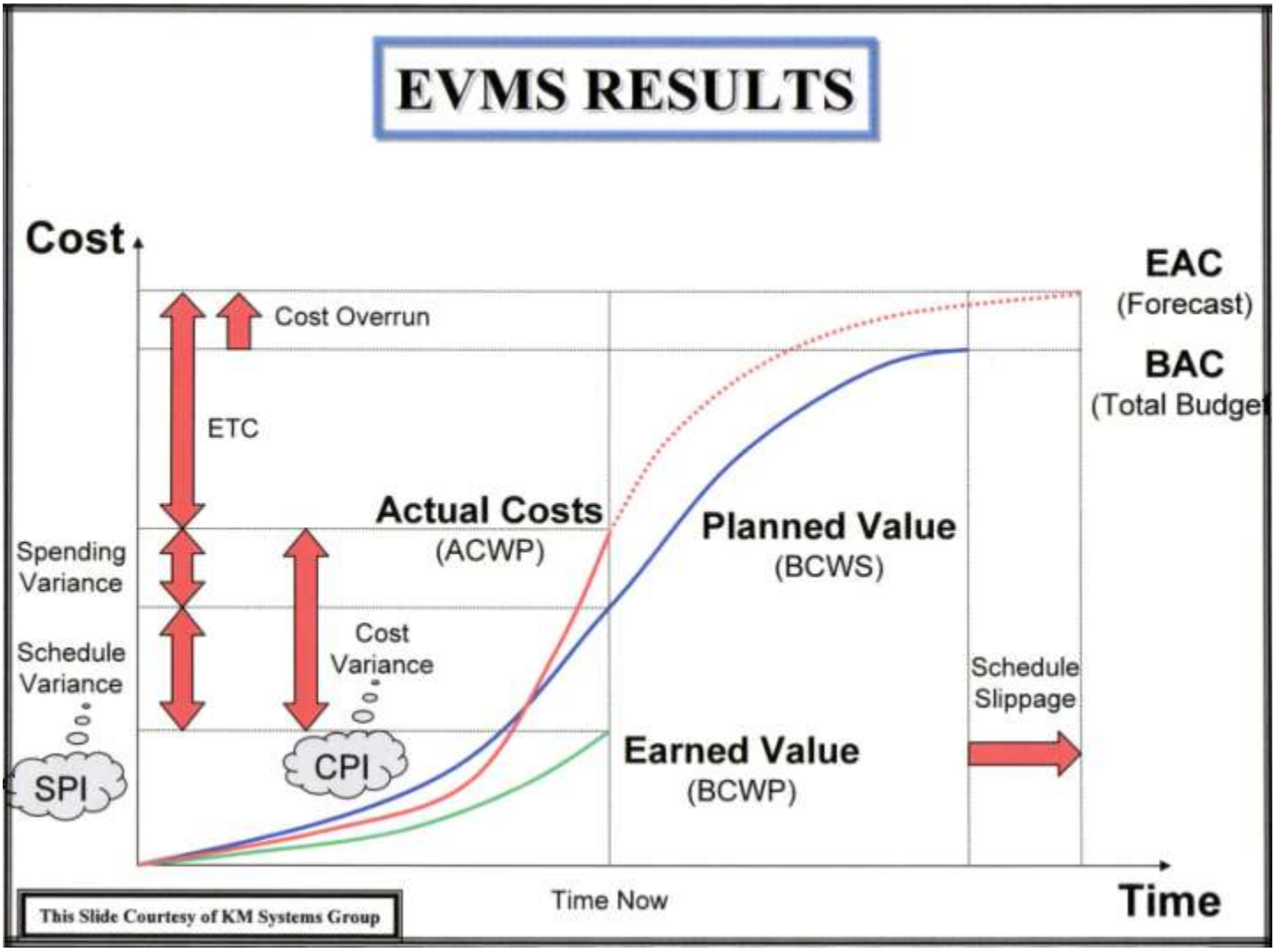
The most notable variance is "Cost Variance (CV)" and equals "Earned Value (BCWP)" less "Actual Costs (ACWP)". The other key variance is "Schedule Variance (SC)" and equals "Earned Value (BCWP)"less "Planned or Budgeted Cost (BCWS)". The formulae representing the aforementioned relationships are as follow:

- CV = BCWP – ACWP (+ is favorable, - is unfavorable)
- SV = BCWP – BCWS (+ is favorable, - is unfavorable)

The above relationships can also be evaluated by indices. The "Cost Performance Index (CPI)" equals "Earned Value" divided by "Actual Costs (ACWP)". And the "Schedule Performance Index (SPI)" equals "Earned Value" divided by "Planned Cost (BCWS)". Formulae representing these two indices are as follow:, performance

- CPI = BCWP/ACWP (if CPI >1.0, performance is favorable; if <1.0, performance is unfavorable)
  - <1 means that the cost of completing the work is higher than planned (bad)
  - =1 means that the cost of completing the work is right on plan (good)
  - >1 means that the cost of completing the work is less than planned (good)
- SPI = BCWP/BCWS (if SPI>1.0, performance is favorable; if<1.0. performance is unfavorable)

A graph is attached that pictorially shows the various earned value terms, variances and indices of EVM.



The above chart also shows other key relationships and their formulae are as:

- Variance at Completion = Budget at Completion less Estimate at Completion or VAC = BAC – EAC
- To Complete Performance Index = Work Remaining divided by Cost Remaining or
  TCPI = (BAC – BCWP) / (EAC – ACWP)

All the above course content describes the various EVM terms and how they are related. We will now outline how a project is assembled, base-lined and how the EVM principles can be applied to one's advantage in evaluating progress to date and how variances are evaluated to determine acceptable corrective action.

Before explaining the project "Deliverables" in detail, they are listed below:

- Organizational Chart
- Work Breakdown Structure (WBS)
- Cost Tracking Matrix
- Scope Development & Verification
- Project Schedule (cost/resource loaded)
- Earned Value & Cash Flow Charts

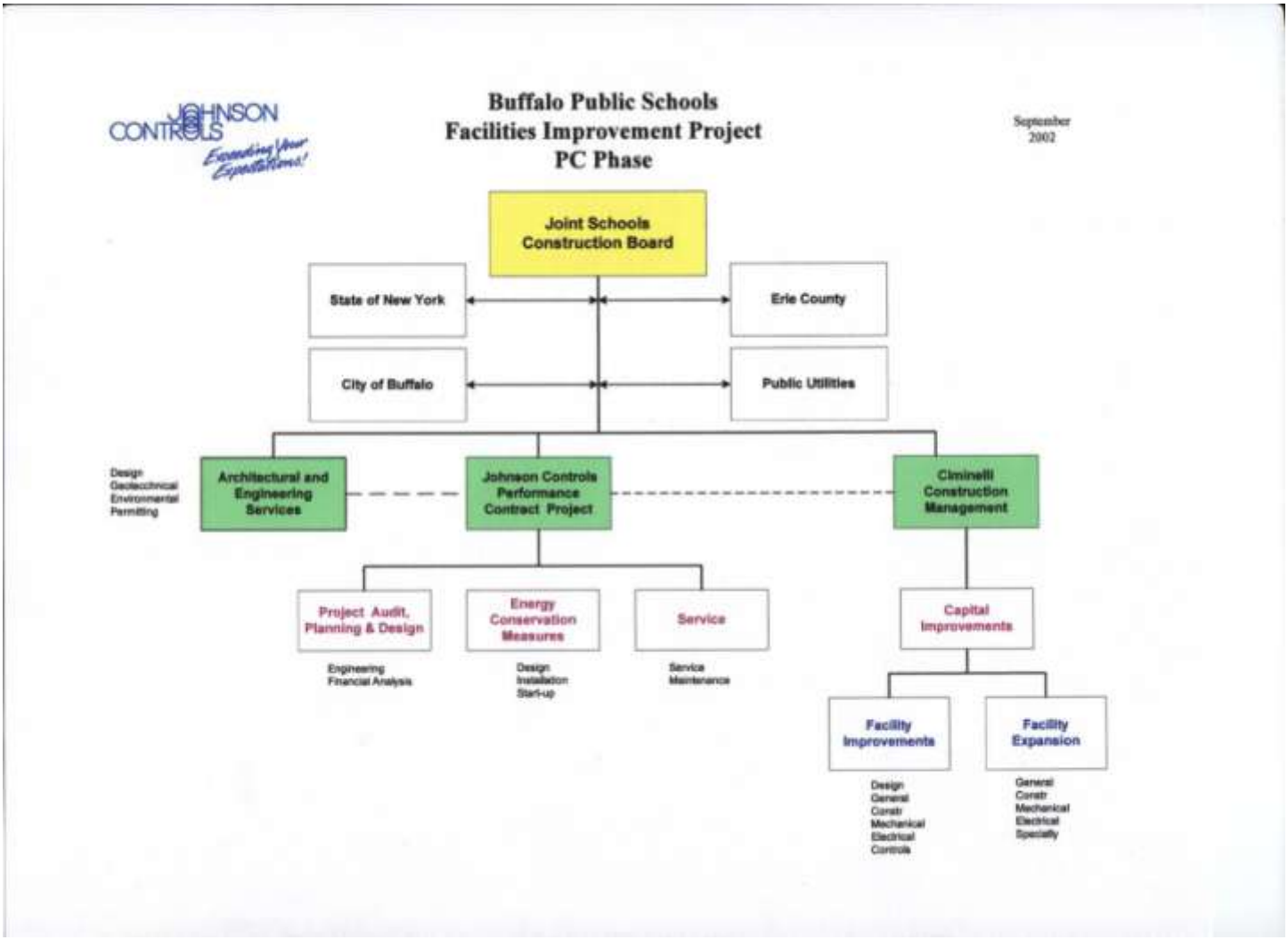
- Issues/ Risk Log
- Project Execution Plan (PEP)
- Monthly Project Review

The first step in assembling project documents is the drafting of an **"Organizational Chart".**A chart accepted by all contract parties will establish clear and precise lines of communication among the parties. Such a chart will improve customer relations and identify all resources.

Primary purposes of this deliverable are to:

- Integrate the Project Team
- Provide a clear line of communication among the team members
- Help develop better customer relations
- Identify resources to be allocated to the project

A sample of a good organizational chart is attached below. It depicts a contract by Ciminelli Construction Management and Johnson Controls with the Buffalo Public Schools.



The next deliverable in assembling a project is called the **"Work Breakdown Schedule".**It can take several different forms but it basically identifies all resources associated with a project, generallythru "levels 1 & 2".

Purpose of the WBS is to:

- Provide a framework for grouping all the work elements
- Logically subdivide the execution of the work
- Ensure that all project requirements have been identified
- Serve as a guide for identifying changes of scope

Noted below is a "WBS Structure" in tabular form that outlines the project elements for levels 1 and 2. Generally a project is developed through level 3. A graphical form through level 1 can be included in a project plan.

TYPICAL PROJECT: WBS MATRIX

WBS Level 1	WBS Level 2
1. PROJECT INITIATION	1.1 Bid Process
	1.2 Milestone Dates
2. PROJECT MGMT	2.1 Project Planning
	2.2 Permits
	2.3 Award Subcontracts
	2.4 Project Mobilization
3. PROCUREMENT	3.1 Electrical Distribution
	3.2 HVAC Equipment
	3.3 Lighting
	3.4 QC/QA
4. INSTALLATION	4.1 General Requirements
	4.2 Sitework
	4.3 Concrete
	4.4 Masonry
	4.5 Steel
	4.6 Wood/Plastic
	4.7 Thermal/Moisture Prot
	4.8 Doors/Windows
	4.9 Finishes
	4.10 Specialties
	4.11 Special Equipment
	4.12 Furnishings
	4.13 Low Temp Panels
	4.14 Elevators
	4.15 Mechanical
	4.16 Electrical
	4.17 Refrigeration
	4.18 Fire protection
5. PROJECT CLOSEOUT	5.1 Training
	5.2 Documentation
	5.3 As-Builts
	5.4 Demobolize Project Site

The **"Cost Tracking Matrix",**if used properly, can build upon the "WBS' in addition to identifying project costs. This tool can help identify differences between budget and proposal amounts as well as identifying variances. It can also be used to track costs through the life of the project.

The Project Manager can use this deliverable to:

- Organize the Request for Proposal process
- Compile data submitted by subcontractors and vendors
- Compare proposed prices to the initial estimates

This matrix has (3) major components and they are:

- Subcontractors – summarizes all the required subcontracts
- Material – summarizes all major vendor material purchases
- Contingency – summarizes any owner-controlled contingency funds

A good example of this "Cost Tracking Matrix" tool is noted below:

Project Initiation

	Description	Cost			
		Budget	Proposal	Actual	Variance
	Proposal Costs				0
	Permits				0
	Bonds				0
	Home Office Overhead				0
	Office/Office Set-up				0
	Safety				0
	Mobilization Costs				0
	PROJECT INITIATION TOTALS:	0	0	0	0

Engineering & Management

	Description	Proposal Date			Award Date		Engineer or Manager Name	Cost			
		Plan	Actual	Expires	Plan	Actual		Budget	Proposal	Actual	Variance
	Project Management										0
	Travel & Expenses										0
	Project Support										0
	Architect										0
	Structural Engineer										0
	Mechanical Engineer										0
	Electrical Engineer										0
	Other Consultants										0
	ENGINEERING & MANAGEMENT TOTALS:							0	0	0	0

Material Procurement

	Description	Proposal Date			Bond	Award Date		Vendor Name	Cost			
		Plan	Actual	Expires	Rqrd	Plan	Actual		Budget	Proposal	Actual	Variance
	Material Package 1											0
	Material Package 2											0
												0
	MATERIAL PROCUREMENT TOTALS:								0	0	0	0

Installation

	Description	Proposal Date			Bond	Award Date		Subcontractor Name	Cost			
		Plan	Actual	Expires	Rqrd	Plan	Actual		Budget	Proposal	Actual	Variance
	Div 1 - General Requirements											0
	Div 2 - Site Construction											0
	Div 3 - Concrete											0
	Div 4 - Masonry											0
	Div 5 - Metals											0
	Div 6 - Wood & Plastics											0
	Div 7 - Thermal & Moisture Protection											0
	Div 8 - Doors & Windows											0
	Div 9 - Finishes											0
	Div 10 - Specialties											0
	Div 11 - Equipment											0
	Div 12 - Furnishings											0
	Div 13 - Special Construction											0
	Div 14 - Conveying Systems											0
	Div 15 - Mechanical											0
	Div 16 - Electrical											0
												0
	SUBCONTRACT TOTALS:								0	0	0	0

Project Closeout

	Description	Cost			
		Budget	Proposal	Actual	Variance
	Training				0
	Warranty				0
	As Builts				0
	O & M Manuals				0
	CLOSEOUT TOTALS:	0	0	0	0

Contingencies

	Contingency Description	Cost			
		Budget	Proposal	Actual	Variance
	Project Contingency				0
	Owner's Allowance(s)				0
	Owner's Contingency				0
	CONTINGENCIES TOTALS:	0	0	0	0

Change Order Cost

CO #	Change Order Description	Proposal Date			Bond	Award Date		Owner/Subcontractor/Vendor Name	Cost			
		Plan	Actual	Expires	Rqrd	Plan	Actual		Budget	Proposal	Actual	Variance
1												0
2												0
6												0
	CHANGE ORDER COST TOTALS:								0	0	0	0
	GRAND TOTAL:								0	0	0	0

The **"Scope of Work or Scope Development & Verification"** is used to document all pertinent information from the contract documents. This deliverable also builds on the WBS and Cost Tracking Matrix. It will be used to validate quantity survey and apply productivity rates to the various trades for determining man-hours and costs to be inserted into the "base-lined schedule".

This matrix provides:

- Documentation and quantification of the project elements and estimates the required man-hours to complete each element of the project
- Detailed breakdown of the installation elements of the WBS
- A list of all activities required to install all parts of each system; the rows of the matrix should be organized by system and installation services

One of the tables used in validating scope is noted below:

ECM	ACTIVITY	PRODUCTIVITY	BUILDING																	
			ADMIN & MAIN	ALTO PARK ELEMENTARY	ARMUCHEE ELEMENTARY	ARMUCHEE HIGH	CAVE SPRINGS	COOSA HIGH SCHOOL	FLOYD TECH	GARDEN LAKES ELEM	GLENWOOD ELEM	MCHENRY ELEM	MIDWAY ELEM	MODEL ELEM	MODEL HIGH MIDDLE	NEW PEPPERELL	PEPPERELL PRIMARY	PEPPERELL HIGH	PEPPERELL MIDDEL
	1500K BTU BOILER	100MHRS/UNIT													1				
	DEMO EXISTING BOILER	64MHRS/UNIT													2				
	2400K BTU BOILER	120MHRS/UNIT													1				
CEILING TILE																			
	CEILING TILE	.0252MHRS/SF															27800		
RESTROOM ENHANCEMENT																			
	1.6 GAL FLUSH VALVE	.5MHR/	1						5		8		13	33	65			60	
	1.6 GAL VALVE KIT	.5MHR/	15	32		41	21	46		37	37	38					43		47
	WC REPLACEMENT	3.5MHR/	16	32		41	21	46	5	37	45	38	13	33	65		43	60	47
	WC TANK TYPE	3.5MHR/					2	1							10				
	NEW URINALS	3.5MHR/															12	8	
	1 GAL VALVE KIT	.5MHR/	7	11		16	4	12	2	15	15	8						34	18
	1GAL VALVE	.5MHR/									2		2	10	28				
	.5 GAL FAUCETS	.75MHR/	2	23		22	9	13	4	19	23	25	18	13	61		19	19	29
	2 G SHOWER HEADS	.25MHR/	12			12		24							6		3	29	
	.5 METERED FAUCETS	.75MHR/	2			2											6		
	.5 G AERATOR	.25MHR/	19			14	12	14		5	4	5		2	6		2	41	10
LIGHTING IMPROVEMENTS																			
	UPGRADE TO T8	.66hr/fixture	988	431	83	1780	499	1696	444	495	659	620	582	635	1725	829	877	1357	1232
	EXIT LIGHTING LED	.5hr/fixture	22	17	42	72	31	58	7	21	23	15	18	27	65		23	45	58
	GYM METAL HALIDE	3.5hr/fixture	70	9		49	18	15			8	9		15	22	12	8	21	24

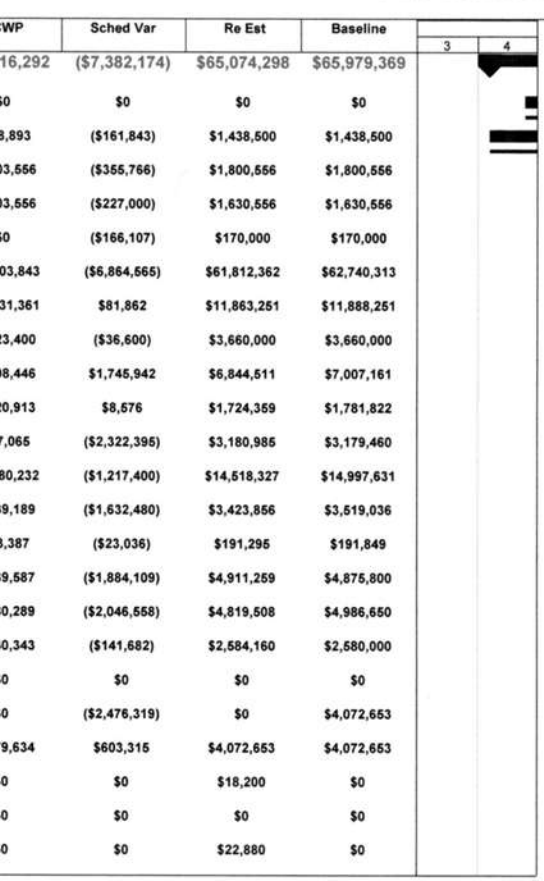
The **"Project Schedule"**can now be assembled using the WBS (work structure), the Cost Tracking Matrix (project costs) and Scope of Work Matrix (structure & man-hours) which will show the plan and elements of the project. The schedule can then be "base-lined" for the agreed upon date and cost against which the EVM Principles can be applied for the duration of the project. All Issues/Risks with a 100% probability are to be included in the baseline schedule.

A sample base-lined project schedule is noted below. The project started on 4/7/05 and was scheduled to be completed on 3/17/07. The attached schedule had been updated on 2/27/06 and shows the relative EVM quantities for BCWS and BCWP. The work level has been raised to a level 2 for clarity.

RDC # 7039
BEAVER DAM, WI

Current Date: Wed 9/28/11
Status Date: Mon 2/27/06

WBS	Task Name	% Comp	Start	Finish	BCWS	BCWP	Sched Var	Re Est	Baseline
0	RDC #7039 Beaver Dam, WI	35%	Thu 4/7/05	Sat 3/17/07	$56,898,465	$49,516,292	($7,382,174)	$65,074,298	$65,979,369
1	PROJECT INITIATION	99%	Mon 4/25/05	Mon 7/3/06	$0	$0	$0	$0	$0
2	DESIGN & CM	56%	Thu 4/7/05	Thu 9/14/06	$970,735	$808,893	($161,843)	$1,438,500	$1,438,500
3	MATERIAL PROCUREMENT	0%	Mon 6/20/05	Fri 2/24/06	$1,759,322	$1,403,556	($355,766)	$1,800,556	$1,800,556
3.1	DCC Purchases	0%	Mon 6/20/05	Wed 2/8/06	$1,630,556	$1,403,556	($227,000)	$1,630,556	$1,630,556
3.2	Operations Purchases	0%	Mon 6/20/05	Fri 2/24/06	$166,107	$0	($166,107)	$170,000	$170,000
4	CONSTRUCTION	34%	Mon 7/18/05	Sat 3/17/07	$54,168,409	$47,303,843	($6,864,565)	$61,812,362	$62,740,313
4.1	Sitework	78%	Mon 7/18/05	Sat 7/15/06	$10,549,499	$10,631,361	$81,862	$11,863,251	$11,888,251
4.2	Off-Site Improvements	0%	Mon 9/19/05	Mon 9/19/05	$3,660,000	$3,623,400	($36,600)	$3,660,000	$3,660,000
4.3	Site Paving	34%	Mon 9/19/05	Sat 6/17/06	$3,152,504	$4,898,446	$1,745,942	$6,844,511	$7,007,161
4.4	Concrete Foundations	99%	Tue 8/30/05	Mon 6/12/06	$1,712,337	$1,720,913	$8,576	$1,724,359	$1,781,822
4.5	Interior Slab on Grade	34%	Thu 11/10/05	Mon 4/24/06	$3,179,460	$857,065	($2,322,395)	$3,180,985	$3,179,460
4.6	Metal Building Package	61%	Mon 9/26/05	Mon 6/26/06	$14,997,631	$13,780,232	($1,217,400)	$14,518,327	$14,997,631
4.7	Building Package	10%	Sat 10/15/05	Fri 7/14/06	$2,671,669	$1,039,189	($1,632,480)	$3,423,856	$3,519,036
4.8	Dock Equipment	60%	Mon 11/7/05	Thu 3/30/06	$136,423	$113,387	($23,036)	$191,295	$191,849
4.9	Mechanical	41%	Tue 8/30/05	Sat 3/17/07	$4,423,696	$2,539,587	($1,884,109)	$4,911,259	$4,875,800
4.10	Electrical	49%	Mon 8/15/05	Wed 5/31/06	$4,826,848	$2,780,289	($2,046,558)	$4,819,508	$4,986,650
4.11	Fire Protection	46%	Mon 9/19/05	Mon 6/19/06	$2,382,025	$2,240,343	($141,682)	$2,584,160	$2,580,000
4.12	Conveyors	13%	Mon 7/18/05	Tue 11/21/06	$0	$0	$0	$0	$0
4.13	Racking	0%	Mon 3/6/06	Thu 7/13/06	$2,476,319	$0	($2,476,319)	$0	$4,072,653
4.14	Contingencies	78%	Sat 10/1/05	Mon 8/28/06	$2,476,319	$3,079,634	$603,315	$4,072,653	$4,072,653
4.15	Punch List & TCO	0%	Thu 6/15/06	Thu 7/20/06	$0	$0	$0	$18,200	$0
4.16	Possession & Ship	0%	Mon 7/31/06	Tue 10/31/06	$0	$0	$0	$0	$0
5	PROJECT CLOSEOUT	0%	Thu 6/15/06	Thu 8/17/06	$0	$0	$0	$22,880	$0



CM: Laney Johnston Page 1 of 2 7039 Schedule Update 2-27-06 rev 1.mpp
5. Monthly Report View

After a project schedule has been base-lined, the Project Team can develop the Project Performance Charts which include the **"Earned Value"** and **"Cash Flow"** curves. The "**Performance Monitor"** tracks Earned Value and Cash Flow throughout the life of the project.

The positive and negative variances from the benchmark (Baseline) indicate the health of the project and provide warning signs of potential problems to the Project Manager. A negative schedule or cost variance can be attributed to lack of productivity, failure of predecessor activities not being completed as scheduled, material and/or equipment not being delivered as scheduled, incorrect baseline data or numerous other reasons. The Project Team must determine the root causes for the negative variances and incorporate corrective action as appropriate.

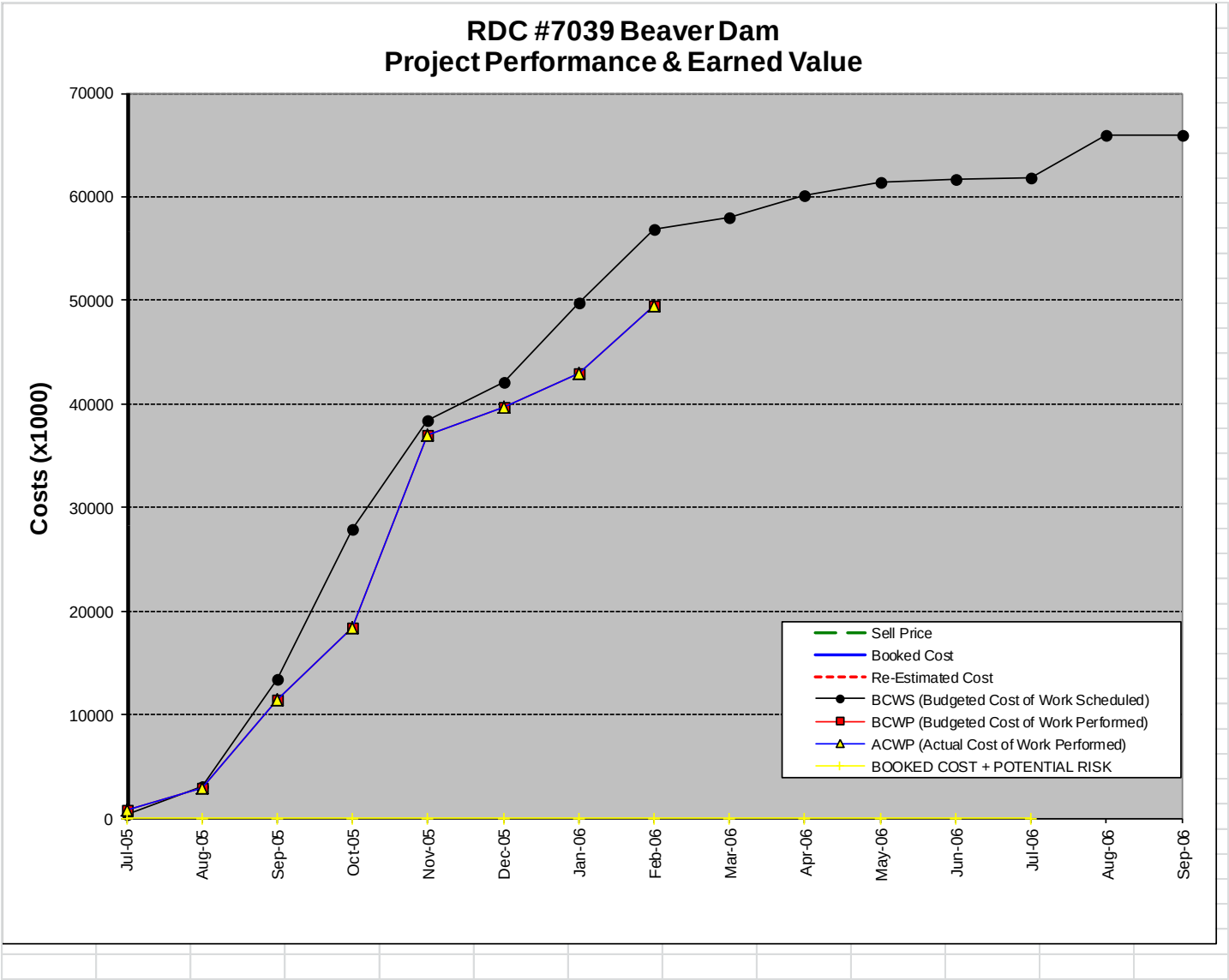
The **"Performance Monitor"** for the Beaver Dam project conducted in July 2005 is below:

Performance Monitor
RDC #7039 Beaver Dam

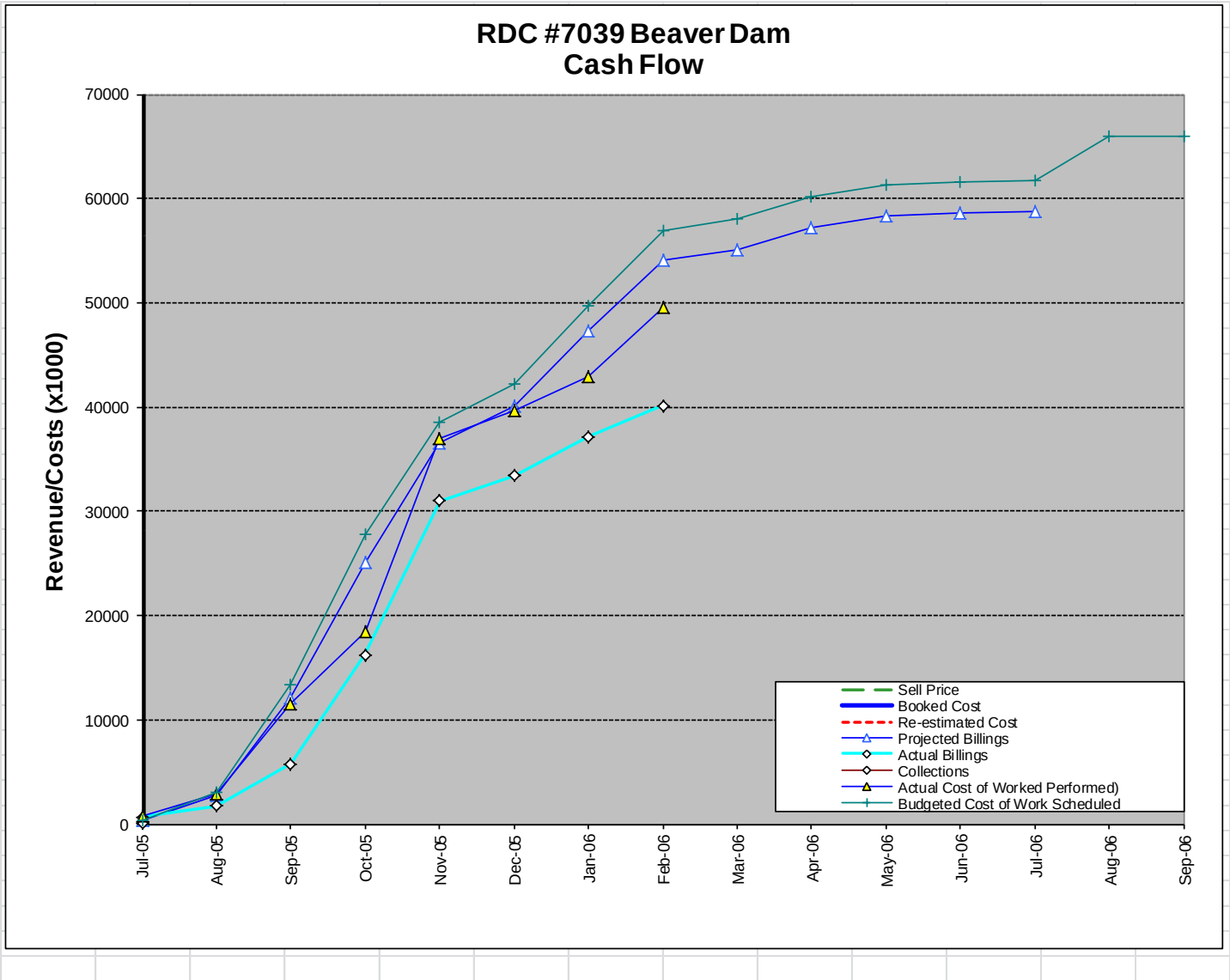
A	B	C	D	E	F	G	H
Data through last day of the month	BCWS	BCWP	ACWP	POTENTIAL RISK (ISS/RSK LOG)	End Date Variance Days	Projected Billings (Planned)	Actual Billings
Jul-05	$378	$735	$735	$0	0	$340	$861
Aug-05	3,096	$2,900	$2,900	$0	0	$2,787	$1,704
Sep-05	$13,403	$11,500	$11,500	$0	0	$12,063	$5,778
Oct-05	$27,845	$18,441	$18,441	$0	1	$25,061	$16,240
Nov-05	$38,473	$37,013	$37,013	$1,075	17	$36,550	$31,000
Dec-05	$42,158	$39,732	$39,732	$1,925	42	$40,050	$33,419
Jan-06	$49,757			$0		$47,270	
Feb-06	$54,719			$0		$51,983	
Mar-06	$58,003			$0		$55,103	
Apr-06	$60,189			$0		$57,179	
May-06	$61,368			$0		$58,299	
Jun-06	$61,628			$0		$58,547	
Jul-06	$61,794			$0		$58,705	
Aug-06	$65,952						
Sep-06	$65,979						

COST			Reporting Results Guide for Project Cost			Reviewer Criteria and Considerations
Sell Price	Baseline Cost	Current Re-Estimate	Green Globe	Satisfactory	ACWP=or<than BCWP	Assignment of a cost or schedule color to indicate a project trend considers numerous project facts and considerations. Depending on project conditions, a project may obtain a warning color not solely based upon the results guide. Considerations include: 1. The schedule is not adjusted/updated to account for all current conditions, ie correct start dates, changeorders, major procurements. 2. Overall project percent complete and time left to recover. 3. Should BCWS be adjusted to reflect changed conditions. 4. Is the schedule self imposed or contractural. 5. Billing cycle inconsistancies and is the ACWP
$65,979	$65,979	$65,979	Yellow Globe	Concern	ACWP > BCWP up to 105%	
			Red Globe	Major Concern	ACWP > BCWP more than 105%	

The **"Earned Value"** chart derived from the above Performance Monitor for the Beaver Dam project is noted below:



The **"Cash Flow"** chart also derived from the above Performance Monitor for the Beaver Dam Project is noted below:



The next deliverable is a most important document that needs early assembly and constant updating throughout the project. It is called the **"Issues/Risk Log".** A sample of one assembled for a medical project in Johnson City, Tennessee is noted below along with assemble instructions.

Any issues/risks that are identified or become a 100% probability are to be or will be included in the project costs. Any and all issues/risks are kept on the log for the life of the project.

Issues/Risk Log Instructions

Definitions

Issue	*An item, occurrence, condition, written statement, drawing, or action that may or may not impact the project in a positive or negative way.*
Risk	*A condition or event that may causeexposure to the chance of loss or gain.*
Impact Explanation	*The explanation of an issue or risk impact to the project*
Potential Cost Impact	*The estimated potential cost impact to the project*
Probability of Occurrence	*The estimated probability that an impact will occurgiven current conditions*
Adjusted Potential Cost Impact – Shortfall	*The estimated potential cost impact multiplied by the estimated probability. A shortfall impact is something not in yoru favor that reduces project contingency or margin.*
Adjusted Potential Cost Impact – Savings	*The estimated potential cost impact multiplied by the estimated probability. A savings impact is something in our favor that adds to project contingency*
Potential Time Impact to End Date	*The estimated positive or negative impact to theproject contract end date in workdays*.
Responsible Party	*The person with primary responsibility to address theIssue*
Risk Management Strategy	*Recommended actions to mitigate the issue/risk*
Progress Action/Status	*An explanation of the current status of the issue/risk that will culminate in its resolution. When the issue/risk is resolved, the wording "resolved" or "completed" should be inserted.*
Target resolution date	*Targeted date of issue resolution or completion.*
Booked Proficiency & Risk	*A project contingency fund for unforeseen development estimating errors, and future unknown impacts to the project*
Net identified shortfall or savings	*Subtotal of items appearing on the Issues/Risk Log as resolved or 100% probable.*
Revised project contingency	*Booked Proficiency & Risk plus net Identified (shortfall or savings).*
Identified Risk	*Issues/Risk Log items that have some probability of occurring in the future. This figure does not include items included with revised project contingency.*

Issues/Risk Log Instructions

Procedure

1) Fill in project issue or risk items in the Issue/Risk column.

2) Fill in all boxes to the right of the Issue/Risk Description box. Enter the Impact explanation. Estimate the probability of occurrence as 0%(if issue only) 25%, 50%, 75%, or 100% if a risk. An item can be 100% if the risk has occurred, i.e. low or high executed subcontract, spent cost, or executed material purchase order.

3) Extend math of potential cost impact times the probability and enter the result in the shortfall or savings column.

4) If item is resolved, shade all horizontal boxes in the row, light gray. If an item is resolved, it is either 0% or 100% probable.

5) Subtotal risk items and fill in the Summary Data Sheet.
   A - Booked Proficiency and Risk from the Booking Presto.
   B - Subtotal cost of 100% issue/risk items (net positive and negative).
   C - Subtotal A + B.
   D - Subtotal cost of 25, 50, 75% risk items (net positive and negative).

6) Cost from the Summary Data sheet is entered onto the page three table of the Start-up Trip Report.

7) Identified Risk (item D), is entered onto the Earned Value data worksheet in the Earned Value/Cash Flow Monitoring form.

8) Number all issue/risk items in the left column.

9) The Issues/Risk Log is a “live document” to be updated on a regular basis and submitted with monthly schedule updates to the Construction Management Services Group.

The “Issues/Risk Log” is used to compile potential risks to the project at the onset and all during the project’s life. It is formatted to facilitate identification, quantification and resolution of potential risks. Issues identified typically consist of:

- Contract terms and conditions
- Conflicts between various contract documents
- Additional scope related items that were not addressed in the estimate

Johnson City, TN Medical Center

Grey shaded areas denote issue is resolved.

ISSUES / RISK LOG

draft: July 17, 2003

#	Issue/Risk	Impact Explanation	Potential Cost Impact ($)	Probability of Occurrence (%)	Adjusted Potential Cost Impact ($) (Positive)	Adjusted Potential Cost Impact ($) (Negative)	Potential Time Impact to End Date (Days)	Responsible Party	Risk Management Strategy	Progress Actions/Status	Target Resolution Date
1	Liquidated Damages of $1,500/day beyond guaranteed completion date (bid form, page BF-2)	schedule needs to be detailed sufficiently to establish a comfort level to complete project ahead of schedule	$60,000	50%		$30,000			establish and maintain logs that document all factors affecting time completion; eg. Changes, weather, work stoppages, etc.		
2	Hold Harmless Agreement (page H-1)	too broad a form; includes client's cots even when problem was caused solely by client	$75,000	25%		$18,750			negotiate new language such as " JCI agrees to hold harmless and indemnify client from and against liability to the extent caused by JCI's negligent peerformance of services to any limitations or other provisions client and JCI have agreed to"		
3	JCI will be responsible for "Builders Risk" insurance (contract article 8, page A-3)	this insurance is usually paid by the client	$150,000	50%		$75,000			make certain that monies are included in re-bid		
4	client is allowed to a cessation period of 30 days that is to be included in the 550 calendar day completion; contractor is entitled to $900/day compensation (contract article 12, page A-4)	30 day schedule loss but $27,000 maximum compensation to JCI	$27,000	50%	$13,500				must determine if schedule can tolerate 30 day suspension and is $27,000 compensation sufficient		
5	client has option to use working day system rather than calendar day system (general conditions article 10C, page GC-13)	possible loss of schedule days	$45,000	50%		$22,500			must agree with client on non-working days		
6	there is no monetary compensation for time extensions (general conditions article 11, page GC-14)	could impact margin	$50,000	25%		$12,500			modify article to include consideration for cost reimbursement		
7	indemnification is too broad a form (general conditions article 33C, page GC-30)	see Risk #2 above	$75,000	25%		$18,750			see Risk #2 above		
8	JCI can reduce retention to 5% after "final" or "substantial" completion (genral conditions article 42b, page GC-38)	cost of money will be affected for 30-60 days	$200,000	50%	$100,000				must have client agree to "substantial" completion		
9	a 5 year guaranty period is required (general conditions article 48, page GC-40)	industry practice is one year; this will need to be addressed if required	$50,000	50%		$25,000			negotiate one year guaranty with client		
10	JCI will be responsible to locate and preserve all active utilities whetther shown on the drawings or not (supplementary conditions SC-7, page SC-3)	could be costly especially with the foundation work involved; piles are driven 100'	$100,000	75%		$75,000			negotiate this requirement out of contract		
11	JCI will be responsible for work delays whether responsible in whole or part (supplementary conditions SC-9.01, page SC-4)	can be most costly to JCI	$300,000	50%		$150,000			negotiate modification to language		
12	client has right to suspend work with or without cause should evidence of historical or archaelogical deposits be discovered during construction (supplementary conditions SC-10, page SC-5)	JCI would be compensated for de-mobe costs only	$200,000	25%	$50,000				negotiate modification to language		
13	JCI will be repsonsible foran Interim Life Safetyprogram that includes safety assessment and checklist of existing systems and added features during construciton (supplementary conditions article SC-19, page SC-7)	additional costs need to be determined	$150,000	25%		$37,500			evaluation of existing life safety system needs to be accomplished to determine cost impact		
14	JCI will be repsonsible for an Infection Control Program during the life of the construction project (supplementary conditions article SC-20, page SC-7)	cost impact needs to be determined	$100,000	25%		$25,000			review IC-1 thru IC-7documentsneed to be reviewed to ascertain cost impact		
15	all permits except for initial review by State Fire Marshal to be responsibility of JCI (AIA supplementary conditions article 3.7, page AIA-SC-3)	cost impact needs to be determined	$100,000	50%		$50,000			need to visit local and state review agencies to determine plan review and permit costs		
16	adverse weather days are tabulated (AIA supplementrary conditions article 4.3.8.3, page AIA-SC-4)	70 calendar days per year are allowed - is this loss in schedule acceptable?		0%		$0			JCI must scrutinize schedule		
17	overlays for MEP and GC work must be submitted to architect for review (GC Section 01040 article 1.03, page 01040-2)	certain MEP overlays are generally done for subcontractor coordination but the specs are requiring more overlays including GC work	$50,000	100%		$50,000			cost impact must be determined		
18	concrete overlay drawings are required (GC Section 01040 article 1.04, page 01040-2)	same as above	$20,000	100%		$20,000			same as above		
19	JCI will be responsible for establishing property lines, bench datums, etc (GC Section 01051 article 1.02, page 01051-1)	contractor is generally provided a survey with property lines and becnhmarks	$25,000	50%		$12,500			same as above		
20	available soil report will not be part of the contract documents (GC Section 01051 article 1.03, page 01051-1)	this is normal industry practice	$35,000	100%		$35,000			must negotiate the inclusion of soil report in to contract		
21	building warranty period is 12 months and water-tightness is 24 months (GC Section 01740, page 01740-4)	this is more in line with industry standard but is in contrast to Risk #9	$50,000	50%		$25,000			must clarify warranty period with client		
22	design drawings do not reflect "site utilization"	construction access, laydown areas, fireld offices/trailers. Etc will impact cost	$50,000	50%		$25,000			a "site utilization" plan needs to be developed and approved to determine cost impact		
23	no hazardous materials are addessed during demolition of existing structures	certainly asbestos will be present in addition to contaminated soils	$100,000	50%		$50,000			must stipulate scope responsibility or include allowance in final bid		
24	construction will be adjacent to existing building operations	there will certainly be schedule and cost impacts	$50,000	100%		$50,000			determine both schedule and cost impacts		
25	lack of completeness and inconsistencies in design drawings and specifications	general contractor is generally held liable	$80,000	50%		$40,000			JCI must conduct thorough review of documents at various stages and submit claims as deemed appropriate		
26	pricing escalation over year and a half project	potential added costs	$125,000	100%	$125,000				review existing and anticipated labor, material and equipment costs via CII, ENR, subcontractors, etc.		
		there is no mention of requirements							qualify this potential cost impact in		

Johnson City, TN Medical Center

Summary Data

A	**Booked Proficiency & Risk**	**$0**	A project contingency fund for unforeseen development estimating errors, and future unknown impacts to the project
B	**Net Identified (Savings/<Shortfall>)**	**$30,000**	Net identified (savings or shortfall). These items appear on the Issues/Risk Log as resolved or 100% probable following the start-up process.
C	**Revised Project Contingency**	**$30,000**	Booked proficiency and risk plus identified (savings/shortfall) **A+B**
D	**Identified Risk**	**$579,000**	Identified risk documented on the Issues/Risk Log that has some probability of occurring in the future. This figure does not include items accounted for following the start-up and included with Revised Project Contingency

The next deliverable is called the"**Project Execution Plan (PEP)".**It is a narrative document written at a level appropriate for customers. Primary purposes of the PEP are to:

- Document the scope and schedule baseline
- Communicate to the customer that the GC/AE/CM fully understand the customer's expectations and requirements
- Document planning assumptions, decisions and inconsistencies
- Provide for early identification of problem areas and risks
- Clearly communicate the project plan to the entire Project Team

A sample of the Buffalo School System PEP follows:

Buffalo Schools

Project Execution Plan

October 2002

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1.0 Overview

1.1 Project Execution Plan Overview

This Project Execution Plan (PEP) has been developed to provide information regarding the Buffalo Schools PC Project. The objective of the PEP is as follows:

- Provide a description of the project.
- Establish the project baselines.
- Document the plans, organization, structures, and processes that will be used to manage this project.

1.2 Project Overview

This Project Execution Plan (PEP) is for energy conservation measures for the Buffalo PublicSchools located in Buffalo, New York. The Project includes the design, procurement, and installation of the following Energy Conservation Measures (ECM's):

- lighting retrofits in six facilities:
- chiller replacements at four facilities
- cooling towers at two facilities
- architectural enclosure for mechanical equipment
- heat exchangers in three facilities
- boilers in two facilities
- replace roof top units on two facilities
- variable frequency drive's (VFD's) in four facilities
- motor replacement in four facilities
- power monitoring in five facilities
- new or upgraded control systems in six facilities.

The total duration of the contract as currently planned is shown on the project schedule attached to this document. Johnson Controls has presented detailed cost information that reflects the description of work as stated above. The Project will be financed through energy savings for a period of six years. Specific work to be performed under this contract is described in section 4.0 of this document.

2.0 Focus

Johnson Controls will focus its efforts on providing high quality construction, project documentation control, financial control, and completion of the work on or ahead of the project schedule. Johnson Controls will make every attempt to exceed the expectations of *Customer's name* on this project.

3.0 Project Organization

3.1 Project Management Team

The Johnson Controls Project Manager, *name*, has the overall responsibility for the day to day management of the project and coordination of all subcontracted portions of the work in accordance with the Contract

Documents. The Project Manager will ensure that all work is performed safely and in accordance with the design and contract documents.

Johnson Controls will establish a Project Office for overall management of the Project. The Project Office will serve as a center for management, communications, planning, design review, field engineering, and technical support, as well as the center of coordination for the installation of the ECMs to be installed under this contract. All work associated with implementing the project scope of work will be managed from this office.

3.2 Core Engineering Team

The Johnson Controls Core Engineering Team Leader, *enter name*, is located in the *enter location* office and will manage the generation of all of the designs associated with the Controls Systems.

3.3 Area & Local Resources

The Johnson Controls Branch office, located in *name location*, will provide support for Project Management, Engineering, Project Controls, Customer Interface, Procurement, Subcontractor Coordination, Testing, Startup, Commissioning, and Contract Closeout. The Installation Manager, *enter name*; the Area Installation Manager, *enter name*; and the Area General Manager, *enter name* will allocate resources to support the project. Branch offices are dispersed throughout the Area providing strong geographic support.

3.4 Subcontractors

Johnson Controls will execute agreements with the following subcontractors:

Horton Mechanical.	Electrical Contractor
O&M Engineering	Graphics Contractor
LRI	Lighting Retrofit
Applied Building Technologies	Lighting Retrofit
Horton Mechanical	Mechanical Contractor
Automatic Controls	Fisher Tri-Temp Contractor
Wiesman	Air and Water Balancing
Mueller Associates II	Consulting Engineer
E & E	Building Envelope

Johnson Controls and all subcontractors will meet Equal Employment Affirmative Action and COMAR requirements. Subcontractors will procure all permits as required for their respective work. The scope of each subcontract will be discussed in detail in section 4.0.

3.5 Johnson Controls Corporate Office

The Johnson Controls Corporate office in Milwaukee, Wisconsin provides several project support services. The Construction Management Services (CMS) supports project management in providing standard management tools, software, scheduling, and claims avoidance processes. Other procedures, documentation support, and standards are provided by the Safety and Field Installation Support groups.

4.0 Project Scope Baseline

4.1 General

Johnson Controls will execute the work in accordance with the terms and conditions of the contract. The general scope of the work and general clarifications to the specifications are listed in this document. Johnson Controls will resolve inconsistencies between the specifications and Johnson Controls' standard practices with *customer name* on a case by case basis.

Johnson Controls will have overall responsibility for project management, site coordination of subcontractors, schedule management, and coordination with *customer name* for access to areas in individual buildings. Johnson Controls will manage the installation of control systems. The subcontractors will perform engineering for all mechanical and electrical systems. An engineering firm, licensed in the State of *name state*, will perform design approval for the work. Johnson Controls will perform review and approval of drawings.

Additional work requested by, *name customer*, that is not included in the scope of work will require a change order to the contract with the appropriate compensation and time adjustments for the change in scope.

The foundation of effective project management is the identification of the scope of the project and the organization of the scope into a comprehensive work breakdown structure (WBS). Johnson Controls will integrate all phases of the project from the estimating phase through the close out phase in accordance with a defined WBS.

Changes to the contract will be controlled and negotiated to ensure all involved parties fully understand any technical, cost and schedule impacts that may result. This Project Execution Plan will be periodically updated, as required, to reflect any approved changes to the scope, schedule, cost, or quality requirements of the contract. A Change Order log will be maintained by the Project Manager to provide a detailed chronological record of changes.

Changes to the scope, schedule, cost, or quality requirements of the contract will be submitted by the Project Manager on a change order form. The form requires review and approval by *customer name* prior to inclusion into baselines for the project.

4.2 Equipment Vendors

During the engineering phase, a detailed material equipment list will be generated that identifies materials, quantities, WBS charge element, and date required. Materials will be ordered with adequate lead-time to be available on site when required for installation activities. A periodic update of the material equipment list will be generated to assure compliance with the project schedule.

All suppliers of material or services are evaluated to assure that they are qualified by Johnson Controls to provide the specified material or service. The Project Manager, or designee, will perform the supplier review and document these reviews. Criteria for evaluation will include reliability, a Quality Control Plan that is consistent with the requirements for the material or service to be provided, facility evaluation, and a history of providing like materials or services.

It is the responsibility of the Project Manager to require that specifications be rigidly followed. At a minimum, material purchase orders shall specify material, specification and grade, identification requirements, and certification requirements. Subcontractors/suppliers will be required to follow salient Quality Assurance (QA)

requirements as specified in the purchase/subcontract document. Failure to meet standards may result in procurement changes or modifications as directed by the Project Manager.

Purchase orders will be executed with the following vendors:

- List major purchases and equipment items here

4.3 Mechanical/HVAC Design and Construction

A subcontract with *Company name*, will be [or has been] executed for the design and construction of the mechanical/HVAC work. The scope of work for *Company name* includes the following:

- List major scope items here

4.4 Electrical Design and Construction

A subcontract with *Company name*, will be [or has been] executed for the design and construction of the electrical work. The scope of work for *Company name* includes the following:

- List major scope items here

4.5 Fire Alarm/Life Safety

Fire Alarm work will be engineered by Simplex who will prepare fire alarm drawings.A subcontract with *Company name* will be [or has been] executed for the installation of the fire alarm components. The design drawings prepared by Simplex will be reviewed and approved by the [local fire Marshall] prior to construction. The fire alarm systems that will be designed and installed include the following:

- Insert Systems here

4.6 Security System

Security system work will be engineered by *company name* that will prepare building security design drawings.A subcontract with *Company name* will be [or has been] executed for the installation of the security system components. The building security systems that will be designed and installed include the following:

- List features of the system here

4.7 Building Management System Controls

The Johnson Controls Core Engineering Team will work in accordance with the project schedule to design controls required for the building management system (BMS). A subcontract with *Company name* will be [or has been] executed for the installation of the BMS controls. The BMS components that will be designed and installed include the following:

- List features of the system here

5.0 Project Cost Baseline

All estimates are based upon the WBS and include material cost, labor man-hours, and associated labor rates to install or construct elements of the project. Work included in the contract is broken down by WBS with an associated sub-account number for time phased budgeting and the collection of costs. The financial status of the project is reported to Johnson Controls management on a regular basis with monthly reconciliation of cost variances.

Materials descriptions in the estimate will include the specification, grade of the material, and any code requirements as specified. The end product of the material and equipment estimate will be the master equipment list that will be used from procurement through startup and commissioning. For materials or equipment not included in the Johnson Controls product line, the estimate will specify who will procure the material, Johnson Controls or a subcontractor, and the preferred vendor.

A critical element of the estimating process is documentation of scope and design assumptions. This forms the basis of the estimate upon which customer-requested revisions to the estimate can be evaluated.

6.0 Project Quality

The Johnson Controls Project Manager will have the following responsibilities with respect to quality control (QC):

- Ensure all work is performed in compliance with contract requirements, code requirements, and construction industry standards.
- Establish a job specific QC program.
- Ensure that all controls work is performed in accordance with Johnson Controls standards.
- Manage and coordinate QC activities, submittals, tests, samples, and results.
- Ensure that weekly project briefings are held to discuss quality.
- Ensure that drawings are kept up to date with the proper revision and provided to the contractor.
- Inspect equipment to be installed, and reject equipment if found to be non-compliant with specifications or damaged during transportation.
- Investigate and resolve warranty problems, and indicate the action taken on Warranty Reports.

7.0 Project Safety

Johnson Controls will work in a manner that promotes the safety of *customer name*, Johnson Controls, subcontractor employees, the public, and the environment. The Project Manager will administer and oversee the safety program for the individual subcontractors. Johnson Controls' Corporate Safety Department will audit the project periodically for compliance with Johnson Controls, *customer name*, and OSHA safety guidelines. The major elements of the safety program are as follows:

- Documentation, investigation, and reporting of occupational injuries in accordance with Johnson Controls, *customer name*, and OSHA guidelines.
- Posting of OSHA worker safety guidelines and right to know information.
- Conducting weekly site safety meetings.

- Training personnel on the site safety policy, right to know, use, and maintenance of personal protective equipment.
- Issuance and control of safety related work permits.
- Control of work site access to alleviate work area congestion.
- Maintaining an all-inclusive record of Material Safety Data Sheets and a log of all hazardous materials on site.
- Implementation of lock-out and tag-out procedures.
- Enforcement of fall protection education.
- Identification and monitoring of confined space.
- Hazardous material identification and abatement coordination.

8.0 Engineering and Submittal Process

8.1 Engineering Design Documentation and Drawings

All design work performed by Johnson Controls and its subcontractors will be controlled, documented and approved by Johnson Controls using a formal document control system.Items critical for safety or performance will receive a more stringent review. Johnson Controls review assures that the design is consistent with the design basis and assures that all changes and revisions are clearly documented.

8.2 Submittals

Design submittals will be reviewed for completeness, thoroughness, and compliance with applicable codes. The subcontractors will provide a submittal schedule listing all drawings, cut-sheets, and samples that are to be submitted to Johnson Controls. These reviews satisfy the final link between the subcontractors and Johnson Controls to ensure that quality becomes part of the design process.

9.0 Procurement

As the engineering is accomplished, a detailed material equipment list will be generated that identifies materials, quantities, WBS charge element, date required, estimated cost, etc. Materials will be ordered by WBS whenever possible. A comparison of the estimated quantities of materials versus the original contract baseline will be performed to identify any positive or negative variances. Significant differences in quantities will be investigated and resolved. Materials will be ordered with adequate lead-time to avoid the potential impact to work. The subcontractors will provide material storage and deliveries to the project will be on a just in time basis. The material equipment list will be periodically updated.

All suppliers of material or services are pre-qualified by Johnson Controls to provide the material or service. The Project Manager, or designee, will perform and document the supplier/contractor reviews. Criteria for evaluation will include safety, performance on past projects, quality control, financial stability, and cost.

It shall be the responsibility of the Project Manager to require that specifications be rigidly followed. At a minimum, material purchase orders shall specify material, type and grade, identification requirements and certification requirements. Subcontractors/suppliers will be required to follow salient QA requirements as specified in the purchase/subcontract document.

Johnson Controls will furnish the controls material. Subcontractors will furnish all other electrical and mechanical materials and structural systems required for the installation of the new equipment, building automation system controls, plumbing, and lighting. Johnson Controls will transfer the purchased controls materials to the subcontractors for installation.

10.0 Construction

Construction will be performed to fully integrate with *customer name* activities. Integration will be accomplished using key interface milestones for work that must be completed by *customer name* and their contractors prior to the initiation of Johnson Controls work. The proposed sequence of work will be by ECM, phase, or building.

Johnson Controls will ensure that all work has received the proper inspection in accordance with the contract documents, local building ordinances, and *customer name* construction standards.

Written acceptance of all work performed will be by *customer name*. Each ECM will be punch-listed and signed off as completed.

11.0 Start-Up and Testing

Johnson Controls will perform start-up and testing activities in accordance with standard Johnson Controls practice and will provide operations and maintenance information in the form of four sets of manuals. Two sets of as-built drawings will be provided to *customer name* upon completion of the work.

Field Training – Johnson Controls will provide field training for *customer name* staff members. This training will consist of field training that will be performed upon completion of the installation of the new systems and the installation of the mechanical equipment.

Building Automation System testing – Johnson Controls will provide the services of control technicians at startup to checkout the system, input required data and place the system in operation. Johnson Controls will checkout each system for control function through the entire sequence and will verify proper operation of each item in the sequences of operation, including all hardware and software. Johnson Controls will calibrate field equipment, adjust all control parameters and logic (virtual) points including control loops, gain constants and integral constraints and verify data communications before the system is placed on-line. Johnson Controls will calibrate each instrumentation device connected to the control network by making a comparison between the reading at the device and the display at the central station, using a instrument at least twice as accurate as the device to be calibrated. Johnson Controls will check each control point within the control network by making a comparison between the control command at the central station and field-controlled device. Johnson Controls, Inc. will verify operation of all systems in the specified failure modes upon network failure or loss of power, and verify that all systems return to control automatically upon resumption of network operation or return of power. Johnson Controls will deliver written certification to *customer name* that the complete system, as installed, has been calibrated, tested and is ready for operation.

Johnson Controls and the lighting subcontractors will take light level and watt usage measurements prior to performing lighting retrofits and after retrofits to ensure that code requirements are met and that energy savings are realized. *Customer's name* acceptance of a system will indicate custody transfer of the system from Johnson Controls to *customer name*.

12.0 Risk

Johnson Controls recognizes that all projects contain risk. Similar projects' historical experience, business experience, and experienced personnel allow Johnson Controls to forecast and limit most project risk. Project risk is often caused by inexperience, lack of communication, unreliable suppliers, and lack of proper project control systems.

12.1. Asbestos

The existing insulation and fireproofing materials in some of the *customer name* buildings may contain asbestos containing materials (ACM's). *Customer name* is responsible for the abatement of ACM's that have been installed on equipment that Johnson Controls will perform work on, and loose ACM contamination that has settled on mechanical equipment and floors. Johnson Controls will require certification by *customer name* that the work areas are free of ACM's and are available for Johnson Controls to perform work. Should Johnson Controls encounter any materials that may contain asbestos or other suspect materials that were not abated by *customer name*, Johnson Controls will stop work and communicate with *customer name*.

12.2 PCB's

Johnson Controls recognizes that the removal of existing light fixtures entails the removal of old style ballast's that may contain PCB's. Johnson Controls has pre-qualified / certified subcontractors that will be used to properly remove and dispose of the ballasts and lamps according to state, local, and federal regulations.

12.3 Lead-Based Paint

Any existing lead based paint in areas of the buildings where Johnson Controls and its subcontractors are required to work must be abated prior to beginning work. *Customer name* is responsible for the abatement. Johnson Controls will not be responsible for delays caused by abatement and certification activities or any associated costs.

12.4 Other Project Risks

Changed site conditions, material damage, labor strikes, facility access, allowed work time, quality of work, worker safety, and financial terms all may contribute to project risk. Johnson Controls is experienced managing project risk and it is our responsibility and job to do so.

Johnson Controls and the project team will manage project risk using the following systems and methodologies.

- Thorough and continuous planning
- Detailed quantification of facility audits
- Subcontract document review and legal review of terms and conditions
- Adherence to safety programs
- Application of claims avoidance programs
- Utilization of regular and multiple communication systems
- Utilization of superior technology
- Competitive bidding and supplier evaluation
- Utilization of procedures for management of asbestos, lead paint, and hazardous materials.

- Employee and customer training
- Implementation of a quality control and assurance program
- Implementation of Project Controls processes for scheduling, cost control, earned value, documentation, and reporting systems.
- Insurance
- Supplier and subcontractor bonding
- Product warranties

.

13.0 Communications

13.1 General Communication

Communication is critical to the success of all projects. A list of primary project participants with mailing address, voice mail numbers, pagers, fax numbers, etc. will be prepared. Standard reports or documents will be listed with a standard distribution list. Standard meeting schedules will be included with a list of attendees that will participate.

13.2 Electronic and Written Correspondence

Electronic mail will be used extensively to quickly communicate with all project team members. The formal submittal of deliverables to *customer name* will be accompanied by a correspondence letter that outlines the information contained in the attachment as well as any requested actions. Johnson Controls will also actively issue both written and electronic correspondence to the subcontractors to ensure the proper execution of subcontractor coordination items.

13.3 Project Meetings

A standard weekly team meeting will be held with the core project team and any other key interface organizations. This meeting will include a review of the current schedule. The schedule review will include an update of the status of all tasks and the development of work plans to mitigate any schedule slippage. The updated schedule will be issued weekly to identified personnel. During these communication meetings, it will be critical to review any external interface points to ensure good coordination between subcontractors.

On a monthly basis, a detailed review of schedule performance will be conducted. This review will be done based on the WBS structure and variance analysis. Corrective action will be done for elements that exceed established current period or cumulative thresholds. In addition, a summary of accomplishments and project issues will be prepared.

14.0 Document Control

All documentation for this project will be maintained in an indexed system that allows project documents to be readily retrievable. The organization of project documentation is essential to tracking project commitments and deliverables and serves as a permanent, audible record. Distribution lists will be reviewed with *customer name* to determine the appropriate person(s) for distribution.

Drawings, specifications, and test procedures will be released separately for Johnson Controls review and for the material procurement and installation stages of the project.

Only "Issued For Construction" documents will be used for construction. One set of drawings will be redlined to reflect "As-built" conditions. The final set of drawings and specifications will be changed and submitted to *customer name* upon completion of the project.

Attachments List

Description	Rev. No.
Project Organizational Chart	0
Project Work Breakdown Structure	0
Project Schedule	0

The final deliverable in applying EVM Principles to a project is the **"Monthly Project Review"** which is usually assembled by the Project Manager or Project Director and is used for internal evaluation of how the project is progressing compared to the agreed-upon baseline.

The periodic or monthly update of the project schedule identifies cost and time variances that will allow the Project Manager to ascertain a recovery plan to negate or minimize any negative variances.

The report to upper management can be in any format desired just so the problem areas are highlighted and the Project Team has determined what measures are to be taken to overcome any cost and/or time deficiencies identified in the update.

A suggested format for an internal monthly review follows:

PM MonthlyReview

XYZ Corporation
Project Management Dept

Date: 09/10/07
To: XXXXXXX (Logistics PM),
CC:

Time Management

Schedule Status: ●Edit according to status: COLOR**Green: BCWP = or > BCWS**
Satisfactory, Concern, or Major Concern **Yellow: BCWP 0 – 20 workdays behind BCWS**
Red: BCWP > 20 workdays behind BCWS

Baseline completion date: XXXXX
Current completion date: XXXXX
Finish Variance = #days ahead/behind "Baseline" schedule

This project reflects # % complete as of mm/yy vs. Last reported # % complete as of mm/yy

Critical activities requiring attention

- List activity name and ID from schedule, location
- XXX
- XXX

Cost Management

Earned Value: ● Edit according to status: COLOR**Green: ACWP =or < than BCWP**
Satisfactory, Concern, or Major Concern **Yellow: ACWP > BCWP up to 105%**
Red: ACWP > BCWP more than 105%

This project reflects "Actual Costs" under/over "Work Performed" by $ XXXXX. Variance is attributed to:

- List major sources of variance
- XXX

Cash Flow

Statement re status of projected billings vs. actual billings, vs. collections. The project is/ is not cash positive.

This project has/has not been re-estimated to reflect all cost to complete:Date of Re-estimate:**mm/yy**

Risk Management

Issues/Risk Log

Total project Issues	XXXXX
Resolved project Issues	XXXXX
Unresolved project Issues	XXXXX

Original Project Contingency	$ XXXXXX
Remaining Project Contingency	$ XXXXXX

Unresolved Project Issues Cost Exposure $ XXXXXX amount positive or negative

A monthly Project Manager's narrative report follows:

PROJECT MANAGER'S MONTHLY UPDATE NARRATIVE

(This narrative is required to accompany the Project Manager's updated schedule, Issues/Risk Log, and Performance Curve reports each month)

Project Name: **Customer:** **Area:** **Project Location:**	**Contract Number (s):**
Project Manager:	**Month/Yearof Narrative:**
Date Project Execution Plan (PEP) Delivered to Customer: (M/D/Y**)** _____	
Safety:	
• Is Safety Program in Place?	Yes/No
• Comment on project safety record to date	
Risk Management:	
• Major Issues/Risks to be listed in the CMS Monthly Project Review Report (emailed report)	
• Number of Issues added to Issues/Risk Log this month	
• Number of Issues resolved in Issues/Risk Log this month. (Quantified issues that are 100% resolved should be incorporated into a re-estimate)	
• Change (increase or decrease) in "Identified Risk" amount (Line D of "Summary Data" Excel worksheet from Issues/Risk Log workbook)	**$**
Major Accomplishments for the month: (Schedule reductions, cost savings, approvals, etc.)	
Major Work to Perform next month(Describe major work planned for the coming month):	
Schedule Status (Provide reasons the project is ahead of or behind baseline plan):	
Customer Schedule Status (If Applicable)**:**	
• Status date of Customer schedule used in baseline schedule:	Status Date:

• Status date of Customer's most current revised schedule:	Status Date:
• Have revised Customer milestone dates been inserted into schedule?	Yes/No
• Are late Customer milestone tasks delaying project finish date?	Yes/No
• Has the Customer been informed in writing of delay impacts?	Yes/No Date:
Change Order Status:	
• List change orders and amounts negotiated and booked during the month. List change order issues that remain outstanding, unresolved, proposed, or unapproved.	
• Have approved change orders by Customer been entered into contract? (If not, explain reason.)	Yes/No
• Have change orders been incorporated and baselined into the schedule?	Yes/No
Cash Flow:	
• Are actual billings greater or less than planned billings?	Greater/Less Than
• Provide reasons if actual billings are less than planned billings:	
• If any invoice is outstanding 60 days or greater, please explain:	
Earned Value (Provide reasons the ACWP amount from IIS is greater or less than BCWP (earned value amount)).	
Re-Estimate:	
• Cost and date of current re-estimate (multi if more than one booked project)	$ Date(s):_____
• Reason for re-estimate:	
• If current re-estimate exceeds current original estimated cost (slippage), describe steps taken to reduce slippage:	
Lessons Learned for the month:	

Course Summary

The student after having read the course contents should now have a basic understanding how EVM Principles apply to the development and management of a project. In this course all the pertinent project documents are called "deliverables". Whatever documents or deliverables are used in compiling and updating a project schedule, the Project Manager and Project Team should have a complete understanding of the project criteria if properly managed will deliver the project to the owner or customer as expected.

Project criteria used in assembling and updating a schedule shall include but not be limited to the following documents:

- Design drawings and specifications
- Performance contract between owner and contractor
- Scopes of work for all work elements
- Subcontracts
- Site conditions
- Outside agency influence
- Consultant involvement

The top ten reasons why projects are successful are:

1. Early and complete planning
2. Strong client focus and participation
3. Strong senior management support
4. Well defined requirements and objectives
5. Effective change order process
6. Necessary resources available
7. Regular updating and evaluation
8. Quality risk analysis
9. Highly skilled project management leadership
10. Effective project communication