Jefferson Science Associates, LLC

200
Organization

Project Control System Manual
Revision 7

200 Organization

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

201 Project Control System Integration

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

202 Work Breakdown Structure

A. The Work Breakdown Structure with its associated WBS dictionary is the key element for organizing a project. The WBS is a structural organization of related elements that defines the total work scope required to accomplish project objectives. Its purpose is to divide the project into manageable segments of work to facilitate planning, budgeting, estimating, work authorization, cost accumulation, and performance reporting. A well designed WBS will incorporate all required project work and will not contain any work that falls outside the actual scope of the project.

B. The WBS takes the form of a multi-level hierarchical framework depicting the overall project deliverable broken down into smaller system components. Each descending level represents an increasingly detailed definition of a system component. A high-level WBS is developed early in the conceptual stage of the project with more detail added as the project definition is refined. The level of detail in a WBS is a function of the size of the project and a balance between complexity, risk, and the Project Manager's need for control.

C. Early and accurate WBS planning is essential to getting a project off to a good start. If project requirements change however, the WBS will evolve with the project. Revisions to the WBS may be required due to the expansion or contraction of project scope and/or the movement of a project through its various stages (i.e., design, engineering, development, production/installation, and operation). Modifications to the WBS are implemented by means of the Change Control process.

202.1 WBS Development

The project WBS is a product-oriented decomposition of the project (Exhibit 1) and is organized in multiple levels of increasing detail. WBS Level 1 is the entire project and represents the total responsibility assigned to the Project Manager. (Note: Each Jefferson Lab project using an Earned Value Management System will be assigned a JSA Enterprise Project Structure code. This code will represent the Level 1 WBS number element for the project.) At WBS Level 2, the overall project is subdivided into major segments that define the key deliverables and usually includes a project management element. The depth of a WBS is dependent upon the size and complexity of the project and the level of detail needed to plan and manage it. Additional levels of the WBS can be included as needed to extend the WBS to a level of detail necessary to reflect the complexity of the work scope. Not all legs of the WBS must be composed of the same number of levels. Each WBS element is assigned a unique WBS number. The WBS number is used to accumulate and report performance measurement data (cost estimates, budgets, earned value, and actual costs) and to summarize data at higher WBS levels. Performance measurement data are derived directly from entry-level data collected or prepared at the appropriate level of the WBS.

202.2 WBS Dictionary

A complete Work Breakdown Structure requires an associated dictionary (Exhibit 2) to provide descriptive information for each WBS element. The WBS dictionary thoroughly describes the scope of each work element (including deliverables) identified in the WBS. It may also outline the resource types required to produce each element. As with the WBS itself, the WBS dictionary is revised to reflect project changes via the Change Control process and is kept up to date during the life of the project.

203 Organizational Breakdown Structure

A complementary arrangement to the WBS is the Organizational Breakdown Structure (OBS) for defining project authority and assigning work responsibilities (Exhibit 3). Project leadership can design a hierarchical framework where unique work responsibilities can be established for each part of a project. The framework establishes the formal authority relationships that exist among the various organizational team elements. This can take the form of a standard organization chart with the structure progressively detailed downward to the lowest levels of management.

204 WBS and OBS Integration

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

B. Control accounts are made up of one or more work packages and/or planning packages.

- Work packages constitute the basic building blocks used in planning, executing, measuring, and controlling project work. Work packages consist of a series of discrete, apportioned, or level of effort activities that have been planned, scheduled and budgeted in detail. Work packages are a subdivision of a control account and normally reside at the lowest level of a WBS branch. This may not necessarily be at the lowest level of the project WBS. Once work for a control account is authorized, a charge code is assigned to work packages allowing costs to be accumulated in the Jefferson Lab financial system.
- Planning packages are created during initial baseline planning when work scope within a control account is identified, scheduled and budgeted, but not defined in enough detail for proper execution. They reside at similar levels in the WBS as work packages and are normally developed for far-term work scope where precise estimates of work, schedule or budget are not possible. Planning packages must be refined with more detail to become work packages. This refinement

must occur before actual work begins. In certain situations, a work package may have a "planning activity" that gets refined at a later date. This usually involves a project procurement where the subcontract details have not yet been finalized. Procurement pegpoints, as described in Section 600, are an example of a planning activity definitized into a work activity.

- It is possible for there to be intermediate roll-up WBS levels between where the control account is established and the level where the work/planning packages for that control account are developed.

205 Responsibility Assignment Matrix

The Responsibility Assignment Matrix (RAM) (Exhibit 4) is developed to correlate the relationship between the project work scope and an appointed authority responsible for accomplishing this work. The matrix is created such that the intersection of a WBS element and an OBS element identifies the control account. The RAM is "dollarized" by annotating the control account cell with the amount of project budget (derived from the Cost Management System) that is allocated to the control account. The RAM is updated when baseline changes are made to the control account.

206 Exhibits

1. WBS Example
2. WBS Dictionary Example
3. Organizational Breakdown Structure Example
4. Responsibility Assignment Matrix Example

Exhibit 1. WBS Example

Project Name: Technology & Engineering Development Facility						
WBS Level						
1	**2**	**3**	**4**	**5**	**WBS Title**	**WBS Number**
X					**TEDF Project**	**1.0**
	X				**Project Planning**	**1.1**
		X			Conceptual Planning	1.1.1
		X			Planning	1.1.2
	X				**Engineering and Design**	**1.2**
		X			Design Services	1.2.01
		X			Pre-Construction Services	1.2.02
		X			Pre-Construction Project Management	1.2.03
	X				**Construction**	**1.3**
		X			Conventional Facilities Construction	1.3.1
			X		Civil/Site and Early Procurements	1.3.1.1
			X		TED Building Construction	1.3.1.2
			X		TL Building Construction	1.3.1.3
			X		TL Renovation	1.3.1.4
		X			Furnished Furniture/Equipment	1.3.2
			X		TED Furniture/Equipment	1.3.2.1
			X		TL Furniture/Equipment	1.3.2.2
			X		TL Ren Furniture/Equipment	1.3.2.3
		X			Construction Management Services	1.3.3
			X		Construction Management	1.3.3.1
				X	TED Construction Management	1.3.3.1.1
				X	TL Construction Management	1.3.3.1.2
				X	TL Ren Construction Management	1.3.3.1.3
			X		Commissioning	1.3.3.2
				X	TED Commissioning	1.3.3.2.1
				X	TL Commissioning	1.3.3.2.2
				X	TL Ren Commissioning	1.3.3.2.3
			X		A-E Support	1.3.3.3
				X	TED A/E Support	1.3.3.3.1
				X	TL A/E Support	1.3.3.3.2
				X	TL Ren A/E Support	1.3.3.3.3
		X			Project Management	1.3.4

Exhibit 2. WBS Dictionary Example

Jefferson Science Associates, LLC

12 GeV Upgrade

WBS DICTIONARY

Revisions	
CR #	Date

WBS Number	WBS Element
1.4.2.1	Construction Hall B CLAS Superconducting Magnets: Torus and Solenoid

Technical Content (including Processes)

Torus Magnet: This WBS element includes design, engineering, and fabrication of 6 flat panels of superconducting coils with polar angle coverage from 5 degrees to 40 degrees and azimuthal acceptance from 50% at 5 degrees to more than 90%at 40 degrees The $\int Bdl > 3$ Tm@ 5 degree and about 0.5 Tm at 40 degrees Coil cryostat width front face is about 10 mm.

Solenoid Magnet: This WBS element includes design, engineering, and fabrication of the superconducting solenoid with 5 Tesla central field with aperture of 0.78 m and opening angle of 80 degrees in the forward direction. The field uniformity in the target area is better than10-4 in cylinder 0.07 x 0.03m for polarized target operation. The outer dimensions are diameter of about 2m and length of about 1.8 m. It consists of the main coil and compensating coil to minimize the stray field at the detectors location.

Resource Type Summary

- Design/Mechanical/Electrical Engineers
- Design/Mechanical/Electrical Technicians
- Senior Scientist
- Senior Staff
- Procurements
- Travel
- Machine Shop

Deliverables

- Torus Magnet
- Solenoid Magnet

Exhibit 3. Organizational Breakdown Structure Example

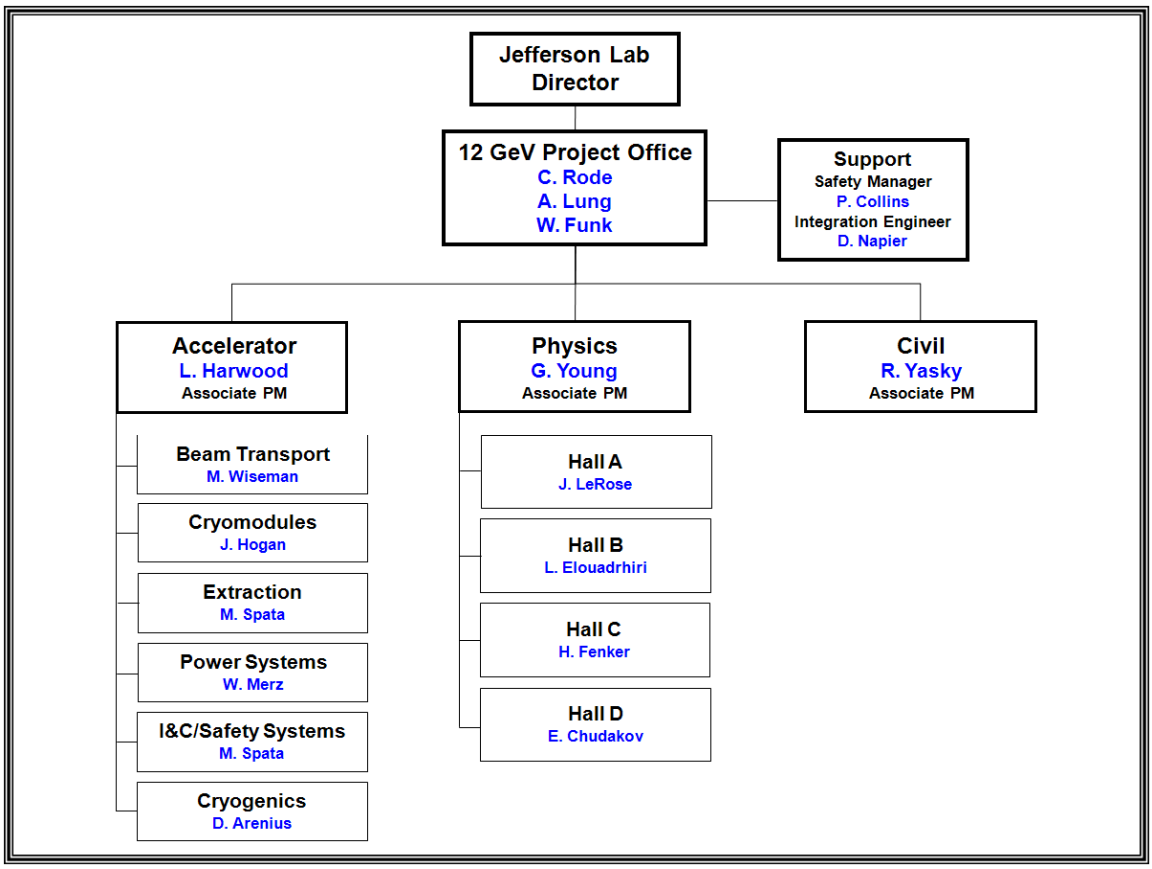

Exhibit 4. Responsibility Assignment Matrix Example

WBS	WBS Title	ORGANIZATION													
		JLab Institute for SRF Science & Technology	JLab Engineering Division Electrical Systems Support	JLab Engineering Division Mechanical Engineering	JLab Engineering Division Cryogenics	JLab Center for Advanced Studies of Accelerators	JLab Experimental Hall A	12 GeV Project Office	12 GeV Accelerator	12 GeV Physics	12 GeV Civil	12 GeV Hall B	12 GeV Hall C	12 GeV Hall D	TOTAL
		J. Hogan	B. Merz	M. Bevins	D. Arenius	M. Spata	J. LeRose	C. Rode	L. Harwood	G. Young	R. Yasky	L. Elouadrhiri	H. Fenker	E. Chudakov	$K
ACD/CDR															
1.0								3,497							3,497
R&D															
1.1.1.1	R&D Accel Systems Cryomodules	1,465													1,465
1.1.1.2	R&D Accel Systems Power Systems		1,067												1,067
1.1.1.4	R&D Accel Systems Beam Transport			191											191
1.1.2	R&D Hall A						83								83
1.1.3	R&D Hall B											1,318			1,318
1.1.4	R&D Hall C												465		465
1.1.5	R &D Hall D													1,844	1,844
1.1.6	R&D Civil										55				55
1.1.7	R&D Project Management							391							391
PED															
1.2.1.1	PED Accel Systems Cryomodules	791													791
1.2.1.2	PED Accel Systems Power Systems		2,215												2,215
1.2.1.3	PED Accel Systems Cryogenics				1,438										1,438
1.2.1.4	PED Accel Systems Beam Transport			2,870											2,870
1.2.1.5	PED Accel Systems Extraction					424									424
1.2.1.6	PED Accel Systems Instrumentation, Controls, and Safety Systems					1,145									1,145
1.2.2.1	PED Upgrade Hall A						172								172
1.2.2.2	PED Upgrade Hall B											2,711			2,711
1.2.2.3	PED Upgrade Hall C												1,534		1,534
1.2.3	PED Hall D													2,640	2,640
1.2.4	PED Conventional Facilities										1,061				1,061
1.2.5	PED Project Management							2,997							2,997
1.2.6	PED Accelerator Systems Commissioning Planning					143									143
Construction															
1.3.1.1	Construction Accel Systems Cryomodules Procurements	18,367													18,367
1.3.1.2	Construction Accel Systems Cavity String Assembly	1,572													1,572
1.3.1.3	Construction Accel Systems Cryomodule Assembly	2,312													2,312
1.3.1.4	Construction Accel Systems Acceptance Testing	623													623
1.3.1.5	Construction Accel Systems Installation	576													576
1.3.1.6	Construction Accel Systems Microphonics	280													280
1.3.2.1.1	Construction Accel Systems Power Systems RF Power		9,424												9,424
1.3.2.1.2	Construction Accel Systems Power Systems RF Control		3,222												3,222