Jefferson Science Associates, LLC

200
Organization

Project Control System Manual
Revision 4

200 Organization

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

201 Project Control System Integration

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

202 Work Breakdown Structure

A. Each Jefferson Lab project using an Earned Value Management System will be assigned a JSA Enterprise Project Structure code. This code will represent the Level 1 WBS number element for the project.

B. The Work Breakdown Structure (Exhibit 1) with its associated WBS dictionary is the key element for organizing a project. Its purpose is to divide the project into manageable segments of work to facilitate planning and control of technical scope, schedule and cost. A well designed WBS will

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

C. The WBS is a structural organization of related elements that defines the total work scope required to accomplish project objectives. It takes the form of a multi-level hierarchical framework depicting the overall project deliverable down to the smallest system component. Each descending level represents an increasingly detailed definition of a project component. The project WBS describes the technical content of the project, and is the basis for project management, cost estimating and budgeting, schedule management, cost and schedule control, and reporting of cost and schedule performance. A high-level WBS is developed early in the conceptual stage of the project with more detail added as the project definition is refined. The level of detail in a WBS is a function of the size of the project and a balance between complexity, risk, and the Project Manager's need for control.

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

202.1 WBS Development

A. The project WBS is a decomposition of the project (Exhibit 2) and is organized in multiple levels of increasing detail. The first four levels of the WBS are defined to facilitate overall assignment of project management responsibilities and the logical aggregation of cost data. WBS Level 1 is the entire project and represents the total responsibility assigned to the Project Manager. For WBS Level 2, the overall project is divided into segments that depend upon the reporting requirements of the Project Customer. For DOE projects, these Level 2 segments will normally be funding types [Budget and Reporting (B&R) Classification Codes] while DOD projects will normally have product-oriented elements. WBS Level 3/4 elements are definable product-oriented components of Level 2 segments that accomplish a specific purpose.

B. Additional levels of the WBS (Levels 5, 6, etc.) can be included as needed to extend the WBS to a level of detail necessary to reflect the complexity of the work scope. Not all legs of the WBS must be composed of the same number of levels.

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

202.2 WBS Dictionary

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

203 Project Organization

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

204 WBS and Organization Integration

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

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

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

205 Responsibility Assignment Matrix

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

206 Exhibits

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

Exhibit 1. WBS Example

WBS Level

1 2 3

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

Exhibit 2. WBS Diagram Example

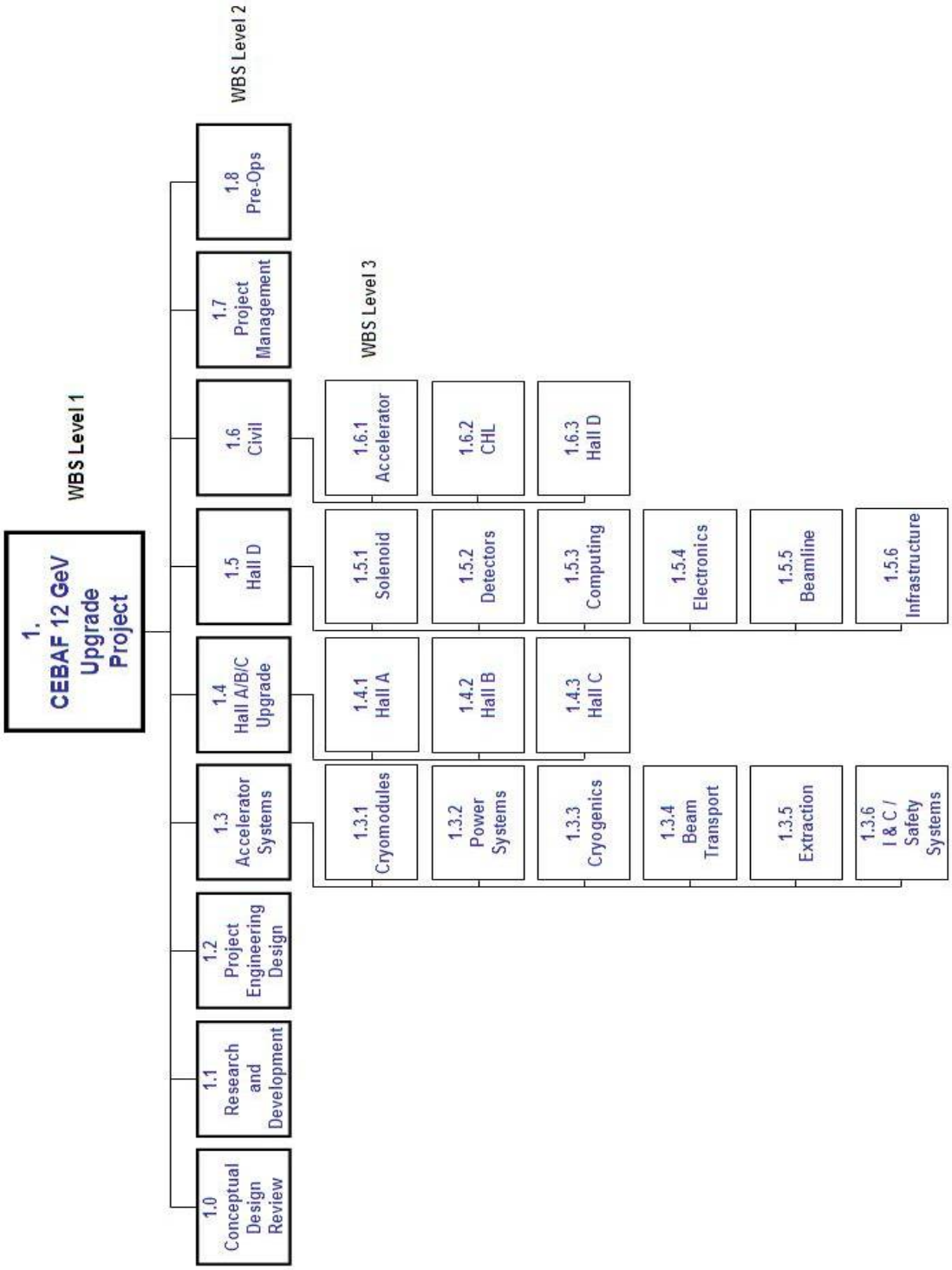

Exhibit 3. WBS Dictionary Example

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

Exhibit 4. Project Organization Example

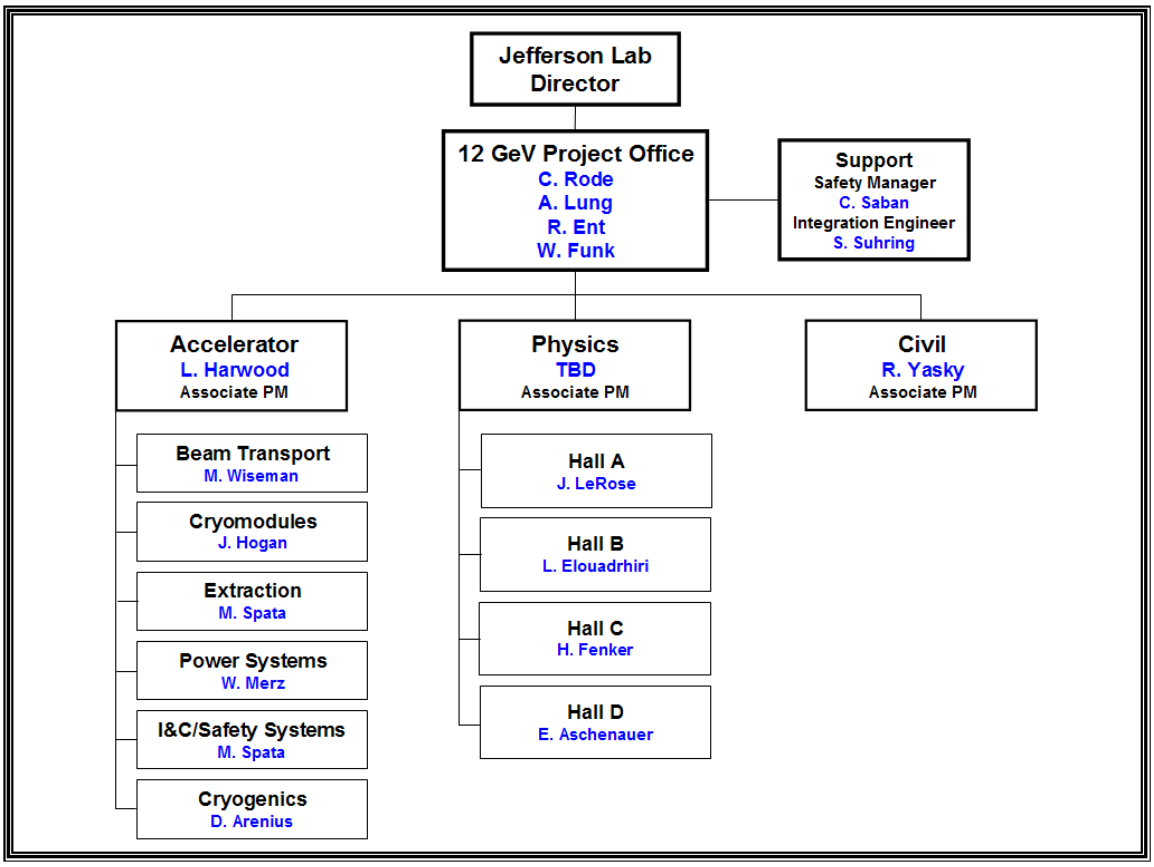

Exhibit 5. Responsibility Assignment Matrix Example

WBS	Description	$K	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. Wiseman	D. Arenius	M. Spata	J. LeRose	C. Rode	L. Harwood	Rode (actin	R. Yasky	L. Elouadrhir	A. Bruell	E. Aschenauer	
ACD/CDR																
1.0																
R&D																
1.1.1.1	R&D Accel Systems Cryomodules															
1.1.1.2	R&D Accel Systems Power Systems															
1.1.1.3	Not Used															
1.1.1.4	R&D Accel Systems Beam Transport															
1.1.1.5	Not Used															
1.1.1.6	Not Used															
1.1.2	R&D Hall A															
1.1.3	R&D Hall B															
1.1.4	R&D Hall C															
1.1.5	R &D Hall D															
1.1.6	R&D Civil															
1.1.7	R&D Project Management															
PED																
1.2.1.1	PED Accel Systems Cavity String Assembly Cavities															
1.2.1.2	PED Accel Systems RF Power Klystrons															
1.2.1.3	PED Accel Systems Cryogenics Accelerator CHL Building Layout and Utilities Req															
1.2.1.4	PED Accel Systems Beam Transport Spreaders & Recombiners Dipoles															
1.2.1.5	PED Accel Systems Extraction Cavities															
1.2.1.6	PED Accel Systems Instrumentation, Controls, and Safety Systems Beam Diagnostics BPMs															
1.2.2.1	PED Upgrade Hall A Computing DAQ Upgrade for HRS															
1.2.2.2	PED Upgrade Hall B Magnet															
1.2.2.3	PED Upgrade Hall C Magnet Quadrupoles															
1.2.3	PED Hall D															
1.2.4	PED Conventional Facilities															
1.2.5	PED Project Management															
1.2.6	Planning															