

Long Baseline

SAMPLE WBS STRUCTURE for MASTER PROJECT SCHEDULE

| | |
|--------------|--|
| 1 | LONG BASELINE: INTEGRATED SYSTEM DESIGN |
| 1.1 | Project Administration |
| 1.1.1 | Installation Milestones |
| 1.1.2 | Project Management |
| 1.2 | Systems Engineering |
| 1.2.1 | Experiment Requirements Definition & Management |
| 1.2.1.1 | Requirements Management Database: Integrated Sys. Design |
| 1.2.1.2 | Project Performance Baseline Document |
| 1.2.2 | Site Investigation |
| 1.2.2.1 | Coring & Geo-Technical Studies |
| 1.2.3 | Sub-Systems Interface Definition & Control Documents |
| 1.2.4 | Information Management: Project Documentation & Records |
| 1.2.5 | Configuration Management |
| 1.2.6 | Continuous Risk Management |
| 1.2.7 | Quality Management |
| 1.2.7.1 | Quality Planning |
| 1.2.7.2 | Quality Assurance |
| 1.2.7.3 | Quality Control |
| 1.3 | Integrated Safety Management |
| 1.3.1 | Safety Training |
| 1.3.2 | Hazardous Assessment & Response Plans |
| 1.3.3 | Other Experiment Specific Safety Management Elements |
| 1.3.4 | Safety Engineering |
| 1.3.4.1 | System A Safety |
| 1.3.4.2 | System B Safety |

| | |
|----------------|--|
| 2 | DETECTOR |
| 2.1 | Detector: Integrated System Design (ISD) |
| 2.1.1 | Project Administration |
| 2.1.1.1 | Installation Milestones |
| 2.1.1.2 | Project Management |
| 2.1.2 | Systems Engineering |
| 2.1.2.1 | Experiment Requirements Definition & Management |
| 2.1.2.1.1 | Requirements Management Database: Integrated Sys. Design |
| 2.1.2.1.2 | Project Performance Baseline Document |
| 2.1.2.2 | Site Investigation |
| 2.1.2.2.1 | Project Requirements / Site Conditions "Gap Analysis" |
| 2.1.2.3 | Sub-Systems Interface Definition & Control Documents |
| 2.1.2.4 | Information Management: Project Documentation & Records |
| 2.1.2.5 | Configuration Management |
| 2.1.2.6 | Continuous Risk Management |
| 2.1.2.7 | Quality Management |
| 2.1.2.7.1 | Quality Planning |
| 2.1.2.7.2 | Quality Assurance |
| 2.1.2.7.3 | Quality Control |
| 2.1.3 | Integrated Safety Management |
| 2.1.3.1 | Safety Training |
| 2.1.3.2 | Hazardous Assessment & Response Plans |
| 2.1.3.3 | Other Experiment Specific Safety Management Elements |
| 2.1.3.4 | Safety Engineering |
| 2.1.3.4.1 | System A Safety |
| 2.1.3.4.2 | System B Safety |

2.2 Detector: Design & Review

2.2.1 Instrumentation & Equipment: Design & Review

2.2.1.1 Preliminary Design & Review (50%)

2.2.1.1.1 Detector Hardware

- 2.2.1.1.1.1 PMT's
- 2.2.1.1.1.2 HV
- 2.2.1.1.1.3 Cabling
- 2.2.1.1.1.4 Calibration Systems
- 2.2.1.1.1.5 Electronics & DAQ
- 2.2.1.1.1.6 Backgrounds Control

2.2.1.2 Final Design & Review

2.2.2 Special Systems: Design & Review

2.2.2.1 Preliminary Design & Review (50%)

2.2.2.1.1 Special Utilities

- 2.2.2.1.1.1 Ventilation
- 2.2.2.1.1.2 Fire Protection
- 2.2.2.1.1.3 Plumbing
- 2.2.2.1.1.4 Power (regular & clean)
- 2.2.2.1.1.5 Sanitary
- 2.2.2.1.1.6 Lighting
- 2.2.2.1.1.7 Security System

2.2.2.1.8 Oxygen Monitoring

2.2.2.1.2 Specialized Systems

- 2.2.2.1.2.1 Water purification system
- 2.2.2.1.2.2 Communications & Data System
- 2.2.2.1.2.3 Veto Systems
- 2.2.2.1.2.4 Detector Interface
- 2.2.2.1.2.5 Other Specialized Systems

2.2.2.1.3 Specialized Structures & Enclosures

- 2.2.2.1.3.1 Floors
- 2.2.2.1.3.2 Decks, Bridges & Stairs
- 2.2.2.1.3.3 Water System
- 2.2.2.1.3.4 Veto Systems
- 2.2.2.1.3.5 Drainage & Contrainment
- 2.2.2.1.3.6 Isolation features

2.2.2.1.4 Materials Handling Equipment

- 2.2.2.1.4.1 Rail Transport
- 2.2.2.1.4.2 Bridge Crane
- 2.2.2.1.4.3 Gantry Crane

2.2.2.1.5 Laboratory Outfitting

2.2.2.2 Final Design & Review

2.3 Detector: Procurement

2.3.1 Licenses & Regulatory Requirements

2.3.2 Instrumentation/Equipment & Installation

2.3.2.1 Bid & Award

2.3.2.1.1 Contractor Procurement

- 2.3.2.1.1.2 Contractor 1
- 2.3.2.1.1.2 Contractor 2

2.3.2.1.2 Equipment Procurement

- 2.3.2.1.2.1 PMT's
- 2.3.2.1.2.2 HV
- 2.3.2.1.2.3 Cabling
- 2.3.2.1.2.4 Calibration Systems
- 2.3.2.1.2.5 Electronics & DAQ

2.3.2.2 In-House Fabrication

- 2.3.2.2.1 Detector Interface
- 2.3.2.2.2 Backgrounds Control

2.3.3 Special Utilities Procurement

2.3.3.1 Bid & Award

2.3.3.1.1 Contractor Procurement

- 2.3.3.1.1.1 Contractor 1
- 2.3.3.1.1.2 Contractor 2

| | |
|------------------|---|
| 2.3.3.1.2 | Equipment Procurement |
| 2.3.3.1.2.1 | HVAC |
| 2.3.3.1.2.2 | Ventilation |
| 2.3.3.1.2.3 | Fire Protection |
| 2.3.3.1.2.4 | Plumbing |
| 2.3.3.1.2.5 | Power (regular & clean) |
| 2.3.3.1.2.6 | Sanitary |
| 2.3.3.1.2.7 | Lighting |
| 2.3.3.1.2.8 | Security System |
| 2.3.3.1.2.9 | Oxygen Monitoring |
| 2.3.4 | Specialized Systems |
| 2.3.5 | Specialized Structures & Enclosures |
| 2.3.6 | Materials Handling Equipment |
| 2.3.7 | Laboratory Outfitting |
| 2.4 | DUSEL Site Equipment & Materials Control |
| 2.4.1 | Site Equipment & Materials Inventory |
| 2.4.1.1 | Special Systems Inventory |
| 2.4.1.1.1 | Special Utilities |
| 2.4.1.1.2 | Specialized Systems |
| 2.4.1.1.3 | Specialized Structures & Enclosures |
| 2.4.1.1.4 | Materials Handling Equipment |
| 2.4.1.1.5 | Laboratory Outfitting |
| 2.4.1.2 | Instrumentation & Equipment Inventory |
| 2.4.1.2.1 | Detector |
| 2.4.2 | Surface Pre-Assembly & Testing |
| 2.4.2.1 | Special Systems Pre-Assembly & Testing |
| 2.4.2.1.1 | Special Utilities |
| 2.4.2.1.2 | Specialized Systems |
| 2.4.2.1.3 | Specialized Structures & Enclosures |
| 2.4.2.1.4 | Materials Handling Equipment |
| 2.4.2.1.5 | Laboratory Outfitting |
| 2.4.2.2 | Instrumentation & Equipment Pre-Assembly & Testing |
| 2.4.2.2.1 | Detector |
| 2.4.2.3 | Laboratory Special Systems Pre-Assembly & Testing |
| 2.4.3 | Equipment & Materials UG Transport |
| 2.4.3.1 | Surface Disassembly & Packaging |
| 2.4.3.2 | UG Transport of Equipment & Materials |
| 2.5 | Detector: Construction & Installation |
| 2.5.1 | Mobilization - Demobilization |
| 2.5.2 | Special Systems Construction |
| 2.5.2.1 | Special Utilities |
| 2.5.2.1.1 | HVAC |
| 2.5.2.1.2 | Ventilation |
| 2.5.2.1.3 | Fire Protection |
| 2.5.2.1.4 | Plumbing |
| 2.5.2.1.5 | Power (regular & clean) |
| 2.5.2.1.6 | Sanitary |
| 2.5.2.1.7 | Lighting |
| 2.5.2.1.8 | Security System |
| 2.5.2.1.9 | Oxygen Monitoring |
| 2.5.2.1.10 | Voice/Data Cabling & Data Network Equipment |

| | |
|------------------|---|
| 2.5.2.2 | Specialized Systems |
| 2.5.2.2.1 | Water purification system |
| 2.5.2.2.2 | Communications & Data System |
| 2.5.2.2.3 | Veto Systems |
| 2.5.2.2.4 | Detector Interface |
| 2.5.2.2.5 | Other Specialized Systems |
| 2.5.2.3 | Specialized Structures & Enclosures |
| 2.5.2.3.1 | Floors |
| 2.5.2.3.2 | Decks, Bridges & Stairs |
| 2.5.2.3.3 | Water System |
| 2.5.2.3.4 | Veto Systems |
| 2.5.2.3.5 | Drainage & Contrainment |
| 2.5.2.3.6 | Isolation features |
| 2.5.2.4 | Materials Handling Equipment |
| 2.5.2.4.1 | Rail Transport |
| 2.5.2.4.1.1 | Rail bed improvements |
| 2.5.2.4.1.2 | Track improvements |
| 2.5.2.4.1.3 | Rolling stock |
| 2.5.2.4.2 | Bridge Crane |
| 2.5.2.4.2.1 | Crane rail attachments |
| 2.5.2.4.2.2 | Crane rail |
| 2.5.2.4.2.3 | Bridge |
| 2.5.2.4.2.4 | Hoist |
| 2.5.2.4.2.5 | Electrification |
| 2.5.2.4.3 | Gantry Crane |
| 2.5.2.5 | Laboratory Outfitting |
| 2.5.2.5.1 | Finishes |
| 2.5.2.5.2 | Signage |
| 2.5.2.5.3 | Furniture, fixtures & equipment |
| 2.5.2.5.4 | Partitions |
| 2.5.2.5.5 | Others |
| 2.5.2.5.6 | Clean Room & Counting room |
| 2.5.2.5.7 | Laboratory outfitting |
| 2.5.3 | Equipment & Instrumentation Installation (EII) |
| 2.5.3.1 | Detector |
| 2.5.3.1.1 | PMT's |
| 2.5.3.1.2 | HV |
| 2.5.3.1.3 | Cabling |
| 2.5.3.1.4 | Electronics & DAQ |
| 2.5.3.1.5 | Detector Interface |
| 2.5.3.1.6 | Backgrounds Control |
| 2.5.3.1.7 | Calibration Systems |
| 2.6 | Detector: Testing & Acceptance |
| 2.6.1 | Systems Integration & Testing |
| 2.6.2 | Acceptance & Operational Readiness Reviews |
| 2.7 | Detector: Commissioning |
| 2.8 | Detector: Close-Out |
| 2.8.1 | Administrative Close-Out |
| 2.8.2 | Field Close-Out |

3 LARGE CAVITY EXCAVATION (LCE)

| | |
|--------------|--|
| 3.1 | LCE: Integrated System Design (ISD) |
| 3.1.1 | Project Administration |
| 3.1.1.1 | Installation Milestones |
| 3.1.1.2 | Project Management |
| 3.1.2 | Systems Engineering |
| 3.1.2.1 | Experiment Requirements Definition & Management |
| 3.1.2.1.1 | Requirements Management Database: Integrated Sys. Design |
| 3.1.2.1.2 | Project Performance Baseline Document |
| 3.1.2.2 | Site Investigation |
| 3.1.2.2.1 | Coring & Geo-Technical Studies |
| 3.1.2.3 | Sub-Systems Interface Definition & Control Documents |

3.1.2.4 Information Management: Project Documentation & Records
 3.1.2.5 Configuration Management
 3.1.2.6 Continuous Risk Management
 3.1.2.7 Quality Management

3.1.2.7.1 Quality Planning
 3.1.2.7.2 Quality Assurance
 3.1.2.7.3 Quality Control

3.1.3 Integrated Safety Management

3.1.3.1 Safety Training
 3.1.3.2 Hazardous Assessment & Response Plans
 3.1.3.3 Other Experiment Specific Safety Management Elements
 3.1.3.4 Safety Engineering

3.1.3.4.1 System A Safety
 3.1.3.4.2 System B Safety

3.2 LCE: Design & Review

3.2.1 Excavation Design & Review

3.2.1.1 Preliminary Design & Review (50%)

3.2.1.1.1 Cavity Design
 3.2.1.1.2 Rock Stabilization Design
 3.2.1.1.3 Cavity Liner Design
 3.2.1.1.4 Support Structures Design
 3.2.1.1.5 Waste Rock Disposal
 3.2.1.1.6 Cavity Finishes & Drains

3.2.1.2 Final Design & Review

3.3 LCE: Procurement

3.3.1 Licenses & Regulatory Requirements

3.3.2 Excavation

3.3.2.1 Bid & Award

3.3.2.1.1 Contractor Procurement

3.3.2.1.1.1 Contractor 1
 3.3.2.1.1.2 Contractor 2

3.3.2.1.2 Equipment Procurement

3.3.3 Excavation Materials

3.4 DUSEL Site Equipment & Materials Control

3.4.1 Site Equipment & Materials Inventory

3.4.1.1 Excavation Equipment
 3.4.1.2 Excavation Materials

3.4.2 Surface Pre-Assembly & Testing

3.4.3 Equipment & Materials UG Transport

3.4.3.1 Surface Disassembly & Packaging

3.4.3.1.1 Excavation Equipment
 3.4.3.1.2 Excavation Materials

3.4.3.2 UG Transport of Equipment & Materials

3.5 LCE: Construction

3.5.1 Mobilization - Demobilization

3.5.2 Large Cavity Excavation & Ground Support

3.5.3 Large Cavity Waste Rock Removal

3.5.4 Cavity Finishes

3.5.4.1 Shotcrete
 3.5.4.2 Concrete Floors

3.6 LCE: Testing & Acceptance

3.6.1 Systems Integration & Testing

3.6.2 Acceptance & Operational Readiness Reviews

3.7 LCE: Commissioning

3.8 LCE: Close-Out

3.8.1 Administrative Close-Out
 3.8.2 Field Close-Out

4 Fermi Lab Beamline

5 FACILITIES INFRASTRUCTURE (FI)

5.1 FI: Integrated System Design (ISD)

5.1.1 Project Administration

5.1.1.1 Installation Milestones

5.1.1.2 Project Management

5.1.2 Systems Engineering

5.1.2.1 Site Investigation

5.1.2.2 Sub-Systems Interface Definition & Control Documents

5.1.2.3 Information Management: Project Documentation & Records

5.1.2.4 Configuration Management

5.1.2.5 Continuous Risk Management

5.1.2.6 Quality Management

5.1.2.6.1 Quality Planning

5.1.2.6.2 Quality Assurance

5.1.2.6.3 Quality Control

5.1.3 Integrated Safety Management

5.1.3.1 Safety Training

5.1.3.2 Hazardous Assessment & Response Plans

5.1.3.3 Other Experiment Specific Safety Management Elements

5.1.3.4 Safety Engineering

5.1.3.4.1 System A Safety

5.1.3.4.2 System B Safety

5.2 FI: Design & Review

5.2.1 FI Utility Systems: Design & Review

5.2.1.1 Preliminary Design & Review (50%)

5.2.1.1.1 Control Systems

5.2.1.1.2 Data Management & CyberInfrastructure Systems

5.2.1.1.3 HVAC

5.2.1.1.4 Ventilation System

5.2.1.1.5 Fire Protection

5.2.1.1.6 Plumbing

5.2.1.1.7 Power (regular & clean)

5.2.1.1.8 Sanitary

5.2.1.1.9 Lighting

5.2.1.1.10 Security System

5.2.1.1.11 Oxygen Monitoring

5.2.1.1.12 Health & Safety Systems

5.2.1.1.13 Materials Handling Systems

5.2.1.1.14 Water Management Systems

5.2.1.1.15 Storage & Containment Systems

5.2.1.1.16 Mechanical & Speciality Services Systems

5.2.1.1.17 Other Infrastructure, Outfitting, & Utilities

5.2.1.2 Final Design & Review

5.2.2 FI Construction Utilities: Design & Review

5.2.2.1 Preliminary Design & Review (50%)

5.2.2.1.1 Construction: Electrical Power

5.2.2.1.2 Construction: Ventilation

5.2.2.1.3 Construction: Water Supply

5.2.2.1.4 Construction: Other Utilities

5.2.2.2 Final Design & Review

5.3 FI: Procurement

5.3.1 Licenses & Regulatory Requirements

5.3.2 FI Utility Systems: Procurement

5.3.2.1 Bid & Award

5.3.2.1.1 Contractor Procurement

5.3.2.1.1.1 Contractor 1

5.3.2.1.1.2 Contractor 2

5.3.2.1.2 Equipment Procurement

5.3.2.1.2.1 Control Systems

5.3.2.1.2.2 Data Management & CyberInfrastructure Systems

5.3.2.1.2.3 HVAC

- 5.3.2.1.2.4 Ventilation System
- 5.3.2.1.2.5 Fire Protection
- 5.3.2.1.2.6 Data Management & CyberInfrastructure Systems
- 5.3.2.1.2.7 Oxygen Monitoring
- 5.3.2.1.2.8 Health & Safety Systems
- 5.3.2.1.2.9 Materials Handling Systems
- 5.3.2.1.2.10 Water Management Systems
- 5.3.2.1.2.11 Mechanical & Speciality Services Systems
- 5.3.2.1.2.12 Other Infrastructure, Outfitting, & Utilities

5.3.3 FI Construction Utilities: Procurement

5.3.3.1 FI Bid & Award

5.3.3.1.1 Contractor Procurement

5.3.3.1.1.1 Contractor 1

5.3.3.1.1.2 Contractor 2

5.4 DUSEL Site Equipment & Materials Control

5.4.1 FI Utility Systems

5.4.1.1 FI Utility Systems: Equipment

5.4.1.2 FI Utility Systems: Materials

5.4.2 FI Construction Utilities

5.4.2.1 FI Construction Utilities: Equipment

5.4.2.2 FI Construction Utilities: Materials

5.4.3 Surface Pre-Assembly & Testing

5.4.2.1 FI Construction Utilities: Equipment

5.4.2.2 FI Construction Utilities: Materials

5.4.4 Equipment & Materials UG Transport

5.4.4.1 Surface Disassembly & Packaging

5.4.4.2 UG Transport of Equipment & Materials

5.5 FI: Construction & Installation

5.5.1 Mobilization - Demobilization

5.5.2 FI Construction Utilities: Construction

5.5.2.1 Construction: Electrical Power

5.5.2.2 Construction: Ventilation

5.5.2.3 Construction: Water Supply

5.5.2.4 Construction: Other Utilities

5.5.3 FI Utility Systems: Construction

5.5.3.1 Control Systems

5.5.3.2 Data Management & CyberInfrastructure Systems

5.5.3.3 HVAC

5.5.3.4 Ventilation System

5.5.3.5 Fire Protection

5.5.3.6 Plumbing

5.5.3.7 Power (regular & clean)

5.5.3.8 Sanitary

5.5.3.9 Lighting

5.5.3.10 Security System

5.5.3.11 Oxygen Monitoring

5.5.3.12 Health & Safety Systems

5.5.3.13 Materials Handling Systems

5.5.3.14 Water Management Systems

5.5.3.15 Storage & Containment Systems

5.5.3.16 Mechanical & Speciality Services Systems

5.5.3.17 Other Infrastructure, Outfitting, & Utilities

5.6 FI: Testing & Acceptance

5.6.1 Systems Integration & Testing

5.6.2 Acceptance & Operational Readiness Reviews

5.7 FI: Commissioning

5.8 FI: Close-Out

5.8.1 Administrative Close-Out

5.8.2 Field Close-Out