March 2012

FESS/Engineering Project No. 6-10-20

MC-1 Building

PP

Project Plan for the conventional construction of the MC-1 Building

Fermi National Accelerator Laboratory Office of Science / U.S. Department of Energy Managed by Fermi Research Alliance, LLC.

Submitted, Accepted, and Approved By:

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The Project Plan (PP) describes the management, control systems and procedures used by Fermi National Accelerator Laboratory (Fermilab) to meet the technical, cost, and schedule objectives of this project. The Project Plan is comprised of a Project Charter (PC), Conceptual Design Report (CDR) and Project Execution Plan (PEP). This controlling document establishes the basis for managing the project, throughout the projects life cycle including, initiating, planning, executing, monitoring/controlling and closing.

This project will be managed based on the guidance provided in DOE Manual 413.3-1. This manual is not the sole source for all requirements and guidance that apply to the acquisition of capital assets. Other DOE Order and Manuals, especially regarding design, engineering, management reserve and indirect costs have been used to determine the basis for estimating costs and establishing baselines. This identification, implementation and compliance with other relevant Orders, Manuals and requirements are the responsibility of the Integrated Project Team.

This project will be managed by a certified Project Management Professional (PMP) certified by Project Management Institute (PMI) employing FESS/Engineering policies and procedures which adhere to the Project Management Institute's knowledge areas and process groups, tailored to conform to the relevant DOE orders, manuals and requirements.

The Project Plan is to be viewed as a "living document," and as such, will be revised when necessary. The Fermilab Project Manager is authorized to approve non-substantive changes to the Project Plan (e.g. name changes to the positions stated in the Project Plan), but will inform the DOE Federal Project Director via electronic mail of such changes. Baseline changes will require approval by the Department of Energy's (DOE) Fermi Site Office.

Section 1 – Project Charter (PC)
The Project Charter (PC) formally authorizes the project. The Project Charter incorporates the signed U.S. Department of Energy Construction Authorization as part of this document. The Project Charter states the project justification within the framework of the Fermilab's strategic goals. The Project Charter defines the roles and identifies the Fermilab Project Director and the Fermilab Project Manager as well as other key members of the Integrated Project Team.

Section 2 – Conceptual Design Report
The Conceptual Design Report (CDR) is intended to be a self-consistent basis for a project baseline scope, cost estimate and schedule. It is not a Title 1 report and has not answered every technical design question. The current level of contingency is believed to be consistent with the degree of technical confidence in the design at this stage. It is recognized that some basic construction concerns will be reviewed and optimized during the remaining stages of the project.

Section 3 – Project Execution Plan
The Project Execution Plan (PEP) defines the Enterprise Environmental Factors and Fermilab's Organizational Process Assets that provides project management the methodology which defines the process.

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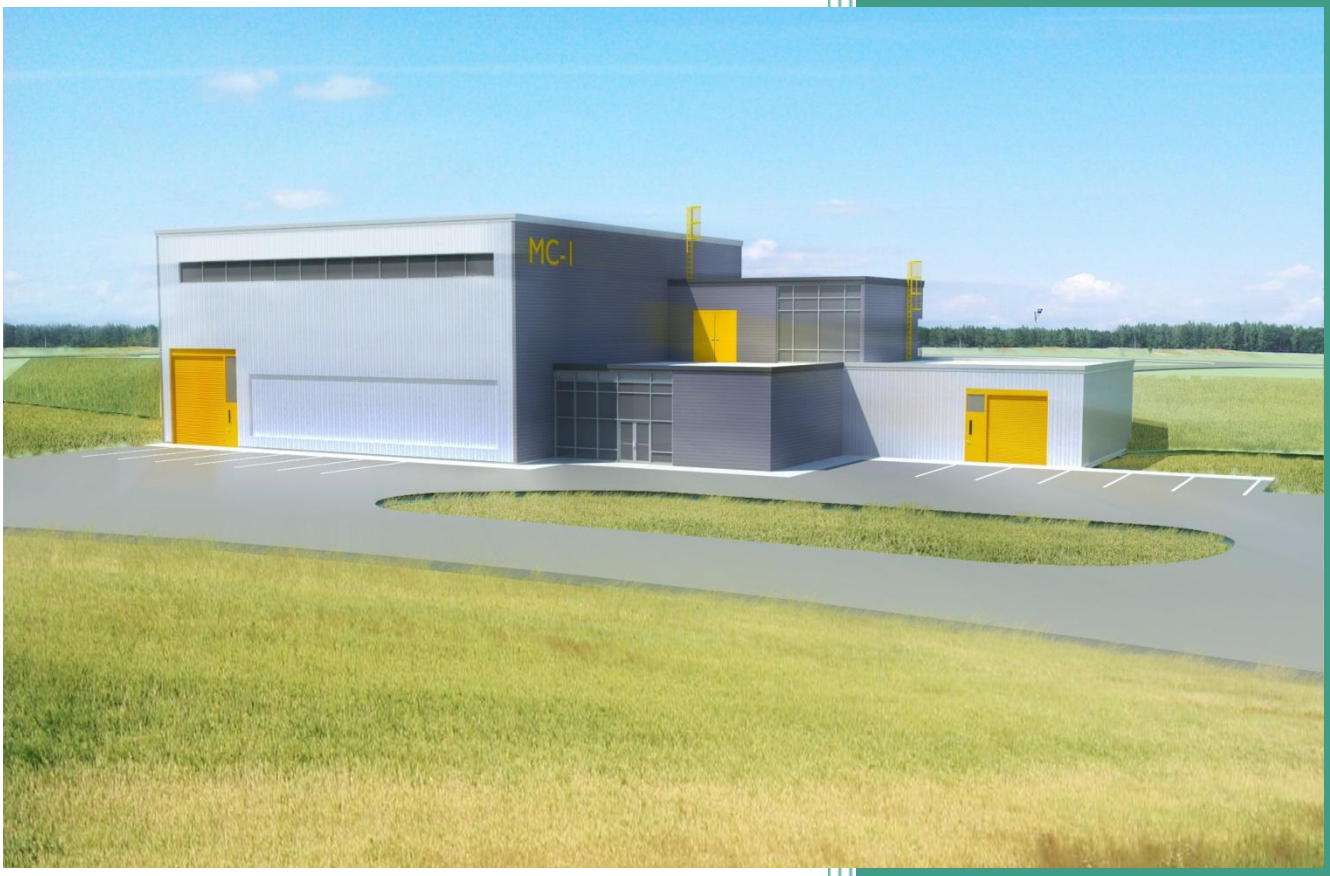
Project Charter



MC-1 Building

FESS/Engineering Project No. 6-10-20

1.1 PROJECT JUSTIFICATION

MC-1 Building

New facilities at Fermilab, the nation's dedicated particle physics laboratory, would provide thousands of scientists from across the United States and around the world with world-class scientific opportunities. In collaboration with the Department of Energy and the particle physics community, Fermilab is pursuing a strategic plan that addresses fundamental questions about the physical laws that govern matter, energy, space and time. Fermilab is advancing plans for the best facilities in the world for the exploration of neutrinos and rare subatomic processes, far beyond current global capabilities.

Certain particle physics experiments require particle beams with incredibly large numbers of particles: the Intensity Frontier. Beginning in 2013, Fermilab's upgraded accelerator complex will create more intense particle beams for experiments such as MINOS, NOvA and MicroBooNE that will explore neutrino interactions and rare subatomic processes. The planned muon experiments, Muon g-2 and Mu2e, will benefit from the more intense proton beams provided by Fermilab's accelerator complex in the future as well.

To establish a base for these future muon experiments, the Muon Campus (MC) is being developed to house these future experiments.

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1.1 PROJECT JUSTIFICATION MC-1 Building

The first of these experiments proposed to be housed at the new campus is Muon g-2. In support of this experiment, the MC-1 Building will be constructed to initially house the Muon g-2 experiment followed by studies of other alternate muon experiments suited to a more intense muon beam. It is proposed to operate these devices (serially) in a new facility to be constructed in the new Muon Campus benefiting from the reuse of the existing accelerator system, specifically the recycler and antiproton facilities.

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1.2 EXECUTIVE SUMMARY

This project will construct a general purpose facility for the study of muon detectors. The internal outfitting of the facility will be designed and constructed to accommodate the Muon g-2 Experiment and consideration to subsequent alteration to future follow-on configurations.

The general building will be comprised of a 13,500 gross square-feet facility. The experimental hall will consist of an 80'x80' high-bay facility with overhead bridge crane and one-story basement area designed to support large loads from accelerator equipment. Equipment access will be from a grade-level loading dock. A one and two-story Service Building will include areas for the installation of computing facilities, power supplies, control/counting room, storage space and building support equipment. A one-story 40'x40' Refrigeration Room will be included to house refrigeration equipment in support of installed experiments as well as toilet and janitorial services and general space for shop equipment.

Utilities will be tapped from nearby feeders and piping in existing utility corridors, including; electrical, communications, natural gas, industrial cooling water, sanitary sewer, domestic water and chilled water. The proposed site has been examined and is not in any wetlands, defined floodplain, or other protected area.

The facility will be constructed in consideration of construction in support of the future Muon Campus, including future beamline enclosures, refrigeration utilities and the future Mu2E Experiment.

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1.2 EXECUTIVE SUMMARY **MC-1 Building**

Project Costs

The Total Estimated Cost (TEC) for this project is estimated to be $9.0M funded in FY12 & FY13 dollars.

The TEC includes Construction, EDIA (Engineering, Design, Inspection and Administration), Management Reserve and Indirect Costs. The TEC has been escalated to FY13 dollars.

Also included in the TEC are the Indirect Costs associated with this project, which is based on current published laboratory rates (as of October 2011).

Schedule

Based on Directive Approval	Month 0
Engineering Start	Month 1
Construction Start	Month 10
Construction Complete	Month 30
Engineering Complete	Month 33
Project Complete	Month 36

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1.3.1 DOE MANAGEMENT

The U.S. Department of Energy (DOE) provides funding for this project to Fermilab. The Fermi Site Office (FSO) will make funds available to Fermilab for the project based on the existing directive system.

The Site Manager of the FSO has been delegated the authority and responsibility for field oversight of the project. This includes line management authority, responsibility and accountability for overall project implementation and contract administration.

The FSO administers the Management and Operations (M&O) contract with Fermi Research Alliance (FRA) for the operations of Fermilab and exercises oversight of Fermilab. The FSO Manager has been delegated responsibility and authority for execution of the project. The specific responsibilities of the FSO manager are:

- Supervision of DOE Federal Project Director and Fermi Site Office staff;
- Review of and concurrence with this Project Plan;
- Review documents as required by federal regulations or departmental orders or notices;
- Approval of Fermilab subcontract actions, within the authority delegated to FSO

The Chicago Office (CO) of DOE can provide support to the FSO in the following areas as requested:

- Quality Assurance
- Implementation of ES&H
- Project Management Systems
- Design Review
- Legal

The FSO Manager has delegated authority and responsibility for management and direction of the project to the DOE Federal Project Director, Alan Harris. The specific responsibilities of the DOE Project Director include:

- Review and approval of this Project Plan and changes thereto;
- Measurement of performance against established goals including technical performance, cost levels, and schedule milestones;
- Making any necessary changes or corrective actions within the appropriate thresholds established in this Project Plan;
- Overseeing Fermilab's management of construction activities;
- Monitoring project progress via reports prepared by the Fermilab Project Manager;

- Coordinating the approval of the Project Plan by the FSO Manager.

The DOE has delegated the responsibility for design and construction of this project to Fermilab.

1.3.2 FERMILAB MANAGEMENT

The project management team structure shown in Figure 1 identifies the organizational structure that will be responsible for design, procurement and construction of the Project.

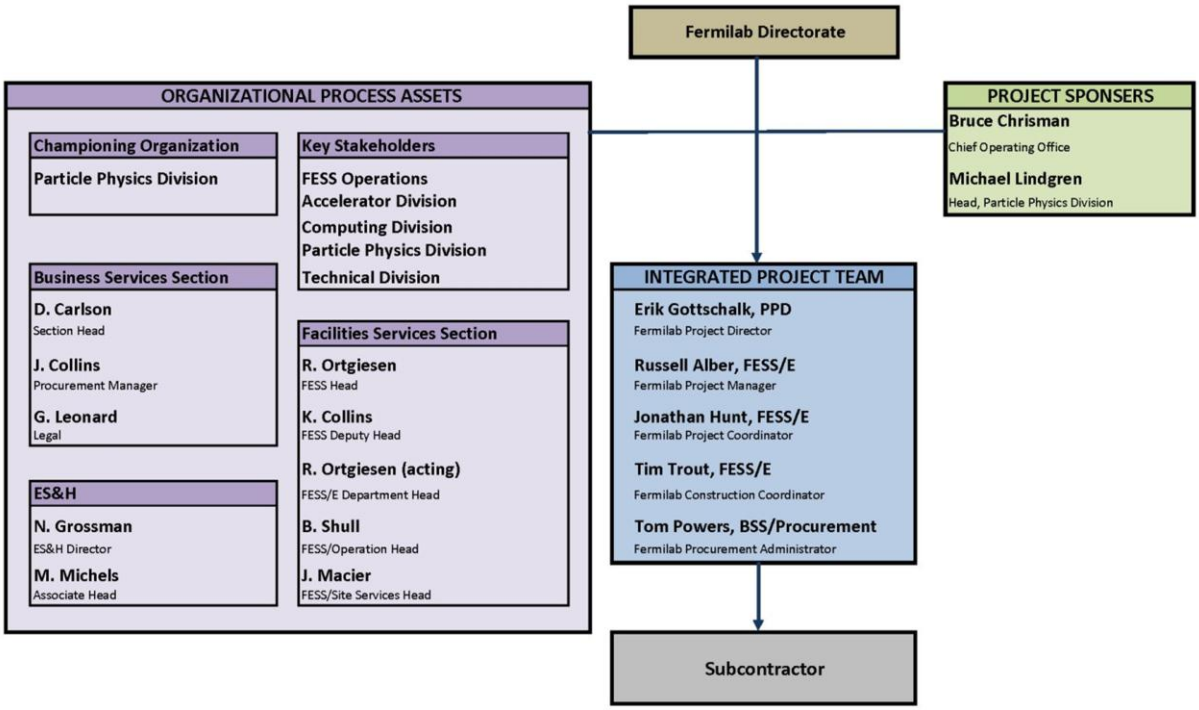

Figure 1 – Fermilab Project Management Team Structure

1.3.2.1 Directorate

As with all activities at Fermilab, the Fermilab Directorate is at the highest level of responsibility.

1.3.2.2 Project Sponsors

The Fermilab Chief Operating Officer (COO), Bruce Chrisman and Michael Lindgren of the Particle Physics Division are the Project Sponsors championing the project. The Project Sponsors establish and approve the mission need and allocate the funds from the Fermilab budget.

1.3.2.3 Integrated Project Team

The integrated project team is comprised of the Fermilab Project Director, Fermilab Project Manager, Project Engineer, Construction Manager, Fermilab Design Coordinator, Fermilab Construction Coordinator and the Fermilab Procurement Administrator.

1.3.2.3.1 Fermilab Project Director

The Project Sponsors have designated Erik Gottschalk of the Particle Physics Division as the Fermilab Project Director. The Fermilab Project Director is a key stakeholder that has accepted the scope of work as described within this project's Conceptual Design Report as being appropriate and complete. The Fermilab Project Director will initiate all scope changes and shall secure any additional funding authority as defined by the Fermilab Project Manager. A summary of the Fermilab Project Director's functions and responsibilities is provided in the Integrated Project Team Responsibilities Matrix included in Appendix B.

1.3.2.3.2 Fermilab Project Manager

Project Management, design, construction management, cost and schedule for this project are the responsibility of the Facilities Engineering Services Section (FESS). FESS will manage the design and conventional construction activities associated with this project, as well as accept line management responsibility for safety. This effort will be accomplished using the resources of the FESS Engineering Department. The FESS/Engineering Manager shall assure proper attention to the coordination and timely completion of the project.

Fermilab has designated Russell Alber of FESS/Engineering as Fermilab Project Manager. The Fermilab Project Manager is a State of Illinois licensed professional and is certified by the Project Management Institute (PMI) as a Project Management Professional (PMP). The Fermilab Project Manager is committed to manage to a successful completion, the defined project scope for the cost stated within the allotted project schedule.

Based on the size and complexity of this project, the Fermilab Project Manager, will serve as Construction Manager. The Fermilab Project Manager will utilize the resources of the FESS/Engineering Department as appropriate for design, construction phase support, and construction coordination. Portions of the civil design may be subcontracted to an Architectural/Engineering firm. The Fermilab Project Manager/Construction Manager shall be the first line of contact with the Construction Subcontractor's organization. A summary showing the functions and

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responsibilities of the Fermilab Project Manager/Construction Manager is provided in the Integrated Project Team Responsibility Matrix contained in Appendix B.

1.3.2.3.3 Project Coordinator

Jon Hunt of FESS/Engineering has been assigned as Project Coordinator for this project. The Project Coordinator will handle coordination of design team efforts in the execution of this project. A summary of the Project Coordinator functions and responsibilities is provided in the Integrated Project Team Responsibility Matrix contained in Appendix B.

1.3.2.3.4 Fermilab Construction Coordinator

Tim Trout of FESS/Engineering has been assigned as Fermilab Construction Coordinator (FCC). Job coordination during construction phase activities will be accomplished through the FCC, a member of the FESS/Engineering department, who shall be responsible for daily monitoring of all work at the site, including the environment, safety and health (ES&H) program. The FCC reports to the Construction Manager for this project.

1.3.2.3.5 Fermilab Procurement Administrator

Tom Powers of the Business Services sections (BSS), Procurement Department has been assigned as Fermilab Procurement Administrator. Separate PA's may be assigned for the procurement of the architectural/engineering services (A&E) and for the construction subcontract. Through the head of the BSS the Fermilab Procurement Administrators will execute all subcontracts. The details of the PA's functions and responsibilities are provided in the Integrated Project Team Responsibility Matrix contained in Appendix B.

1.3.3 ORGANIZATIONAL PROCESS ASSETS

Organizational process assets are those Fermilab processes that can be used to influence the project's success. These assets and organizations are described below.

1.3.3.1 Championing Organization

The championing organization provides support for the project throughout the project process by providing objectives for the eventual operational use of the project. Since the championing organization will be the primary beneficiary of the project, the input of the organization is vital to establishing the goals and objectives for the project.

1.3.3.2 Stakeholders

All project stakeholders are considered to be organizational project assets and are considered invaluable during the planning and execution of the project. The Fermilab Project Director and Fermilab Project Manager will identify those key stakeholders and obtain the relative inputs critical to the project's success. Prospective users, landlord ES&H personnel and building managers are always key stakeholders that are included in the process.

1.3.3.3 Business Services Section

The Business Services Section (BSS) has the responsibility for subcontract administration, providing budget status and subcontract/requisition information. The details of the Fermilab Procurement Administrator's, a member of the Integrated Project Team, responsibilities have been identified and described in the Integrated Project Team Responsibility Matrix contained in Appendix B.

1.3.3.4 ES&H Management

The Environment, Safety and Health (ES&H) Section has the responsibility for providing safety coordination support and oversight of safety throughout the project. As with all Fermilab projects, attention to ES&H concerns will be part of project management and safety will be incorporated into all processes. Line management for safety on this project will be the responsibility of the Facilities Engineering Services Section.

The ability to perform the construction work in a safe, environmentally acceptable manner will be designed into the project. Construction documents (drawings and specifications) will be reviewed as the documents are developed, by Fermilab engineering, construction, and safety professionals to ensure ES&H concerns are addressed. Project specific safety and health requirements for construction will be outlined in the construction documents.

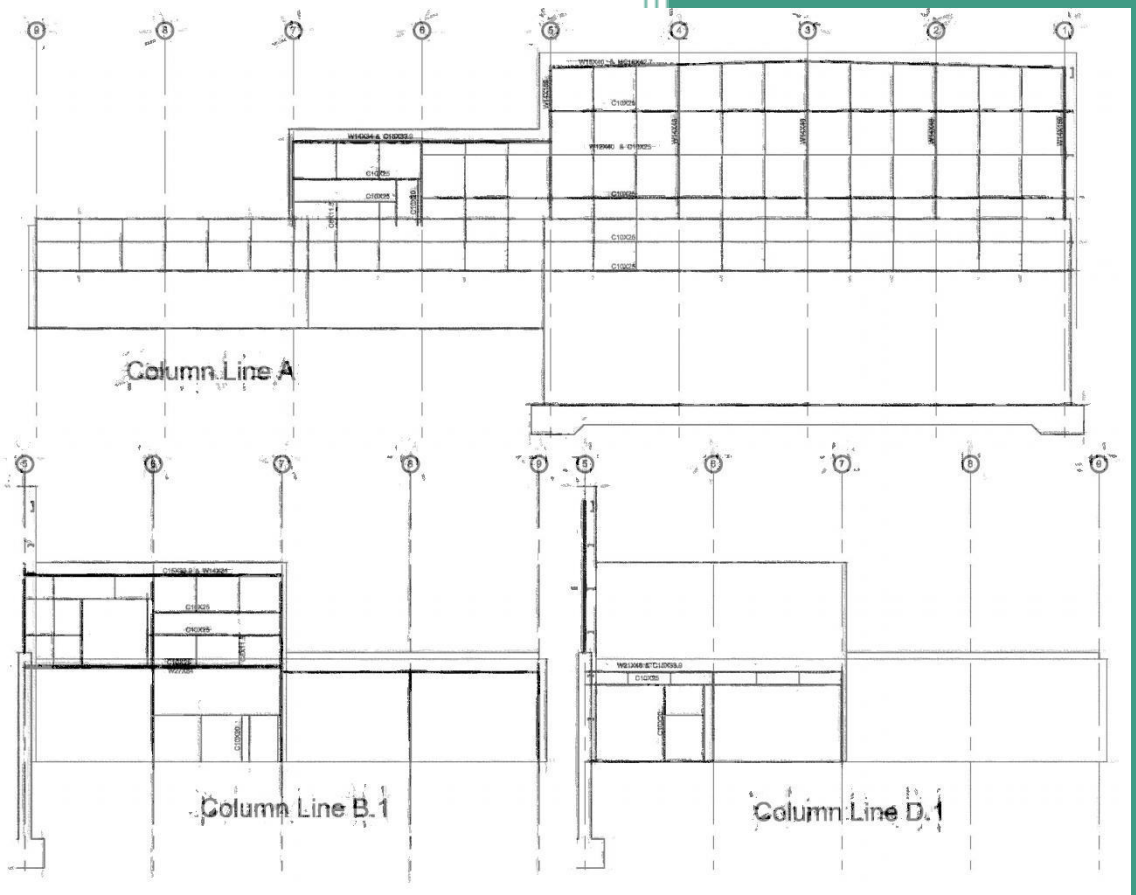
The potential subcontractors will be qualified for bidding by submitting specific information about their safety and health program with the proposals. During construction the subcontractors will utilize Project Hazard Analyzes (PHA) to plan the work and mitigate hazards. The Fermilab Construction Coordinator will audit the subcontractor's compliance with the PHA's and with their overall Safety Plan. The Fermilab ES&H Section will augment the FCC with appropriate safety personnel during construction.

1.3.3.5 Facilities Engineering Services Section

The Facilities Engineering Services Section (FESS) has the responsibility of coordinating existing and proposed infrastructure, including sewer and water,

power and communication systems, site roads and overall grounds. FESS will provide criteria and project reviews for systems and areas that they will maintain and service. The ability to safely maintain and service the project's deliverable will be designed into the project documents. Construction documents (drawings and specifications) will be reviewed as the documents are developed for appropriateness, ES&H concerns and life cycle value.

Conceptual Design Report



MC-1 Building

FESS/Engineering Project No. 6-10-20

The proposed MC-1 Building will be located within the new Muon Campus located northeast of the existing Anti-Proton Facility. The building will be located to accept a future beamline enclosure from the proposed extraction point off of the existing AP-30 enclosure. The south side of the facility will be constructed to support the berm required to shield the future beamline for the Mu2E Experiment.

The new building will include 13,500 gross square-feet including 7,500 gross square-feet of high-bay assembly and experimental area, 4,400 gross square-feet Service Building and 1,600 gross square-feet of refrigeration room.

Listed below are the planned spaces for the project:

Experimental Hall 7,500 SF

Lower-level Heavy Material Assembly/Experimental Area 6,400 SF

This area will include a below-grade large floor area (with crane coverage) for experimental apparatus and future heavy assembly and storage. Area below the Loading Dock will be used for storage and potentially used for additional power supplies in support of the future beamline. A minimum of two feet (2') of concrete shielding in the form of cast-in-place concrete walls and/or precast shielding blocks shall be used to provide shielding to building occupants or ground level around the experimental area.

Loading Dock and grade-level walks 1,100 SF

The Loading Dock will provide grade-level truck access into the Experimental Hall and will be designed to support heavy loading conditions consistent with large truck loads. Grade-level walks will be provided to provide access from the loading to the Support Area. Stairways will be provided to provide access to the lower-level Heavy Assembly/Experimental Area.

Service Building 4,400 SF

First Floor 2,800 SF

Power Supply Room 1,300 SF

The power supply room will house power supplies and racks to support the experiments in the Experimental Hall. Provisions will be made to dedicate floor space and provide buried conduits to support the future beamline enclosure to Mu2E.

Computer Room 550 SF

The Computer Room will be constructed to support the use of a maximum of 16 server racks. Cooling for the room will be accomplished through a cooling unit discharging

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into a common below-floor plenum. The "computer" floor will be provided at grade-level, 2 feet above the concrete floor slab below.

Control/Counting Room/Entry 950 SF

The Control/Counting Room provides space for the operation of the experiment including the associated computer hardware. It is recognized that this space will be minimally occupied as the day to day operation of the experiment will likely occur at a central facility located elsewhere. As such, this space will serve as the front end to remote systems and will be used mainly during assembly, initial startup and maintenance/repair activities.

Second Floor 1,600 SF

Storage Room 800 SF

The Storage Room will be able to provide conditioned floor space for storage and/or meeting space. This space may also serve future mixed space use such as technician space and light assembly depending on the future needs of the building.

Mechanical Room 800 SF

The Mechanical Room houses space for the HVAC equipment for the Experimental Hall and Support Area. This area will have access to the roof to maintain/repair condenser units and rooftop equipment.

Refrigeration Room 1,600 SF

Refrigerator Area/Shop Area 1,500 SF

This area will house the refrigerators to support the Experimental Hall experimental equipment. Space for one (1) active refrigerator and one (1) spare refrigerator will be provided. Space for one (1) future refrigerator will be supplied to support equipment needed for Mu2E. "Warm" cryogenic lines will be installed under another project as well as "cold" lines for future experiments.

Toilet/Janitor Closet 100 SF

A uni-sex toilet facility will be provided. The toilet will be A.D.A compliant for handicapped access. Provisions will be made for a mop sink in an adjacent Janitor Closet (J.C.)

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Room Finishes

Room Finishes will be as follows:

Experimental Hall

- All high-bay areas are to have sealed concrete floors and painted exposed structure.
- Loading Dock and grade-level walks are to have sealed concrete floors and painted exposed structure.

Service Building

- The Power Supply Room will have sealed concrete floors and painted exposed structure.
- The Computer Room will have a raised computer floor and painted exposed structure.
- The Control/Counting Room/Entry will have vinyl tile floor and painted exposed structure. The ceiling will be lay in acoustical tile.
- The Storage Room will have vinyl floor and painted exposed structure. The ceiling will be lay in acoustical tile.
- The Mechanical Room will have sealed concrete floors and painted exposed structure.

Refrigeration Room

- The Refrigerator/Shop Area will have sealed concrete floors and painted exposed structure.
- The Toilet/Janitor Closet will have ceramic tile floors and walls. The ceiling will be lay in acoustical tile.

Exterior Finishes

The exterior finishes will be in a style consistent with the Muon Campus Master Plan and will include prefinished metal siding, aluminum window framing, insulated glass and concrete exposed surfaces at earth retaining walls.

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The performance requirements listed below describe the project specifics that exceed or are not addressed in the applicable building codes and standards requirements contained in Section 2.4, Quality Levels.

2.2.1 MECHANICAL SYSTEMS

The HVAC systems for the MC-1 Building will conform to ASHRAE 90.1, ASHRAE 62 and applicable NFPA requirements and applicable sections of the Fermilab Engineering Standards Manual

Mechanical systems and Metasys controls will be further investigated during subsequent phases in accordance with ASHRAE 90.1 and Federal Life Cycle costing analysis.

All plumbing work to be installed in accordance with Illinois Plumbing Code and Standard Specifications for Water & Sewer Main Construction in Illinois.

A duplex sump pump system will be installed to collect subsurface water from around the MC-1 Facility.

A new sanitary lift station will be installed as part of this project to accept sanitary effluent from the MC-1 Building as well as a future connection from Mu2E. The existing restroom facility at AP-10 will be abandoned and a new sanitary force main will be installed from the new lift station to the existing laboratory sanitary system.

Heating, Ventilation and Air Conditioning Design Parameters:

Experimental Hall

- Temperature: Winter - 68 degrees F (+/- 2 F) / Summer - 78 degrees F (+/- 2F)
- Humidity: 55% maximum relative humidity, no minimum
- Air distribution: Special care to be taken to ensure even distribution of heating and cooling – assume two branch ducts on each side of experimental hall to maintain temperature stability

Service Building

Power Supply Room

- Temperature: Winter – 68 degrees F min. / Summer – Ambient
- Humidity: 50% maximum relative humidity, no minimum

Computer Room

A 10 Ton CRAC unit will be installed in the Computer Room. The unit will be air-cooled, downflow, compressorized systems. The 10 Ton unit is selected based on an equipment load of 16 one-kw racks. Operation data from this

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system will be passed to a Johnson Metasys DDC device for connection to the site wide DDC network.

Control/Counting/Entry

- Temperature: Winter – 68 degrees F min. / Summer – 75 degrees F
- Humidity: 50% maximum relative humidity, no minimum

Storage Room

- Temperature: Winter – 68 degrees F min. / Summer – 75 degrees F
- Humidity: 50% maximum relative humidity, no minimum

Mechanical Room

- Temperature: Winter – 68 degrees F min. / Summer – Ambient
- Humidity: No maximum or minimum humidity requirement

Refrigeration Room

Refrigerator/Shop Area

- Temperature: Winter – 68 degrees F min. / Summer – Ambient
- Humidity: No maximum or minimum humidity requirement
- Purge Vent: 2,000cfm exhaust to atmosphere for Oxygen Deficiency Hazard

Toilet/Janitor

- Temperature: Winter – 68 degrees F min. / Summer – 75 degrees F
- Humidity: 50% maximum relative humidity, no minimum

2.2.2 ELECTRICAL SYSTEMS

The electrical power for the MC-1 Building will be provided by a new 1,500 kVA transformer. The transformer has been sized to accommodate the anticipated electrical power for both the conventional facilities and the anticipated programmatic equipment.

A new concrete encased power duct bank will be installed to connect the MC-1 Building to the existing Fermilab 13.8 kv electrical infrastructure system. This connection will occur at a new manhole north of AP-30. A new 4-bay air switch will be installed to accommodate future connection to Mu2E . The new transformer will be connected to the MC-1 Building via a new concrete encased ductbank and will be routed to new electrical service switchgear inside the building. The switchgear will be sized to accommodate the entire 1,500 kVA power from the new transformer. From the switchgear the electrical power will serve conventional facilities equipment and programmatic equipment for the MC-1 Building.

The power for the conventional HVAC equipment will be provided from the new electrical panelboard, utilizing 480v power.

New electrical panels serving the lights, outlets and general house power will be included in the electrical power distribution system.

Equipment power will be provided from panelboards in the building.

2.2.3 FIRE PROTECTION SYSTEMS

For the purposes of the Conceptual Design Report, it is assumed that no hydrogen will be used throughout this facility.

Fire Alarm/Fire Suppression systems for the MC-1 Building shall be designed in accordance with the applicable sections of the Fermilab Engineering Standards Manual.

Automatic sprinkler systems shall be designed to a minimum of an Ordinary Hazard Group 2 classification, in accordance with National Fire Protection Association (NFPA) latest edition. The most commonly used NFPA standards relative to automatic sprinkler systems are: 13, 20, 25, 318 and 750.

Fire alarm systems shall be designed with a minimum standby power (battery) capacity. These batteries shall be capable of maintaining the entire system in a non-alarm condition for 24 hours, in addition to 15 minutes in full load alarm condition. The most commonly used NFPA standards relative to fire alarm systems are: 70, 72, 90A, and 318.

The facility will be equipped with a hard-wired, zoned, general evacuation fire alarm system consisting of:

- Manual fire alarm stations at the building exits
- Sprinkler system water flow and valve supervisory devices
- Combination fire alarm horn/strobe located throughout the building
- A 24 volt addressable fire alarm control panel
- Connection to the site wide FIRUS monitoring system
- Smoke detection as required.

2.2.4 STRUCTURAL SYSTEMS

The building structure will consist of a steel-framed structure resting on a cast-in-place concrete foundation system. The second floor structure will consist of steel beams and girders with a composite metal deck and concrete slab. The roof system will consist of steel trusses and purlins and beams with metal roof decking. The foundation system will be designed to include drilled caissons to bedrock and a thick

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base slab to accommodate heavy equipment loads consistent with high-bay assembly areas on-site.

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2.3.1 SAFEGUARDS AND SECURITY

Direction for security issues related to the design of this project is taken from the current operating procedures of the Fermilab activities.

Access to site areas outside any beam line excavation limits will be allowed during normal business working hours. Access to any radiological areas, areas within 50 feet of existing beam lines, are controlled by the Accelerator Division Radiation Safety and will require coordination of work efforts and beam line operations.

2.3.2 ENERGY CONSERVATION

All elements of this project will be reviewed for energy conservation features that can be effectively incorporated into the overall facility design. Energy conservation techniques and high efficiency equipment will be utilized wherever appropriate to minimize the total energy consumption.

2.3.3 HEALTH AND SAFETY

All aspects of the project will be evaluated to ensure that the adequate health and safety precautions are incorporated in the design and construction of this project.

2.3.4 ENVIRONMENTAL PROTECTION

The overall environmental impact of this project will be evaluated and reviewed as required to conform to all applicable portions of the National Environmental Policy Act (NEPA).

2.3.5 DECONTAMINATION AND DECOMMISSIONING

Decontamination and decommissioning procedures are an important part of Fermilab environment, safety and health policies. These policies are described in Chapter 8070 of the Fermilab Environment, Safety and Health Manual. Appropriate decontamination and decommissioning procedures will be instituted for this project.

2.3.6 TELECOMMUNICATIONS

The existing Fermilab fiber optic data communication network will be extended to the project.

2.3.7 COMPUTER EQUIPMENT

No computer equipment will be installed as part of this project.

2.3.8 HANDICAPPED PROVISIONS

The applicable requirements of the Uniform Federal Accessibility Standards (UFAS), Americans with Disabilities Act (ADA) and the Americans with Disabilities Act

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Accessibility Guidelines (ADAAG) will be incorporated into the design of this project. Compliance with the ADA will be based upon an evaluation of the job descriptions and required tasks for the personnel assigned to work in this facility. Those areas included in the scope of this project that will require accessibility as well as the established routes to those areas will be designed in full compliance with the existing statutes.

2.3.9 EMERGENCY SHELTER PROVISIONS

Site specific emergency shelter provisions will be incorporated into this project.

2.3.10 SPACE MANAGEMENT REQUIREMENTS

In 2009, a space offset request was approved by DOE HQ for this facility.

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2.4 QUALITY LEVELS

MC-1 Building

The design of this project will be in accordance with recognized engineering practices and design standards and will comply with the applicable portions of the U.S. Department of Energy and the State of Illinois codes, orders and regulations as incorporated into contract No. DE-AC02-07CH11359 between the U.S. Department of Energy and Fermi Research Alliance, LLC. A URL link to the contract is included in Appendix B of this document.

Fermilab has adopted the Necessary and Sufficient Process (NSP) for determining the Work Smart Set (WSS) of Standards which are used to determine the appropriate environment, safety and health standards used to ensure the safe and environmentally responsible operations of the Laboratory. The Work Smart Set in effect for this project is included in Appendix B of this Project Plan. Where no edition or "latest edition" is noted on the Work Smart Set, it is assumed that the edition in effect at the time of the acceptance of this Project Plan will be used.

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The Baseline Project Costs contained in Section 3.2.2 assumes that the improvements will be done as part of the General Plant Project (GPP) program and includes the costs associated with Engineering, Design, Inspection and Administration (EDIA), Contingency and Indirect Costs.

The estimated construction costs are based on cost data taken from Means Cost Estimating Guides, historical data and recent construction history at Fermilab. While the suggested project budget can provide input for the feasibility of the project, further design refinement will affect the final cost of the project.

Engineering Design and Inspection (ED&I) activities are included in the suggested project budgets. ED&I activities include the engineering and design activities in Preliminary and Final Design, the inspection activities associated with Construction Phase Support. The descriptions are based on DOE Directive G413.3-21, Chapter 6. Past historical data and DOE Directive G413.3-21, Section 5.4.3 indicates that 15%-25% of the construction cost is an appropriate range. Non-traditional, first of a kind projects may be higher, while simple construction such as buildings will be lower than this range (on the order of 6%); the more safety and regulatory intervention is involved, the higher the percentage.

Administration activities include those defined by DOE Directive G413.3-21, Section 5.4.3 as Project Management (PM) and Construction Management (CM). Project management costs range from 5%-15% of the other estimated project costs for most DOE projects, depending on the nature of the project and the scope of what is covered under project management.

DOE Directive G413.3-21, Section 6.4.5 was used as guidance in estimating the appropriate Contingency for this project.

Indirect costs are costs incurred by an organization for common or joint objectives and which cannot be identified specifically with a particular activity or project. The multipliers used in this document are based on current Fermilab rates.

The costs contained in the estimates listed above are based on FY2012 dollars. Adjustment to the escalation will need to be applied should this assumption change.

DOE Guide 413.3-21, *Cost Estimating Guide* classifies cost estimates into one (1) of five (5) categories. These classifications are listed below in Figure 2:

Cost Estimate Classification	Primary Characteristics	
	Level of Definition (% of Complete Definition)	Cost Estimating Description (Techniques)
Class 5, Concept Screening	0% to 2%	Stochastic, most parametric, judgment (parametric, specific analogy, expert opinion, trend analysis)
Class 4, Study or Feasibility	1% to 15%	Various, more parametric (parametric, specific analogy, expert opinion, trend analysis)
Class 3, Preliminary, Budget Authorization	10% to 40%	Various, including combinations (detailed, unit-cost, or activity-based; parametric; specific analogy; expert opinion; trend analysis)
Class 2, Control or Bid/Tender	30% to 70%	Various, more definitive (detailed, unit-cost, or activity-based; expert opinion; learning curve)
Class 1, Check Estimate or Bid/Tender	50% to 100%	Deterministic, most definitive (detailed, unit-cost, or activity-based; expert opinion; learning curve)

Figure 2 - Cost Estimate Classifications

These classifications are based on the Association for the Advancement of Cost Engineering (AACE) Recommended Practice No. 18R-97. These classifications help ensure that the quality of the cost estimate is appropriately considered when applying escalation and contingency.

The level of detail and accuracy of the budget becomes more definitive as the project's scope is refined. In a project's earliest phases, the Initiation, or Pre-Conceptual Phase (before Critical Decision [CD] -0, an Order-of-Magnitude (or Parametric) Estimate is usually required. When a capital asset acquisition project has completed the Conceptual Design Phase, a Preliminary Budget Range is required to establish the Budget Baseline at CD-1. Budget refinements shall be based on a Definitive Estimate for every element in the WBS and is required for CD-2.

The classification for the cost estimates contained in this project definition report is considered a Class 3 (Preliminary) based on the preliminary nature and level of definition of the programmatic requirements.

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FERMILAB: FESS COST ESTIMATE						
				ESTIMATED SUBCONTRACT AWARD AMOUNT		$5,210,000
Subcontractor's Overhead and Profit	18.0%				$795,000	
Subcontract Base Estimate					$4,415,000	
MC-1 Building		Project No.	Status:	Date:	Rev Date	
		6-10-20	PP	01-Feb-12		ALTERNATE
	DESCRIPTION OF WORK:	QUANTITY	UNITS	UNIT COST	AMOUNT	DEDUCT
01	**Building Foundation Complete**	$2,038,000				$400,000
	Mobilize/Survey/Temp. Power/Phone	1	Lot	$10,000	$10,000	$0
	Silt Fencing/Erosion Control	1	Lot	$6,000	$6,000	$0
	Clear and Grub	1	Lot	$10,000	$10,000	$0
	Site Drainage/Level site/Clear topsoil	1	Lot	$20,000	$20,000	$0
	Demolish existing hardstand parking lot	2600	SY	$4	$10,400	$0
	Excavate for High Bay	8500	CY	$23	$195,500	$0
	Jersey Barriers for Excavation	250	LF	$30	$7,500	$0
	Earth Retaining wall for excavation	170	LF	$80	$13,600	$0
	Excavate for foundations (avg. 3' deep)	425	CY	$25	$10,600	$5,600
	6' dia concrete caissons	10	Ea	$8,000	$80,000	$0
	4' dia concrete caissons	32	Ea	$6,000	$192,000	$36,000
	Foundation/Retaininng Wall	630	CY	$550	$346,500	$27,500
	FBP Column Footings (1'x6.3'x6.3' = 1.5 CYx17ea.)	26	CY	$350	$9,100	$3,200
	FBP Strip Footings (2' widex1' deep = 0.074 CY x 230')	17	CY	$350	$6,000	$2,100
	FBP Perimeter Walls (1.1' wide x 3.5' deep = 0.141 CY x 230')	33	CY	$400	$13,200	$4,400
	Granular under slab 6"	240	CY	$30	$7,200	$1,100
	Foundation mat slab - High Bay	530	CY	$350	$185,500	$0
	Sump Pit (w/duplex pumps and piping)	1	Ea	$65,000	$65,000	$0
	Concrete Slab-On-Grade	4570	SF	$8	$36,600	$23,000
	8" concrete apron & stoops	445	SF	$15	$6,700	$0
	5" concrete sidewalk	660	SF	$7	$4,600	$0
	Misc. concrete	1	Lot	$10,000	$10,000	$0
	Concrete bollards	22	Ea	$350	$7,700	$0
	Backfill and compact	4160	CY	$32	$133,100	$1,600
	Dewar Tank Foundations	1	Lot	$20,000	$20,000	$20,000
	Install sanitary sewer					
	Remove existing sewer	230	LF	$5	$1,200	$0
	Abandon existing sewer	1	Lot	$3,000	$3,000	$0
	Install new manholes	1	Ea	$4,000	$4,000	$0
	Install new Sanitary Lift Station	1	Ea	$56,000	$56,000	$0
	Install new 6" PVC Pipe	325	LF	$30	$9,800	$0
	Install new 4" Force Main	420	LF	$30	$12,600	$0
	Clean-outs	1	Ea	$500	$500	$0
	Storm Drainage					
	New Drainage Ditches	500	LF	$20	$10,000	$3,000
	Install new drainage pipe under parking lot	160	LF	$20	$3,200	$600
	Install new inlets	6	Ea	$250	$1,500	$500
	Install underground utilities		LF			
	Communication Duct	260	LF	$350	$91,000	$0
	Domestic Water Supply (DWS)	80	LF	$30	$2,400	$0
	Industrial Cooling Water (ICW)	95	LF	$30	$2,900	$0
	Gas	90	LF	$30	$2,700	$0
	Chilled Water (CW)	610	LF	$30	$18,300	$0
	Install Undergound Electrical Utilities					
	2-5" Conc. Encased Duct	830	LF	$350	$290,500	$0
	Install electrical manhole	2	Ea	$15,000	$30,000	$0
	New pad for 1500KVA transformer	1	Lot	$35,000	$35,000	$0
	New pad for 15KV switch	1	Lot	$15,000	$15,000	$0
	Install ground grid	1	Lot	$10,000	$10,000	$1,500
	Asphalt pavement parking lot	1460	SY	$13	$19,000	$8,800
	Repave road over installed pipe	300	SY	$9	$2,600	$0
	Stripe parking lot	1	Lot	$2,000	$2,000	$1,000
	Guardrail	100	LF	$80	$8,000	$0
02	**Structural Steel, Floors and Roof Complete**	$1,140,000				
	Columns (W8x31) - light	2.6	Ton	$6,000	$15,600	$7,500
	Columns (W10x49) - medium	4	Ton	$5,000	$20,000	$0
	Columns (W14x159) - heavy	21	Ton	$4,000	$84,000	$0
	Columns (W14x99) - heavy	4	Ton	$4,000	$16,000	$0
	Runway beam (30 ton crane)	8	Ton	$4,000	$32,000	$0

Figure 3 – Summary of Engineer's Estimate

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2.5 COST ESTIMATE

MC-1 Building

FERMILAB: FESS COST ESTIMATE						
					ESTIMATED SUBCONTRACT AWARD AMOUNT	$5,210,000
Subcontractor's Overhead and Profit	18.0%				$795,000	
Subcontract Base Estimate					$4,415,000	
MC-1 Building		Project No.	Status:	Date:	Rev Date	
		6-10-20	PP	01-Feb-12		ALTERNATE
Crane Steel		7	Ton	$5,000	$35,000	$0
Second floor						
Floor Steel - light		4	Ton	$6,000	$24,000	$0
Floor Steel - heavy		6	Ton	$4,000	$24,000	$0
1 1/2" composite deck (32'-6"x40')		1120	SF	$2	$2,200	$0
3/4" shear studs @ 1'c/c		230	Ea	$4	$900	$0
Misc. steel and bent pl's		1	Ton	$6,000	$6,000	$0
Roof steel - High Bay						
Trusses (4.18 tons x 3 ea.)		12	Ton	$6,000	$72,000	$0
Girders x 20' x 5ea. - medium		2	Ton	$5,000	$10,000	$0
Girders x 20' x 8ea. - heavy		7	Ton	$4,000	$28,000	$0
Purlins (W14x22)		13	Ton	$6,000	$78,000	$0
Bracing angles 28.25'x14ea		5	Ton	$6,000	$30,000	$0
Bottom chord beams 20' x 10ea.		2.85	Ton	$6,000	$17,100	$0
Bottom chord bracing angles 28.25'x14ea		5.83	Ton	$6,000	$35,000	$0
Roof steel - Low Bay						
Girders		3.62	Ton	$6,000	$21,700	$0
Girders x 20' x 8ea. - medium		4.42	Ton	$5,000	$22,100	$11,100
Girders x 20' x 2ea. - heavy		1.4	Ton	$4,000	$5,600	$0
Purlins (W14x22)		2.47	Ton	$6,000	$14,800	
Purlins (W18x35)		9	Ton	$6,000	$54,000	$29,000
Bracing angles 28.25'x14ea		7.22	Ton	$6,000	$43,300	$15,000
Exterior Steel						
Girts (C8x11.5)		0.7	Ton	$6,000	$4,200	$0
Girts (C10x20)		0.68	Ton	$6,000	$4,100	$0
Girts (C10x25)		18	Ton	$6,000	$108,000	$23,300
Girts (C15x33.9)		5.12	Ton	$6,000	$30,700	$9,400
Girts (MC18x42.7) - medium		7.86	Ton	$5,000	$39,300	$0
Welded Frames (HSS10x4x3/8)		1.3	Ton	$6,000	$7,800	$3,400
Welded Frames (HSS10x10x3/8) - medium		1.1	Ton	$6,000	$6,600	$3,300
Beams (W8x31)		0.22	Ton	$6,000	$1,300	$0
Beams (W12x40) - medium		5	Ton	$5,000	$25,000	$0
Bracing Angles (2L4x4x1/2)		8	Ton	$6,000	$48,000	$8,600
Sag Rods (5/8" Round Bar)		0.77	Ton	$6,000	$4,600	$400
1 1/2" type B deck		10800	SF	$2	$21,600	$4,300
Misc. steel and bent pl's		2	Ton	$6,000	$12,000	$2,400
Truss on North Wall						
Bracing Angles (2L6x4x1/2)		3	Ton	$6,000	$18,000	$0
Beams (W12x40) - medium		5	Ton	$5,000	$25,000	$0
Beams (W14x48) - medium		1.5	Ton	$5,000	$7,500	$0
Channel for stiffening column (C18x51) - medium		0.6	Ton	$5,000	$3,000	$0
Loading Dock and Walkway						
Floor Steel		5.49	Ton	$6,000	$32,900	$0
Floor Steel - Medium Weight		4.2	Ton	$5,000	$21,000	$0
1 1/2" composite deck		1060	SF	$2	$2,100	$0
3/4" shear studs @ 1'c/c		190	Ea	$4	$800	$0
Misc. steel and bent pl's		1.1	Ton	$6,000	$6,600	$0
Temporary stair		1	Lot	$2,000	$2,000	$0
Concrete - Second Floor		1400	SF	$3	$4,200	$0
Concrete - Walkway		450	SF	$7	$3,200	$0
Concrete - Loading Dock		610	SF	$15	$9,200	$0
03 Building Shell Complete	**$371,000**					
Exterior Siding						
Exterior siding w/insulation		16420	SF	$12	$197,000	$19,800
Trim & flashing		1	Lot	$12,000	$12,000	$0
Built-up roofing						
Rigid insulation board		11800	SF	$2	$21,200	$3,200
4-ply roofing		11800	SF	$2	$23,600	$3,600
Blocking and flashing		1	Lot	$8,000	$8,000	$1,000
Connect to exist. roof		1	Lot	$8,000	$8,000	$1,000
Windows (3' strip x 70')		210	SF	$35	$7,400	$0
Glass Window Walls and Doors						

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FERMILAB: FESS COST ESTIMATE							
				ESTIMATED SUBCONTRACT AWARD AMOUNT		$5,210,000	
Subcontractor's Overhead and Profit		18.0%				$795,000	
Subcontract Base Estimate						$4,415,000	
MC-1 Building			Project No.	Status:	Date:	Rev Date	
			6-10-20	PP	01-Feb-12		ALTERNATE
	Alum/Glass walls (12'x70')		840	SF	$40	$33,600	$0
	Alum/Glass entry doors (3'x7')		2	Ea	$1,000	$2,000	$0
	Exterior Doors						
	H.M. doors (dbl. 6'x7')		1	Ea	$8,000	$8,000	$0
	H.M. doors (dbl. 10'x7')		1	Ea	$8,000	$8,000	$0
	Roll-up door (16'x13')		1	Ea	$20,000	$20,000	$0
	Roll-up door (10'x11')		1	Ea	$10,000	$10,000	$10,000
	H.M. doors (3'x7')		3	Ea	$4,000	$12,000	$4,000
04	**Mechanical, Plumbing, Electrical Rough-In**	$552,000					
	Electrical Rough-in (Elec. group estimate)						
	Panelboard, 225A MLO, 480Y/277 (w/fdr's)		4	Ea	$15,000	$60,000	$0
	75KVA 480-P/208Y/120-S Transformer		2	Ea	$10,000	$20,000	$0
	Panelboard, 225A MLO, 208Y/120 (w/fdr's)		2	Ea	$6,000	$12,000	$0
	Install RGS conduit and boxes for rec, lights and mech.						
	Receptacle Rough-in		1	Lot	$90,000	$90,000	$11,900
	Lighting Rough-in		1	Lot	$40,000	$40,000	$5,300
	Telecom Rough-in (raceway system)		1	Lot	$10,000	$10,000	$1,300
	Mechanical Rough-in		1	Lot	$320,000	$320,000	$42,200
05	**Interior Work**	$304,000					
	CMU Walls						
	CMU		6480	SF	$9	$58,300	$20,200
	Stairs						
	Steel pan stairs (incl. rails)		86	Risers	$300	$25,800	$0
	Stair landings		65	SF	$100	$6,500	$0
	Doors and hardware						
	H.M. doors, 3'x7' (interior)		6	Ea	$700	$4,200	$0
	H.M. doors, 6'x7' dbl. (interior)		4	Ea	$1,000	$4,000	$0
	Painting						
	Paint struct steel & framing		1	Lot	$50,000	$50,000	$6,600
	Paint partitions		1	Lot	$8,000	$8,000	$1,100
	Paint doors & misc.		1	Lot	$8,000	$8,000	$1,100
	Trim-out Electrical						
	Receptacle Trim-out		1	Lot	$15,000	$15,000	$2,000
	Lighting Trim-out		1	Lot	$12,000	$12,000	$1,600
	Telecom Trim-out		1	Lot	$7,500	$7,500	$1,000
	Trim-out Mechanical		1	Lot	$10,000	$10,000	$1,300
	DDC		1	Lot	$15,000	$15,000	$0
	Fire Supression System		12010	SF	$5	$60,100	$8,000
	Fire Detection System		1	Lot	$10,000	$10,000	$0
	Misc. trim & finishes		1	Lot	$10,000	$10,000	$0
06	**Project Complete**	$10,000					
	Landscaping		1	Lot	$10,000	$10,000	$0

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2.5 COST ESTIMATE

MC-1 Building

FERMILAB FESS COST ESTIMATE							
					ESTIMATED ADVANCED PROCUREMENT AMOUNT	$510,000	
Escalation							
Subcontract Base Estimate						$510,000	
MC-1 Building			Project No.	Status:	Date:	Rev Date	
Advanced Procured Items			6-10-20	PP	01-Feb-12		ALTERNATE
	DESCRIPTION OF WORK:		QUANTITY	UNITS	UNIT COST	AMOUNT	DEDUCT
01	**Equipment**	$510,000					
	30 Ton Bridge Crane		1	Lot	$175,000	$175,000	
	1500 kVA Transformer		2	Lot	$150,000	$300,000	
	15.8 KV Air Switch		1	Lot	$35,000	$35,000	

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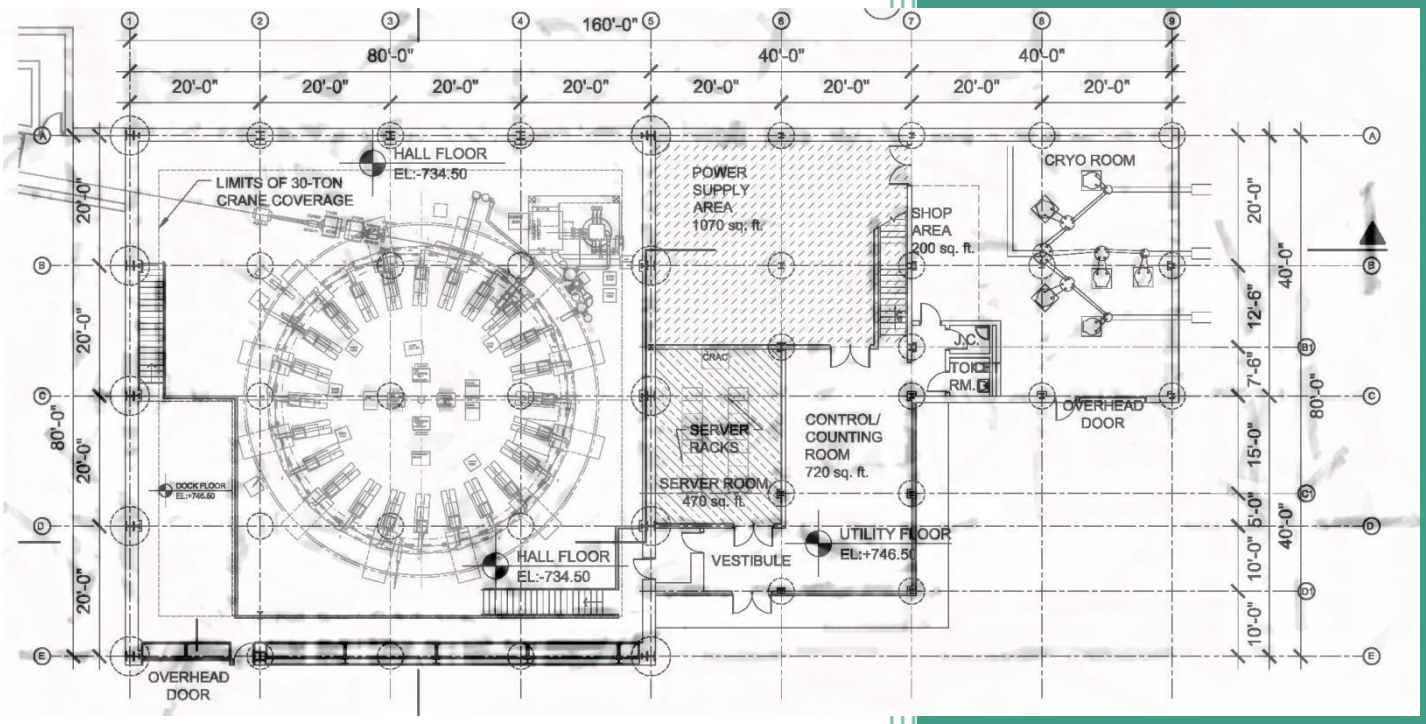
Project Execution Plan



MC-1 Building

FESS/Engineering Project No. 6-10-20

The following resource requirements have been identified for this project.

3.1.1 FUNDING

This project is a General Plant Project (GPP) with a Total Estimated Cost (TEC) of $9.0M.

3.1.2 HUMAN RESOURCES

Divisions/Sections/Research Centers (D/S/C) will be responsible for assigning the responsibilities of individuals within the design and construction organization as indicated in Figure 1 of the Project Charter.

Design reviews will occur at varying levels throughout Final Design. All Divisions/Sections/Research Centers are aware of the design review process and will assign appropriate personnel to complete the reviews for conformance and compliance with D/S/C requirements.

Divisions/Sections/Research Centers will provide required personnel to coordinate construction phase activities that directly affect their operations. For example, the Facilities Engineering Services Section (FESS) will provide personnel to coordinate related activities with the Fermilab Construction Coordinator.

FESS/Engineering will provide licensed professional architects, professional engineers and structural engineers for the design and coordination of the project. Project management will be by certified project manager professionals. Where required, FESS/Engineering will retain the professional services of consulting architects and/or engineers for final design and construction oversight.

If appropriate, the development of construction documents and bid packages may be accomplished by use of an Architectural-Engineering (A/E) firm in conjunction with the Integrated Project Team during Final Design. The selection of the A/E firm will be based on qualifications and past performance on similar FESS/Engineering projects. Existing professional services contract will be used to accomplish this work.

The A/E may be retained during construction phase activities for engineering support of the following:

- Bid Period Information Requests;
- Amendment/Addendum Development;
- Shop Drawing/Submittal Review;
- Assistance in estimating and negotiating changes to the subcontracted work;

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- Responding to subcontractor request for information including developing sketches/revisions to the subcontract documents
- Periodic site visits;
- Punchlist development.

The FESS/Engineering department will provide the construction management for the project, coordinating the subcontractor's construction subcontract. Field inspection, environment, safety and health, and quality control of construction activity will be the responsibility of the subcontractor. FESS/Engineering will provide quality and safety assurance during construction phase activities.

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The Project Baseline identifies the basis for evaluating project performance. The components are the Work Breakdown Structure, which identifies each component of the project, the Baseline Costs, Escalation Rates, and Baseline Schedule and Milestones.

3.2.1 WORK BREAKDOWN STRUCTURE (WBS) DICTIONARY

Listed below is the breakdown of the WBS for this project. Further breakdown of the above listed structure may be applied as required for accounting purposes. Items covered under Other Project Costs are noted as such.

Level 1 – MC-1 Building

1.0 Engineering, Design and Inspection (ED&I)

ED&I activities include the engineering and design activities in Preliminary Design and Final Design, the inspection activities associated with Construction Management. The descriptions are based on DOE Directive G413.3-21, Chapter 6. In addition, DOE Directive G413.3-21, Section 5.4.3 was used as guidance in estimating the ED&I cost for this project. This DOE Directive can be found at the DOE website. Appendix B of this document contains the URL link to this chapter.

Listed below is a further breakdown of this WBS

1.1 This WBS item will be used for Preliminary Design ED&I
1.2 This WBS item will be used for Final Design ED&I
1.3 This WBS item will be used for Construction Management ED&I

2.0 Administration

Administration activities include those defined by DOE Directive G413.3-21, Section 5.4.3 as Project Management (PM) and Construction Management (CM). This DOE Directive can be found at the DOE website. Appendix B of this document contains the URL link to this chapter.

Listed below is a further breakdown of this WBS

2.1 This WBS item will be used for Preliminary Design Administration
2.2 This WBS item will be used for Final Design Administration
2.3 This WBS item will be used for Construction Management Administration

3.0 Construction

3.1 This is fixed-price construction portion of the project;

3.2 This is Time and Materials construction orders for this project;
3.3 This WBS item will be used for advanced procured materials.

For accounting purposes, the management reserve of the above listed WBS items will be included in the WBS costs. DOE Directive G430.1-1, Chapter 11 was used as guidance in estimating the appropriate management reserve for this project. This DOE Directive can be found at the DOE website. Appendix B of this document contains the URL link to this chapter.

For accounting purposes, the indirect costs of the above listed WBS items will be included in the WBS items. For reference purposes, Indirect Costs rates are defined by DOE Order 4700.1 that states indirect costs are "…costs incurred by an organization for common or joint objectives and which cannot be identified specifically with a particular activity or project." The multipliers used in this document are based on current Fermilab rates. Appendix B of this document contains the URL link to the Fermilab Indirect Cost rates. While Indirect Costs have been estimated and included in the Total Project Cost, the Finance Section will confirm that the allocated funds are adequate. The Indirect Costs are not considered as part of the managed baseline.

3.2.2 BASELINE PROJECT COSTS

Listed below are the baseline project costs for this project.

		Base Cost	Management Reserve	Indirect Costs	Subtotal
1.1	Preliminary Design ED&I				$0
1.2	Final Design ED&I	$400,000	$100,000	$100,000	$600,000
1.3	Construction ED&I	$400,000	$100,000	$228,000	$728,000
2.1	Preliminary Design Administration				$0
2.2	Final Design Administration	$100,000	$25,000	$61,000	$186,000
2.3	Construction Administration	$100,000	$25,000	$61,000	$186,000
3.1	Fixed Price Construction	$5,210,000	$1,303,000	$95,000	$6,608,000
3.2	Time and Materials Construction	$0	$0	$0	$0
3.3	Advanced Procurement	$510,000	$77,000	$105,000	$692,000
	TOTALS	**$6,720,000**	**$1,630,000**	**$650,000**	**$9,000,000**

3.2.3 SCOPE CONTINGENCY

In order to provide a well-balanced, manageable project, several items of scope contingency have been identified. These items will be identified on the final construction documents as "alternate deducts" during the competitive procurement activities. During the source evaluation process, the project team will review the alternate deducts and determine which ones should be excluded from the scope of work, if necessary.

Under this Project Plan, the estimated fixed-price subcontract award is estimated at $5,210,000. At this stage of the project, a 25% contingency is applied to cover the cost of overruns to the fixed-price subcontract. If at the time of receipt of proposals, the proposals are greater than the estimate, half of the available contingency can be used to offset the higher bids, allowing for an acceptable upper-limit proposal of $5,861,000. A 12.5% contingency would then be available at the start of construction.

In the event that the acceptable upper-limit proposal is exceeded, scope contingency has been identified as a means of reducing scope while still providing a fully-functional building at project completion. The Request for Proposal (RFP) will ask for a base-bid price incorporating the full scope as defined by the subcontract documents. In addition to a base-bid price, the RFP will ask for an alternate deduct pricing based on the following alternate deduct options:

- Alternate Deduct 1: Remove Refrigeration Room from scope of work, including; foundations structural steel, exterior finishes, dewar tank foundations, electrical and mechanical trim out. (~$370K)
- Alternate Deduct 2: Remove auxiliary parking lot from scope of work, including; asphalt, bollards and drainage culverts. (~$30K)

For a detailed list of deductions associated with this Alternate Deduct, see ALTERNATE DEDUCT column in the attached Cost Estimate.

The Alternate Deduct (Scope Contingency) is estimated at approximately $400,000. The Alternate Deducts will allow for proposals with a base-bid price of up to $6,261,000 to be modified by executing the Alternate Deduct options and still be within the budget limits of this GPP Project.

3.2.4 ESCALATION

The baseline project and associated cost estimate assumes that the midpoint of construction will be the 3rd quarter of fiscal year 2013 (FY13). DOE Directive G413.3-21, Section 6.4.4 was used as guidance in estimating the appropriate escalation for

this project. This DOE Directive can be found at the DOE website. Appendix B of this document contains the URL link to this chapter.

3.2.5 BASELINE PROJECT SCHEDULE AND MILESTONES

The baseline schedule listed below sets forth the major activities and milestones essential for the completion of the project. The milestones are defined as:

Project Execution Plan

MILESTONE	DEFINITION	BASELINE
Start Project	Directive signed	Month 0
Start Engineering	Engineering work for the project starts when a task is entered into the Task Database	Month 1
Begin Construction	Notice To Proceed/Purchase Order Issued	Month 10
Construction Complete	Final acceptance of all work	Month 30
Engineering Complete	Completion of Close-out Documents	Month 33
Project Complete	Project Closed	Month 36

3.2.6 FUNDING PROFILE

Listed below are the anticipated total costs by fiscal year for this project as contained in the Fermilab Project Request Form.

	FY12	FY13	TOTAL
Construction	$0	$5,720,000	$5,720,000
EDIA	$400,000	$600,000	$1,000,000
Management Reserve	$0	$1,630,000	$1,630,000
Subtotal	$400,000	$7,950,000	$8,350,000
Indirect Costs	$100,000	$550,000	$650,000
TOTAL	**$500,000**	**$8,500,000**	**$9,000,000**

The Project Management, Construction Management, design, construction and inspection for this project will be performed in compliance with the applicable DOE Orders and Fermilab Policy and Procedures and in accordance with the Work Breakdown Structure.

3.3.1 DESIGN

If appropriate, the development of construction documents and bid packages may be accomplished by use of an Architectural-Engineering (A/E) firm in conjunction with the FESS/Engineering Project Team during Final Design. The selection of the A/E firm will be based on qualifications and past performance on similar FESS/Engineering projects. Existing professional services contract will be used to accomplish this work.

Architectural and Engineering (A/E) services procurement will conform to the Business Services Section (BSS) A/E selection procedures. Consulting firms will be selected based on the firms strengths of subject area expertise required for the project. Consultants will normally be selected from the firms that have been prequalified and that are under a master contract. Where specific individuals or area of expertise are required for the success of the project and this expertise is not available with the pre-selected firms then sole source justification will be written. A/E's will conform to the current version of the FESS Engineering A&E Handbook in force at the start of the project.

3.3.2 CONSTRUCTION

The majority of the construction work for this project will be accomplished by means of one or more construction packages. The Conventional Construction packages will be a competitively bid, lump sum contract. A Time and Materials (T&M) task may be used for preparatory work that is specialized and difficult to include in the competitive procurement process.

3.3.2.1 Possible Sources for the Conventional Construction Subcontractors

Fermilab has access to several Subcontractors that have sufficient qualifications to execute this Subcontract. Subcontractors are selected in response to a Request for Proposal and must meet specific safety and quality requirements. When applicable, there will be a close-out meeting to formally assess the performance of subcontractors in accordance with FESHM Chapter 7010.

3.3.2.2 Performance Based Incentive Process

The subcontractor will be paid only for work completed. In addition, retention may be reduced from 10% to as little as 2% during the subcontract if the subcontractor maintains a safe environment and meets subcontract milestones.

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3.3.2.3 Methods of Completion

The Request for Proposal (RFP) process will be used to solicit proposals from area Subcontractors with the appropriate safety records and experience to accomplish this work.

3.3.2.4 Source Selection Process

A Source Evaluation Team (SET) will be established which will include the Fermi Project Director, Fermi Project Manager, Fermi Project Coordinator, and Fermi Procurement Officer to evaluate and select a Subcontractor for the Conventional Construction Package. Evaluation criteria will be included in the Request For Proposal (RFP) documents as a basis for the SET evaluation of proposals.

3.3.2.5 Justification for Non-competitive Acquisitions

Anticipated non-competitive acquisitions may include Time and Material (T&M) tasks and advanced-procured items requiring longer than tolerated fabrication or delivery time. These items will be identified during the Final Design phase.

3.3.2.6 Milestones for Acquisition

Construction milestones will be established for inclusion into the subcontract documents.

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3.4.1 COST CONTROL

A separate cost account will be maintained for the following elements listed in the project Work Breakdown Schedule (WBS): Engineering Design and Inspection (ED&I), Administration, and Construction. The baseline budget for each element will be shown on all reports. Costs charged to these accounts will be reported monthly on a report available on the Business Services Section (BSS) website. The Fermilab Project Manager will review the report as needed in order to verify the validity of all cost charges during the reporting period, that commitments are correct, and that projections of costs can be covered by the baseline budget for each work element.

The Fermilab Project Manager has the responsibility for the use and commitment of project funds. Any costs or commitments that are made without his signed approval or that of higher Laboratory management may be rejected. Progress payments to the Architect/Engineer, suppliers, and subcontractors will be made upon receipt and approval of acceptable invoices, nominally on a monthly basis.

The Fermilab Project Manager, within authorized limits, will be responsible for the administration of the project's management reserve funds.

The Funding Profile, depicted in Section 3.2.6, is based on the current DOE funding profile. This plan reflects the best estimate of funding levels and the baseline schedule. The Funding Profile establishes the planned rate of accrued costs for the life of the project. The Fermilab Project Manager is responsible for updating, as needed, the project Estimate at Completion (EAC) for each work element to reflect changes in design and construction, and for overall project fiscal management.

3.4.2 SCHEDULE CONTROL

The Baseline Schedule, shown in Section 3.2.5 of this project plan, depicts the milestones and their expected achievement dates. As the project develops, the schedule may be further refined. The Fermilab Project Manager shall have the responsibility to monitor and control these tasks within the baseline. The baseline may be revised with DOE Fermi Site Office concurrence.

The Integrated Project Team will review work progress with the subcontractor at regular intervals. Any identified difficulties will require the subcontractor to provide a plan for their resolution. Significant schedule slippage will be cause for expediting actions by BSS at the request of the Fermilab Project Manager.

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Project Execution Plan

3.4.3 CHANGE CONTROL PROCEDURES AND AUTHORITIES

Changes to the project's internal baseline can occur to the scope, cost, or schedule aspects of the project. Changes at WBS Level 1 and below will be made with the approval of the Fermilab Project Manager for cost changes up to $75,000 and schedule changes up to 3 months. Cost and schedule changes above these amounts and changes to the scope of the project as outlined in the CDR will require the approvals of the Change Control Board. Any change to the Total Project Cost will require the approval of the Change Control Board and DOE Fermi Area Office. Project change control will be accomplished in accordance with practices listed below.

Change Control Procedures

Change	Approval Required	Change Request Form
Normal Field Changes no added cost or time	Fermilab Project Manager	None
In scope ≤$75k or ≤3 mos. schedule change	Fermilab Project Manager	None
In scope >$75k or >3 mos. schedule change	Control Board	Required
Total Project Cost	Control Board DOE Fermilab Directorate	Required
Non-Emergency Required for ES&H regulations	Control Board	Required
Change to Project Scope or Schedule	Control Board DOE Fermilab Sponsors	Required

The Change Control Board (Control Board) will be comprised of the following named individuals or the designees:

DOE Fermi Site Office	A. Harris (non-voting)
Sponsor - Chief Operating Officer	B. Chrisman
Sponsor – D/S/C Head	M. Lindgren
Project Director	E. Gottschalk
Project Manager	R. Alber (Chair)

The Fermilab Project Manager will act as Chair to the Control Board. The Control Board will consider the change requests promptly and, in cases not requiring additional information or discussion, will respond within two (2) weeks.

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3.5.1 INTEGRATED SAFETY MANAGEMENT (ISM)

Fermilab subscribes to the philosophy of Integrated Safety Management (ISM), in accordance with Department of Energy Order 413.3b "Program and Project Management for the Acquisition of Capital Assets." Appendix B of this document contains a URL link to the DOE order. Fermilab requires its subcontractors and sub-tier subcontractors to do the same. ISM is a system for performing work safely and in an environmentally responsible manner. The term "integrated" is used to indicate that the Environment, Safety & Health (ES&H) management systems are normal and natural elements of doing work. The intent is to integrate the management of ES&H with the management of the other primary elements of construction: quality, cost, and schedule.

The subcontractor(s) shall submit proof of an effective integrated safety management program. The program must be described in the terms listed below.

- Line Management Responsibility for Safety;
- Clear Roles and Responsibilities;
- Competence Commensurate with Responsibility;
- Balanced Priorities;
- Identification of Safety Standards and Requirements;
- Hazard Controls Tailored to Work Being Performed;
- Operations Authorization.

3.5.2 QUALITY ASSURANCE

All aspects of this project will be periodically reviewed with regard to Quality Assurance issues from Conceptual Design through Close-out. This review process will be completed in accordance with the applicable portions of the Fermilab Director's Policy Manual, Section 10. Appendix B of this document contains a URL link to the Fermilab Director's Policies. The following elements will be included in the design and construction effort:

- An identification of staff assigned to this project with clear definition of responsibility levels and limit of authority as well as delineated lines of communication for exchange of information;
- Requirements for control of design criteria and criteria changes and recording of standards and codes used in the development of the criteria;
- Periodic review of design process, drawings and specification to insure compliance with accepted design criteria;
- Identification of underground utilities and facility interface points prior to the commencement of any construction in affected areas;

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- Conformance to procedures regarding project updating and compliance with the approved construction schedule;
- Conformance to procedures regarding the review and approval of shop drawings, samples test results and other required submittals;
- Conformance to procedures for site inspection by Fermilab personnel to record construction progress and adherence to the approved contract documents;
- Verification of project completion, satisfactory system start-up and final project acceptance.

3.5.3 HIGH PERFORMANCE BUILDING DESIGN

Refer to Appendix B for High Performance Building Design.

3.5.4 RELIABILITY AND MAINTAINABILITY

Both reliability and future maintenance are considered in the design of all components of Fermilab site. Materials and construction techniques are selected during the design process to provide adequate design life, accessibility, and minimal maintenance.

When completed, the facility resulting from this project will become the formal responsibility of the Fermilab Particle Physics Division. The completed project, and the utilities and systems that support it, will be added to the overall laboratory maintenance and building inspection program of the Facilities Engineering Services Section. The Facilities Engineering Services Section and Business Services Section will coordinate the preventative maintenance, normal service and emergency repairs for the building.

The Building Research Board National Research Council states that if a building receives an adequate level of maintenance and repair funding, a steady-state situation should exist wherein the inventory would remain in a service condition that would neither decline nor improve and a maintenance and repair backlog would not develop. Maintenance is defined as the day-to-day work necessary to sustain property in order to realize the originally anticipated useful life of a fixed asset. Maintenance includes periodic inspection, adjustment, lubrication, and cleaning (non-janitorial) of equipment, replacement of parts etc. to assure continuing service and to prevent breakdown. Repair is defined as the work required to restore damaged or worn-out property to a normal operating condition. In general, repairs are curative and maintenance is preventive.

Operations are the activities related to a building's normal performance of the function for which it is used. The cost of utilities, janitorial services, window cleaning,

rodent control and waste management are generally included within the scope of operations and are not maintenance.

The following preliminary maintenance and repair costs forecast is based on information contained in the Whitestone Building and Repair Cost Reference 2011 and indexed for the Chicago, Illinois area. The Building M&R Cost Profile is based on the General Laboratory model. While not an exact match, the functions and basic material selections are considered similar in nature to provide a preliminary forecast of maintenance and repair costs for this project.

Cost (FY2011)	**Annual Cost Per Square Foot**	**Annual Cost as % of Replac. Cost**
PM and Minor Repair	$2.47	0.66%
Unscheduled Maintenance	$2.01	0.49%
Renewal and Replacement	$5.41	1.38%
Total M&R Costs	**$9.89**	**2.53%**

If requested, a detailed maintenance and repair forecast for this project will be developed after the completion of construction. A copy of the referenced Whitestone Building and Repair Cost Reference data is included in the Appendix B of this project plan.

3.5.5 VALUE MANAGEMENT

It is not anticipated that a separate value management exercise will be required for this project. However, internal reviews of designs at various levels of completion will be performed by the most experienced individuals at Fermilab with the goal to identify cost effective design solutions. These internal reviews will focus on understanding the impact of the technical requirements on the overall project including optimization to reduce the life cycle costs.

3.5.6 RISK MANAGEMENT

The majority of the risk management on this project involves the coordinated activities affecting ongoing Fermilab operations. Sufficient schedule float is currently anticipated for the activities related to constructing project to accommodate minor potential disruptions.

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3.5.7 DESIGN REVIEWS

Design reviews are accomplished in accordance with FESS/Engineering Standard Operating Procedure 8.3.5.1, "Document Reviews." Designs are reviewed for conformance to project requirements and for appropriateness of the proposed systems, impacts on existing systems and operations, specific technical requirements to be incorporated into the design and compliance with best and required practices of authority having jurisdiction.

The objective of the reporting and review activity is to provide the assemblage and integration of project related cost data, schedule status and performance progress into reports for the monitoring and management of the project.

Per Fermilab's engineering policy, an Engineering Risk Assessment has been performed and determined that the project is Low Risk therefore the project will follow standard FESS Engineering procedures. See Appendix B for the Engineering Risk Assessment Worksheet.

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3.6.1 REPORTING

Daily – If appropriate, construction logs may be prepared by the Fermilab Construction Coordinator that document the ongoing progress, quality assurance, safety and change issues. When required, the Subcontractor prepares daily quality control reports documenting their efforts on field activities. The Fermilab Project Manager and Fermilab Construction Manager are provided these reports on the following workday.

Weekly – The Subcontractor submits a summary report of quality control activities for the previous week at the weekly construction meeting. These reports will include a "look ahead" schedule that details the expected progress in the coming weeks.

Quarterly - The Fermilab Project Manager will review construction progress, changes, Subcontractor payouts and general project progress in order to prepare a Quarterly General Plant Project (GPP) report.

3.6.2 REVIEWS

Directorate Level Review – If appropriate and requested, the project team will meet with the Directorate to review the project related cost data, schedule status and performance progress.

Multi-Organization Construction Site Safety Walkthrough – These walkthroughs will occur periodically as determined by the Fermilab Project Manager. The walkthroughs will be completed in accordance with Section 7010 of the Fermilab Environment Safety and Health Manual (FESHM). A copy of the procedure is included in Appendix B of this Project Plan.

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Conceptual Design Drawings

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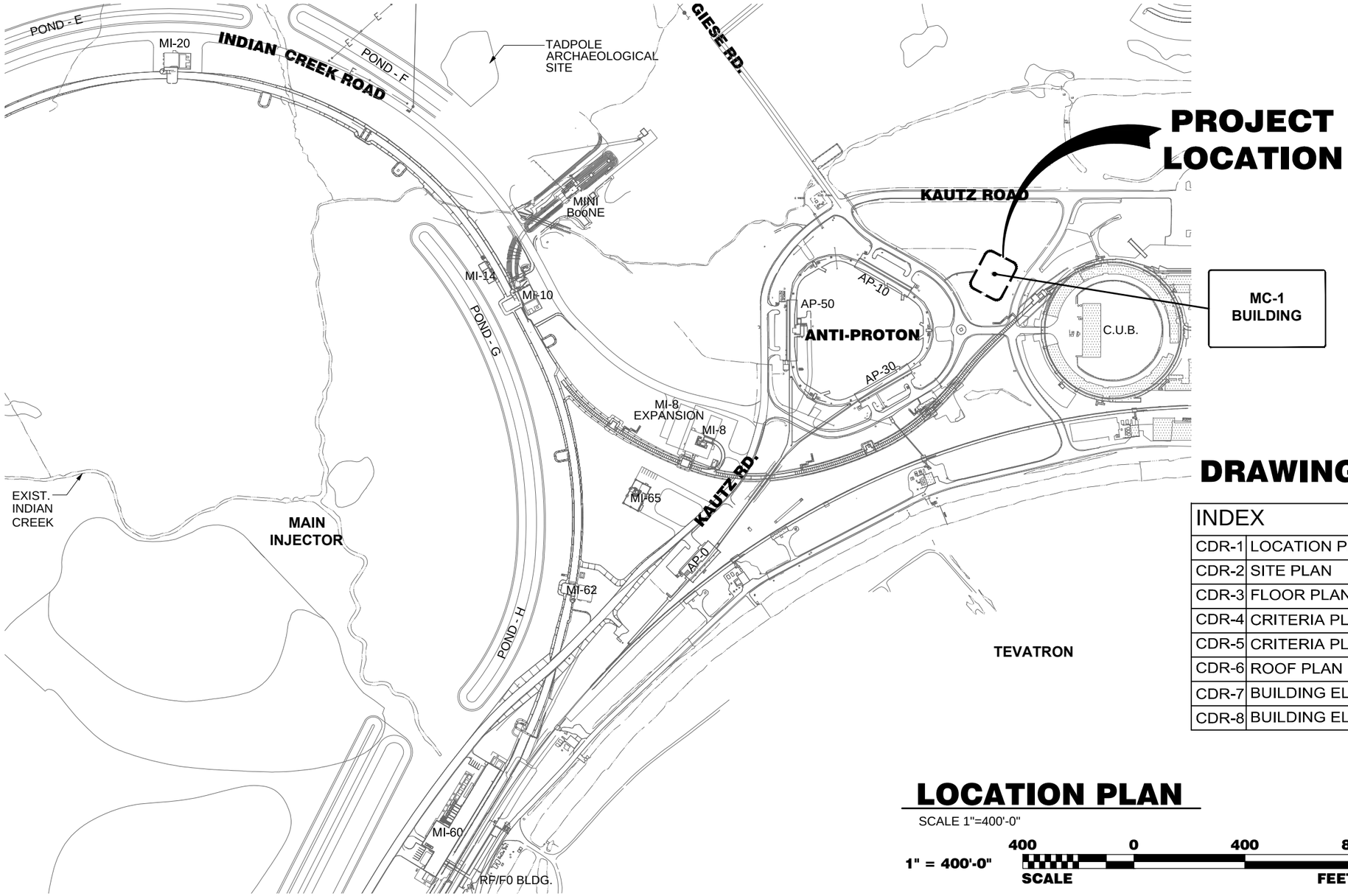
MC-1 BUILDING

FESS Proj. No. 6-10-20



DRAWING LIST

INDEX	
CDR-1	LOCATION PLAN
CDR-2	SITE PLAN
CDR-3	FLOOR PLAN
CDR-4	CRITERIA PLAN - SHEET 1 OF 2
CDR-5	CRITERIA PLAN - SHEET 2 OF 2
CDR-6	ROOF PLAN
CDR-7	BUILDING ELEVATION & SECTION
CDR-8	BUILDING ELEVATION & SECTION

LOCATION PLAN

SCALE 1"=400'-0"

1" = 400'-0"

400 0 400 800

SCALE FEET

SCALE:

S W E PROJECT NORTH

MC-1 BUILDING

LOCATION PLAN

CDR

Fermilab

U.S. DEPARTMENT OF ENERGY

DATE

MARCH 2012

PROJECT NO.

6-10-20

DRAWING NO.

CDR-1

NEW ELEC. MH

ABANDON EXIST. LIFT STATION

ABANDON SAN. SEWER PIPE

CAP SAN. SEWER FOR FUTURE DEMOLITION

FUTURE BERM

FUTURE BEAMLINE ENCLOSURE

NEW ELEC. MH

NEW ELEC. DUCTBANK

FUTURE M2E BUILDING

HARDSTAND

FUTURE CONN.

NEW SAN. MH

NEW COMM. DUCT BANK

NEW ELEC. DUCTBANK

CAP SAN. SEWER FOR FUTURE DEMOLITION

NEW 4" SAN SEWER FORCE MAIN

FUTURE BEAMLINE ENCLOSURE

FUTURE ROAD

6" PVC

AUXILIARY PARKING

SOUTH BOOSTER ROAD

g-2 RING LAY-DOWN AREA

NEW CHILLED WATER PIPE

NEW CONNECTION TO EXIST. FORCE MAIN AND CLEANOUT

NEW 4" SAN SEWER FORCE MAIN

NEW SANITARY LIFT STATION

NEW DWS, ICW, CHW, AND GAS LINES

1" = 50'-0"

50 0 50 100

SCALE FEET

SCALE:

S E W

PROJECT NORTH

MC-1 BUILDING

SITE PLAN

CDR

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DATE

MARCH 2012

PROJECT NO.

6-10-20

DRAWING NO.

CDR-2

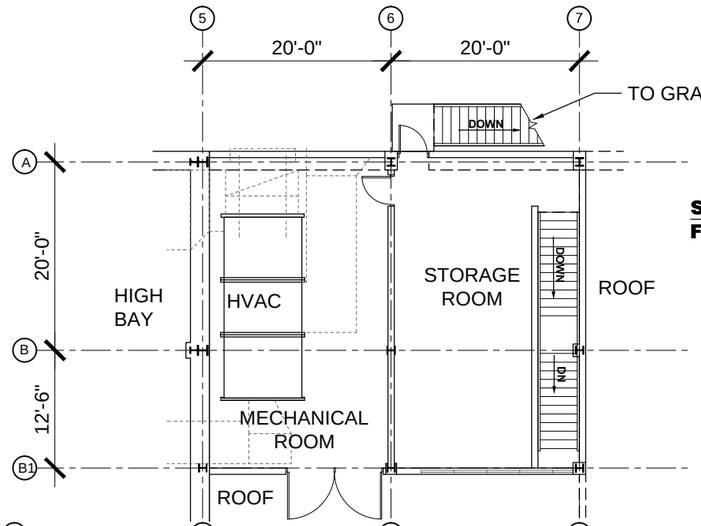
Mar 07, 2012 - 3:35pm C:\Users\jheidorn\appdata\local\temp\AcPublish_4308\CDR-2_MC-1 Site Plan.DWG

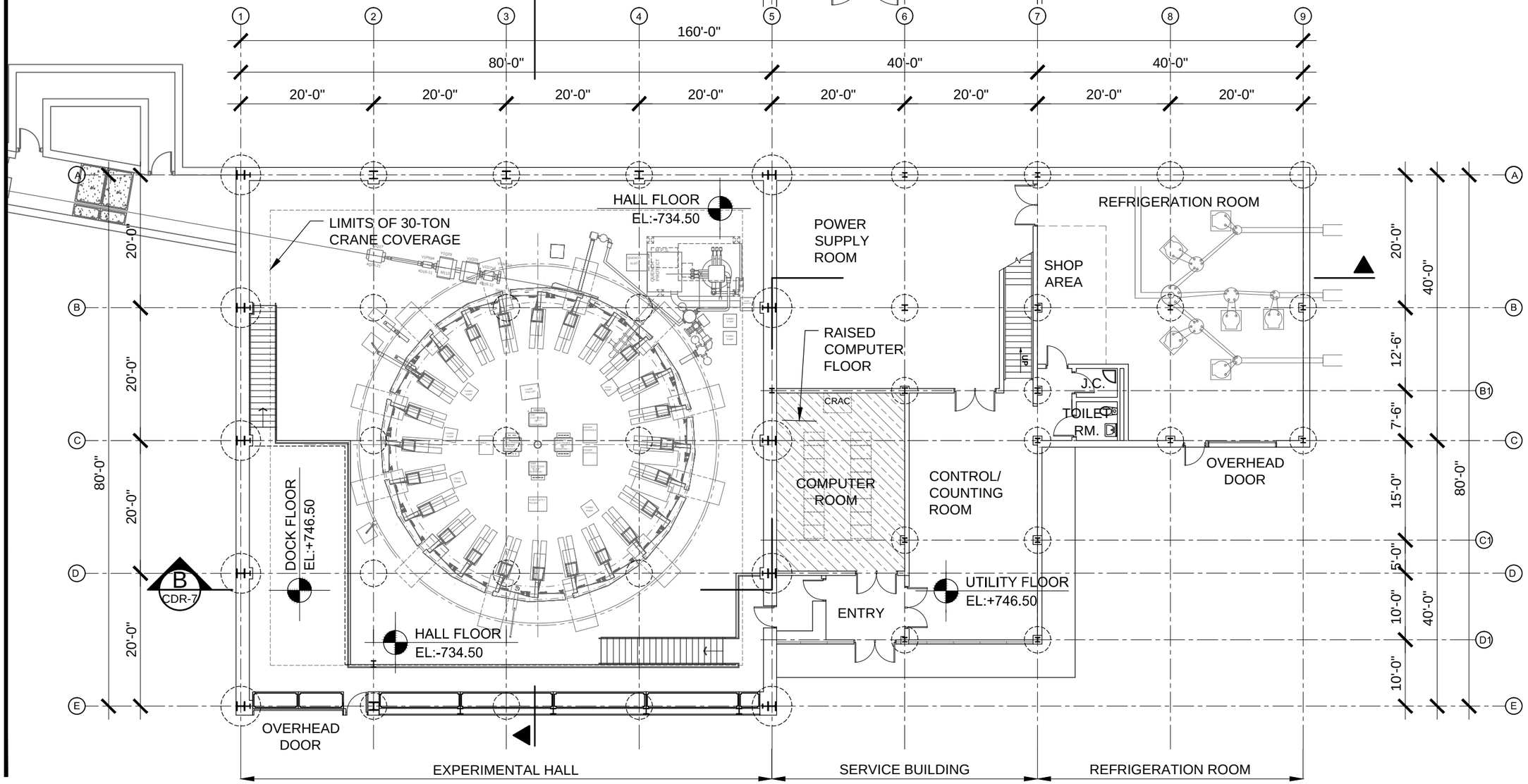
1/16"=1'-0"

8 0 8 16 24 32 40

SCALE FEET

SECOND FLOOR PLAN
FIN. FL. EL. 761.50'





SCALE:

S
E W
PROJECT NORTH

MC-1 BUILDING
FLOOR PLAN

CDR

Fermilab

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DATE
MARCH 2012

PROJECT NO.
6-10-20

DRAWING NO.
CDR-3

EXPERIMENTAL HALL

FUNCTION: HOUSE MUON STORAGE RING AND ASSOCIATED EQUIPMENT
EXTERIOR RADIATION SHIELDING: 2 FT.
EQUIPMENT ACCESS: 1-30 TON OVERHEAD CRANE IN BUILDING ABOVE

HVAC:
HUMIDITY**:** NO MINIMUM OR MAXIMUM REQUIREMENT (ASSUME 55% RH MAX).

TEMPERATURE**:** SUMMER 78F ± 2F, WINTER 68F ± 2F

EQUIPMENT HEAT LOAD TO AIR: NEGLIGIBLE

LCW (LOW CONDUCTIVITY WATER) NOT INCLUDED**:** WATER COOLING TO POWER SUPPLY AND MAGNETS BY OTHERS. ASSUMED TO BE TIED IN FROM EXISTING TUNNEL LCW SYSTEM BY ACCELERATOR

BASIS**:** INDOOR AIR HANDLER (LOCATED IN MECHANICAL ROOM) UTILIZING CHILLED WATER FROM CUB. UNIT WILL HAVE GAS HEAT, METASYS CONTROLS, ECONOMIZER, AND DUCT DISTRIBUTION INTO THE HALL WITH DE-STRATIFICATION FANS. UNIT WILL BE TIED INTO SITEWIDE FESS METASYS SYSTEM. NO BACK-UP UNIT.

PURGE VENTILATION: 2,000 CFM EXHAUST

OCCUPANT LOAD: 5 PERSONS

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

FIRE DETECTION: AIR SAMPLING SMOKE DETECTION AND ALARM (VOICE) NOTIFICATION THROUGHOUT

LIGHTING: 75 FC

EMERGENCY LIGHTING: AS REQUIRED

EXIT SIGNS: PER SCOPE

CONV. RECEPT: 120/208V AS REQUIRED 2-480VOLT WELDING RECEPTACLES

COMPUTER ROOM

HVAC:
HUMIDITY: NO MINIMUM OR MAXIMUM HUMIDITY REQUIREMENT

TEMPERATURE STABILITY: NONE

TEMPERATURES: 75F SUMMER, 68F WINTER MINIMUM

EQUIPMENT LOAD TO AIR: TBD

BASIS: ASSUME 10 TON INDOOR CRAC-TYPE HVAC UNIT UTILIZING AVAILABLE CHILLED WATER FROM CUB, WITH ELECTRIC HEAT. NO BACK-UP UNIT.

PURGE VENTILATION: NO REQUIREMENT

OCCUPANT LOAD: 5 PERSONS

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

FIRE DETECTION: SPOT TYPE SMOKE DETECTION MANUAL PULL STATIONS AT EXITS AND ALARM (VOICE) NOTIFICATION THROUGHOUT

LIGHTING: 55 FC

EMERGENCY LIGHTING: AS REQUIRED

EXIT SIGNS: PER SCOPE

CONV. RECEPT: 120/208V AS REQUIRED

NO. RACKS: 16 - (2'X3')

STORAGE ROOM

HVAC:
HUMIDITY: 50% MAXIMUM RH; NO MINIMUM

TEMPERATURE STABILITY: NONE

TEMPERATURES: 75F SUMMER, 68F WINTER MINIMUM

EQUIPMENT LOAD TO AIR: TBD

PURGE VENTILATION: NO REQUIREMENT

OCCUPANT LOAD: 5 PERSONS

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

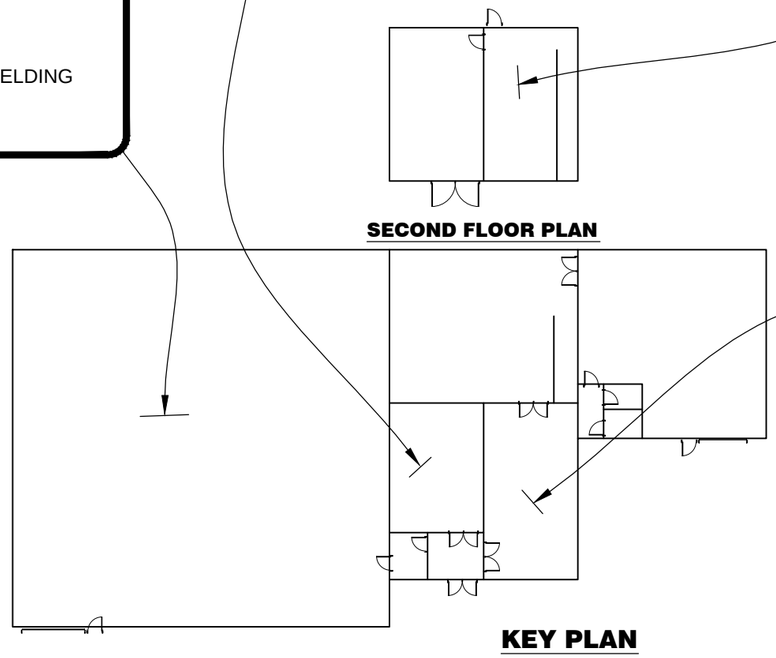
FIRE DETECTION: SPOT TYPE SMOKE DETECTION MANUAL PULL STATIONS AT EXITS AND ALARM (VOICE) NOTIFICATION THROUGHOUT

LIGHTING: 55 FC

EMERGENCY LIGHTING: AS REQUIRED

EXIT SIGNS: PER SCOPE

CONV. RECEPT: 120/208V AS REQUIRED



CONTROL/COUNTING ROOM

HVAC:
HUMIDITY: 50% MAXIMUM RH, NO MINIMUM

TEMPERATURE STABILITY: NONE

TEMPERATURES: 75F SUMMER, 68F WINTER MINIMUM

EQUIPMENT LOAD TO AIR: TBD

PURGE VENTILATION: NO REQUIREMENT

OCCUPANT LOAD: 5 PERSONS

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

FIRE DETECTION: SPOT TYPE SMOKE DETECTION MANUAL PULL STATIONS AT EXITS AND ALARM (VOICE) NOTIFICATION THROUGHOUT

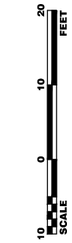
LIGHTING: 55 FC

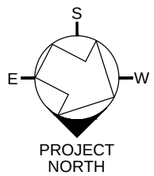
EMERGENCY LIGHTING: AS REQUIRED

EXIT SIGNS: PER SCOPE

CONV. RECEPT: 120/208V AS REQUIRED

SCALE:





MC-1 BUILDING

CRITERIA PLAN - SHEET 1 OF 2

CDR

Fermilab

U.S. DEPARTMENT OF ENERGY

DATE

MARCH 2012

PROJECT NO.

6-10-20

DRAWING NO.

CDR-4

POWER SUPPLY ROOM

VENTILATION & HEATING ONLY:
HUMIDITY: 50% MAXIMUM RH, NO MINIMUM.

TEMPERATURE STABILITY: NONE

TEMPERATURES: SUMMER AMBIENT VENTILATION, AND WINTER 68F MINIMUM.

EQUIPMENT HEAT LOAD TO AIR: TBD

LCW: NOT INCLUDED (WATER COOLING TO POWER SUPPLY AND MAGNETS BY OTHERS, ASSUMED TO BE TIED IN FROM EXISTING TUNNEL LCW SYSTEM BY ACCELERATOR DIVISION).

BASIS: INTAKE AIR WALL LOUVER W/ MOTORIZED DAMPER, INTERLOCK WITH EXHAUST FANS, AND ELECTRIC HEATERS

PURGE VENTILATION: NO REQUIRMENT

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

FIRE DETECTION: SPOT TYPE SMOKE DETECTION MANUAL PULL STATIONS AT EXITS AND ALARM (VOICE) NOTIFICATION THROUGHOUT

LIGHTING:	30 FC
EMERGENCY LIGHTING:	AS REQUIRED
EXIT SIGNS:	PER CODE
CONV. RECEPT:	120/208V AS REQ.

MECHANICAL ROOM

VENTILATION & HEATING ONLY:
HUMIDITY: NO MINIMUM OR MAXIMUM HUMIDITY REQUIREMENT.

TEMPERATURE STABILITY: NONE

TEMPERATURES: SUMMER AMBIENT VENTILATION, AND WINTER 68F MINIMUM.

BASIS: INTAKE AIR WALL LOUVER W/ MOTORIZED DAMPER, INTERLOCK WITH EXHAUST FANS, AND ELECTRIC HEATERS

PURGE VENTILATION: NO REQUIRMENT

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

FIRE DETECTION: SPOT TYPE SMOKE DETECTION MANUAL PULL STATIONS AT EXITS AND ALARM (VOICE) NOTIFICATION THROUGHOUT

LIGHTING:	30 FC
EMERGENCY LIGHTING:	AS REQUIRED
EXIT SIGNS:	PER CODE
CONV. RECEPT:	120/208V AS REQ.

REFRIGERATION ROOM

VENTILATION & HEATING ONLY:
HUMIDITY: NO MINIMUM OR MAXIMUM HUMIDITY REQUIREMENT.

TEMPERATURE STABILITY: NONE

TEMPERATURES: SUMMER AMBIENT VENTILATION, AND WINTER 68F MINIMUM.

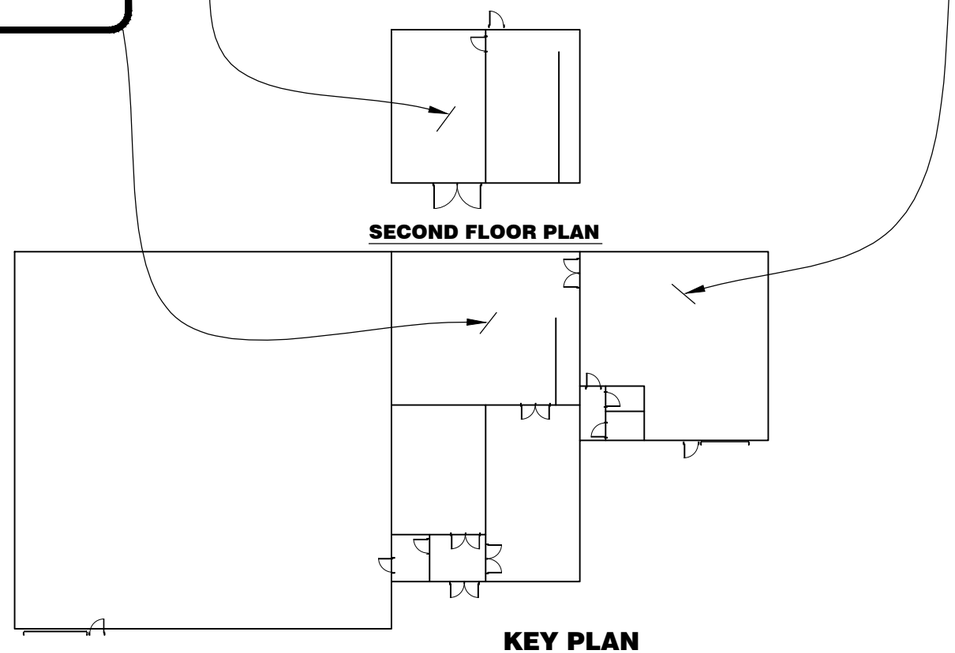
BASIS: INTAKE AIR WALL LOUVER W/ MOTORIZED DAMPER, INTERLOCK WITH EXHAUST FANS, AND ELECTRIC HEATERS

PURGE VENTILATION: 2,000 CFM EXHAUST

FIRE SUPPRESSION: WET PIPE SPRINKLER SYSTEM DESIGNED TO ORDINARY HAZARD GROUP 2

FIRE DETECTION: SPOT TYPE SMOKE DETECTION MANUAL PULL STATIONS AT EXITS AND ALARM (VOICE) NOTIFICATION THROUGHOUT

LIGHTING:	30 FC
EMERGENCY LIGHTING:	AS REQUIRED
EXIT SIGNS:	PER CODE
CONV. RECEPT:	120/208V AS REQ.



SCALE:
20 10 0 10 FEET
SCALE
1" = 10'-0"

S
E W
PROJECT NORTH

MC-1 BUILDING
CRITERIA PLAN - SHEET 2 OF 2

CDR

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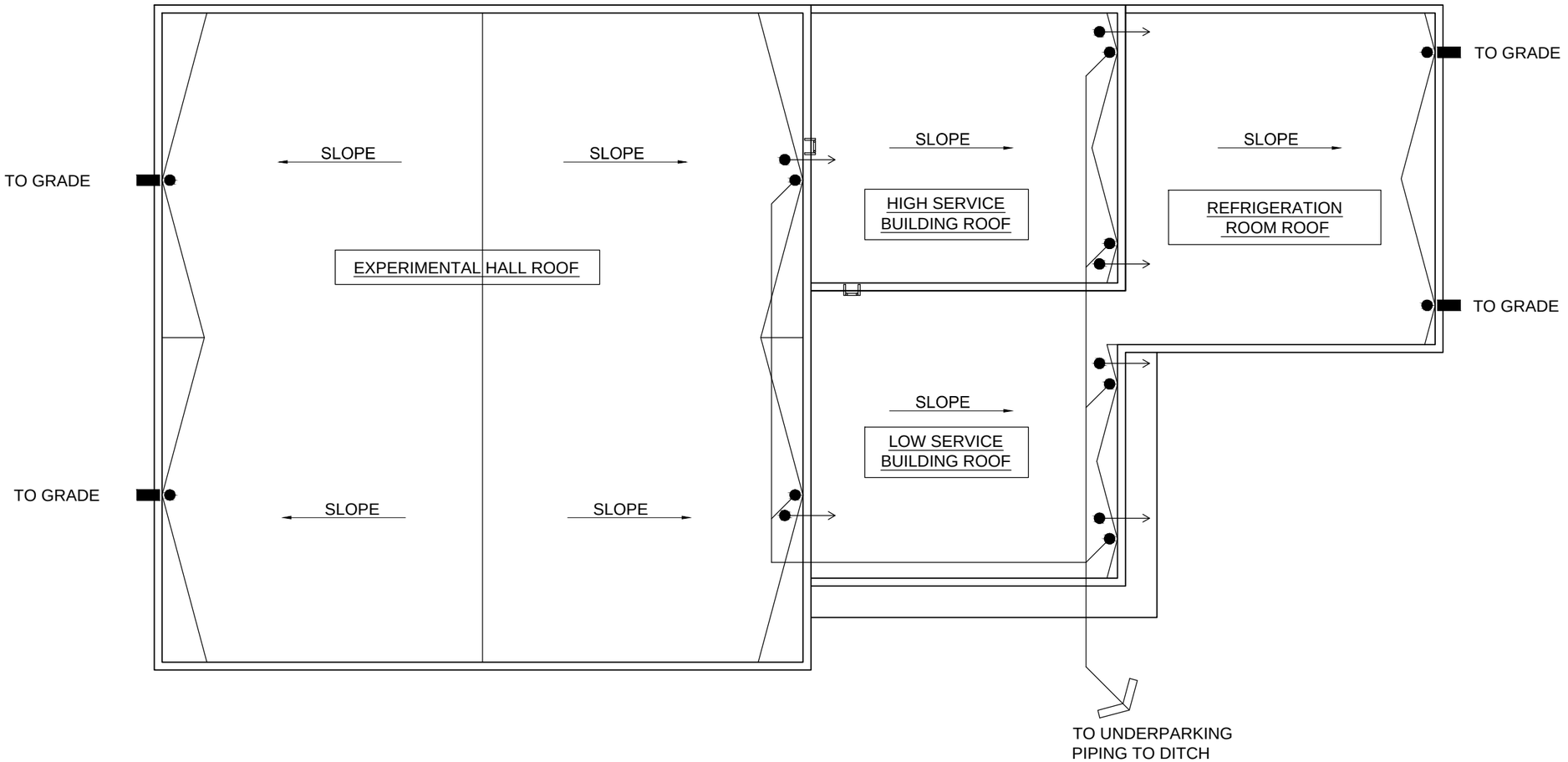
U.S. DEPARTMENT OF ENERGY

DATE
MARCH 2012

PROJECT NO.
6-10-20

DRAWING NO.
CDR-5



1/16"=1'-0"

8 0 8 16 24 32 40

SCALE FEET

SCALE:

S
E W
PROJECT
NORTH

MC-1 BUILDING

ROOF PLAN

CDR

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U.S. DEPARTMENT OF ENERGY

DATE

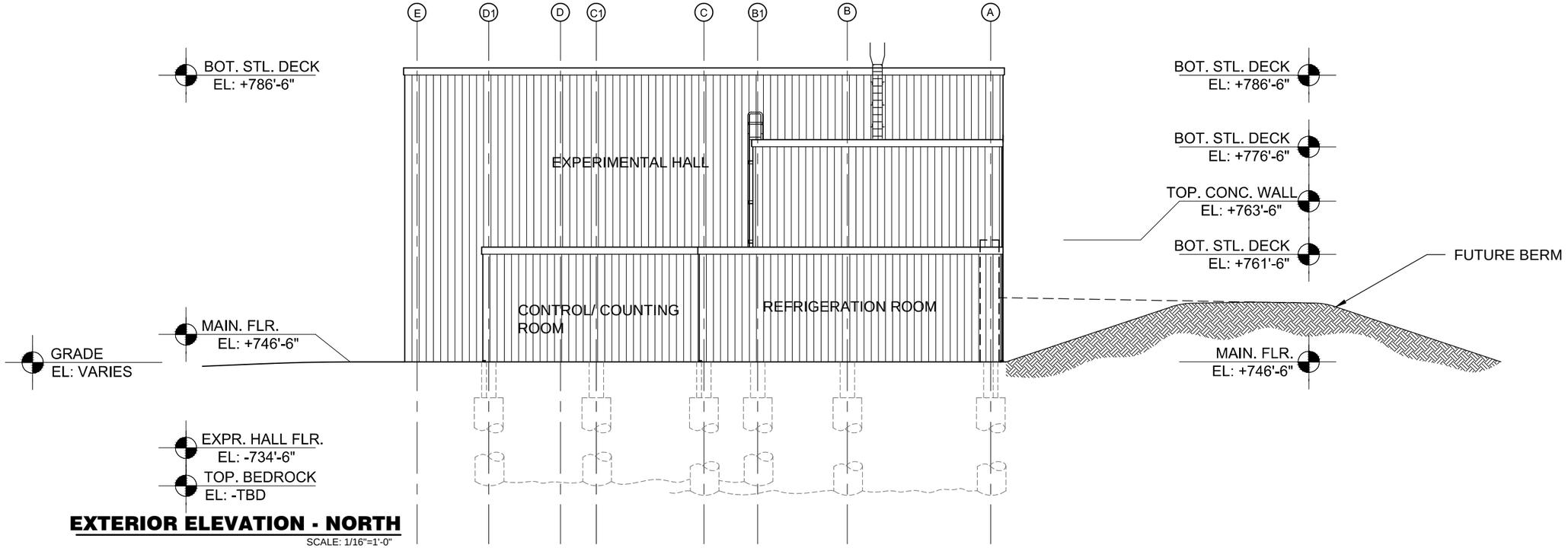
MARCH 2012

PROJECT NO.

6-10-20

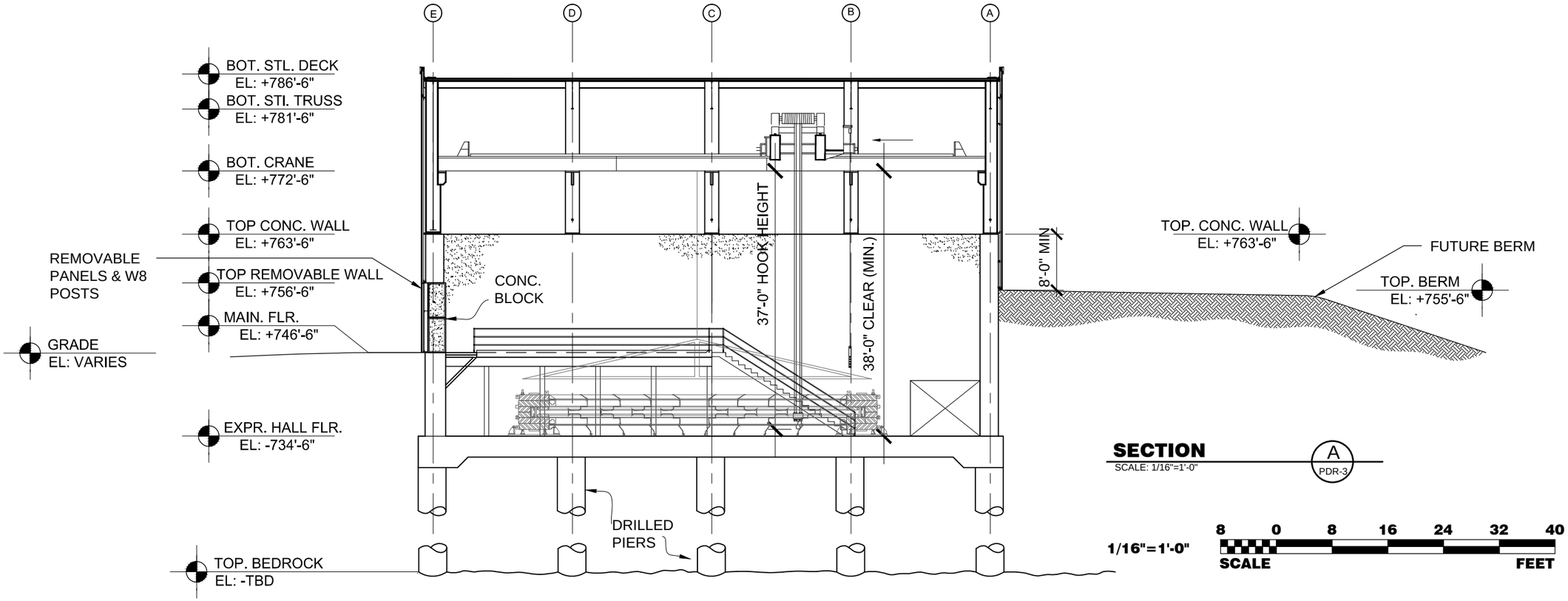
DRAWING NO.

CDR-6



EXTERIOR ELEVATION - NORTH

SCALE: 1/16"=1'-0"



SECTION A PDR-3

SCALE: 1/16"=1'-0"

1/16"=1'-0"

8 0 8 16 24 32 40

SCALE FEET

SCALE:

MC-1 BUILDING

BUILDING SECTION & ELEVATION

CDR

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DATE

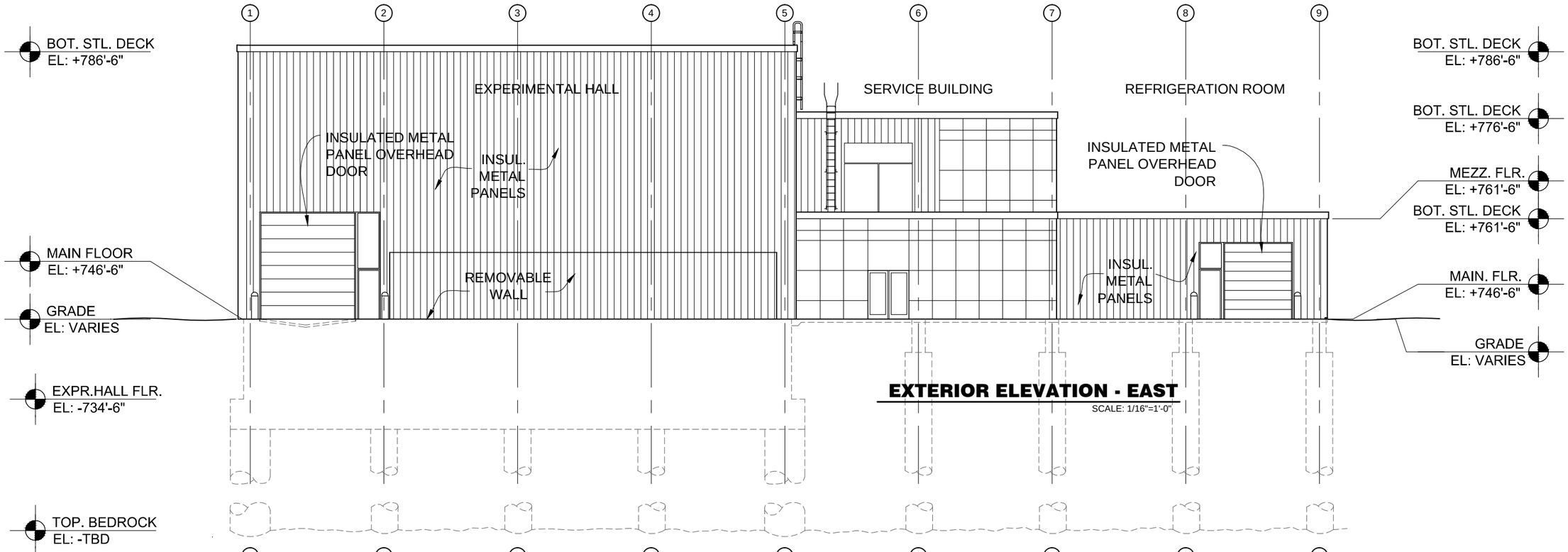
MARCH 2012

PROJECT NO.

6-10-20

DRAWING NO.

CDR-7



SCALE:

MC-1 BUILDING

BUILDING SECTION & ELEVATION

CDR

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U.S. DEPARTMENT OF ENERGY

DATE

MARCH 2012

PROJECT NO.

6-10-20

DRAWING NO.

CDR-8

URL List of referenced DOE Directives and Guides

- DOE Directive 413.3b
  http://www.directives.doe.gov/directives/current-directives/413.3-BOrder-b/view
- DOE Directive G413.3-21
  https://www.directives.doe.gov/directives/current-directives/413.3-EGuide-21/view

URL List of referenced Fermilab Policies, Procedures and Guidance

- DOE/Fermi Research Associates Contract DE-AC02-07CH11359
  http://fra-hq.org/pdfs/FRA_Contract.pdf
- Fermilab Director's Policy Manual
  http://www.fnal.gov/directorate/Policy_Manual.html
- Fermilab Environment Safety and Health Manual (FESHM)
  http://www-esh.fnal.gov/FESHM/7000/7010.htm
- Fermilab Engineering Manual
  http://www.fnal.gov/directorate/documents/FNAL_Engineering_Manual.pdf
- FESS/Engineering Policy Manual
  http://fess.fnal.gov/engineering/PolicyManual.pdf
- FESS/Engineering Procedure Manual
  http://fess.fnal.gov/engineering/FESSProcedureManual.pdf
- FESS Environmental Review Form Database
  http://fess-oracle-web.fnal.gov:8085/FessEnvironmentalReviewProj-war/home.seam
- Fermilab Indirect Burden Rates
  http://finance.fnal.gov/Accounting/index.html

Attachments Contained In This Appendix

- URL List of referenced DOE Directives and Guides
- URL List of referenced Fermilab Policies, Procedures and Guidance
- Integrated Project Team Responsibility Matrix
- Life Safety Analysis
- NEPA Documentation
- Sustainable Design/High Performance Building Review Memo
- LEED/Guiding Principles Checklist
- Engineering Risk Assessment
- Whitestone Building and Repair Cost Reference Information
- Fermilab Work Smart Set, Chapter 1070 of FESHM
- Multi-Organization Construction Site Safety Walkthrough Procedure
- Stakeholder Input
  - Comment and Compliance Review Request
  - Stakeholder Comments

INTEGRATED PROJECT TEAM RESPONSIBILITY MATRIX

MC-1 Building

	PROJECT SPONSERS		INTEGRATED PROJECT TEAM					ORGANIZATIONAL PROCESS ASSETS									
	Directorate	Championing Organization	D/S/C	FESS/Engineering	FESS/Engineering	FESS/Engineering	Business Services Section	Directorate	Business Services Section	Business Services Section	Facilities Engineering Services Section	Facilities Engineering Services Section	Championing Organization	Championing Organization	Facilities Engineering Services Section	ES&H Section	Business Services Section
	Chief Operating Officer	*Division/Section/Center Head*	*Fermilab Project Director*	*Fermilab Project Manager*	*Fermilab Design Coordinator*	*Fermilab Construction Coordinator*	*Procurement*	*Finance Section Budget Office*	*Legal*	*Accounting*	*Section Head*	*FESS Engineering Department Head*	*Div. / Sec. Safety Officer*	*Div. / Sec. Budget Officer*	*Environmental*	*Safety and Health*	*Security*
WORK PHASE	**B. Chrisman**	**M. Lindgren, PPD**	**E. Gottschalk**	**R. Alber**	**J. Hunt**	**TBD**	**TBD**	**C. Trimby**	**Department**	**Department**	**R. Ortgiesen**	**R. Ortgiesen (Acting)**	**E. McHugh**	**E. Arroyo**	**R. Walton**	**J. Cassidy**	**B. Flaherty**
Project Justification CD-0																	
establish mission need, identify funding	Approve mission need, place in GPP/AIP queue	Establish mission need; appoint Fermilab Project Director	Prepare/submit mission need									Provide Project Cost Range					
Preliminary Design CD-1																	
Establish FESS/Engineering task		Assess D/S/C resource availability	Define project scope	Establish project and task request for Operating Reserve Funds for devlopment of CDR	Develop design costs for each disciple							Determine Fermilab Project Manager					
				Coordinate engineering resources, selection, tasking													
				Review in-house and A/E human resource requirements													
	Issue Approval to Proceed on Operating Reserve task			Submit task request for Operating Reserve funding							Review engineering task request for Operating Reserve funds	Review, concur and forward task request for Operating Reerve funds to COO					
Human Resource Management				Determine need for in-house and A/E human resource requirements								Review workload assignments					
				Prepare A/E RFP Memo	Review A/E RFP		Issue A/E RFP										
				Review A/E proposal	Review A/E proposal		Forward A/E to FPM		Assist with contracting								
				Initiate requisition for A/E work			Establish tasking purchase order with A/E										
Prepare NEPA documentation				Enter FERF into tracking database	Develop information for FERF						Interface with ES&H Section				Review FERF and detemine if PIF is required.		
			Submit PIF	Review PIF											Develop PIF, if needed		
															Interface with ES&H Section to support PIF process		
Develop Project Plan	Preliminary acceptance of aesthetic concerns	Provide D/S/C Resources as required	Coordinate customer team	Establish project design team	Direct design teams effort						Provide FESS Resources as Required	Monitor, Review and Comment					
			Provide project requirements	Interface with customer	Interface w/ customer												
			Assist in Developing Project Plan Documents	Develop Project Plan Documents	Assist in Developing Project Plan Documents												
Lab-wide Comment and Compliance Review	Review and Comment	Review and Comment	Review and Comment	Issues CCR, comment resolution	Coordinate CCR, comment resolution		Review and Comment		Review and Comment		Review and Comment	Review and Comment	Review and Comment	Review and Comment	Review and Comment	Review and Comment	Review and Comment
Fermilab Project Request Form	approve PRF	Approve Fermilab Project Request Form	Submit Fermilab Project Request Form	Draft Fermilab Project Request Form										Review Submittal and Forward to Finance Section			
	Review Directive Request							Create and Submit Directive Request to DOE									
Project Plan Approval			Accepts project scope	Accepts Project Baseline, Cost , Scope and sSchedule													
	Accept and Approve Project Plan	Accept and Approve Project Plan	Accept and Approve Project Plan	Submit Project Plan													
Project Plan Submittal to DOE for Construction Directive Authorization								Submit Construction Directive Authorization									
Project Filing			Monitor Filing	Establish Project File Requirements	Maintain Project Files							Monitor Project Filing					
Final Design CD-2																	
Establish Funding Codes				Request Work Package				Create Work Package						Create PCM for Task Numbers, submit request to Finance			
Human Resource Management				Determine need for in-house and A/E human resource requirements								Review workload assignments					
				Prepare A/E RFP Memo	Review A/E RFP		Issue A/E RFP										
				Review A/E proposal	Review A/E proposal		Forward A/E to FPM		Assist with Contracting								
				Initiate requisition for A/E work			Establish tasking purchase order with A/E										
Design Coordination Meetings			Participate in Meetings	Participate in Meetings	Coordinate and Lead Meetings												
Design Development				Approve change orders	Interface with Customer and Fermilab organizations		issue change orders										
					Lead Development of Construction Documents, Drawings, Exhibits												
Execute Project Plan Exhibit A and Exhibit B				assist in writing Exhibit A	coordinate writing of Exhibit A&B		assist in writing Exhibit A		provide counsel as requested								
Internal Cost Tracking and Control				Monitor Design Progress and Costs						provide timely cost data to PM							
				initiate Design Phase Change Orders (if required)	Review Design Phase Change Orders		Issue Design Phase Change Orders to A/E firms (if required)										
				Review and Approve A/E invoices	Review and Approve A/E invoices		Review and Approve A/E invoices			pay invoices		approve A/E invoices					

LEGEND	
	Indicates Initiator of Action
	Indicates Approval Action Required

LIST OF ACRONYMS	
AP	Acquisition Plan
BO	Beneficial Occupancy
CCB	change control board
A/E	Architectural Engineering Consultant
PIF	Project Information Form (NEPA)
PEP	Project Execution Plan
CDR	Conceptual Design Report
FPM	Fermilab Project Manager
D/S/C	divisions/sections/research centers
PO	Purchase Order
RFP	Request for Proposal
FERF	FESS Environmental Review Form
COO	Chief Operating Officer
SET	Source Evaluation Team

Date Printed: 2/22/2012

INTEGRATED PROJECT TEAM RESPONSIBILITY MATRIX

MC-1 Building

	PROJECT SPONSERS		INTEGRATED PROJECT TEAM					ORGANIZATIONAL PROCESS ASSETS									
	Directorate	Championing Organization	D/S/C	FESS/Engineering	FESS/Engineering	FESS/Engineering	Business Services Section	Directorate	Business Services Section	Business Services Section	Facilities Engineering Services Section	Facilities Engineering Services Section	Championing Organization	Championing Organization	Facilities Engineering Services Section	ES&H Section	Business Services Section
	Chief Operating Officer	*Division/Section/Center Head*	*Fermilab Project Director*	*Fermilab Project Manager*	*Fermilab Design Coordinator*	*Fermilab Construction Coordinator*	*Procurement*	*Finance Section Budget Office*	*Legal*	*Accounting*	*Section Head*	*FESS Engineering Department Head*	*Div. / Sec. Safety Officer*	*Div. / Sec. Budget Officer*	*Environmental*	*Safety and Health*	*Security*
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Change Control for Design	Secure Additional Funding	Secure Additional Funding	Initiate Changes to Design Performance Baseline	Establish CCB for Design Phase	Prepare Estimates of Cost and Schedule Impacts												
			Secure Additional Funding For Changes	Provide Cost and Schedule Impact of Proposed Changes to Fermilab Project Director													
Lab-wide Comment and Compliance Review			Review and Comment	Issues CCR, comment resolution	Coordinate CCR, comment resolution		Review and Comment		Review and Comment		Review and Comment	Review and Comment	Review and Comment	Review and Comment	Review and Comment	Review and Comment	Review and Comment
Monitoring and Controlling			Monitor Design Progress	Coordinate Engineering Resources, Selection, Tasking, Invoices													
				Monitor Design Progress													
			Monitor Project Costs	Monitor Project Costs													
				Review and Approve A/E Invoices	Review and Approve A/E Invoices		Review and Approve A/E Invoices			Pay A/E Invoices		Review and Approve A/E Invoices					
Value Management (tailored)			Participate in Value Management	Coordinate and Lead Value Management Exercises	Participate in Value Management	Participate in Value Management											
Develop Design Phase Cost and Schedule Estimate				Lead Development of Design Phase Cost and Schedule Estimate	Assist in Development of Design Phase Cost and Schedule Estimate												
Independent Cost Estimate			Concur with Need for Independent Cost Estimate	Determine need for Independent Cost Estimate	Provide Input for Need for Independent Cost Estimate												
				Prepare A/E RFP Memo	Review A/E RFP		Issue A/E RFP										
				Review A/E proposal	Review A/E proposal		Forward A/E to FPM		Assist with Contracting								
				Initiate requisition for A/E work			Establish tasking purchase order with A/E										
Design Phase Submittals				Prepare Signature Sheet for Release of Design Phase Documents													
			Approve Release of Design Phase Documents	Approve Release of Design Phase Documents	Approve Release of Design Phase Documents						Approve Release of Design Phase Documents	Approve Release of Design Phase Documents					
Request For Proposal			Review Request For Proposal Documents	Review Request For Proposal Documents			Develop Request For Proposal Documents										
Regulatory Permits									Provide Counsel as Requested				Identify Required Permits		Identify Required Permits		
				Provide Permit Information	Provide Permit Information						Approve Permit Submittal				Prepare Permit Application		
			Approval Permit Submittal	Approval Permit Submittal											Submit Application to ES&H Section		
				Monitor Permitting Process													
Update Project Plan			Identify Changes to Project Plan	Identify Changes to Project Plan	Identify Changes to Project Plan						Identify Changes to Project Plan	Identify Changes to Project Plan			Identify Changes to Project Plan		
				Update Project Plan													
			Approve Changes to Project Plan	Approve Changes to Project Plan													
Project Reporting				Monitor Design Progress and Costs				Initiate Request for Quarterly GPP Reports									
				Prepare Quarterly GPP Reports						Provide Timely Cost Data to FPM							
			Review Quarterly GPP Reports									Review Quarterly GPP Reports		Review Quarterly GPP Reports			
	Review Quarterly GPP Reports							Review Quarterly GPP Reports						Forward Quarterly GPP Reports to Finance Section			
								Submit Quarterly GPP Reports to DOE									
Directive Modifications		Review and Approve Directive Modification Request Form	Review and Approve Directive Modification Request Form	Prepare Directive Modification Request Form										Review and Approve Directive Modification Request Form			
														Submit Directive Modification Request Form to Finance Section			
								Review Directive Modification Request Form									
	Review and Approve Directive Modification Request Form																
								Forward Directive Modification Form to DOE									
Project Filing			Monitor Filing	Establish Project File Requirements	Maintain Project Files							Monitor Project Filing					
Procurement CD-3																	
Issue Request For Proposal				Initiate Construction Requisition													
	Approve Requsition	Approve Requsition	Approve Requsition								Approve Requsition	Approve Requsition		Approve Requsition			
							Issue Request For Proposal										
Pre-Proposal Meeting (if required)				Determine Necessity for Pre-Proposal Meeting													
							Coordinate and Chair Pre-Proposal Meeting										
			Participate in Pre-Proposal Meeting	Participate in Pre-Proposal Meeting	Participate in Pre-Proposal Meeting											Participate in Pre-Proposal Meeting	

LEGEND	
	Indicates Initiator of Action
	Indicates Approval Action Required

LIST OF ACRONYMS	
AP	Acquisition Plan
BO	Beneficial Occupancy
CCB	change control board
A/E	Architectural Engineering Consultant
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FERF	FESS Environmental Review Form
COO	Chief Operating Officer
SET	Source Evaluation Team

Date Printed: 2/22/2012

INTEGRATED PROJECT TEAM RESPONSIBILITY MATRIX

MC-1 Building

	PROJECT SPONSERS		INTEGRATED PROJECT TEAM					ORGANIZATIONAL PROCESS ASSETS									
	Directorate	Championing Organization	D/S/C	FESS/Engineering	FESS/Engineering	FESS/Engineering	Business Services Section	Directorate	Business Services Section	Business Services Section	Facilities Engineering Services Section	Facilities Engineering Services Section	Championing Organization	Championing Organization	Facilities Engineering Services Section	ES&H Section	Business Services Section
	Chief Operating Officer	*Division/Section/Center Head*	*Fermilab Project Director*	*Fermilab Project Manager*	*Fermilab Design Coordinator*	*Fermilab Construction Coordinator*	*Procurement*	*Finance Section Budget Office*	*Legal*	*Accounting*	*Section Head*	*FESS Engineering Department Head*	*Div. / Sec. Safety Officer*	*Div. / Sec. Budget Officer*	*Environmental*	*Safety and Health*	*Security*
WORK PHASE	**B. Chrisman**	**M. Lindgren, PPD**	**E. Gottschalk**	**R. Alber**	**J. Hunt**	**TBD**	**TBD**	**C. Trimby**	**Department**	**Department**	**R. Ortgiesen**	**R. Ortgiesen (Acting)**	**E. McHugh**	**E. Arroyo**	**R. Walton**	**J. Cassidy**	**B. Flaherty**
Requests For Information					Coordinates RFIs												
			Monitors RFI Process	Concurs with Replies for RFIs	Prepares Replies For RFIs							Monitors RFI Process					
Amendments				Concurs with Need for Amendment to RFP			Determines Need for Amendment to RFP										
			Monitors Amendment Process		Assemble Amendment Documentation							Monitors Amendment Process					
							Issues Amendment to RFP										
Proposal Evaluations				Chair Source Evaluation Team			Source Selection Officer									evaluate safety submittals	
			Participate in Source Evaluation Team	Evaluate Corporate Quality Control Plan	Participate in Source Evaluation Team		Participate in Source Evaluation Team		Provide Counsel as Requested			Monitor Source Evaulation Team Process					
				Evaluate Schedule Submittal			Review Proposals for Business Related Issues										
				Forward Recommendation to Source Selection Officer													
Negotiations				Assist in Negoiations			Conduct Negotiations		Provide Counsel as Requested								
Subcontract Award				Initate Recommendation To Award												Review and Accept Safety Documentation	
			Approve Award	Approve Award			Award Subcontract		Provide Counsel as Requested								
Update Project Plan For Construction Phase			Identify Changes to Project Plan	Identify Changes to Project Plan	Identify Changes to Project Plan						Identify Changes to Project Plan	Identify Changes to Project Plan			Identify Changes to Project Plan		
				Update Project Plan													
			Approve Changes to Project Plan	Approve Changes to Project Plan													
Project Filing			Monitor Filing	Establish Project File Requirements	Maintain Project Files							Monitor Project Filing					
Construction																	
Pre-Construction Meeting				Determine Necessity for Pre-Construction Meeting													
							Coordinate and Chair Pre-Construction Meeting										
			Participate in Pre-Construction Meeting	Participate in Pre-Construction Meeting	Participate in Pre-Construction Meeting	Participate in Pre-Construction Meeting							Participate in Pre-Construction Meeting			Participate in Pre-Construction Meeting	Participate in Pre-Construction Meeting
Subcontractor Corporate Safety Plan				Review Submittals		Review Submittals										Review/Approve Safety and Health Submittals	
				Accept Subcontractor Corporate Safety Plan													
Subcontractor Quality Control Plan				Review Subcontractor Plan	Review Subcontractor Plan	Review Subcontractor Plan											
				Accept Subcontractor Quality Control Plan													
Storm Water Erosion Control Plan				Review Plan	Review Plan	Review Plan									Review/Approve Environmental Submittals		
				Accept Storm Water Erosion Control Plan													
Hazard Analysis						Review and Accept Hazard Analysis						Monitor Process				Assist Review as Requested	
Fermilab Permits				Monitor Process	Monitor Process	Obtain and Maintain Currency						Monitor Process			Provide Oversite and Support of Process		
Notice To Proceed				Monitor Process		Assure Predessocors are in Place	Issue Notice To Proceed					Monitor Process					
Cost Loaded Schedule (CLS)				Review CLS	Review CLS	Review and Comment on CLS											
				Accept CLS													
Submittal List				Review Submittal List	Review Submittal List	Review Submittal List											
					Approve Submittal List												
A/E Support For Construction Phase				Determine need for in-house and A/E human resource requirements								Review workload assignments					
				Prepare A/E RFP Memo	Review A/E RFP		Issue A/E RFP										
				Review A/E proposal	Review A/E proposal		Forward A/E to FPM		Assist with Contracting								
				Initiate requisition for A/E work			Establish tasking purchase order with A/E										
Execute Construction Phase				Monitors Process		Fermilab Competent Person											
						First Line Contact with Subcontractor											
						Coordinate Fermilab Interfaces (services, outages, etc.)											
Inspections and Reports				Monitor QA program		QA Inspections for Technical and Safety Plan Compliance					Support as Requested	Support as Requested	Support as Requested			Support as Requested	
				Monitor Progress and Trends		Daily Construction Report to FPM					Monitor Progress and Trends	Monitor Progress and Trends					
Labor Reporting						Obtain Man-hour Reports from Subcontractor	Review Davis-Bacon Payroll Submittals										
Deficiency Log				Monitor Deficiency Log	Monitor Deficiency Log	Maintain Deficiency Log											
Submittals				Monitor Submittal Review Process	Coordinate Submittal Review	Participate in Submittal Review Process											
				Issue and Approve Actions													
					Maintain Submittal Log												

LEGEND	
	Indicates Initiator of Action
	Indicates Approval Action Required

LIST OF ACRONYMS	
AP	Acquisition Plan
BO	Beneficial Occupancy
CCB	change control board
A/E	Architectural Engineering Consultant
PIF	Project Information Form (NEPA)
PEP	Project Execution Plan
CDR	Conceptual Design Report
FPM	Fermilab Project Manager
D/S/C	divisions/sections/research centers
PO	Purchase Order
RFP	Request for Proposal
FERF	FESS Environmental Review Form
COO	Chief Operating Officer
SET	Source Evaluation Team

Date Printed: 2/22/2012

INTEGRATED PROJECT TEAM RESPONSIBILITY MATRIX

MC-1 Building

	PROJECT SPONSERS		INTEGRATED PROJECT TEAM					ORGANIZATIONAL PROCESS ASSETS									
	Directorate	Championing Organization	D/S/C	FESS/Engineering	FESS/Engineering	FESS/Engineering	Business Services Section	Directorate	Business Services Section	Business Services Section	Facilities Engineering Services Section	Facilities Engineering Services Section	Championing Organization	Championing Organization	Facilities Engineering Services Section	ES&H Section	Business Services Section
	Chief Operating Officer	*Division/Section/Center Head*	*Fermilab Project Director*	*Fermilab Project Manager*	*Fermilab Design Coordinator*	*Fermilab Construction Coordinator*	*Procurement*	*Finance Section Budget Office*	*Legal*	*Accounting*	*Section Head*	*FESS Engineering Department Head*	*Div. / Sec. Safety Officer*	*Div. / Sec. Budget Officer*	*Environmental*	*Safety and Health*	*Security*
WORK PHASE	**B. Chrisman**	**M. Lindgren, PPD**	**E. Gottschalk**	**R. Alber**	**J. Hunt**	**TBD**	**TBD**	**C. Trimby**	**Department**	**Department**	**R. Ortgiesen**	**R. Ortgiesen (Acting)**	**E. McHugh**	**E. Arroyo**	**R. Walton**	**J. Cassidy**	**B. Flaherty**
Engineering Changes				Initiate Engineering Change Request													
					Develop Documentation for Engineering Changes												
				Concur with Engineering Change Request	Issue Engineering Change Request												
							Issue Engineering Change Request to Subcontractor										
							Forward Engineering Change Request Information from Subcontractor to Project Team				review / approve						
				Review Subcontractor Engineering Change Request Submittal	Review Subcontractor Engineering Change Request Submittal	Review Subcontractor Engineering Change Request Submittal											
				Initiate Requisition													
	Approve Requsition	Approve Requsition	Approve Requsition								Approve Requsition	Approve Requsition		Approve Requsition			
							Issue Supplemental Agreement										
				Maintain Engineeeing Change Log													
Claim Review and Negotiations				Lead Review and Negotiations	Assist Review	Assist Review	Assist Review and Negotiation		provide counsel as requested		assist review						
				Approve Settlements			Determine Settlements										
Supplemental Agreements				Approve Supplemental Agreements			Issue Supplemental Agreements										
Non-compliance Notifications						Draft Non-compliance Notification	Provide Counsel as Requested		provide counsel as requested								
				Issue Non-compliance Notification			Concur with Non-compliance Notification										
				Monitor Non-compliance Notifications													
Construction Meeting				Participate in Meetings	Patricipate in Meetings	Chair Meeting	Patricipate in Meetings						Attend as Requested		Attend as Requested	Attend as Requested	
Weekly Project Team Meeting			Participate in Meetings	Participate in Meetings	Chair Meeting	Participate in Meetings	Participate in Meetings									Participate in Meetings	
Project Management Group Meeting	Participate in Meetings	Participate in Meetings	Participate in Meetings	Lead Presentation		Participate in Meetings	Participate in Meetings	Participate in Meetings								Participate in Meetings	
Project Reporting				Monitor Design Progress and Costs				Initiate Request for Quarterly GPP Reports									
				Prepare Quarterly GPP Reports						Provide Timely Cost Data to FPM							
			Review Quarterly GPP Reports									Review Quarterly GPP Reports		Review Quarterly GPP Reports			
	Review Quarterly GPP Reports							Review Quarterly GPP Reports						Forward Quarterly GPP Reports to Finance Section			
								Submit Quarterly GPP Reports to DOE									
Cost Tracking and Control				Monitor Construction Progress	Monitor Construction Progress	Monitor Construction Progress	Monitor Construction Progress			Provide Timely Cost Data to FPM		Track A/E invoices and FESS Engineering Costs					
				Monitor EDIA Costs													
				Monitor Project Costs													
Subcontractor Progress Updates				Review and Comment on Subcontractor Update Submittals	Review and Comment on Subcontractor Update Submittals	Conduct Progress Updates with Subcontractor	Review and Comment on Subcontractor Update Submittals										
Invoice Approvals				Review Invoices	Review Invoices	assure invoice checklist is complete											
				Approve Invoices	Approve A/E and Subcontractor Invoices	Approve Subcontractor Invoices	Approve Invoices										
Punch List				Determine Punchlist Start													
			Participate in Walkthroughs	Coordinate Customer Walkthroughs	Coordinate Engineering Portion of Walkthroughs	Coordinate Punch List Walkthroughs	Monitor Punch List Activity										
					Transmit Punch List to Subcontractor	Assemble Lab Punch IList											
						Monitor Completion of Punch List Items											
Beneficial Occupancy			Accept Customer D/S/C Responsibilities	Coordinate Customer D/S/C Responsibilities		Coordinate Walkthroughs											
			Approve Beneficial Occupancy	Approve Beneficial Occupancy	Transmit Beneficial Occupancy to Sucbontractor	Initiate Beneficial Occupancy Form	Approve Beneficial Occupancy				Approve Beneficial Occupancy	Approve Beneficial Occupancy					
Final Acceptance			Approve Final Acceptance	Approve Final Acceptance	Transmit Final Acceptance to Subcontractor	Initiate Final Acceptance Form	Approve Final Acceptance				Approve Final Acceptance	Approve Final Acceptance					
Update Project Plan			Identify Changes to Project Plan	Identify Changes to Project Plan	Identify Changes to Project Plan						Identify Changes to Project Plan	Identify Changes to Project Plan			Identify Changes to Project Plan		
				Update Project Plan													
			Approve Changes to Project Plan	Approve Changes to Project Plan													
Incident Investigations						Initiate Call Tree					Assist as Required	Assist as Required	Assist as Required	Assist as Required	Assist as Required	Assist as Required	Assist as Required
						Obtain Incident Report from Subcontractor										monitor process	monitor process
			Monitor Incident Repsone	Issue Incident Report, Monitor Response		Prepare Incident Report for FPM					Monitor Incident Repsone	Monitor Incident Repsonse	Monitor Incident Repsonse	Monitor Incident Repsonse	Monitor Incident Repsonse	Monitor Incident Repsonse	Monitor Incident Repsone
Lessons Learned				Assist as Required	Assist as Required	Assist as Required						Develop Lessons Learned					

LEGEND	
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	Indicates Approval Action Required

LIST OF ACRONYMS	
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Date Printed: 2/22/2012

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MC-1 Building

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	Chief Operating Officer	*Division/Section/Center Head*	*Fermilab Project Director*	*Fermilab Project Manager*	*Fermilab Design Coordinator*	*Fermilab Construction Coordinator*	*Procurement*	*Finance Section Budget Office*	*Legal*	*Accounting*	*Section Head*	*FESS Engineering Department Head*	*Div. / Sec. Safety Officer*	*Div. / Sec. Budget Officer*	*Environmental*	*Safety and Health*	*Security*
WORK PHASE	**B. Chrisman**	**M. Lindgren, PPD**	**E. Gottschalk**	**R. Alber**	**J. Hunt**	**TBD**	**TBD**	**C. Trimby**	**Department**	**Department**	**R. Ortgiesen**	**R. Ortgiesen (Acting)**	**E. McHugh**	**E. Arroyo**	**R. Walton**	**J. Cassidy**	**B. Flaherty**
Environment, Safety and Heath Compliance	Monitor Compliance	Monitor Compliance	Monitor Compliance	Monitor Compliance		Monitor Compliance	Monitor Compliance				Monitor Compliance	Monitor Compliance	assist on technical issues		Monitor Compliance	Monitor Compliance	
				Interface with Subcontractor	Assist as Requested	Assure Subcontractor Compliance										Assist as Requested	
As-Built Documentation					Assist as Requested	Assure As-builts Kept Current and Accurate											
Directive Modifications		Review and Approve Directive Modification Request Form	Review and Approve Directive Modification Request Form	Prepare Directive Modification Request Form										Review and Approve Directive Modification Request Form			
														Submit Directive Modification Request Form to Finance Section			
								Review Directive Modification Request Form									
	Review and Approve Directive Modification Request Form																
								Forward Directive Modification Form to DOE									
Project Filing			Monitor Filing	Establish Project File Requirements	Maintain Project Files							Monitor Project Filing					
Close-out CD-4																	
Subcontractor Performance Review			Participate in Review	Participate in Review		Participate in Review	Coordinate and Lead Review									Participate in Review	
Final Payment and Renetention Release						Assure Invoice Checklist is Complete											
				Review and Approve Subcontractor Invoices	Review and Approve Subcontractor Invoices	Review and Approve Subcontractor Invoices	Review and Approve Subcontractor Invoices										
				Assist as Required	Assist as Required	Assist as Required	Move Outstanding Issues to Warranty										
Level1 Budget Close	Approve Budget Close	Approve Budget Close		Determine Close Date				Activate Level 1 Budget Close		Assure All Commitments in Place				Request Budget Close			
Notice of Project Closeout	Approve Closeout	Approve Closeout												Submit Project Closeout Request			
Final Budget Close								Activate Final Budget Close						Initiate Final Close			
Directive Modifications		Review and Approve Directive Modification Request Form	Review and Approve Directive Modification Request Form	Prepare Directive Modification Request Form										Review and Approve Directive Modification Request Form			
														Submit Directive Modification Request Form to Finance Section			
								Review Directive Modification Request Form									
	Review and Approve Directive Modification Request Form																
								Forward Directive Modification Form to DOE									
Project Filing			Monitor Filing	Establish Project File Requirements	Maintain Project Files							Monitor Project Filing					

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DRAFT

FIRE PROTECTION/LIFE SAFETY ANALYSIS FOR THE FERMILAB MC-1 BUILDING

Prepared for

FERMI NATIONAL ACCELERATOR LABORATORY

P.O. Box 500
Batavia, IL 60510

Aon FPE Project No. 1808186-002

Prepared by

AON FIRE PROTECTION ENGINEERING

February 7, 2012

Aon Fire Protection Engineering Corporation
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I. Introduction

This report outlines fire protection and life safety recommendations for the new Fermilab MC- 1 Building. The building will be constructed on the Fermilab site, on Kautz Road approximately 100 feet southeast of the AP0 target building.

The project includes constructing a new experiment hall with a loading dock, control/ counting room, server room, power supply room, cryogenic room, and a mezzanine for a conference room and mechanical room. The experiment hall will be approximately 80 feet by 80 feet in area and will house the *g* – 2 storage ring. The new facility will have a gross floor area of approximately 12,720 square feet. The facility will be connected to the existing AP1 tunnel by a 50 foot long tunnel. The floor of the experiment hall will be 10'-6" below grade. The remainder of the facility will be constructed at grade.

The fire protection and life safety recommendations contained in this report are based on our review and analysis of the following documents:

- Conceptual design drawings for the MC-1 Building dated January 2012
- 2012 *International Building Code* (IBC)
- 2012 *International Fire Code* (IFC)
- NFPA 101 – 2012 Edition, the *Life Safety Code* (LSC)

The recommendations made as a result of this analysis are listed in Section X of this Report.

II. Occupancy Classification

The MC-1 Building will primarily be used to house a superconducting magnet with ancillary support spaces. The *2012 International Building Code* (IBC) would classify the building as a Use Group F-2 (Low Hazard Factory Industrial) occupancy. NFPA 101 – 2012 Edition, the *Life Safety Code* (LSC), would classify the building as an Industrial Occupancy.

III. Building Height and Area

Preliminary design drawings indicate that the building will be one-story (41'-6") in height and have an area of 12,720 sq. ft.

IV. Building Construction

The building construction type is not indicated on the design drawings. Based on the proposed height and area, the building may be constructed of Type IIB construction in accordance with IBC Table 601.

V. Means of Egress

A. Exits

Buildings are required to have a minimum of two exits per IBC Section 1021.2. The conceptual design drawings show three exits from the building.

The calculated occupant load for the building is approximately 138 persons. The total exit capacity provided by the three building exits is approximately 680 persons. Sufficient exit capacity will be provided.

B. Mezzanine

As currently designed, the "mezzanine" exceeds 50% of the area of the room that it is located in, and therefore, constitutes a "story". Per IBC Section 505.2.1, Exception No. 2, the aggregate area of a mezzanine in a building of Type I or II construction protected by an automatic fire sprinkler system cannot exceed ½ of the floor area of the room it is located within. Unless the mezzanine is redesigned to comply with IBC Section 505, an additional exit is required from the mezzanine because the occupant load (33 persons) and travel distance (145 feet) exceed that permitted by IBC Table 1021.2(2) for stories having only one exit.

C. Travel Distance

The maximum travel distance to an exit is approximately 170 feet (Experiment Hall), which is within the limitation of 300 feet imposed by the IBC for an F-2 occupancy.

D. Common Path of Travel

As currently designed, the common path of travel is approximately 90 feet (Mechanical Mezzanine), which is within the limitation of 100 feet imposed by the IBC for an F-2 occupancy protected by a fire sprinkler system.

VI. Mezzanine

The "mezzanine" has a floor area of 1,300 square feet. The room that the mezzanine is located in has floor area of approximately 750 square feet. As currently designed, the mezzanine does not comply with IBC Section 505 in the following aspects:

1. The floor area of the mezzanine exceeds ½ the floor area of the room the mezzanine is located in (IBC Section 505.2.1, Exception No. 2).
2. The mezzanine is not open as required by IBC Section 505.2.3.

The "mezzanine" can remain as currently shown if treated as "story", which would require an additional enclosed exit from the "mezzanine" that discharges directly to the outside.

VII. Smoke Control

A smoke control system is not required for this facility.

VIII. Fire Protection Systems

A. Automatic Fire Sprinkler System

An automatic fire sprinkler system is required for the facility by IBC Section 1014.3 because the common path of travel from the Mezzanine exceeds 75 feet.

B. Fire Standpipe System

A standpipe system is not required for this facility.

C. Fire Alarm System

A fire alarm system is required for this facility by LSC Section 40.3.4.1.

IX. Emergency Power System

Means of egress illumination and exit signs are required to be connected to an emergency power source to provide power for duration of at least 90 minutes (IBC Sections 1006.3 & 1011.6.3).

X. Recommendations

Based on our review of the project documents and the applicable codes, Aon Fire Protection Engineering has the following recommendations. It should be understood that these recommendations are based on a preliminary design and are subject to change as the design progresses.

1. Provide an automatic fire sprinkler system designed to protect an Ordinary Hazard Group 1 occupancy.

2. Provide an addressable fire detection/alarm system for the facility, to include the following:

    - Manual fire alarm stations at all building exits
    - Area smoke detectors for the Power Supply Room and Server Room
    - Air sampling smoke detection system for the Experiment Hall
    - Duct smoke detectors on the supply sides of all air handling units having a design capacity greater than 2,000 cfm
    - Addressable input modules for monitoring sprinkler system waterflow detectors and valve supervisory switches
    - Combination fire alarm audible/visual devices located throughout the building in accordance with NFPA 72
    - Addressable fire alarm control panel.

3. Provide portable fire extinguishers for the facility in accordance with IBC and LSC requirements.

4. All new interior wall and ceiling finishes should have a Class A rating (Flame spread 0-25, Smoke development 0-450).

5. Provide exit signage in accordance with IBC and LSC requirements.

6. Provide emergency egress lighting throughout the facility in accordance with IBC and LSC requirements.

7. Either design the mezzanine to comply with IBC Section 505, or provide an additional enclosed exit from this space that discharges directly to the outside.

8. Reverse the door swings shown from the Experiment Hall to swing in the direction of exit travel.

Prepared By:

Rick Glenn, P.E.
Project Manager

Fermilab

Fermilab Environmental Review Form Ver. 09/20/2006

The purpose of providing this information is to establish the appropriate level of environmental review for the project/activity. The information below includes both construction and operation phases of the project/activity if applicable. Please consider any known regulatory permits that may be required for each phase.

Project Information

Date:2/22/12

Project/Activity Title:MC-1 Building

Project Number/Identifier:6-10-20

Point of Contact:15287N - JONATHAN HUNT

Project Manager:12699N - RUSSELL ALBER

Project Description
(Please describe the general scope of the project including a project location. Please attach a site map if necessary.)

This project will construct a 13,500 SF building. Utilities will be tapped from nearby feeders. The total project area will be roughly 0.5 acres.

Project Schedule

Please estimate the project schedule

Estimated Project Start:03-01-2013

Estimated Project Duration:20 months,0 days

Potential Environmental Effects

Air Emissions

(Systems containing any refrigerants, regardless of volume, portable or permanent electrical generators, boilers or other sources of gaseous emissions, such as any internal combustion engines)

Construction and demolition waste

(Indicate whether C and D waste will be disposed of in a landfill or recycled, either by Fermilab or a commercial recycling vendor)

ALL C&D WASTE WILL BE DISPOSED OF BY FERMILAB. ALL APPROPRIATE MATERIAL WILL BE SENT TO A RECYCLING VENDOR FOR SORTING AND RECYCLING.

Excavation

(Estimate the area to be affected, volume of spoils, expected, disposition of spoils, and soil erosion control measures.)

EXCAVATION FOR THE BUILDING WILL CREATE TEMPORARY SPOILS TO BE STORED ADJACENT TO THE PROJECT SITE. SPOILS NOT USED AS BACKFILL WILL BE DISPOSED OF ON THE FERMILAB SITE. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED.

Asbestos

(Indicate how any asbestos will be remediated)

PCBs

(processing, transport, disposal, or removal)

Chemical use or storage

(Has the affected area ever been used as a chemical dispensing area, waste or product storage area, or been the site of any chemical spills? Does the area involve a solid waste management Unit?)

Exposure of workers, employees, or members of the public to radiation.

Liquid effluent

(including sanitary sewer, soil, or surface water)

Hazardous or other regulated waste

Demolition of any part of a building/structure that is, or qualifies to be, in the List of Facilites Containing Radioactive Materials?

(Note: If so, certification that thee facility has been surveyed and found to be uncontaminated must be received from the Fermilab Senior Radiation Safety Officer before any Notice to Proceed(NTP) on the project may be issued.)

Activation of soil or groundwater

Other

THIS PROJECT WILL INSTALL TWO NEW 1,500 KVA TRANSFORMERS.

New or modified environmental permits issued by external regulatory authorities

(Note: If new or modified permits are required, a PIF must be prepared, and a NEPA determination made by DOE-FSO)

Disposition by Fermilab Environmental Reviewer

Generic CX: NO CX Number: N/A Date of Determination: N/A

PIF Required: YES

Comments:This project is expected to be subsumed into the "Muon Campus" project review. The larger project is expected to fall within the same categorical exclusion as MC-1.

Fermilab Environmental Reviewer:09588N - ROD WALTON

Fermilab

From: Rod Walton, FESS

To: MC-1 Building Project File 6-10-20

Subject: MC-1 Building Strategy for Sustainability

Date: February 23, 2012

The purpose of this analysis is to determine whether the mandate to design buildings according to LEED Gold standards is practical for the MC-1 Building project. If LEED is impractical and/or not life cycle cost effective, the Guiding Principles for High Performance Sustainable Buildings (GP) will be pursued to the maximum extent practicable and consistent with project mission and life cycle cost analyses.

Minimum Program Requirements for LEED

The LEED 2009 Minimum Program Requirements (MPRs) are the minimum standards for projects to qualify for LEED certification. The MPRs are published as part of the LEED 2009 manual and supplemented by guidance in a separate publication. It should be noted that the LEED Supplemental Guidance discourages projects that have characteristics that are atypical and that may make achievement of the certification difficult.

Seven MPRs must be met prior to further consideration as a LEED certified building. The project must:

1. comply with all environmental regulations,
2. be a complete, permanent building,
3. use a reasonable site boundary,
4. exceed 1000 s.f. in gross floor area,
5. be designed to serve at least one FTE,
6. commit to sharing whole building energy and water data for at least five years, and,
7. have a gross floor area of at least 2% of the gross land area within the site boundary.

MPR #5 requires that the building serve at least one full time equivalent (FTE) under normal building operations. The calculation of an FTE is based on 40 hours per week for 48 work weeks and works out to 240 8-hour days. Failure to meet this requirement does not disqualify the project, but it would not be eligible for any of the Indoor Environmental Quality optional credits (although the prerequisites would still have to be met).

DOE guidance related to buildings requires that not only LEED be met for new construction, but that the Guiding Principles also be completely satisfied. Because there are 9 optional LEED credits in the Indoor Environmental Quality category that are considered mandatory to meet the Guiding Principles, this could be fatal for a project that is designed to be unoccupied. In order to meet the

Guiding Principles, the project would have to implement strategies to satisfy the guiding principles that would not result in LEED credits.

LEED Checklist Completion

If the MPRs could be met, and if the project decided to pursue LEED certification, each of the LEED credits would have to be evaluated. According to the DOE standards, new buildings would simultaneously have to meet the Guiding Principles, by acquiring "mandatory" LEED credits. A preliminary analysis by Fermilab concluded that only 11 points were "probably" attainable in the project (see worksheet). Adding credits that are considered to be "possibly" attainable raises the total to 13. In order to achieve LEED Gold, at least 60 points are necessary.

Conventional wisdom dictates that more than the minimum LEED points should be developed in order to achieve the minimum needed for a given level of LEED certification. This is because the LEED validation process conducted by the U.S. Green Building Council (USGBC) is very stringent and proposed credits are often disqualified during the scoring process. Our conclusion is that if the above problems with the MPRs could be overcome and LEED certification were to be pursued, it is unlikely to succeed without substantial expense beyond what would be necessary to fulfill the science mission of the project. It should be noted that if the designed occupancy of the project were less than one FTE, then the Indoor Environmental Quality points (15 possible) would be disqualified.

Another possibility would be to attempt LEED certification at a lower level than "Gold". To obtain the lowest certification, 40 credits would be necessary. Even this lowered level becomes difficult to achieve if the project expects that less than one FTE would ultimately occupy the space. Under the best scenario, only 11 credits would be candidates for approval. If the project were designed to include occupancy by one FTE, then it is possible that the basic LEED certification could be achieved, but at additional expense.

Additional Guidance from USGBC

In addition to the MPRs, included in the Supplemental Guidance document, USGBC addresses "unusual buildings" in the following way:

> "Some buildings have characteristics that are not specifically prohibited by the MPRs, but nonetheless make them unsuitable for evaluation under the LEED rating systems. If a project team recognizes that their building has such a characteristic, *they are encouraged to implement green building strategies but refrain from attempting LEED certification*. " [emphasis added]

Meeting the Guiding Principles for New Construction

If it is concluded that LEED-Gold certification is not feasible and cost-effective, the Guiding Principles would become the sustainability standard for the project to meet. A preliminary assessment of the proposed building results in completion, or very likely completion, of 100% of the individual elements within the five guiding principles (see worksheet).

Recommendation: MC-1 Building Strategy for Sustainability

We conclude from the above that attempting to certify the project under LEED would be unnecessarily complex, given the nature of the project. If undertaken, it would likely inflate the cost substantially for a building that is not currently envisioned to house any full time occupants. On the other hand, completing the guiding principles for the building would seem to be a more realistic application of sustainability goals. Completion of the guiding principles for the MC-1 Building would represent Fermilab's commitment to implement measures to advance sustainability in general, and the spirit of E.O. 13514 specifically.

The MC-1 Building project recommends that this course of action be followed, including finding the means to design and execute the project in such a way as to accomplish as many of the guiding principle elements as reasonably attainable. The LEED 2009 checklist would provide a supplemental guide for potentially important sustainability measures without formally registering the project with the USGBC or attempting certification.

U.S. DEPARTMENT OF ENERGY

HIGH PERFORMANCE and SUSTAINABLE BUILDINGS
Assessment and Compliance Tool for New Construction

Sandia's MESA Microsystems Fabrication

NREL's Science & Technology Facility

Introduction

The Department of Energy's Transformational Energy Action Management (TEAM) Initiative was launched in August of 2007. The TEAM Initiative laid out a plan for the Department of Energy (DOE) to meet or exceed the goals outlined in Executive Order (EO) 13423, "Strengthening Environmental, Energy, and Transportation Management." DOE Order 436.1, Departmental Sustainability, is transforming the way DOE manages its energy, water and petroleum use, while moving to a more healthy and sustainable workplace.

High performance and sustainable buildings represent one of the key areas in EO 13423 and the TEAM Initiative. EO 13423 and its Implementation Instructions require DOE to: (1) ensure that new construction and major renovation of agency buildings comply with the Guiding Principles set forth in the Memorandum of Understanding (MOU) on Federal Leadership in High Performance and Sustainable Buildings (HPSB), (2) ensure that 15 percent of the agency's existing building inventory, including leased space, as of the end of fiscal year 2015 incorporate the Guiding Principles, and (3) beginning with the FY 2009 funding cycle, address each of the five Guiding Principles when planning the funding for design and construction of buildings that meet the agency-defined capital asset threshold. These requirements are also embodied in DOE Order 436.1 Departmental Sustainability.

The MOU establishes a common set of Guiding Principles to:

1) Employ integrated design principles
2) Optimize energy performance
3) Protect and conserve water
4) Enhance indoor air quality
5) Reduce environmental impacts of materials

In addition, pursuant to DOE Order 436.1 all new buildings and major building renovations at Critical Decision One (CD-1) or lower with a value exceeding $5 million, must implement the Guiding Principles of the Executive Order and attain U.S. Green Building Council (USGBC) LEED® Gold certification. All new buildings and major building renovations with a value below $5 million, must implement the Guiding Principles.

The HPSB Assessment and Compliance Tool for New Construction is a resource for implementing and documenting compliance with the Guiding Principles and LEED® Gold Certification for new construction. Portions of the tool are adapted from the US Green Building Council's LEED® rating system. Instructions for using this Tool are located on a subsequent tab. For existing buildings refer to the HPSB Assessment and Compliance Tool for Existing Buildings.

Key to Tabs

1. Cover
2. Introduction
3. Key to Tabs
4. Instructions for New Construction
5. Building Information
6. Compliance Summary Checklist NC
7. Integrated Design
8. Commissioning
9. Energy Efficiency
10. On-Site Renewable Energy
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28. LEED® Checklist for New Construction
29. Frequently Asked Questions
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Instructions

Pursuant to EO 13423 new buildings will incorporate the Guiding Principles to the extent practical and that are lifecycle cost effective. Pursuant to DOE Order 436.1 all new buildings and major building renovations at Critical Decision One (CD-1) or lower with a value exceeding $5 million, must implement the Guiding Principles of the Executive Order and attain U.S. Green Building Council (USGBC) LEED® Gold certification. All new buildings and major building renovations with a value below $5 million, must implement the Guiding Principles.

To help you comply with EO 13423 and DOE Order 436.1 for new construction, reference the Compliance Summary Checklist for New Construction (Summary Checklist NC) and the various Assessment Compliance Forms for each Guiding Principle requirement. The checkboxes on the Summary Checklist NC and the Assessment Compliance Forms work interdependently. Marking a checkbox on the Summary Checklist NC will populate the checkbox on the relevant Assessment Compliance Form and vise versa. In addition, marking the checkboxes on the Summary Checklist NC will populate a total percentage of Guiding Principles achieved.

In this way, the Summary Checklist NC serves as a quick list to demonstrate compliance with the Guiding Principles while the Assessment Compliance Forms provide a detailed description of the intent of each Guiding Principle and more details on how to comply. The Summary Checklist NC also lists the necessary supporting documents and gives an opportunity to provide notes. In the event that a Guiding Principle cannot be met the Summary Checklist NC can also be used to explain the reason why.

The LEED Checklist for New Construction (LEED Checklist NC) can also be used to comply with DOE Order 436.1. It is designed as a tool to match Guiding Principles with corresponding LEED points (credits) and can be used throughout the planning and construction process. Like the Summary Checklist NC, it can also be used as a final checklist to ensure that all of the Guiding Principles have been met. Marking the checkbox on the right hand side will populate a total percentage of Guiding Principles achieved. LEED certification credits related to required Guiding Principles are highlighted in yellow and marked with the corresponding LEED point. To determine potential LEED points mark the Yes column on the left hand side with points that can be achieved, mark the Maybe column with points that are potentially achievable and mark the No column with points that are not applicable or that cannot be achieved. There are no LEED points given to Prerequisites and they are coded with two options: "Y" for achievable or "N" for not achievable or not applicable.

Additional documentation and a separate process are required to apply for official LEED® Gold certification. It is the responsibility of each Program Secretarial Office to register their building with USGBC. The USGBC LEED Certification Report serves to document both LEED® Gold status and compliance with the Guiding Principles. See FAQ for more information on registering with USGBC for LEED certification.

In addition, the Project Assessment and Reporting System (PARS) has recently been modified in order to begin collecting information on LEED certification data for new buildings. This change aligns PARS data to the Secretary's February 29, 2008 memorandum and the update to DOE Order 436.1, directing that all new buildings with a value exceeding $5M at CD-1 or lower beginning in FY 2009 must be designed and constructed to achieve LEED Gold certification.

To collect this information, DOE has added three new data fields in PARS: LEED Certification Goal being pursued at CD-2, actual LEED Certification attained at CD-4, and LEED Certification Narrative. These new fields will be required and can be found under the Project ID Table. A description of these fields can be found in the news article under News on your PARS homepage as well as in the Data Dictionary under the PARS Help tab.

High Performance and Sustainable Buildings Guiding Principles
Building Information and Project Team Page

Building Information	**Federal Real Property Building ID**	
	Building Name	MC-1 Building
	Agency/Site	DOE/Fermilab
	PSO	
	Department	
	Address	P.O. Box 500
	City	Batavia
	State	IL
	Zip Code	60510

*Information entered above will auto-populate the appropriate fields on subsequent tabs

		Name	**Phone**	**Email**
Project Team	**Main Contact:**	Russ Alber		
	Project Team Members:			

Project Lead Signature:		**Date:**	

High Performance Sustainable Buildings
Compliance Summary Checklist for New Construction

MC-1 Building

Federal Real Property ID:

* For a detailed explanation of each Guiding Principle and required actions please refer to the corresponding Compliance Tab.

This field will populate as the Guiding Principles are marked complete and documented. ---------->

% Guiding Principles Complete

100.0%

Guiding Principle	Action Required	Yes/No	Suggested Compliance Verification Documents	On File?	Notes
1. Employ Integrated Design Principles					
Integrated design	Use a collaborative, integrated planning and design process that:				
	Initiates and maintains an integrated project team as described on the Whole Building Design Guide in all stages of a project's planning and delivery, http://www.wbdg.org/design/engage_process.php		Complete the Building Information Tab or equivalent document, e.g., a team roster. Follow the DOE. O. 436.1	☑	
	Integrates the use of OMB's A-11, Section 7, Exhibit 300: Capital Asset Plan and Business Case Summary		Provide documentation and use this checklist or equivalent (USGBC LEED) to demonstrate incorporation. The establishment of 436.1 and meet the goal setting requirement.	☑	436.1 and 450.1 are no longer in force, but the goals are still established in the SSPP
	Establishes performance goals for siting, energy, water, materials and indoor environmental quality along with other comprehensive design goals and ensures incorporation of these goals throughout the design and lifecycle of the building		The establishment of 436.1 meet the goal setting requirement. Use this checklist or equivalent (USGBC LEED) to demonstrate incorporation.	☑	We will need to establish goals in combination with the commissioning
	Considers all stages of the building's lifecycle, including deconstruction.		The establishment of 436.1 meet the goal setting requirement. Use this checklist or equivalent (USGBC LEED) to demonstrate incorporation.	☑	We will need to establish goals in combination with the commissioning
Commissioning	Employ commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include an experienced commissioning provider, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.		Provide a commissioning plan. In-house experienced personnel or team acceptable. (may provide compliance for GP IV. Enhance Indoor Environmental Quality: Moisture Control.)	☑	
2. Optimize Energy Performance					
Energy Efficiency	Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the ENERGY STAR® targets for new construction and major renovation where applicable. For new construction, reduce the energy use by 30 percent compared to the baseline building performance rating per the American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE)/Illuminating Engineering Society of North America (IESNA) Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy use by 20 percent below pre-renovations 2003 baseline. Laboratory spaces may use the Labs21 Laboratory Modeling Guidelines.		Have a licensed engineer or architect provide documents that identify that the energy use targets were achieved or provide USGBC LEED submittal documentation also stating that the goals were achieved.	☑	We will probably want to establish the 30% better than ASHRAE goal.
	Use ENERGY STAR® and FEMP-designated Energy Efficient Products, where available?		Provide standard purchasing policy/policies, constructions specifications, or retain proof of purchase.	☑	Covered by FL-1, etc.

Guiding Principle	Action Required	Yes/No	Suggested Compliance Verification Documents	On File?	Notes
On-Site Renewable Energy	Per the Energy Independence and Security Act (EISA) Section 523, meet at least 30% of the hot water demand through the installation of solar hot water heaters, when lifecycle cost effective.		Implement on-site solar hot water heating and retain design specs, statement of work, or photos, etc. If not lifecycle cost effective provide justification.	☑	Not LCC Effective
	Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when lifecycle cost effective.		Any of the following or equivalent: design specs, statement of work, photos, etc. If not lifecycle cost effective provide justification.	☑	We already fulfill this with several small projects.
Measurement and Verification	Per the Energy Policy Act of 2005 (EPAct) Section 103, install building level electricity meters in new major construction and renovation projects to track and continuously optimize performance.		Retain statement of work, billing records, photos, etc and/or provide ENERGY STAR® label certification if applicable.	☑	This is really our new standard.
	Per EISA Section 434, include equivalent meters for natural gas and steam, where natural gas and steam are used.		Retain statement of work, billing records, photos, etc and/or provide ENERGY STAR® label certification if applicable	☑	NG meters if there is any NG in the building. Otherwise, NA = Yes
Benchmarking	Compare actual performance data from the first year of operation with the energy design target, preferably by using ENERGY STAR® Portfolio Manager for building and space types covered by ENERGY STAR®. Verify that the building performance meets or exceeds the design target, or that actual energy use is within 10% of the design energy budget for all other building types. For other building and space types, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.		Use ENERGY STAR's Portfolio Manager or Labs 21 database to enter annual performance data and print out the Statement of Energy Performance on an annual basis to track performance over time.	☑	Standard operating procedure will be to record energy and water usage in Energy Star PM.
3. Protect and Conserve Water					
Indoor Water	Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the EPAct 1992, Uniform Plumbing Codes 2006, and the International Plumbing Codes 2006 fixture performance requirements.		Use Watergy, the LEED® water calculator, or equivalent modeling to establish baseline usage and calculated savings or provide documentation based on metering/bills.	☑	Depending on whether there are any faucets, we would just install Watergy rated fixtures. If no fixtures, just NA
	The installation of water meters is encouraged to allow for the management of water use during occupancy.		Install water meter(s) and provide documentation.	☑	We install meters for DWS if appplicable
	The use of harvested rainwater, treated wastewater, and air conditioner condensate should also be considered and used where feasible for nonpotable use and potable use where allowed.		Document use of harvested rainwater, treated wastewater, and air conditioner condensate as applicable.	☑	We "consider" and probably reject.
Outdoor Water	Use water efficient landscape and irrigation strategies, such as water reuse, recycling, and the use of harvested rainwater, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities).		Retain documentation from design tools, such as the LEED® water calculator or other water tools to provide a statement on how water usage was reduced and calculated, or document minimal use of irrigation water due to nominal or no landscape. Choose irrigation contractors who are certified through a WaterSense labeled program and document outdoor potable water consumption reduction. (May provide compliance for GP III. Protect and Conserve Water: Water-Efficient Products)	☑	Our policy is to use no DWS for landscaping.
	The installation of water meters for locations with significant outdoor water use is encouraged.		Document Installation and use of outdoor water meters.	☑	NA = Yes
	Employ design and construction strategies that reduce storm water runoff and discharges of polluted water offsite. Per EISA Section 438, to the maximum extent technically feasible, maintain or restore the predevelopment hydrology of the site with regard to temperature, rate, volume, and duration of flow using site planning, design, construction, and maintenance strategies.		Provide documents that demonstrate strategy implemented to reduce storm water runoff and maintain or restore predevelopment hydrology of the site.	☑	Latest draft guidance makes clear that the entire site can be considered when assessing sorm water strategy. We take credit for retaining almost all water on site.

Guiding Principle	Action Required	Yes/No	Suggested Compliance Verification Documents	On File?	Notes
Process Water	Per the Energy Policy Act of 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.		Document water conservation strategy in process systems. Documentation may be provided by licensed engineer, water utility or through an energy service provider. Guiding principle is met if no potable water is used.	☑	NA unless we are planning on cooling towers.
Water Efficient Products	Specify EPA's WaterSense-labeled products or other water conserving products, where available.		Any of the following or equivalent: purchasing or design specifications, statement of work, receipts, etc.	☑	Again, depends on whether there are restrooms, etc. If so, easy to comply.
	Choose irrigation contractors who are certified through a WaterSense labeled program.			☑	NA = Yes
4. Enhance Indoor Environmental Quality					
Ventilation and Thermal Comfort	Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone AND		Document compliance with ASHRAE Standards by licensed architect or engineer or achieve an ENERGY STAR Label Certification	☑	NA if there are no occupants
	ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.			☑	NA if there are no occupants
Moisture Control	Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture.		Document inspection-driven moisture prevention strategy that is part of building commissioning plan that specifies maintenance of the roof drainage and the foundation system, or document that your building does not have a moisture problem.	☑	Part of commissioning report.
Daylighting	Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks.		Document through computer simulation or by light measurement.	☑	NA if there are no occupants
	Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.		Document that individual lighting control is available for the occupants by schematic of floor layout, showing locations of manual lighting controls (such as task lighting) or statement based upon visual audit.	☑	NA if there are no occupants
Low-Emitting Materials	Specify materials and products with low pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings.		Establish contract(s), design specifications, purchasing specifications or solicitations with specific language for the purchase of low emitting materials, durable goods, consumables and for green cleaning.	☑	Item for specs
Protect Indoor Air Quality during Construction	Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2007. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.		Before major renovations, develop and implement an indoor air quality management plan, specification or guidelines. May use USGBC LEED reference documentation.	☑	Item for specs
Tobacco Smoke Control	Implement a policy indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy. Post signage indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy.		Establish environmental tobacco smoke control policy or equivalent. Policy may be for entire site, PSO or for Agency.	☑	Director's policy #25

Guiding Principle	Action Required	Yes/No	Suggested Compliance Verification Documents	On File?	Notes
5. Reduce Environmental Impact of Materials					
Recycled Content	Per Section 6002 of the Resource Conservation and Recovery Act (RCRA), for EPA-designated products, specify products meeting or exceeding EPA's recycled content recommendations. For other products, specify materials with recycled content when practicable. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.		Incorporate the FAR requirements for the purchase of EPA-designated products into contracts, bid solicitations and purchasing specifications and use products meeting or exceeding EPA's recycled content recommendations. Provide construction, purchasing or bid specifications, and/or affirmative procurement report.	☑	Item for specs
Biobased Content	Per Section 6002 of the Resource Conservation and Recovery Act (RCRA), for EPA-designated products, specify products meeting or exceeding EPA's recycled content recommendations. For other products, specify materials with recycled content when practicable. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.		Incorporate the FAR requirements for the purchase of USDA-designated products into contracts and use products meeting or exceeding USDA's biobased content recommendations. In addition, use biobased products made from rapidly renewable resources and certified sustainable wood products. Provide construction, purchasing or bid specifications, and/or affirmative procurement report.	☑	Item for specs
Environmentally Preferable Products	Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.		Establish purchasing contracts, bids construction documents with specification language for the purchase of environmentally preferable materials, durable goods, cleaning supplies, and consumables. Ensure that language is explicit and clear regarding such considerations as VOC limits and Green Seal requirements.	☑	Item for specs
Waste and Materials Management	Incorporate adequate space, equipment, and transport accommodations for recycling in the building design. During a project's planning stage, identify local recycling and salvage operations that could process site-related construction and demolition materials. During construction, recycle or salvage at least 50 percent of the non-hazardous construction, demolition and land clearing materials, excluding soil, where markets or onsite recycling opportunities exist. Provide salvage, reuse and recycling services for waste generated from major renovations, where markets or onsite recycling opportunities exist.		Documentation may be in the form of receipts, agreements or contracts with local recycling and product reclaiming services. Documentation may include contract specifications with vendors, for example, outlining carpet recycling programs through the manufacturer/distributer or may include photos, or polices that illustrate recycling initiatives for batteries, computers, and beverage containers. Building or site recycling program documentation except able.	☑	Item for specs
Ozone Depleting Compounds	Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.		Document zero use of CFC-refrigerants (policy, equipment specification, procurement specification or contract) unless a third party audit shows that a replacement or conversion is not economically feasible - in which case show that a phase out plan is in place. Do not use halons in fire suppression. Use all alternatives consistent with EPA's Significant New Alternatives Policy (SNAP) regulatory requirements.	☑	This is already our policy.

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Integrated Design

Building Name: MC-1 Building | Approved By: | Title:

Building ID: | LEED AP Assigned to Project:

Guiding Principle I. Employ Integrated Design Principles: Integrated Design	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Use a collaborative, integrated planning and design process that:			
Initiates and maintains an integrated project team as described on the Whole Building Design Guide in all stages of a project's planning and delivery, http://www.wbdg.org/design/engage_process.php	Create an inter-sustainable team. Complete the Building Information Tab or equivalent document, e.g., a team roster. Follow the DOE. O. 436.1.	☑	IO Credit 2: LEED Accredited Professional
Integrates the use of OMB's A-11, Section 7, Exhibit 300: *Capital Asset Plan and Business Case Summary*	Provide documentation and use this checklist or equivalent (USGBC LEED) to demonstrate incorporation. The establishment of 436.1 meet the goal setting requirement.	☑	
Establishes performance goals for siting, energy, water, materials and indoor environmental quality along with other comprehensive design goals and ensures incorporation of these goals throughout the design and lifecycle of the building	The establishment of 436.1 meet the goal setting requirement. Use this checklist or equivalent (USGBC LEED) to demonstrate incorporation.	☑	SS Credit 1 Site Selection
Considers all stages of the building's lifecycle, including deconstruction.	The establishment of 436.1 meet the goal setting requirement. Use this checklist or equivalent (USGBC LEED) to demonstrate incorporation.	☑	

Related References

DOE Order 436.1: DEPARTMENTAL SUSTAINABILITY

OMB Circular A-11 2002, OMB revised Circular A-11, Section 55—Energy and Transportation Efficiency Management—to encourage Federal agencies to incorporate ENERGY STAR® and/or the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ into up-front design concepts for new construction and/or building renovation.

DOE Order 413.3b Program and Project Management for the Acquisition of Capital Assets

On-line Resources

http://www.wbdg.org/references/mou_id.php

http://www.wbdg.org/design/engage_process.php

http://www.eere.energy.gov/buildings/info/design/integratedbuilding/

www.usgbc.org

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Commissioning

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle I. Employ Integrated Design Principles: Commissioning	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Employ commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include an experienced commissioning provider, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.	Provide a commissioning plan. In-house experienced personnel or team acceptable. The commissioning report should identify that building systems are working according to specifications and address humidity control as appropriate and include an inspection-driven moisture prevention strategy as appropriate (provides compliance for GP. Enhance Indoor Environmental Quality: Moisture Control.)	☑	EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems

Related References

DOE Order 413.3b Program and Project Management for the Acquisition of Capital Assets: Issue a Checkout, Testing, and Commissioning Plan that identifies subtasks, systems, and equipment. The Commissioning Plan ensures that the equipment, systems, and facilities including High Performance Sustainable Building systems, perform as designed and are optimized for greatest energy efficiency, resource conservation, and occupant satisfaction. The Commissioning Plan includes checkout and testing criteria required for initial operations.

On-line Resources

www.ashrae/org
www.bcxa.org
http://www.wbdg.org/design/greenspec_msl.php?s=019100
http://www.wbdg.org/project/buildingcomm.php

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Energy Efficiency

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle II. Optimize Energy Performance: Energy Efficiency	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the ENERGY STAR® targets for new construction and major renovation where applicable. For new construction, reduce the energy use by 30 percent compared to the baseline building performance rating per the American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE)/Illuminating Engineering Society of North America (IESNA) Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy use by 20 percent below pre-renovations 2003 baseline. Laboratory spaces may use the Labs21 Laboratory Modeling Guidelines.	Have a licensed engineer or architect provide documents that identify that the energy use targets were achieved or provide USGBC LEED submittal documentation also stating that the goals were achieved.	☑	EA Prerequisite 2. Minimum Energy Performance EA Credit 1. Optimize Energy Performance
Use ENERGY STAR® and FEMP-designated Energy Efficient Products, where available.	Provide standard purchasing policy/policies, constructions specifications, or retain proof of purchase.	☑	

Related References
DOE Order 436.1 Departmental Sustainability
The Energy Independence and Security Act of 2007 (EISA)
The Energy Policy Act of 2005 (EPACT)

On-line Resources
http://www.wbdg.org/references/mou_ee.php
http://www.wbdg.org/pdfs/10cfr435.pdf
http://www.wbdg.org/ccb/REGS/doe435.pdf
http://www.energystar.gov/benchmark
http://www1.eere.energy.gov/femp/financing/superespcs_fempassist.html
http://www.energystar.gov/ia/business/evaluate_performance/pm_pe_guide.pdf

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
On-Site Renewable Energy

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle II. Optimize Energy Performance: Renewable Energy	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Per the Energy Independence and Security Act (EISA) Section 523, meet at least 30% of the hot water demand through the installation of solar hot water heaters, when lifecycle cost effective.	Implement on-site solar hot water heating and retain design specs, statement of work, or photos, etc. If not lifecycle cost effective provide justification.	☑	EA Credit 2. On-Site Renewable Energy
Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when lifecycle cost effective.	Implement onsite renewable energy and retain design specifications, contracts, statement of work, or photos, etc. If not lifecycle cost effective provide justification.	☑	EA Credit 2. On-Site Renewable Energy

Related References
The Energy Independence and Security Act of 2007 (EISA)
The Energy Policy Act of 2005 (EPACT)

On-line Resources
http://www.wbdg.org/references/mou_ee.php
http://www.wbdg.org/pdfs/10cfr435.pdf
http://www.wbdg.org/ccb/REGS/doe435.pdf
http://www.energystar.gov/benchmark
http://www1.eere.energy.gov/femp/financing/superespcs_fempassist.html
http://www.energystar.gov/ia/business/evaluate_performance/pm_pe_guide.pdf

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Measurement And Verification

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle II. Optimize Energy Performance: Measurement and Verification	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Per the Energy Policy Act of 2005 (EPAct) Section 103, install building level electricity meters in new major construction and renovation projects to track and continuously optimize performance.	Install building utility level meters. Retain statement of work, billing records, photos, etc and/or provide ENERGY STAR® label certification if applicable.	☑	EA Credit 5. Measurement and Verification
Per EISA Section 434, include equivalent meters for natural gas and steam, where natural gas and steam are used.	Install building utility level meters. Retain statement of work, billing records, photos, etc and/or provide ENERGY STAR® label certification if applicable.	☑	

Related References

The Energy Independence and Security Act of 2007 (EISA)
The Energy Policy Act of 2005 (EPACT)

On Line - Resources

http://www.wbdg.org/pdfs/10cfr435.pdf
http://www.wbdg.org/ccb/REGS/doe435.pdf
http://www.energystar.gov/benchmark
http://www1.eere.energy.gov/femp/financing/superespcs_fempassist.html
http://www.energystar.gov/ia/business/evaluate_performance/pm_pe_guide.pdf

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction

Benchmarking

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle II. Optimize Energy Performance: Benchmarking	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Compare actual performance data from the first year of operation with the energy design target, preferably by using ENERGY STAR® Portfolio Manager for building and space types covered by ENERGY STAR®. Verify that the building performance meets or exceeds the design target, or that actual energy use is within 10% of the design energy budget for all other building types. For other building and space types, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.	Use ENERGY STAR's Portfolio Manager or Labs 21 database to enter annual performance data and print out the Statement of Energy Performance on an annual basis to track performance over time.	☑	EA Credit 5. Measurement and Verification
Related References			
The Energy Independence and Security Act of 2007 (EISA) The Energy Policy Act of 2005 (EPACT)			
On-Line Resources			
http://www.wbdg.org/pdfs/10cfr435.pdf http://www.wbdg.org/ccb/REGS/doe435.pdf http://www.energystar.gov/benchmark http://www1.eere.energy.gov/femp/financing/superespcs_fempassist.html http://www.energystar.gov/ia/business/evaluate_performance/pm_pe_guide.pdf			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Indoor Water

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle III. Protect and Conserve Water: Indoor Water	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the EPAct 1992, Uniform Plumbing Codes 2006, and the International Plumbing Codes 2006 fixture performance requirements.	Show a 20% reduction of fixture potable water use from the calculated fixture water usage baseline (Energy Policy Act of 1992). Use tools such as Watergy, the LEED water calculator, the ENERGY STAR Portfolio Manager for water savings to establish baseline usage and calculated savings or provide documentation based on metering/bills.	☑	WE Credit 3.1. Water Use Reduction: 20% Reduction
The installation of water meters is encouraged to allow for the management of water use during occupancy.	Install water meter(s) and provide documentation.	☑	
The use of harvested rainwater, treated wastewater, and air conditioner condensate should also be considered and used where feasible for nonpotable use and potable use where allowed.	Document use of harvested rainwater, treated wastewater, and air conditioner condensate as applicable.	☑	WE Credit 2. Innovative Wastewater Technologies

EO 13423 Guidance to Reduce Water Consumption

Beginning in 2008, Federal agencies must reduce water consumption intensity through life-cycle cost-effective measures, relative to the baseline of the agency's water consumption in fiscal year 2007 by 2 percent annually through the end of FY 2015 or 16 percent by the end of FY 2015. DOE Supplemental Guidance To The Instructions for Implementing Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management" Establishing Baseline and Meeting Water Conservation Goals of Executive Order 13423. Executive Order 13423 requires all Federal agency heads to develop a water-use baseline based on FY 2007 water consumption. All potable water use in covered facilities should be reported, whether used for human consumption, building process, power plant or building cooling, landscape watering, irrigation, or industrial uses.

Related References

http://www1.eere.energy.gov/femp/pdfs/water_guidance.pdf

Online Resources

http://ofee.gov/eo/eo13423_WaterGuidance200801.pdf
http://www1.eere.energy.gov/femp/information/download_watergy.html
http://www1.eere.energy.gov/femp/water/water_fedrequire.html
http://www.epa.gov/watersense/index.htm
http://www1.eere.energy.gov/femp/index.html
http://www.wbdg.org/references/mou_iw.php

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Outdoor Water

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle III. Protect and Conserve Water: Outdoor Water	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Use water efficient landscape and irrigation strategies, such as water reuse, recycling, and the use of harvested rainwater, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities).	Retain documentation from design tools, such as the LEED water calculator or other water tools to provide a statement on how water usage was reduced and calculated, or document minimal use of irrigation water due to nominal or no landscape. Choose irrigation contractors who are certified through a WaterSense labeled program and document outdoor potable water consumption reduction.	☑	WE Credit 1.1 Water Efficient Landscaping: Reduce by 50% WE Credit 1.2 Water Efficient Landscaping: No Potable Water Use or No Irrigation
The installation of water meters for locations with significant outdoor water use is encouraged.	Document Installation and use of outdoor water meters.	☑	
Employ design and construction strategies that reduce storm water runoff and discharges of polluted water offsite. Per EISA Section 438, to the maximum extent technically feasible, maintain or restore the predevelopment hydrology of the site with regard to temperature, rate, volume, and duration of flow using site planning, design, construction, and maintenance strategies.	Provide documents that demonstrate strategy implemented to reduce storm water runoff and maintain or restore predevelopment hydrology of the site.	☑	SS Prerequisite 1. Construction Activity Pollution runoff SS Credit 6.1 Stormwater Design: Quantity Control SS Credit 6.2 Stormwater Design: Quality Control

Related References

The Energy Independence and Security Act of 2007 (EISA)

On-Line Resources

http://www1.eere.energy.gov/femp/information/download_watergy.html
http://www.us.kohler.com/waterconservation/calculator.jsp?section=2&nsection=2&nsubsection=1&nitem=article1
http://www1.eere.energy.gov/femp/water/water_fedrequire.html
http://www.epa.gov/watersense/index.htm
http://www.wbdg.org/references/mou_ow.php

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Process Water

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle III. Protect and Conserve Water: Indoor Water	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Per the Energy Policy Act of 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.	Document water conservation strategy in process systems. Documentation may be provided by licensed engineer, water utility or through an energy service provider. Guiding principle is met if no potable water is used.	☑	
EO 13423 Guidance to Reduce Water Consumption			
Beginning in 2008, Federal agencies must reduce water consumption intensity through life-cycle cost-effective measures, relative to the baseline of the agency's water consumption in fiscal year 2007 by 2 percent annually through the end of FY 2015 or 16 percent by the end of FY 2015. DOE Supplemental Guidance To The Instructions for Implementing Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management" Establishing Baseline and Meeting Water Conservation Goals of Executive Order 13423. Executive Order 13423 requires all Federal agency heads to develop a water-use baseline based on FY 2007 water consumption. All potable water use in covered facilities should be reported, whether used for human consumption, building process, power plant or building cooling, landscape watering, irrigation, or industrial uses.			
Related References			
http://www1.eere.energy.gov/femp/pdfs/water_guidance.pdf			
On-line Resources			
http://ofee.gov/eo/eo13423_WaterGuidance200801.pdf http://www1.eere.energy.gov/femp/information/download_watergy.html http://www1.eere.energy.gov/femp/water/water_fedrequire.html http://www.epa.gov/watersense/index.htm http://www1.eere.energy.gov/femp/index.html http://www.wbdg.org/references/mou_iw.php			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Water Efficient Products

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle III. Protect and Conserve Water: Water Efficient Products	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Specify EPA's WaterSense-labeled products or other water conserving products, where available.	Any of the following or equivalent: purchasing or design specifications, statement of work, receipts, etc., to prove the installation of Water Sense - labeled products or other water conserving products.	☑	
Choose irrigation contractors who are certified through a WaterSense labeled program.	Document through contracts or statement of work.	☑	

EO 13423 Guidance to Reduce Water Consumption

Beginning in 2008, Federal agencies must reduce water consumption intensity through life-cycle cost-effective measures, relative to the baseline of the agency's water consumption in fiscal year 2007 by 2 percent annually through the end of FY 2015 or 16 percent by the end of FY 2015. DOE Supplemental Guidance To The Instructions for Implementing Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management" Establishing Baseline and Meeting Water Conservation Goals of Executive Order 13423. Executive Order 13423 requires all Federal agency heads to develop a water-use baseline based on FY 2007 water consumption. All potable water use in covered facilities should be reported, whether used for human consumption, building process, power plant or building cooling, landscape watering, irrigation, or industrial uses.

Related References

http://www1.eere.energy.gov/femp/pdfs/water_guidance.pdf

On-Line Resources

http://ofee.gov/eo/eo13423_WaterGuidance200801.pdf
http://www1.eere.energy.gov/femp/information/download_watergy.html
http://www1.eere.energy.gov/femp/water/water_fedrequire.html
http://www.epa.gov/watersense/index.htm
http://www1.eere.energy.gov/femp/index.html
http://www.wbdg.org/references/mou_iw.php

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Ventilation and Thermal Comfort

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle IV. Enhance Indoor Environmental Quality: Ventilation and Thermal Comfort	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone AND	Document compliance with ASHRAE Standards by licensed architect or engineer or achieve an ENERGY STAR Label Certification	☑	EQ Credit 7.1 Thermal Comfort - Design
ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.	Document compliance with ASHRAE Standards by licensed architect or engineer or achieve an ENERGY STAR Label Certification	☑	EQ Prerequisite 1. Minimum IAQ Performance

Related References

41 CFR § 102-74.195:
41 CFR § 102-74.185(b)

Resources

http://www.wbdg.org/references/mou_vtcomfort.php
www.epa.gov/iaq/largebldgs/I-beam/index.html
http://www.ashrae.org/
http://www.energystar.gov/ia/business/evaluate_performance/pm_pe_guide.pdf

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction

Moisture Control

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle IV. Enhance Indoor Environmental Quality: Moisture Control	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture.	This may include an inspection-driven moisture prevention strategy that is part of building commissioning plan that specifies maintenance of the roof drainage and the foundation system, or document that your building does not have a moisture problem.	☑	EQ Prerequisite 1. Minimum IAQ Performance EQ Credit 7.1 Thermal Comfort - Design EA Prerequisite 1. Fundamental Commissioning of the Building Energy Systems
On-Line Resources			
http://www.wbdg.org/references/mou_mc.php			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction

Daylighting

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle IV. Enhance Indoor Environmental Quality: Daylighting	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks.	Document through computer simulation or by light measurement.	☑	EQ Credit 8.1 Daylight & Views, 75% Daylight/ 90% Views
Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.	Document that individual lighting control is available for the occupants by simple schematic of floor layout, showing locations of manual lighting controls (such as task lighting) or statement based upon visual audit.	☑	EQ Credit 6.1 Controllability of Systems - Lighting
On-Line Resources			
http://www.eere.energy.gov/buildings/info/design/integratedbuilding/passivedaylighting.html			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction

Low-Emitting Materials

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle IV. Enhance Indoor Environmental Quality: Low-Emitting Materials	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Specify materials and products with low pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings.	Contracts, bid specifications, and/or purchase agreements that designate the purchase of low emitting materials. Ensure that language is explicit, such as VOC limits, Green Seal or other similar labeling requirements are clearly specified.	☑	EQ Credit 4.1 Low Emitting Materials: Adhesives and Sealants EQ Credit 4.2 Low Emitting Materials: Paints and Coatings EQ Credit 4.3 Low Emitting Materials: Carpet Systems
On-Line Resources			
http://www.wbdg.org/design/greenspec.php http://www.wbdg.org/references/mou_lem.php			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Protect Indoor Air Quality During Construction

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle IV. Enhance Indoor Environmental Quality: Protect Indoor Air Quality During Construction	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2007. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.	Before major renovations, develop and implement an indoor air quality management plan, specification or guidelines. May use USGBC LEED reference documentation.	☑	EQ Credit 3.1 Construction IAQ Management Plan EQ Credit 3.2 Construction IAQ Management Plan - Before Occupancy
On-Line Resources			
http://www.wbdg.org/references/mou_iaq.php Sheet Metal and Air Conditioning Contractors' National Association, www.smacna.org			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Environmental Tobacco Smoke Control

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle IV. Enhance Indoor Environmental Quality: Environmental Tobacco Smoke Control	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Implement a policy indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy. Post signage indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy.	Establish environmental tobacco smoke control policy. Post signage prohibiting smoking within 25 feet at building entrances, operable windows, and air intakes.	☑	EQ Prerequisite 2: Environmental Tobacco Smoke Control
On-Line Resources			
http://www.wbdg.org/design/greenspec.php http://www.wbdg.org/references/mou_lem.php			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction

Recycled Content

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle V. Reduce Environmental Impact of Materials: Recycled Content	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Per Section 6002 of the Resource Conservation and Recovery Act (RCRA), for EPA-designated products, specify products meeting or exceeding EPA's recycled content recommendations. For other products, specify materials with recycled content when practicable. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.	Incorporate the FAR requirements for the purchase of EPA-designated products into contracts and use products meeting or exceeding EPA's recycled content recommendations. Provide construction, design, purchasing or bid specifications.	☑	MR Credit 4.1 recycled Content 10% (post consumer + 1/2 pre-consumer) MR Credit 4.2 recycled Content 20% (post consumer + 1/2 pre-consumer)

Related References

40 CFR 247. Section 6002 of RCRA requires Federal agencies to give preference in their procurement to the purchase of specific EPA-designated recycled content products. Implement the provisions of 40 CFR 247. Section 6002 of RCRA (For EPA-designated products, use products meeting or exceeding EPA's recycled content recommendations).

And adhere to the following Federal Acquisition Regs:
FAR 52.223-1 and -2 Biobased Products Preference Provision and Clause
FAR 52.223-4 and -9 Estimate of Percent of Recovered Material Content for EPA designated Products

On-Line-Resources

http://www.wbdg.org/references/mou_rc.php
www.epa.gov/cpg
http://www.hss.energy.gov/pp/epp/
http://www.epa.gov/cpg/products.htm

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction

Biobased Content

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle V. Reduce Environmental Impact of Materials: Biobased Content	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Per Section 9002 of the Farm Security and Rural Investment Act (FSRIA), for USDA-designated products, specify products with the highest content level per USDA's biobased content recommendations. For other products, specify biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. USDA's biobased product designations and biobased content recommendations are available on USDA's BioPreferred web site at <www.usda.gov/biopreferred>.	Incorporate the FAR requirements for the purchase of USDA-designated products into contracts and use products meeting or exceeding USDA's biobased content recommendations. Provide construction, purchasing or bid specifications that document the use of biobased products made from rapidly renewable resources and certified sustainable wood products. Any procurement that is subject to RCRA Section 6002 shall not be subject to the requirements of this section should they be in conflict.	☑	MR Credit 6 Rapidly Renewable Materials MR Credit 7 Certified Wood

Related References

And adhere to the following Federal Acquisition Regs (FAR):
FAR 52.223-1and -2 Biobased Products Preference Provision and Clause

On-Line Resources

http://www.hss.doe.gov/pp/epp/epspecs.html
http://www.wbdg.org/references/mou_bc.php
http://www.biopreferred.gov/Default.aspx?SMSESSION=NO
http://www.ofee.gov/gp/bioprod.asp
http://www.da.usda.gov/procurement/biobased/APP.pdf
http://www.hss.doe.gov/pp/epp/library/EPP-SPECS-Recy-Vendor-rev.pdf
http://www.hss.energy.gov/pp/epp/
http://www.biopreferred.gov/Catalog.aspx

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Environmentally Preferable Products

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle V. Reduce Environmental Impact of Materials: Environmentally Preferable Products	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.	Establish purchasing contracts, bids construction documents with specification language for the purchase of low emitting materials, durable goods, and consumables. Ensure that language is explicit, such as VOC limits, carpet and Rug Institute's Green label Plus program, Green Seal and other similar "labeling" requirements are clear.	☑	EQ Credit 4.1: Low Emitting materials - Adhesives and Sealants EQ Credit 4.2: Low Emitting Materials - Paints and Coatings EQ Credit 4.3: Low Emitting Materials - Carpet Systems

Related References
And adhere to the following Federal Acquisition Regs (FAR): FAR 52.223-1and -2 Biobased Products Preference Provision and Clause

On-line Resources
http://www.hss.doe.gov/pp/epp/epspecs.html http://www.wbdg.org/references/mou_bc.php http://www.biopreferred.gov/Default.aspx?SMSESSION=NO http://www.hss.energy.gov/pp/epp/ http://www.biopreferred.gov/Catalog.aspx

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Waste and Materials Management

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle V. Reduce Environmental Impact of Materials: Waste and Materials Management	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Incorporate adequate space, equipment, and transport accommodations for recycling in the building design. During a project's planning stage, identify local recycling and salvage operations that could process site-related construction and demolition materials. During construction, recycle or salvage at least 50 percent of the non-hazardous construction, demolition and land clearing materials, excluding soil, where markets or onsite recycling opportunities exist. Provide salvage, reuse and recycling services for waste generated from major renovations, where markets or onsite recycling opportunities exist.	Documentation may be in the form of receipts, agreements or contracts with local recycling and product reclaiming services. Waste may be apportioned by major category, such as flooring, walls, plumbing, and electrical etc., to estimate volume/weight diverted.	☑	MR Credit 2.1 Construction Waste Management – Divert 50% from Disposal MR Prerequisite 1 Storage and Collection of Recyclables
On-line Resources			
http://www.wbdg.org/references/mou_cw.php http://www.wbdg.org/design/greenspec_msl.php?s=017419 http://www.epa.gov/epaoswer/non-hw/debris-new/pubs.htm			

High Performance Sustainable Buildings
Assessment Compliance Form for New Construction
Ozone Depleting Compounds

Building Name: MC-1 Building Approved By: Title:

Building ID:

Guiding Principle V. Reduce Environmental Impact of Materials: Ozone Depleting Compounds	Suggested Guidance to Achieving Compliance	Documents On File?	Related LEED ® Credit
Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.	Document zero use of CFC-refrigerants (policy, equipment specification, procurement specification or contract) unless a third party audit shows that a replacement or conversion is not economically feasible - in which case show that a phase out plan is in place.	☑	EA Prerequisite 3. Fundamental Refrigerant Management
	Follow the provisions of the following: FAR 52.223-11 Ozone Depleting Substances, FAR 52.223-12 Refrigeration Equipment and Air conditioners.		EA Credit 4. Enhanced Refrigerant Management
	Do not use halons in fire suppression. Use all alternatives consistent with EPA's Significant New Alternatives Policy (SNAP) regulatory requirements.		
	Do not purchase aerosols or foam products except for those permitted by 40 CFR part 82 subpart C.		

On-line Resources

DOE Order 436.1
Ozone: http://www.arnet.gov/far/0219/html/Subpart_23_8.html
http://www.wbdg.org/references/mou_odc.php
http://www.epa.gov/ozone/snap/
Refrigeration: http://farsite.hill.af.mil/archive/Far/1997-11_cd99o5/52_220.htm#P1283_141632

High Performance and Sustainable Buildings Guiding Principles
Checklist for New Construction

Building Name: INITIAL LEED ASSESSMENT FOR THE MC-1 BUILDING

Address: P.O. Box 500 Batavia IL 60510

These fields will populate as corresponding guiding principles and LEED credits		
	%HPSB Guiding Principles Achieved	100%
	Total LEED Credits (Yes column)	11
	Possible Total LEED Credits (Yes column+ Maybe Column)	13

Initial			Assessment			Final
LEED			Sustainable Sites		26 Points	HPSB
YES	Maybe	No				
Y			Prereq 1	Construction Activity Pollution Prevention	LEED Rqd	☑
			Credit 1	Site Selection	1	☑
			Credit 2	Development Density & Community Connectivity	5	
			Credit 3	Brownfield Redevelopment	1	
			Credit 4.1	Alternative Transportation, Public Transportation Access	6	
			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1	
			Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	3	
			Credit 4.4	Alternative Transportation, Parking Capacity	2	
1			Credit 5.1	Site Development, Protect or Restore Habitat	1	
1			Credit 5.2	Site Development, Maximize Open Space	1	
	1		Credit 6.1	Stormwater Design, Quantity Control	1	☑
1			Credit 6.2	Stormwater Design, Quality Control	1	☑
			Credit 7.1	Heat Island Effect, Non-Roof	1	
			Credit 7.2	Heat Island Effect, Roof	1	
			Credit 8	Light Pollution Reduction	1	
3	**1**	**0**	**Subtotal**			
LEED			Water Efficiency		10 Points	HPSB
YES	Maybe	No				
Y			Prereq 1	Water Use Reduction, Reduce by 20%	LEED Rqd	☑
2			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	2	☑
2			Credit 1.2	Water Efficient Landscaping, No potable water use or irrigation	2	☑
			Credit 2	Innovative Wastewater Technologies	2	☑
			Credit 3.1	Water Use Reduction, 30% Reduction	2	
			Credit 3.2	Water Use Reduction, 35% Reduction	1	
			Credit 3.3	Water Use Reduction, 40% Reduction	1	
4	**0**	**0**	**Subtotal**			
LEED			Energy & Atmosphere		35 Points	HPSB
YES	Maybe	No				
Y			Prereq 1	Fundamental Commissioning of the Building Energy Systems	LEED Rqd	☑
Y			Prereq 2	Minimum Energy Performance	LEED Rqd	☑
Y			Prereq 3	Fundamental Refrigerant Management	LEED Rqd	☑
			Credit 1	Optimize Energy Performance:		
				12% New Buildings or 8% Existing Building Renovations	1	
				14% New Buildings or 10% Existing Building Renovations	2	
				16% New Buildings or 12% Existing Building Renovations	3	
				18% New Buildings or 14% Existing Building Renovations	4	
				20% New Buildings or 16% Existing Building Renovations	5	
				22% New Buildings or 18% Existing Building Renovations	6	
				24% New Buildings or 20% Existing Building Renovations	6	
				26% New Buildings or 22% Existing Building Renovations	8	
				28% New Buildings or 24% Existing Building Renovations	9	
				30% New Buildings or 26% Existing Building Renovations	10	☑
				32% New Buildings or 28% Existing Building Renovations	11	
				34% New Buildings or 30% Existing Building Renovations	12	
				36% New Buildings or 32% Existing Building Renovations	13	
				38% New Buildings or 34% Existing Building Renovations	14	
				40% New Buildings or 36% Existing Building Renovations	15	
				42% New Buildings or 38% Existing Building Renovations	16	
				44% New Buildings or 40% Existing Building Renovations	17	
				46% New Buildings or 42% Existing Building Renovations	18	
				48% New Buildings or 44% Existing Building Renovations	19	
			Credit 2	On-Site Renewable Energy (DOE Order 436.1)	1 to 7	☑
				1% Renewable Energy	1	
				3% Renewable Energy	1	
				5% Renewable Energy	1	
				7% Renewable Energy	1	
				9% Renewable Energy	1	
				11% Renewable Energy	1	
				13% Renewable Energy	1	
			Credit 3	Enhanced Commissioning	2	
			Credit 4	Enhanced Refrigerant Management	2	☑
			Credit 5	Measurement & Verification	3	☑
			Credit 6	Green Power	2	
0	**0**	**0**	**Subtotal**			

LEED			Materials & Resources		14 Points	HPSB
YES	Maybe	No				
Y			Prereq 1	Storage & Collection of Recyclables	LEED Rqd	☑
			Credit 1.1	Building Reuse, Maintain 55% of Existing Walls, Floors & Roof	1	
				Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1	
				Building Reuse, Maintain 95% of Existing Walls, Floors & Roof	1	
			Credit 1.2	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1	
1			Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1	☑
			Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1	
1			Credit 3.1	Materials Reuse, 5%	1	
			Credit 3.2	Materials Reuse,10%	1	
1			Credit 4.1	Recycled Content, 10% (post-consumer + ½ pre-consumer)	1	☑
			Credit 4.2	Recycled Content, 20% (post-consumer + ½ pre-consumer)	1	☑
	1		Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regionally	1	
			Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regionally	1	
			Credit 6	Rapidly Renewable Materials	1	☑
			Credit 7	Certified Wood	1	☑
3	**1**	**0**	**Subtotal**			

LEED			Indoor Environmental Quality		15 Points	HPSB
YES	Maybe	No				
Y			Prereq 1	Minimum IAQ Performance	LEED Rqd	☑
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	LEED Rqd	☑
			Credit 1	Outdoor Air Delivery Monitoring	1	
			Credit 2	Increased Ventilation	1	
			Credit 3.1	Construction IAQ Management Plan, During Construction	1	☑
			Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1	☑
			Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1	☑
			Credit 4.2	Low-Emitting Materials, Paints & Coatings	1	☑
			Credit 4.3	Low-Emitting Materials, Carpet Systems	1	☑
			Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1	☑
			Credit 5	Indoor Chemical & Pollutant Source Control	1	
			Credit 6.1	Controllability of Systems, Lighting	1	☑
			Credit 6.2	Controllability of Systems, Thermal Comfort	1	
			Credit 7.1	Thermal Comfort, Design	1	☑
			Credit 7.2	Thermal Comfort, Verification	1	
			Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1	☑
			Credit 8.2	Daylight & Views, Views for 90% of Spaces	1	
0	**0**	**0**	**Subtotal**			

LEED			Innovation & Design Process		6 Points	HPSB
YES	Maybe	No				
			Credit 1.1	Innovation in Design: Provide Specific Title	1	
			Credit 1.2	Innovation in Design: Provide Specific Title	1	
			Credit 1.3	Innovation in Design: Provide Specific Title	1	
			Credit 1.4	Innovation in Design: Provide Specific Title	1	
			Credit 1.5	Innovation in Design: Provide Specific Title	1	
1			Credit 2	LEED® Accredited Professional	1	☑
1	**0**	**0**	**Subtotal**			

LEED			Regional Priority Credits		4 Points	HPSB
YES	Maybe	No				
			Credit 1.1	Regional Priority: Specific Credit	1	
			Credit 1.2	Regional Priority: Specific Credit	1	
			Credit 1.3	Regional Priority: Specific Credit	1	
			Credit 1.4	Regional Priority: Specific Credit	1	
0	**0**	**0**	**Subtotal**			

11	**2**	**0**	**Subtotal Yes/Maybe/No**

Fulfillment of Guiding Principles for HPSB may result in meeting 32-34 LEED NC credits and 7 prerequisites. LEED credits and prerequisites that relate to the Guiding Principles are highlighted in yellow.

Pursuant to DOE Order 436.1 all new buildings and major building renovations at Critical Decision One (CD-1) or lower with a value exceeding $5 million, must implement the Guiding Principles of the Executive Order and attain U.S. Green Building Council (USGBC) LEED® Gold certification.

LEED Certification Rating System

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80 points & Above

Notes:

1. WE Credit 1.2: can be met when methods are used to eliminate the usage of potable water for landscape irrigation.
2. WE Credit 2: where feasible for nonpotable use and potable use where allowed.
3. EA Credit 1: note LEED energy optimization requirements are different from the Guiding Principle minimum requirements.
4. EA Credit 2: may result in 1-3 credits.
   EA Credit 2: where life cycle cost effective
5. EQ Credit 4.4 furniture and equipment are not considered based building elements and are not included.
6. WE Prereq: Only if Life cycle cost-effective

For more information on LEED Certification and credits, visit www.usgbc.org

* This is applicable only to the LArTF Surface Buildings portion, and is not applicable to underground facilities.

Department of Energy's USGBC LEED® Accredited Professionals as of June 2008

Name	City	State	DOE Affiliation
Alber, Russell	Naperville	IL	Fermi National Accelerator Laboratory
Anglin, Rob	Livermore	CA	Lawrence Livermore National Laboratory
Bodelson, Michael	Sante Fe	NM	Los Alamos National Laboratory
Carlisle, Nancy	Golden	CO	National Renewable Energy Laboratory
Daulton, Jennifer	Idaho Falls	ID	Idaho National Laboratory
Diamond, Richard	Berkeley	CA	Lawrence Berkeley National Laboratory
Dixon, Steven	Lombard	IL	Fermi National Accelerator Laboratory
Dyer, Beverly	Washington	DC	Department Of Energy Headquarters
Eenberg, Steve	Berkeley	CA	Lawrence Berkeley National Laboratory
Ellsworth, Paula	Las Vegas	NV	National Securities Technology
Farrar-Nagy, Sara	Golden	CO	National Renewable Energy Laboratory
Flett, Gregory	Upton	NY	Brookhaven National Laboratory
Fowler, Kim	Richland	WA	Battelle - Pacific Northwest National Laboratory
Gowri, Krishnan	Richland	WA	Battelle Northwest
Gray, Matthew	Washington	DC	Department Of Energy Headquarters - FEMP
Greenberg, Steve	Berkeley	CA	Lawrence Berkeley National Laboratory
Gregg, Michael	Oak Ridge	TN	UT-Battelle
Hayter, Sheila	Golden	CO	National Renewable Energy Laboratory
Holaday, S. Rene	Los Alamos	NM	Los Alamos National Laboratory
Humble, David	Albuquerque	NM	Sandia National Laboratories
Iadach, Michael	Los Alamos	NM	Los Alamos National Laboratory
Indelicato, Anthony	Laweranceville	NJ	U. S. Department Of Energy
Kandt, Alicen	Boulder	CO	National Renewable Energy Laboratory
King, Karin	Livermore	CA	Lawrence Livermore National Laboratory
Kirk, Gregory	Richland	WA	Pacific Northwest National Laboratory
Kumar, Satish	Washington	DC	Lawrence Berkeley National Laboratory
Ladach, Michael	Los Alamos	NM	Los Alamos National Laboratory
Liu, Bing	Richland	WA	Battelle - Pacific Northwest National Laboratory
Maltin, Marla	Los Alamos	NM	Los Alamos National Laboratory
Mathew, Paul	Washington	DC	Lawrence Berkeley National Laboratory
McGeachen, Thomas	Princeton	NJ	Princeton Plasma Physics Laboratory
McMordie, Kate	Richland	WA	Pacific Northwest National Laboratory
Mizner, Jack	Albuquerque	NM	Sandia National Laboratories
Morse, John	Golden	CO	National Renewable Energy Laboratory
Morton, Jennifer	Idaho Falls	ID	Idaho National Laboratory
Norek, George	Argonne	IL	Argonne National Laboratory
Payne, Christopher	Washington	DC	Lawrence Berkeley National Laboratory
Peters, R. Cecil	Oak Ridge	TN	UT-Battelle
Pittman, Jeff	Richland	WA	Pacific Northwest National Laboratory
Pless, Shanti	Golden	CO	National Renewable Energy Laboratory

DOE LEED AP's - Continued			
Name	**City**	**State**	**DOE Affiliation**
Richman, Eric	Richland	WA	Battelle - Pacific Northwest National Lab
Robichaud, Robert	Boulder	CO	National Renewable Energy Laboratory
Rosenberg, Michael	Eugene	OR	Pacific Northwest National Laboratory
Seiter, Doug	Golden	CO	Golden Project Management Center
Sizemore, Mary		OH	Legacy Management
Solana, Amy	Portland	OR	Pacific Northwest National Laboratory
Tanner, Stephanie	Washington	DC	National Renewable Energy Laboratory
Terrill, Alison	Livermore	CA	Lawrence Livermore National Laboratory
Thomas, Warren	Oak Ridge	TN	Oak Ridge National Laboratory
Trychta, Keith	Argonne	IL	Argonne National Laboratory
Van Geet, Otto	Golden	CO	National Renewable Energy Laboratory
VanZandbergen, Gary	Batavia	IL	Fermi National Accelerator Laboratory
Walton, Rodney	Batavia	IL	Fermi National Accelerator Laboratory
Watkins, Gary	Richland	WA	Battelle - Pacific Northwest National Laboratory
Watson, Ian	Livermore	CA	Lawrence Livermore National Laboratory
Wiegand, Peter	Oak Ridge	TN	UT-Battelle
Wilcher, Kirby	Oak Ridge	TN	UT-Battelle
Yuan, Wenbo	Livermore	CA	Lawrence Livermore National Laboratory

Engineering Risk Assessment

Interpreting the Graded Approach Worksheet

The purpose of this chapter is to define a risk-based graded approach for use in engineering projects. This process helps the lead engineer and department head evaluate project risks and determine the appropriate level of documentation and review a project needs. The project manager may add additional requirements, as defined in **Chapter 1: Requirements and Specifications**.

The lead engineer and department head complete the graded approach worksheet as part of the specification process. Completion of the graded approach worksheet is a way to quantify project risk early in a project. If a project carries a high level of risk, the engineer needs to complete further risk analysis based on guidelines from other governing organizations.

Definitions

Graded Approach: *A graded approach uses a list of factors to establish the appropriate level of formality a project requires.*
Risk-Based Graded Approach: *A risk-based graded approach evaluates the level of risk in various risk elements in order to establish the appropriate level of controls a project requires.*
Risk Element: *A risk element is an aspect of a project that could prevent its successful completion, without appropriate control measures.*

Risk Assessment

The Engineering Policy Manual Team has identified 15 potential risk elements to evaluate for each project.
The department head and lead engineer determine the level of risk for each element and document it using the graded approach worksheet. The department head and lead engineer can use the guidelines in this chapter to determine the overall level of risk and to highlight high-risk categories. This risk assessment applies to the engineering subproject at hand, not the overall project. A subproject is a self-contained engineering task, component or system that generally falls under the responsibility of a single department. Subprojects do not take on the risk level of the larger project.

The engineer should record, in Tables 1 and 2 below, risk assessment integer values between 1 and 5, as follows:
1 low risk
2 low to medium risk
3 medium risk
4 medium to high risk
5 high risk
Definitions of the risk levels are given below with criteria for risk levels 1, 3 and 5. Levels 2 and 4 are implied to fall between those provided.

Interpreting the Graded Approach Worksheet

The lead engineer fills out an engineering and project risk element table for his or her project or subproject. If the project or subproject has a risk score of 5 in any engineering risk element (A - G), it requires formal control as described within the Engineering Manual chapters indicated in the table below. If the subtotal of the risk scores for the elements related to one chapter is higher than the high risk score indicated in the table below, the topic covered in that chapter requires formal control. If the project or subproject has a risk score of 5 in any project risk element (A - O), or the project management risk (H - O) subtotal is 25, notify the project manager. The project manager may choose to elevate formal control requirements to address elevated project management risk (H - O).

Engineering Risk Assessment

Project: MC-1 Building
Lead Engineer: R. Alber
Department: FESS/Engineering
Date: February 22, 2012

Chapter		Engineering Risk Element A	B	C	D	E	F	G	High Risk	Subtotal	Assessment
1	Requirements and Specifications	1	1				2		≥ 10	4	Standard Risk
3	Requirements and Specification Review	1	1		1	1	2		≥ 16	6	Standard Risk
4	System Design	1	1	2		1	2	1	≥ 19	8	Standard Risk
5	Engineering Design Review	1	1	2		1	2	1	≥ 19	8	Standard Risk
6	Procurement and Implementation		1		1	1	2	1	≥ 16	6	Standard Risk
7	Testing and Validation	1				1	2	1	≥ 13	5	Standard Risk
8	Release to Operations						2		≥ 4	2	Standard Risk
9	Final Documentation		1				2		≥ 7	3	Standard Risk

Project Risk Element H	I	J	K	L	M	N	O	High Risk	Subtotal	Assessment
2	3	2	2	1	1	1	2	≥ 25	14	Standard Risk

Engineering Risk Elements	
A	Technology
B	Environmental Impact
C	Vendor Issues
D	Resource Availability
E	Safety
F	Quality Requirements
G	Manufacturing Complexity

Project Risk Elements	
H	Schedule
I	Interfaces
J	Experience / Capability
K	Regulatory Requirements
L	Project Funding
M	Project Reporting Requirements
N	Public Impact
O	Project Cost

Engineering Risk Assessment

Project: MC-1 Building
Lead Engineer: R. Alber
Department: FESS/Engineering
Date: February 22, 2012

Technology

Score	
1 - Low Risk	1

This defines the degree of technical complexity the Lead Engineer or engineering team will face in executing the project.

1 The project will use off-the-shelf technology.
3 Engineers will purchase and modify off-the-shelf technology.
5 The project will require the development of new technology.

Environmental Impact

1 - Low Risk	1

This defines the potential level of environmental impact.

1 There will be no environmental impact.
3 The project may have some environmental impact but will not require an environmental assessment, as determined by FESHM.
5 The project will require an environmental impact statement.

Vendor Issues

2 - Low to Medium Risk	2

This defines the degree of complexity to be expected with vendors. Complicating factors may include long-lead-time items and issues with vendor qualification and reliability.

1 Vendors could cause minor issues.
3 Vendors could cause manageable complications.
5 Vendor issues could result in significant schedule delays or cost overruns or could otherwise jeopardize the successful completion of the project.

Resource Availability

1 - Low Risk	1

This defines the availability of internal and external resources to plan and execute the project.

1 Resources will be readily available.
3 Resources could be somewhat restricted.
5 The difficulty of obtaining resources puts the project schedule at high risk.

Quality Requirements

1 - Low Risk	1

This determines the effort required to achieve the quality level the customer assigns to the final product.

1 The quality requirements can be met easily with existing infrastructure.
3 The quality requirements are challenging but can be met with existing infrastructure.
5 The quality requirements are beyond the capability of existing infrastructure.

Safety

2 - Low to Medium Risk	2

This defines the safety issues the project team will encounter while completing the project.

1 The project will require standard safety considerations.

3 The project will require increased diligence due to its location, the configuration of the product or the type of work required. This includes work requiring review according to FESHM.

5 The project will require very restrictive safety considerations. This includes work requiring review and personnel safety systems.

Manufacturing Complexity

1 - Low Risk	1

This defines the degree of complexity to be expected when combining the elements of technology, operations and schedule in product manufacturing.

1 The manufacturing processes will be routine.

3 The project will require an existing technology that the manufacturer has not previously used.

5 The project will require new or complex manufacturing methods.

Schedule

2 - Low to Medium Risk	2

This defines how much time the Lead Engineer or engineering team will have to complete the schedule.

1 Time will be unlimited.

3 The schedule will be somewhat constrained.

5 The subproject will be on the overall project critical path and has no schedule contingency.

Interfaces

3 - Medium Risk	3

This defines the risk associated with the complexity of integrating multiple subprojects.

1 One department at Fermilab will be involved with a standalone project.

3 Project success depends upon contributions from multiple departments at Fermilab.

5 Project success depends upon contributions from multiple institutions.

Experience/Capability

2 - Low to Medium Risk	2

This defines the level of experience and capability project team members will have.

1 Only experts will participate.

3 A blend of experts and inexperienced personnel will participate.

5 Only inexperienced personnel will participate.

Regulatory Requirements

2 - Low to Medium Risk	2

This identifies the degree to which oversight by governmental or other regulatory agencies will impact the project.

1 Regulatory agencies will have minor to no involvement.

3 The Department of Energy, DOE, will have direct regulatory involvement.

5 DOE, as well as state or federal government, will have regulatory involvement.

Project Funding

1 - Low Risk	1

This defines the availability and approval status of project planning and execution funds.

1 A single source within Fermilab will fund the project.

3 A source outside of Fermilab will fund the project.

5 Multiple sources outside of Fermilab will fund the project.

Project Reporting Requirements

1 - Low Risk	1

This indicates the level of reporting to the senior management the project requires.

1 Reports to senior management about the project will not be required.

3 The project will require quarterly performance reports.

5 The project will be highly visible. Top management or outside agencies will schedule visits and issue monthly performance reports.

Public Impact

1 - Low Risk	1

This indicates how much the project will affect the public or public opinion.

1 The public will not be affected.

3 The public may be somewhat affected and should be informed with news releases.

5 The project may have an impact on the public. The public should be involved through public forums and may participate in advisory councils.

Project Cost

2 - Low to Medium Risk	2

This defines how much the project is projected to cost.

1 The project will be within the department operating budget.

3 The project will require divisional budget planning.

5 The project will require laboratory or DOE budget tracking and reporting.

2. M&R Cost Profiles

This chapter presents estimates of 50-year maintenance cost profiles for 74 models. Each two-page profile includes a description of the model, a list of major components, and forecasts of maintenance and repair (M&R) costs at various levels of aggregation. The profile estimates were made with the Whitestone MARS Facility Cost Forecast System, calibrated for the Washington, D.C. area. The profiles can be adjusted for other areas using the Local Maintenance Cost Index shown in Chapter 3, and modified to include different components shown in Chapter 5.

Table 2-1
Summary of M&R Cost Profiles

Model	GSFT	PRV	Annual M&R Cost per GSFT*	Annual M&R Cost as % of Repl. Value
Electrical Power, Backup	240	$781,790	$86.52	2.66%
Guard House	100	41,604	69.46	16.70
Central Plant, Boiler	1,100	703,471	40.61	6.35
Electrical Power, Substation	220	320,019	24.25	1.67
Data Center, Tier III	25,000	48,811,977	23.27	1.19
Central Plant, Chilled Water	9,175	7,048,429	20.60	2.68
Pump House	195	124,706	19.07	2.98
Central Plant, Steam	43,500	44,701,494	14.90	1.45
Laboratory, Agricultural	27,000	10,153,418	12.52	3.33
Restaurant, Fast Food	4,000	1,267,243	12.24	3.86
Laboratory, Electronics	30,200	10,237,918	10.71	3.16
Laboratory, Life Science	27,400	10,939,320	10.36	2.59
Car Wash	800	245,033	10.03	3.28
Apartments, 1-3 Story	22,500	4,691,880	9.91	4.75
Garage, Service Station	1,400	379,001	9.54	3.52
Natatorium	10,280	2,375,584	9.06	3.92
Restaurant	10,000	3,121,190	8.52	2.73
Laboratory, General	56,000	18,814,700	8.49	2.53
Apartments, 4-7 Story	60,000	12,121,945	8.34	4.13
Bank, Branch	4,100	1,059,447	8.27	3.20
Public Restroom	500	137,788	7.79	2.83
Motel, 40 Units	18,000	3,673,374	7.38	3.61
Fire Station	6,000	1,535,268	7.36	2.88
Laundry, Self-Service	3,000	655,482	7.25	3.32
Greenhouse, Research	2,100	454,647	7.21	3.33
Motel, 18 Units	8,000	1,747,953	6.97	3.19
Warehouse, HAZMAT	3,680	798,695	6.96	3.21
Clubhouse, Golf	6,000	1,663,465	6.74	2.43
Cafeteria	21,500	7,035,709	6.55	2.00
College Dormitory, 50 Room	25,000	6,547,845	6.33	2.42
Store, Convenience	4,000	826,087	5.73	2.78
Religious Education	10,000	2,726,217	5.67	2.08
Telecom Central Office	5,000	1,436,673	5.60	1.95
Hospital, Research	540,200	176,328,254	5.46	1.67
Hospital, General	125,000	48,607,650	5.45	1.40
College Student Union	25,000	5,387,525	5.38	2.49
Movie Theater	10,000	2,129,316	5.36	2.52
Visitor Center	20,700	4,915,035	5.22	2.20
Medical Clinic	13,000	4,078,007	5.13	1.64
Religious Assembly	17,000	4,327,530	4.99	1.96
Community Center	10,000	2,613,597	4.86	1.86
Store, Retail	8,000	1,652,174	4.79	2.32
Passenger Terminal	12,000	2,633,901	4.77	2.17
Apartments, 24 Story	220,000	44,426,778	4.71	2.33
College Auditorium	24,000	4,286,076	4.70	2.63
Court House	30,000	8,235,749	4.47	1.63
Municipal Building	11,000	2,908,266	4.42	1.67
Health Club w/Gymnasium	40,000	8,655,961	4.40	2.03
Mortuary	10,000	2,384,479	4.34	1.82
Post Office	13,000	1,919,555	4.18	2.83
Club, Social	22,000	5,185,803	4.09	1.74
Skating Rink	30,000	5,174,917	3.87	2.24
Day Care Center	12,000	2,941,441	3.85	1.57
Bowling Center	20,000	4,928,588	3.84	1.56
Manufacturing Plant, Process	50,700	12,091,083	3.82	1.60
Public Library, 3 Story	60,000	13,787,273	3.80	1.66
Jail, County	318,455	64,602,477	3.62	1.78
Maintenance Shop	12,100	2,574,282	3.56	1.67
Outdoor Pool	10,280	2,375,584	3.54	1.53
College Lecture Classrooms	90,000	18,321,957	3.48	1.71
Warehouse, Temperature Controlled	8,200	1,180,707	3.46	2.40
Elementary School	47,000	9,888,099	3.43	1.63
Warehouse, Self-storage	24,000	2,809,848	3.28	2.80
Office Building, 2 Story	83,000	16,561,720	3.16	1.58
Auto Salesroom	21,000	3,331,286	3.00	1.89
Manufacturing Plant, Light	45,000	10,896,218	3.00	1.24
Aircraft Hangar	32,000	9,332,007	2.97	1.02
Supermarket	96,000	16,391,086	2.85	1.67
Office Building, 15 Story	250,000	49,793,402	2.84	1.43
Manufacturing Plant, Machinery	384,000	84,626,798	2.80	1.27
Office Park	65,000	13,023,487	2.80	1.40
Store, Department	94,000	15,400,653	2.71	1.65
Warehouse, Dry	80,000	8,454,513	2.33	2.20
Garage, Parking	110,800	11,658,816	1.06	1.00

*Average costs over 50-year lifetime, Washington, D.C. area

From the cost analyst's perspective, the most useful information in these profiles is the year-by-year total shown under the "Cost per GSFT by System" section. A projection of M&R costs is required in the financial evaluation of virtually all large construction or renovation projects. Often this trend is estimated with a simple approximation (typically two to four percent of replacement value). This simplification obscures the oscillations in M&R requirements, and misstates costs when expressed in terms of present value. In comparison, Whitestone estimates are based on component life-cycles that provide a more realistic and defensible projection of M&R costs.

For the purposes of the facility manager, average values for M&R costs may be more useful than detailed year-to-year estimates. Conversations about facility funding and budgeting usually dwell on average costs per square foot, or average costs as a percentage of replacement value. Among our models, the highest average cost per gross square foot is for the Electrical Power, Backup ($86.52), while the Parking Garage had the lowest average cost ($1.06).

The reader may note the rankings in order of cost are different when expressed in terms of replacement value. The highest average M&R cost from this perspective was for the Guard House —17 percent of replacement value. A complete list of replacement costs is shown in Table A-1 in the Appendix. In general, we are wary of costs expressed in terms of replacement values because of the great variation in new construction costs and the difficulty of determining replacement costs for older assets. Replacement values have been completely revised based on a Whitestone survey of actual federal construction projects.

Profile estimates are sensitive to a variety of factors such as unscheduled maintenance rates, in-house shop rates, and facility utilization. These sensitivities are discussed in Chapter 6, Definitions and Methods.

Laboratory, General

Gross Square Feet:	56,000
Height in Ft:	25
Exterior:	Clay Brick
Floor coverings:	Carpet, Ceramic Tile, Finished Concrete
HVAC:	Chilled Water, Heat Exchanger, Single Zone
Capacity:	N/A
Occupancy:	500
Replacement Cost:	$18,814,700

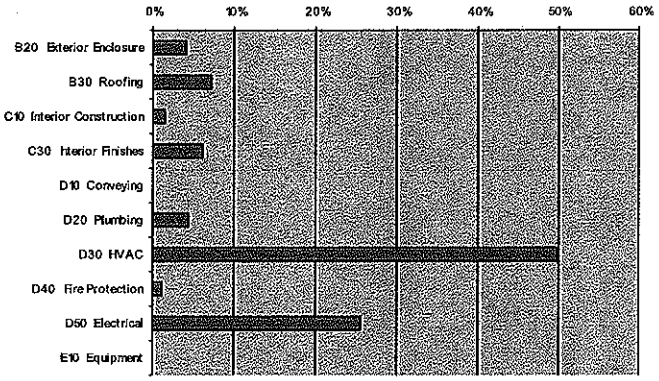
Components

Uniformat / Component	Quantity	Units
B20 Exterior Enclosure		
Aluminum Louver, 1st Floor	5	Each
Clay Brick, Exterior, 1st Floor	11000	Sq Ft
Concrete Block, Exterior, 1st Floor	12800	Sq Ft
Steel Single 12'x12', Painted, Roll-up Door	1	Each
Steel, Painted, Exterior Door	7	Each
B30 Roofing		
Single-Ply Thermoset Roof	56000	Sq Ft
C10 Interior Construction		
Movable Partitions, Office, Fabric, 6'	100	Ln Ft
Toilet Partitions, Painted Metal, Overhead Braced	16	Each
Steel, Painted, Interior Door	114	Each
C30 Interior Finishes		
Ceramic Tile, 4"x4", Interior Wall Finish	2500	Sq Ft
Gypsum Board, Interior Wall Finish	42700	Sq Ft
Carpet, Nylon 20 oz., High Traffic	13800	Sq Ft
Ceramic Tile Flooring	17000	Sq Ft
Concrete, Painted Flooring	25200	Sq Ft
Acoustical Tile, Dropped Ceiling	54400	Sq Ft
Gypsum Board, Finished Ceiling	1600	Sq Ft
D10 Conveying		
Hoist Electric, Overhead, Chain, 3 Ton	1	Each
D20 Plumbing		
Drinking Fountain, Refrigerated	2	Each
Lavatory, Vitreous China	27	Each
Service Sink, Iron, Enamel	2	Each
Sink, Stainless Steel	2	Each
Tankless Water Closet	16	Each
Urinal, Vitreous China	9	Each
Circulator Pump, 1/2 HP, Hot Water	1	Each
Circulator Pump, 1 HP, Cold Water	2	Each
Circulator Pump, 3 HP, Cold Water	3	Each
Pipe & Fittings, 3/4" Copper, Cold Water	1.7	K Ln Ft
Pipe & Fittings, 3/4" Copper, Hot Water	0.88	K Ln Ft
Pipe & Fittings, 2" Copper, Cold Water	0.8	K Ln Ft
Pipe & Fittings, 4" Copper, Cold Water	0.4	K Ln Ft
Pipe & Fittings, 4" Steel	1.5	K Ln Ft
Pipe & Fittings, 12" Steel	1.3	K Ln Ft
Pipe Insulation, Fiberglass, Cold Water	4	K Ln Ft
Pipe Insulation, Fiberglass, Hot Water	1.2	K Ln Ft
Water Heater, Gas/Oil, 275 Gph	1	Each
Backflow Preventer, 4"	2	Each
Floor Drain	4	Each
Pipe & Fittings, 4" Cast Iron	1.6	K Ln Ft
Pipe & Fittings, 6" Cast Iron	1.3	K Ln Ft
Pipe & Fittings, 4" PVC	0.777	K Ln Ft
Roof Drain, 4-6"	16	Each
Sump Pump, 1/2 HP	2	Each
Air Compressor, 25 HP	2	Each
Compressed Air Dryer	2	Each
Gas Compressor, 7 1/2 HP	2	Each
D30 HVAC		
Chemical Feed System	1	Each
Condensate Receiver Station, 10-15 Gal.	1	Each
Expansion Tank, 100 Gal.	2	Each
Expansion Tank, 400 Gal.	1	Each
Heat Exchanger, Steam-to-Water, 40 Gpm	1	Each
Steam Trap, F&T, 2"	6	Each
Valve, Non-Drain, 2"	430	Each
Valve, Non-Drain, 4"	50	Each
Chiller, Reciprocal Water-Cooled Hermetic, 100 Ton	1	Each
Circulation Pump, 5 HP, Chiller & Condenser Water	4	Each
Circulation Pump, 25 HP, Chiller & Condenser Water	2	Each
Cooling Tower, 100 Ton	2	Each
Evaporative Cooler, Indirect, 2,000 Scfm	12	Each
Evaporative Cooler, Indirect, 5,000 Scfm	1	Each
Pipe & Fittings, 2" Copper	0.5	K Ln Ft
Pipe & Fittings, 2" Steel	1.6	K Ln Ft
Pipe & Fittings, 3" Steel	1.8	K Ln Ft
Pipe & Fittings, 6" Steel	1.3	K Ln Ft
Pipe & Fittings, 8" Steel	0.3	K Ln Ft
Air Handler, Single Zone, 6,500 Cfm	2	Each
Air Handler, Single Zone, 10,000 Cfm	25	Each
Duct Insulation, Fiberglass Blanket	18200	Sq Ft
Ductwork	26000	Lbs

50-Year M&R Cost Summary

Task Type	50 Year Total Cost	Annual Cost per GSFT	Annual Cost as % of Replacement
PM & Minor Repair	$6,185,971	$2.21	0.66%
Unscheduled Maintenance	$4,635,141	$1.66	0.49%
Renewal & Replacement	$12,953,025	$4.63	1.38%
Total	**$23,774,137**	**$8.49**	**2.53%**

Distribution of M&R Costs



Thirty Most Costly M&R Tasks

M&R Task	Task Cost*	Pct.**
Replace MV Switchgear, >1,200 Amp.	46.57	13.6%
Replace Air Handler, Single Zone, 10,000 Cfm	29.58	8.7%
Maintain Air Handler, Single Zone, 10,000 Cfm	22.44	6.6%
Lubricate, Repack Gland, Valve, Non Drain, 2"	21.64	6.3%
Replace Membrane, Single-Ply Thermoset Roof	19.28	5.6%
Replace Valve, Non-Drain, 2"	15.84	4.6%
Replace Carpet, Nylon 20 oz., High Traffic	8.54	2.5%
Refinish Gypsum Board, Interior Wall Finish	7.66	2.2%
Replace Ceramic Tile Flooring	6.25	1.8%
Maintain Power Panel Board, 208 Y/120 V, 200 Amp.	6.15	1.8%
Maintain Evaporative Cooler, Indirect, 2,000 Scfm	5.87	1.7%
Replace Power Panel Board, 208 Y/120 V, 200 Amp.	5.81	1.7%
Replace Evaporative Cooler, Indirect, 2,000 Scfm	5.32	1.6%
Maintain Single-Ply Thermoset Roof	5.26	1.5%
Maintain Direct Digital Controls, System Points	5.06	1.5%
Replace Circuit Breaker, Main, MV, 600 V, 1,600 Amp.	4.60	1.3%
Replace Direct Digital Controls, System Points	4.52	1.3%
Replace Transfer Switch, HV, Auto, 600 V	4.02	1.2%
Replace Valve, Non-Drain, 4"	3.54	1.0%
Maintain Chemical Feed System	3.33	1.0%
Clean & Seal Concrete Block, Exterior, 1st Floor	3.14	0.9%
Replace Steel, Painted, Interior Door Locks	3.07	0.9%
Replace Chiller, Reciprocal Water-Cooled Hermetic, 100 Ton	2.97	0.9%
Clean & Reseal Clay Brick, Exterior, 1st Floor	2.71	0.8%
Repair Air Handler, Single Zone, 10,000 Cfm	2.67	0.8%
Lubricate, Repack Gland, Valve, Non Drain, 4"	2.52	0.7%
Maintain Cooling Tower, 100 Ton	2.44	0.7%
Replace Batteries & Check Operation, Smoke Detector	2.17	0.6%
Replace Cooling Tower, 100 Ton	1.99	0.6%
Maintain Chiller, Reciprocal Water-Cooled Hermetic, 100 Ton	1.96	0.6%

**Task cost ($2010) per GSFT over 50 years.*

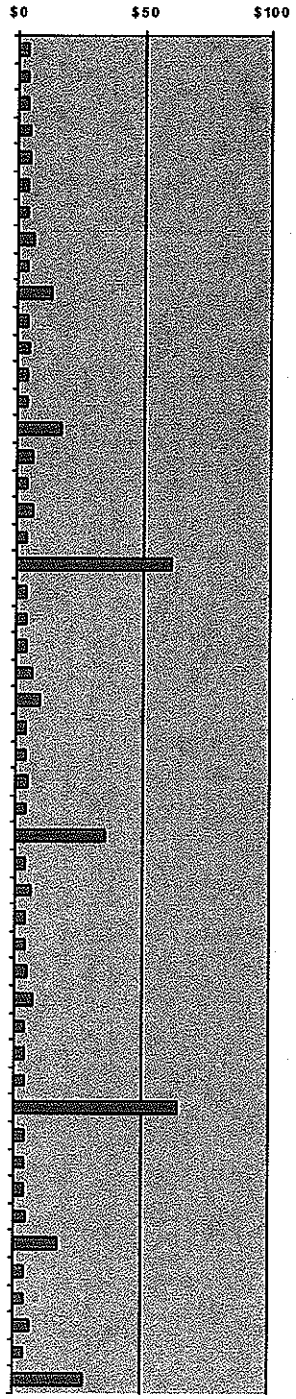
***Percent of total M&R costs.*

Note: For a complete list of components see Chapter 2.2. For alternative locations use the Local Indexes shown in Chapter 3.

Cost per GSFT by System

Asset Age	Exterior Closure	Roofing	Interior Construction	Stairways	Interior Finishes	Conveying Systems	Plumbing	HVAC Systems	Fire Protection	Electrical	Equipment	Special Construction	Site Improvements	Total per GSFT
1		.20				.00	.15	2.65	.05	.58	.00			**3.64**
2		.20			.03	.00	.22	2.65	.05	.61	.00			**3.77**
3		.20				.00	.15	2.70	.05	.58	.00			**3.69**
4		.20	.05		.70	.00	.28	2.65	.05	.61	.00			**4.56**
5	.01	.33	.19			.00	.23	2.70	.08	.75	.00			**4.31**
6		.20			.03	.00	.22	2.70	.05	.61	.00			**3.82**
7		.20				.00	.19	2.66	.05	.58	.00			**3.69**
8		.20	.05		2.09	.00	.29	2.65	.05	.61	.00			**5.96**
9		.20			.06	.00	.15	2.70	.05	.58	.00			**3.75**
10	2.85	.53	.81		.35	.00	.60	5.71	.25	2.34	.03			**13.47**
11		.20				.00	.15	2.65	.05	.58	.00			**3.64**
12		.20	.05		.70	.00	.49	2.69	.15	.61	.00			**4.89**
13		.20				.00	.15	2.69	.05	.58	.00			**3.68**
14		.20			.03	.00	.26	2.66	.05	.61	.00			**3.82**
15	.03	.33	.19		.20	.00	.34	14.48	.11	1.12	.00			**16.83**
16		.20	.05		2.09	.00	.29	2.69	.05	.61	.00			**6.00**
17		.20				.00	.16	2.65	.08	.58	.00			**3.68**
18		.20			.09	.00	.22	2.66	.05	3.17	.00			**6.39**
19		.20				.00	.15	2.69	.05	.58	.00			**3.68**
20	2.85	9.64	1.08		1.07	.00	1.30	18.41	.22	26.38	.03			**60.99**
21		.20				.00	.19	2.67	.05	.58	.00			**3.70**
22		.20			.03	.00	.23	2.65	.08	.61	.00			**3.80**
23		.20				.00	.15	2.69	.05	.61	.00			**3.71**
24		.20	.05		2.09	.00	.49	2.69	.15	.61	.00			**6.29**
25	1.61	.33	.23		.00	.08	1.95	4.25	.06	.94	.00			**9.46**
26		.20			.03	.00	.22	2.69	.05	.61	.00			**3.81**
27		.20			.06	.00	.15	2.66	.05	.58	.00			**3.71**
28		.20	.05		.70	.00	.26	2.66	.05	.64	.00			**4.57**
29		.20				.00	.23	2.69	.08	.58	.00			**3.79**
30	2.88	.53	.81		.55	.00	.74	17.41	.28	11.61	.03			**34.83**
31		.20				.00	.15	2.65	.05	.58	.00			**3.64**
32		.20	.05		2.09	.00	.22	2.65	.05	.61	.00			**5.89**
33		.20				.00	.22	2.70	.05	.61	.00			**3.79**
34		.20			.03	.00	.23	2.65	.08	.61	.00			**3.80**
35	.06	.33	.19			.00	.82	2.71	.06	.73	.00			**4.91**
36		.20	.05		.76	.00	.36	2.73	.15	3.17	.00			**7.43**
37		.20				.00	.28	2.66	.05	.58	.00			**3.78**
38		.20			.03	.00	.16	2.65	.05	.61	.00			**3.71**
39		.20				.00	.21	2.70	.05	.58	.00			**3.75**
40	2.84	9.64	1.08		2.46	.00	1.22	19.79	.22	26.59	.03			**63.88**
41		.20				.00	.29	2.65	.08	.61	.00			**3.83**
42		.20			.03	.00	.20	2.66	.05	.61	.00			**3.76**
43		.20				.00	.21	2.69	.05	.58	.00			**3.75**
44		.20	.05		.70	.00	.16	2.66	.05	.61	.00			**4.44**
45	.05	.33	.19		.26	.00	.60	14.49	.11	1.09	.00			**17.14**
46		.20			.03	.00	.17	2.69	.08	.64	.00			**3.81**
47		.20				.00	.21	2.65	.05	.58	.00			**3.70**
48		.20	.05		2.09	.00	.36	2.69	.15	.61	.00			**6.16**
49		.20				.00	.32	2.69	.05	.58	.00			**3.86**
50	4.44	.53	.85		6.61	.08	2.06	4.76	.32	7.91	.03			**27.58**
Total	**17.62**	**30.39**	**6.15**		**25.98**	**.36**	**19.02**	**211.65**	**4.42**	**108.63**	**.31**			**424.54**

50-Year Total M&R Cost Profile per GSFT



A value of ".00" means a cost of more than $.000 but less than $.005 per GSFT.

Note: For a complete list of components see Chapter 2.2. For alternative locations use the Local Indexes shown in Chapter 3.

3. Local M&R Costs

The statistics in this chapter focus on local maintenance costs for 255 major North American and International areas. Three types of measures are presented:

Section 3.1: Local maintenance cost indexes measure M&R costs across areas.

Section 3.2: In-house shop rates for trades and supervisory positions common to facility staff.

Section 3.3: Contract labor rates for trades common in M&R construction.

The local maintenance cost index is based on the M&R costs of the 2 Story Office Building (shown in Chapter 2) standardized to the Washington, D.C. area. The range of the index is considerable, as Table 3-1 indicates. Costs in New York, NY are an estimated 29% higher than those in Washington, D.C. for the same asset. In the other direction, M&R costs in Beijing, CHN are an estimated 76% lower than the Washington, D.C. value. This index can be used for simple comparisons among areas, and also used to adjust the cost profiles in Chapter 2 for areas other than Washington, D.C. For a listing of international contract labor and in-house shop rates; see tables A-5 and A-6 in Appendix 1.

Table 3-1
Comparison of M&R Costs by Area

Area	Local Maintenance Cost Index*	Area	Local Maintenance Cost Index*	Area	Local Maintenance Cost Index*	Area	Local Maintenance Cost Index*	Area	Local Maintenance Cost Index*
New York, NY	128.5	Albany, NY	97.7	Atlanta, GA	90.4	Little Rock, AR	83.9	**International Cities+**	
Yonkers, NY	128.5	Annapolis, MD	97.5	Manchester, NH	90.3	Boise, ID	83.9		
San Francisco, CA	125.2	Baltimore, MD	97.5	Dover, DE	89.7	Montgomery, AL	83.8	Zurich, CHE	105.5
Philadelphia, PA	121.4	Indianapolis, IN	97.5	Cedar Rapids, IA	89.7	Cheyenne, WY	83.6	Berlin, DEU	87.5
New Brunswick, NJ	121.4	Madison, WI	97.5	Denver, CO	89.7	Tucson, AZ	83.6	Paris, FRA	78.5
Trenton, NJ	121.4	Terre Haute, IN	97.4	Beaumont, TX	89.6	Beaufort, SC	83.5	Sydney, AUS	75.2
Jersey City, NJ	120.7	Worcester, MA	97.4	Altus, OK	89.0	Charleston, SC	83.5	Tokyo, JPN	64.5
Morristown, NJ	120.7	Sacramento, CA	97.4	Louisville, KY	88.9	Dallas, TX	83.4	London, GBR	63.6
Newark, NJ	120.7	Duluth, MN	97.4	Toledo, OH	88.8	Orlando, FL	83.3	Sao Paulo, BRA	55.2
Camden, NJ	120.5	Moline, IL	97.3	Baton Rouge, LA	88.7	Amarillo, TX	83.2	Seoul, KOR	49.4
Chicago, IL	118.1	Akron, OH	97.3	Great Falls, MT	88.6	Huntsville, AL	83.2	Istanbul, TUR	45.8
Oakland, CA	115.3	Salem, OR	97.3	Grand Rapids, MI	88.5	Columbia, SC	83.2	Abu Dhabi, UAE	38.1
San Jose, CA	113.9	Evansville, IN	97.1	Phoenix, AZ	88.5	Las Cruces, NM	83.2	Buenos Aires, ARG	37.7
Springfield, IL	113.0	Springfield, MA	97.0	Utica, NY	88.3	Fort Worth, TX	82.5	Riadh, SAU	36.2
Hilo, HI	112.7	Rochester, MN	96.8	Savannah, GA	88.1	Oklahoma City, OK	82.5	Johannesburg, ZAF	31.9
Honolulu, HI	112.7	Santa Barbara, CA	96.5	Lewiston, ME	87.6	Springfield, MO	82.1	Mexico City, MEX	30.7
Ann Arbor, MI	111.1	Youngstown, OH	96.4	Mobile, AL	87.5	Roanoke, VA	82.0	Moscow, RUS	30.6
Rockford, IL	108.2	San Diego, CA	95.9	Biloxi, MS	87.4	Bowling Green, KY	81.8	St. Petersburg, RUS	30.3
Minneapolis, MN	107.8	Lowell, MA	95.9	Spokane, WA	87.4	Raleigh-Durham, NC	81.8	Cairo, EGY	29.6
St. Paul, MN	107.8	Providence, RI	95.9	Chattanooga, TN	87.4	Knoxville, TN	81.7	Shanghai, CHN	29.4
St. Louis, MO	107.6	Anacortes, WA	95.8	Wichita Falls, TX	87.3	Nashville, TN	81.0	Karachi, PAK	28.5
Kansas City, MO	107.5	Brockton, MA	95.7	St. George, UT	87.2	Fayetteville, AR	80.9	Mumbai, IND	26.3
Las Vegas, NV	107.3	Jefferson City, MO	95.6	Lincoln, NE	87.0	Macon, GA	80.9	Beijing, CHN	24.1
Atlantic City, NJ	106.9	Buffalo, NY	95.4	Sioux City, IA	87.0	Charlotte, NC	80.8		
Peoria, IL	106.6	Riverside, CA	95.4	Shreveport, LA	87.0	Pierre, SD	80.4		
Detroit, MI	105.9	Reno, NV	95.3	Richmond, VA	86.9	Rapid City, SD	80.4		
Boston, MA	105.8	Oxnard, CA	95.2	Houston, TX	86.8	Bismarck, ND	80.2		
Norwalk, CT	105.5	Cincinnati, OH	94.9	Colorado Springs, CO	86.8	Daytona Beach, FL	80.1		
Stamford, CT	105.5	Flint, MI	94.9	Jacksonville, FL	86.7	Columbus, GA	80.0		
New Haven, CT	104.6	Olympia, WA	94.9	Hampton, VA	86.7	Fort Smith, AR	80.0		
Gary, IN	103.7	Davenport, IA	94.7	Newport News, VA	86.7	Greensboro, NC	79.7		
Seattle, WA	103.4	Cumberland, MD	94.5	Norfolk, VA	86.7	Sioux Falls, SD	79.1		
Portland, OR	103.3	Fresno, CA	94.3	Virginia Beach, VA	86.7	Winston-Salem, NC	78.9		
Waterbury, CT	103.2	Harrisburg, PA	94.0	Waco, TX	86.6	Tallahassee, FL	78.8		
Danbury, CT	103.2	Pueblo, CO	94.0	Miami, FL	86.6	Fargo, ND	78.5		
Springfield, OH	103.1	Saginaw, MI	93.3	Wichita, KS	86.5	Lubbock, TX	78.3		
Lansing, MI	103.0	Columbus, OH	93.2	Fort Lauderdale, FL	86.4	Alamogordo, NM	77.7		
Pittsburgh, PA	102.9	Syracuse, NY	93.1	Albuquerque, NM	86.0	El Paso, TX	77.1		
Juneau, AK	101.9	Watertown, NY	93.1	Frankfort, KY	85.8	Hagatna, GU	75.9		
Milwaukee, WI	101.8	Dayton, OH	92.9	Lexington, KY	85.8	San Juan, PR	69.6		
Anchorage, AK	101.3	Rochester, NY	92.8	Sante Fe, NM	85.6				
Kokomo, IN	101.2	South Bend, IN	92.7	Austin, TX	85.5	**Canadian Cities+**			
Hartford, CT	101.1	Stockton, CA	92.6	Pocatello, ID	85.5				
Anaheim, CA	101.0	Green Bay, WI	92.6	Birmingham, AL	85.3	Calgary, AB	97.8		
Los Angeles, CA	101.0	Muncie, IN	92.5	Portland, ME	85.2	Toronto, ON	97.6		
Norwich, CT	100.8	New Orleans, LA	92.3	Jackson, MS	85.1	Ottawa, ON	96.6		
Cleveland, OH	100.3	Concord, NH	92.3	Memphis, TN	85.1	Hamilton, ON	96.4		
Charleston, WV	100.1	Topeka, KS	92.2	Corpus Christi, TX	85.0	London, ON	96.4		
Washington, D.C.	100.0	Erie, PA	92.1	Ogden, UT	84.8	Vancouver, BC	96.3		
Tacoma, WA	99.9	Fall River, MA	92.0	Salt Lake City, UT	84.8	Edmonton, AB	96.2		
Parkersburg, WV	99.6	Medford, OR	92.0	Key West, FL	84.8	Victoria, BC	95.3		
Carson City, NV	99.5	Des Moines, IA	91.8	Tulsa, OK	84.7	Halifax, NS	94.1		
Fairbanks, AK	99.4	Battle Creek, MI	91.6	San Antonio, TX	84.4	Montreal, QC	93.0		
Bakersfield, CA	99.4	Kalamazoo, MI	91.6	Owensboro, KY	84.4	Quebec City, QC	90.5		
Richland, WA	99.2	Lawton, OK	91.3	Tuscaloosa, AL	84.2	St. John's, NL	88.3		
Wilmington, DE	99.0	Omaha, NE	91.0	Augusta, ME	84.1	Regina, SK	85.9		
Marquette, MI	99.0	Helena, MT	90.9	Tampa, FL	84.1	Winnipeg, MB	84.7		
Scranton, PA	98.6	Billings, MT	90.8	Burlington, VT	84.1				
Reading, PA	98.5	Boulder, CO	90.6	Montpelier, VT	84.1				
Eugene, OR	97.9	Eau Claire, WI	90.6	Rutland, VT	84.0				

*Total average cost, Washington D.C.=100
+Adjusted using 5/14/10 exchange rate from Reuters.com

3.1 Local Maintenance Cost Indexes, Selected North American Areas

Area	Cost per GSFT*	Local Index	255 Area Ranking
Charleston, WV			
PM & Minor Repair	$.61	96.4	56
Unscheduled Maintenance	$.46	96.3	50
Renewal & Replacement	$2.08	102.1	44
Total Average Cost	$3.15	100.1	48
Charlotte, NC			
PM & Minor Repair	$.45	70.8	220
Unscheduled Maintenance	$.30	63.6	218
Renewal & Replacement	$1.79	87.9	210
Total Average Cost	$2.54	80.8	218
Chattanooga, TN			
PM & Minor Repair	$.54	84.9	136
Unscheduled Maintenance	$.38	80.0	138
Renewal & Replacement	$1.83	89.9	186
Total Average Cost	$2.75	87.4	152
Cheyenne, WY			
PM & Minor Repair	$.52	81.6	153
Unscheduled Maintenance	$.37	77.3	153
Renewal & Replacement	$1.74	85.8	222
Total Average Cost	$2.63	83.6	198
Chicago, IL			
PM & Minor Repair	$.76	119.6	13
Unscheduled Maintenance	$.58	121.0	13
Renewal & Replacement	$2.38	116.9	3
Total Average Cost	$3.72	118.1	11
Cincinnati, OH			
PM & Minor Repair	$.55	86.9	121
Unscheduled Maintenance	$.40	83.1	122
Renewal & Replacement	$2.04	100.2	59
Total Average Cost	$2.99	94.9	96
Cleveland, OH			
PM & Minor Repair	$.65	101.3	38
Unscheduled Maintenance	$.48	100.9	39
Renewal & Replacement	$2.03	99.8	63
Total Average Cost	$3.16	100.3	47
Colorado Springs, CO			
PM & Minor Repair	$.51	80.3	160
Unscheduled Maintenance	$.36	74.9	161
Renewal & Replacement	$1.86	91.5	169
Total Average Cost	$2.73	86.8	160
Columbia, SC			
PM & Minor Repair	$.46	71.5	216
Unscheduled Maintenance	$.30	63.8	217
Renewal & Replacement	$1.86	91.4	172
Total Average Cost	$2.62	83.2	206
Columbus, GA			
PM & Minor Repair	$.44	68.6	227
Unscheduled Maintenance	$.29	60.2	229
Renewal & Replacement	$1.79	88.2	206
Total Average Cost	$2.52	80.0	223
Columbus, OH			
PM & Minor Repair	$.53	82.5	150
Unscheduled Maintenance	$.38	79.3	143
Renewal & Replacement	$2.03	99.9	62
Total Average Cost	$2.93	93.2	106
Concord, NH			
PM & Minor Repair	$.55	85.7	130
Unscheduled Maintenance	$.38	79.9	140
Renewal & Replacement	$1.98	97.2	94
Total Average Cost	$2.90	92.3	117
Corpus Christi, TX			
PM & Minor Repair	$.47	74.2	199
Unscheduled Maintenance	$.32	68.1	200
Renewal & Replacement	$1.88	92.4	156
Total Average Cost	$2.68	85.0	181
Cumberland, MD			
PM & Minor Repair	$.56	87.4	119
Unscheduled Maintenance	$.41	85.4	111
Renewal & Replacement	$2.01	98.8	74
Total Average Cost	$2.97	94.5	100
Dallas, TX			
PM & Minor Repair	$.49	76.6	183
Unscheduled Maintenance	$.34	70.7	179
Renewal & Replacement	$1.80	88.5	202
Total Average Cost	$2.62	83.4	202
Danbury, CT			
PM & Minor Repair	$.61	95.7	64
Unscheduled Maintenance	$.44	92.1	76
Renewal & Replacement	$2.20	108.1	24
Total Average Cost	$3.25	103.2	35
Davenport, IA			
PM & Minor Repair	$.59	92.0	91
Unscheduled Maintenance	$.43	90.6	86
Renewal & Replacement	$1.96	96.5	104
Total Average Cost	$2.98	94.7	99
Dayton, OH			
PM & Minor Repair	$.53	83.8	143
Unscheduled Maintenance	$.38	79.4	142
Renewal & Replacement	$2.01	99.0	70
Total Average Cost	$2.93	92.9	110

*Annual average costs, over a 50 year service life, of maintaining the 2 Story Office Building shown in Chapter 2.
Note: Local Indexes are standardized (equal 100) for the Washington D.C. area.

Fermilab Work Smart Set

INTRODUCTION

Fermilab has adopted the Necessary and Sufficient (N&S) Process for determining the Work Smart Set of Standards (WSS) to determine the appropriate ES&H standards to ensure the safe and environmentally responsible operations of the laboratory. Fermilab, in conjunction with participation from, the DOE FSO, the Chicago Operations Office (CH) and the Office of Science (SC), conducted the first site-wide application of the Departmental N&S Closure Process. The result was a set of significant hazard aspects and impacts that were used to establish a Work Smart Set of Standards (WSS). The WSS were incorporated into the prime contract with DOE. These standards, if properly implemented, provide adequate assurance that the public, workers, and environment are protected from adverse consequences. Fermilab's work activities, the hazards associated with the work, and the standards are reviewed on an annual basis, and revised as needed. Additionally, new standards promulgated by DOE or national standards-making bodies (e.g. National Fire Protection Association) are evaluated and incorporated into the WSS as appropriate.

RESPONSIBILITIES

The Chief Operating Officer is responsible for assuring that suggested changes to Fermilab's WSS are incorporated into the FRA contract with DOE.

The ESH Section Head is responsible for

- Conducting annual review of WSS and recommending to Fermilab management changes to the set.
- Distributing copies of the revised WSS to the Library.

The Laboratory Services, Information Resources Department Manager is responsible for assuring that all WSS are available through the library system.

PROGRAM DESCRIPTION

The WSS shall be reviewed on an annual basis. The ESH Section Head will transmit to the Chief Operating Officer recommendations of changes to the WSS. Once the set has been accepted by DOE-FSO and incorporated into the contract with FRA, copies shall be distributed to the Library and the FESHM chapter.

Appendix A
Fermilab Work Smart Set of Standards

10 CFR 1021 (DOE NEPA rules)
10 CFR 1022 (Compliance with Floodplain/Wetlands environmental review requirements)
10 CFR 1046 Subpart B, App. A, Chapter X, par. H through I inclusive. (Physical protection of security interests, protective force personnel)
10 CFR 835 (Occupational radiation protection - applicable and enforceable portions)
10 CFR 850 (Chronic Beryllium Disease Prevention Program)
10 CFR 851 (Worker Safety and Health Program)
10 CFR 860 (Trespass to land owned & leased by the U.S. Government)
17 IAC 525 and permit pursuant (Nuisance animal trapping permits)
17 IAC 3702 (Construction and Maintenance of Dams)
18 U.S. Code Sections 841-848 (Use, or threat of use, of explosives; includes civil disorders)
28 CFR 36 (Section 302(b)(2) of the Americans with Disabilities Act and Section 4.1.3(9) of the ADAAG -- accommodations and accessibility)
29 CFR 1903.13 (Imminent danger)
29 CFR 1903.2 (Posting of notice...)
29 CFR 1904 (Recordkeeping and reporting occupational injuries and illnesses)
29 CFR 1910 (OSHA general industry standards - applicable and enforceable portions)
29 CFR 1926 (OSHA construction industry standards - applicable and enforceable portions)
29 CFR 1928 Subpart C (Roll-over protective structures - applicable and enforceable portions)
29 CFR 1928 Subpart D (Safety for agricultural equipment - applicable and enforceable portions)
29 CFR 1977.12 (Exercise of any right afforded by the Act)
29 CFR 1977.4 (Persons prohibited from discriminating)
29 IAC Chapter 1, Subchapter f (Emergency services, disasters, and civil defense /ESDA/ chemical safety)
33 CFR 320-323, 328-330 (Army Corp of Engineers wetlands regs)
35 IAC (State of IL environmental regs - applicable and enforceable portions)
36 CFR 60, 63, 65 (National historic landmark program)
36 CFR 78-79 (NHPA waiver and collection curation regs)
36 CFR 800 (Protection of historic and cultural properties)
40 CFR (Federal environmental regs - applicable and federally-enforceable portions)
41 IAC 100 (Fire prevention and safety)
41 IAC 120 (Boiler and pressure vessels)
41 IAC 140 (Policy and procedures manual for fire protection personnel)
41 IAC 160 (Storage, transportation, sale and use of gasoline and volatile oils: rules relating to general storage)
41 IAC 170 (Storage, transportation, sale and use of petroleum and other regulated substances)
41 IAC 180 (Storage, transportation, sale and use of volatile oils)
43 CFR 7 (Archaeological collections)
49 CFR (Offsite) Parts 100-177 (Applicable Parts) Parts 178-199 (Applicable Parts) Parts 382-399 (Applicable Parts)
49 CFR (Onsite) Parts 382-399 (Applicable Parts) 177.848 (Segregation Table for Hazardous Materials)
50 CFR 17 (Endangered species rules)
71 IAC 400 (Illinois accessibility code, Subparts C-F)

77 IAC 830 (Structural pest control code)
77 IAC 855 (Rules for Asbestos Abatement for Public & Private Schools and Commercial & Public Buildings in Illinois)
77 IAC 890 (Plumbing code)
77 IAC 900 (Drinking water systems requirements)
77 IAC 905 (Private Sewage Disposal Code)
77 IAC 920 (Water well construction code)
77 IAC 925 (Well pump installation)
92 IAC 700 and all permits pursuant (Construction in water course permit application)
92 IAC 704 and all permits pursuant (Regulation of public waters)
92 IAC 708 and all permits pursuant (Floodway construction permit application)
105 ILCS 105 (Asbestos Abatement Act)
225 ILCS 207 (Commercial and Public Building Asbestos Abatement Act)
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ANSI A 17.3 (Elevator Maintenance)
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ANSI B15.1 (Power transmission apparatus)
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ANSI Z88.2 (Respiratory Protection) 1992
ANSI Z136.1 (Lasers), 2000
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ANSI/ASME B30.10 (Hooks) 2005
ANSI/ASME B30.11 (Monorails and Underhung Cranes) 2004
ANSI/ASME B30.16 (Overhead Hoists (Underhung)) 2003
ANSI/ASME B30.17 (Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)) 2003
ANSI/ASME B30.2 (Overhead and gantry cranes) 2005
ANSI/ASME B30.20 (Below the hook lifting devices) 2006
ANSI/ASME B30.21 (Manually Lever Operated Hoists) 2005
ANSI/ASME B30.22 (Articulating Boom Cranes) 2002
ANSI/ASME B30.5 (Mobile and locomotive truck cranes) 2004
ANSI/ASME B30.9 (Slings) 2003
ANSI/ASME B31.1 (Power piping) 2001, B31.1a 2002, Addenda to b 31.1 2001
ANSI/ASME B31.3 (Process Piping) 2004
ANSI/ASME B31.5 (Refrigeration piping) 2001
ANSI/ASME B31.8 (Gas transmission and piping systems) 2003
ANSI/ASME B31.9 (Building Services Piping) 1996
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Archaeological Resources Protection Act of 1979 [amended], 16 USC 470aa et seq.
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ASME B20.1-1996 (Safety Standard for Conveyors & Related Equipment)
Atomic Energy Act of 1954 [amended], 42 USC 2011 et seq.
ANSI N323A-1997 (Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments)
ANSI N323D-2002 (American National Standard for Installed Radiation Protection Instrumentation)

Batavia Code of Regulations, City Ordinance, Section 8-3-10-3
International Building Code Fire Prevention Code (latest edition)
International Building Code (latest edition)
Boiler & Pressure Vessels of the Illinois Office of the State Fire Marshall - applies to CUB Boilers Only
CERCLA/SARA, 42 USC 9601 et seq.
City Code of Warrenville, IL Title 7, Chapter 4, sewer/sewerage ordinance
Clean Air Act Amendments 1990, 42 USC 7401 et seq., and Illinois State Implementation Plan, 40 CFR 52 Subpart O
Clean Water Act, 33 USC 1251 et seq.
DOE Order 420.1A Fire Protection (Section 4.2)
DOE Order 5400.5 Derived Concentration Guide Table and dose limits to the public (Chapter 2, Section 1; Chapter 3)
DOE Manual 231.1A (Environment, Safety and Health Reporting Manual), as it applies to injury recordkeeping only, September 9, 2004
DuPage County Health Department Private Water Supply Ordinance (Chapter 18, Article 18-4, DuPage County Code)
E.O. 11988 (Floodplain Management)
E.O. 11990 (Protection of Wetlands)
E.O. 12580 (Implementation of superfund)
E.O. 13101 (Greening the Government through Waste Prevention, Recycling, and Federal Acquisition)
E.O. 13058 (Protecting Federal Employees and the Public from Exposure to Tobacco Smoke in the Federal Work Place)
E.O. 13148 (Greening the Government through Leadership in Environmental Management)
E.O. 13149 (Greening the Government through Federal Fleet and Transportation Efficiency)
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FESHM 3010 (Significant and Reportable Occurrences) (formerly, Occurrence reporting)
FESHM 5031 (Pressure vessels)
FESHM 5031.1 (Pressure piping systems)
FESHM 5032 (Cryogenic system review)
FESHM 5032.1 (Liquid nitrogen dewar installation rules)
FESHM 5032.2 (Guidelines For the Design, Fabrication, Testing, Installation, and Operation of LH2 Targets)
FESHM 5032.3 (Transporting gases in building elevators)
FESHM 5033 (Vacuum vessel safety)
FESHM 5033.1 (Vacuum window safety)
FESHM 5035 (Mechanical refrigeration systems)
FESHM 5040 (Fermilab electrical safety program)
FESHM 5041 (Electrical utilization equipment safety)
FESHM 5042 (AC electrical power distribution safety)
FESHM 5043 (Management and use of cable tray systems)
FESHM 5044 (Protection against exposed electrical bus)
FESHM 5046 (Low voltage, high current power distribution systems)
FESHM 5064 (Oxygen deficiency hazards)
FESHM 5084 (Ergonomics Program)
FESHM 6020.3 (Installation of flammable gas lines in or near cable trays)

FESHM 9030 (Aviation safety)
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Illinois Chemical Safety Act, 430 ILCS 45/1 et seq.
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Illinois Endangered Species Protection Act, 520 ILCS 10/1 et seq.
Illinois Ground Water Protection Act, 415 ILCS 55/1 et seq.
Illinois Health and Safety Act, 820 ILCS 225/1 et seq.
Illinois Pesticide Act, 415 ILCS 60/1 et seq.
Illinois Structural Pesticide Act, 225 ILCS 235/1 et seq.
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National Fire Protection Association Codes and Standards (NFPA Standards - applicable portions)
NFPA (National Electric Code), 2005
NFPA 70E (Standard for Electrical Safety in the Workplace), 2004
National Historic Preservation Act of 1966 [amended], 16 USC 470 et seq.
Native American Graves Protection and Repatriation Act of 1990, 25 USC 3001 et seq.
NEPA, 42 USC 4321 et seq.
OSH Act, 29 USC 654(a)(1) -- General duty clause.
Privacy Act of 1974, 5 USC 552a
RCRA Part B Permit (Illinois Log #131), including Emergency Contingency plan
RCRA, 42 USC 6901 et seq.
Recommended standards for Water Works, Great Lakes Upper Mississippi R. Bd. of State Public Health & Environmental Managers (1992)
Safe Drinking Water Act, 42 USC 300f et seq.
Standard Methods for the Examination of Water and Wastewater, 18th Ed., APHA (1992)
Standards and Specifications for Soil Erosion and Sediment Control, 10/87, IEPA 87-102
TSCA, 15 USC 2601 et seq.
UL Listing
Uniform Federal Accessibility Standards, Chapter 4, Accessible Elements and Spaces: Scope and Technical Requirements
Energy Solutions LLC Bulk Waste Disposal and Treatment Facilities Waste Acceptance Criteria
Rather than attempt a precise analysis of all necessary standard citations to exclude non-applicable parts, inclusive citations were made qualified by the phrase "applicable and enforceable parts thereof." To the extent these standards apply to DOE and not the contractor, the contractor will assist DOE in complying with them. This Set does not change any existing Federal, State or local enforcement authority. For standards not applicable as a matter of law (other than FESHM provisions), the applicable version shall be the revision in effect on July 14, 1995, unless otherwise indicated. For FESHM provisions, the applicable version shall be the most recent version established through the procedures set forth in Appendix I.

Fermilab
ESH Section

Multi-Organization Construction Site Safety Walkthrough

1.0 Background and Purpose

Background: The vast majority of incidents happen when barriers are bypassed, procedures are not followed or there are departures by workers from safe behaviors. Unsafe conditions have historically been a small percentage of the causes of accidents whereas behaviors or unsafe acts are the bulk of the causes. In order to eliminate these incidents from the workplace we must concentrate our efforts to those actions that will have the biggest return on "investment" such as the elimination of unsafe behaviors and the evaluation of work processes and barriers to determine conformance with accepted practices.

Purpose: To establish a process for conducting formal safety program evaluations and field assessments through site safety walkthroughs for construction activities. These walk-throughs should consider management systems, employee behaviors, conformance to the subcontractor safety plan, and performance to Fermilab requirements as expressed in contractual documents, pre-bid and pre-construction meetings.

2.0 Scope

This procedure applies to all active construction activities that require a multi-organizational scrutiny as designated by the Chief Operating Officer.

3.0 Responsibilities

3.1 Construction Manager

3.1.1 Determine the frequency of walkthroughs based upon input received from the Chief Operating Officer and the Project Manager. Frequency should be identified in the Project Execution Plan (PEP).

3.1.2 Identify walk-through team members. The team should be kept to a reasonable size and may include the Construction Manager, Construction Coordinator, Subcontractor Superintendent, a representative from the Fermilab ESH Section, a representative from the Department of Energy Fermi Site Office if requested, and a Project ESH Coordinator, if one is assigned.

3.1.3 Conduct a closeout meeting as described below.

3.2 Construction Coordinator

3.2.1 Assist the Construction Manager in the walkthrough process as requested. Such requests may include:

3.2.1.1 Transmit all concerns to the Sub-Contractor for resolution and provide copies to all team members.

3.2.1.2 Review corrective action responses from the Sub-Contractor and provide feedback to the Construction Manager and the Project ES&H Coordinator.

3.2.1.3 Track responses to action items (in a formal database, daily/weekly logs or construction meeting minutes).

3.2.1.4 Document & distribute closeout-meeting minutes.

3.3 ES&H Section Representative

3.3.1 Provide technical support relative to safety issues.

3.4 Project ES&H Coordinator

3.4.1 Participate in walkthroughs keeping an eye especially toward safety issues that would impact installation and operational activities that will follow construction.

3.4.2 Provide feedback from walkthroughs and closeout meetings directly to the Project Manager.

4.0 Procedure

4.1 The Construction Manager (CM) will identify the time and frequency of the walkthrough.

4.2 The CM will develop an agenda for the walk-through and identify any specific areas to focus on. Appendix A should be used as guidance. Trying to cover a broad spectrum of programs or activities may result in specifics being missed. This is especially true for a larger project, or one covering more than one work site. Interviews with subcontractor employees are encouraged.

Field observations from one visit may give rise to focused assessments at a future date or provide justification for a formal audit.

4.3 CM will complete a closeout meeting with all participating organizations to discuss results of the walkthrough and to discuss suggestions for possible corrective actions.

4.4 Document walkthrough results through meeting minutes that will be distributed to all participating organizations.

4.5 Enter concerns and corrective actions into a database created for the specific project.

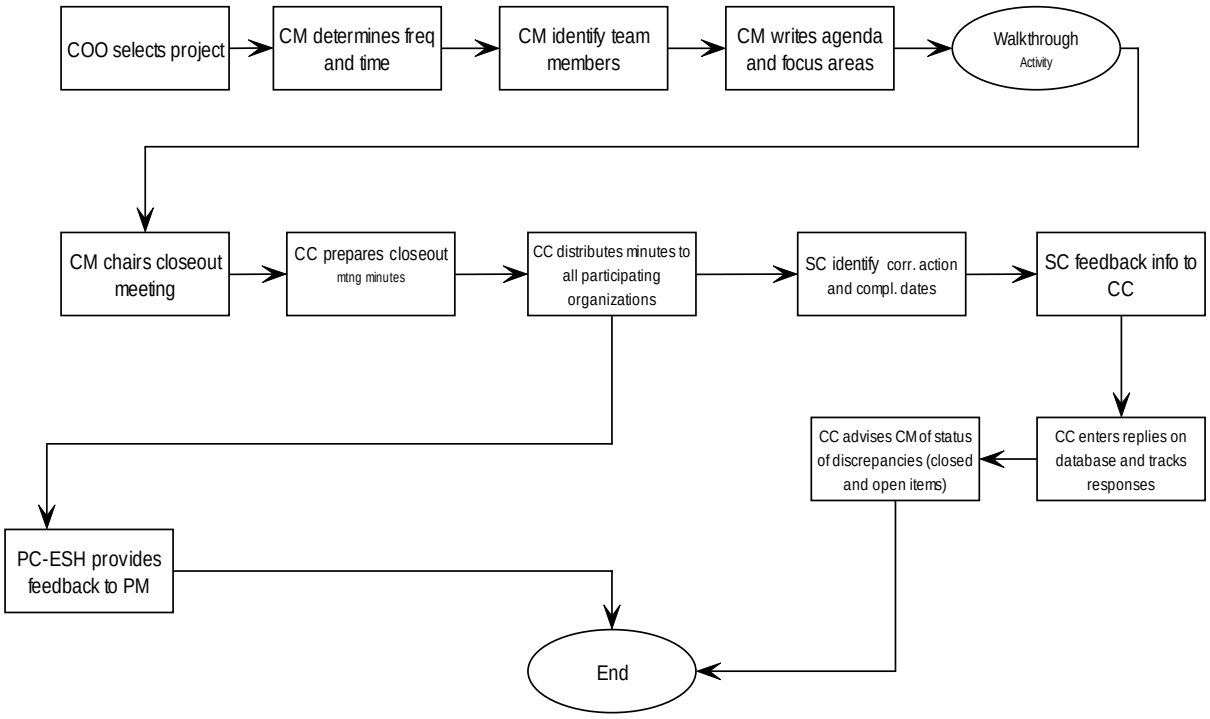
5.0 Corrective Actions

5.1 The walkthrough report shall be provided to the subcontractor for action.

5.2 The subcontractor shall identify corrective actions and completion dates. Corrective actions shall be completed as quickly as possible.

Flow Diagram

Construction Project
Multi-Organizational Safety Walkthrough



Abbreviations:

COO	Chief Operating Officer
CM	Construction Manager
CC	Construction Coordinator
PC-ESH	Project ES&H Coordinator
PM	Project Manager

Appendix

ESH Assessment Guidance- Areas of Inquiry

1. Injuries or Illnesses

2. General
   - Housekeeping
   - Garbage Containers
   - Emergency Phone #s Posted
   - Emergency Communication
   - Fence Condition
   - Gates
   - Signage on Fences and Gates
   - Whip Checks
   - Electrical Cords
   - GFCI's
   - Gas Test Log
   - Machine/Equipment Guards
   - Lighting
   - Ladders
   - Explosive Storage
   - Oxy/Acetylene Storage
   - Scaffolding

2. Traffic Control
   - Barricades
   - Traffic Signs
   - Flag Person
   - Vests
   - Flag

3. Shafts & Tunnels
   - Hand held lights/Miners Lights
   - Lighting
   - Communication
   - Ventilation
   - Self Rescuers Present

- Housekeeping
- Air/Noise Testing
- Signage
- Barricades

4. Emergency Equipment
   - Fire Extinguishers
   - First Aid Kits
   - Oxygen
   - Blankets
   - Eye Wash
   - Infection Control
   - Medical Emergency Teams
   - Rescue Teams

5. Personal Protective Equipment
   - Hard Hats
   - Eye Protection
   - Hearing Protection
   - Foot Protection
   - Respiratory Protection
   - Hand Protection
   - Fall Protection Harness/Lanyard
   - Face Protection
   - Barrier Cream

6. Cranes
   - Inspections
   - Certifications
   - Anti-Two Blocks
   - Hook Latches
   - Perimeter Barricades
   - Glass
   - Horn
   - Fire Extinguisher
   - Rigging Equipment

7. Equipment
   - Daily Inspections
   - Glass

- Back-Up Alarm
- Fire Extinguishers
- Hydraulic Oil Leaks

8. Work Planning
    - H/A for Tasks Performed
    - Dail Huddles
    - Tool Box Meetings
    - Monthly ESH Meetings
    - Records/Log Reviews
    - LOTO