MINU
Main Injector Neutrino Upgrade
Conceptual Design Report

FESS/Engineering Project No. 6-6-49
February 2007

Fermilab

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

This Conceptual Design Report (CDR) is intended to be a self-consistent basis for a project baseline cost estimate. 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.

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Section I

The Main Injector Neutrino Upgrade (MINU) project will provide new service buildings to house new power supplies and new kicker magnet support equipment to support the future increase of the NuMI beam power from 400kW to 700 kW. The use of the accumulator ring for the stacking of protons is made possible as well. The project will require construction of two new service buildings around the Main Injector, MI-14 and MI-39, and one small addition at MI-60 to house an anode power supply. The work will require excavation for installation of penetrations from the new service buildings to the existing Main Injector tunnel, excavation for building foundations at all three locations, utility installation in trenches for power and communication ductbanks, and industrial cooling water (ICW) piping. Floodplain mitigation for the area taken at MI-14 and Space Compensation demolition for the entire area to be constructed is also required.

Project Costs

The Total Estimated Cost (TEC) for this project is estimated to be $4,715,000 with $586,000 funded in FY07 and the remaining $4,129,000 funded in FY08.

The TEC includes Construction, EDIA (Engineering, Design, Inspection and Administration), Management Reserve and Indirect Costs. The TEC has been estimated in FY07 dollars.

Also included in the TEC are the Indirect Costs associated with this project, which is based on current laboratory rates.

The Project Execution Plan (PEP) for this project contains detailed breakdown of the TPC.

Schedule

Based on Directive Approval	Month 0
Engineering Start	Month 1
Construction Start	Month 7
Construction Complete	Month 30
Engineering Complete	Month 34
Project Complete	Month 36

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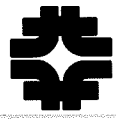

The neutrino oscillation program at Fermilab, devoted to long-baseline muon-neutrino disappearance searches, currently utilizes the NuMI (Neutrinos at the Main Injector) facility to produce a neutrino beam directed through the earth from Fermilab to a detector in northern Minnesota, over a baseline of about 735 kilometers (MINOS). Future experiments that will utilize the NuMI facility include MINERvA and NOvA. MINERvA is a neutrino scattering experiment that will be installed upstream of the NuMI near detector. The NOvA Experiment is designed to study neutrino oscillations in the NuMI neutrino off-axis beam to search for electron neutrino appearance. Design values of the NuMI facility are 4 × 10E13 120 GeV protons/pulse (ppp) every 1.9 seconds—corresponding to a beam power of 400 kW and 7.7 x 10E16 protons per hour. Work currently underway will provide 320 kW of beam power (7.3 x 10E16 protons per hour) to NuMI while still supplying adequate protons for the Collider and other fixed-target programs. This is less than the design basis for the NuMI facility. The construction of the buildings proposed in this GPP Project will permit future equipment installations to increase the proton delivery rate to the NuMI facility to its full design basis, as well as to eventually provide even more Main Injector beam for anticipated future experiments. Taking advantage of the machines and beamline elements that would become surplus once the Collider program shuts down, along with upgrades to existing machines, the beam power delivered to the NuMI facility could increase to 700 kW (1.3 x 10E17 protons per hour).

To permit these upgrades, the Main Injector Neutrino Upgrade (MINU) project will provide new service buildings to house new power supplies and new kicker magnet support equipment that, if installed, would increase the beam power to 700 kW. This equipment would also make the use of the accumulator ring to stack protons at 8GeV possible. The project would require construction of two new service buildings around the Main Injector, MI-14 and MI-39, and one small addition at MI-60 to house an anode power supply. The work would require excavation for installation of penetrations from the new service buildings to the existing Main Injector tunnel, excavation for building foundations at all three locations, utility installation in trenches for power and communication ductbanks, and industrial cooling water (ICW) piping. Floodplain mitigation for the area taken at MI-14 and Space Compensation demolition for the entire area to be constructed is also required.

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MI-14 Service Building

The MI-14 Service Building will house kicker supplies for new kicker magnets in the region of magnet Q104 in the Main Injector tunnel and power supplies for a new 8 GeV proton injection beamline into the recycler. The existing MI-10 Service Building has insufficient room to house this new equipment, and it is too far physically from the required location in the Main Injector for the cable lengths to the enclosure. Thus, a new building needs to be constructed.

The location of the building will be on the inside of the Main Injector enclosure ring, due to the existing Mini-BooNE extraction line located on the outside of the ring in this area. The building will be positioned between the berm and the pond, requiring the access to the building from a new road to be built on top of the berm.

The function of the kicker supply portion of the building is very similar to the F-17 Service Building, hence the design has been based on that facility. The power supply room portion of the building has been set at 50% of the kicker supply space.

The criteria for this facility are:

- One story building with 11.5' clear height
- 1-ton hoist to be supported from roof beams
- Depressed floor for kicker room to contain oil from equipment to mitigate spills
- Oil-resistant coating on concrete floor
- 8 - 6" sweeping conduit penetrations from building to MI enclosure
- 6 - 6" sweeping conduit penetrations from building to MI enclosure for power supply room
- 2 - 6" straight conduit penetrations to MI enclosure for LCW supply and return piping
- 2 - 6" straight conduit penetrations to MI enclosure for fluorinert cooling system piping
- Kicker power requirements: 480V power for equipment, to be supplied from spare breaker in MI-10 via new ductbank to MI-14. Kicker systems will require dedicated 45kVA; 480-120/208VAC transformer and panelboard with 10 – 20A three phase circuits
- Power supply power requirements: new 750kVA; 13.8kV-480/277VAC transformer located adjacent to the building
- Communications/controls to be supplied from MI-10 via new ductbank to MI-14
- ICW supply/return from main distribution along Indian Creek Road to serve for fire suppression

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- Concrete masonry wall separating power supply and kicker rooms
- One set of double doors for entrance into kicker room from outside, with 90" min. clearance for infrequent loading of tall equipment. Additionally, one personnel door will be supplied.
- One set of double doors for entrance into power supply room from outside, with 90" min. clearance for infrequent loading of tall equipment. Additionally, one personnel door will be supplied.
- Air conditioning and unit heaters serving each of the 2 rooms

Because the MI-14 Service Building would be constructed in the existing floodplain, compensatory flood storage volume would be created by excavating a volume of material below the 100 year flood elevation. The floor of the building itself would be constructed above the high water level. Although the location of the required space management demolition has not been determined, this work would involve demolition of existing concrete, steel, or masonry structures, and restoration of the surrounding area.

MI-39 Service Building

The MI-39 Service Building will house kicker supplies for new kicker magnets in the region of magnet Q400 in the Main Injector tunnel. The existing MI-40 Service Building has insufficient room to house this new equipment, and it is too far physically from the required location in the Main Injector for the cable lengths to the enclosure. Thus, a new building needs to be constructed.

The building is sited on the south side of the MI enclosure because of the wetlands known to exist in this area and because the berm is very high and the building would need to be built on piers to bring it up to an accessible grade. Positioning the building on the south side of the enclosure constrains the site by the enclosure to the north and west, existing Indian Creek Road to the south, and the existing MI-40 substation to the east. The area can be accommodated if the existing drainage swale and culvert is replaced with a catch basin that connects culvert pipes, and the area filled in. Vehicle access into the building will be via new hardstand adjacent to the existing road. Maintenance access to the berm would be via the new hardstand and ramp to the west of the building.

The function of MI-39 would be very similar to the F-17 Service Building; hence the design has been based on that facility.

The criteria for this facility are:

- One story building with 11.5' clear height
- 1-ton hoist to be supported from roof beams

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- Depressed floor for kicker room to contain oil from equipment to mitigate spills
- Oil-resistant coating on concrete floor
- 8 - 6" sweeping conduit penetrations from building to MI enclosure
- 2 - 6" straight conduit penetrations to MI enclosure for LCW supply and return piping.
- 2 - 6" straight conduit penetrations to MI enclosure for fluorinert cooling system piping
- Kicker power requirements: 480V power for equipment, to be supplied from spare breaker in MI-10 via new ductbank to MI-14. Kicker systems will require dedicated 45kVA; 480-120/208VAC transformer and panelboard with 10 – 20A three phase circuits
- Communications/controls to be supplied from MI-40 via new ductbank to MI-39
- ICW supply/return from main distribution along Indian Creek Road to serve for fire suppression
- One set of double doors for entrance into kicker room from outside, with 90" min. clearance for infrequent loading of tall equipment. Additionally, one personnel door will be supplied.
- Air conditioning and unit heaters serving the room.

MI-60 Anode Supply Room

A fourth anode supply room will be constructed in the same manner as the other 3 existing anode supply rooms at MI-60. The open site to the north of the existing high bay and south of the adjacent anode supply room is sufficient in area, but requires creation of a fire wall at the north side of the high bay to comply with requirements of NFPA 850.

The fire wall will consist of leaving the existing siding and windows in place while constructing an 8" concrete masonry wall to the north, then roofing over the cavity in between new and existing. Finally, siding to match the existing building will cover the masonry.

The anode supply room will be 10' x 25' in area, with a new transformer pad and containment and a new switch pad. An existing transformer and switch will be moved from F-0 for reuse in this location. The room will have lights, dedicated air cooling, and power similar to the existing rooms. A door will be installed from the west wall of MI-60 into the new room.

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Structural Systems

Design Loads shall be as listed below and in accordance with the Fermilab Engineering Standards Manual:

- Floors shall be designed to support a concentrated load of 2000 lbs. applied to an area 2'-6" x 2'-6".
- 150 psf or weight of actual equipment.

Live Load Reduction:

- No live load reductions are permitted for roof or mechanical equipment areas.

Mechanical Systems

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

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

Heating, Ventilation and Air Conditioning Design Parameters:

- Temperature: 65 degrees Fahrenheit to 75 degrees Fahrenheit
- Humidity: 40% - 45% Relative Humidity

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

Electrical Systems

Electrical system modifications will comply with applicable sections of National Electric Code and applicable sections of the Fermilab Engineering Standards Manual.

Primary Supply 480/277 V, 3 phase, 4 wire
Secondary Supply Power Distribution: 120/208 V, 3 phase, 4 wire
Lighting: 277 V

Illumination Levels:

Main Corridor and Public Areas:	20	fc.
Interior Emergency Lighting	5	fc.

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Fire Protection Systems

Fire Alarm/Fire Suppression systems 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 1 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, 231, 231C, 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.

Sustainable Building Design

Sustainability is broadly defined as the design and implementation of projects to simultaneously minimize their adverse environmental impacts, maximize occupants' health and well-being, and improve bottom line economic performance. The concept of sustainability is a desirable approach to development that recognizes that resources are limited, and that there is a responsibility of the present generation to preserve resources for future ones.

The United States Green Building Council (USGBC) has developed the Leadership in Energy and Environmental Design (LEED) standard to provide guidance for builders who wish to incorporate sustainable elements into their projects. LEED for new construction is a set of specific and quantifiable measures, each of which confers a credit towards certification of a project as a "LEED-certified" building. While this project is not intended to become a certified building, the project processes and each project element will be evaluated during design to reduce their impact on natural resources without sacrificing program objectives. The project design will incorporate maintainability, aesthetics, environmental justice and program requirements to deliver a well-balanced project.

The Appendix of this document contains the results of the project team discussions concerning the LEED goals for this project in the form of a LEED checklist. This checklist will be reviewed at the conclusion of Title 2 and again at the Beneficial Occupancy of the project to track the status of the project goals.

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PART 1 SAFEGUARDS AND SECURITY

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

A portion of the building will be accessible to Fermilab personnel during normal work hours. Keyed access to the controlled areas during normal working hours will be controlled by the Accelerator Division.

During non-working hours, when the building is unoccupied, all exterior and personnel access doors into the building will be locked and security guards will regularly inspect the building during routine security patrols of the Fermilab site.

PART 2 ENERGY CONSERVATION

In accordance with Section 0110-12 "Energy Conservation" of DOE Order 6430.1A - General Design Requirements, all elements of this project will be reviewed for energy conservation features that can be effectively incorporated into the overall building design. Energy conservation techniques and high efficiency equipment will be utilized wherever appropriate to minimize the total energy consumption of the building.

PART 3 HEALTH AND SAFETY

Exiting for the building will be provided in accordance with NFPA 101 Life Safety Code to assure adequate egress in the event of an emergency. The building will also be provided with portable fire extinguishers appropriate for the intended use of the building.

PART 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).

PART 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.

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PART 6 QUALITY ASSURANCE

All aspects of this project will be periodically reviewed with regard to Quality Assurance issues from Conceptual Design through Title III completion. This review process will be completed in accordance with the applicable portions of the Fermilab Institutional Quality Assurance Program (FIQAP) currently under final development. The following elements will be included in the Fermilab Quality Assurance Program for 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.
- 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

PART 7 MAINTENANCE AND OPERATION

When completed, this project will become the formal responsibility of the Fermilab Accelerator 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 Accelerator Division will coordinate the all 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

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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 2002 escalated to FY2007 and indexed for the Chicago, Illinois area. The Building M&R Cost Profile is based on the Community Center 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 (FY2007)	Annual Cost Per Square Foot	Annual Cost as % of Replac. Cost
PM and Minor Repair	$1.10	1.17%
Unscheduled Maintenance	$1.27	1.34%
Renewal and Replacement	$3.34	3.53%
Total M&R Costs	**$5.71**	**6.04%**

If requested, a detailed maintenance and repair forecast for this project will be developed after the completion of Title 3. A copy of the referenced Whitestone Building and Repair Cost Reference data is included in the Appendix of this document.

PART 8 TELECOMMUNICATIONS

The existing Fermilab telephone communications network is adequate to provide normal telecommunication support to the new work.

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PART 9 COMPUTER EQUIPMENT

Extending the existing Main Injector data communication network will provide access to the accelerator controls and computing system.

PART 10 HANDICAPPED PROVISIONS

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

PART 11 EMERGENCY SHELTER PROVISIONS

The adjacent existing service building provides the required emergency shelter provisions. In MI-60, the existing building provides the required emergency shelter provisions.

PART 12 SPACE MANAGEMENT REQUIREMENTS

Beginning in FY 2003, all new DOE Office of Science funded construction projects, including line items, GPP and IGPP, which provide new space, must have an equivalent amount of excess space allocated from the DOE Office of Science Space Bank. This project includes funding for the elimination of existing Fermilab square footage equal to the new space. The FY07 cost for disposal of similar space is $40 per square foot.

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APPLICABLE CODES, STANDARDS AND QUALITY LEVELS

MINU

The design of this project will be in accordance with recognized architectural and engineering practice and will comply with the applicable portions of the 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.

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PREPROCURED ITEMS COST ESTIMATE

Project Title: MINU			Project No. 6-6-49	Status: CDR	Date: 27-Feb-07	Revision Date:
ITEM NO.	DESCRIPTION OF WORK:		QUANTITY	UNITS	UNIT COST	AMOUNT
01	**ADVANCED PROCURED ITEMS**	**$125,000**				
01	750 kVA Transformer (MI-14)		1	Ea	$40,000.00	$40,000.00
02	750 MCM Triplex Cable (MI-14)		2340	LF	$22.00	$51,000.00
03	15kV Air Switch (MI-14)		1	Ea	$15,000.00	$15,000.00
04	15kV Air Switch (MI-60)		1	Ea	$15,000.00	$15,000.00
05	750 MCM Triplex Cable (MI-60)		200	LF	$22.00	$4,000.00
	SUBTOTAL:	$125,000				
	OVERHEAD & PROFIT @ 0%	$0				
	TOTAL:	**$125,000**				

Section VI

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FERMILAB: FESS COST ESTIMATE

Project Title: MINU					Project No. 6-6-49	Status: CDR	Date: FEB 2007	Revision Date:
ITEM NO.				DESCRIPTION OF WORK:	QUANTITY	UNITS	UNIT COST	AMOUNT
Division	Sub	Building	Shutdown					
01				**General Requirements $15,000**				
01	70	14	1	Mobilization	1	Lot	$2,000.00	$2,000.00
01	70	39	1	Mobilization	1	Lot	$2,000.00	$2,000.00
01	70	60	1	Mobilization	1	Lot	$1,000.00	$1,000.00
01	71	14	0	Utility Locates	1	Lot	$4,000.00	$4,000.00
01	71	39	0	Utility Locates	1	Lot	$3,500.00	$3,500.00
01	71	60	0	Utility Locates	1	Lot	$2,000.00	$2,000.00
02				**Existing Conditions $25,000**				
02	50	14	0	Floodplain Remediation	1	Lot	$25,000.00	$25,000.00
03				**Concrete $332,000**				
03	30	14	1	Install concrete footings	47	CY	$350.00	$16,450.00
03	30	14	1	Install concrete foundation wall	140	CY	$400.00	$56,000.00
03	30	14	1	Install transformer foundation	1	Lot	$10,000.00	$10,000.00
03	30	14	0	Install floor slab	55	CY	$300.00	$16,500.00
03	30	14	0	Install stoops and ramps	6	CY	$350.00	$2,100.00
03	30	14	0	Install reinforcing slab over enclosure	51	CY	$750.00	$38,250.00
03	30	39	1	Install concrete footings	35	CY	$350.00	$12,250.00
03	30	39	1	Install concrete foundation wall	100	CY	$400.00	$40,000.00
03	30	39	0	Install floor slab	37	CY	$300.00	$11,100.00
03	30	39	0	Install stoops and ramps	3	CY	$350.00	$1,050.00
03	30	39	0	Install reinforcing slab over enclosure	34	CY	$750.00	$25,500.00
03	30	60	1	Install transformer foundation	1	Lot	$20,000.00	$20,000.00
03	30	60	0	Anode Room foundation walls	8	CY	$350.00	$2,800.00
03	30	60	0	Anode Room floor slab	6	CY	$300.00	$1,800.00
03	30	60	0	Firewall footing	3.1	CY	$350.00	$1,085.00
03	30	60	0	Firewall foundation wall	5.4	CY	$400.00	$2,160.00
03	81	14	1	Cut penetrations in precast (including shoring)	18	Ea	$2,500.00	$45,000.00
03	81	39	1	Cut penetrations in precast (including shoring)	12	Ea	$2,500.00	$30,000.00
04				**Masonry $28,000**				
04	20	14	0	Concrete block walls	600	SF	$10.00	$6,000.00
04	20	60	0	Concrete block walls	2220	SF	$10.00	$22,200.00
05				**Metal $86,000**				
05	10	14	0	Steel columns	1.5	Ton	$3,000.00	$4,500.00
05	10	14	0	Steel beams and bracing	7	Ton	$4,000.00	$28,000.00
05	10	14	0	Steel girt framing	1	Lot	$6,000.00	$6,000.00
05	10	39	0	Steel columns	1.1	Ton	$3,000.00	$3,300.00
05	10	39	0	Steel beams and bracing	5	Ton	$4,000.00	$20,000.00
05	10	39	0	Steel girt framing	1	Lot	$4,000.00	$4,000.00
05	30	14	0	Roof decking	2300	SF	$5.00	$11,500.00
05	30	39	0	Roof decking	1500	SF	$5.00	$7,500.00
05	30	60	0	Roof decking	250	SF	$5.00	$1,250.00
06				**Wood, Plastics and Composites $0**				
07				**Thermal and Moisture Protection $327,000**				
07	17	14	0	Install bentonite waterproofing	1800	SF	$10.00	$18,000.00
07	17	39	0	Install bentonite waterproofing	1100	SF	$10.00	$11,000.00
07	40	14	0	Insulated siding w/liner panel	2400	SF	$35.00	$84,000.00
07	40	39	0	Insulated siding w/liner panel	1760	SF	$35.00	$61,600.00
07	40	60	0	Siding w/girts	2300	SF	$35.00	$80,500.00

FERMILAB: FESS COST ESTIMATE

Project Title: MINU					Project No. 6-6-49	Status: CDR	Date: FEB 2007	Revision Date:
ITEM NO.				DESCRIPTION OF WORK:	QUANTITY	UNITS	UNIT COST	AMOUNT
07	40	60	0	Interior shielding (liner panel)	840	SF	$25.00	$21,000.00
07	50	14	0	Built-up roofing, insulation and flashing	2300	SF	$10.00	$23,000.00
07	50	39	0	Built-up roofing, insulation and flashing	1500	SF	$10.00	$15,000.00
07	50	60	0	Built-up roofing, insulation and flashing	250	SF	$10.00	$2,500.00
07	60	60	0	Flashings	1	Lot	$10,000.00	$10,000.00
08				**Openings $22,000**				
08	10	14	0	Exterior doors	2	Ea	$1,500.00	$3,000.00
08	10	14	0	Exterior equipment double doors	2	Ea	$5,000.00	$10,000.00
08	10	14	0	Interior door	1	Ea	$1,000.00	$1,000.00
08	10	39	0	Exterior doors	1	Ea	$1,500.00	$1,500.00
08	10	39	0	Exterior equipment double doors	1	Ea	$5,000.00	$5,000.00
08	10	60	0	Interior door	1	Ea	$1,000.00	$1,000.00
09				**Finishes $9,000**				
09	90	14	0	Painting	1	Lot	$4,000.00	$4,000.00
09	90	39	0	Painting	1	Lot	$3,000.00	$3,000.00
09	90	60	0	Painting	1	Lot	$2,000.00	$2,000.00
10				**Specialties $0**				
11				**Equipment $0**				
12				**Furnishings $0**				
13				**Special Construction $0**				
14				**Conveying Equipment $0**				

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FERMILAB: FESS COST ESTIMATE

Project Title: MINU					Project No. 6-6-49	Status: CDR	Date: FEB 2007	Revision Date:
ITEM NO.				DESCRIPTION OF WORK:	QUANTITY	UNITS	UNIT COST	AMOUNT
21				**Fire Suppression $40,000**				
21	10	14	0	Fire protection	2250	SF	$10.00	$22,500.00
21	10	39	0	Fire protection	1500	SF	$10.00	$15,000.00
21	10	60	0	Fire protection	250	SF	$10.00	$2,500.00
22				**Plumbing $23,000**				
22	11	14	1	Install two straight 6" conduit for LCW	100	LF	$25.00	$2,500.00
22	11	14	1	Install two straight 6" conduits for fluorinert	100	LF	$25.00	$2,500.00
22	11	14	1	Install ICW line w/riser	1	Lot	$6,500.00	$6,500.00
22	11	39	1	Install two straight 6" conduit for LCW	100	LF	$25.00	$2,500.00
22	11	39	1	Install two straight 6" conduits for fluorinert	100	LF	$25.00	$2,500.00
22	11	39	1	Install ICW line w/riser	1	Lot	$6,500.00	$6,500.00
23				**Heating, Ventilating and Air Conditioning $145,000**				
23	30	14	0	HVAC Units	3	Ea	$25,000.00	$75,000.00
23	30	14	0	Unit heaters	3	Ea	$2,000.00	$6,000.00
23	30	39	0	HVAC Units	2	Ea	$25,000.00	$50,000.00
23	30	39	0	Unit heaters	2	Ea	$2,000.00	$4,000.00
23	30	60	0	HVAC	1	Lot	$10,000.00	$10,000.00
25				**Integrated Automation $40,000**				
25	00	14	0	Monitoring and Control	1	Lot	$15,000.00	$15,000.00
25	00	39	0	Monitoring and Control	1	Lot	$15,000.00	$15,000.00
25	00	60	0	Monitoring and Control	1	Lot	$10,000.00	$10,000.00
26				**Electrical $431,000**				
26	05	14	1	Install 14-6" conduits w/sweeps (14ea.x120ft.)	1680	LF	$25.00	$42,000.00
26	05	14	1	Building ground to enclosure	1	Lot	$4,000.00	$4,000.00
26	05	39	1	Building ground to enclosure	1	Lot	$4,000.00	$4,000.00
26	05	39	1	Install 8-6" conduits w/sweeps (8ea.x120ft.)	960	LF	$25.00	$24,000.00
26	10	14	1	4-5" Ductbank MI Manhole to New Air Sw	60	LF	$150.00	$9,000.00
26	10	14	1	2-5" Ductbank New Air Sw to New Xfmr	225	LF	$150.00	$33,750.00
26	10	14	1	Handholes	2	Ea	$500.00	$1,000.00
26	10	14	1	Reinforced Concrete Pad	4	CY	$400.00	$1,600.00
26	10	14	1	Trench and backfill	4	Cy	$80.00	$320.00
26	10	14	1	Grounding around switch pad	1	Lot	$4,000.00	$4,000.00
26	10	14	1	750 MCM Triplex Cable (Preprocured by Fermilab)	0	LF	$22.00	$0.00
26	10	14	1	Remove old 3C 750 cable	75	LF	$5.00	$375.00
26	10	14	1	Pull 3C 750 EPR	2340	LF	$8.50	$19,890.00
26	10	14	1	Pull 3C 350 EPR	225	LF	$8.50	$1,912.50
26	10	14	1	350 MCM Triplex Cable (Material)	225	LF	$15.00	$3,375.00
26	10	14	1	15kV Air Switch (Preprocured by Fermilab)	0	Ea	$11,500.00	$0.00
26	10	14	1	Set 15kV Switch	1	Ea	$1,200.00	$1,200.00
26	10	14	0	750kVA Transformer (Preprocured by Fermilab)	0	Ea	$40,000.00	$0.00
26	10	14	0	Set Transformer	1	Ea	$1,200.00	$1,200.00
26	10	14	0	1200A Panelboard	1	Ea	$6,000.00	$6,000.00
26	10	14	1	Inline Splices Hardware (1P)	9	Ea	$375.00	$3,375.00
26	10	14	1	Inline Splice (1P)	9	Ea	$600.00	$5,400.00
26	10	14	1	Terminations Air (1P) Hardware	12	Ea	$85.00	$1,020.00
26	10	14	1	Air Terminations (1P)	12	Ea	$600.00	$7,200.00
26	10	14	1	Fire Wrap in manholes	4	Ea	$1,800.00	$7,200.00
26	10	14	1	Hi-Pot Cables	1	Lot	$4,000.00	$4,000.00
26	10	60	1	3-5" Ductbank New Air Sw to PMH60-3	60	LF	$150.00	$9,000.00
26	10	60	1	Air Sw Reinforced Concrete Pad	4	CY	$400.00	$1,600.00
26	10	60	1	Trench and backfill	4	CY	$80.00	$320.00
26	10	60	1	Grounding around switch pad	1	Lot	$4,000.00	$4,000.00
26	10	60	1	Fused Disc Sw Reinforced Concrete Pad	4	CY	$400.00	$1,600.00
26	10	60	1	Trench and backfill	4	CY	$80.00	$320.00

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FERMILAB: FESS COST ESTIMATE

Project Title: MINU					Project No. 6-6-49	Status: CDR	Date: FEB 2007	Revision Date:
ITEM NO.				DESCRIPTION OF WORK:	QUANTITY	UNITS	UNIT COST	AMOUNT
26	10	60	1	Grounding around switch pad	1	Lot	$4,000.00	$4,000.00
26	10	60	1	Vac Cont Reinforced Concrete Pad	4	CY	$400.00	$1,600.00
26	10	60	1	Trench and backfill	4	CY	$80.00	$320.00
26	10	60	1	Grounding around Vac Contr pad	1	Lot	$4,000.00	$4,000.00
26	10	60	1	1-5" Ductbank New Air Sw to Fused Disc Sw	20	LF	$125.00	$2,500.00
26	10	60	1	1-5" Ductbank Fused Disc Sw to Vac Contr	20	LF	$125.00	$2,500.00
26	10	60	1	750 MCM Triplex Cable (Preprocured by Fermilab)	0	LF	$22.00	$0.00
26	10	60	1	Pull 3C 750 EPR	200	LF	$8.50	$1,700.00
26	10	60	1	15kV Air Switch (Preprocured by Fermilab)	0	Ea	$13,000.00	$0.00
26	10	60	1	Set 15kV Switch	1	Ea	$1,200.00	$1,200.00
26	10	60	1	Inline Splices Hardware (1P)	3	Ea	$375.00	$1,125.00
26	10	60	1	Inline Splice (1P)	3	Ea	$600.00	$1,800.00
26	10	60	1	Terminations Air (1P) Hardware	24	Ea	$85.00	$2,040.00
26	10	60	1	Air Terminations (1P)	24	Ea	$600.00	$14,400.00
26	10	60	1	Fire Wrap in manholes	1	Ea	$1,800.00	$1,800.00
26	10	60	1	Hi-Pot Cables	1	Lot	$4,000.00	$4,000.00
26	10	60	1	Fused Disc Sw MATERIAL BY OTHERS			$0.00	$0.00
26	10	60	1	Vac Contactor MATERIAL BY OTHERS			$0.00	$0.00
26	10	60	1	Grounding & Shlding Anode Sup Rm	1	Lot	$5,000.00	$5,000.00
26	14	60	0	HVAC Power	1	Lot	$5,000.00	$5,000.00
26	20	14	1	4-5" Ductbank XFMR to Bldg	60	LF	$150.00	$9,000.00
26	20	14	1	4-750MCM, 4-350MCM, 4-250MCM	60	LF	$36.00	$2,160.00
26	20	14	1	200A Fused Disc Sw	2	Ea	$800.00	$1,600.00
26	20	14	1	3"C; 4#4/0; 1#2	10	LF	$25.00	$250.00
26	20	14	1	2-5" Ductbank Pwr (480V)	80	LF	$125.00	$10,000.00
26	20	14	1	2-5" Ductbank Comm	80	LF	$125.00	$10,000.00
26	20	14	1	Handholes	4	Ea	$500.00	$2,000.00
26	20	14	1	3"C; 4#4/0; 1#2	100	LF	$25.00	$2,500.00
26	20	14	1	200A Fused Disc Sw	2	Ea	$800.00	$1,600.00
26	20	14	0	1200A Panelboard	1	Ea	$6,000.00	$6,000.00
26	20	14	0	1 1/2"C, 3#2, 1#8	10	LF	$15.00	$150.00
26	20	14	0	100A Fused Disc Sw	3	Ea	$600.00	$1,800.00
26	20	14	0	45kVA XFMR	3	Ea	$2,000.00	$6,000.00
26	20	14	0	100A Panelboard	2	Ea	$1,500.00	$3,000.00
26	20	14	0	225A Panelboard	1	Ea	$2,000.00	$2,000.00
26	20	14	0	Misc Cabling	1	Lot	$8,000.00	$8,000.00
26	20	39	1	4-5" PVC XFMR to Bldg	60	LF	$40.00	$2,400.00
26	20	39	1	4-750MCM, 4-350MCM, 4-250MCM	60	LF	$36.00	$2,160.00
26	20	39	1	200A Fused Disc Sw	2	Ea	$800.00	$1,600.00
26	20	39	1	3"C; 4#4/0; 1#2	10	LF	$25.00	$250.00
26	20	39	1	2-5" Ductbank Pwr (480V)	80	LF	$125.00	$10,000.00
26	20	39	1	2-5" Ductbank Comm	80	LF	$125.00	$10,000.00
26	20	39	1	Handholes	4	Ea	$500.00	$2,000.00
26	20	39	1	3"C; 4#4/0; 1#2	100	LF	$25.00	$2,500.00
26	20	39	1	200A Fused Disc Sw	2	Ea	$800.00	$1,600.00
26	20	39	0	1200A Panelboard	1	Ea	$6,000.00	$6,000.00
26	20	39	0	1 1/2"C, 3#2, 1#8	10	LF	$15.00	$150.00
26	20	39	0	100A Fused Disc Sw	3	Ea	$600.00	$1,800.00
26	20	39	0	45kVA XFMR	3	Ea	$2,000.00	$6,000.00
26	20	39	0	100A Panelboard	2	Ea	$1,500.00	$3,000.00
26	20	39	0	225A Panelboard	1	Ea	$2,000.00	$2,000.00
26	20	39	0	Misc Cabling	1	Lot	$8,000.00	$8,000.00
26	24	14	0	HVAC Power	1	Lot	$5,000.00	$5,000.00
26	24	39	0	HVAC Power	1	Lot	$5,000.00	$5,000.00
26	27	14	0	Receptacles	1	Lot	$6,000.00	$6,000.00
26	27	39	0	Receptacles	1	Lot	$6,000.00	$6,000.00
26	51	14	0	Lighting	1	Lot	$16,000.00	$16,000.00
26	51	39	0	Lighting	1	Lot	$12,000.00	$12,000.00
26	51	60	0	Lighting	1	Lot	$250.00	$250.00

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FERMILAB: FESS COST ESTIMATE

Project Title: MINU					Project No. 6-6-49	Status: CDR	Date: FEB 2007	Revision Date:
ITEM NO.				DESCRIPTION OF WORK:	QUANTITY	UNITS	UNIT COST	AMOUNT
27				**Communications** **$0**				
28				**Electronic Safety and Security** **$40,000**				
28	31	14	0	Fire detection	2250	SF	$10.00	$22,500.00
28	31	39	0	Fire detection	1500	SF	$10.00	$15,000.00
28	31	60	0	Fire detection	250	SF	$10.00	$2,500.00
31				**Earthwork** **$154,000**				
31	05	14	1	Install soil and erosion control	1	Lot	$2,500.00	$2,500.00
31	05	39	1	Install soil and erosion control	1	Lot	$2,500.00	$2,500.00
31	11	14	1	Clear and Grub	1	Lot	$2,200.00	$2,200.00
31	11	39	1	Clear and Grub	1	Lot	$2,000.00	$2,000.00
31	14	14	1	Strip and stockpile topsoil	1	Lot	$3,000.00	$3,000.00
31	14	39	1	Strip and stockpile topsoil	1	Lot	$3,000.00	$3,000.00
31	23	14	1	Excavate for foundation and penetrations	3400	CY	$10.00	$34,000.00
31	23	14	0	Backfill w/CA-7 drainage fill at enclosure	200	CY	$35.00	$7,000.00
31	23	14	0	Backfill	3100	CY	$10.00	$31,000.00
31	23	39	1	Excavate for foundation and penetrations	3200	CY	$10.00	$32,000.00
31	23	39	0	Backfill w/CA-7 drainage fill at enclosure	120	CY	$35.00	$4,200.00
31	23	39	0	Backfill	2800	CY	$10.00	$28,000.00
31	23	60	1	Excavate for foundation	110	CY	$10.00	$1,100.00
31	23	60	1	Backfill	90	CY	$20.00	$1,800.00
32				**Exterior Improvements** **$33,000**				
32	05	14	0	Aggregate hardstand	330	SY	$45.00	$14,850.00
32	05	39	0	Aggregate hardstand	190	SY	$45.00	$8,550.00
32	90	14	0	Restore vegetation	1	Lot	$5,000.00	$5,000.00
32	90	39	0	Restore vegetation	1	Lot	$5,000.00	$5,000.00
33				**Utilities** **$12,000**				
33	40	39	0	Rework storm drainage and manhole	1	Lot	$12,000.00	$12,000.00
41				**Material Processing and Handling Equipment** **$6,000**				
41	20	14	0	One-ton hoist	1	Lot	$3,000.00	$3,000.00
41	20	39	0	One-ton hoist	1	Lot	$3,000.00	$3,000.00

SUBTOTAL:		**$1,768,000**
DIFFICULT CONDITIONS PREMIUM	10%	$177,000
OVERHEAD & PROFIT	20%	$354,000
EXPECTED SUBCONTRACT PRICE:		**$2,299,000**

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Section VII

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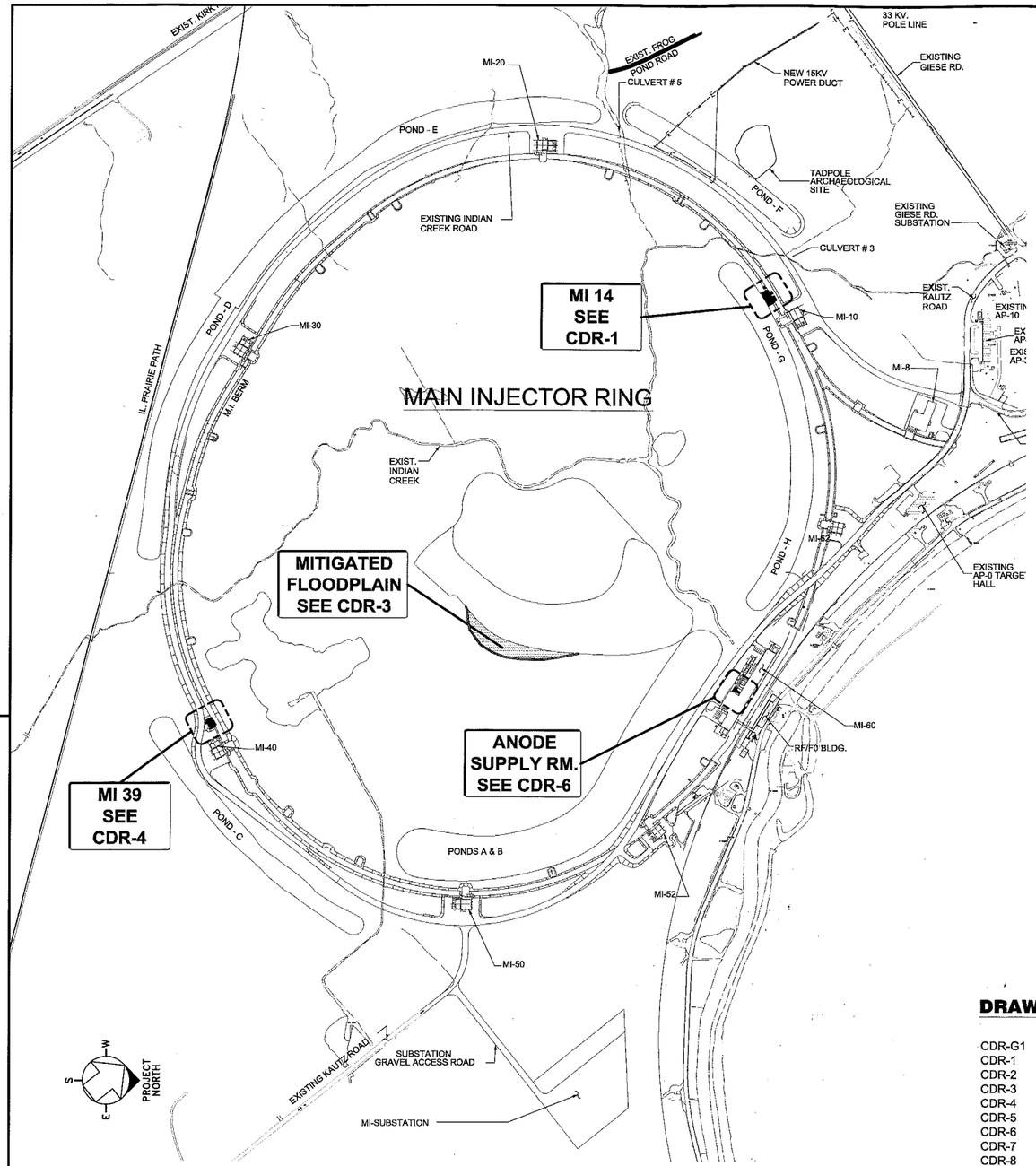
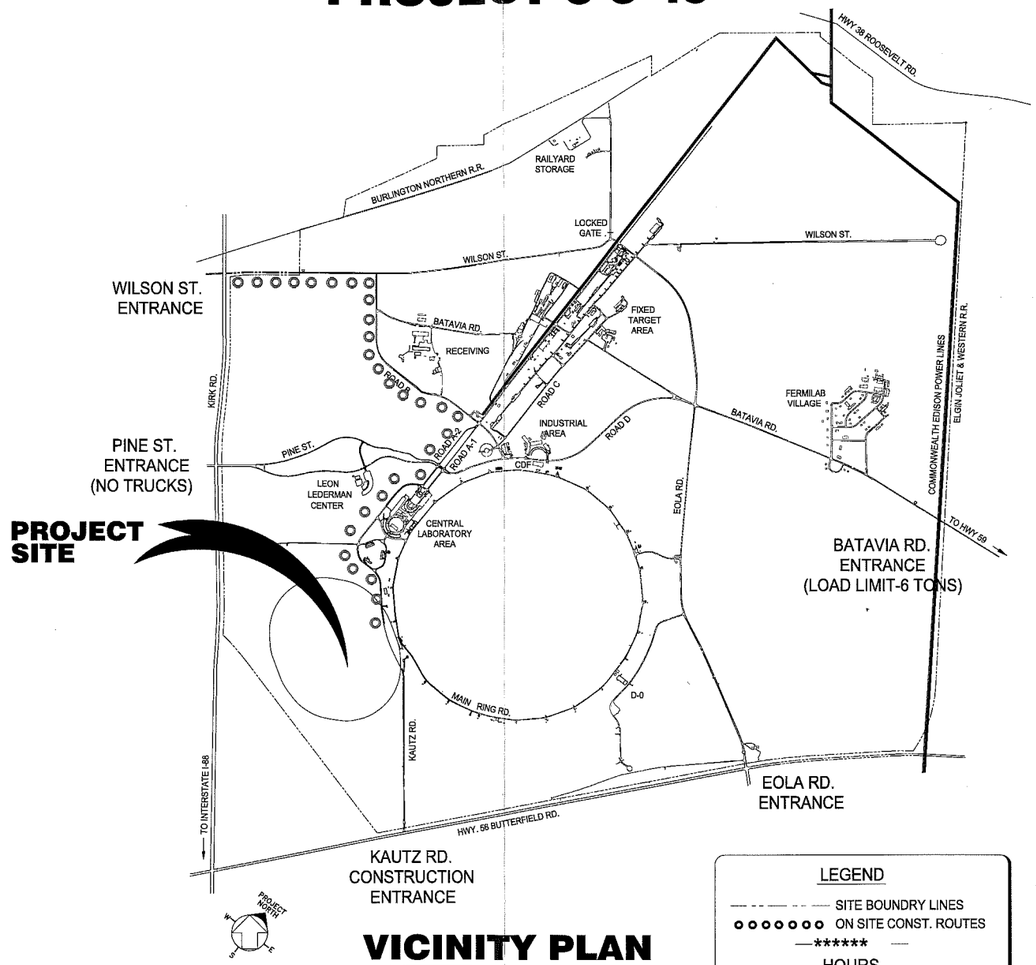
MINU
MAIN INJECTOR NEUTRINO UPGRADE
PROJECT 6-6-49



LOCATION PLAN



VICINITY PLAN

DRAWING LIST

CDR-G1	LOCATION PLANS & DRAWING LIST
CDR-1	MI-14 SERVICE BUILDING - SITE PLAN
CDR-2	MI-14 SERVICE BLDG. - CROSS SECTION
CDR-3	MITIGATED FLOODPLAIN AREA
CDR-4	MI-39 SERVICE BUILDING - SITE PLAN
CDR-5	MI-39 SERVICE BLDG. - CROSS SECTION
CDR-6	MI 60 ANODE SUPPLY ROOM - PLANS
CDR-7	MI 60 BUILDING ELEVATIONS
CDR-8	MI 60 BUILDING SECTIONS
CDR-9	ELECTRICAL SINGLE LINE DIAGRAM
CDR-10	MI 14 SERVICE BLDG. - PLAN & ELEVS.
CDR-11	MI 39 SERVICE BLDG. - PLAN & ELEVS.

LEGEND

SITE BOUNDRY LINES

ON SITE CONST. ROUTES

HOURS

WILSON ST.....6 AM TO 8 PM
PINE ST.....6 AM TO 8 PM
BATAVIA RD.....6 AM TO 8 PM
EOLA RD.
KAUTZ RD.

REV.	DATE	DESCRIPTIONS
		REVISIONS

	NAME	DATE
DESIGNED	.	.
DRAWN	.	.
CHECKED	.	.
APPROVED	.	.
SUBMITTED	.	.

SCALE:

FERMI NATIONAL ACCELERATOR LABORATORY

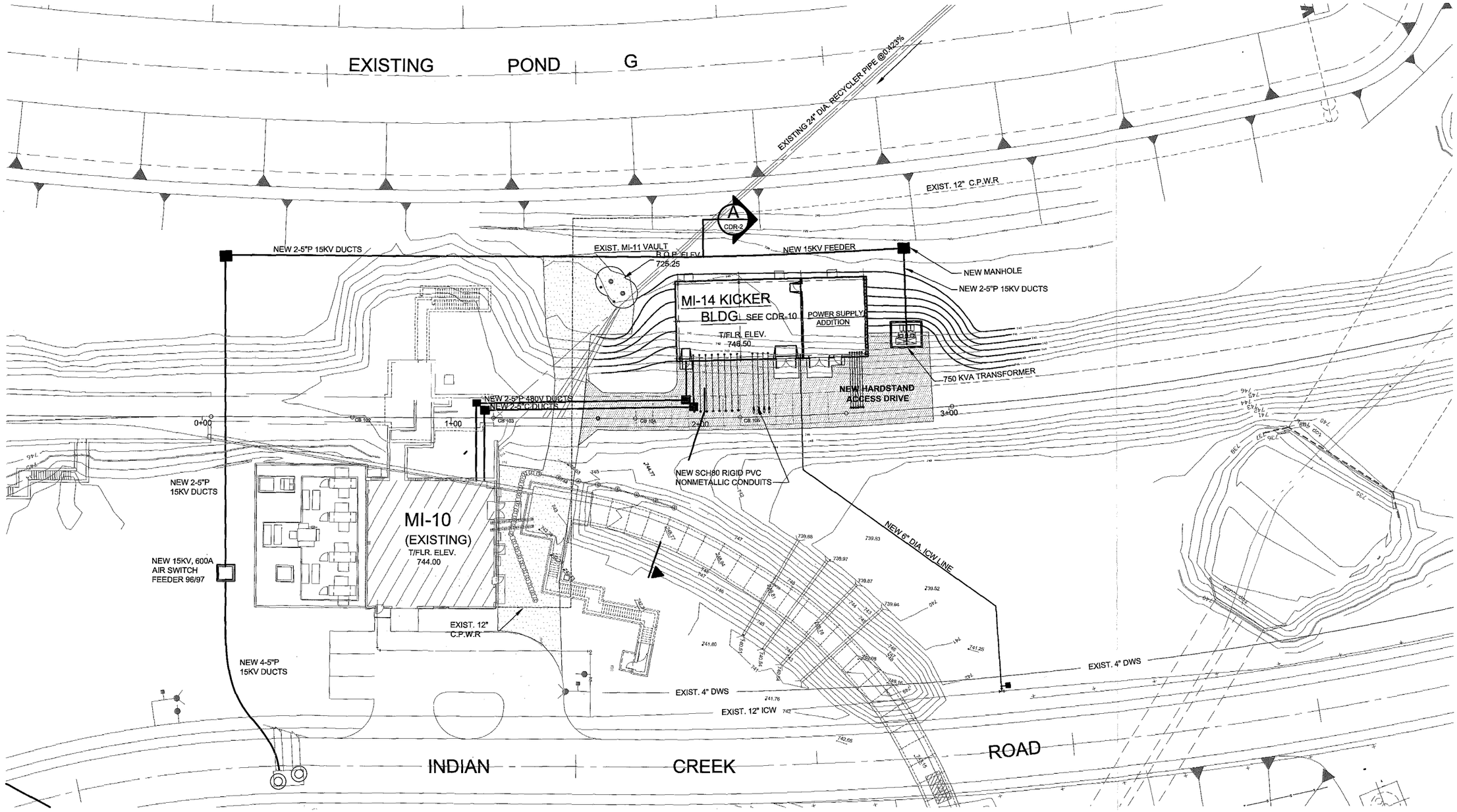
UNITED STATES DEPARTMENT OF ENERGY

MINU

LOCATION PLANS & DRAWING LIST

DRAWING NO. **6-6-49** **CDR-G1** REV.

Dwg: 6-6-49 G-1.dwg Plotted: 09FEB07 @ 09:46:45a.m.



REV.	DATE	DESCRIPTIONS
		PREVIOUS

	NAME	DATE
DESIGNED	.	.
DRAWN	.	.
CHECKED	.	.
APPROVED	.	.
SUBMITTED	.	.

PROJECT NORTH

SCALE:

1" = 20'-0"

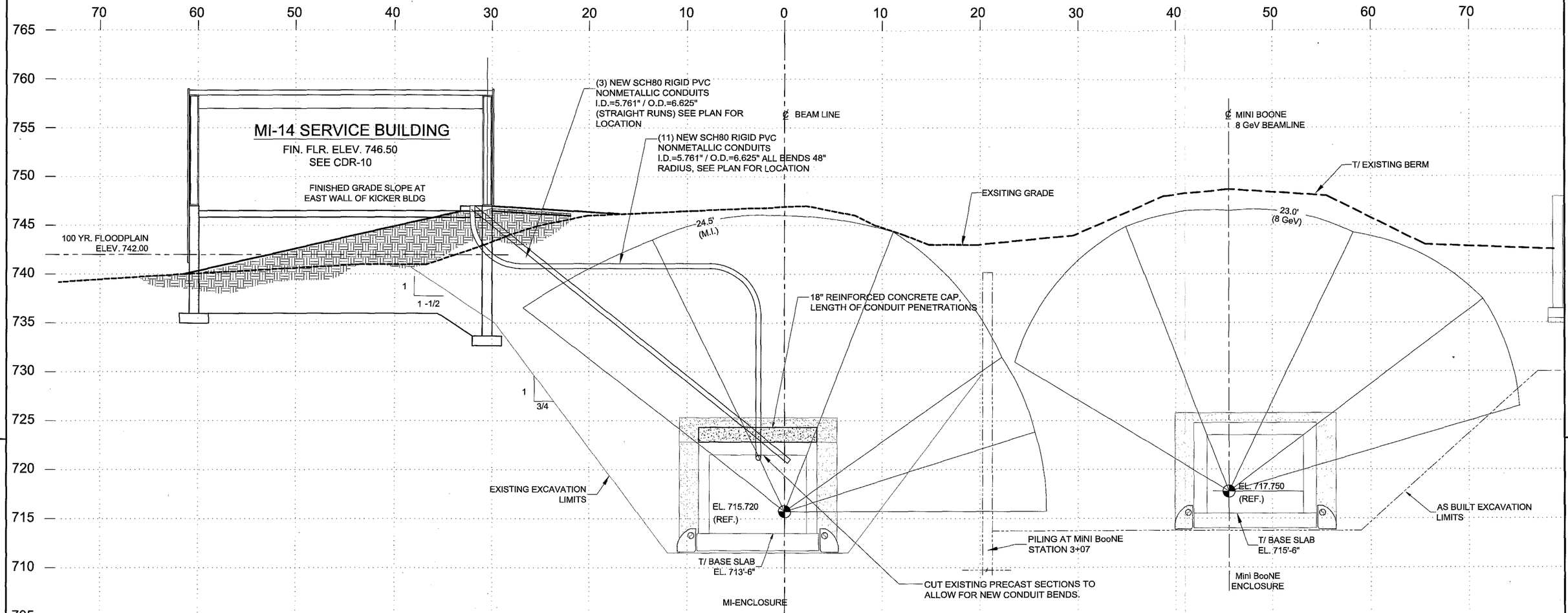
20 0 20 40
SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

UNITED STATES DEPARTMENT OF ENERGY

MINU

MI-14 SERVICE BUILDING - SITE PLAN



STA. 2+05 (MAIN INJECTOR)

STA. 3+01 (MiNI BooNE)

SECTION

SCALE: 1" = 5'

A
CDR-1

REV.	DATE	DESCRIPTIONS
		REVISIONS

	NAME	DATE
DESIGNED	.	.
DRAWN	.	.
CHECKED	.	.
APPROVED	.	.
SUBMITTED	.	.

SCALE:

1" = 5'-0"

5 0 5 10
SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

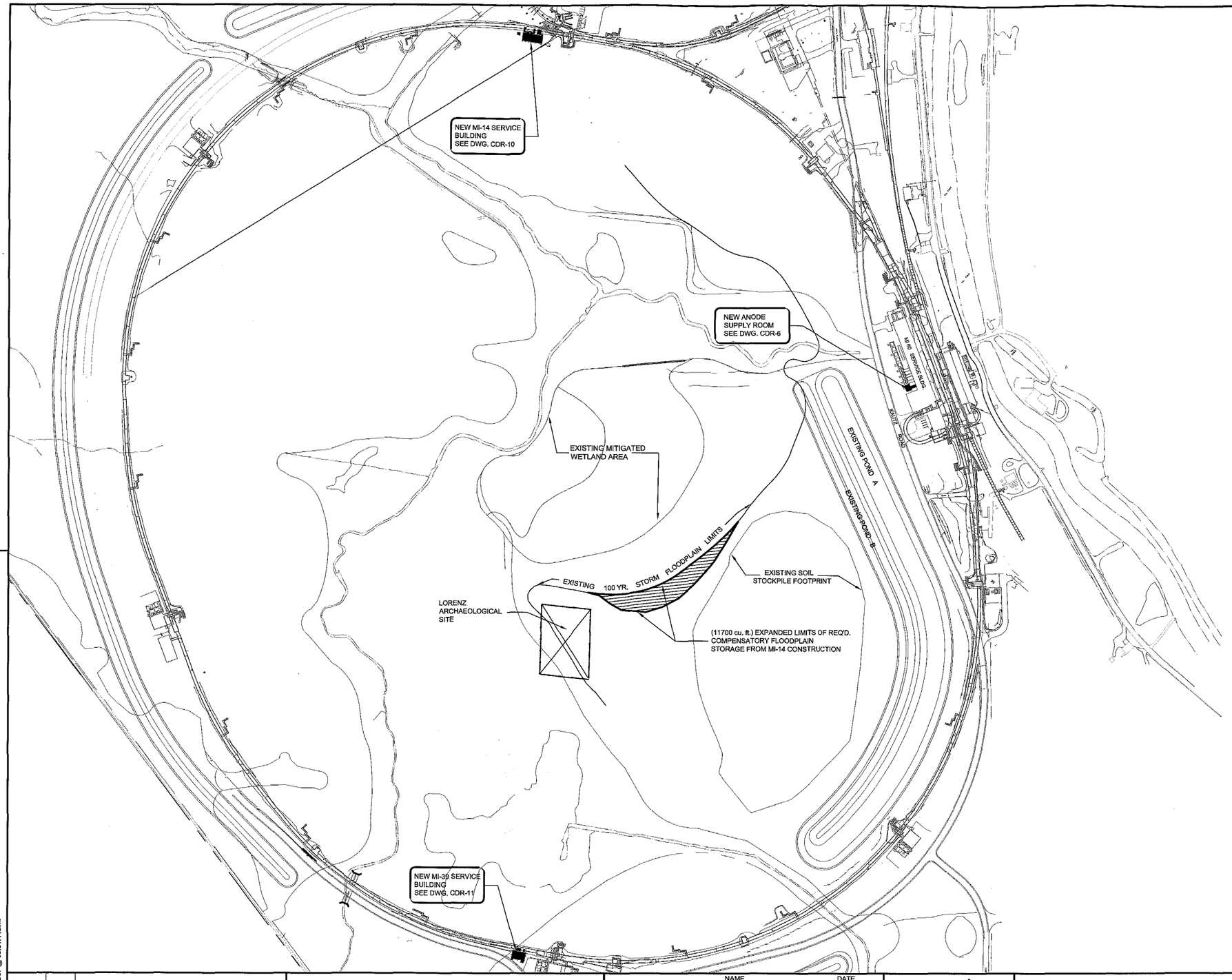
UNITED STATES DEPARTMENT OF ENERGY

NIMU

MI-14 SERVICE BLDG. - CROSS SECTION

DRAWING NO. **6-6-49** **CDR-2** REV.

Dwg: 6-6-49 CDR-2.dwg Plotted: 09FEB07 @ 09:50:48a.m.



REV.	DATE	DESCRIPTIONS
		REVISIONS

	NAME	DATE
DESIGNED	.	.
DRAWN	.	.
CHECKED	.	.
APPROVED	.	.
SUBMITTED	.	.

PROJECT NORTH

SCALE:

1" = 200'-0" 200 0 200 400 SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

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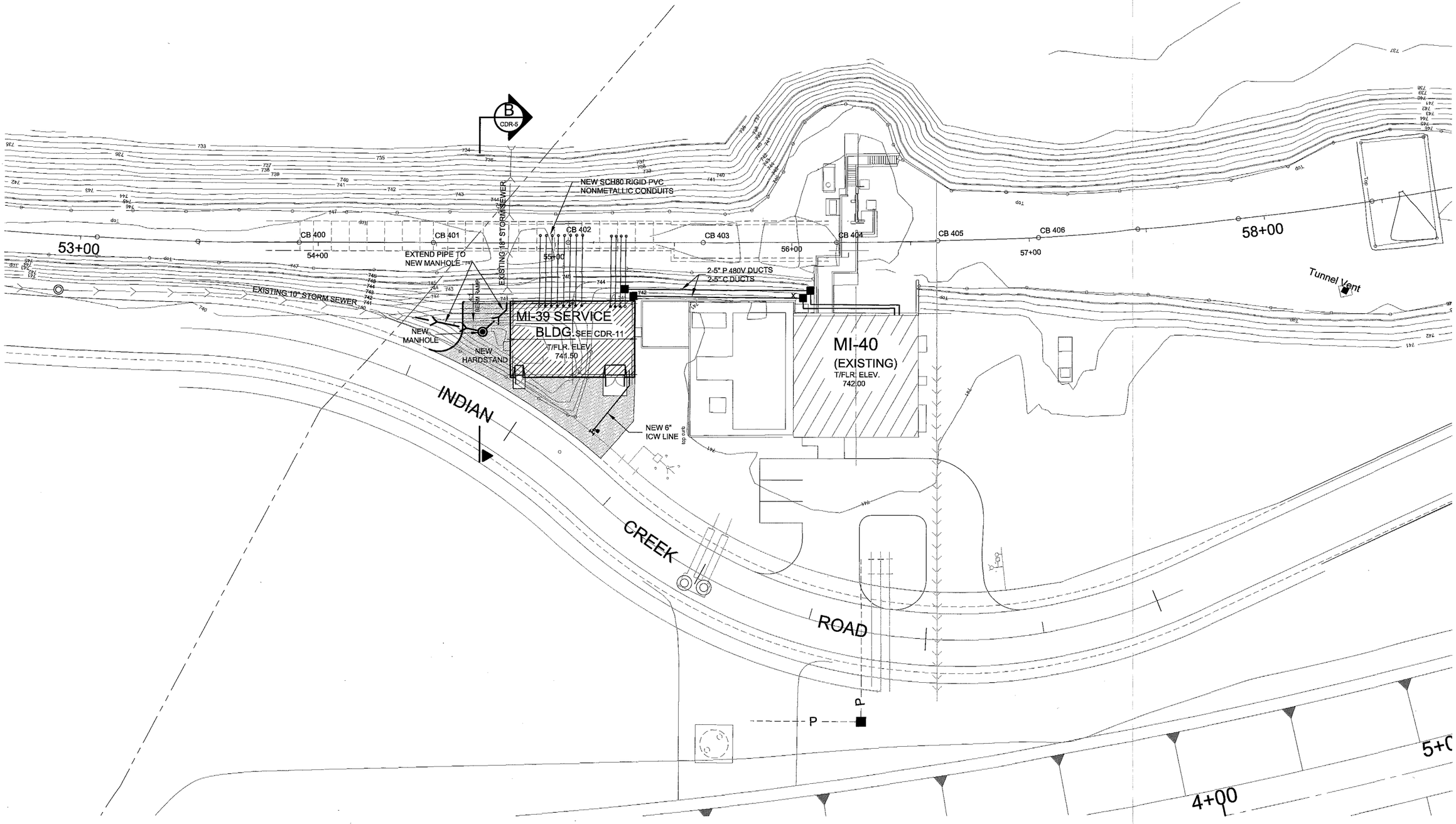
MINU

MITIGATED FLOODPLAIN AREA

DRAWING NO. **6-6-49** **CDR-3** REV.

Dwg: 6-6-49 CDR-3.dwg Plotted: 09FEB07 @ 09:51:44a.m.



REV.	DATE	DESCRIPTIONS
		REVISIONS

	NAME	DATE
DESIGNED	.	.
DRAWN	.	.
CHECKED	.	.
APPROVED	.	.
SUBMITTED	.	.

PROJECT NORTH

SCALE:

1" = 20'-0"

20 0 20 40
SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

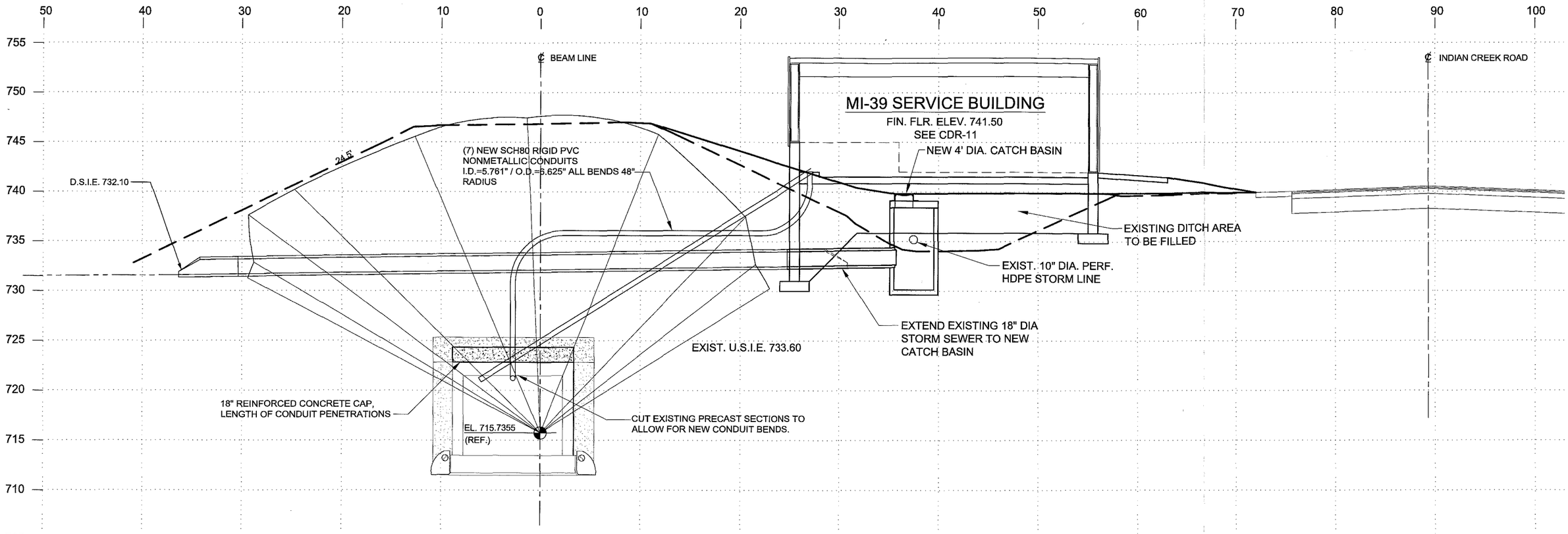
UNITED STATES DEPARTMENT OF ENERGY

MINU

MI-39 SERVICE BUILDING - SITE PLAN

DRAWING NO. **6-6-49** **CDR-4** REV.

Dwg: 6-6-49 CDR-4.dwg Plotted: 09FEB07 @ 09:52:33a.m.



STA 54+80

SECTION

SCALE: 1" = 5'

B
CDR-4

REV.	DATE	DESCRIPTIONS
		REVISIONS

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APPROVED	.	.
SUBMITTED	.	.

SCALE:

1" = 5'-0"

5 0 5 10
SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

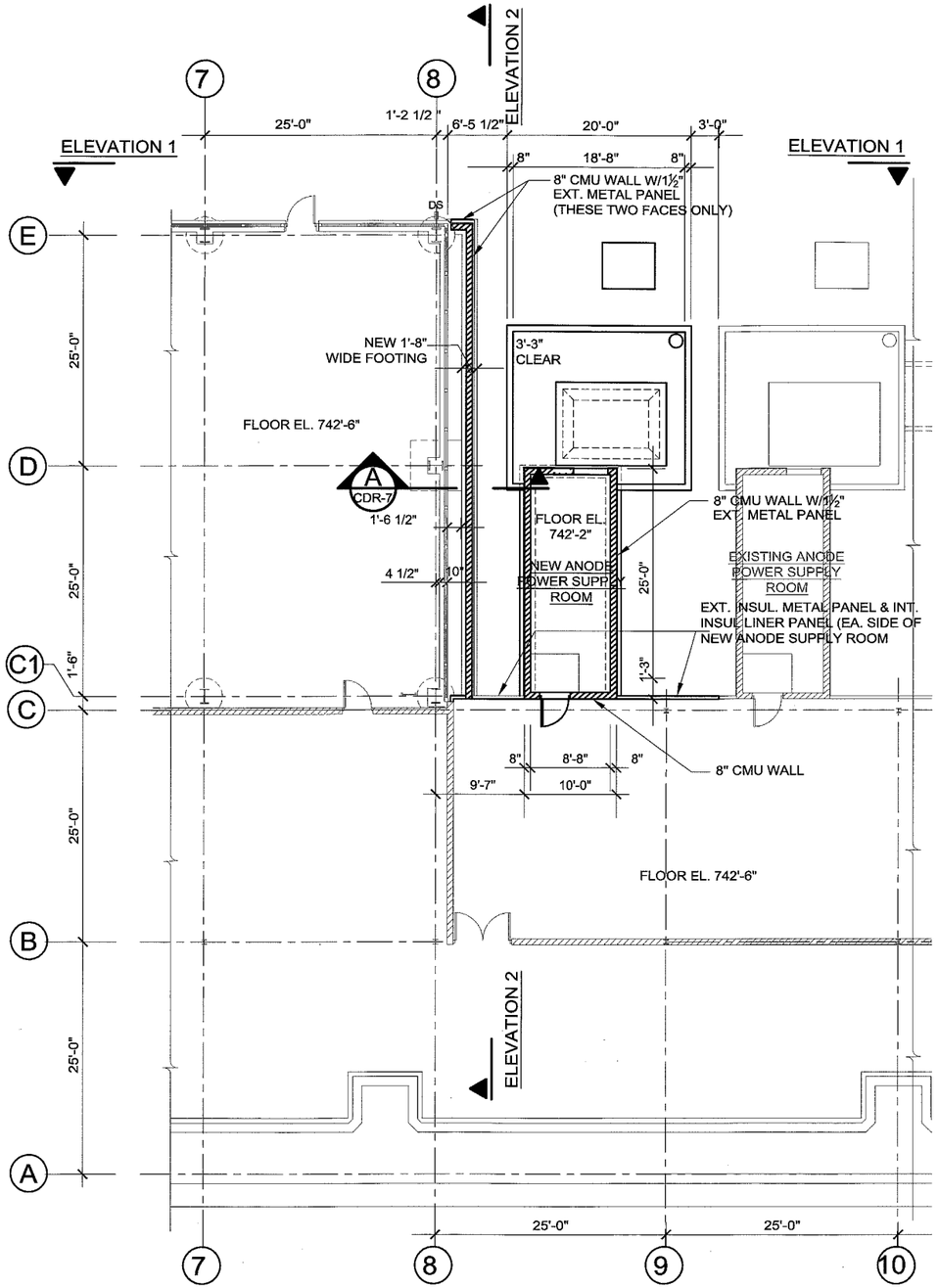
UNITED STATES DEPARTMENT OF ENERGY

MINU

MI-39 SERVICE BLDG. - CROSS SECTION

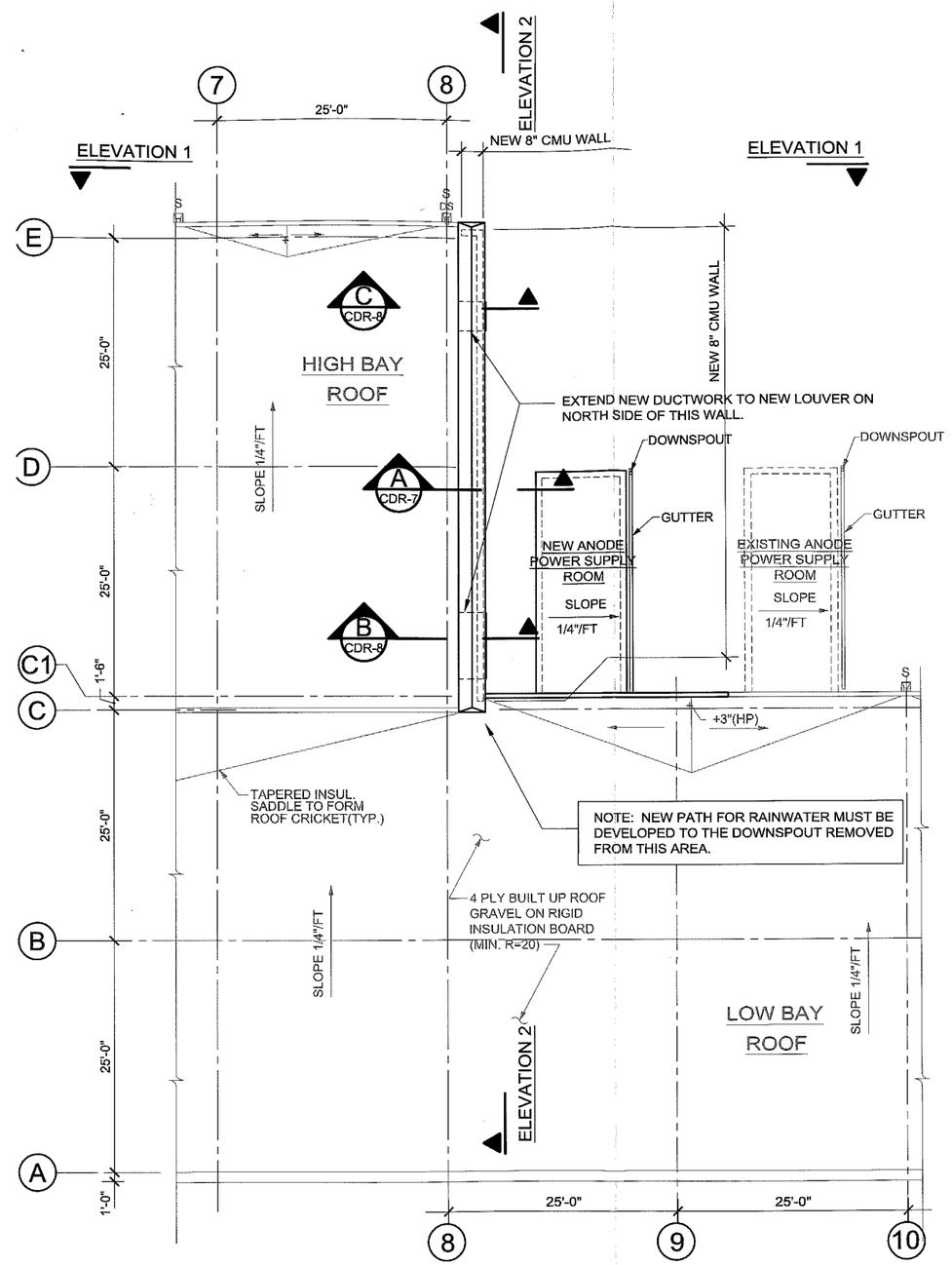
DRAWING NO. **6-6-49** **CDR-5** REV.

Dwg: 6-6-49 CDR-5.dwg Plotted: 09FEB07 @ 09:53:14a.m.



FLOOR PLAN AT NEW ANODE POWER SUPPLY ROOM

SCALE: 1/8"=1'-0"



ROOF PLAN

SCALE: 1/8"=1'-0"

REV.	DATE	DESCRIPTIONS
		REVISIONS

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SUBMITTED	.	.

PROJECT NORTH

SCALE:

1/8"=1'-0"

8 0 8 16

SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

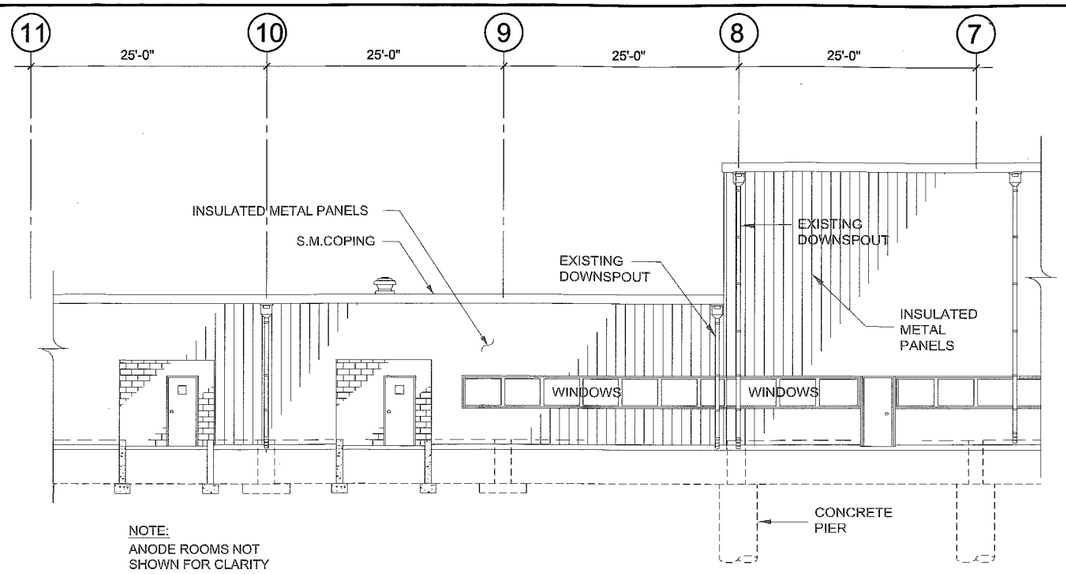
UNITED STATES DEPARTMENT OF ENERGY

MINU

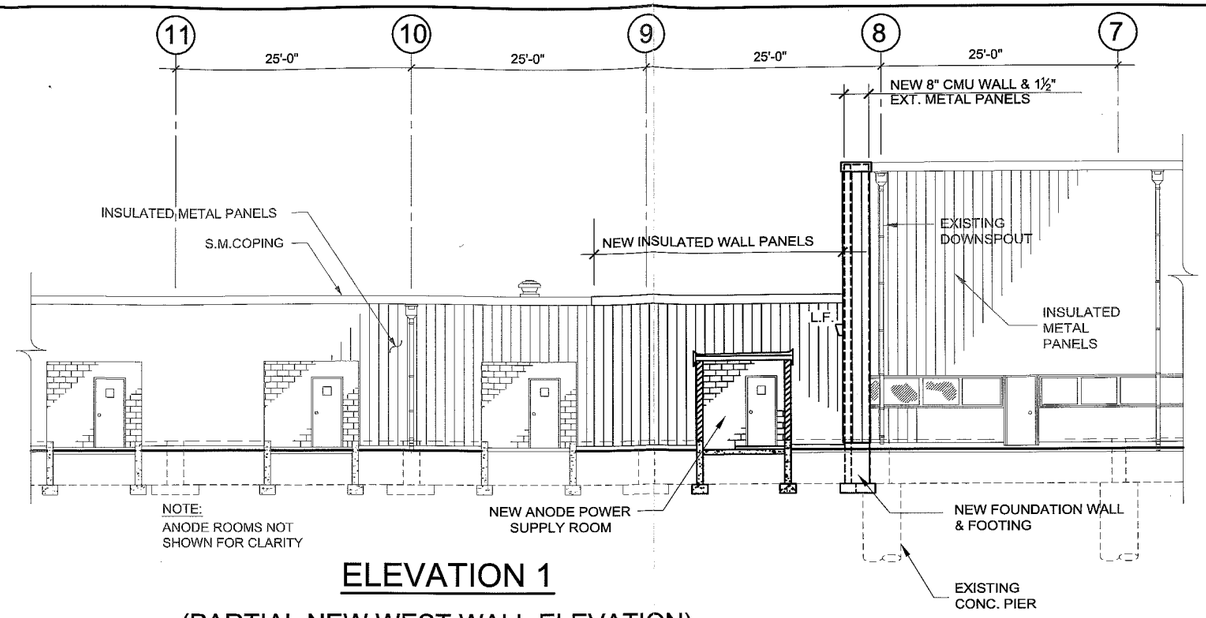
MI 60 ANODE SUPPLY ROOM - PLANS

DRAWING NO. **6-6-49** **CDR-6** REV.

Dwg: 6-6-49 CDR-6.dwg Plotted: 09FEB07 @ 09:54:21a.m.

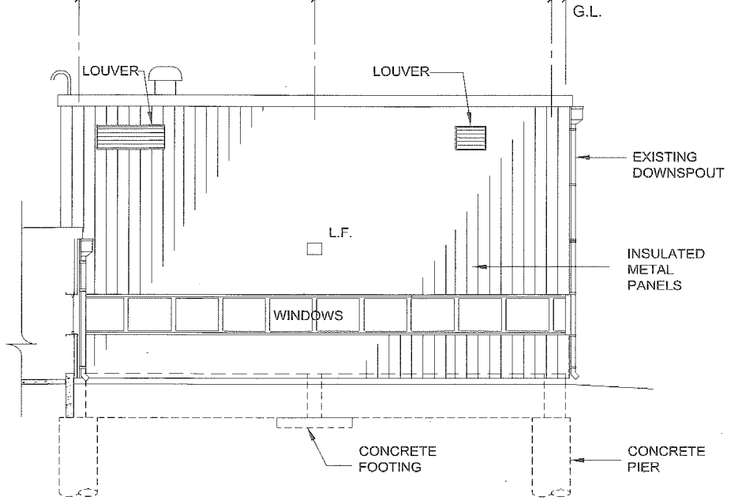


PARTIAL EXISTING WEST WALL ELEVATION

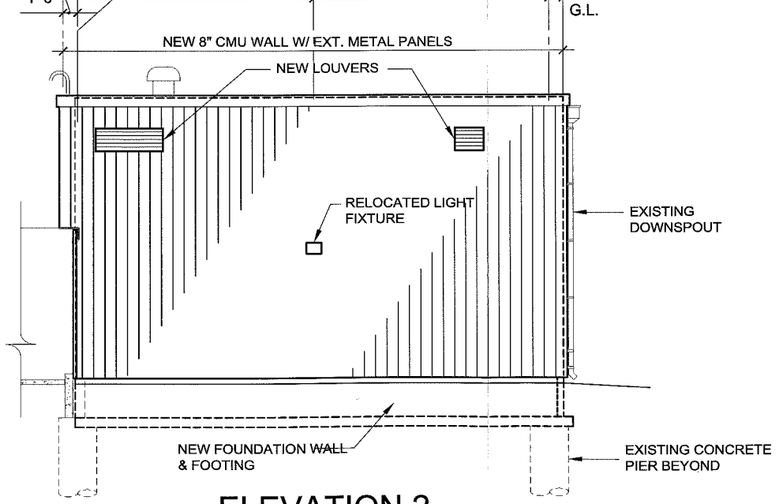


ELEVATION 1

(PARTIAL NEW WEST WALL ELEVATION)



PARTIAL EXISTING NORTH WALL ELEVATION



ELEVATION 2

(PARTIAL NEW NORTH WALL ELEVATION)

REV.	DATE	DESCRIPTIONS

REVISIONS

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APPROVED	.	.
SUBMITTED		.

SCALE:

1/8"=1'-0"

8 0 8 16

SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

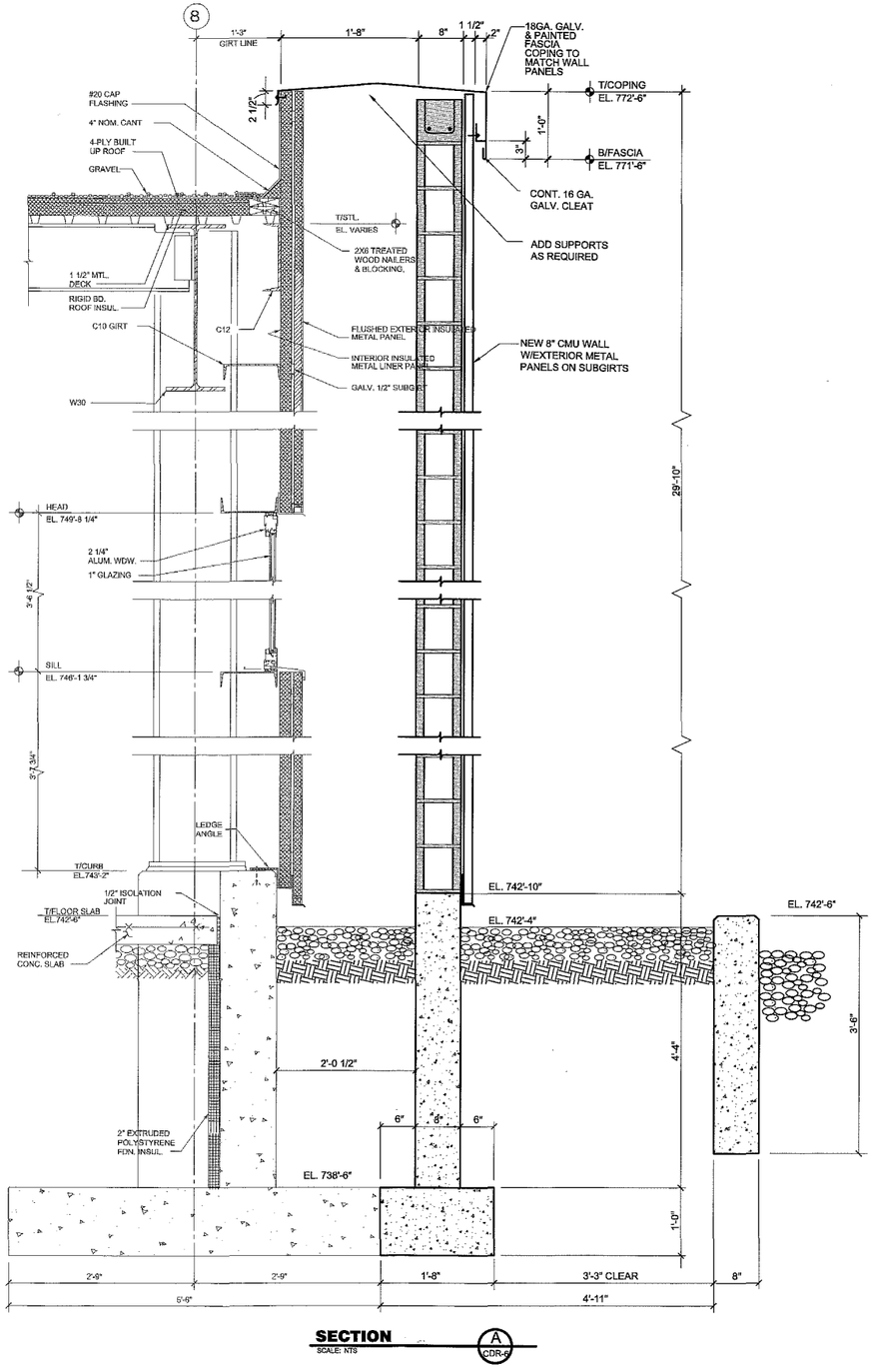
UNITED STATES DEPARTMENT OF ENERGY

MINU

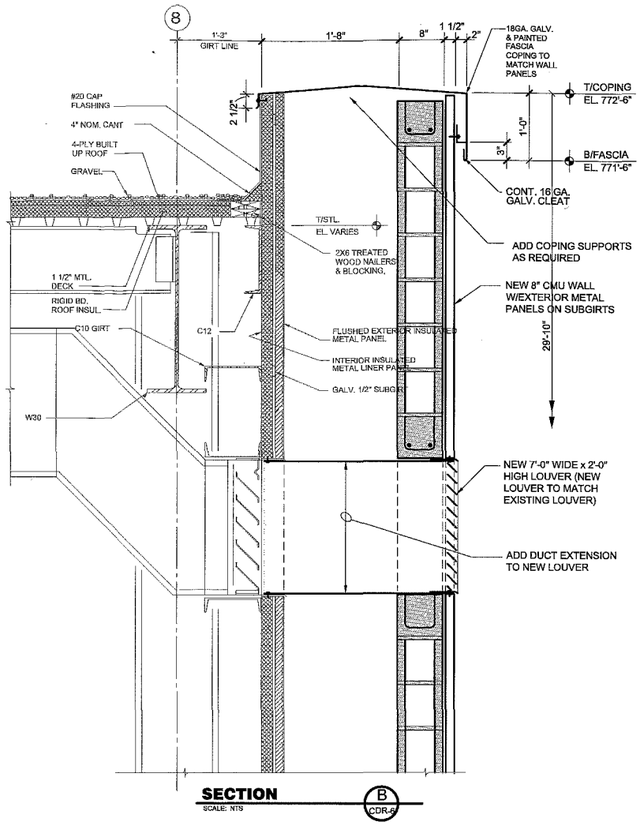
MI 60 BUILDING ELEVATIONS

DRAWING NO. **6-6-49** **CDR-7** REV.

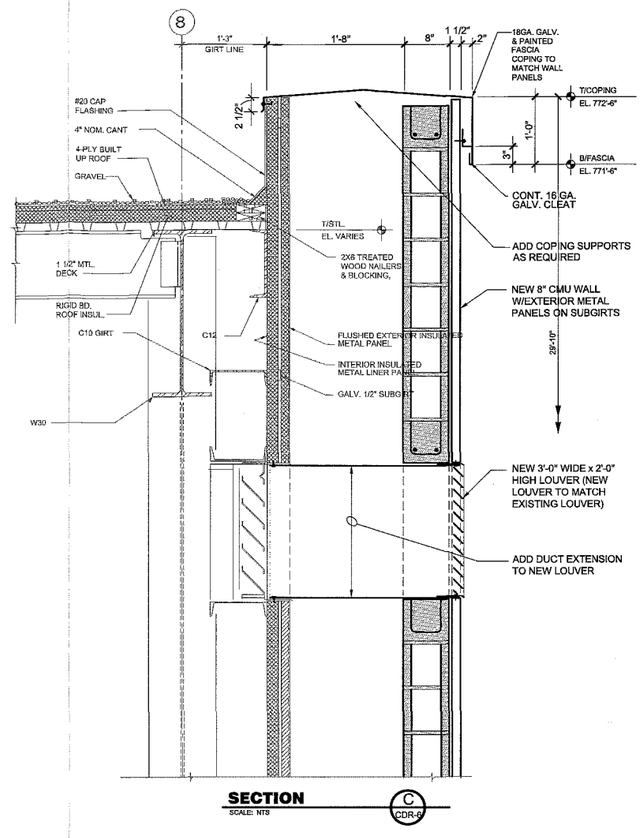
Dwg: 6-6-49 CDR-7.dwg Plotted: 09FEB07 @ 09:55:01a.m.



SECTION A CDR-6
SCALE: NTS



SECTION B CDR-6
SCALE: NTS



SECTION C CDR-6
SCALE: NTS

NOTE:

THIS MASONRY WALL SHALL BE DESIGNED WITH ADEQUATE LATERAL BRACING AND REINFORCEMENT FOR ALL LOADS THAT MIGHT BE INFLICTED UPON IT.

REV.	DATE	DESCRIPTIONS
		REVISIONS

	NAME	DATE
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SCALE:

1/8"=1'-0"

8 0 8 16
SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

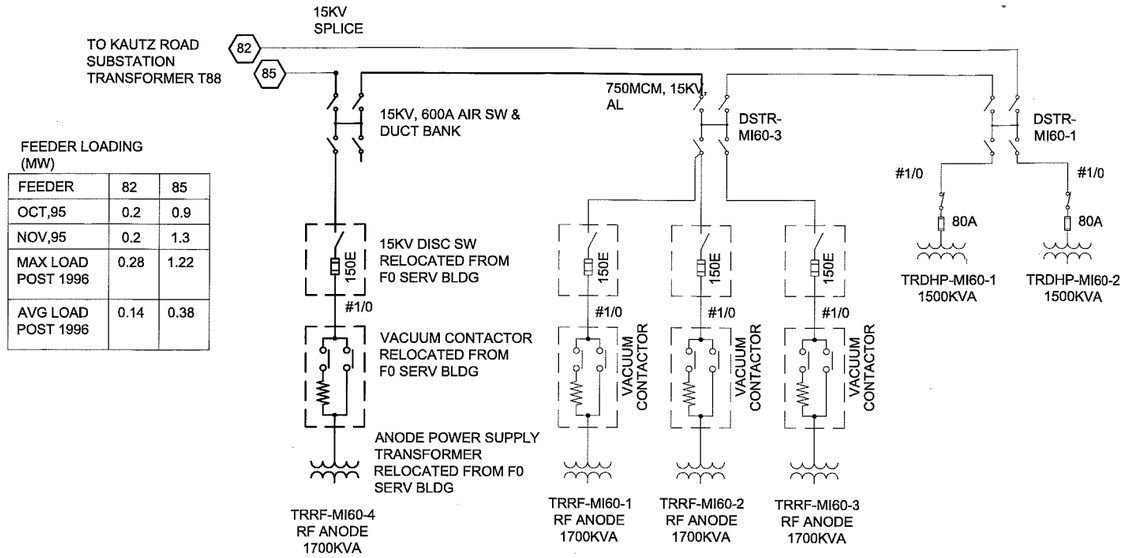
UNITED STATES DEPARTMENT OF ENERGY

MINU

MI 60 BUILDING SECTIONS

DRAWING NO. **6-6-49** **CDR-8** REV.

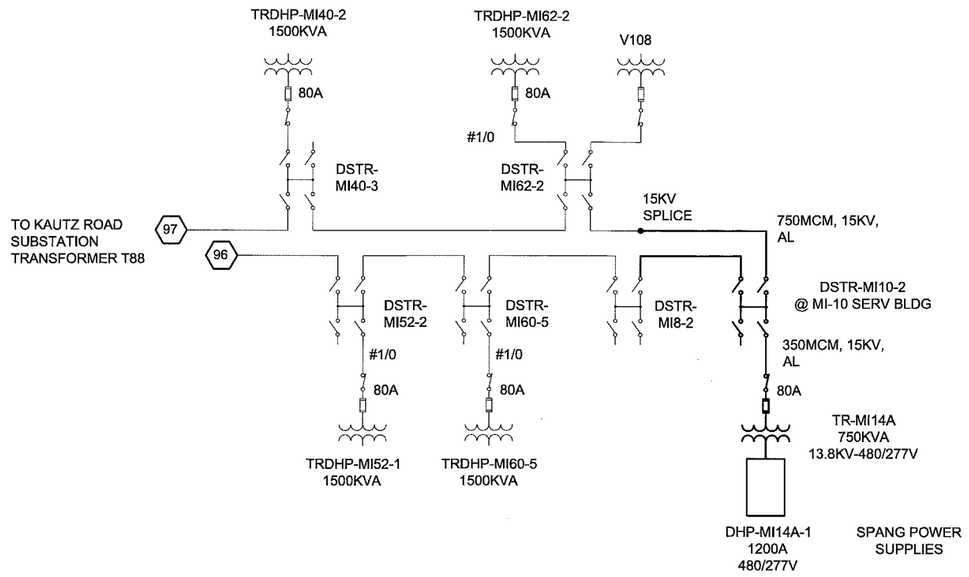
Dwg: 6-6-49 CDR-8.dwg Plotted: 09FEB07 @ 09:58:16a.m.



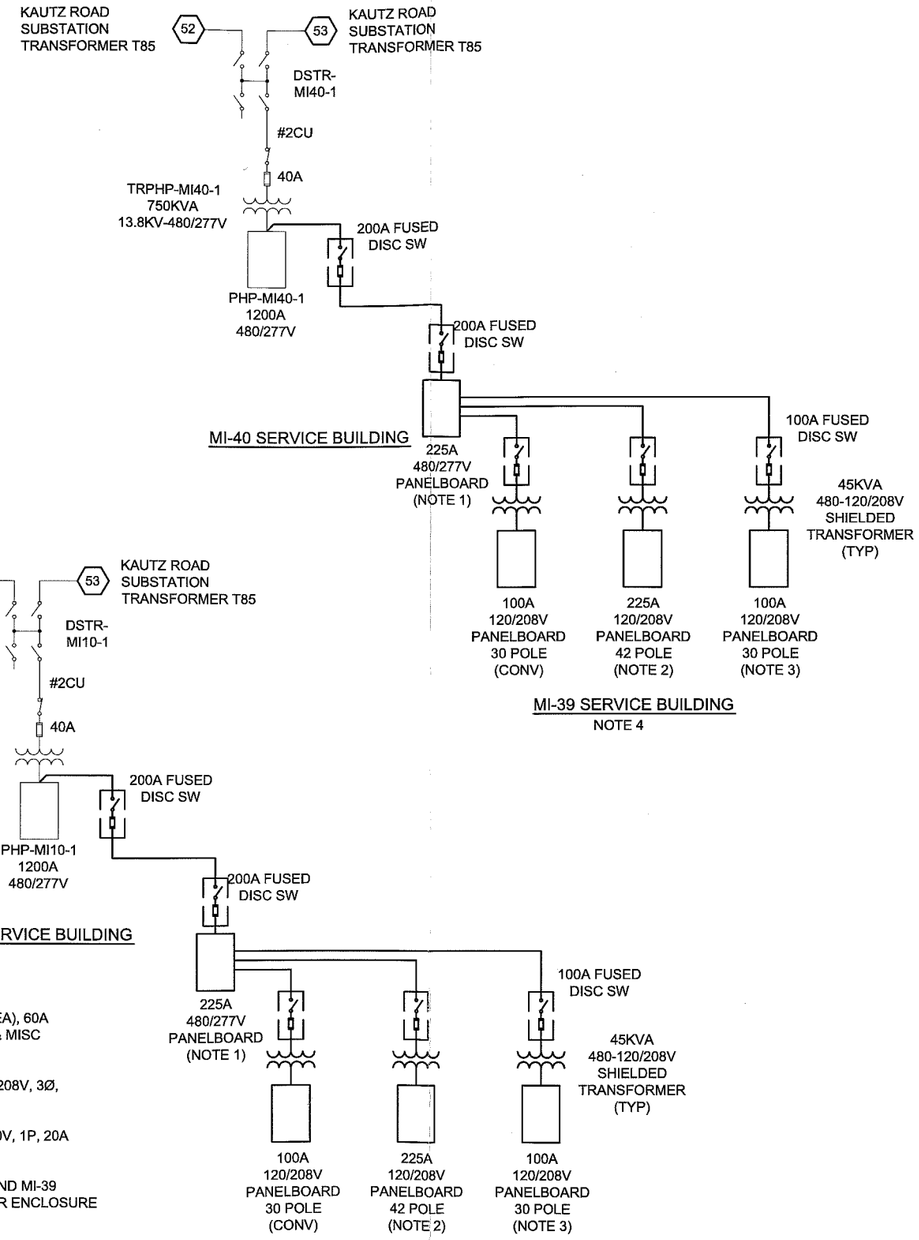
FEEDER LOADING (MW)

FEEDER	82	85
OCT,95	0.2	0.9
NOV,95	0.2	1.3
MAX LOAD POST 1996	0.28	1.22
AVG LOAD POST 1996	0.14	0.38

MI-60 SERVICE BUILDING



MI-14 SERVICE BUILDING



MI-40 SERVICE BUILDING

MI-10 SERVICE BUILDING

MI-39 SERVICE BUILDING
NOTE 4

MI-14 SERVICE BUILDING
NOTE 4

NOTES:
1. 2 FLUORINERT PUMPS (10A, 480V, 3Ø EA), 60A WELDING RECEPT, MARV AIR (HVAC) & MISC BLDG LOADS.
2. KICKER POWER SUPPLIES: 10 TOTAL; 208V, 3Ø, 20A CIRCUITS EACH
3. ELECTRONICS RACKS: 10 TOTAL; 2-120V, 1P, 20A CIRCUITS EACH.
4. CONNECT MI-14 BUILDING GROUND AND MI-39 BUILDING GROUND TO MAIN INJECTOR ENCLOSURE GROUND CABLE.

REV.	DATE	DESCRIPTIONS
		REVISIONS

	NAME	DATE
DESIGNED	.	.
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APPROVED	.	.
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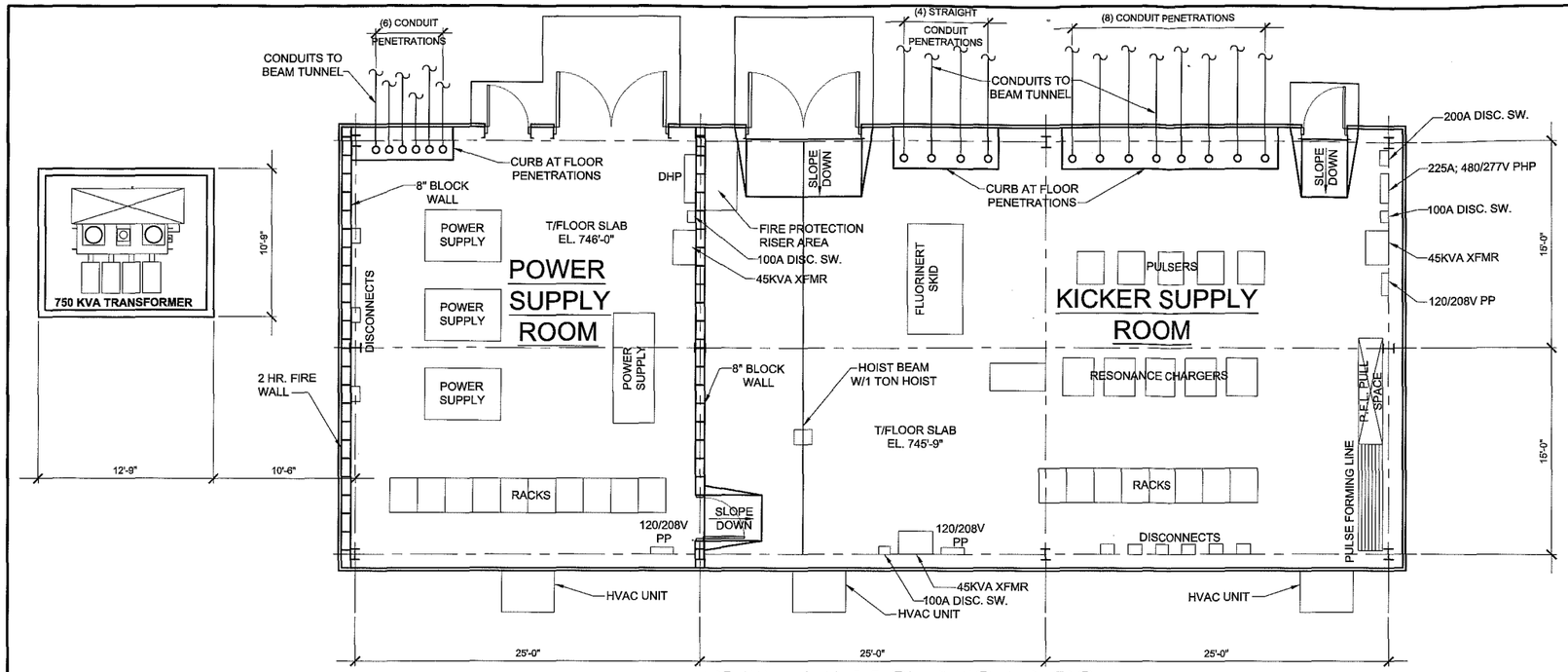
SCALE:

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

MINU
ELECTRICAL SINGLE LINE DIAGRAM

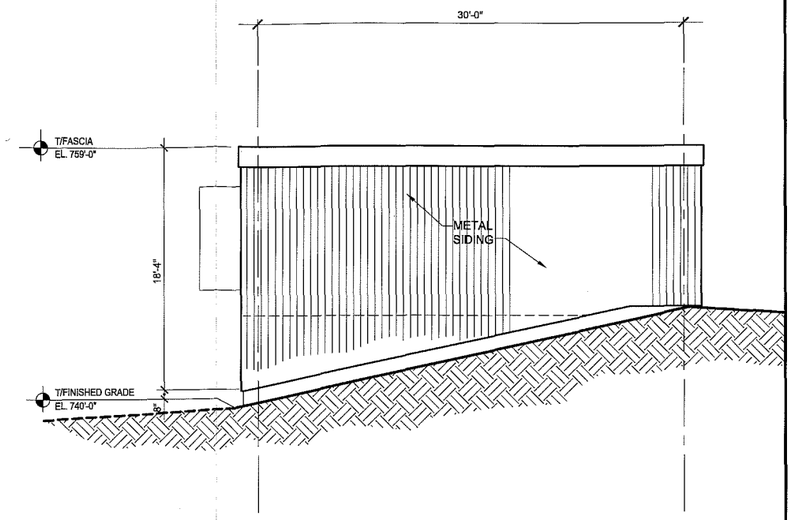
DRAWING NO. **6-6-49** **CDR-9** REV.

Dwg: 6-6-49 CDR-9.dwg Plotted: 09FEB07 @ 11:25:53a.m.



PLAN - MI 14 SERVICE BLDG.

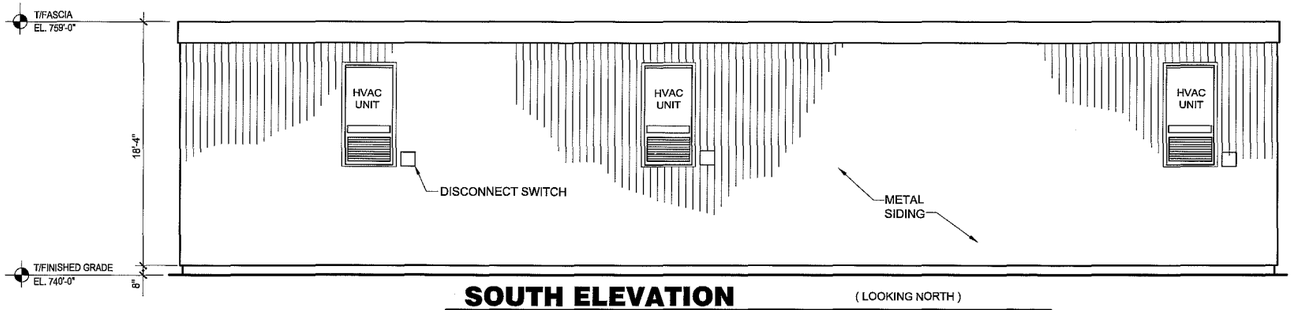
SCALE: 3/16" = 1'-0"



EAST ELEVATION

(LOOKING WEST)

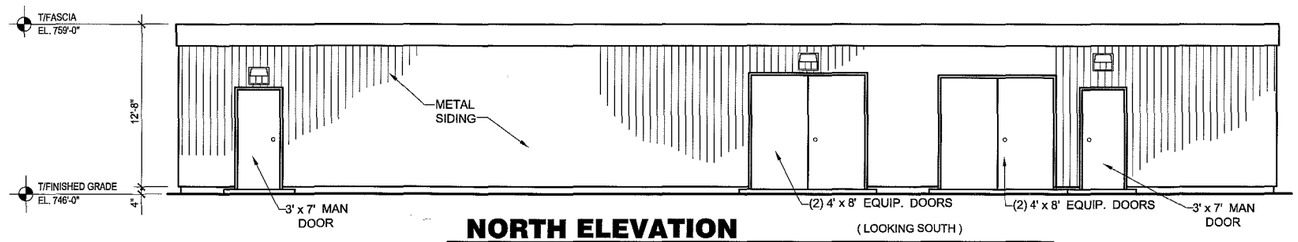
SCALE: 3/16" = 1'-0"



SOUTH ELEVATION

(LOOKING NORTH)

SCALE: 3/16" = 1'-0"



NORTH ELEVATION

(LOOKING SOUTH)

SCALE: 3/16" = 1'-0"

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		REVISIONS

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CHECKED	.	.
APPROVED	.	.
SUBMITTED	.	.

PROJECT NORTH

W E S

SCALE:

3/16"=1'-0"

2 0 2 4 6 8 10 12 14

SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

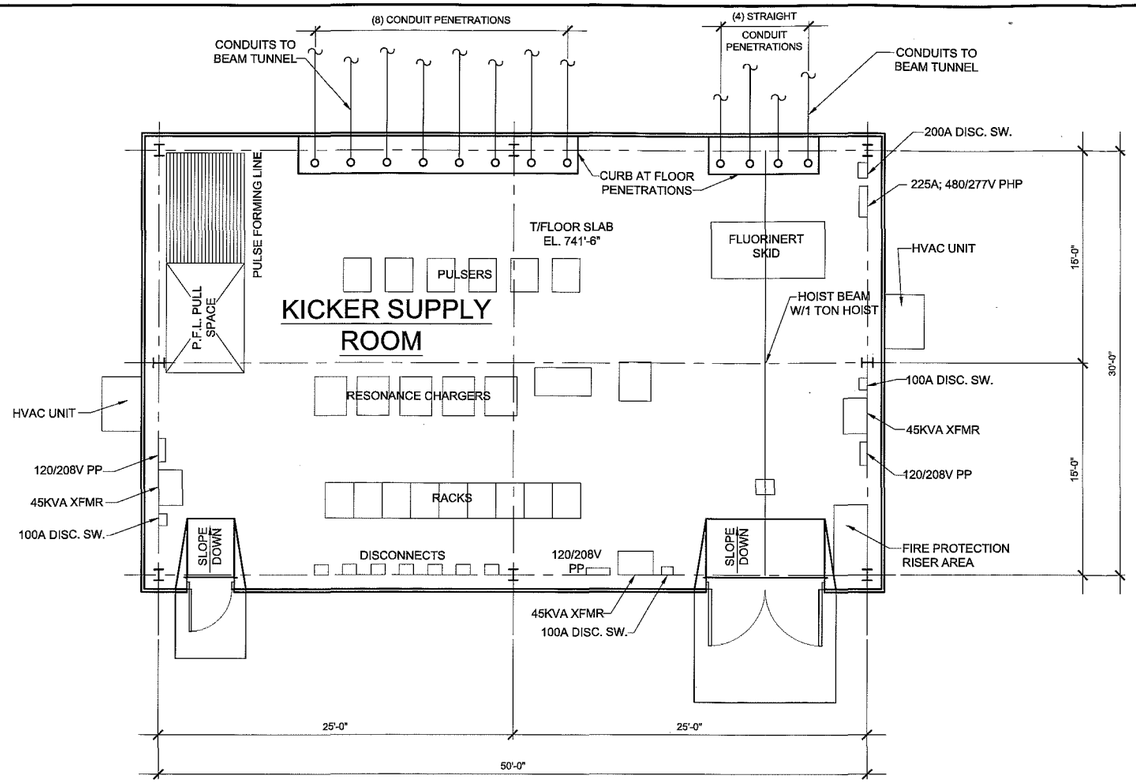
UNITED STATES DEPARTMENT OF ENERGY

MINU

MI-14 SERVICE BLDG. - PLAN & ELEVS.

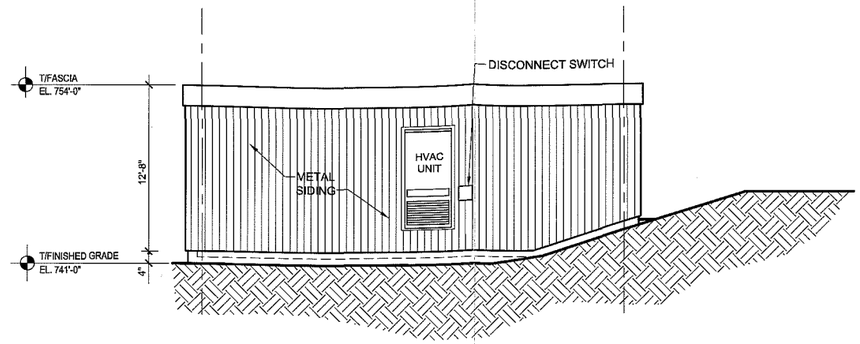
DRAWING NO. **6-6-49** **CDR-10** REV.

Dwg: 6-6-49 CDR-10.dwg Plotted: 09FEB97 @ 11:27:28a.m.



PLAN - MI 39 SERVICE BLDG.

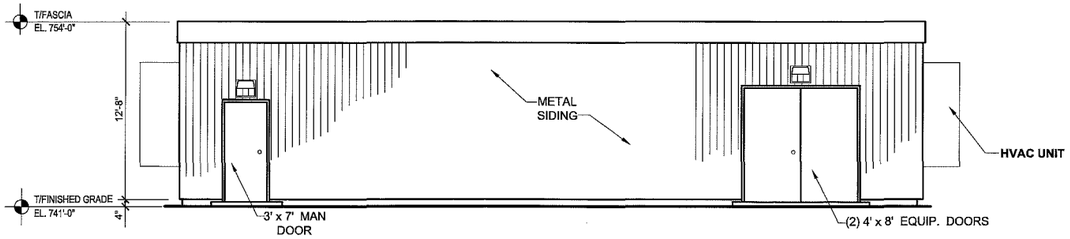
SCALE: 3/16" = 1'-0"



EAST ELEVATION

(LOOKING WEST)

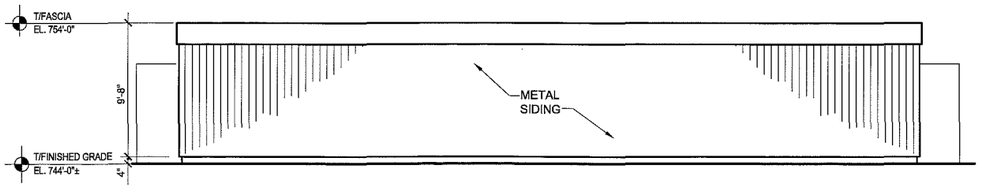
SCALE: 3/16" = 1'-0"



SOUTH ELEVATION

(LOOKING NORTH)

SCALE: 3/16" = 1'-0"



NORTH ELEVATION

(LOOKING SOUTH)

SCALE: 3/16" = 1'-0"

REV.	DATE	DESCRIPTIONS

REVISIONS

	NAME	DATE
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APPROVED	.	.
SUBMITTED	.	.

PROJECT NORTH

SCALE:

3/16"=1'-0"

2 0 2 4 6 8 10 12 14

SCALE FEET

FERMI NATIONAL ACCELERATOR LABORATORY

UNITED STATES DEPARTMENT OF ENERGY

MINU

MI-39 SERVICE BLDG. - PLAN & ELEVS.

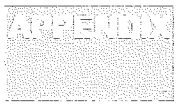
DRAWING NO. **6-6-49** **CDR-11** REV.

Dwg: 6-6-49 CDR-11.dwg Plotted: 09FEB07 @ 11:28:21a.m.

APPENDIX MINU

This appendix contains:

- Fermilab Environmental Evaluation Notification Form
- Floodplain Notification for Proposed Construction and Operation of MI-14 Service Building at Fermi National Accelerator Laboratory (Fermilab), Batavia, IL
- Fermilab Engineering Standards Manual
- DOE SC Space Management Requirements
- LEED Checklist
- Whitestone Building and Repair Cost Reference Information
- Stakeholder Input from Comment and Compliance Review



Fermi National Accelerator Laboratory / Kirk Road and Pine Street / P.O. Box 500 / Batavia, IL 60510 / 630.840.3000 / www.fnal.gov / fermilab@fnal.gov
Office of Science / U.S. Department of Energy / Managed by Fermi Research Alliance, LLC

hour) to NuMI while still supplying adequate protons for the Collider and other fixed-target programs. This is still less than the design basis for the NuMI facility, but closer to the desired intensity. Phase 2 of the Proton Plan has been incorporated into the NOvA Experiment and would consist of further upgrades and modifications to existing accelerator and beamline systems to increase the proton delivery rate to the NuMI facility to its full design basis, as well as to provide a surplus of Main Injector beam for anticipated future experiments. It would take advantage of the machines and beamline elements that would become surplus once the Collider program shuts down, along with upgrades to existing machines, to increase the beam power delivered to the NuMI facility to 700 kW (1.3 x 10E17 protons per hour).

In support of these upgrades, the proposed Main Injector Neutrino Upgrade Project (MINU) would provide service buildings to house new power supplies and new kicker magnet support equipment to increase the beam power to 700 kW. The project would require construction of two new service buildings around the Main Injector, MI-14 and MI-39, and one small addition at MI-60 to house an anode power supply (see the attached site map). The work would require excavation for installation of penetrations from the new service buildings to the existing Main Injector tunnel, excavation for building foundations at all three locations, utility installation in trenches for power and communication ductbanks, and industrial cooling water (ICW) piping. Because the MI-14 Service Building would be constructed in the existing floodplain, compensatory flood storage volume would be created by excavating a volume of material below the 100 year flood elevation. The floor of the building itself would be constructed two feet above the high water level. Although the location of the required space management demolition has not been determined, this work would involve demolition of existing concrete, steel, or masonry structures, and restoration of the surrounding area.

Since these upgrades would be built to increase protons to the existing NuMI beamline, alternative locations are not feasible. The approach of increasing repetition rate in the Main Injector and using an existing ring (the Recycler ring) as a pre-injector to the Main Injector is the most cost-effective approach to increase beam intensity down the neutrino line. Other alternatives would have to include building a new accelerator ring and thus be much more costly and have a much larger impact on the environment. Inaction would require neutrino experiments using the upgraded NuMI facility to run for longer periods of time to obtain the same data that could be obtained with the proposed increase in protons available from the upgraded facility. Alternatives to locating the MI-14 Service Building in the proposed location in the existing floodplain were examined. The physics criteria require equipment inside the building to be within 200 ft of the kicker injection location in the Main Injector tunnel. The building cannot be sited outside the Main Injector berm because existing facilities that would remain in service already occupy areas that are within the 200 ft requirement. The MI-10 service building is one of these but there is not enough room adjacent to the building to construct an addition, of adequate size to house

- [ ] Other protected species
- [x] Wetland/Floodplains
- [ ] Archaeological or historical resources
- [ ] Non-attainment areas

B. Regulated Substances/Activities: Will the proposed action involve any of the following regulated substances or activities?

- [x] Clearing or Excavation
- [x] Demolition or decommissioning
- [ ] Asbestos removal
- [ ] PCBs
- [ ] Chemical use or storage
- [ ] Pesticides
- [ ] Air emissions
- [x] Liquid effluents
- [ ] Underground storage tanks
- [x] Hazardous or other regulated waste (including radioactive or mixed)
- [x] Radioactive exposures or radioactive emissions
- [x] Radioactivation of soil or groundwater

C. Other relevant Disclosures

- [ ] Threatened violation of ES&H permit requirements
- [ ] Siting/construction/major modification of waste recovery or TSD facilities
- [ ] Disturbance of pre-existing contamination
- [ ] New or modified permits
- [ ] Public controversy
- [ ] Action/involvement of another federal agency
- [ ] Public utilities/services
- [ ] Depletion of a non-renewable resource

IV. NEPA Recommendation

Fermilab has reviewed this proposed action and conclude that the appropriate level of NEPA determination is a Categorical Exclusion. The conclusion is based on the proposed action meeting the applicable requirements in DOE's NEPA Implementation Procedures, 10 CFR 1021, Subpart D, Appendix B1.15, B3.10.

V. DOE/CH-FAO NEPA Coordinator Review

Concurrence with the recommendation for determination:

NEPA Coordinator reviewer Jonathan Cooper

Signature _____

project, although the tritium concentration would likely be somewhat higher. This increase would not present any new waste management challenges, and equipment changes are being explored that might eventually decrease the substantial cost of managing this waste. No hazardous or mixed waste is expected to be generated as a result of the project.

Radiation exposures or radioactive air emissions:
Although more protons would be directed towards NuMI than at any time in the past, the total number of protons being produced by the accelerator complex as a whole would remain well below the limits of the current safety assessment document (SAD), 3.54 x 1017 protons per hour (from the Linac), and the beam energy (120 GeV) would remain well below the current maximum (1 TeV in the Tevatron). Radiation exposures would increase in some areas. Personnel and public exposures would remain well below regulatory limits and within guidelines of the Fermilab Radiological Control Manual. Occupational doses accrued during maintenance activities would be better controlled than in the past due to upgrading of the work cell to allow more remote manipulation, installation of a shielded work platform, better component design (which should increase reliability), and improved procedures based on lessons learned. Radionuclide emissions would be monitored and reported in accordance with existing practices. Potential increases due to higher beam intensity can be mitigated, if necessary, by operational changes, e.g., increasing decay time before ventilating the tunnels. Cumulative air emissions are expected to remain substantially below the National Emission Standards for Hazardous Air Pollutants (NESHAPs) threshold for continuous monitoring and far below the regulatory limit for effective dose equivalent to the public.

Radioactivation of soil or groundwater:
Some soil and groundwater in the immediate vicinity of the NuMI tunnel walls would experience a higher radiation environment due to the increased beam rate per hour. Activation in the groundwater beyond the immediate vicinity of the NuMI facility is projected to be negligible, primarily because groundwater in the vicinity of the tunnel constantly flows into the tunnel void and is pumped to the surface. Residence time therefore limits activation of the water itself as well as contact time with/leaching of activation products in the surrounding rock and soil.

Wetland/Floodplains
See attached Floodplain Assessment for the proposed MI-14 Service Building.

Floodplain Statement of Findings
MI-14 Service Building at Fermi National Accelerator Laboratory (Fermilab)

This notice is prepared in accordance with U.S. DOE Floodplain and Wetlands Environmental Review notice requirements at 10 CFR Part 1022.14 *Findings*. A Notice of Proposed Action for the project was published on [date]. This statement of findings takes into account comments received by DOE from members of the public in response to the Notice of Proposed Action.

Floodplain Impacts

No significant downstream flood hazards exist in this area. The small volume of storage capacity displaced by the MI-14 service building would be directly mitigated by the excavation of sufficient soil to provide for compensatory flood storage at a 1.5:1 ratio to the volume lost. This would add 11,700 cubic feet of flood water storage. The Main Injector is designed to route all floodwaters in excess of the 100 year storm around the outside of the existing berm, by-passing the infield where the proposed service building would be built.

Because the loss of flood storage would be replaced at a greater than one-to-one ratio, the proposed action would result in a benefit to flood storage capacity, both in the short term and in the long term. Impact on water quality in Indian Creek would be temporary and mitigated by appropriate erosion control measures, and revegetation to match the existing flora.

Alternatives

No practicable alternatives have been identified to the location of the MI-14 service building in the floodplain. The physics criteria require equipment inside the building to be within 200 ft of the kicker injection location in the Main Injector tunnel. Locations outside the Main Injector berm that meet this distance requirement are already occupied by facilities that must remain in service. There is insufficient room adjacent to the existing MI-10 service building to construct an addition of the size necessary to house the proposed MI-14 equipment. The only feasible site for the MI-14 service building, therefore, is inside the MI berm, within the floodplain. Taking no action would avoid impact on the floodplain, but would preclude the Laboratory's attainment of physics goals and would greatly increase the time required by existing and future experiments to amass their desired data sets.

Conclusion

In the absence of impacts on the floodplain and other sensitive resources, DOE has determined that the proposed action falls within a category of actions that requires neither an Environmental Assessment nor an Environmental Impact Action, under the DOE National Environmental Policy Act Implementing Procedures at 10 CFR Part 1021, Subpart D.

ENGINEERING STANDARDS MANUAL

Fermilab
FESS/Engineering

Rev. 1

Fermilab
FESS/Engineering

Introduction

The Fermilab Engineering Standards Manual is a formal document for all aspects of engineering at the laboratory. For FESS/Engineering and its consultants, the applicable portions may be found in Chapter 2: Civil Engineering Standards, where the standards for each discipline are outlined.

In addition to the existing, Laboratory-approved document, FESS/Engineering has developed supplementary standards information, intended for eventual incorporation into the Manual. At this time, this information is maintained in separate appendix to this publication, and identified as such. All FESS/Engineering work should incorporate both the existing accepted document and the supplement.

Chapter 2: Civil Engineering Standards

2.1 General Requirements

2.1.1 Aesthetics Approvals - - Mandatory

2.1.1. Aesthetic Approvals
All proposed modifications that affect the exterior appearance of buildings or modify landscaping, roads or parking areas are to be reviewed and accepted by the Directorate.

2.1.2 Approval for Modifications to Buildings and Systems - - Mandatory

Standards
Document 2.1 B

Fermilab

RECEIVED
AUG 15 1994
FACILITIES ENG. SERVICES

Director's Office

August 8, 1994

To: Division/Section Heads

From: John Peoples

Subject: Building Modifications

I designated Ray Stefanski, Associate Director for Operations Support as my representative to approve any proposed building modifications. Ray is to review all proposed building modifications for compliance with building and safety codes and for aesthetic considerations. Building modifications are defined as any modification which modifies any structural element of the building, adds any additional interior walls, or modifies any of the existing electrical, HVAC, fire protection, sanitary sewer, potable water, or industrial water services. Review of technical equipment modifications is not included in this definition unless it necessitates modifying one of the above. As a rule, Ray will use FESS's Engineering & Planning Group to review any proposed modifications.

cc: Directorate
Building/Area Managers

FACILITIES ENGINEERING SERVICES
CORRESPONDENCE DISTRIBUTION
RESP INFO
cc: EC KC GM PN VR
RESPOND BY:
FOLLOW-UP ON
FILE

2.2 Civil

2.2.1 Design Criteria Matrix to N&S Standards - - Mandatory

2.2.1 CIVIL DESIGN CRITERIA	U.S. CODE OF FEDERAL REGULATIONS			EXECUTIVE ORDERS							STATE OF ILLINOIS STANDARDS					FERMI STANDARDS
DESIGN ELEMENTS	10 CFR 1021 (DOE NEPA rules)	29 CFR 1910 (OSHA Gen Ind Stds)	29 CFR 1926 (OSHA Const Ind Stds)	71 IAC (Illinois Accessibility Code)	77 IAC 920 (Water well constn code)	77 IAC 925 (Well pump installation)	92 IAC 700 (Const/water course permit appl)	92 IAC 704 (Regulation of public waters)	Nat'l. Poll Disch Elim System	92 IAC 708 (Floodway const permit appl)	Illinois Standard for Road and Bridge Constuction	Standards and Specifications for Soil Erosion and Sediment Control 10/87, IEPA 87-102	Uniform Federal Accessibility Standards, Ch 4, Accessible Elements and Spaces: Scope and Technical Requirements	IDOT Design/Standards Manuals	Illinois Standards For Sewer and Water Construction	Secondary Containment for oil filled Transformers (Draft)
Civil Construction Projects	X	X	X													
Construction Projects involving Waters of the State			X				X	X	X	X						
Construction Projects > 5 acres in size									X			X				
Excavation												X				
Erosion Control Design												X				
Water Well Installation					X	X										
Sewer and Water Utilities											X			X	X	
Roadway/Pavement Design				X							X		X	X		
Transformer Containment Design																X

2.3 Architectural

2.3.1 Design Criteria Matrix to N&S Standards - - Mandatory

Design elements	10 CFR 835 (Occup. Rad. Protection	28 CFR 36 (ADA)	29 CFR 1920 (OSHA Construction Industry Standards)	Occupational Safety and Health Act	71 IAC (Illinois Accessibility Code) Illinois Administrative Code	100 1AC (Fire prevention and Safety) (Illinois Administrative Code)	National Fire Protection Association Fire Codes (NFPA)	BOCA Fire Prevention Code	BOCA National Building Code	Uniform Federal Accessibility Standards, CH 4, Accessible Elements and Spaces: Scope and Technical Requirements	FESHM 2010 Rev 11/95 (Planning and review of accelerator facilities and their operations)Fermilab Environmental Safety and Health Manual	FESHM 5032.2 (Guidelines for the design, fabrication, testing, installation, and operation of LH2 Targets) (Fermilab Environmental, Safety and Health Manual
Administration									X		X	X
General Planning	X	X	X	X	X	X	X	X	X	X	X	X
Use or Occupancy									X			
Special Use and Occupancy									X		X	
General Building Limitations									X			
Types of Construction									X			
Fire Resistant Materials and Construction							X		X			
Means of Egress							X		X			
Accessibility		X			X		X		X	X	X	
Roofs and Roof Structures									X			
Masonry									X			
Wood									X			
Glass and Galzing									X			
Gypsum Board and Plaster									X			
Elevators and Conveying Systems		X			X		X		X		X	

2.4 Structural

2.4.1 Design Criteria Matrix to N&S Standards - - Mandatory

2.4 A. STRUCTURAL DESIGN CRITERIA						
DESIGN ELEMENTS	ANSI B30.20,B30.11,B30.17	National Electric Code	NFPA	OSHA 2206&1910	Hoist Manufacturers Institute	BOCA National Building Code
1. Structural loads						X
2. Structural tests and inspections						X
3. Foundations and retaining walls						X
4. Structural concrete						X
5. Structural masonry						X
6. Structural steel						X
7. Structural wood						X
8. Overhead cranes	X	X	X	X	X	

2.4.2. Structural Loadings - - Mandatory

The following section addresses specific structural requirements that either will further clarify the matrix-referenced codes or site specific variations from them.

Structural Loadings

- Snow Loads: The flat roof snow load (Pf) shall not be less than 30.0 psf for any building on site.
- Wind Loads: The following shall be used for determining design wind loads
  Basic wind speed = 80 mph.
  Exposure Category = B
- Earthquake Loads: The following shall be used for determining design earthquake loads
  Av = 0.05
  Aa = 0.05
- Lateral Soil Loads: The following shall be used for determining design lateral soil loads, unless local soil tests have been performed.
  Active earth pressure coefficient, Ka = 0.5
  Unit weight of soil, [gamma] = 130 pcf
- Special Loads : The following shall be used for determining design special loads
  Down drag for vertical soil reaction on enclosures = 10%

2.5 Mechanical

2.5.1 Design Criteria Matrix to N&S Standards - - Mandatory

2.5.1 MECHANICAL DESIGN CRITERIA	US CODE OF FED REGS	US ACTS			STATE OF ILLINOIS STANDARDS						LOCAL ORDINANCES				STANDARDS					CODES			FERMI STDS	
DESIGN ELEMENTS	10 CFR Part 435 Subpart A / ASHRAE 90.1 - 1989	Clean Water Act	Safe Drinking Water Act	Toxic Substances Control Act	35 IAC (State of IL environmental regs)	77 IAC 890 (Illinois Plumbing Code)	77 IAC 920 (Drinking water syst req)	77 IAC 920 (Water well constn code)	77 IAC 925 (Well pump installation)	120 IAC (Boiler & pressure vessels)	Kane County Health Department Ordinance 910191 Water Well Code	City Code of Warrenville, IL, Title 7, Chapter 4, sewer/sewerage ordinance	Batavia Code of Regulations, City Ordinance, Section 8-3-10-3	DuPage County Health Department Private Water Supply Ordinance (OH-0002-90, Ch. 34, DuPage County Code)	American Conference of Governmental Industrial Hygienist/Threshold Limit Values	ANSI/ASHRAE 14 (Mechanical refrigeration)	ANSI/ASME B31.5 (Refrigeration piping)	ANSI/ASME B31.8 (Gas transmission and piping systems)	ASME Pressure Vessel Code-Section VIII	National Fire Protection Association National Fire Codes NFPA	BOCA National Building Code	FESHM 5031 (Pressure vessels)	FESHM 5031.1 (Pressure piping systems)	FESHM 5035 (Mechanical refrigeration systems)
HVAC	X																				X			
Load Calculations	X																				X			
Insulation	X																X				X			
Ductwork																					X			
Piping																	X				X	X	X	X
Design Conditions	X																				X			
Ventilation															X					X	X			
Special Systems (Cleanrooms)															X					X				
Central Plant - Cooling	X															X	X		X		X	X	X	X
Refrigeration	X															X	X		X		X	X	X	X
Central Plant - Heating	X									X										X	X	X	X	
Air Handling Systems	X																				X			
Pumping Systems								X	X		X			X							X			
Testing, Adjusting and Balancing	X														X									
HVAC Commissioning	X																							
Underground Piping						X	X				X	X									X			
Backflow Prevention		X	X			X	X				X			X							X			
Domestic Water Systems			X			X		X	X	X	X		X	X							X			
Drain, Waste and Vent						X						X									X			
Natural Gas Systems						X												X		X	X			
ICW Systems		X				X															X			
Water Treament				X	X	X	X				X			X	X						X			
Insulation																					X			
Strainers and Filters						X	X														X			

2.6 HVAC Control Systems

2.6.1 Guidance Engineering Standards - - Guidance

Guidance Engineering Standards

- All Direct Digital Control (DDC) systems shall be Johnson Controls (JCI) Metasys Facilities Management Systems or compatible with the Metasys system through a Johnson Controls Integrator.
- All DDC systems shall communicate over the DDC sitewide ARCNET network. Preferred mediums of communication are coaxial cable, twisted pair cable, or optical fiber.
- Any control functions that are related to life safety shall be "hard-wired" as opposed to being staged/controlled through a DDC computer.
- Any programming modifications to existing DDC systems shall be performed or coordinated by the FESS DDC group.
- Any addition of points to existing DDC systems shall be performed or coordinated by the FESS DDC group.
- When a system is designed for a dehumidification application, the heating device shall be placed after the cooling device. This design allows the heating device to temper the air after the cooling device has removed the moisture.
- When a system is designed using outside air, a low limit thermostat shall be used to protect water coils. Upon sensing temperatures below the low limit thermostat, the system shall be hardwired such that the fans are shutdown, the outside air dampers are closed, and all water coil valves are positioned for full flow through the coil.

2.6.2 Advisory Engineering Standards - - Advisory

Advisory Engineering Standards

- Control cable 24 volts or less should be 18 AWG, stranded, shielded cable, 2 or 3 conductors as required.
- 120-volt control cable should be 12 AWG, stranded cable.
- Systems designed using outside air should have a minimum outside air damper position for improved indoor air quality. It is also good practice to install carbon dioxide sensors. Upon sensing high carbon dioxide readings, the outside air dampers shall open to improve the indoor air quality. Wall-mounted carbon dioxide sensors are preferred over duct-mounted sensors.
- SCR vernier control is recommended when using staged electric heaters.
- Proportional analog control is preferred over modulated control.
- Whenever possible, systems with economizer controls are recommended to provide outside air for free cooling. Dry bulb switchover is usually adequate. Larger HVAC systems (25 tons or greater) should consider using enthalpy switchover.
- Pneumatic actuators should be used whenever clean, dry air is available.
- Johnson Controls UNT and AHU controllers are recommended for applications where packaged control programs are sufficient. For more flexibility, the Johnson Controls DX9100 Controller is recommended.

- Fire Department connection should be a 4-inch "Storz" quick connect with a 22½-degree straight-galvanized elbow on the exterior inlet pipe to the Storz connection. Also, the gasket should be removed from the Storz cap.
- Waterflow alarm detectors (switches) should be provided with double pole, double throw contacts, rated at 120 VAC at 3 amps.
- Preaction sprinkler systems should be configured as double interlocked as manufactured by Viking. In addition, the air supervisory switch should be cross-zoned with the releasing detection.
- A control valve should be provided after the preaction valve assembly, to facilitate testing without introducing water throughout the piping network.
- Waterflow supply test information can be obtained from the FESS-Engineering Group.
- For water-mist systems and preaction systems, refer to special suppression systems.
- All control valves should be provided with electronic valve supervisory (tamper) switches.
- As-built documents should be provided to FESS.

2.7.3 Fire Alarm System - - Guidance

- Acceptable equipment manufacturers for fire alarm control panels are Siemens-Cerberus (Pyrotronics) and Fire Control Instruments (FCI).
- All fire alarm control panels (FACP) should be provided with a T-45 key and lock assembly.
- FACPs should be provided with a silence switch or function key for all notification appliances.
- FACPs should be provided with a fire department testing switch or function key to disable notification devices and sub-functions during testing.
- FACPs should be provided with a by-pass switch for in-duct smoke detector fan shutdown operations.
- Addressable/analog circuits should be a minimum of 18 AWG solid twisted jacketed cable. Conventional (Hardwire) initiating circuits should be a minimum of 16 AWG solid cable. Indicating appliance circuits should be a minimum of 14 AWG solid cable.
- All cabling should be installed in conduit, EMT minimum. The minimum conduit size should be 3/4".
- When designing conventional systems, a supervisory zone should monitor the in-duct smoke detectors. In-duct smoke detectors should be manufactured by System Sensor.
- When designing an addressable/analog system, in duct smoke detectors should provide a supervisory or status alarm at the fire alarm control panel and signal output should be a supervisory alarm.
- Whether at the FACP, the in-duct smoke detector housing, or addressable module, relay contacts should be provided to monitor a single normal open or closed dry set of contacts for HVAC controls, i.e., fan shutdown.
- All manual pull stations should be dual action types and able to be reset with a T-45 key or a 9/16" allen wrenches.
- Line type heat detection, manufactured by Protectowire, should be installed in beam enclosures.
- Air sampling smoke detection, manufactured by Fenwal, should be installed in experimental hall areas.
- All fire alarm systems should be connected to Fermilab's FIRUS systems, capable of indicating FIRE ALARM, SUPERVISORY ALARM, and TROUBLE ALARM.
- FACP should be provided with a walk-test feature.
- All FACP shall be provided with smoke verification.
- Addressable/analog device descriptions should be reviewed by the Fire Department and Fire Systems Maintenance Group prior to download program in FACP. In addition, a hard copy of software and as-built documents should be provided to FESS.

2.7.4 Special Suppression Systems - - Guidance

- If air sampling is the method of detection, then the air sampling display should be programmed so that 100% at 40 seconds sends a signal via FIRUS indicating that FIRST LEVEL OF AIR SAMPLING IN ALARM. Release of agent should be at 100% for 60 seconds.
- If cross-zone detection is provided, then additional signal outputs from the releasing control panel to FIRUS should indicate FIRST DETECTOR ZONE IN ALARM and SECOND DETECTOR ZONE IN ALARM.
- The manifold pressure switch should connect directly into FIRUS and indicate AGENT RELEASED.
- Provide a time delay after second alarm prior to releasing agent to facilitate HVAC shut-down.
- Equipment shut-down, such as dampers and electronics should be from a manifold pressure switch.
- Manifold pressure switches should be provided with a minimum of double pole and double throw contacts.
- HVAC shut-down should occur at second alarm of cross-zone.

2.8.2 Grounding - - Reserved

2.8.3 Raceways - - Guidance

2.8.4 Cables and Wires - - Reserved

2.8.5 Transformers - - Reserved

2.8.6 Switchboards and Panelboards - - Guidance

2.8.7 Safety Switches - - Reserved

2.8.8 Motors - - Guidance

2.8.9 Space Heaters - - Guidance

2.8.10 Receptacles - - Reserved

2.8.11 Lighting - - Guidance

2.8.12 Lightning Protection - - Guidance

See Appendix for supplementary information on all Electrical Sections, 2.8.1 -2.8.12

2.3 Architectural

2.3.2 Space Allocation

The Fermilab site contains a wide variety of building occupancy types and construction types. Building types and areas within buildings at Fermilab include:

- Offices and support areas
- Industrial buildings
- Workbench labs
- Service/utility buildings
- Access buildings to access underground tunnels and research areas
- Technical areas
- Computer rooms
- Specialty function buildings

In general the space allocations for the many functions present at Fermilab are determined based on the unique needs of the particular project. However, the following guidance is provided for office and administrative areas.

Office/Administrative
A typical primary office space at Fermilab should not exceed 125 square feet. This is defined as the personnel occupied area in which an activity's normal operational functions are performed.

Office support area is limited to an additional 22% of the primary office area. Included in this support area are:

- Reception areas
- Meeting rooms
- File areas
- Central storage
- Library / reference

Not included in the support area calculations are:
- Toilets
- Stairwells
- Elevators
- Corridors
- Building equipment rooms

This formula results in a maximum of 152 s.f. per person as a planning guideline.

In general when planning offices, there should be an emphasis on shared spaces rather than private offices. Where glass walls occur facing corridors they should be kept clear of file cabinets, shelving, etc. Ceiling heights should be 8'-6" to 9'-0".

In Wilson Hall aisles should be open, with open office areas providing views to the outside or to the Atrium wherever possible.

2.3.3 Common Materials and Finishes

- Roofing Materials: All membrane roofing shall consist of 4-ply gravel surface fiberglass built-up roof system, by Johns Manville or approved equal, on compatible rigid insulation. No singly ply roofing shall be allowed.
- Metal Siding: Most structures at Fermilab use metal siding. The standard system consists of a 12" wide x 1½" thick, 20 gauge face panel and 12" wide x 1½" thick, 20 gauge liner panel. Exterior panels shall have manufacturer's standard 3 coat PVDF finish, Kynar 500 or approved equal. Interior panels shall have silicon polyester coating, color as selected from manufacturer's standard colors. Siding on most new construction will be stepped profile (6" high and 6" low) similar to Centria #IW21-A or flush panel IW11-A. The colors are

		Specify length.
Hook Strip	B-232	Type 304 stainless steel, satin finish. Specify length.
Roll Towel Dispenser/Waste Receptacle Combination	B-3960	Fully recessed, flush-front unit. Satin finish stainless steel. Seamless beveled flange.
Grab Bar	B-6206.99	Straight Grab Bar, satin finish with concealed mounting with four set screws. Peened nonslip gripping surface.
Mirror	B-290	Type 304 stainless steel angle frame with satin finish. Specify series number followed by width and height.
Shower Curtain Rod and Flanges	B-6047	Classic Series Extra-Heavy-Duty Shower Curtain Rod, type 304 stainless steel, satin finish. Specify length.
Shower Grab Bar	B-5861.99	Satin finish with concealed mounting with peened grip.
Shower / Dressing Area Seat	B-519	Shower/Dressing Area Seat, foam-padded, white vinyl seat with enclosed plywood base.
Folding Shower Seat	B-518	Folding Shower Seat, foam-padded, white vinyl seat with enclosed plywood base.
Vinyl Shower Curtain	B-204-2	Opaque, matte white vinyl, .008" thick with nickel plated brass grommets.
Shower Curtain Hook	B-204-1	Type 304 stainless steel hook for use on 1" and 1 ¼" diameter rods.
Shower Soap Dish	B-680	One-piece soap dish, polished stainless steel.
Mop Strip with Shelf	B-224	Shelf With mop and broom holders and rag hook, type 304 stainless steel, satin finish.

Toilet Partitions: Provide floor mounted metal toilet partitions with ADA compliant hardware.

2.5 MECHANICAL

2.5.2 Design Conditions

- Inside Design Temperature/RH for Conventional Buildings – Cooling
  - 78° Ddb/50% RH for office
  - No cooling for warehouses, shops, toilets

- Inside Design Temperature/RH for conventional buildings-Heating
  - 72° Fdb for offices
  - 55° Fdb for Storage (occupied)
  - 50° Fdb for Warehouses
  - 60° Fdb for kitchens
  - 65° Fdb for shops
  - 70° Fdb for toilets

- Outside Design Temperature
  - Winter 99%/Summer 1% for process lab
  - Winter 97.5%/Summer 2.5% for personnel comfort

- Typical Design criteria for Non-conventional facility
  - Project requirements will determine what criteria will be used for design.

- Ventilation
  - Personnel ventilation requirement- Ashrae 62
  - Industrial/Process ventilation requirement
  - Equipment room ventilation

- Low Conductivity Water System
  - Project requirements will determine what criteria will be used for design.

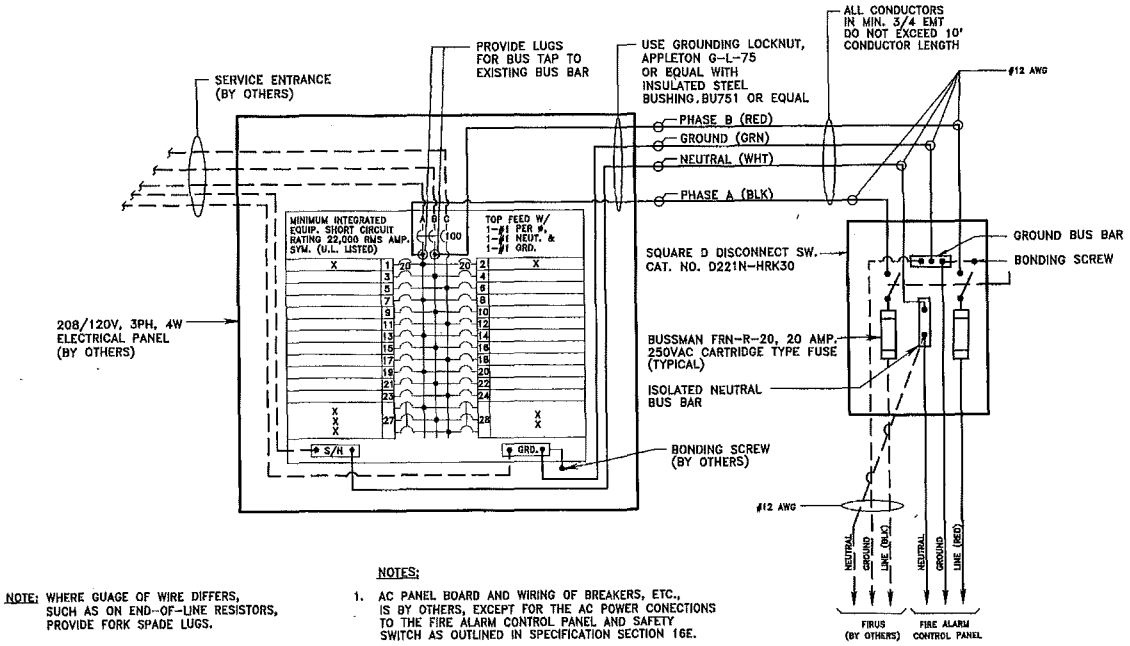
- Energy Conservation- ECR is required for Projects or retrofit where total energy consumption exceed 500 million BTU per year or if building is larger than 10,000 gross square feet

- Hydronics
  - Chilled water system
  - Hot water system
  - Pumps
  - System pressurization

- A control valve should be provided after the preaction valve assembly, to facilitate testing without introducing water throughout the piping network.
- If feasible, air compressors should be mounted above the point of connection with flexible tubing, such as rubber hose.
- Waterflow supply test information can be obtained from the FESS-Engineering Group.
- For water-mist systems and preaction systems, refer to special suppression systems.
- All control valves should be provided with electronic valve supervisory (tamper) switches.
- As-built documents should be provided to FESS.

2.7.3 Fire Alarm System Design Considerations - Guidance

- Acceptable equipment manufacturer for fire alarm control panels is Siemens-Cerberus (Pyrotronics).
- All fire alarm system AC power connections should be hardwired via dedicated circuits serving no other load(s). Each AC power connection should be provided with a 2 fuse safety switch, as detailed below. All associated conductors and connections should be installed entirely within approved electrical enclosures, conduits or raceway as defined in the Engineering - Electrical Standards. The AC Power Panel Main Breaker and safety switches should be the only disconnecting means for the fire alarm and FIRUS AC power connections. Safety switches should be clearly labeled "Fire Alarm System Power" and should be locked (padlocks provided by Fermilab). The safety switch should be connected below the Main Breaker on the associated AC Panel Board. Connections between the AC Panel Board and the supply side terminals on the safety switch should be No. 12 AWG stranded copper conductors insulated for 600 volts.



NOTE: WHERE GUAGE OF WIRE DIFFERS, SUCH AS ON END-OF-LINE RESISTORS, PROVIDE FORK SPADE LUGS.

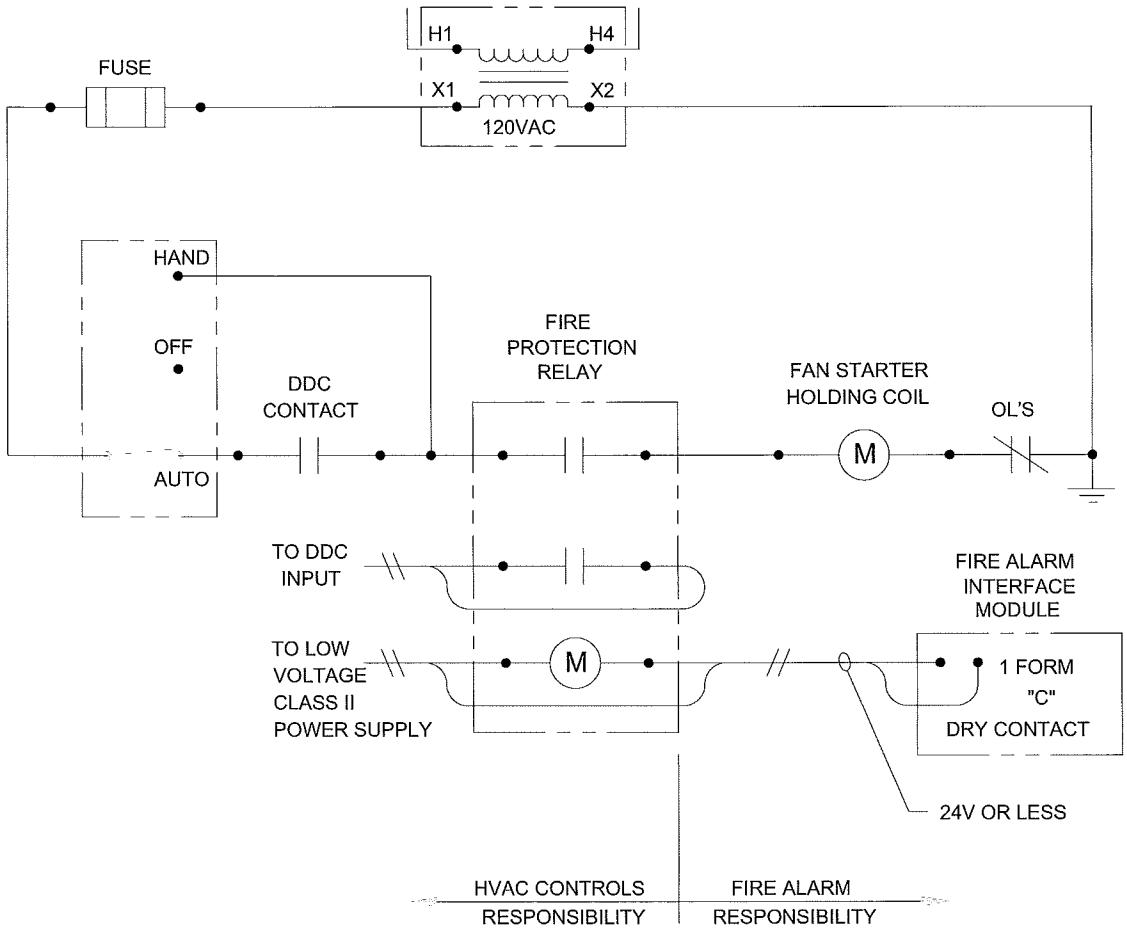
NOTES:

1. AC PANEL BOARD AND WIRING OF BREAKERS, ETC., IS BY OTHERS, EXCEPT FOR THE AC POWER CONECTIONS TO THE FIRE ALARM CONTROL PANEL AND SAFETY SWITCH AS OUTLINED IN SPECIFICATION SECTION 16E.
2. FIRE ALARM SUBCONTRACTOR SHALL COORDINATE AC CONNECTIONS WITH CONSTRUCTION COORDINATOR, FERMILAB'S DUTY ELECTRICIAN AND FERMILAB'S FIRE TECHNICIANS.
3. THIS SCHEMATIC DETAIL IS FOR REFERENCE ONLY, NOT FOR CONSTRUCTION.

TYPICAL AC PANEL BOARD CONNECTIONS

NOT TO SCALE

- All fire alarm control panels (FACP) should be provided with a T-45 key and lock assembly.
- FACPs should be provided with a silence switch or function key for all notification appliances. Switch should silence audible devices only, visual devices should remain flashing when in alarm.



FAN MOTOR STARTER SCHEMATIC

NOT TO SCALE

NOTES:

1. FIRE PROTECTION RELAY AND POWER TO BE PROVIDED BY DDC CONTROLS.
2. FIRE ALARM CONTRACTOR TO PROVIDE 1 PAIR #14A. SOLID THHN 6 FEET COILED AT THE FIRE PROTECTION RELAY. TERMINATION WILL BE BY OTHERS.

- Audible devices should be a steady alarm.
- All manual pull stations should be dual action types and able to be reset with a T-45 key or a 9/16" allen wrench.
- Line type heat detection, manufactured by Protectowire, should be installed in beam enclosures.
- Air sampling smoke detection, manufactured by Fenwal, should be installed in experimental hall areas. Test valve stations located approximately 6'-0" AFF should be provided.
- All fire alarm systems should be connected to Fermilab's FIRUS systems, capable of indicating FIRE ALARM, SUPERVISORY ALARM, and TROUBLE ALARM.
- FACP should be provided with a walk-test feature.

2.8.2 Grounding:

A. Solid Grounding: Grounded wye, 480/277V and 120/208V systems shall be utilized. Neutral-ground connection shall be made at the transformer only. Neutral-ground connections at switchboards or panelboards shall not be used.

B. High Resistance Grounding: High resistance grounding (100Ω) shall be used for 4160/2400V systems.

C. Ground Resistance:
   1. A ground resistance of 0.5Ω is the preferred value. If this value cannot be achieved, additional ground rods or soil treatment methods shall be employed.

D. Substation Grounding:
   1. A grounding loop shall be installed around the perimeter of the substation pad with cross connections to the primary compartments, secondary compartments and air switch compartments.
      a) All quadrants of the air switch shall be connected to the ground loop.
   2. Ground Conductor (Loop and Cross Conductor):
      a) 750kVA and below: 250MCM bare stranded copper.
      b) Above 750kVA: 500MCM, bare stranded copper.
      c) Loop conductor shall be located a minimum of 18" outside the perimeter of the substation concrete and a minimum of 18" below finished grade.
   3. Ground rods shall be 1" x 10' copper clad steel at corners of substation.

E. Building Grounding:
   1. For buildings with voltages greater than 600V, highly sensitive or explosion proof equipment, a 500MCM bare stranded copper conductor ground loop shall be installed around the perimeter of the building with columns connected to the ground loop.
      a) Loop conductor shall be located a minimum of 18" outside the perimeter of the building and a minimum of 18" below finished grade.
   2. For buildings with voltages <u>not</u> greater than 600V, ground rods shall be connected to the steel columns with 500MCM bare copper cable at the corners of the building and at intermediate columns grounded at distances not to exceed 50'-0".
      a) Ground rods shall be located a minimum of 12'-0" outside the perimeter of the building and a minimum of 18" below finished grade.
   3. Sub-grade ground connections and connections to building columns shall be made with exothermic weld types.

F. Electrical Equipment Grounding:
   1. All electrical equipment shall be grounded by direct connection to the enclosure or frame to the:
      a) Ground loop or;
      b) Steel column or structural member that is grounded or;
      c) An exposed ground bus within the building.
   2. Each device shall be individually grounded to the ground system. Looping or "daisy chaining" of the ground cable is prohibited.
   3. Switchboards and Motor Control Centers:
      a) Ground conductor size: #4/0AWG.
   4. Safety Switches, Motor Starters, Contactors and Miscellaneous Electrical Equipment:
      a) Ground conductor size: Same as the grounding conductor used for the load equipment, but not smaller than #6AWG.
   5. 460V Motors:
      a) Grounding conductor size when there is no provision for connecting a ground conductor at the motor terminal housing:

MOTORS	GROUND CONDUCTOR
Up to 75Hp	#6
100Hp-150Hp	#2
200Hp-500Hp	#4/0

   6. Dry Type Transformers:

2. Insulation: THHN (90°C).
3. Ampacities shall be in accordance with NEC Table 310-16 (75°C).
4. Color coding shall be as follows:

	120/208V	480/277V
Ground	Green	Green
Neutral	White	Gray
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow

F. Control Cable
1. Type: Copper.
2. Insulation:
   a) 50°C or less: SO (60°C) - Rubber.
   b) Above 50°C: FEP Teflon – (200°C).
3. Overall Jacket: Neoprene.
4. Color coding shall be in accordance with ICEA S-19-81 Table 5-2.

2.8.5 Transformers – General

A. Transformer must be at least as large (KVA) as the load it will operate. If load requires a large starting current as in the case of motors with full voltage starting and that are started more than once per hour or to allow for future load growth, increase the transformer size by a minimum of 20%. An additional 10% should be factored in for harmonic allowances.

B. Voltages:
1. Transformers over 600V shall be delta connected in the primary side for 13,800 Volts, 3Ø system and grounded wye connected on the secondary side for 4160V or 480/277V, 3Ø system.

C. Low voltage transformers under 600V shall be delta connected on the primary side for 480V, 3Ø system and grounded wye connected on the secondary side for 120/208V, 3Ø system.

2.8.6 Oil Filled Transformers:

A. Transformers shall be installed outdoors at least 30'-0" away from buildings (edge of transformer housing to building).
   1) If space limitations dictate that transformers 500kVA and above are to be installed less than 30'-0" from a building, fire-resistive walls (without openings) shall be installed within a 30'-0" radius from the centerline of the transformer.

B. Transformer oil containment shall be provided and shall comply with Fermilab requirements.
   1) Oil containment shall be addressed using Fermilab's oil containment plan for the specific application. This implies using concrete retaining walls with sufficient depth and crushed stone filler to contain the spill of the largest transformer or oil-filled device. It also requires appropriate liners and an inspection drain pit.

C. R-Temp insulated transformers installations may be adjacent to buildings, regardless of window opening or building construction. When installed indoors they shall be installed in a one (1) hour fire rated vault with sprinklers protection. Neither practice, however, are preferred installations.

D. Standard oil filled transformer ratings 13.8kV-480/277V are as follows:
1. 1500kVA
2. 1000kVA
3. 750kVA
4. 500kVA
5. 225kVA
6. 112½kVA

E. Installation parameters for 13.8kV-480/277V, 3Ø, oil filled transformers:

KVA	I_p Amp	Primary Fuse	Panalboard	Conduit Size	Secondary Breaker	Secondary Feeder
112½	4.9A	6A	400A	2-2"	400A	2#4/0/Ø 2#4/0 2#1
225	9.8A	15A	600A	2-2"	600A	2-350MCM/Ø 2#2/0 2#1

D. Switchboards shall be provided with power monitors. Current transformers, shorting strips and voltage switch and fuses shall be provided. Power monitor typically will be manufactured by Square D.

E. Incoming feeders from the unit substation or transformer to the switchboard shall be as follows:

Switchboard	Phase Conductors	Neutral Conductor	Ground Conductor	Conduit
2000A	4-750MCM/Ø	4-350MCM	4-250MCM	4-5"

2.8.9 Lighting and Distribution Panelboards

A. Power distribution panelboards and lighting panelboards shall be 480/277V or 120/208V with standard current ratings as 100A, 225A, 400A, 600A, 800A,and 1200A.

B. Panelboards used in a 480/277V system are typically sub-fed from a switchboard or from another panelboard. Panelboards are typically furnished with a main overcurrent protective device.

C. Panelboards are designated in accordance with its current rating as follows:

Designation	Type	Ampacity	Voltage
DHP	Distribution-High Power	600A-1600A	480/277V
PHP	High Power Panel	100A-400A	480/277V
LP	Lighting Panel	100A-225A	480/277V
ELP	Emergency Lighting Panel	100A-225A	480/277V
PP	Panelboard	100A-225A	120/208V
E	*	- - - - - - -	- - - - - - -

* - Any panelboard designated with an "E" prefix will denote an emergency panelboard fed via multiple sources.

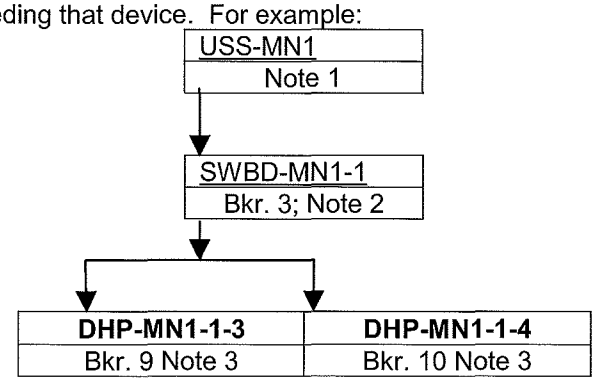
D. Standard ratings and incoming feeders for panelboards shall be as follows:

Panelboard Rating	Phase Conductors	Neutral Conductor	Ground Conductor	Conduit Size
1600A	4-500MCM/Ø	4#4/0	4#4/0	4-4"
1200A	3-500MCM/Ø	3#4/0	3#4/0	3-4"
800A	2-500MCM/Ø	3#1/0	3#1	3-2½"
600A	2-350MCM/Ø	2#2/0	2#1	2-2"
400A	2#4/0/Ø	2#4/0	2#1	2-2"
225A	1#4/0/Ø	1#4/0	1#2	1-2"
100A	1#1/0/Ø	1#1	1#6	1-2"

2.8.10 Unit Substation, Transformer, Switchboard and Panelboard Equipment Designations:

The following to be reviewed and revised by FNAL after resolution of panel tagging.

A. Each successive panelboard or transformer shall be identified as the type of switchboard, panelboard or transformer and by the location of the circuit breaker in the switchboard or panelboard feeding that device. For example:



1. On motor branch circuits when the combination starter is not used to disconnect both motors and controllers from all ungrounded supply conductors.
2. In sight form motors when installed outdoors or when the combination starter or branch circuit protection does not have a lock open position and is not within sight or more than 50'-0" away from the motor.
3. On feeders for overhead cranes at a readily accessible location.
4. In sight within unit heaters or duct heaters when not provided with integral disconnects.
5. In sight within HVAC equipment when the equipment is not provided with integral disconnects.

B. Enclosures:
1. NEMA 1: Indoor, dry locations.
2. NEMA 3R: Outdoor.
3. NEMA 4: Outdoor or indoor, wet locations.

2.8.12 Motor Starters:

Whenever possible, squirrel cage induction type, polyphase motors shall be started on full voltage.

2.8.13 Motors

A. All AC motors shall be energy efficient, constant load and shall be rated as per the following:
1. AC motors over ½HP to 200HP shall be rated 460V, 3Ø, 60HZ.
a) Regardless of HP rating, device coordination shall be required.
2. AC motors rated ½HP and below shall be rated 115V, 1Ø, 60HZ.

B. General-purpose 3Ø motors shall be squirrel cage induction type, NEMA Design B for normal torque applications, continuous duty, with NEMA Class F insulation.

C. General-purpose 1Ø motors shall be capacitor start, continuous duty, with NEMA Class B insulation.

D. AC motors for indoor installation clean areas shall have drip proof type enclosures.

E. AC motors for outdoor or indoor environments containing dust, dirt, water, etc., shall have totally enclosed fan cooled (TEFC) enclosures.

F. High voltage AC motors (2300V and above) shall have drip proof type enclosures fir installation in indoor, clean areas or weather protected Type II enclosures for outdoor installations.

G. Cable and Conduit for 460V, 3Ø Motors, 60Hz, Continuos Duty Squirrel Cage Induction Motors (40°C)

Motor Size (HP)	Full Load Current (Amp)	NEMA Starter Size	Number & Size of Conductors	Conduit
½	1	1	4#12	½"
¾	1.4	1	4#12	½"
1	1.8	1	4#12	½"
1 ½	2.6	1	4#12	½"
2	3.4	1	4#12	½"
3	4.8	1	4#12	½"
5	7.6	1	4#12	½"
7 ½	11	1	4#12	½"
10	14	1	4#12	½"
15	21	2	4#10	½"
20	27	2	4#8	¾"
25	34	2	4#8	¾"
30	40	3	4#6	¾"
40	52	3	3#4 & 1#6	1"
50	65	3	3#2 & 1#6	1 ¼"
60	77	4	3#2 & 1#6	1 ¼"
75	96	4	3#1 & 1#6	1 ½"
100	124	4	3#2/0 & 1#2	2"
125	156	5	3#4/0 & 1#2	2"
150	180	5	3#4/0 & 1#2	2 ½"
200	240	5	3-350MCM & 1#4/0	3"
250	296	6	3-500MCM & 1#4/0	3"
300	343	6	8#4/0	2-2 ½"
350	392	6	6-250MCM & 2#4/0	2-2 ½"

3. Enclosed suspended or surface mount fluorescent fixtures normally with one (1) or two (2) lamps for stairways and corridors.
4. Recessed incandescent fixtures in control rooms where reading CTR screens may be required.

D. Tunnels/Enclosures/Radiated Areas:
1. Strip type fluorescent fixtures with one (1) or two (2) lamps with metallic guards and magnetic ballasts.
2. Where sufficient ceiling height is provided, 10% uplight shall be provided.
3. Parking Lots:
   a) Pole mounted, wide spread type fixtures (400W or 1000W) with metal halide lamps.
4. Building Exteriors:
   a) Surface mounted, weather-proof wall pack type fixtures (100W or 150W) for perimeter lighting for heights not exceeding 25'-0".
   b) Surface mounted floodlights (150W or 400W) metal halide, wide spread distribution for heights exceeding 25'-0" and normally installed 3'-0" below the top of the building height.

E. Emergency Lighting:
1. Normally provided with the use of self-contained battey packs with two (2) floodlights mounted 7'-6" above the floor. Emergency lights shall be connected to the same source as the normal lighting source.

F. Lighting calculations shall be performed using the Zonal Cavity Method, Point by Point Analysis or Lumen Method. If reflectances are unknown, use 30% for walls, 30% for ceilings and 20% for floors.

2.8.15 Lightning Protection:

Lightning protection shall be provided for buildings where computers and sensitive electronic devices are installed, flammable gasses are used or that are located in places remote from other higher structures and exposed to lightning strike.

DISTRIBUTION:
P. Dehmer/SC-10
P. Rosen/SC-20
E. Oliver er/SC-30
A. Davies/SC-50
A. Patrinos/SC-70
M. Holland, Manager/Brookhaven Area Office
M. Gunn, Manager/Chicago Operations Office
G. Boyd, Manager/Oak Ridge Operations Office
K. Klein, Manager/Richland Operations Office
R. Wunderlich/CH-ARG
D. Nolan/OAK-BSO
G. Malosh/ORO-X10 P. Kruger/RL
J. Monhart/Fermi Area Office
J. Faul/Princeton Area Office R. Purucker/Ames Area Office J. Muhlestein/Stanford Site Office J. Conley/TJNAF Area Office

cc:

T. Joseph/SC-7 J. Salmon/SC-4 M. Johnson/SC-3

by Critical Decision (CD)-0. For planned GPP and IGPP construction projects, they should be submitted at the beginning of each fiscal year. The requests are to include:

- project name,
- project description,
- funding source (line item, GPP, IGPP, other),
- funding program,
- space to be added,
- space to be removed by the project (if any),
- fiscal year construction is expected to start,
- fiscal year construction is expected to end.

2. Space allocations will be approved at the level of SC-3, or above, prior to their inclusion in the SC budget. In general, excess space removed at a site via GPP, IGPP, overhead or the Science Laboratories Infrastructure (SLI) Excess Facilities Disposition subprogram will be allocated back to that site for new GPP, IGPP or line item construction.

3. When available banked space is insufficient to offset planned construction at a site, SC-82 will work with that site, other SC sites, and other LPSOs to identify space that can be allocated to that site. Use of banked space from other sites requires the requesting site to submit a Request for Secretarial Waiver (RSW) for approval by the Secretary through SC-82. SC will seek to obtain space planned to be eliminated by the Environmental Management (EM) Program prior to using SC banked space.

4. Clean-up activities which result in the transfer of facilities from one DOE Program to another (e.g., from SC to EM) cannot be considered as "elimination of excess space." However, in cases in which the transfer results in demolition of other, non-SC excess facilities, the SC Site Manager will ensure that the facility transfer agreement includes a provision giving SC the right of first refusal to an equitable portion of the eliminated space.

5. SC Site Managers will maintain *Site Space Plans* of space eliminated, expected to be eliminated, banked (i.e., allocated to new projects), and expected to be banked for planned projects by each resident Program by year. The banking portion is referred to as the *Site Space Bank*. Space banking begins with space eliminated in FY 2002. Site Space Plans must be submitted to SC-82 annually, along with the banking requests for all eliminations at the sites in the previous fiscal year, by the end of November of the following fiscal year. The requests are to follow the format recommended by OECM at the web site listed above. In addition to the information specified by OECM, the banking requests also should identify the

eliminated after the start of construction, the elimination must be accomplished by the end of the fiscal year in which the construction is completed/occupied.

2. Sponsoring Program – The Program that is funding the project which provides new space.

3. Site Space Bank (SSB) – The total excess space eliminated beginning in FY 02 and available for offsetting construction of new space. Space expected to be removed in future years can be included in the SSB; however, such space must be designated as "space planned to be eliminated." The SSB is part of the Site Space Plan.

4. SC Space Bank – A database of space eliminated, expected to be eliminated, banked (i.e., allocated to new projects), and expected to be banked for planned projects at SC sites. The Space Bank will also include information on excess space elimination needed for construction projects that add space at non-SC sites.

IV. FREQUENTLY ASKED QUESTIONS

1. Who "owns" the banked space at an SC site? Under the SC process, SC-1 owns all the banked space and can allocate it as best fits the needs of the Office of Science in meeting its mission. SC-3 serves as the SC Space Manager and is supported by SC-82.

2. Does all the allocated space from the space bank actually have to be eliminated prior to the start of construction? No, the elimination of the offsetting space must be accomplished by the end of the fiscal year in which the new project providing space is completed/occupied.

3. When a new construction project eliminates excess space, can such space be removed after the new space is completed and occupied? Yes, if that is the project sequence (e.g. if, during the construction period, the building which is going to be demolished is needed to house the people who will move into the new building).

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LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Project Checklist

PROJECT NAME: MINU

FESS/Engineering Project No. 6-6-49

			Project Stage		
			CDR	Title II	B.O.
Sustainable Sites		14 Points			
Prereq 1	**Erosion & Sedimentation Control**	Required	X		
Credit 1	**Site Selection**	1	X		
Credit 2	**Urban Redevelopment**	1			
Credit 3	**Brownfield Redevelopment**	1			
Credit 4.1	**Alternative Transportation**, Public Transportation Access	1			
Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1	X		
Credit 4.3	**Alternative Transportation**, Alternative Fuel Vehicles	1	X		
Credit 4.4	**Alternative Transportation**, Parking Capacity	1	X		
Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1			
Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1			
Credit 6.1	**Stormwater Management**, Rate and Quantity	1	?		
Credit 6.2	**Stormwater Management**, Treatment	1			
Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1			
Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1	?		
Credit 8	**Light Pollution Reduction**	1	X		
		Subtotal	**5**	**0**	**0**
Water Efficiency		5 Points			
Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1	X		
Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1	X		
Credit 2	**Innovative Wastewater Technologies**	1			
Credit 3.1	**Water Use Reduction**, 20% Reduction	1			
Credit 3.2	**Water Use Reduction**, 30% Reduction	1			
		Subtotal	**2**	**0**	**0**

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Project Checklist

PROJECT NAME: MINU

FESS/Engineering Project No. 6-6-49

Energy & Atmosphere — 17 Points

			Project Stage		
			CDR	Title II	B.O.
Prereq 1	**Fundamental Building Systems Commissioning**	Required			
Prereq 2	**Minimum Energy Performance**	Required	X		
Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required	X		
Credit 1.1	**Optimize Energy Performance**, 15% New / 5% Existing	1			
Credit 1.2	**Optimize Energy Performance**, 20% New / 10% Existing	1			
Credit 1.3	**Optimize Energy Performance**, 25% New / 15% Existing	1			
Credit 1.4	**Optimize Energy Performance**, 30% New / 20% Existing	1			
Credit 1.5	**Optimize Energy Performance**, 35% New / 25% Existing	1			
Credit 1.6	**Optimize Energy Performance**, 40% New / 30% Existing	1			
Credit 1.7	**Optimize Energy Performance**, 45% New / 35% Existing	1			
Credit 1.8	**Optimize Energy Performance**, 50% New / 40% Existing	1			
Credit 1.9	**Optimize Energy Performance**, 55% New / 45% Existing	1			
Credit 1.10	**Optimize Energy Performance**, 60% New / 50% Existing	1			
Credit 2.1	**Renewable Energy**, 5%	1			
Credit 2.2	**Renewable Energy**, 10%	1			
Credit 2.3	**Renewable Energy**, 20%	1			
Credit 3	**Additional Commissioning**	1			
Credit 4	**Ozone Depletion**	1			
Credit 5	**Measurement & Verification**	1			
Credit 6	**Green Power**	1			
		Subtotal	**0**	**0**	**0**

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Project Checklist

PROJECT NAME: MINU

FESS/Engineering Project No. 6-6-49

Materials & Resources — 13 Points

			Project Stage		
			CDR	Title II	B.O.
Prereq 1	**Storage & Collection of Recyclables**	Required	?		
Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1			
Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1			
Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1			
Credit 2.1	**Construction Waste Management**, Divert 50%	1	X		
Credit 2.2	**Construction Waste Management**, Divert 75%	1			
Credit 3.1	**Resource Reuse**, Specify 5%	1	?		
Credit 3.2	**Resource Reuse**, Specify 10%	1			
Credit 4.1	**Recycled Content**, Specify 25%	1	X		
Credit 4.2	**Recycled Content**, Specify 50%	1			
Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1			
Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1			
Credit 6	**Rapidly Renewable Materials**	1			
Credit 7	**Certified Wood**	1			
		Subtotal	**2**	**0**	**0**

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Project Checklist

PROJECT NAME: MINU

FESS/Engineering Project No. 6-6-49

			Project Stage		
			CDR	Title II	B.O.
Indoor Environmental Quality		**15 Points**			
Prereq 1	**Minimum IAQ Performance**	Required	X		
Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required	X		
Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1			
Credit 2	**Increase Ventilation Effectiveness**	1	X		
Credit 3.1	**Construction IAQ Management Plan**, During Construction	1	X		
Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1	X		
Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1	X		
Credit 4.2	**Low-Emitting Materials**, Paints	1	X		
Credit 4.3	**Low-Emitting Materials**, Carpet	1	X		
Credit 4.4	**Low-Emitting Materials**, Composite Wood	1	X		
Credit 5	**Indoor Chemical & Pollutant Source Control**	1	X		
Credit 6.1	**Controllability of Systems**, Perimeter	1			
Credit 6.2	**Controllability of Systems**, Non-Perimeter	1			
Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1			
Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1			
Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1			
Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1			
		Subtotal	**8**	**0**	**0**
Innovation & Design Process		**5 Points**			
Credit 1.1	**Innovation in Design:**	1			
Credit 2	**LEED™ Accredited Professional**	1	X		
		Subtotal	**1**	**0**	**0**
Project Totals		**69 Points**			
Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points			**18**	**0**	**0**

2. Building M&R Cost Profiles

This chapter presents estimates of 50-year maintenance cost profiles for 50 building models. Each two-page profile includes a description of the model building, 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 forecast system, calibrated for the Washington DC metropolitan area. The profiles can be adjusted for other metro 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

Building Type	Gross Sqft.	Annual M&R Cost per Gsft.*	Annual M&R Cost as % of Repl. Value
Car Wash	800	$10.00	4.90%
Garage, Service Station	1,400	7.36	6.40
Apartments 1-3 story	22,500	6.53	6.64
Apartments 4-7 story	60,000	6.27	6.27
Motel	8,000	6.06	6.58
Fire Station	6,000	5.61	5.66
Restaurant, Fast Food	4,000	5.53	4.91
Bank	4,100	5.43	3.56
Telephone Exchange	5,000	5.12	4.92
Motel, 40 Unit	18,000	5.03	4.86
Laundromat	3,000	5.03	4.36
Restaurant, Large	10,000	4.99	4.17
Club, Country	6,000	4.81	3.69
Religious Education	10,000	4.77	4.53
Warehouse, Self-storage	24,000	4.45	7.18
Medical Clinic	13,000	4.17	2.51
Movie Theater	10,000	4.12	3.96
Store, Convenience	4,000	4.10	5.77
Community Center	10,000	4.09	4.34
Hospital, General	125,000	4.08	3.37
Hospital, Research	540,200	4.05	1.53
Dormitory, 50 Room	25,000	4.04	4.93
Bus Terminal	12,000	3.82	4.21
Store, Retail	8,000	3.80	5.14
Funeral Home	10,000	3.76	4.43
Town Hall, 1 Story	11,000	3.66	4.26
Church	17,000	3.60	3.20
Court House 1 Story	30,000	3.52	2.74
Post Office	13,000	3.51	4.28
Auditorium	24,000	3.48	3.34
Public Library, 3 Story	60,000	3.40	3.26
College Student Union	25,000	3.35	3.32
Apartments, 24 Story	220,000	3.17	4.11
Club, Social	22,000	3.15	3.41
Gymnasium	40,000	3.07	3.39
Hockey Rink	30,000	2.94	2.77
College Classroom	90,000	2.89	2.84
Elementary School	47,000	2.81	4.06
Childcare Center	12,000	2.71	2.43
Bowling Center	20,000	2.59	4.13
Garage, Auto Sales	21,000	2.56	3.78
County Jail	318,455	2.46	0.65
Light Manufacturing Plant	45,000	2.37	4.19
Office Park	65,000	2.27	4.92
Supermarket	96,000	2.20	3.25
Department Store	94,000	2.15	3.28
Office Building, 2 Story	83,000	2.04	2.29
Office Building, 15 Story	250,000	1.90	1.65
Aircraft Hangar	32,000	1.86	2.45
Warehouse, Large	80,000	1.80	4.02

*Average costs over 50-year lifetime, Washington DC metro area

From the cost analysts perspective, the most useful information in these profiles is probably the year-by-year total shown under the "Cost per Sqft. 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 (2 to 4 percent of replacement value is common) that obscures the actual 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 building models, the highest average cost per gsft. was for the car wash ($10.00), while the warehouse model had the lowest average cost ($1.80).

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 self-storage warehouse—7.18 percent of replacement value—a result due primarily to a low estimated replacement cost of $62 per square foot. A complete list of replacement costs is shown 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 buildings.

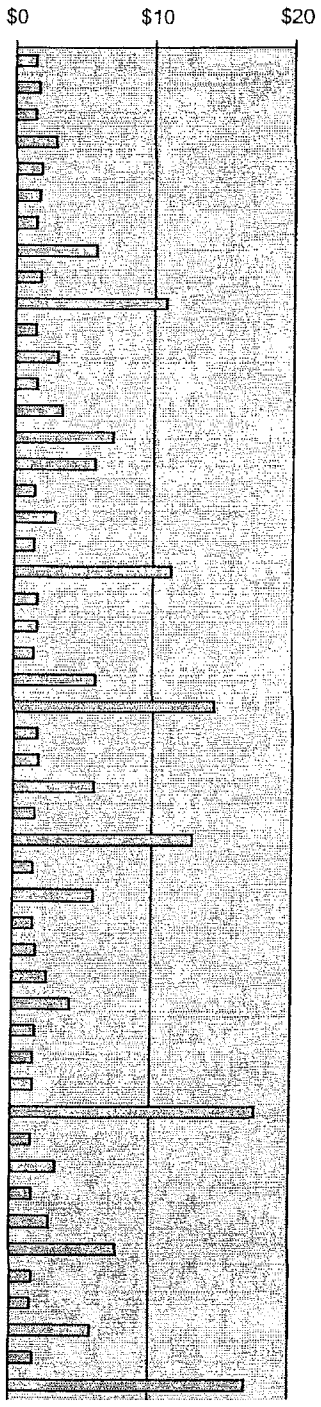
Profile estimates are sensitive to a variety of factors such as unscheduled maintenance rates, in-house shop rates, and types of utilization. These sensitivities are discussed in Chapter 6, Definitions and Methods.

Cost per Sqft. by System

Building Age	Exterior Closure	Roofing	Interior Construction	Stairways	Interior Finish	Conveying Systems	Plumbing Systems	HVAC Systems	Fire Protection	Electrical Systems	Equipment	Total per Sqft.
1	.02	.53	.30				.19	.16	.16	.10		**1.45**
2	.02	.53	.30		.01		.39	.16	.16	.10		**1.66**
3	.02	.58	.30				.19	.16	.16	.10		**1.50**
4	.02	.53	.41		1.16		.39	.16	.16	.10		**2.93**
5	.02	.53	.30				.30	.16	.22	.32		**1.84**
6	.02	.58	.30		.01		.39	.16	.16	.10		**1.71**
7	.02	.61	.30				.20	.16	.16	.10		**1.54**
8	.02	.53	.41		3.39		1.08	.16	.16	.11		**5.86**
9	.02	.58	.30		.34		.19	.16	.16	.10		**1.84**
10	2.79	.53	2.06		.01		.89	3.27	.42	.91		**10.89**
11	.02	.53	.30				.19	.16	.16	.10		**1.45**
12	.09	.58	.41		1.16		.39	.16	.16	.10		**3.06**
13	.02	.53	.30				.38	.16	.16	.10		**1.64**
14	.02	2.26	.30		.01		.40	.16	.16	.10		**3.41**
15	.02	.58	.30				.21	5.09	.22	.69		**7.11**
16	.02	.53	.41		3.39		1.08	.16	.16	.11		**5.86**
17	.02	.53	.30				.19	.16	.16	.10		**1.45**
18	.02	.58	.30		1.32		.39	.16	.16	.10		**3.02**
19	.02	.53	.30				.19	.16	.16	.10		**1.45**
20	2.79	.78	2.18		1.90		1.28	.31	.39	1.73		**11.37**
21	.02	.66	.30				.29	.16	.16	.10		**1.68**
22	.02	.53	.30		.01		.39	.16	.16	.10		**1.66**
23	.02	.53	.30				.19	.16	.16	.10		**1.45**
24	.09	.58	.41		3.39		1.08	.16	.16	.11		**5.99**
25	2.15	.53	.30				7.28	3.27	.22	.62		**14.36**
26	.02	.53	.30		.01		.47	.16	.16	.10		**1.75**
27	.02	.58	.30		.34		.20	.16	.16	.10		**1.85**
28	.02	3.41	.41		1.16		.39	.16	.16	.10		**5.82**
29	.02	.53	.30				.28	.16	.16	.10		**1.55**
30	2.79	.53	2.06		.01		.88	5.09	.42	1.18		**12.96**
31	.02	.58	.30				.20	.16	.16	.10		**1.51**
32	.02	.53	.41		3.39		1.07	.16	.16	.10		**5.84**
33	.02	.53	.30				.20	.16	.16	.11		**1.46**
34	.02	.58	.30		.01		.37	.16	.16	.10		**1.70**
35	.02	.61	.30				.84	.16	.22	.32		**2.47**
36	.09	.53	.41		2.47		.30	.16	.16	.10		**4.22**
37	.02	.58	.30				.36	.16	.16	.10		**1.67**
38	.02	.53	.30		.01		.31	.16	.16	.10		**1.58**
39	.02	.53	.30				.38	.16	.16	.10		**1.64**
40	2.79	.83	2.18		4.13		1.94	3.42	.39	1.83		**17.53**
41	.02	.53	.30				.28	.16	.16	.11		**1.54**
42	.02	2.26	.30		.01		.31	.16	.16	.10		**3.32**
43	.02	.58	.30				.28	.16	.16	.10		**1.59**
44	.02	.53	.41		1.16		.30	.16	.16	.10		**2.84**
45	.02	.53	.30		.34		.51	5.09	.22	.69		**7.70**
46	.02	.58	.30		.01		.30	.16	.16	.10		**1.63**
47	.02	.53	.30				.28	.16	.16	.10		**1.54**
48	.09	.53	.41		3.39		.99	.16	.16	.10		**5.84**
49	.02	.66	.30				.29	.16	.16	.11		**1.68**
50	4.92	.53	2.06		.01		7.80	.16	.42	1.00		**16.90**
Total	19.24	34.33	25.05		32.60		37.63	32.39	9.61	13.45		204.31

A value of "0.00" means a cost of more than $.000 but less than $.005 per gross square foot.

50 Year Profile, Total Cost per Sqft.



3.1 Local Maintenance Cost Indexes, Selected Metro Areas

Area	Cost per Sqft.	Local Index	200 Area Ranking
Chicago, IL			
PM & Minor Repair	$ .46	129.7	15
Unscheduled Maintenance	.47	133.9	15
Renewal & Replacement	1.48	110.4	16
Total Average Cost	2.41	117.8	16
Cincinnati, OH			
PM & Minor Repair	.32	90.5	113
Unscheduled Maintenance	.31	89.1	112
Renewal & Replacement	1.36	101.3	48
Total Average Cost	1.99	97.4	78
Cleveland, OH			
PM & Minor Repair	.33	94.4	98
Unscheduled Maintenance	.33	93.4	97
Renewal & Replacement	1.10	82.1	141
Total Average Cost	1.76	86.2	119
Colorado Springs, CO			
PM & Minor Repair	.32	91.5	110
Unscheduled Maintenance	.31	90.1	110
Renewal & Replacement	1.10	82.1	142
Total Average Cost	1.74	85.1	124
Columbia, SC			
PM & Minor Repair	.17	49.2	198
Unscheduled Maintenance	.14	41.5	198
Renewal & Replacement	.94	70.4	195
Total Average Cost	1.26	61.8	198
Columbus, GA			
PM & Minor Repair	.19	52.6	191
Unscheduled Maintenance	.16	45.3	191
Renewal & Replacement	.99	74.1	182
Total Average Cost	1.34	65.4	189
Columbus, OH			
PM & Minor Repair	.32	91.6	108
Unscheduled Maintenance	.32	90.3	108
Renewal & Replacement	1.38	103.2	34
Total Average Cost	2.02	99.0	71
Concord, NH			
PM & Minor Repair	.30	86.0	126
Unscheduled Maintenance	.29	83.6	127
Renewal & Replacement	1.19	88.8	107
Total Average Cost	1.79	87.4	114
Corpus Christi, TX			
PM & Minor Repair	.22	63.1	184
Unscheduled Maintenance	.20	57.6	184
Renewal & Replacement	1.04	77.4	169
Total Average Cost	1.46	71.5	183
Cumberland, MD			
PM & Minor Repair	$ .32	90.5	112
Unscheduled Maintenance	.31	89.1	111
Renewal & Replacement	1.21	90.3	100
Total Average Cost	1.84	90.1	103
Dallas, TX			
PM & Minor Repair	.28	77.9	148
Unscheduled Maintenance	.26	74.5	148
Renewal & Replacement	1.09	81.3	147
Total Average Cost	1.63	79.5	149
Danbury, CT			
PM & Minor Repair	.38	107.9	45
Unscheduled Maintenance	.38	109.1	45
Renewal & Replacement	1.45	107.8	21
Total Average Cost	2.21	108.0	25
Davenport, IA			
PM & Minor Repair	.34	97.3	89
Unscheduled Maintenance	.34	96.7	89
Renewal & Replacement	1.23	91.5	95
Total Average Cost	1.91	93.4	94
Dayton, OH			
PM & Minor Repair	.33	93.5	103
Unscheduled Maintenance	.32	92.4	103
Renewal & Replacement	1.34	100.1	55
Total Average Cost	2.00	97.7	75
Daytona Beach, FL			
PM & Minor Repair	.24	68.9	177
Unscheduled Maintenance	.22	64.2	177
Renewal & Replacement	1.19	89.1	105
Total Average Cost	1.66	81.3	141
Denver, CO			
PM & Minor Repair	.35	98.3	85
Unscheduled Maintenance	.34	97.8	85
Renewal & Replacement	1.18	87.8	114
Total Average Cost	1.87	91.3	100
Des Moines, IA			
PM & Minor Repair	.33	93.7	102
Unscheduled Maintenance	.32	92.6	102
Renewal & Replacement	1.18	88.0	113
Total Average Cost	1.83	89.8	106
Detroit, MI			
PM & Minor Repair	.41	116.2	26
Unscheduled Maintenance	.41	118.1	26
Renewal & Replacement	1.36	101.5	46
Total Average Cost	2.18	106.9	29

Note: Costs per Sqft. are the annual average costs, over a 50 year service life, of maintaining the two-story office building shown in Chapter 2. Local Indexes are standardized (equal 100) for the Washington DC area.

Fermilab

FESS/Engineering

Please ensure that your review included a review of the project for appropriateness of the proposed systems, impacts on existing systems and operations and specific technical requirements to be incorporated into the design

PLEASE ENTER THE FOLLOWING INFORMATION

Reviewer:

D. Baird

Project Number

6-6-49 MINU (Main

UIP ECP (If applicable)

Project Phase:

Comment and Compliance

Comment Date:

March 9, 2007

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COMMENT

Drawing Reference:

START WITH PAGE NUMBER FIRST FOLLOWED BY SECTION OR DETAIL REFERENCE. Example: A-1, Detail 4

Specification Reference:

PROVIDE SPECIFICATION SECTION AND PARAGRAPH IF APPLICABLE.
Example: 02070 1.5.D.2 (Page 02070-2)

Comment:

Admin,

I have no comments regarding this review at this time. - Dave.

RESPONSE

Project Contact Response:

Comment:

Fermilab

FESS/Engineering

Please ensure that your review included a review of the project for appropriateness of the proposed systems, impacts on existing systems and operations and specific technical requirements to be incorporated into the design

PLEASE ENTER THE FOLLOWING INFORMATION

Reviewer:
Kamran Vaziri

Project Number
6-6-49

UIP ECP (If applicable)

Project Phase:
Comment and Compliance

Comment Date:
March 14, 2007

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COMMENT

Drawing Reference:

START WITH PAGE NUMBER FIRST FOLLOWED BY SECTION OR DETAIL REFERENCE. Example: A-1, Detail 4

Specification Reference:

PROVIDE SPECIFICATION SECTION AND PARAGRAPH IF APPLICABLE.
Example: 02070 1.5.D.2 (Page 02070-2)

Comment:

I have reviewed this project for radiological safety issues during the construction. I have the following comments (K. Vaziri):

1- Since some of these areas have radiological postings, the Fermilab construction coordinator in consultation with the area RSO, should determine the level of training required for the contractors working in these areas.

2- It is important that the scheduling of this jobs to be done in consultation with the area RSO, to take into account the beam operations periods.

RESPONSE

Project Contact Response:

Comment:

Fermilab

FESS/Engineering

Please ensure that your review included a review of the project for appropriateness of the proposed systems, impacts on existing systems and operations and specific technical requirements to be incorporated into the design

PLEASE ENTER THE FOLLOWING INFORMATION

Reviewer:

Teri Dykhuis

Project Number

6-6-49

UIP ECP (If applicable)

Project Phase:

Comment and Compliance

Comment Date:

March 15, 2007

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COMMENT

Drawing Reference:

START WITH PAGE NUMBER FIRST FOLLOWED BY SECTION OR DETAIL REFERENCE. Example: A-1, Detail 4

Specification Reference:

PROVIDE SPECIFICATION SECTION AND PARAGRAPH IF APPLICABLE.
Example: 02070 1.5.D.2 (Page 02070-2)

Comment:

These comments are a day late because I was out sick but I have one comment after reviewing this project. The FESS Project Information Environmental Review Form that is listed as being in the Conceptual Design Report Appendix doesn't appear to be included there. My review is incomplete without being able to take a look at this document.
Teri

RESPONSE

Project Contact Response:

Comment:

Fermilab

FESS/Engineering

Please ensure that your review included a review of the project for appropriateness of the proposed systems, impacts on existing systems and operations and specific technical requirements to be incorporated into the design

PLEASE ENTER THE FOLLOWING INFORMATION

Reviewer:
J Santic

Project Number
6-6-49

UIP ECP (If applicable)

Project Phase:
Comment and Compliance

Comment Date:
March 5, 2007

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COMMENT

Drawing Reference:
CDR-4, 10

START WITH PAGE NUMBER FIRST FOLLOWED BY SECTION OR DETAIL REFERENCE. Example: A-1, Detail 4

Specification Reference:

PROVIDE SPECIFICATION SECTION AND PARAGRAPH IF APPLICABLE.
Example: 02070 1.5.D.2 (Page 02070-2)

Comment:

Section II
MI-14 Service Building:
Revise the transformer rating from "480VAC/208VAC" to "480-120/208VAC".

Revise the Power Supply requirments from "13.8kV/480V 750kVA transformer" to "750kVA, 13.8kV-480/277V transformer".

RESPONSE

Project Contact Response:

Comment:

Fermilab

FESS/Engineering

Please ensure that your review included a review of the project for appropriateness of the proposed systems, impacts on existing systems and operations and specific technical requirements to be incorporated into the design

PLEASE ENTER THE FOLLOWING INFORMATION

Reviewer:

J Santic

Project Number

6-6-49

UIP ECP (If applicable)

Project Phase:

Comment Date:

March 13, 2007

Print | Duplicate | Main Menu

COMMENT

Drawing Reference:

CDR-4, 10

START WITH PAGE NUMBER FIRST FOLLOWED BY SECTION OR DETAIL REFERENCE. Example: A-1, Detail 4

Specification Reference:

PROVIDE SPECIFICATION SECTION AND PARAGRAPH IF APPLICABLE.
Example: 02070 1.5.D.2 (Page 02070-2)

Comment:

Section III
Relabel the Illumination Level from "Main Corridor and Public Areas" to "Building Area"
Revise the Illumination Level for Emergency Lighting from "5 fc" to ">1fc"

DWG CDR-4 Fix the 480V & Comm handholes near the MI-40 building.

DWG. CDR-10 Relabel the 1500kVA as 750kVA.

RESPONSE

Project Contact Response:

Comment: