Conceptual Design Report

FOOTPRINT GALLERY UPGRADE

Project No. 90-CH-400
BAKALIC

Civil Construction

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Chicago Operations Office

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FOOTPRINT GALLERY UPGRADE

CONCEPTUAL DESIGN REPORT

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I

INTRODUCTION

1. Statement of Purpose

The Footprint Gallery Complex will be enlarged and modified. The basic outline of the project will be to add 68,100 square feet of new construction, remodel 20,600 square feet of existing space, and retire by removal 17,500 square feet. The principal items to be addressed are: the creation of larger Main Control Rooms and Central Control Computer Rooms, the replacement of several temporary structures with permanent facilities, the provision for a growth in population of 132 people, and the creation of an intermediate sized meeting/lecture room facility. Disjointed second floor areas will be connected and made accessible to the handicapped, secure and informative viewing for visitors will be provided, and parking will be increased to match the expected growth.

The new construction will provide for a more centralized concentration of systems and support personnel of the Fermilab Accelerator Division, reflecting the growth of these organizations during the last 15 years.

Experiments, such as the D-Zero detector and antiproton deceleration (E760), have been assigned to the Accelerator Division for support. The associated physicists and experimenters make up the most significant component of the growth in population for which this construction will provide additional space.

2. Scope of Conceptual Design Report

This report begins with a justification of the need that traces existing space usage. Area, usage and personnel tabulations are reviewed and alternative solutions are considered. Design criteria reflecting current needs are defined. Conceptual design drawings illustrate an overall solution through a series of construction phases. Conceptual cost estimates and schedules are included.

3. Relationship of Other Facilities

The Footprint Gallery Complex lies at the operational heart of the Fermilab Accelerator between the Linac, Booster Accelerator, Transfer Gallery and Wilson Hall. The initial designers of Fermilab concentrated the Accelerator Division operating functions, and eventually the operating personnel, in a connecting building called the Cross Gallery. The wisdom of these design choices has been proved again and again since the initial construction. The arrangement in plan view of all these buildings resembles a large footprint, and the terminology of Footprint Gallery is now taken to include the entire complex of buildings, excluding Wilson Hall.

II

SUMMARY AND RECOMMENDATIONS

1. Summary of Design Provisions

The Footprint Gallery Upgrade project substantially improves the quality and useful quantity of equipment and personnel space for the Accelerator Division of Fermi National Accelerator Laboratory. In a three-phase construction program, approximately 68,100 square feet of space are added, 20,600 square feet are extensively remodeled and 17,500 square feet of substandard space are retired.

The following considerations have been addressed: An enlargement and replacement of the Main Control Room, an enlargement and replacement of the Central Control Computer Room, the replacement of several temporary structures with permanent facilities, the provision for a population growth of 132 people, the creation of an intermediate sized (200 person) meeting/lecture room, connection of disjointed second floor areas with access to the handicapped, improved viewing for visitors, and necessary increases in parking.

The present population of the Footprint Gallery Complex is 530. Including the build-up of the D-Zero Experiment, the population is projected to reach 662. This Upgrade project matches the area requirements for this growth of 132 persons.

Other areas of improvement in support of the major considerations outlined above are cable and communication access, personnel circulation, elevators, access to parking lots, tech workspaces, equipment high bay space, mechanical rooms, toilet facilities, meeting rooms, offices, HVAC distribution, handicap access, fire protection and parking lots.

The design provides for a concentration of new space relatively close to the new Main Control Room. The majority of the new construction is located in three areas: the addition of a second floor over existing construction on the north ends of the east and west Booster Gallery, the addition of a second floor over the south end of the Transfer Gallery, and an additional two-story construction along the south side of the Cross Gallery. The majority of the remodeling rebuilds the interior of the western three-quarters of the existing Cross Gallery. The significant structures to be removed are trailers and portakamps on the immediate south side of the Cross Gallery, and the Cooling Ring structure on the west of the Booster.

Table II-1, at the end of this chapter, tabulates the present areas and proposed changes to the gross functional space usage in the Footprint Gallery Area. Each of the three phases are shown, including as appropriate with each phase additions due to new construction, removals, and the removals and additions due to remodeling.

Table II-2 tabulates the space by buildings and floors in the Footprint Gallery area. For each of the three phases, additions and subtractions are shown in a manner similar to Table II-1.

Table II-3 is derived from Table II-1. The incremental changes from additions and subtractions during each phase are shown, and the total usage of area at the end of each phase is shown.

Table II-4 is derived from Table II-1. Usage of areas of new construction, removals, and before and after remodeling is shown.

Table II-5 shows the usage of areas of new construction and remodeling by floors.

All areas in this Conceptual Design Report are in gross square feet, before any factors for building efficiency or utilization efficiency are considered. Note that conversions are defined in DOE General Design Criteria 6430.1A and Federal Property Management Regulations Temporary Regulation D73 which convert 200 gross square feet of office space to 135 occupiable square feet of office space.

2. WBS Level 1 & 2 Cost Estimate Overview

A Work Breakdown Structure (WBS) of six levels is used for the development of the cost estimate for the Footprint Gallery Upgrade. Level 1 costs are summarized below:

Engineering, Design, Inspection & Administration @ 30%	$ 2,820,000
Conventional Construction	9,480,000
Contingency at 20%	2,500,000
Total Footprint Gallery Upgrade	$14,800,000

Detailed costs by construction phases are shown in Chapter VI and the appendices.

3. Overview Construction Schedule

Key dates for the Footprint Gallery Upgrade project are listed below:

	Start	Complete
Title I Design	October 1989	January 1990
Title II Design	January 1990	February 1993
Title III Construction	March 1990	June 1993

A bar chart and schedule detail is shown in Chapter VII.

4. Proposed Method of Accomplishing Work

Preliminary Title I and Final Title II Design will be accomplished, where possible and practical, by board-selected professional architectural engineering firms, or by Fermilab staff as appropriate. Pre-Title I Design and Construction Management will be done by Fermilab staff.

A series of fixed-price construction contracts and Fermilab procurement contracts is planned for the the construction work of the Footprint Gallery Upgrade. The subcontracts and procurements parallel closely the construction phases that will be used and are listed below:

Construction Phase	Number of Contracts Construction	Procurement	Start Construction
Phase 1: Site Prep, Booster and Transfer Galleries, West Entrance	3	3	March 1990
Phase 2: Utilities, Cross Gallery South Addition, Control & Computer Rooms Parking Extension	4	2	November 1990
Phase 3: Cross Gallery North Addition, Cross Gallery Remodeling, Landscaping	3	5	November 1991

The construction phases and packages are described in Chapter V.

5. Recommendations

The design of the Footprint Gallery Upgrade described in this report has been dictated by the operational requirements of the Accelerator Division, by safety requirements for Fermilab operating personnel and to the general public, and by architectural conformity with other facilities at the Fermilab site.

This design is in accordance with recognized architectural and engineering practice and complies with applicable standards and referenced standards of the United States Department of Energy and the State of Illinois.

It is therefore recommended that this conceptual design report be validated for inclusion in the budget submissions of the Department of Energy.

Table II-1

PRESENT AND PROPOSED UPGRADE USAGE - FOOTPRINT GALLERY BUILDINGS

Areas in Gross Square Feet - ( ) Indicates Reduction in Area

Usage - Function	Total Area 1990	Phase 1 New Const.	Phase 1 Removal & Retire	Phase 2 New Const.	Phase 3 New Const.	Phase 3 Remodel Removals	Phase 3 Remodel Build	Total Area at Completion
Accelerator Equip.	47,600	500	0	0	0	(3,700)	3,700	48,100
Tech & Assembly	78,100	11,500	*(6,700)	0	0	(800)	800	82,900
Offices	70,400	26,900	**(10,800)	5,100	1,500	(9,000)	7,500	91,600
Meeting/ Lecture Rooms	6,000	2,600	0	600	0	(700)	6,800	15,300
Control Room/ Computer Room	5,400	0	0	9,900	0	(5,400)	0	9,900
Storage	13,100	2,400	0	0	0	0	800	16,300
Public Areas	1,000	3,500	0	3,600	0	(1,000)	1,000	8,100
TOTALS	221,600	47,400	(17,500)	19,200	1,500	(20,600)	20,600	272,200

Notes on Removals:

* 6,700 square feet removed - former Electron Cooling Ring
** 10,800 square feet removed - Portakamps and Trailers south of Cross Gallery

Summary of Information in Table II-1

New Construction	Phase I	47,400
	Phase II	19,200
	Phase III	1,500
	TOTAL	68,100
Remodeling	TOTAL	20,600
Removal & Retire	TOTAL	17,500

Table II-2

PRESENT AND PROPOSED UPGRADE AREAS - FOOTPRINT GALLERY BUILDINGS

Areas in Gross Square Feet - ( ) Indicates Reduction in Area

Usage - Function	Total Area 1990	Phase 1 New Const.	Phase 1 Removal & Retire	Phase 2 New Const.	Phase 3 New Const.	Phase 3 Remodel Removals	Phase 3 Remodel Build	Total Area at Completion
Cross Gallery								
1st Floor	36,400			10,200	1,500	(20,600)	20,600	48,100
2nd Floor	10,000			9,000				19,000
Lower Level	9,400							9,400
Transfer Gallery								
1st Floor	21,200	9,900						31,100
2nd Floor	16,200	6,600						22,800
Linac Gallery								
1st Floor	32,400	1,500						33,900
2nd Floor	9,700	2,000						11,700
Lower Level	11,300							11,300
East Booster Gal.								
1st Floor	12,700	500						13,200
2nd Floor		13,200						13,200
West Booster Gal.								
1st Floor	13,200	500						13,700
2nd Floor		13,200						13,200
SE Booster Lab								
1st Floor	7,900							7,900
2nd Floor	7,900							7,900
SW Booster Lab								
1st Floor	7,900							7,900
2nd Floor	7,900							7,900
SUBTOTAL	204,100	47,400	0	19,200	1,500	(20,600)	20,600	272,200
Other Space								
Portakamps	10,800		(10,800)					0
Electron Ring	6,700		(6,700)					0
TOTAL AREAS	221,600	47,400	(17,500)	19,200	1,500	(20,600)	20,600	272,200

Table II-3

PRESENT AND PROPOSED UPGRADE USAGE - FOOTPRINT GALLERY BUILDINGS INCREMENTS FOR EACH PHASE; TOTALS AT PHASE COMPLETION

(Increments are the sum of Construction, if any, less Removals, if any)

Areas in Gross Square Feet - ( ) Indicates Reduction in Area

Usage - Function	Total Area 1990	Phase I Increment	Total Area after Phase 1	Phase 2 Increment	Total Area after Phase 2	Phase 3 Increment	Total Area At Completion
Accelerator Equip.	47,600	500	48,100	0	48,100	0	48,100
Tech & Assembly	78,100	4,800	82,900	0	82,900	0	82,900
Offices	70,400	16,100	86,500	5,100	91,600	0	91,600
Meeting/ Lecture Rooms	6,000	2,600	8,600	600	9,200	6,100	15,300
Control Room/ Computer Room	5,400	0	5,400	9,900	15,300	(5,400)	9,900
Storage	13,100	2,400	15,500	0	15,500	800	16,300
Public Areas	1,000	3,500	4,500	3,600	8,100	0	8,100
TOTALS	221,600	29,900	251,500	19,200	270,700	1,500	272,200

NOTE: Each "increment" item may be calculated from the information found in Table II-1, as follows:

1. Phase 1 increment = Phase 1 New Construction - Phase 1 Removal
2. Phase 2 increment = Phase 2 New Construction
3. Phase 3 increment = Phase 3 New Construction - Phase 3 Remodel Removal + Phase 3 Remodel Build

Table II-4

PRESENT AND PROPOSED UPGRADE USAGE - FOOTPRINT GALLERY BUILDINGS
TOTAL AREAS ADDED BY NEW CONSTRUCTION, TOTAL AREAS RETIRED, TOTAL AREAS REMODELED

Areas in Gross Square Feet - ( ) Indicates Reduction in Area

Usage - Function	New Construction	Removal & Retire	Remodel Removals	Remodel Build
Accelerator Equip.	500	0	(3,700)	3,700
Tech & Assembly	11,500	*(6,700)	(800)	800
Offices	33,500	**(10,800)	(9,000)	7,500
Meeting/ Lecture Rooms	3,200	0	(700)	6,800
Control Room/ Computer Room	9,900	0	(5,400)	0
Storage	2,400	0	0	800
Public Areas	7,100	0	(1,000)	1,000
TOTALS	68,100	(17,500)	(20,600)	20,600

Notes on Removals:

* 6,700 square feet removed - former Electron Cooling Ring
** 10,800 square feet removed - Portakamps and Trailers south of Cross Gallery

Table II-5

PROPOSED USAGE OF NEW AND REMODELED SPACE BY FLOOR FOOTPRINT GALLERY BUILDINGS

Areas in Gross Square Feet

Usage - Function	1st Floor New	1st Floor Remodeled	2nd Floor New	2nd Floor Remodeled	Total New	Total Remodeled
Accelerator Equip.	500	3,700	0	0	500	3,700
Tech & Assembly	11,500	800	0	0	11,500	800
Offices	3,000	7,500	30,500	0	33,500	7,500
Meeting/ Lecture Rooms	800	6,800	2,400	0	3,200	6,800
Control Room/ Computer Room	4,900	0	5,000	0	9,900	0
Storage	0	800	2,400	0	2,400	800
Public Areas	3,400	1,000	3,700	0	7,100	1,000
TOTALS	24,100	20,600	44,000	0	68,100	20,600

Summary of Information in Table II-5

New Construction	First Floor	24,100
	Second Floor	44,000
	TOTAL	68,100
Remodeling	Fist Floor	20,600
	Second Floor	0
	TOTAL	20,600

III

JUSTIFICATION OF NEED

1. Existing Arrangements

The Footprint Gallery complex is the operations center of the Fermilab Accelerator Division. The Footprint Galleries are also the workplace for most members of the Fermilab Accelerator Division, as well as being the workplace for visitors working on accelerator-related technology, experimenters assigned to the Accelerator Division for support, and personnel associated with projects such as the Medical Accelerator. Accelerator Division personnel support the following major components of the Fermilab Complex: Linac, Booster, Conventional Main Ring, Superconducting Tevatron, Antiproton Source, Fixed Target Extraction, and the second major colliding experiment (D-Zero).

The population of the Footprint Gallery complex at the time of the preparation of this Conceptual Design Report is:

a.	The Accelerator Division		531
b.	Less: Accelerator Division personnel permanently located at the Central Helium Liquifier or RF Buildings		(29)
c.	Plus "visitors"		28
	includes: D-Zero and other experiments	10	
	Guests: (CERN, Soviet Union, Medical Accelerator)	18	
	TOTAL POPULATION		530

Of this total population, 327 are in offices and 203 in "tech areas".

For the purposes of planning this Conceptual Design Report, the growth of the population has been estimated and at the completion of Phase 3 it will be as follows:

a.	The Accelerator Division	571	(+40)
b.	Less: Accelerator Personnel at CHL and RF	(29)	

c.	"Visitors"		120	(+92)
	Includes:	D-Zero	80	(+70)
		E760	20	(+20)
		Guests, etc.	20	(+ 2)
	TOTAL POPULATION		662	(+132)

Of this total population, 459 will be in offices and 203 in "tech areas".

The original Footprint Gallery construction was built to house the equipment for the first Fermilab Accelerators, (Linac, Booster, Conventional Main Ring) and the Extraction system. Space for a relatively small core of operations and support personnel was included. Many of the personnel for the systems and support departments were originally housed in the Fermilab Central Laboratory (Wilson Hall). From the period of 1975 onwards, the operational inconvenience of a large physical separation of offices and developmental laboratories from the accelerator equipment drove a series of moves of personnel into offices and workspaces created in additions and modifications to the Footprint Galleries. These areas included makeshift offices in already congested locations, as well as portakamps, trailers and the occupation of an unused temporary accelerator facility for the fabrication of machine components by technicians.

As the Accelerator Division has grown over the last decade, additional space has been created. At least three distinct periods of growth can be identified: the construction of the Tevatron, the construction of the Antiproton Source, and the construction of the D-Zero experiment. All these efforts have resulted in permanent staff increases of the Division. In some cases, such as the construction of the Antiproton Source, permanent additions (the "Southeast" and "Southwest" Booster Galleries) were designed to provide office space for new systems and support departments (the Antiproton Source Department and the Cryogenic Department in support of the Tevatron). In other cases, such as the growth of support staff for electronics and controls for the Tevatron, avowedly temporary offices were created from trailers and portakamps with a varying degree of discomfort for the inhabitants due to distances to restrooms, lack of enclosed hallways (in some instances) and now general deterioration.

Other areas in the Footprint Galleries have become inadequate. Both the Main Control Room and the Central Control Computer Room have been outgrown. There is insufficient space for the equipment and personnel necessary to operate and monitor the additional equipment that has been added over the last decade. It will become ever more awkward to operate the accelerator while restricted to the present area. The limited space in the Main Control Room restricts the number and type of studies that might be undertaken in parallel with accelerator operation or other studies. The accelerator itself can be operated in several modes at once, but it is difficult to arrange these mixed modes of operation and study in a calm, centrally organized, and cooperative environment. There is also a complete lack of work space to place accelerator consoles for studies of accelerator systems nearby, but not inside, the Main Control Room.

Although there is very poor support for tours by distinguished guests or by the general public, the Linac and Main Control Room constitute a very popular part of the public viewing of Fermilab. In 1987, more than 9,000 people were escorted through public areas of the accelerator. There exists considerable opportunity for improving the general appearance of the area open to public viewing, as well as for improving the presentation to the public of explanations of the accelerator operation which they are viewing. This will require some enlargement of the areas devoted to such tours and explanatory exhibits.

There is a distinct lack of space for large development or assembly of any sort, whether for accelerator or D-Zero projects, and a complete lack of space for archival storage of computer tapes and documentation for any of the Accelerator Host computers.

The office and laboratory space created over the last dozen years or so is frequently in very local second-story areas. There are at least seven such second-story areas, all disconnected. NOT ONE of these areas (housing office and work space for over 150 people) is accessible by elevator, thereby excluding handicapped or wheelchair-bound personnel from any of these areas. These work areas were generally created without any reference to where the staff employed would park, creating extremely long and inconvenient distances from nearest parking areas. Many of the work areas were created in buildings not originally viewed as housing personnel. Heating and cooling, planned for certain limited types of operating accelerator equipment, was not sufficient in areas now occupied by reasonable numbers of staff. The noise levels from nearby equipment is frequently high; poor heating, cooling and ventilation can make the simple expedient of closing a door unpleasant.

The location of staff with respect to the equipment they are expected to support is frequently less than ideal; the distribution of available offices is such that it has not been possible to both bring crucial personnel near to critical areas (such as the Main Control Room or the Central Computer Room) and to simultaneously concentrate entire departments within reasonable distances of each other and the respective departmental administrators. In addition to these considerations, the Accelerator Division has faced at least the following additional groups of personnel to house over the years: The Neutron Therapy Facility, and the "Loma Linda" or "Medical Accelerator Development" effort. There is also a reasonably steady demand for space for technical staff on mid- to long-range exchange or loan from scientific institutes around the world, and specifically from the USSR, CERN, DESY, Japan, and China. The support for such visitors varies with time, but has been a steady load.

There are two recent developments that have essentially caused Accelerator Division personnel to believe that a coherent upgrade and reorganization of the workspaces of the Division should be proposed and executed. There are additional staff and experimenters expected yet to arrive to support the D-Zero experiment (estimated by management to require at least 70 additional offices)

and additional staff to support upgrades to the accelerator. These additional people simply cannot be housed, even with the retention of all the space scheduled to be removed by the elimination of portakamps as planned when the Booster Gallery Additions were completed. The Accelerator Division has no further flexibility with space currently under roof; has no further space for the location of "nearby" portakamps or trailers even if desired, and has destroyed necessary assembly space to create office and laboratory work areas. The plans proposed in this Conceptual Design Report permit a staged evolution from a very poor existing arrangement to a work area designed to permit people to conveniently access and support the Fermilab accelerators.

2. Alternative Solutions Considered

a. Remodeling Within the Current Structures

It was considered and rejected that the size of the Main Control Room and the Central Computer Room be increased as part of a remodeling project strictly limited to the space available within the existing structures. Any increase in space for these areas would be balanced by a corresponding reduction in office and technical support space. This is impractical because we must provide for an expansion of the population as outlined above, and there is no way to support both an expansion of the area of the Main Control Room, the Central Computer Room and to increase office space by means of a remodeling project limited to the areas of existing structures. Also, this approach does not permit one to remove deteriorating temporary structures.

Almost all plans restricted to remodeling the Main Control Room and the Central Computer Room have an additional difficulty, since the accelerator is scheduled for essentially continuous operation for the next five years. This limits "downtime" to periods on the order of one month during changeovers from Collider to Fixed Target operations, and back. It is simply impractical to remodel rooms, with accompanying dirt and dust, while attempting to operate electronic equipment which has a very low tolerance to dirt and dust. It is necessary that new rooms be prepared, and then equipment rapidly moved into them, without exposure to hostile environments.

b. Addition of More Temporary Structures (portakamps, trailers, etc.)

The possibility of additional temporary structures for use as offices and work areas was reviewed and determined to be inappropriate. This proposal does not address the deterioration of the existing temporary structures. There is very limited space in the Footprint Area in which to add any further temporary structures. The structures themselves limit the amount of usable space, and so do

not address the problems of space limitations of the Main Control Room and Main Computer Room; the temporary structures would simply add offices and small work areas. It is unlikely that sufficient temporary structures could be added within a useful distance of the central Footprint Gallery area to provide the estimated area for needed expansion. Temporary structures are costly to maintain, and not aesthetic.

c. **New Construction at a Distant Site**

Construction of a new facility at a distant site was considered and rejected. A new facility at a distance containing an enlarged Main Control Room and an enlarged Central Computer Room is impractical because of the existence of many cables coming and going from the Main Control Room and the Central Computer Room out to the accelerator equipment. The rerouting or complete replacement of these cables within a limited period of time is impossible. A requirement of any acceptable proposal for improving the Main Control Room and Central Computer Room is that the termination of the existing cables may be relocated in a short time in a simple fashion, with any alteration of the cables limited to simple splicing or extension without the need for electronic repeaters. From practical considerations, therefore, the location of any improved Main Control Room and Central Computer Room must be near, and not distant from, the existing location. A distant new structure limited to office and work space would further disperse staff from the Main Control Room and central support facilities, aggravating the existing problems. Under the current arrangements, staff is widely dispersed both within organizational units and from the operations center. A major consideration of this Conceptual Design is to locate staff centrally within the Footprint Gallery area, rather than on its periphery. Relocating the population associated with the D-Zero experiment at a distance is similarly unattractive, since the purpose of locating the D-Zero experiment in the Accelerator Division was to encourage close cooperation between accelerator support organizations and the experiment. Physical proximity does encourage such cooperation.

3. Conclusion

The existing area in the Footprint Gallery complex is too small to support necessary changes to permit the expansion of the facilities central to the operation of the accelerator and to provide for the expected growth in population. Proposals restricted to either remodeling existing areas, the addition of temporary space, or new construction at a distance have been considered and rejected as impractical in each case. Therefore, a proposal to construct additional space in the immediate central area of the Footprint Galleries, coupled with the removal of temporary structures, and including some extensive remodeling of existing areas has been developed as the practical solution to the existing problems.

IV

DESIGN CRITERIA

1. Technician Work Space and Office Space

a. Personnel Relocation and Occupancy

This project is planned to be executed in three phases. It is necessary to demonstrate that each phase is consistent with the goals of the project when completed and with the needs at the time each phase is completed. All personnel presently occupying space in any of the temporary structures on the south side of the existing "cross member" of the Footprint Galleries must be provided for before those structures can be removed to create space for the construction of the south addition that will house the new Main Control Room and Central Computer Room. Also, on the same time scale of the completion of the first phase, it will be necessary to provide space for the approximately 55 (of an eventual 70) additional experimenters expected in association with the D-Zero experiment. As a minimum, it will be therefore necessary to find space for the approximately 43 people presently occupying the temporary structures, and the 55 additional people expected. To first order, all the space presently under roof in the above temporary structures is office space. Therefore, it is important that the first phase emphasize office space, which it does.

The majority of the Phase 1 construction adds a second floor over the east and west Booster Galleries and a second floor over the south end of the Transfer Gallery. All this second floor space is scheduled for office utilization and is estimated to be 26,900 square feet. It is planned that this all be created as single occupancy offices, yielding approximately 133 such offices, with 54 new offices created over each of the Booster Galleries and 25 new offices created over the Transfer Gallery. Almost all of this space would be used by personnel associated with the D-Zero experiment, as the following calculation will show. There are 43 people, essentially all associated with D-Zero, now in the temporary structures. By the end of Phase 1 at least 55 more people associated with D-Zero requiring office space will be present. Thus, ninety-eight of the 133 offices will be immediately utilized. The remaining 35 offices in Phase 1 will be necessary to house people displaced during the remodeling for Phase 3, which is so extensive that most of the space to be remodeled will not be habitable during that period. Ultimately, Phases 1, 2 and 3 will create 26,900, 5,100 and 1,500 square feet of new office space, and 7,500 square feet of remodeled office space. This totals to

41,000 square feet, or about 205 offices. This will be office space for the following people: 43 displaced from close-in temporary structures, 55 additional associated with D-Zero, 76 people currently housed in offices in the area to be remodeled, 16 people to be displaced from offices created in areas designated to be "recaptured" for technician space and labs (especially in the Booster Gallery first floor labs), and 15 people who could be housed as the Division grows. About the equivalent of 10 offices should be reserved for equipment rooms (large copy machines, laboratory central computer printers, etc.), and the remodeling also must provide approximately the same number of small conference rooms (one ten-person, two twenty-person) that will be destroyed in the course of the remodeling.

The total population of the Footprint Gallery Complex expected at the completion of Phase 3 utilizing office space will be 459. 205 will be occupying offices in 41,000 gross square feet created or remodeled during this work, and 254 will be in existing offices in 50,600 gross square feet untouched by this work. Using DOE/GSA standards as discussed in Chapter II, Section 1, the gross office space for 459 people is 91,800 square feet. This is approximately what the total gross office space in the Footprint Gallery will be (91,600 square feet) at the completion of Phase 3.

b. Technician and Laboratory Space

Several large areas will result from either the new construction, remodeling in the Footprint Gallery "cross member" and from the "recapture" of areas currently occupied as offices (inefficiently), the present configuration having increasingly eliminated necessary development and assembly areas. The largest technician area to result from the new construction is in the "southeast" area of the cross member addition; this area to be created during Phase 1. This is all to be relatively "high bay" to permit large scale subassembly of mechanical and power supply components. One type of work to be carried out here is power supply assembly and testing currently done in the ground floor (basement) of the Central Laboratory (Wilson Hall). This will both bring this operation to a more convenient location for the departments and people involved, and will also be most helpful to the divisions and departments in the Central Laboratory, where all assembly and test space in the ground floor is at a premium. The Accelerator Operations Staff office space is included in the discussion of Office Space above. Its location, however, must be retained in the vicinity of the Main Control Room. Although this area may be large rooms internally subdivided, space for each of the operators (approximately 30) must be provided. Also, technician support areas for computer/control room maintenance staff and engineers employed by Fermilab, Computer/Control Room parts storage (both for Fermilab and maintenance subcontractors),

and suitable storage for "short term" Computer Archival materials (disks, tapes, documentation libraries) must be created, and in some instances must meet DOE standards for such archival areas. It is assumed in this discussion that the Accelerator Division will continue to have access to some long term vaulting in Wilson Hall; this means that most or all of the vaulting space will not vanish or migrate to the new Computer Center, where it would be much less convenient. The exact floor space to be used for each of these utilizations is waiting for detailed planning of the remodeled and "recaptured" areas.

c. **Special Requirements**

The following items have received special attention during the planning phases:

1) Linking as many second floor areas as possible to each other, for ease of intercommunication.

2) Handicapped Access to as many second floor areas as possible.

3) Computer archiving, especially for "short term" materials, assuming the retention of "long term vaulting" in Wilson Hall. Any future Laboratory decision to remove the Wilson Hall "long term" vaulting would present the Accelerator Division with an additional vaulting problem.

4) The proximity of the Accelerator Operations staff to the new Main Control Room.

5) The Proximity of at least one remodeled small conference room to the Main Control Room.

6) Centralization and Accessibility of the Accelerator Division Headquarters.

2. Main Control and Central Control Computer Rooms

a. Existing Arrangements

The Main Control Room: The Main Control Room is the location from which the operations staff runs those parts of the accelerator complex within the Accelerator Division's purview which are being "normally" operated for high energy physics research. There are seven "operator control console" stations inside the "inner" main control room, and an additional (eighth) console, as well as radiation and electrical lock out trees in an "outer" main control room. There are at present a total of twenty "operator control console" stations sited around the accelerator complex. The

additional twelve consoles not in the main control room serve a variety of purposes: three at the Antiproton Source control room in "AP-10" service building and two in the main accelerator "RF" building are frequently used by systems specialists working on these systems for whom a proximity to the equipment may be very important. Other consoles at the Central Helium Liquifier and the Colliding Detector Facility (CDF) are generally used to permit the operators of these facilities to watch particular subsystems in detail and also to watch accelerator operations in a cursory fashion. The remaining four consoles are utilized in a variety of fashions for accelerator system and accelerator control development; one of these is inside the central computer room. The present "mix" of utilization of consoles is unlikely to change dramatically in the future; nor is the large physical distribution of consoles as now implemented likely to change significantly. What is unsatisfactory at present, and likely to change in the future, is the relative limitation of operator console stations in the Main Control Room. It must be understood that the work done by an operator or systems staff member working in the main control room is very likely to be quite different from that done by someone working at a functionally equivalent console at a distance. By practice and design, the accelerator as an integrated system is only scheduled, studied, or operated from within the Main Control Room. This is necessary because the interaction of the various components of the accelerator can only be programmed and executed as a logical unity. Therefore, a "crew chief" is in charge of ALL operations of the accelerator complex, and he organizes this effort from his post inside the "inner" Main Control Room. This inter-related operation, however, may consist of several super-imposed operations simultaneously, and it is quite possible that a misoperation or failure of one sub-component of the accelerator complex may influence another. For this reason, it is essential that the "crew chief" have an operational purview of all studies and/or operations using the accelerator complex. Thus, the seven operator console stations are grouped conveniently closely together in the inner control room. When originally designed, the Main Control Room was perceived as providing work locations for several independently controlled pieces of the accelerator complex: Linac, Booster, Main Ring, Extraction. It was certainly useful to have these functions centralized, although the original implementation did require disjointed control. This has changed; the entire accelerator complex may be equally accessed from ANY of the twenty operator control console stations. Also, the accelerator complex has grown: Superconducting Tevatron, Antiproton Source (Targeting, Debuncher, Accumulator) and Collider Operation in addition to Fixed Target Extraction. The operation of these various parts requires an interleaving of several scenarios: for example the production of Anti-Protons and their collection utilizing the Linac, Booster, Main Ring, and Antiproton

Source simultaneously with Collider Operation of the Tevatron, and all this can be accomplished with interleaved "machine study cycles". Under such a scenario, it has been already demonstrated that seven console work stations functioning under the purview of the "crew chief" may be insufficient. The space inside the existing "inner control room", however, precludes the addition of even one more operator console station. Similarly, there are accelerator systems (for example, Tevatron cryogenics) which must be operated continuously, rather independently of the particular state of the physics program or acceleration cycle. It is possible, but not particularly desirable, to permit such "systems" to be studied and reviewed at a physical distance from the main control room and the purview of the crew chief. Ideally, this type of work would be done in a nearby area (such as the present "outer control room") where the conversations of the support systems personnel would not distract conversations of accelerator studies or operations personnel, but still sufficiently close that the crew chief might be able to correlate and control changes in conditions in either the accelerator operations or support systems. The present "outer" control room does not have sufficient room to add more control console stations for these purposes either. In short, a somewhat larger, and perhaps more conveniently organized Main Control Room environment might meet the following objectives: A larger but still compact and disjoint area for accelerator complex operations and studies, a larger but compact area for systems development and study, still within the purview of the crew chief, and a convenient work area for technical visitors and experts to examine the accelerator and or support systems. All the present safety interlock systems would need to be retained.

The present Main Control Room does not have a "false floor", thus the routing of any wiring necessary for the operation of the equipment pertinent to operator control consoles or dedicated diagnostic devices is awkward, and the end product messy.

The Central Computer Room: The present central computer room houses most, but not all of the Accelerator Central control, development, and research computational engines. The most significant exceptions are some "front end" engines for the conventional Main Accelerator which are housed (for space considerations) one floor below in an auxiliary room. A substantial reduction in the number of such engines in that auxiliary room has been made in the recent past, and one could conceivably consider consolidating all the remaining engines either physically or by function with engines in the Central Computer Room, if space permitted. The present configuration of the equipment in the Central Computer Room includes four Digital Equipment Corporation VAXes (three 11/785's, one 11/8650), one Floating Point Systems FPS-164, and over thirty Digital Equipment Corporation PDP-11 mini-computer

configurations, each occupying (fairly loosely) approximately one and one half standard electronic equipment racks. In addition the VAX cluster disk drives, tape drives, printers (impact and laser), and computer console (printer) terminals reside in this room. Other equipment includes: One Accelerator Controls Operator Console station, networking interface equipment to support links to hundreds of terminals within the division and via Port-Selector equipment to the laboratory at large, and a (too) limited amount of media storage cabinets. Space for the addition of computers for control system upgrade studies, additional console work stations, and storage is at a premium; to first order it is unavailable. If nothing is done, eventually extremely undesirable steps, such as the removal of the one Control Console within the computer room, will become necessary so that computer engines may be housed in the room.

The chief criteria of this project will be to increase the available space for equipment, and to allow a consolidation of some remaining equipment still dispersed, and to permit sufficient space to retain the ability for controls system development to be studied in the immediate proximity of the computational support engines.

The present arrangement does permit quick access from the Main Control Room into the Central Computer Room; this is important since the Accelerator Operations Staff also serve as operators of the Control Computers on "off-hours" shifts. This proximity must be retained in any new planning for an "upgrade".

The accelerator operators are housed in several subdivided areas which are crowded and not ideally designed to support the variety of hardware and software jobs undertaken by this staff in addition to the operation of the accelerator.

Public Viewing, by the general as contrasted to the visiting technical public, is limited and unsatisfactory, but in spite of this it is a very popular component of the public tours conducted through Fermilab. Provisions for larger groups to view the Main Control Room, as well as for additional explanatory exhibits which may be easily comprehended during casual viewing are urgently needed as part of our desire to explain the facility to the visiting general public. At present, a few very small glass windows, rather removed from the 'inner' control room, opening off a small and crowded hallway, are the extent of the provisions for public viewing of the Main Control Room. Space limitations blocked the public view of the Central Computer Room quite a few years ago.

b. **Improvements and Upgrades**

The Main Control Room: The desirable features are to increase the available space for both the "inner" and "outer" control rooms as outlined above, and to provide the crew chief with a good purview of all the work in both areas. The inner control room would support two or three additional operator stations; and the outer control room might support a total of four stations. The control room would utilize a false floor. Architectural means to suppress noise generated by the equipment would be utilized.

The Central Computer Room would provide more space for additional equipment than can be housed in the existing facility, permitting expansion of the central cluster and the development of new control services. A second control console station in the computer room (or on the same level) could be added. False flooring remains essential. It would be EXTREMELY desirable if COOLING (and power) could be continued in the absence of central utilities (and during feeder servicing alternate powering routes provided.)

Media storage at convenient locations meeting "short to mid-term" storage specifications should be provided.

The proximity to the Main Control Room must be retained.

The operator staff must be provided with adequate work space outside but proximate to the Main Control Room.

Public Viewing for escorted Fermilab tours for the general public must be improved. Both the viewing and explanatory exhibits must be provided, while keeping interference with "normal" operations and staff movement to a minimum.

3. **Common Areas**

a. **Meeting/Lecture Room**

The Accelerator Division has no large (100 - 200) person meeting Room or Lecture Hall. In fact, the largest meeting room available in the Division can (inconveniently) hold about 40 people. There are regular lectures offered to the Division at large on accelerator related topics at meetings scheduled twice a week (Tuesday afternoons and Thursday mornings.) The expected attendance varies, but is certainly larger than 40, and for topics of considerable interest may approach or exceed 100. Such meetings/lectures may only be convened in Wilson Hall, which is certainly not central to people in the Accelerator Division. It is difficult to demonstrate, but certainly plausible, that staff who might benefit from the meetings/lectures are

deterred from attending by considerations of distance (and weather!) Thus, it is proposed that a room capable of comfortably accommodating 200 people for meetings and lectures be constructed as part of the remodeling proposed after the relocation of the Main Control Room and Central Computer Room. There are some rather fortuitous considerations that argue strongly for utilizing the space available for remodeling, including the central location within the division and the fact that the available ceiling room is high, permitting one to design a room for 200 people with an acceptable pitch for viewing from rear seats. The almost 200 D-Zero experimenters, when meeting in full collaboration, require a room this size.

b. **West Entrance Area**

The Linac has always provided a considerable obstacle to easy access from the largest parking lot (and most heavily used by staff of the Accelerator Division) and their respective work locations. It is proposed to create on the West side of the Linac shielding berm an Entrance area, from which one would access a "second story corridor" (by stairs or elevators). This second story corridor would cross the Linac and then offer connected access to six of the present or newly constructed second floor areas, as well as access via stairs and elevators to the first floor areas of the Cross Gallery. This simple device of a west entrance area and cross corridor will serve several important purposes: Increase the convenience of access to employee parking, connect now disjoint second floor areas, and provide (via elevator) handicapped access to the very large fraction of the work space of the Accelerator Division from which they are now excluded.

The removal of the temporary "cooling ring study building" and the completion of the west side parking lot will provide convenient parking for almost all staff to be located in the new or remodeled work areas; parking must be increased in any case for the additional staff expected for the D-Zero Experiment.

V

CONSTRUCTION PACKAGE DESCRIPTIONS

1. Overview

The construction work for the Footprint Gallery Upgrade has been divided into three construction phases with a total of ten construction contract packages. This will provide the following features:

a. Available space for personnel moves during major remodeling work.

b. New utilities and utility routes prior to old system removal.

c. Construction time flexibility relative to accelerator operations.

d. Early beneficial occupancies of areas as completed.

e. Early relief in the most critical spaces and utilities.

These contract packages are referenced to the Work Breakdown System (WBS) that is described in Section VI, Cost Estimate. The gross areas affected by each construction phase are listed in Section II, Table II-2.

2. Phase 1 Construction - WBS 1.1.1

Phase 1 will do site preparation work, add a second story to the existing Booster Galleries, construct the Transfer Gallery Addition and build an entrance at the West Parking Lot.

Site Preparation (WBS 1.1.1.1) will clear away existing temporary office trailers, reroute some of the underground utilities and fill in a perimeter strip at the Booster Pond for future green space. This new perimeter strip is especially useful as a staging area for the following construction work. Two new substations will be sited in this area in future packages.

The Booster Gallery Addition (WBS 1.1.1.2A) constructs an entire second floor of offices above both existing West and East Booster Galleries. The present arc-shaped buildings will be faced with new two-story precast concrete wall panels to continue the appearance of the existing South Booster Lab buildings. Designs were considered during the South Booster Lab construction to make the new Booster Gallery second floor compatible and uniform in appearance. Elevators and stairs will be installed about midway in each arc building and access to the present first floor areas will be improved. Mechanical areas for the new second floor will be added and existing mechanical areas will be reconfigured.

The Transfer Gallery Addition (WBS 1.1.1.2B) constructs a new high bay tech work space in the area between the south end of the Transfer Gallery and the East Booster Gallery. Along the east side of the addition will be a partial second-story level with a row of offices and an aisle joining the Transfer Hall, various mezzanines in the Cross Gallery, the new Booster Gallery and the Southeast Booster Lab. Mechanical and storage rooms will be placed on elevated floor areas which are adjacent to the Booster Enclosure below where additional shielding thickness is required.

The new Footprint Gallery West Entrance (WBS 1.1.1.3) constructs a small entrance lobby with stairs and elevator leading to a second-story crosswalk over the existing Linac Gallery. This West Entrance will provide direct personnel access from the West Parking Lot into the second floors of the new West Booster Gallery and the existing Southwest Booster Lab.

All Phase 1 construction work may be completed independent of the construction work of another project, the Antiproton-Proton Collider Upgrade: Linac. The entrances and aisles of the West Entrance package will connect to the Linac second floor areas when and as these areas are built.

3. Phase 2 Construction - WBS 1.1.2

Phase 2 will relocate and add to utility systems, construct the Cross Gallery South Addition, set up the occupancy of the Main Control Room and Computer Room and extend the Southwest Parking Lot.

The Footprint Gallery Utilities (WBS 1.1.2.1) extends the existing utility tunnel south to the area of the new Control Room. An existing substation along the south exterior of the Cross Gallery and a new substation are installed in the new Booster Pond perimeter area. Other underground services such as industrial cold water, domestic water and some sewers are also rerouted and extended where needed.

The Cross Gallery South Addition (WBS 1.1.2.2) constructs a new two-story addition along the south wall of the present Cross Gallery and an atrium two stories high next to the principal aisles, Control Room and Computer Room. Cable access floors are provided in the Control Room and Computer Room portions of this addition. Considerable rework and enlargement of several mechanical equipment rooms are included as well as large new HVAC and fire protection systems for the new rooms. New offices along the south elevation are constructed for the control room operators. A new elevator and cross aisle from the atrium will join into the new aisles of the Phase 1 construction.

The Control and Computer Room Occupancy (WBS 1.1.2.3) completes the interiors of these rooms with access floors, Halon systems, ceilings, HVAC terminations and installs much of the trunk cabling into these new areas. This work scope is highly dependent on accelerator operations and some parts of this contract will extend over a long time period to allow critical work to occur during accelerator down periods.

The Southwest Parking Lot Extension (WBS 1.1.2.4) removes an existing plywood structure, fills the area, regrades and extends the existing West Parking lot to the south. The berm slope of the Linac west exposure is regraded to match other berms on the Fermilab site, and the area leveled is prepared for additional parking. A portion of the existing West Parking Lot is restriped and new islands are installed around hydrants and street lights. A bus pull-in area at the West Entrance with visitor walkways is included.

4. Phase 3 Construction - WBS 1.1.3

Phase 3 completes the Footprint Gallery Upgrade with a Cross Gallery Northwest Addition, extensive remodeling of existing space to build a new Meeting Room Complex and landscaping of the north Cross Gallery area and the West Entrance area.

The Cross Gallery North Addition (WBS 1.1.3.1) extends the north wall of the present building and installs a sloping precast wall similar to the walls installed on previous additions. Windows are modified in the existing structure to symmetrize the entire facade. Structural reframing is done to provide spans for a new 200-person meeting room.

The Cross Gallery Remodeling (WBS 1.1.3.2) completes the interior remodeling in the Cross Gallery. Toilet areas are enlarged, a small lobby is constructed and adjoins to the aisles constructed in Phase 2. A meeting room is built. New HVAC equipment replaces existing out-of-date units and upgrades the Cross Gallery systems to current design standards.

The Footprint Gallery Landscaping (WBS 1.1.3.3) completes the upgrade at the appropriate planting time of the year. Parking areas, curbing, shrubbery and lawn are reconfigured to match the North Addition. At the new West Entrance and along the regraded Linac berm, plantings and ground cover are replaced.

VI

COST ESTIMATE

1. Work Breakdown Structure

The Work Breakdown Structure (WBS) is planned in six levels for the Footprint Gallery Upgrade project. WBS Overview Levels 1-3 are shown in this section. Detail Levels 4-6 are shown in Appendix C. The WBS numbers closely parallel the construction phases and contract packages and are cross-referenced also in Appendix C.

2. Construction Cost Estimate Overview

WBS Overview Levels 1-3 are listed by construction phase in Table VI-1 on the following page. These costs include overhead and profit, escalation and contingency.

3. Construction Cost Funding Profile

WBS Overview Levels 1-2, as divided into the four fiscal years over which the Footprint Gallery Upgrade construction is planned, are listed in Table VI-2 of this section. Contingency and Engineering, Design, Inspection and Administration (E.D.I.A.) are apportioned according to accrued construction costs over these fiscal years.

4. Basis of Cost Estimate

The Cost Estimate is based on the construction phases, conditions and assumptions listed below:

Construction Phases: The three construction phases and the various construction contract packages are described in Section V. Basically, each construction contract package is estimated separately.

Engineering, Design, Inspection & Administration: E.D.I.A. is included at approximately 30% of the construction costs. Much of the Footprint Gallery Upgrade includes remodeling of existing space, new construction in very confined areas and relocation and extension of existing utilities and systems that must be done in limited time frames associated with accelerator down periods. A considerable amount of field investigation and measurement is needed prior to final design drawing preparation.

Subcontractor's Overhead, Profit and Bonds: These items are included in the aggregate at 20%. The sub-subcontractor's overhead and profit are included in the unit costs in the quantity take-off pages.

Escalation: Data from D.O.E. Departmental Price Change Index, August 1987 update, is used for the anticipated economic escalation rates. Annual rates are 4.3%, 4.8%, 5.0%, 5.6% and 5.9% for 1989 through 1993 construction respectively. Computations are detailed in Table C-1.

Contingency: Contingencies are applied to the escalated costs including E.D.I.A. Approximately 20% is used on all construction phases.

On the following pages are the Total Cost Overview tables. Detailed cost tabulations appear in the appendices.

5. Methodology of Cost Estimate

The cost estimate has been prepared on a unit cost per square foot basis determined by current commercially published data and verified by recent construction experience at Fermilab as far as possible. This parametric approach is used because extensive detailed drawings are not available for estimation during the conceptual design phase. Quantity take-off estimation can be especially misleading for work that involves extensive remodeling and building addition work.

Means Square Foot Costs, 1988, published by R. S. Means Inc., is used as the prime source of unit cost per square foot data. Fermilab has used much of the Means estimating system during the past decade and has found their information reliable and accurate if carefully interpreted and applied. Key points of consideration, especially for remodeling work in this project, are as follows:

Specific Occupancy: The construction work is carefully divided into the types of occupancy, floor by floor. Many of the two- and three-story portions of the project have very different occupancies on each floor in a given vertical slice.

Composite Per Square Foot Costs: A unit cost is derived for each type of occupancy, style of building construction and gross amount of that specific occupancy in a given construction package. In general, the mechanical and electrical components of the unit costs are increased to reflect the occupancies in control rooms.

Accurate Square Foot Computation: A detailed computation of floor areas according to occupancies is done to improve the overall accuracy of the estimate.

Fermilab Construction Experience: Construction costs from the previous six years have been reviewed and analyzed according to type of occupancy and construction. This data is compared to the unit costs that have been derived from the Means data.

Table VI-1

COST ESTIMATE OVERVIEW BY CONSTRUCTION PHASES

WBS Level 1-2 - Cost in Dollars

Design/Construction Phase Description	Start-Complete Construction	Const. Costs WBS 1.1	E.D.I.A. WBS 1.2	Contingency WBS 1.3	Total Costs WBS 1.
Title I Design Report	October 1989 January 1990	-	$ 600,000	-	$ 600,000
Phase 1: Site Preparation Booster & Transfer Gallery West Entrance	March 1990 July 1991	$ 4,920,000	$ 1,140,000	$ 1,140,000	$ 7,200,000
Phase 2: Utilities, Cross Gallery South Addition, Control & Computer Rooms Southwest Parking Lot	November 1990 January 1992	$ 2,930,000	$ 690,000	$ 780,000	$ 4,400,000
Phase 3: Cross Gallery North Addition, Cross Gallery Remodeling, Landscaping	November 1991 June 1993	$ 1,630,000	$ 390,000	$ 580,000	$ 2,600,000
TOTAL ALL PHASES		$ 9,480,000	$ 2,820,000	$ 2,500,000	$ 14,800,000

Table VI-2

COST ESTIMATE OVERVIEW BY FISCAL YEARS

WBS Level 1-2 - Cost in Dollars

WBS Nos.	Type of Costs Description	F.Y. 1990	F.Y. 1991	F.Y. 1992	F.Y. 1993	TOTAL All Years
1.1	CONSTRUCTION	$ 2,500,000	$ 5,000,000	$ 1,250,000	$ 730,000	$ 9,480,000
1.2	E.D.I.A.	$ 2,000,000	$ 500,000	$ 250,000	$ 70,000	$ 2,820,000
1.3	CONTINGENCY	$ 500,000	$ 1,000,000	$ 500,000	$ 500,000	$ 2,500,000
1.	TOTAL - FOOTPRINT GALLERY UPGRADE	$ 5,000,000	$ 6,500,000	$ 2,000,000	$ 1,300,000	$ 14,800,000

VII

ENGINEERING AND CONSTRUCTION SCHEDULE

1. Overview Schedule

The overview schedule in bar chart form on the following page summarizes key dates and milestones in the Footprint Gallery Upgrade project. The first two milestones (A,B), contract award for A-E firm services and early completion/approval of the Title I Design Report, are essential for a prompt construction start. Three design review milestones (C,D,E) are flagged to emphasize dates when all criteria must be finalized for each construction phase of final Title II design.

2. Personnel Relocation

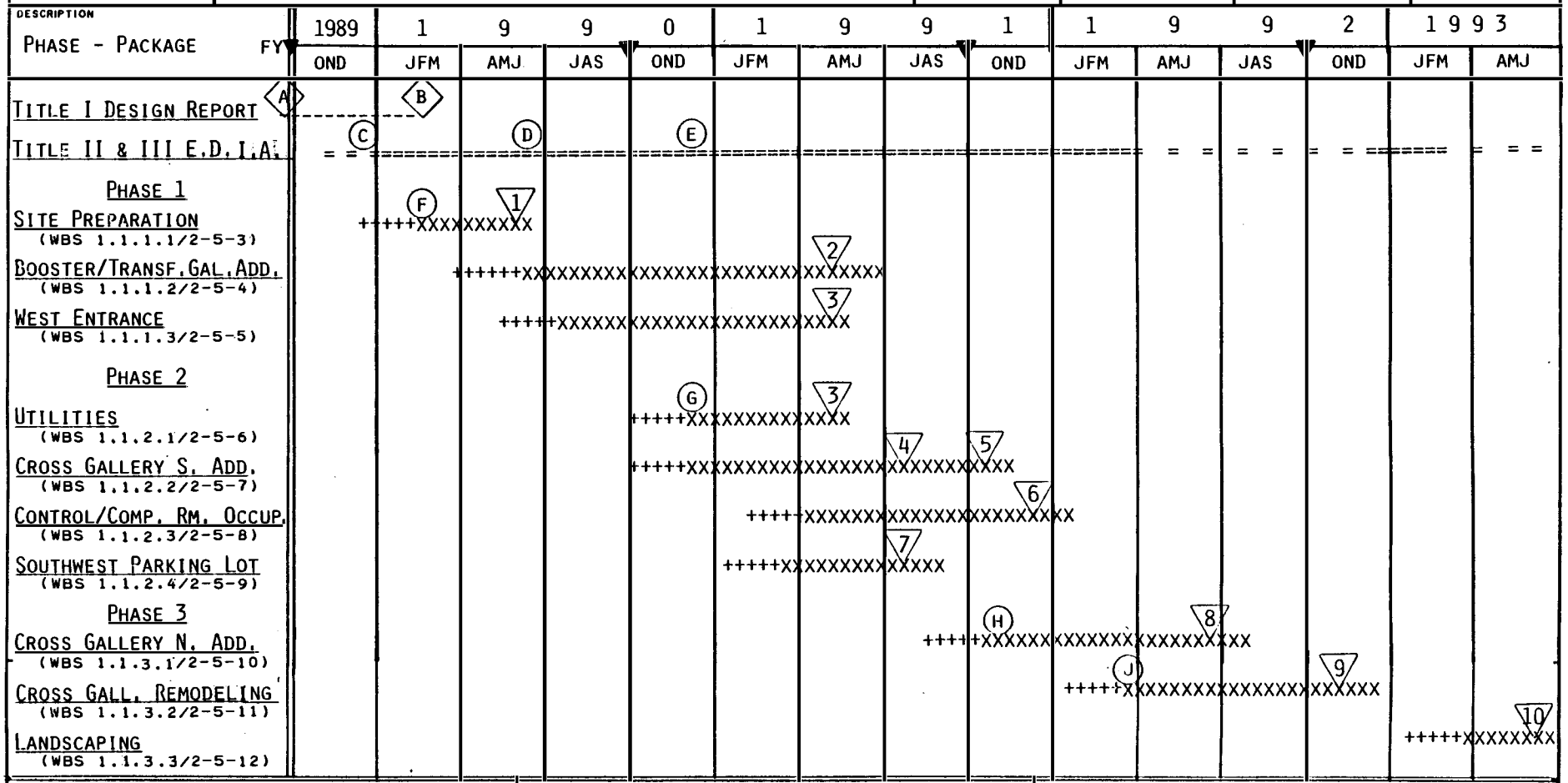
Four personnel relocation milestones (F,G,H,J) are listed to study the sequencing of new space being available and existing space being vacated. From this preliminary study, temporary relocations and doubling up will be needed in certain limited areas during the first two years.

3. Civil Construction

The civil construction milestones (1-10) concentrate on beneficial occupancies of newly built areas for both personnel/equipment to move into or for other follow-on subcontract work. Occupancies in the Control and Computer Rooms and subsequent moving of the Main Control Room are very dependent on Accelerator Division operational schedules. The completion of the entire upgrade project occurs with the completion of final landscaping during the Spring 1993 planting season.

FERMILAB SCHEDULE

PROJECT TITLE	NO.	DATE	REVISION DATE	PAGE
FOOTPRINT GALLERY UPGRADE OVERVIEW CONSTRUCTION SCHEDULE	2-5-1	MAY 1988		1/1



D.O.E. & FERMILAB MILESTONES

- (A) Sep. 1989 — A-E Firm Contracted/Ready to Start
- (B) Feb. 1990 — Title I Design Report approved by D.O.E.
- (C) Dec. 1989 — Booster & Transfer Gallery Criteria Review
- (D) June 1990 — Control & Counting Room Criteria Review
- (E) Dec. 1990 — Cross Gallery Remodeling and North Addition Criteria Review
- (F) Feb. 1990 — Portakamps and Trailers in South Transfer Gallery Area Vacated
- (G) Nov. 1990 — Booster Portakamps & Cross Gallery Offices by New Tunnel Vacated
- (H) Nov. 1991 — Cross Gallery Offices by North Addition Vacated
- (J) Mar. 1992 — Old Control Room, Computer Room and Adjacent Offices Vacated

CONSTRUCTION CONTRACT MILESTONES

- (1) May 1990 — Beneficial Occupancy Pond Backfill Area
- (2) Apr. 1991 — Beneficial Occupancy of Booster Second Floor Offices and Transfer Gallery Addition
- (3) Apr. 1991 — Beneficial Occupancy of West Entrance, Linac Cross Aisle and Utility Tunnel Extension
- (4) Jul. 1991 — Beneficial Occupancy of Control/Computer Rooms by Occupancy Subcontractor
- (5) Oct. 1991 — Beneficial Occupancy of Cross Gallery Offices
- (6) Dec. 1991 — Beneficial Occupancy of Control Room and Computer Room for Start of Control Room Move
- (7) July 1991 — Beneficial Occupancy of new Southwest Parking Lot
- (8) June 1992 — Beneficial Occupancy of North Addition by Cross Gallery Remodeling Subcontractor
- (9) Oct. 1992 — Beneficial Occupancy of Cross Gallery Remodeling
- (10) June 1993 — Landscaping Complete. All Upgrade Construction Complete

LEGEND

0000 OPERATIONS TIME — ---- CONCEPTUAL DESIGN — ==== FINAL DESIGN — ++++ BID TIME — XXXX CONSTRUCTION TIME — %%%% PROCUREMENT TIME — IIII INSTALLATION TIME — (2) MILESTONE NUMBER

APPENDIX A-1

BAKALIC
SCHEDULE 44
FINAL
FY 1990 BUDGET

DEPARTMENT OF ENERGY
GENERAL SCIENCE AND RESEARCH - PLANT AND CAPITAL EQUIPMENT
FY 1990 BUDGET REQUEST
(TABULAR DOLLARS IN THOUSANDS. NARRATIVE MATERIAL IN WHOLE DOLLARS.)
CONSTRUCTION PROJECT DATA SHEETS

CHICAGO OPERATIONS
Field Office

HIGH ENERGY PHYSICS
FERMI NATIONAL ACCELERATOR

1. Title and Location of Project: Footprint Gallery Upgrade
Fermi National Accelerator Laboratory, Batavia, Illinois

2. Project No. 90-CH-400

3. Date A-E Work Initiated: 1st Qtr. FY 1990

5. Previous Cost Estimate: None

3a. Date Physical Construction Starts: 2nd Qtr. FY 1990

6. Current Cost Estimate: $14,800

Date: May 1, 1988

4. Date Construction Ends: 3rd Qtr. FY 1993

7. Financial Schedule:

Fiscal Year	Authorization	Appropriation	Obligations	Costs
1990	$14,800	$ 7,420	$ 7,420	$ 5,000
1991	-	4,430	4,430	6,500
1992	-	2,380	2,380	2,000
1993	-	570	570	1,300
Total	$14,800	$14,800	$14,800	$14,800

8. Brief Physical Description of Project

This project provides for building additions and modifications in the Footprint Cross Gallery and Booster Gallery areas to provide for additional office and technician work space. A new operator control room/computer room area will be provided as well as a meeting/lecture room (about 200 people) to meet the demand not presently fulfilled at Fermilab. Additional parking will also be included, and a new entry-way from the west parking lot to the Cross Gallery will be constructed.

The project will be phased in three stages in order that people presently housed in temporary offices or in space to be modified can be moved into newly created space as the project proceeds. As presently envisaged, these phases can be described as follows:

In Phase I a second story is added above the existing East and West Booster galleries and the south Transfer Gallery. A new entrance from the west parking lot will be provided and a high-bay tech work space will be connected to the southeast corner of the Cross Gallery.

In Phase II a two-story addition will be added to the Cross Gallery. This addition will contain the new control and computer rooms. Existing substations and utilities will be relocated.

In Phase III the northwest corner of the Cross Gallery is extended. A meeting/lecture room will be constructed in the former control/computer areas and tech work space/office areas will be remodeled. Parking, landscaping, and toilet facilities will be provided as required throughout.

The total is approximately 88,700 sq. ft. which consists of 68,100 sq. ft. of new space to be constructed and about 20,600 sq. ft. of existing space to be remodeled. About 132 new parking spaces will be provided.

9. Purpose, Justification of Need for and Scope of Project

The purpose of the Footprint Gallery Upgrade is to provide additional space, to retire portakamps, and to remodel existing space for the variety of occupancies that continue to change with the development of the Fermilab program. Value of space in the Footprint Area has been long recognized for convenience to Wilson Hall, Main Control Room, Linac, Booster, and the Transfer Hall. Over the years, a number of mezzanines, temporary offices, and trailers have been added to this area that are now in need of organized remodeling and

replacement for efficient operation and unification of the various Accelerator departments and groups. The new space will provide suitable areas for both existing and additional Accelerator personnel and experimental groups associated with the Collider program. It is also expected that the number of experimenters on site will increase from present as the construction for the Collider program finishes and data taking operation and analysis begins. Organized planning in the construction of the proposed area will allow for relocation of groups to an appropriate operational habitat and provide a more synergistic working environment. Currently many personnel in various groups are housed in deteriorating trailers, portakamps and make-shift offices in the Footprint area. Facilities such as these are not conducive to efficient operations.

A gradual and orderly relocation of personnel and equipment is required during this construction project so that accelerator downtime is minimized. Offices constructed in a new second floor addition above the present Booster Galleries provide the first free space for relocation. Present access from the west parking lot is circuitous and long. A new entrance on the west side of the Linac enclosure will connect to a corridor over the Linac to the Booster area. The west parking lot will be extended to the south to ease present parking conditions.

The present Main Control Room and adjoining computer rooms have been used since the initial construction in the early 1970s. The demands and requirements have since changed and a new, more efficient layout is needed. The new areas will provide for cable access floors, duct bank/cable tray runs and improved HVAC equipment. Primary power capability will be increased and improved. Nearby tech work space and offices will be provided for the Control Room operating personnel.

Remodeling in the present Cross Gallery will include a meeting/lecture room seating about 200 people. There is at present no meeting room accommodating more than 40 persons in the Footprint Galleries. Remodeled toilet facilities, offices, and corridors are also included. Presently disjointed second floor work areas will be connected, and handicapped access via elevators will be provided. Parking in the horseshoe area north of the Cross Gallery will be modified to accommodate the new construction.

10. Details of Cost Estimate

		Item Cost	Total Cost
a.	Engineering, design, and inspection at 30%		$ 2,820
b.	Construction costs		9,480
	1. Improvements to land including roads, parking, and landscaping	$ 860	
	2. Conventional construction (88,700 sq. ft. @ $97/sq. ft.)	$8,620	
c.	Contingency at 20% of above cost		2,500
	Total		$14,800

11. Method of Performance:

Design of the Footprint Gallery Additions will be by the Operating Contractor and other subcontractors as appropriate. Construction and procurement will be accomplished by fixed-price contracts awarded on a competitive bid basis.

12. Funding Schedule of Project Funding and Other Related Funding Requirements

	FY 1989	FY 1990	FY 1991	FY 1992	FY 1993	TOTAL
a. Total project cost						
1. Total facility costs						
(a) Construction line item	$ 0	$5,000	$6,500	$2,000	$1,300	$14,800
Total facility cost	$ 0	$5,000	$6,500	$2,000	$1,300	$14,800
2. Other project costs						
(a) Direct R&D costs necessary to complete construction	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
(b) Pre-operating costs	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
(c) Capital Equipment	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total other project cost	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Total project costs	$ 0	$5,000	$6,500	$2,000	$1,300	$14,800

b. Total related incremental annual funding requirements (estimated life of project: 15 years)

1. Facility operating cost, power	$100
2. Personnel and M&S operating funds	$190

13. Narrative Explanation of Total Project Funding and Other Related Funding Requirements

Total project costs are explained in Items 8, 9, and 10 above.

14. Incorporation of Fallout Shelters in Future Federal Buildings

Not applicable.

15. Incorporation of Measures for the Prevention. Control. and Abatement of Air and Water Pollution at Federal Facilities

The total estimated cost of this project includes the cost of those measures necessary to assure the facility will comply with Executive Order 12088.

16. Evaluation of Flood Hazards

This project will be located in an area not subject to flooding as determined in accordance with the requirements of Executive Order 11988.

17. Environmental Impact

This project is in compliance with the National Environmental Policy Act.

18. Accessibility to the Handicapped

This project will incorporate all provisions of the Uniform Federal Accessibility Standards.

APPENDIX A-2

DOE DESIGN CRITERIA AND DESIGN PROVISIONS

The documents listed below have been used in the preparation of this Conceptual Design Report and/or will be used during all phases of the project from Title I Design through construction completion.

DESIGN CRITERIA - DOE

General Design Criteria, DOE 6430.1A, 12-25-87 Draft

This General Design Criteria encompasses and references the complete host of industry and other Governmental Standards and Codes. Included are Life Safety, Fire Protection, Product Quality, Design Criteria Goals, Energy Conservation, etc.

PROJECT MANAGEMENT - DOE

Project Management System, DOE 4700.1, 3-6-87

This document encompasses the complete Project Management System, Instructions, Formats and Procedures. Attachment 1 references the many related DOE Orders.

Work Breakdown Structure Guide, DOE/MA 0295, 2-6-87

This document is the general guide for the WBS System.

SITE SPECIFIC CONDITIONS & ORGANIZATION - FERMILAB

Fermilab Safety Manual, Rev. 11/87

This document covers all aspects of safety for the Fermilab site, Radiation, Fire Safety, Construction, Electrical, Life Safety, etc.

Quality Assurance Manual, 10/7/87

This document covers all aspects of Quality Assurance from design through procurement and final testing and installation.

APPENDIX A-3

PROJECT BASIC DATA

for

FY90 VALIDATIONS

Program:	High Energy Physics/ Fermi National Accelerator	**Status of Design:** Conceptual - 100%
Project:	Footprint Gallery Upgrade	Title I - 0%
		Title II - 0%

Project No.: BAKALIC 90-CH-400
(Program Office assigned number only, if available)

TEC:

The TEC is $14.8M
ED&I: 30% of Construction Cost
Contingency: 20% of Design and Construction Cost

Proj. Description/Background:

The Footprint Gallery Complex will be enlarged and modified. The basic outline of the project will be to add 68,100 square feet of new construction, remodel 20,600 square feet of existing space, and retire by removal 17,500 square feet. The principal items to be addressed are: the creation of larger Main Control Rooms and Central Control Computer Rooms, the replacement of several temporary structures with permanent facilities, the provision for a growth in population of 132 people, and the creation of an intermediate sized meeting/lecture room facility. Disjointed second floor areas will be connected and made accessible to the handicapped, secure and informative viewing for visitors provided, and parking will be increased to match the expected growth.

The new construction will provide for a more centralized concentration of systems and support personnel of the Fermilab Accelerator Division, reflecting the growth of these organizations during the last 15 years.

Experiments, such as the D-Zero detector and antiproton deceleration (E760), have been assigned to the Accelerator Division for support. The associated physicists and experimenters make up the most significant component of the growth in population for which this construction will provide additional space.

Other areas of improvement in support of the major considerations outlined above are cable and communication access, personnel circulation, elevators, access to parking lots, tech workspaces, equipment high bay space, mechanical rooms, toilet facilities, meeting rooms, offices, HVAC distribution, handicap access, fire protection and parking lots.

The design provides for a concentration of new space relatively close to the new Main Control Room. The majority of the new construction is located in three areas: the addition of a second floor over existing construction on the north ends of the east and west Booster Gallery, the addition of a second floor over the south end of the Transfer Gallery, and an additional two-story construction along the south side of the Cross Gallery. The majority of the remodeling rebuilds the interior of the western three-quarters of the existing Cross Gallery. The significant structures to be removed are trailers and portakamps on the immediate south side of the Cross Gallery, and the Cooling Ring structure on the west of the Booster.

FY90 Budget Authority:

In FY90 we are asking for Project Authorization of $14.8M of which 23% is for design and 77% is for construction. In FY90 we are asking for an appropriation of $7.42M of which 32% is for design and 68% is for construction.

The Fiscal Year 89 request was $0M; prior year funding was $0M. This is a New Project.

Technical/R&D:

Standard construction/installation is being used.
Supporting R&D - None
Risk Assessment - None

Schedule:

Title I Design start scheduled: 1QFY90
Title I and II Design duration: 39 months
Procurement and Construction start scheduled: 2QFY90
Procurement and Construction completion: 3QFY93

Status of Documentation (For major projects and major systems acquisitions only):

First Submission

Additional Information:

No congressional, institutional and regulatory compliance requirements are required for this project.

Project must be funded to start.

The 20% contingency reflects the degree of confidence in the scope of work, pricing methodology, complexity of the project and uncertainties in a construction program with large amounts of remodeling and phasing.

APPENDIX A-4-1

TITLE AND LOCATION OF PROJECT:

FOOTPRINT GALLERY UPGRADE
FERMI NATIONAL ACCELERATOR LABORATORY

Project No.: BAKALIC
90-CH-400
Line Item

Supplementary Project Data for Strategic Facilities

Site-Wide Requirements/Assets for **CATEGORY**: 10, Office

Other Projects Affecting this Category: None

Unit of Measure: Square Foot

		Current	This Project	Result
A.	Total Existing Assets (in this category)	46,300	43,800	90,100
	-	-	-	-
B.	less: Substandard assets (in this category)	0	0	0
	=	=	=	=
C.	Amount Adequate: (in this category)	46,300	43,800	90,100
	-			-
D.	less: Amount Required: (in this category)	111,300	xxxxxx	111,300
	=	+		=
E.	Excess/(Deficiency) of Adequate Assets	(65,000)	43,800	(21,200)
				=
F.	Excess/(Deficiency) of Total Assets (A-D)	(65,000)	43,800	(21,200)

APPENDIX A-4-2

TITLE AND LOCATION OF PROJECT:

FOOTPRINT GALLERY UPGRADE
FERMI NATIONAL ACCELERATOR LABORATORY

Project No.: BAKALIC
90-CH-400
Line Item

Supplementary Project Data for Strategic Facilities

Site-Wide Requirements/Assets for **CATEGORY:** 52, Accelerator

Other Projects Affecting this Category: BAKALIA 90-CH-0400; Antiproton-Proton Collider Upgrade; Linac 90-CH-GPP Item 10 Service Building Improvement

Unit of Measure: Square Foot

		Current	This Project	Result
A.	Total Existing Assets (in this category)	427,900	12,800	440,700
	-	-	-	-
B.	less: Substandard assets (in this category)	0	0	0
	=	=	=	=
C.	Amount Adequate: (in this category)	427,900	12,800	440,700
	-			-
D.	less: Amount Required: (in this category)	448,900	xxxxxx	448,900
	=	+		=
E.	Excess/(Deficiency) of Adequate Assets	(21,000)	12,800	(8,200)
				=
F.	Excess/(Deficiency) of Total Assets (A-D)	(21,000)	12,800	(8,200)

APPENDIX A-4-3

TITLE AND LOCATION OF PROJECT:

FOOTPRINT GALLERY UPGRADE
FERMI NATIONAL ACCELERATOR LABORATORY

Project No.: BAKALIC
90-CH-400
Line Item

Supplementary Project Data for Strategic Facilities

Site-Wide Requirements/Assets for **CATEGORY**: 70, Research and Development

Other Projects Affecting this Category: BAKALIB 90-CH-0400; Antiproton-Proton Collider Upgrade; 20 GeV Rings

Unit of Measure: Square Foot

		Current	This Project	Result
A.	Total Existing Assets (in this category)	222,400	11,500	233,900
	-	-	-	-
B.	less: Substandard assets (in this category)	0	0	0
	=	=	=	=
C.	Amount Adequate: (in this category)	222,400	11,500	233,900
	-			-
D.	less: Amount Required: (in this category)	285,900	xxxxxx	285,900
	=	+		=
E.	Excess/(Deficiency) of Adequate Assets	(63,500)	11,500	(52,000)
				=
F.	Excess/(Deficiency) of Total Assets (A-D)	(63,500)	11,500	(52,000)

APPENDIX B

FY90 FOOTPRINT GALLERY UPGRADE

PROJECT VALIDATION CHECKLIST

I. Objectives

The Footprint Gallery Upgrade project will enlarge and modify the Footprint Gallery complex. The project will add 68,100 square feet of new construction, remodel 20,600 square feet of existing space, and retire by removal or re-allocation 17,500 square feet. The space and utilization specifications have been developed to support the programmatic needs and goals of the laboratory. Additional information has been supplied to the Validation Review Committee.

II. Scope

A. Requirements

1. Facility Performance Requirements

Fermilab has kept both the High Energy Physics Program Office and the Batavia Area Office fully informed of the goals for the Footprint Gallery Upgrade. There is a mutual understanding of the programmatic needs for the Footprint Gallery Upgrade.

2. Facility Requirements

The general requirements for the facility both in terms of real property, buildings and the hardware have been defined at the conceptual level of design. Materials documenting these requirements have been distributed to the Validation Review Committee.

3. Evaluation of Seismic and Tornado Hazards

The total estimated cost of the project includes the cost of those measures necessary to assure the facility will comply with DOE 6430.1. The project is located in an area of low seismic and tornado activity. The site is already equipped with a tornado warning system. The underground enclosures will provide an adequate tornado shelter area.

4. Safeguards and Security Requirements

Advice and guidance from cognizant safeguards and security personnel will be utilized during the project planning and design stages. Any radiation hazards that are known to exist will be treated in the same manner as the hazards are now treated in the present operating accelerator complex under Accelerator Division control; where known hazards require either shielding or occupancy limitation, these approaches will be implemented. The facility does not involve items of a classified nature. Physical security will be provided in the same manner as that currently existing in the Footprint Gallery Complex.

5. Location

The location of this project is determined by the location of the existing Footprint Gallery Complex and computer and signal cable considerations. The definition of the project best matches the technical requirements to the location. The project is in compliance with the overall Site Development and Facilities Utilization Plan. Land acquisition is not required.

6. Function Definitions

Functions of all major areas within the structures are defined to the extent possible for a conceptual design.

7. Matching of Existing Facilities to Demands

To the largest extent possible, available utilities, roads and accesses will be used; indeed this project by definition is an attempt to improve the utilization of the Footprint Gallery Complex.

8. Initial Complement of Equipment

To the extent relevant (the project being largely office and technician space, or providing for the relocation of existing computers and control equipment), the requirements for any initial complement of equipment have been defined. Cost estimates have been based on similar equipment installed at Fermilab.

9. Quality Levels and Program Requirements

The quality levels and program requirements have been defined by years of operation of the present facility. The levels and requirements have been incorporated into the conceptual design and cost estimate.

10. Emissions and Wastes

Emissions and wastes will be no different than those occurring in the present Footprint Gallery Complex. Total compliance with Federal and State emission and waste regulations will not be a problem.

11. Codes and Standards

The facility will operate within applicable local, state and national codes and standards.

12. Office Space

Office space where provided will conform to accepted square feet/person guidelines. Arrangements are similar to other Fermilab installations.

13. Space Requirements

Space is created in addition to current space; also some extensive remodeling of existing space is included, and some removal is accomplished. The definition of the project includes an expected increase of population of 132 persons, and provides adequate space for the projected profile of personnel in the enlarged population. Most of the office space being removed is in the form of trailers and portakamps which will be retired. The technician space being removed is in the form of temporary construction which will be demolished.

B. Design (Conceptual)

1. Design Status

All design work has been carried through a conceptual design level with full definition of design criteria, preliminary optimization of design alternates and first pass division of design/construction phases. Field investigations of existing conditions have been carried out and these results have been incorporated into the conceptual design. The sequencing of the design work has been analyzed relative to the construction phases and the Fermilab required occupancy needs and accelerator operational modes. The material developed for this Conceptual Design Report will allow a timely and efficient start into full Title I effort when funding is available.

2. Site Conditions

Site conditions are well known in the Footprint Gallery area since construction has been done in the area over the past eighteen years. Soil boring logs are available for most of the construction areas with only several additional borings required for Title I work to improve information on Booster Pond conditions. Existing building conditions are well understood due to conversations with the present building occupants.

3. Safety Hazards and Risks

Hazards and risks are characteristic of those already encountered in the accelerator complex and in its construction. No new unique hazards are expected.

4. Solar Energy Applications

Solar energy applications were considered but no application has been found to be appropriate or cost effective.

5. Design Cost Effectiveness

The design is cost effective at a conceptual design level. Further studies to minimize cost and life-cycle costs will be carried out in parallel with the Title I design.

6. Environmental Assessment

All construction work will be done in areas of existing structures and/or previous disturbance. The impact of the proposed facility on the environment will be no different from the existing facility; no unique hazards are expected.

7. Prerequisite R&D

The necessary R&D to adequately specify design criteria for the relocation and construction of the Main Control Room and Control Computer Room has been done. This is an ongoing activity continuing out of accelerator operational experience. The aggregate of this experience will be folded in with this Conceptual Design Report at the onset of the Title I design effort.

8. Participants

This Conceptual Design Report has been prepared by Fermilab staff members including members of the Accelerator Division and Construction Engineering Services.

9. Uncertainties

The major area of uncertainty is the funding schedule and the consequent affect on construction sequences.

10. Energy Conservation Report

Preliminary energy conservation criteria have been incorporated into this Conceptual Design Report. A detailed Energy Conservation Report will be prepared during the Title I design period.

III. Schedule

The construction schedule in three phases shown in this Conceptual Design Report has been based on the following four general guidelines:

Budget Cycle Timing: including available funding to start Title I design, Headquarters review/approval procedures and expected funding profiles.

Title I and II Design/Approval Timing: including availability of Fermilab and A-E personnel, criteria available from R&D efforts, Fermilab and Headquarters review/approvals, procurement times and subcontract bid/award cycles and logical sequence of design effort relative to space and relocation requirements.

Construction Sequencing and Timing: including subcontract award and mobilization, reasonable manpower levels, multi-subcontractor interference, equipment availability and vacating of existing space.

Occupancies of New Space and Completion Timing: including Fermilab personnel and equipment moves, Fermilab accelerator operations, work space constraints and exterior landscape completion.

IV. Estimate

A. General

1. Estimate Preparation

The estimates presented in this Conceptual Design Report were prepared in April, 1988. Estimates are based on January 1988 data bases. Construction estimates are escalated from January 1988 to the "fiscal midpoint of construction" for each construction phase.

2. Basis of Estimate

Estimates are based on the conceptual design layouts, preliminary engineering calculations and sketches, quantity take-offs where available and square foot estimates. Cost comparisons have been made with specific portions of recent similar Fermilab construction such as Transfer Hall Addition, Booster Laboratories, Industrial Center Building, and several of the Tevatron I and II buildings.

3. Support of Estimates

Commercially published construction data bases such as R.S. Means have been used very successfully at Fermilab for cost estimation. Vendor quotes for this type of project at the conceptual design level are inappropriate.

4. Contingency

The contingency reflects the degree of confidence in the scope of work, pricing methodology, complexity of the project and uncertainties in a construction program with large amounts of remodeling and phasing.

5. Escalation Rates

Escalation rates provided by DOE were used. The most recent information obtainable was dated August 1987.

6. Project Reviews

This is the first cost estimate for this project and is a bottoms up estimate. It has been reviewed by knowledgeable Fermilab staff and management.

7. Uniqueness

No unique construction or fabrication practice is anticipated for this project.

8. Estimating Guides

Square foot estimating data available from commercial publishers (R.S.Means & Richardson) have been used where applicable.

9. Indirect Costs

All known indirect costs have been included in the estimate.

10. Title I/Title II Estimates

Not applicable.

11. Experimental Components

There are no experimental components.

12. Procurement Strategy

To the extent feasible, construction and procurement will be accomplished by fixed-price contracts awarded on the basis of competitive bids.

B. Construction

1. Bulk Materials

Not applicable.

2. Quantity Growth

Not applicable.

3. Bulk Material Pricing

Not applicable.

4. Labor Costs

Cost estimates are based on labor cost data in conformance with local Davis-Bacon rates including applicable fringe and other hidden costs.

5. Equipment Pricing

Equipment pricing is based upon actual experience with related Fermilab construction and on commercially published cost data.

6. Special Process Spares

Not applicable.

7. Indirect Costs

Indirect construction costs have been included.

8. Labor Productivity

Labor productivity is based on much local experience.

9. Labor Availability

All necessary craft labor is available in the Chicago area.

10. Pricing Variants

To the extent required for the conceptual design, the cost estimate reflects code, QA, scheduling, climatic, geographic, and other unique specification requirements.

11. Unitized Pricing

Not applicable.

C. Engineering and Management

1. Contractor Project Management

Contractor project management and engineering costs are included in the E.D.I.A.

2. E.D.I.A. Estimate

E.D.I.A. costs are estimated on the basis of similar construction recently completed at Fermilab with a comparable component of remodeling work

3. Inspection

Inspection, QA and QC costs have been included.

4. Management

Fermilab has considerable experience with the Program Management Control systems used in the TeV I and II projects. These systems are effective and adequate for this project. Adequate management personnel will be made available.

V. Funding and Costs Status

A. Basis for Planned Authorization, Appropriation, and Cost Schedule

The Fermilab Accelerator Division must increase and remodel its space. In the course of the construction of the existing Tevatron, TeV I and TeV II facilities, the size of the Accelerator Main Control Room and the size of the Central Control Computer Room were not increased, although their utilization has increased. During the construction of the Tevatron, temporary structures were installed which have since deteriorated. The space in these structures is still required and must be replaced. Also, in the interest of increasing the physics return from the operation of the Collider, the laboratory has a programmatic goal of constructing and operating a second colliding detector, the "D-Zero Detector". The support facilities and personnel for this detector have been assigned to the Accelerator Division. The provision for space and services for the associated experimental physicists is also a responsibility of the Accelerator Division; a major increase in office space to provide for these experimenters is thereby required. To a lesser extent, an increase in Accelerator Division staff is expected. The time scale for the improvements in all the areas outlined above is consistent with the requested funding profile. Since the need for office space for the experimenters exists, any delay in authorization or appropriation will result in office congestion or in the introduction of temporary structures. These temporary structures will probably not be centralized and convenient for interaction between the experimenters. Delay will thus complicate the analysis of physics from the D-Zero detector. It will also complicate the exploitation of improved operating scenarios of the Collider itself since operations will continue to be hampered in the crowded Main Control Room.

B. Other Associated Project Costs

There are no other associated project costs.

C. Funding Consistency

The annual funding proposed is consistent with the project schedule. The schedule has been developed on the basis of required space, timing of personnel and equipment relocations and consistency with accelerator operational needs. Preliminary Critical Path Method (CPM) network diagram techniques have been used in developing the Conceptual Design Report schedule. Full CPM networks will be developed during design and will be used during all construction phases as has been done at Fermilab for many years.

D. Continuing Resolution Alternatives

In the event of a continuing resolution the project will be delayed proportionally.

E. Contributing Funding

External contributory funding is not considered for this project.

F. Incrementally Funded Construction Contracts

None.

G. Funding By Client or Consultant Agencies

Not applicable.

Table C-1

WORK BREAKDOWN STRUCTURE

WBS and Package Numbers

WBS No.	Title	Pkg. No.
1.	**FOOTPRINT GALLERY UPGRADE**	
1.1	**CONSTRUCTION**	
1.1.1	Phase 1	
1.1.1.1	Footprint Gallery Site Preparation	2-5-3
1.1.1.2	Booster and Transfer Gallery Additions	2-5-4
1.1.1.3	Footprint Gallery West Entrance	2-5-5
1.1.2	Phase 2	
1.1.2.1	Footprint Gallery Utilities	2-5-6
1.1.2.2	Cross Gallery South Addition	2-5-7
1.1.2.3	Control & Computer Room Occupancy	2-5-8
1.1.2.4	Southwest Parking Lot Extension	2-5-9
1.1.3	Phase 3	
1.1.3.1	Cross Gallery North Addition	2-5-10
1.1.3.2	Cross Gallery Remodeling	2-5-11
1.1.3.3	Footprint Gallery Landscaping	2-5-12
1.2	**ENGINEERING, DESIGN, INSPECTION & ADMINISTRATION (E.D.I.A.)**	
1.2.1	E.D.I.A. Phase 1 Construction	
1.2.2	E.D.I.A. Phase 2 Construction	
1.2.3	E.D.I.A. Phase 3 Construction	
1.2.4	E.D.I.A. Title I Design Report	2-5-2
1.3	**CONTINGENCY**	
1.3.1	Phase 1	
1.3.2	Phase 2	
1.3.3	Phase 3	

Table C-2

ESCALATED CONSTRUCTION COST BY CONSTRUCTION PHASES

WBS Level 3-4 - Cost in Dollars

Proj. No.	WBS No.	Project Name	Const. Cost w/ O+P	Escalation Increment	Total Escalated Const. Cost
		Phase 1		(.138)	
2-5-3	1.1.1.1	Site Preparations	305,000	45,000	350,000
2-5-4A	1.1.1.2	Booster Gallery Add.	2,720,000	375,000	3,095,000
2-5-4B	1.1.1.2	Transfer Gallery Add.	1,000,000	140,000	1,140,000
2-5-5	1.1.1.3	West Entrance	295,000	40,000	335,000
	1.1.1	PHASE 1 TOTAL	4,320,000	600,000	4,920,000
		Phase 2		(.186)	
2-5-6	1.1.2.1	Utilities	260,000	50,000	310,000
2-5-7	1.1.2.2	Cross Gallery South Add.	1,585,000	295,000	1,880,000
2-5-8	1.1.2.3	Control & Comp. Rm. Occ.	305,000	55,000	360,000
2-5-9	1.1.2.4	Parking Lot Extension	320,000	60,000	380,000
	1.1.2	PHASE 2 TOTAL	2,470,000	460,000	2,930,000
		Phase 3		(.271)	
2-5-10	1.1.3.1	Cross Gallery N. Add.	240,000	65,000	305,000
2-5-11	1.1.3.2	Cross Gallery Remodeling	940,000	255,000	1,195,000
2-5-12	1.1.3.3	Landscaping	100,000	30,000	130,000
	1.1.3	PHASE 3 TOTAL	1,280,000	350,000	1,630,000
	1.1	ALL PHASE TOTAL	8,070,000	1,410,000	9,480,000

Table C-3

ESCALATED CONSTRUCTION COSTS BY FISCAL YEARS

WBS Level 3-4 - Cost in Dollars

Proj. No.	WBS No.	Project Name	F.Y. 1990	F.Y. 1991	F.Y. 1992	F.Y. 1993	TOTAL YEARS	
		Phase 1						
2-5-3	1.1.1.1	Site Preparations	350,000	-	-	-	350,000	*
2-5-4A	1.1.1.2	Booster Gallery Add.	1,500,000	1,595,000	-	-	3,095,000	
2-5-4B	1.1.1.2	Transfer Gallery Add.	500,000	640,000	-	-	1,140,000	
2-5-5	1.1.1.3	West Entrance	150,000	185,000	-	-	335,000	
	1.1.1	PHASE 1 TOTAL	2,500,000	2,420,000	-	-	4,920,000	
		Phase 2						
2-5-6	1.1.2.1	Utilities	-	310,000	-	-	310,000	
2-5-7	1.1.2.2	Cross Gallery South Add.	-	1,800,000	80,000	-	1,880,000	
2-5-8	1.1.2.3	Control & Comp. Rm. Occ.	-	220,000	140,000	-	360,000	
2-5-9	1.1.2.4	Parking Lot Extension	-	250,000	130,000	-	380,000	*
	1.1.2	PHASE 2 TOTAL	-	2,580,000	350,000	-	2,930,000	
		Phase 3						
2-5-10	1.1.3.1	Cross Gallery N. Add.	-	-	280,000	25,000	305,000	
2-5-11	1.1.3.2	Cross Gallery Remodeling	-	-	620,000	575,000	1,195,000	
2-5-12	1.1.3.3	Landscaping	-	-	-	130,000	130,000	*
	1.1.3	PHASE 3 TOTAL	-	-	900,000	730,000	1,630,000	
	1.1	ALL PHASE TOTAL	2,500,000	5,000,000	1,250,000	730,000	9,480,000	

* Improvements to land.

Table C-4

ENGINEERING, DESIGN, INSPECTION & ADMINISTRATION COSTS BY PHASES

WBS Level 3-4 - Cost in Dollars

Proj. No.	WBS No.	Project Name	Total Escalated Const. Cost	E.D.I.A. Cost	Total Const. Cost w/E.D.I.A.
2-5-2	1.2.4	Title I Design Report	-	600,000	600,000
		Phase 1			
2-5-3	1.2.1.1	Site Preparations	350,000	50,000	400,000
2-5-4A	1.2.1.2	Booster Gallery Add.	3,095,000	765,000	3,860,000
2-5-4B	1.2.1.2	Transfer Gallery Add.	1,140,000	260,000	1,400,000
2-5-5	1.2.1.3	West Entrance	335,000	65,000	400,000
	1.2.1	PHASE 1 TOTAL	4,920,000	1,140,000	6,060,000
		Phase 2			
2-5-6	1.2.2.1	Utilities	310,000	70,000	380,000
2-5-7	1.2.2.2	Cross Gallery South Add.	1,880,000	450,000	2,330,000
2-5-8	1.2.2.3	Control & Comp. Rm. Occ.	360,000	80,000	440,000
2-5-9	1.2.2.4	Parking Lot Extension	380,000	90,000	470,000
	1.2.2	PHASE 2 TOTAL	2,930,000	690,000	3,620,000
		Phase 3			
2-5-10	1.2.3.1	Cross Gallery N. Add.	305,000	55,000	360,000
2-5-11	1.2.3.2	Cross Gallery Remodeling	1,195,000	305,000	1,500,000
2-5-12	1.2.3.3	Landscaping	130,000	30,000	160,000
	1.2.3	PHASE 3 TOTAL	1,630,000	390,000	2,020,000
	1.2	ALL PHASE TOTAL	9,480,000	2,820,000	12,300,000

Table C-5

ENGINEERING, DESIGN, INSPECTION & ADMINISTRATION COSTS BY FISCAL YEARS

WBS Level 3-4 - Cost in Dollars

Proj. No.	WBS No.	Project Name	F.Y. 1990	F.Y. 1991	F.Y. 1992	F.Y. 1993	TOTAL YEARS
2-5-2	1.2.4	Title I Design Report	600,000	-	-	-	600,000
		Phase 1					
2-5-3	1.2.1.1	Site Preparations	50,000	-	-	-	50,000
2-5-4A	1.2.1.2	Booster Gallery Add.	675,000	90,000	-	-	765,000
2-5-4B	1.2.1.2	Transfer Gallery Add.	220,000	40,000	-	-	260,000
2-5-5	1.2.1.3	West Entrance	55,000	10,000	-	-	65,000
	1.2.1	PHASE 1 TOTAL	1,000,000	140,000	-	-	1,140,000
		Phase 2					
2-5-6	1.2.2.1	Utilities	60,000	10,000	-	-	70,000
2-5-7	1.2.2.2	Cross Gallery South Add.	340,000	110,000	-	-	450,000
2-5-8	1.2.2.3	Control & Comp. Rm. Occ.	-	70,000	10,000	-	80,000
2-5-9	1.2.2.4	Parking Lot Extension	-	90,000	-	-	90,000
	1.2.2	PHASE 2 TOTAL	400,000	280,000	10,000	-	690,000
		Phase 3					
2-5-10	1.2.3.1	Cross Gallery N. Add.	-	40,000	15,000	-	55,000
2-5-11	1.2.3.2	Cross Gallery Remodeling	-	40,000	220,000	45,000	305,000
2-5-12	1.2.3.3	Landscaping	-	-	5,000	25,000	30,000
	1.2.3	PHASE 3 TOTAL	-	80,000	240,000	70,000	390,000
	1.2	ALL PHASE TOTAL	2,000,000	500,000	250,000	70,000	2,820,000

Table C-6

COST ESCALATION FACTORS BY CONSTRUCTION PHASES

Reference: Departmental Price Change Index. FY 1989 Guidance. August 1987 Update. (Energy Res.)

Calendar Time	Change Rate	Dates = Fiscal Midpoint of Construction			Remarks
		Phase 1	Phase 2	Phase 3	
Jan. 1988	.000	-	-	-	Cost Data Base - Means
1988	.043	1.043	1.043	1.043	
1989	.048	1.048	1.048	1.048	
Oct. 1990	-	1.041	-	-	10/12 x .050 = Phase 1
1990	.050	-	1.050	1.050	
July 1991	-	-	1.033	-	7/12 x .056 = Phase 2
1991	.056	-	-	1.056	
Oct. 1992	-	-	-	1.049	10/12 x .059 = Phase 3
1992	.059	-	-	-	
Total Esc. Rate		1.138	1.186	1.271	

Sample Calc: Phase 1 = 1.043 x 1.048 x 1.041 = 1.138

Attachment C-7

WBS LEVEL 5 & 6 COST DETAIL SHEETS

WBS No.	Project No.	No. Pages
PHASE 1		
1.1.1.1	2-5-3	6
1.1.1.2	2-5-4A	9
1.1.1.2	2-5-4B	13
1.1.1.3	2-5-5	6
PHASE 2		
1.1.2.1	2-5-6	6
1.1.2.2	2-5-7	11
1.1.2.3	2-5-8	3
1.1.2.4	2-5-9	5
PHASE 3		
1.1.3.1	2-5-10	5
1.1.3.2	2-5-11	9
1.1.3.3	2-5-12	1

FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR WBS LEVEL 5 & 6 COST DETAILS - INDEX	2-5-3	APRIL 1988	WBS LEVEL 5,6	1/1

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES			WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

INDEX

WBS No.	Pkge No.	Package Name	No. Pages
1.1.1.1	2-5-3	Site Preparations	6
1.1.1.2	2-5-4A	Booster Gallery Addition	9
1.1.1.2	2-5-4B	Transfer Gallery Addition	13
1.1.1.3	2-5-5	West Entrance	6
1.1.2.1	2-5-6	Utilities	6
1.1.2.2	2-5-7	Cross Gallery South Addition	11
1.1.2.3	2-5-8	Control & Computing Room Occupancy	3
1.1.2.4	2-5-9	Parking Lot Extension	5
1.1.3.1	2-5-10	Cross Gallery North Addition	5
1.1.3.2	2-5-11	Cross Gallery Remodeling	9
1.1.3.3	2-5-12	Landscaping	1

FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR SITE PREPARATIONS PHASE 1	2-5-3	APRIL 1988	WBS 1.1.1.1	1/6

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

BOOSTER POND PERIMETER FILL	221,600	
DECOMMISSION/RELOCATION OF PORTAKAMPS	32,900	
SUBTOTAL	$ 254,500	
O + P @ 20%	49,500	
SUBTOTAL	$ 305,000	JAN. 88 DOLLARS
ESCALATION TO OCTOBER 1990 @ .138	45,000	
TOTAL	$ 350,000	OCT. 90 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
SITE PREPARATIONS PHASE 1

PROJECT NO. 2-5-3 | DATE APRIL 1988 | REVISION DATE WBS 1.1.1.1 | PAGE 2/6

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	BOOSTER POND FILL								
	DEMOLISH HOUSE, EXTEND S.S., ADD NEW MH	1	LS		2,800	25LF @ 30" RCCP			
	REMOVE GUARDRAIL	837	LF	4.62	3900			020	550 0800
	HAUL TO RAILHEAD FOR STORAGE		LS		2000				
	FURNISH AND DRIVE PILING (22#/SF)	125	T	1050	131,200	15x22x755/2000		021	614 0010
*	PUMP OUT FILL AREA (35,000 GAL)	5	DAYS	400	2,000	(3" CENT. PUMP)		021	404 0800
	BACKFILL (ASSUME 3 MILE HAUL)	1229	CY	10	12,300	(LOADER @ PILE)			
	CONCRETE ACRS	93	CY	400	37 200				
	12" STONE BASE	511	CY	14	7200				J.G
	6" CAT CHOCK	290	CY	16	4600				J.G
	WEEP HOLES @ 20' OC	35	EA	100	3500				
	SPECIAL STRUCTURE @ UTIL TUNNEL	112	SF	13	1500	16'W x 7'0			
	REMOVE STONE + HAUL TO PARKING LOT	670	CY	5	3400	604 + 4x850x.5/27			
	BACKFILL WITH 1' CLAY (3 MI. HAUL)	511	CY	10	5100				
	-"- -"- 6" TOPSOIL (1744 S.Y.)	93	CY	15	1400			022	212 0800
	GRADING	.50	SY	2185	1100				
	LIME, FERTILIZER + SEED	1.10	SY	2185	2400			029	304 0300
*	COULD LOWER BOOSTER POND				221,600				
		OH + P @ 20%			44 400				
					266,000		JAN '88		

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
SITE PREPARATIONS PHASE 1

PROJECT NO. 2-5-3 | DATE APRIL 1988 | REVISION DATE WBS 1.1.1.1 | PAGE 3/6

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

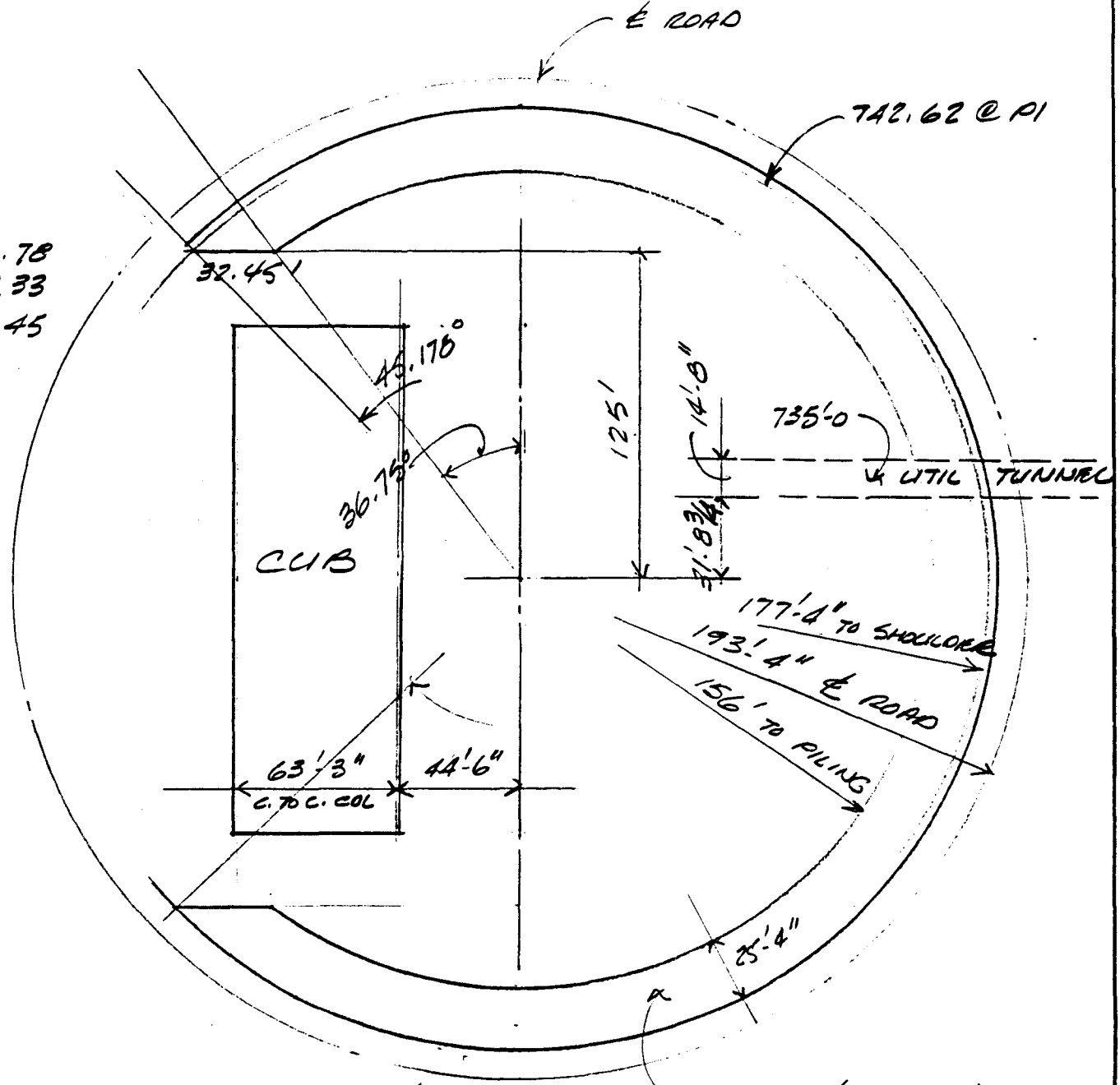
DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	DECOMMISION & REMOVE PORTAKAMPS								
	(ASSUME 18 UNITS)								
	DISCONNECT SERVICES	18	EA	300	5400				
	REMOVE SKIRTS, STAIRS, TEMP. STRUCT.	18	EA	700	12 600				
	REMOVE TO RAILHEAD STORAGE		-						
	CRANES (2) HYDRAULIC 12 TON	2 X 3	DAYS	305	3,000	30 DAYS = 1 WK		016	460 2400
	FLATBED TRAILERS (2)	2 X 3	DAYS	200	1200				
	RIGGERS 6 X 3 X 8	144	HRS	32	4600				
	CRANE OPERATORS 2 X 3 X 8	48	HRS	32	1600				
	OILER	24	HRS	26	600				
	TRUCK DRIVER	48	HRS	25	1200				
	LOAD AND HAUL AWAY DEBRIS	18	EA	150	2700				
			SUBTOTAL		32,900				
			OH & P @ 20%		6600				
			TOTAL		39,500	JAN '88			
			USE		* 40,000				

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-3	WBS 1.1.1.1	4/6

SUBJECT	NAME	
FOOTPRINT GALLERY UPGRADE - CDR SITE PREPARATIONS PHASE 1	TP	
	DATE APRIL 88	REVISION DATE

BOOSTER POND 1



L_c @ R = 177'-4" = 837'

L_c @ R = 156' 690'

L_c @ R = 163.26 741
Δ 0.055°

$A_{25.4'}$ $\frac{(863+690)}{2} \times 25.33$

= 19,668 ft² ÷ 2185 SF

FERMILAB

ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE
CES	2-5-3	WBS 1.1.1.1	5/6

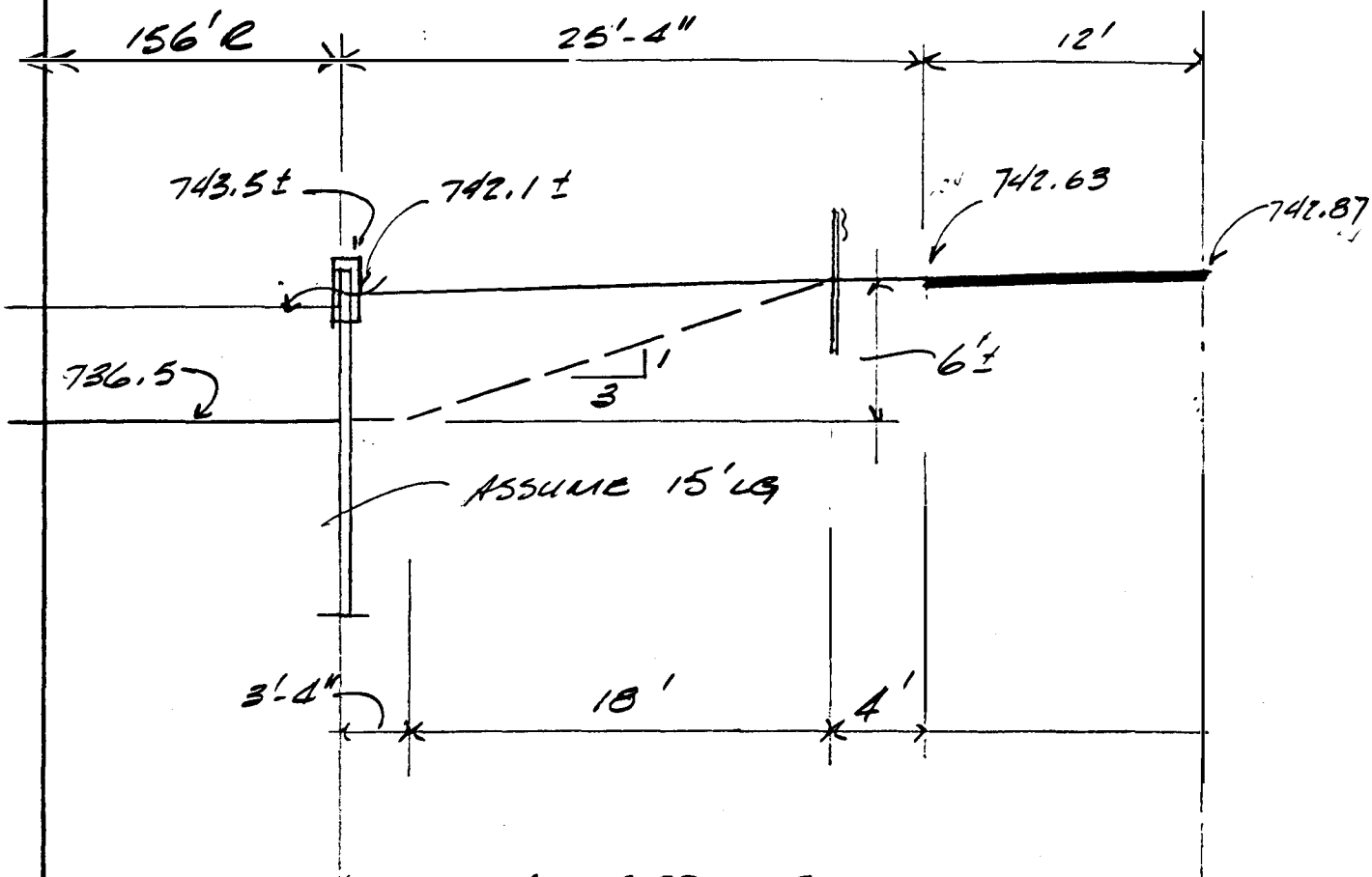
SUBJECT: FOOTPRINT BALLERY UPGRADE - CDR

SITE PREPARATIONS — PHASE 1

NAME: TP

DATE: APRIL 88

REVISION DATE:



$6 \times 18 \times 1/2 = 54 \times 9.33 = 503.98$

$3.33 \times 6 \quad 20 \times 1.67 \quad 33.4$

$74 \quad 537.28 \quad \bar{X} = 7.26$

$156 + R = 163.26$

$V_{FILL} = 741 \times 74 \times 1/27 = 2030$ CY TOTAL < 6" 290, 12" 511, FILL 1229

$L_{PILING} = 690 + (2 \times 32.45) = 755$ LF + SPEC @ TUNNEL

GUARD RAIL REMOVAL: 837'

CONC. CURB: $837' \times 1 \times 3 \times 1/27 = 93$ CY

$2 \times 837 \times 3 = 5022$ SF FORM

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-3	WBS 1.1.1.1	6/6

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
SITE PREPARATIONS PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

DEMOLITION & PORTAKAMP REMOVAL

ELECTRON COOLING RING
A = 6700 ☐'
ASSUME SUBCONTRACTOR TO HAUL ALL DEBRIS OFF SITE
ASSUME NO SALVAGE VALUE
ASSUME REMOVAL OF CONCRETE SLAB
ASSUME REMOVAL OF UTILITIES

USE $0.20 PER CU FT OF FRAME
PER S.F. 6" SLAB ON GRADE W/MRSM 020 754 0480
1.20 PER S.F WALL
0.40 PER S.F ROOF STRUCT
0.30 PER S.F SHINGLES
0.15 SF TRUSSES

6700 / 12' AVE WIDTH = 550' WALL X 2 = 1100 X 8 = 8800

8800 X 1.20 = 10600
6700 X 0.85 = 5700
16,300 ≈ 16,800

" " USE $.25/SF

NO RADIATION PROBLEMS ANTICIPATED

FERMILAB COST ESTIMATE	PROJECT TITLE			PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR BOOSTER GALLERY ADDITION PHASE 1			2-5-4A	APRIL 1988	WBS 1.1.1.2	1/9
SECTION CES	QUANTITIES BY TP	PRICES BY TP	CHECKED BY WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

EAST BOOSTER GALLERY	1,130,300	
WEST BOOSTER GALLERY	1,130,300	
SUBTOTAL	$ 2,260,600	
O + P @ 20%	459,400	
SUBTOTAL	$ 2,720,000	JAN. 88 DOLLARS
ESCALATION TO OCTOBER 1990 @ .138	375,000	
TOTAL	$ 3,095,000	OCT. 90 DOLLARS

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR BOOSTER GALLERY ADDITION PHASE 1	PROJECT NO.: 2-5-4A	DATE: APRIL 1988	REVISION DATE: WBS 1.1.1.2	PAGE: 2/9
SECTION: CES	QUANTITIES BY: TP / PRICES BY: TP / CHECKED BY: WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	BOOSTER GALLERY (E + W)				EAST		WEST		
	SITE WORK + EXCAVATION		4.10	13,700	56,200		SAME		
	SUPERSTRUCTURE		9.30		127,400				
	EXTERIOR		25.00		342,500				
	ROOFING		4.10		56,200				
	INTERIOR FINISHES		12.50		171,300				
	ELEVATOR		4.10		56,200				
	MECHANICAL, PLUMBING & F.P.		13.80		189,000				
	ELECTRICAL		5.60		76 700				
	DEMOLITION		4.00		54,800				
	SUBTOTAL @ $82.50/SF				1,130,300				
	OH + P. @ 20%				229,700				
	TOTAL			1,	360,000	JAN '88			
				USE	1,360,000		($103.03/SF)		
	PER TOWER !								
	TOTAL FOR E & W BOOSTER GALLERY								
				USE	2,720,000	'88	(27,400 SF)		

FERMILAB ENGINEERING NOTE	SECTION CES	PROJECT 2-5-4A	SERIAL-CATEGORY WBS 1.1.1.2	PAGE 3/9

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
BOOSTER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

BOOSTER GALLERY

REMOVE PAVING (4') (4/9 x $3.15) + 1.15 SAWCUT			3
EXCAVATION (TRENCHING + HAND) 5X3X2 SIDES X 1/27 X 5			5
CONC. FTGS. (2X1)+(2X4) = 10 CF X 1/27 X $180			67
FOUND WALL (3+2) X 1/27 X $200			52
BACKFILL (GRANULAR) (30-15) X 1/27 X $18			10
PATCH PAVING 5' X 1/9 X $6	140	3	4.12
PRECAST CONC WALL PANEL (10") 28' X 7/10 X $13			255
WINDOW/SPANDREL STRIP (16+28) 1/2 X 3/10 X $30			198
C.I.P CONC. WALL 8.3 CF X 1/27 X $300	(SHIELD STRUCT	92	
UPPER EYEBROW 6.5 SF X $14			91
LOWER EYEBROW 10 CF X 1/27 X $350			130
WINDOW STRIP 5 SF X $30			150
SOFFIT 4 SF + FRAMING + 2 EDGES	850	26	25.00
FLOOR BEAM 16 X 1/5 @ 3 #/SF X 32 X 0.70			70
FLOOR DECK 32 X $1.20			38
CONC TOPPING 4" NOM. 32 X 4/12 X 1/27 X $200			79
STUB COLUMNS 2 X 11' X 1/10 SPAC = 2.2 PER FT X 15 X $0.7			25
SPANDREL BEAM 12 X 0.7			9
ROOF DECK 34 X $1.10	316	37	9.29
ROOF INSUL 34 X $1.70			58
4 PLY BUR 36 X 1.50			54
COPING & FLASHING 2 LF/FT X6			12
CAULKING & SEALING [(2 X 28 X 1/10) + (10 X 1/5)] X 2	140	16	4.12
		$	1480

1480 X 1/34 = $43.53

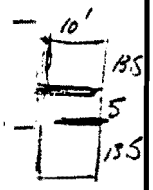
FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4A	WBS 1.1.1.2	4/9

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
BOOSTER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

INTERIOR (BASED ON BOOSTER LABS) ↙ CAL

DRYWALL @ EXT 9.5 + 3.5 + 1.0 + (5+5x1/5) = 17 X $2.50 X 1/34 =	1.32
DRYWALL PARTITIONS 1.32 X $2.50	3.30
CEILINGS	1.50
DOORS	2.20
COLL BLK, END WALLS	1.34
PAINTING (2X 1.32 + 0.33 + 0.50) X 0.40	0.86
CARPETING, CERAMIC, TILE	2.00
	$12.52/SF



PARTITION 9' x 47' x 1/32 x 1/10' = 1.32 #/#

USE $12.50

ELECTRICAL (BOOSTER LABS) ← ESCAL '86½ to '88 MEANS

$151,000 X 1/30,000 = 5.00 X 1.103 = 5.52

USE $5.60

MECHANICAL, F.P. & PLUMBING

$379,600 X 1/30,000 = 12.60 X 1.103 = 13.90

- 31,700

347,900 X 1/30,000 = 12.79 W/O TOILETS

USE $12.80

ELEVATOR (2 REQ'D)

HYDRAULIC, 2000#, 2 FLOORS, 50 FPM $42,300

PIT, PISTON, ETC AS MODIFICATION $12,700

$55,000

(CONSIDER "PITLESS" MODEL HYDRAULIC - OTIS & OTHERS)

2 X $55,000 X 1/26,900 = 4.09 USE $4.10

TOILETS

FINISHES	$13,000 / 2240 =	5.80
PLUMBING	13,600 / 2240	6.07
	$11.87 ≅	12.00/SF

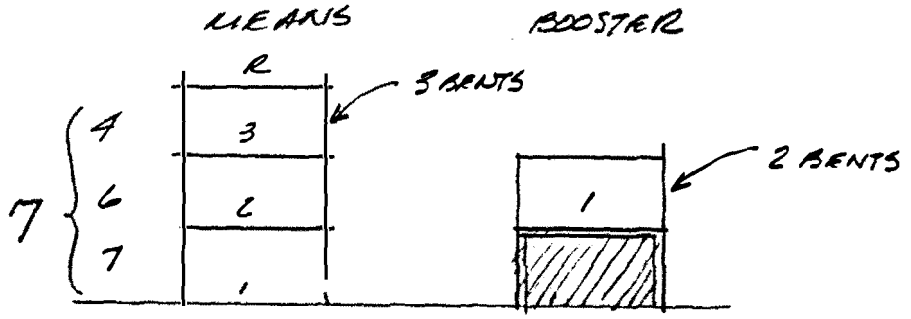
$12 X 1100 X 1/13,700 = $0.96 USE $1.00/SF

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4A	WBS 1.1.1.2	5/9

SUBJECT	NAME	
FOOTPRINT GALLERY UPGRADE - CDR BOOSTER GALLERY ADDITION PHASE 1	TP	
	DATE APRIL 88	REVISION DATE

MEANS RATIONAL

SUPERSTRUCTURE

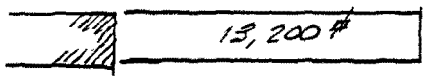


$8.49/SF x 3 x 10/17 = $14.98

EXTERIOR - WALLS

MEANS BASE: 58,000 SF TOTAL, 3 FLOOR, 0.8 WALL, 562' PERIMETER
12' STORY HGT, $14.64/SF

BOOSTER GALLERY: 13,200 SF 1 FLOOR $13.00/SF



388 x (6.5 + 5.5) = 4768
34 x 28 = 952
388 x 28 x 7/10 = 7605
810' PERIMETER 12,825 # WALL

PERIMETER PER S.F.	562/19,333.3 = .02907	810/13200 = .0614
WALL "DENSITY" (12' HGT)	0.8	12825/12 x 1/810 = 1.319
UNIT COST	$14.64	$13.00
COST PER S.F.	$4.09/SF	$12.63/SF

$$\frac{810 \times 12' \times 1.319 \times \$13.00}{13,200}$$

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4A	WBS 1.1.1.2	6/9

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
BOOSTER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

EXTERIOR - WINDOWS

MEANS: 0.2 OF WALL 306 x 1/23.2 = #13.18/SF
12' STORY HGT

BOOSTER GALLERY:

A =	5 x 388	= 1940
	.3 x 388 x 28 x 1/2	1930
	.3 x 388 x 16 x 1/2	931
		3801 #

COST PER S.F. = 3800 x #30 x 1/13,200 = #8.64/SF

16.60 + 10.97 = 27.57 MEANS
FLOAT

EXTERIOR - DOORS USE AVERAGE OF 1 & 3 STORY FACTORY #.42

EXTERIOR - TOTAL MEANS EQUIVALENT FACTOR

WALL	12.63
GLASS	8.64
DOORS	0.42
	#21.69

USE #21.70

ELEVATOR

MEANS COST: #1.99 FOR 2 ELEV, IN 3 STORY OFFICE
2 STORY 42,300
5 STORY 84,000
3 STORY ~56,200 PRORATED

1.99 x 58,000 x 1/2 x 42,300 (2 STORY) / 56,200 (3 STORY) x 1/13,200 = #3.29/SF
(1/2 ↑ ONE ELEV)

BUT MUCH MODIFICATION REQ'D, SO ADD 25%

#4.10 OK

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
BOOSTER GALLERY ADDITION PHASE 1

NAME: TP

DATE: APRIL 88 | REVISION DATE:

MECHICAL SYSTEMS

MEANS F.P. ASSUMES ONLY STANDPIPES & HOSE SYSTEMS @ .15

ADD $1.60 FOR SPRINKLERS, LOOPS TO CONTROL PANEL, ETC

MEANS TOILETS ASSUME ONE FIXTURE FOR 1320 SF

BOOSTER GALLERY HAS 18 IN 13,200SF OR ONE FOR 761 SF

ADD $(1320/761 - 1) \times 0.81 = \$0.59$

ADD ROOF DRAINS, HORIZ. RUN & LEADER
6X $600 X 1/13,200 $0.27

MEANS HEATING & COOLING

OFFICE $7.78 /S.F. (3 STORY, 160.7'X 170.3')
LIBRARY $10.25/S.F. (2 STORY 137.5'X 80')

EXPOSURE RATIO

MEANS

ROOF	58,000 X 1/3	= 19,333 X .05 =	966
WALLS	562 X 3 X 12 X 0.8	16 186 X .06	971
WINDOWS	562 X 3 X 12 X 0.2	4046 .60	2428
			4365

BOOSTER GALLERY 4365/58,000 = 0.075

ROOF	13,200	13 200 X.05 =	660
WALLS	[(2X 388) + 34] X 13 - 3453	7077 X .06	424
		3453 .60	2072
			3156

3156/13,200 = 0.239

.239/.075 = 3.18

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4A	WBS 1.1.1.2	8/9

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
BOOSTER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

DEMOLITION

REMOVE SKYLIGHTS & PATCH OPNGS
CUT IN STAIRS
CUT IN ELEVATOR SHAFT
—"— PIT
REMOVE ROOF FANS
EXTEND DUCTS
DEMOLISH FOR TOILET ROOMS 500 SF x 1.5
MODIFY WALL BRG
MODIFY WINDOWS

USE $4.00 /SF

SUMMARY WITHOUT SITE UTILITIES

			MEANS OFFICE BLDG
FOUNDATIONS	(4.12)	4.10	3.53
SUPERSTRUCTURE	(9.29)	9.30	14.98
EXTERIOR (LOAD BEARING)		25.00	21.70
ROOFING	(4.12)	4.10	3.65
INTERIOR FINISHES		12.50	10.91
ELEVATOR		4.10	(4.10)
MECH (INCL TOILETS)		13.80	(13.80)*
ELECT		5.60	6.22
DEMOLITION		4.00	(4.00)
		82.50/SF	82.89/SF

MEANS USES 8.74 WITH GAS HEAT & STANDPIPE & HOSE F.P.

USE $83.00 /SF
(1988)

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4A	WBS 1.1.1.2	9/9

SUBJECT	NAME	
FOOTPRINT GALLERY UPGRADE - CDR BOOSTER GALLERY ADDITION PHASE 1	TP	
	DATE: APRIL 88	REVISION DATE:

MIDPOINT OF CONSTRUCTION

FEB '90 TO JUN '91 MIDPOINT OCT '90

$(1.091)(1.05)^{.83} = 1.136$

$83 \times 1.136 = \$94.30$ /SF OCT '90

FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE TRANSFER GALLERY ADDITION PHASE 1	2-5-4B	APRIL 1988	WBS 1.1.1.2	1/13

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS

TRANSFER GALLERY 16,200 SF @ 51.35	$ 831,900	
SUBTOTAL	$ 831,900	
O + P @ 20%	168,100	
SUBTOTAL	$ 1,000,000	JAN. 88 DOLLARS
ESCALATION TO OCTOBER 1990 @ .138	140,000	
TOTAL	$ 1,140,000	OCT. 90 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE
TRANSFER GALLERY ADDITION — PHASE 1

PROJECT NO.: 2-5-4B | DATE: APRIL 88 | REVISION DATE: WBS 1.1.1.2 | PAGE: 2/13

SECTION: CES | QUANTITIES BY: TP | PRICES BY: TP | CHECKED BY: WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	TRANSFER GALLERY ADDITION								
	DEMOLITION & SITEWORK		16,200	7.65	123,900				
	SUPERSTRUCTURE & STAIR			7.46	120,900				
	EXTERIOR CLOSURE			5.80	94,000				
	ROOFING			4.43	71,800		410 600		
	INTERIOR CONSTRUCTION			5.83	94,400				
	MECHANICAL			13.33	215,900				
	ELECTRICAL			6.85	111,000				
	SUBTOTAL			57.35	$ 831,900		188		

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE — TRANSFER GALLERY ADDITION — PHASE 1	PROJECT NO.	DATE	REVISION DATE	PAGE
		2-5-4B	APRIL 1988	WBS 1.1.1.2	3/13

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	TRANSFER GALLERY (REF 2-3-6)								
							INCL CRANE RENTAL		
	DEMOLITION + SITEWORK				✓		+ BREAK-UP OF CONC.		
	REMOVE PRECAST FASCIA PANELS	1350	SF	5.00	-		14 TON MAX, 5 PIECES		
	REMOVE WAINSCOT WALL PANEL	320	SF	5.00	8600		4 PIECES		
	REMOVE DOOR ALCOVE PANEL	54	SF	5.00	-		1 PIECE		
	REMOVE WINDOW WALL	260	SF	1.80	500				
	REMOVE DOORS	2	EA	50	100				
	DEMOLISH SOFFIT	460	SF	1.00	500				
	DEMOLISH RET. WALL @ END OF E. GALLERY		—		-				
	FOOTING (1.0 THICK)	180	SF	12.00	2200				
	WALL (0.67' THICK)	250	SF	9.00	2300				
	DEMOLISH CURB + GUTTER	103	LF	3.70	400				
	DEMOLISH C.B.	2	EA	100	200				
	DEMOLISH BITUMINOUS PAVEMENT	650	SY	3.15	2100				
	REMOVE STORM SEWER + BKFILL TRENCH	125	LF	4.-	500				
	RELOCATE FIRE HYDRANT	1	EA		1200	400	+ PIPING		
	RELOCATE SAN. MANHOLE	1	EA		1000				
	ADD NEW SAN MANHOLE	1	EA		1500				
	REROUTE 6" SAN SEWER	160	LF	25	4000				ASBESTOS ON EXPOSURE OF THESE 2 PANELS
	REMOVE PRECAST PANELS ON COL. LINE N	255	SF	5.-	1300	1@ 15'X13' 2@ 7.5X4			
	SAWCUT Δ ENDWALLS 2X12'X8" THICK	24	LF	39	1000				
	DEMOLISH CONC. STOOP + ATTS @ K,-16		LS		300	80#	+ 16' FTG		
	ASBESTOS REMOVAL	60	SF	—	1000				
	REMOVE STR. STEEL PANEL BRACKETS + BRACES		LS		2000				
							30,700		

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE TRANSFER GALLERY ADDITION PHASE 1	PROJECT NO.: 2-5-4B	DATE: APRIL 1988	REVISION DATE: WBS 1.1.1.2	PAGE: 4/13
SECTION: CES	QUANTITIES BY: TP	PRICES BY: TP	CHECKED BY: WN		

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	DEMOLITION & SITEWORK (CONT.)								
	REMOVE E. PRECAST CONC PANELS (N, COL LINE)	630	SF	5.00	3200	10.5 x 60' (3 PIECES)			
	REMOVE N. PRECAST CONC PANEL (14A COL. LINE	1480	SF	5.00	7400	13 x 24 (27,300#)			
	SAW CUT ABOVE PANEL @ 7" THICK	18	LF	34-	400				
	REMOVE ASBESTOS	1480	SF	2.50	3700				
	DEMOLISH PARTITIONS (60 X 8) (ALONG COL ½+)	480	SF	0.60	300				
	REMOVE TIMBER DECKING (55 x 22)	1170	SF	0.50	600				
	TEMPORARY CLOSURES		—		—				
	GR FL @ COL LINE 16 (20 x 90)	1800	SF	5.-	9000				
	SECOND FLOOR @ COL LINE ½+ (60 x 8)	480	SF	2.-	1000				
	SECOND FLOOR @ COL LINE 12 (8 x 22)	180	SF	2.-	400				
	REMOVE S. PRECAST PANEL (12 COL LINE)	165	SF	5.00	800	7.5 x 22			
	SAWCUT ABOVE PANEL (7" THICK)	8	LF	34-	300				
	DEMOLISH ROOFING, DECK + STRUCTURE	1700	SF	3.00	5100	60 x 25 = 1700			
	REMOVE ROOF EXHAUST FANS	1	EA	-	100				
	DEMOLISH ROOFING (DECK TO REMAIN)	6700	SF	1.50	10,000				
	PATCH BITUMINOUS PAVEMENT	20	SY	6-	300				
	NEW STORM SEWER FOR R.O. (12")	160	LF	37-	5900	D.I. UNDER BLDG	43,500	26+2+9	

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE TRANSFER GALLERY ADDITION PHASE 1	PROJECT NO.: 2-5-4B	DATE: APRIL 1988	REVISION DATE: WBS 1.1.1.2	PAGE: 5/13
SECTION: CES	QUANTITIES BY: TP	PRICES BY: TP	CHECKED BY: WN		

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	EXCAVATE BERM + HAUL	550	CY	5.-	2800				
	EXCAVATE FOR COL. FTGS. + FOUND. WALL	52	CY	5.-	300	16 X 1	X 49 X 1/27 +	66 X 3	X 3 X 1/27
	COLUMN FOOTINGS	22	CY	200	4400	16 X 1.5	X 25 X 1/27		
	WALL FOOTINGS (LL')	5	CY	200	1000	2 X 1 X	66 X		
	FOUND. WALL + PILASTERS 66 X 3 X 1 X 1/27	7	CY	300	2100				
	S.O.G. 8" W/ MESH AND GRANULAR FILL	9900	SF	3.-	29 700				
	WALL @ RAISED FLOOR (88+24) X 3.5 X 0.67 X 1/27	10	CY	280	2800				
	BACKFILL (GRANULAR)	90	CY	18	1600				
	SUPERSTRUCTURE (COLS., BMS, + PURLINS @ ROOF)	16 610	SF	4.00	66,400				MEANS FACTORY
	Δ FOR CRANE BAY (STRUCT STL ONLY)	2700	SF	4.55	12,300	6.5 X	0.70/#		
	Δ FOR 2ND FLOOR CORRIDOR	900	SF	6.00	5400	(FLOOR STRUCT. ONLY)			
	Δ FOR 2ND FLOOR @ MECH ROOM	690	SF	6.00	4100				
	Δ FOR 2ND FLOOR @ 10BeU GALLERY	6700	SF	2.25	15,100	(STUDS + TOPPING SLAB)			
	Δ FOR 2ND FLOOR @ E END OF X-GALLERY	1700	SF	8.00	13,600	25 X	GB ASET (12)	& (14)	
	EXTERIOR CLOSURE			-	-				
	N. WALL @ CORRIDOR (90 X 8)	720	SF	18	13,000				
	W. WALL (66 X 28) - (10 X 13 @ CORRIDOR)	1720	SF	24	41,300				
	OVERHEAD DOOR	1	EA		2000				
	PERSONNEL DOOR	1	EA		500				
	S. WALL (INCL WITH W. BOOSTER GALLERY)				N/C				
	E. WALL	310	LF	120.-	37,200				
	ROOFING	16 610	SF	4.10	68,100				
	COPING + FLASHING	610	LF	6-	3700				
	STAIRS	1	EA		4000				
							331,400		

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE TRANSFER GALLERY ADDITION PHASE 1	PROJECT NO.: 2-5-4B	DATE: APRIL 1988	REVISION DATE: WBS 1.1.1.2	PAGE: 6/13

SECTION: CES | QUANTITIES BY: TP | PRICES BY: TP | CHECKED BY: WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	INTERIOR CONSTRUCTION								
	2ND FLOOR (OFFICES)	6600	SF	10.70	70 600		7400 - 800		
	CORRIDOR	900	SF	6.00	5400				
	HIGH BAY	8310	SF	1.55	12,900				
	MECH ROOM (2X 690) + 800	2180	SF	2.50	5,500				
	MECH								
	SPRINKLERS (ORDINARY HAZARD)	19,800	SF	1.70	33,700				
	HIGH BAY (MEANS OFFICE)	9200	SF	7.80	71,800				
	CORRIDOR + OFFICES (BOOSTER GALLERY)	7500	SF	12.10	100,400				
	RELOCATE HVAC + DUCTS @ 2ND FLOOR		LS		10,000				
	ELECTRICAL								
	HIGH BAY (MEANS FACTORY)	9200	SF	5.43	50,000				
	CORRIDOR	900	SF	4.-	3600				
	OFFICES, ETC (BOOSTER	6600	SF	5.60	40,000				
	MECH ROOMS	2180		8.-	17,400				
							471,300		
	SUBTOTAL				831,900				
	ON+P @ 20%				168 100				
	TOTAL (1998)			≈	1,000,000	÷	16,500 SF	=	60.60 /SF

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
TRANSFER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88 | REVISION DATE:

TRANSFER GALLERY -

DEMOLITION

SOUTH WALL OF PRESENT C.G. SOUTHEAST ADDITION

13' x 0.58 x 150 = 1130 #/L.F. x 90' ≈ 102,000 # PANELS

1130 x 25.25 ≈ 28500 # MAX PANEL WGT. (5 FASCIA PANELS)

TOTAL CONC AREA @ FASCIA

(13 x 88) + (20 x 9) ≈ 1350 # (7")

TOTAL WAINSCOT PANEL

80 x 4 = 320 # (8" THK) 4

PANEL @ PERSONNEL DOOR

9 x 6 = 54 # (7") 1

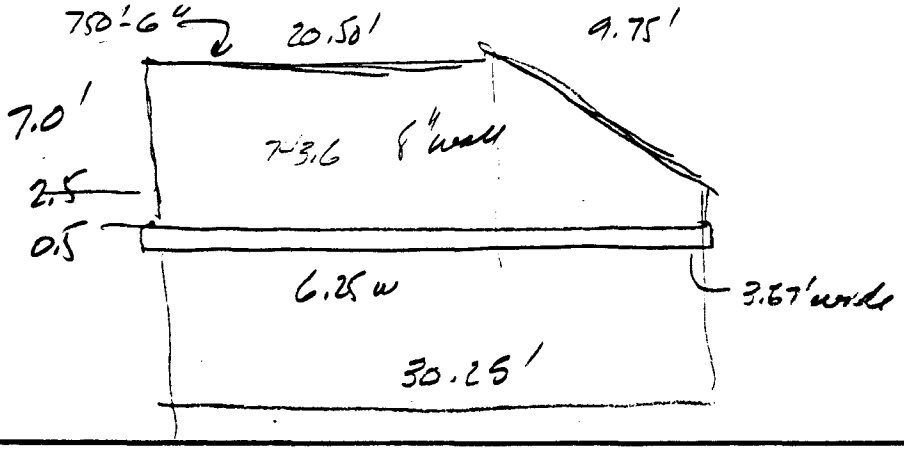
GLASS WALL

80 x 3.25

SOFFIT

5.25 x 88 =

RETAINING WALL @ END OF BOOSTER GALLERY



FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4B	WBS 1.1.1.2	8/13

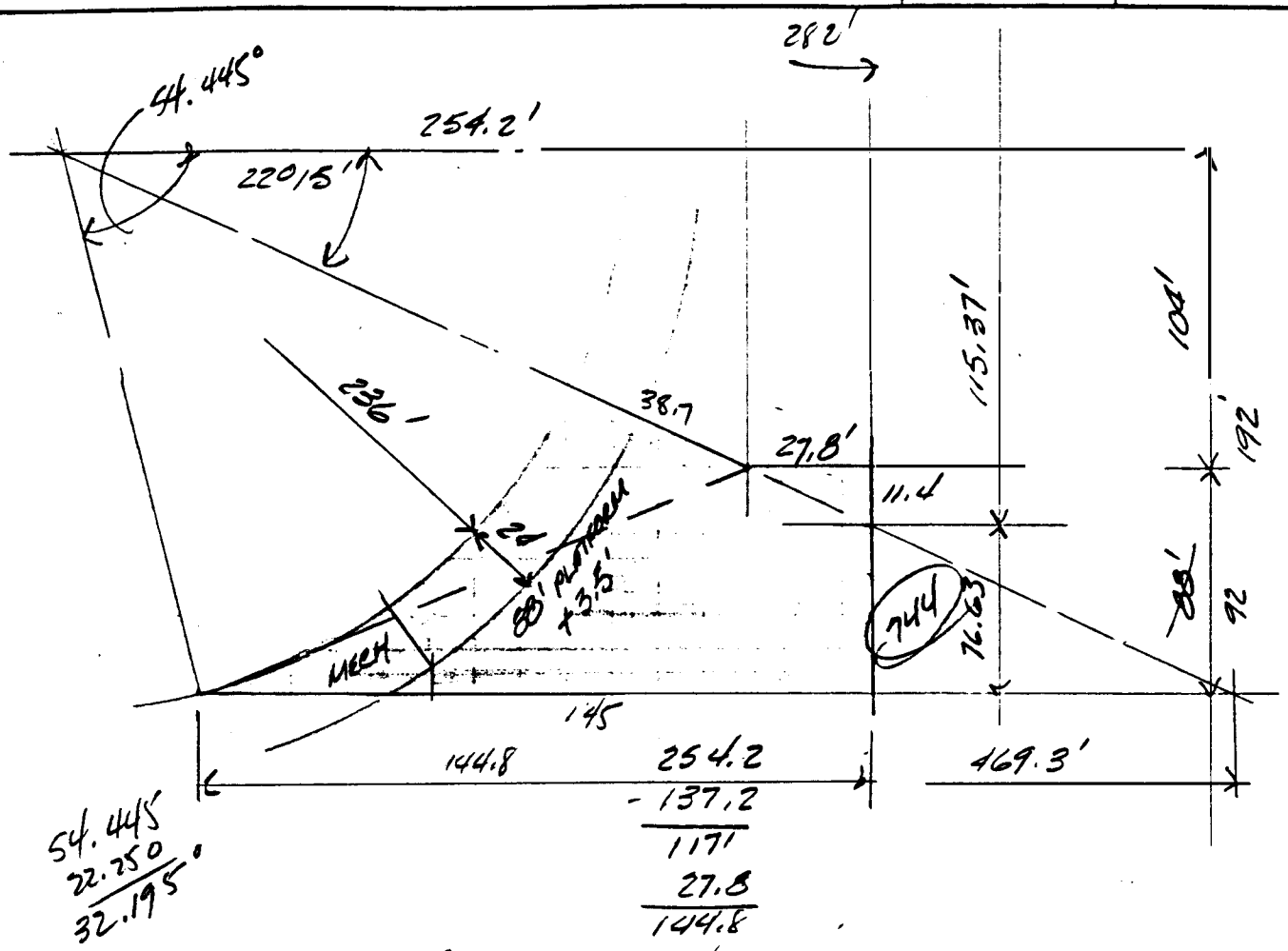
SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR

TRANSFER GALLERY ADDITION — PHASE 1

NAME: TP

DATE: APRIL 88

REVISION DATE:



54.445
22.250
32.195'

SECTOR 15,648 #

△ = 192 (469.3 - 137.2) x 1/2 = 31882

△ = (469.3 - 282) x 76.63 x 1/2 = 7176

Net area: 9058 # + 11.4 x 1/2 x 27.8 = 9216 #

CORRECTION: TRANSFER GALLERY @ 196' FROM E BOOSTER?

ADD 4/x 144.8 = 579

9216

9800

USE 9900 # OK

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4B	WBS 1.1.1.2	9/13

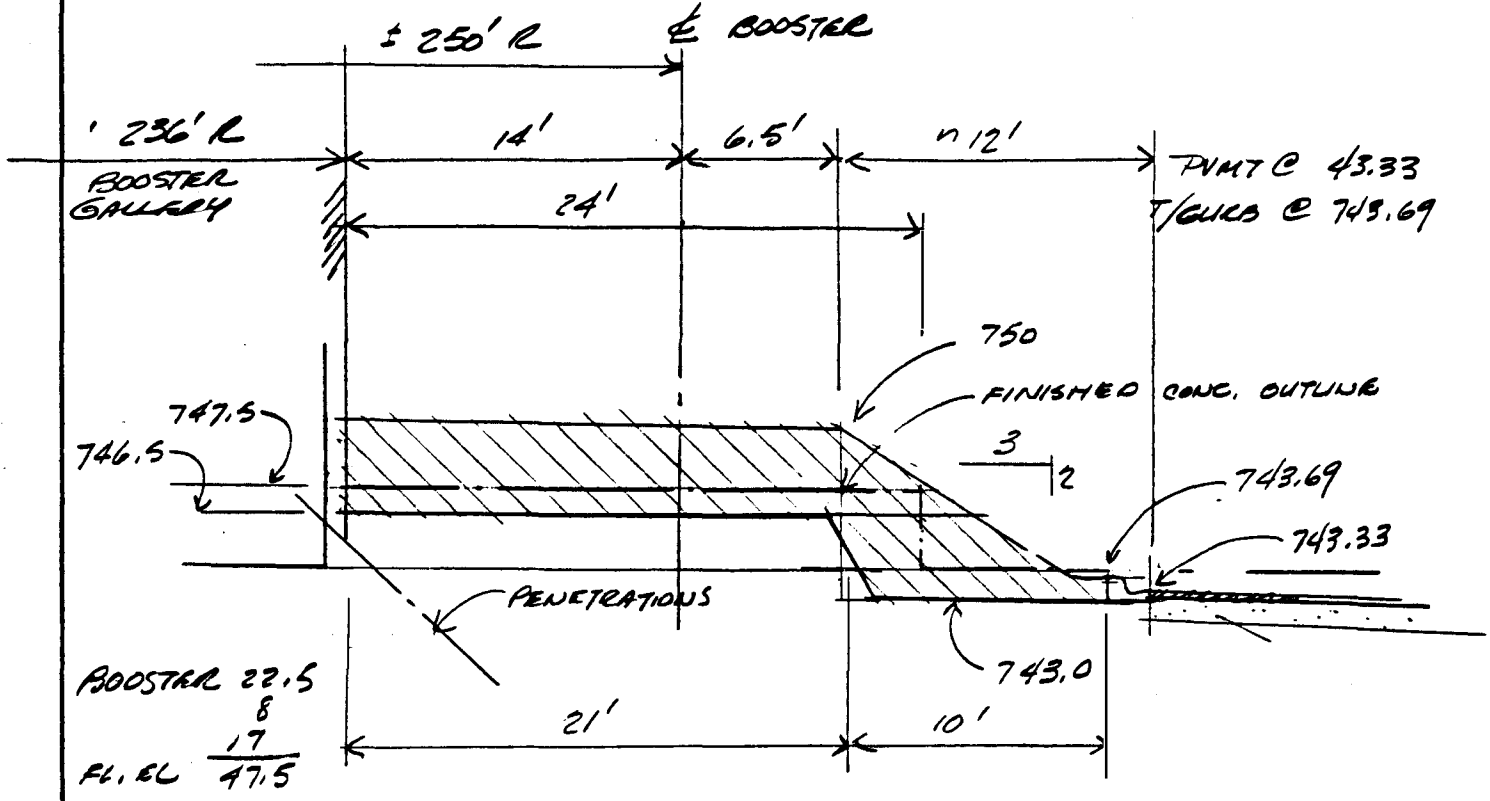
SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR

TRANSFER GALLERY ADDITION PHASE 1

NAME: TP

DATE: APRIL 88 REVISION DATE:

TRANSFER GALLERY EXCAVATION



EXCAVATION

4' X 21' X 88' 7392
7' X 10 X 1/2 X 88 3080
} 10472/27 = 387 @ RAISED FLOOR

(21 + 5) X 7 X 24' = 4368 /27 = 162 @ MECH ROOM

549 CY

USE 550 CY

FERMILAB

ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE
CES	2-5-4B	WBS 1.1.1.2	10/13

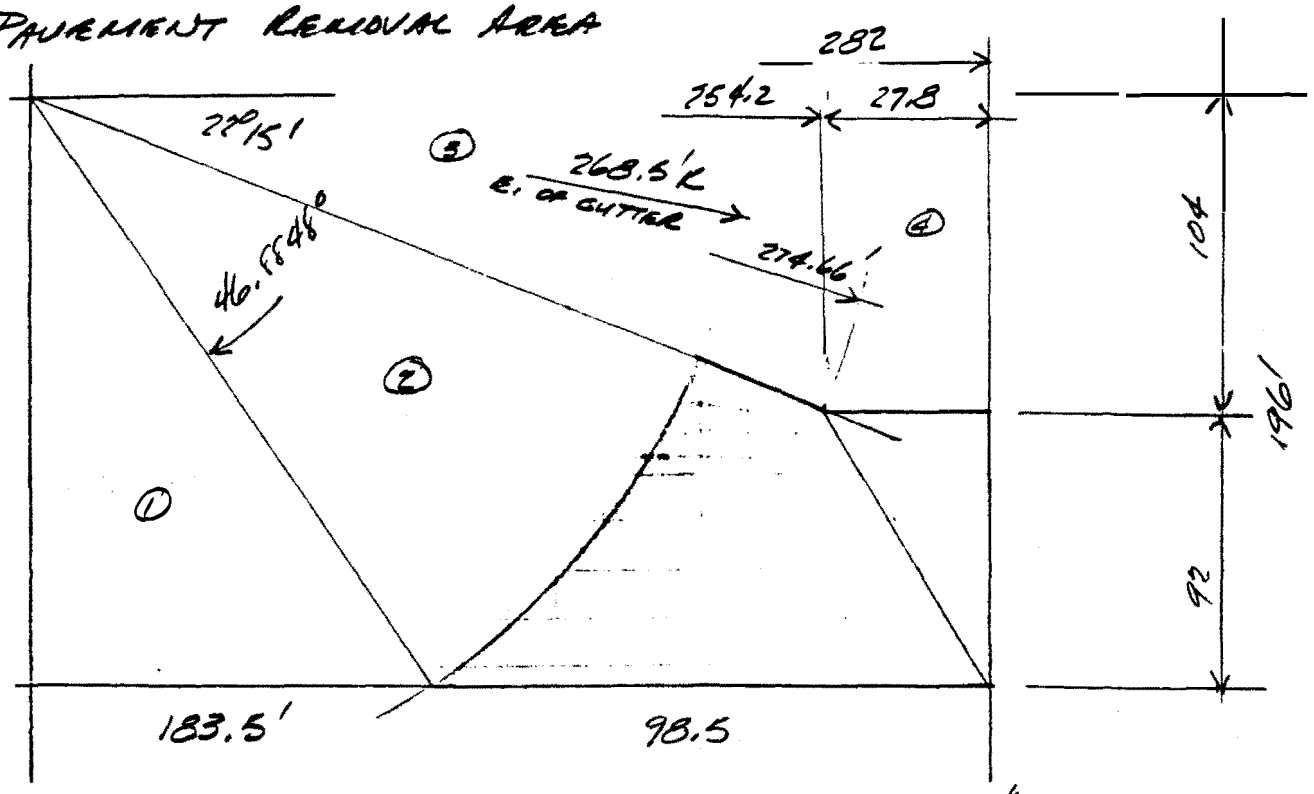
SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
TRANSFER GALLERY ADDITION — PHASE 1

NAME: TP

DATE: APRIL 88

REVISION DATE:

PAVEMENT REMOVAL AREA



TOTAL RECTANGLE: 282 X 196 = 55,272 #

①	183.5 X 196 X 1/2	17 983
②	24.6348/360 X π X (268.5)²	15 498
③	104 X 1/2 X 254.2	13 218
④	27.8 X 104	2891
		49 590 #

NET 5682 #

ADD 5' @ FREE EDGE: 5 X 34 170

SUBTRACT CONC 5852 X 1/9 = 650 SY

BACKFILL —

ASSUME BIT. PAVING @ 743.33
T/GRANULAR 743.00
UNDERSIDE OF 8" SLAB 743.33

5852 X 0.33 X 1/27 + (52 - 22 - 5 - 7) = 90 CY
34

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4B	WBS 1.1.1.2	11/13

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
TRANSFER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

FOOTINGS

20 X 30 AREA 600 X .05 30 K
CRANE REACTION
(10T 30' SPAN) 30 K

60 K / 3 = 20 #

ASSUME 5' SQ. FTG
ASSUME 2' SQ EX.

CRANE SUPERSTRUCTURE (20 X 30 BAY)
ADD 10 #/' FOR COLUMNS
ASSUME 80 #/' CRANE BEAM INCL RAIL

$$\left[(10 \times 24 \times 2) + (2 \times 80 \times 20)\right] \times 1/10 \times 1/30 = 6.13\ \#/SF$$

TOTAL AREA: 90 X 30 = 2700 #

USE 6.5 #/# INCL BRACING

ROOF AREA: (TOTAL)

9900	HIGH BAY
6600	NEW 2ND FLOOR @ TRANSFER GALLERY
- 690	MECH ROOM (32 X 26 X 1/2) + (17AVG X 16) =
- 900	CORRIDOR
1700	REMODELED 2ND FLOOR @ E. END OF X-GALLERY
16,610 #	(9900 - 690 = 9210) + (7400) FOR UNIT COSTING

← 5700 + 1700

TOTAL NEW TRANS GALLERY AREA INCL MECH ROOM: 7400 #
(FOR UNIT PRICING COMPARABLE TO X-GALLERY ADDITION)
↑

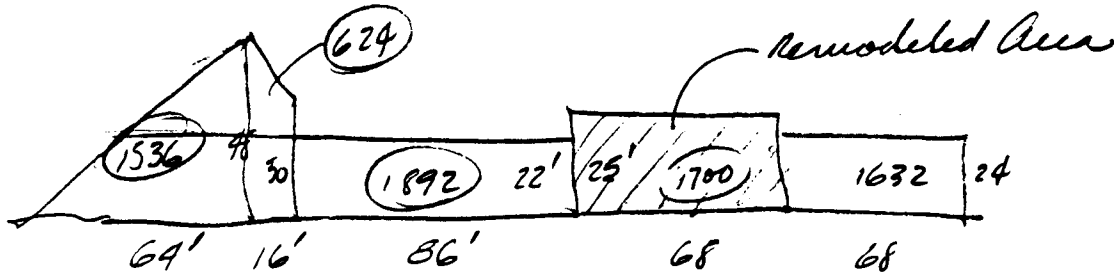
FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4B	WBS 1.1.1.2	12/13

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
TRANSFER GALLERY ADDITION PHASE 1

NAME: TP

DATE: APRIL 88

REVISION DATE:



1536
624
1892
1632
5684 ~ 5700

5700
- 690 mech
5010
1700
6710 ROOF TO BE REMOVED

900 CORRIDOR
6600 NEW - 2ND FLOOR (NET AREA GAINED)
1700 remodeled
8300# NEW + REMODELED 2ND FLOOR
- 690
7610# OVER EXISTING X-GALLERY
- 900 corridor
6710 — USE 6700

FLOOR OVER X GALLERY

STUDS 6700 X 1/17.5 = 890 USE 900 STUDS

5 1/2" THICK DECK — USE 4 1/2" AVE

6700 X 4.5 X 1/12 = 2512 CF OR 93 CY. CONC DECK

(900 X #1.50 X 1/6700) + 1.48 + (.44 X 1/4) + .44

0.20 + 1.48 + 0.11 + .44 = 2.23

USE #2.25/SF

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-4B	WBS 1.1.1.2	13/13

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
TRANSFER GALLERY ADDITION PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

EAST WALL

EXCAVATION	2 X 3 X 1/27	= .2 CY	@ $5	= 1.00
FTG	1 X 2 X 1/27	.07	@ 200	14.00
WALL	16 X .58 X 1/27	.34	@ 300	102.00
GRAN. BKFILL		.13	@ 18	2

$119.00 / LF

USE $120. / LF

INTERIOR CONSTRUCTION (10X22) ← INSUL

DRYWALL (EXT)	7 X 9 = 63 SF X 2.50	0.72
DRYWALL (INT)	(15+10) X 9 = 225 X 2.50 / 220 =	2.55
RAILING	10' X $40 / 220	1.82
DOORS	1 X 500 X 1/220	2.27
PAINTING	63 + 450 + 220 = 733 X .40 = 293 / 220	1.33
CARPETING		2.00
		10.69

USE $10.70

HIGH BAY

FLOOR TILE TECH AREA	88 X 24 X 1.50 X 1/8310	0.38
RAILING	88 X 30 X 1/8310	0.32
STAIRS	2 X $1000 X 1/8310	0.24
PAINT STRUCT STEEL, RAILINGS, CONC WALL SUR, STAIRS @ $5000 LS		0.60
		1.54

USE $1.55

SPRINKLERS

9900	
6600	
1700	
+ 690	MECH
900	
19,790	

FERMILAB COST ESTIMATE	PROJECT TITLE			PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDE WEST ENTRANCE PHASE 1			2-5-5	APRIL 1988	WBS 1.1.1.3	1/6
SECTION CES	QUANTITIES BY TP	PRICES BY TP	CHECKED BY WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

WEST ENTRANCE 3500 SF @ 70.51	$ 246,800	
SUBTOTAL	$ 246,800	
O + P @ 20%	48,200	
SUBTOTAL	$ 295,000	JAN. 88 DOLLARS
ESCALATION TO OCTOBER 1990 @ .138	40,000	
TOTAL	$ 335,000	OCT. 90 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDE
WEST ENTRANCE PHASE 1

PROJECT NO. 2-5-5 | DATE APRIL 1988 | REVISION DATE WBS 1.1.1.3 | PAGE 2/6

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	WEST ENTRANCE								
	DEMOLITION		3500	0.71	2,500				
	EXCAVATION & BACKFILL			5.29	18,500				
	FOUNDATIONS & RETAINING WALL			9.66	33,800				
	SUPERSTRUCTURE & STAIRS			6.67	23,400				
	EXTERIOR WALL			17.66	61,800				
	ROOFING & SKYLIGHTS			3.43	12,000				
	INTERIOR FINISHES			6.40	22,400				
	ELEVATOR			12.09	42 300				
	MECHANICAL			5.74	20,100				
	ELECTRICAL			2.86	10,000				
	SUBTOTAL			70.51	246,800				

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDE WEST ENTRANCE PHASE 1	PROJECT NO.: 2-5-5	DATE: APRIL 1988	REVISION DATE: WBS 1.1.1.3	PAGE: 3/6
SECTION: CES	QUANTITIES BY: TP / PRICES BY: TP / CHECKED BY: WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	WEST ENTRY (NOT INCL DRIVEWAY)								
	(EXTENDING TO LINAC WEST WALL ONLY)								
	EXCAVATE LINAC BERM	1200	CY	4.50	5400	INCL HAUL.			
	EXCAVATE FOR FOUNDATIONS	250	CF	4.50	1100				
	DEMOLISH LINAC RETAINING WALL	145	CF		2500	SAWCUT 28'@ 18"		020	728 @ 20
	GRANULAR BACKFILL AROUND STRUCTURE	665	CY	18	12,000				
	CONC. FOOTINGS	40	CY	180	7,200				
	CONC. FOUNDATION & RETAINING WALLS	95	CY	280	26,600				
	SLAB ON GRADE W/ 6' GRANULAR	3000	SF	2.80	8400	INCL GRANULAR			
	SUPERSTRUCTURE & STAIRS (SEE BACKUP				15,000				
	EXTERIOR WALL								
	PRECAST CONCRETE PANELS	2000	SF	14	28,000				
	ENTRY ROOF CANOPY	250	SF	20	5000				
	WINDOW WALL & ENTRY DOOR	1600	SF	18	28,800	#16/SF + 3200 DOOR			
	ROOFING	2000	SF	4.10	8200				
	SKYLIGHTS	8	EA	300	2400	10 #@ #30			
	FLASHING	236	LF	6-	1400				
	INTERIOR FINISHES		—						
	BLK WALL @ ELEV	468	SF	5.-	2300				
	RAILINGS (ENTRY)	30	LF	60	1800				
	—"— (PASSAGEWAY	88	LF	20	1800				
	TERRAZZO	1500	SF	6	9000				
	CARPETING 12 x (44+30)	35	SY	18	600				
	CEILING 2000 + (12 x 30)	2360	SF	1.50	3500				
	DRYWALL @ EXTERIOR WALLS (98 x 22)	2200	SF	1.32	2900				
	PAINTING (WALLS + RAILING)		LS		500				
							174,400		

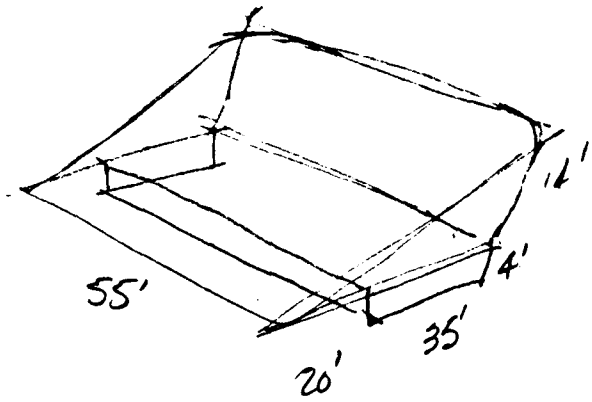
FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDE WEST ENTRANCE PHASE 1	PROJECT NO.: 2-5-5	DATE: APRIL 1988	REVISION DATE: WBS 1.1.1.3	PAGE: 4/6
SECTION: CES	QUANTITIES BY: TP	PRICES BY: TP	CHECKED BY: WN		

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	ELEVATOR HYDRAULIC, 2000# 2 STOPS	1	EA		42,300				
	MECHANICAL								
	HEATING + AC	2000	SF	7.10	14,200				
	SPRINKLERS 2000 + 360	2360	SF	2.50	5,900				
	ELECTRICAL								
	LIGHTING + POWER	2000	SF	5.-	10,000				
							72,400		
					$ 246,800				
		OH & PC		20%	49200				
		TOTAL			$ 296,000		3500 x $84.57/SF		

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-5	WBS 1.1.1.3	5/6

SUBJECT	NAME	
FOOTPRINT GALLERY UPGRADE - CDE WEST ENTRANCE PHASE 1	TP	
	DATE: APRIL 88	REVISION DATE:

WEST ENTRY



BLDG. VOL. IN BERM

55 x 13 x 52 x 1/2 = 15730
36 x 12 x 4 = 1728
17,458 CF
OR 646 CY

USE 650 CY

REMOVE LINAC BERM

66 x 14 x 1/2 x 65' = 30,030
36 x 16 x 4 = 2,304
32,334 CF OR 1198 C.Y

EXCAVATE FOR FOOTINGS

(55 + 35) x 2 x 4 x 3.0		2160
55 x 55 x 1.0	SLABS	3025
2 x 20 x 3 x 3	WING WALLS	360
2 x 36 x 2' AVE x 3	TOP OF BERM	432
4 x 10 x 10	PIT	400

6377 x 1/27 = 236 CY

FOOTINGS

1 x 2 x (50 + 60)		220
65 x 6 x 50		450
(1 x 2 x 32)	ELEV PIT	64
(2 x 20 x 1 x 2)	WING WALLS	80
(2 x 44 x 1 x 2)	ON BERM	176

990 x 1/27 = 37 CY

40 CY

FOUNDATION WALLS

2 x 30 x 13 x 1.0	SIDE WALLS	780
1 x 52 x 13 x 1.5	BACK WALL	1014
4 x 8 x 4 x 1	PIT WALLS	64
2 x 20 x 6 x 1	WING WALLS	240
2 x 44 x 5 x 1		440

2538 x 1/27 = 94 CY

95 CY

BACKFILL

1200 + 250 - 650 - 135 = 665 CY

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-5	WBS 1.1.1.3	6/6

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDE
WEST ENTRANCE PHASE 1

NAME: TP
DATE: APRIL 88
REVISION DATE:

DEMOLISH LINAC RET. WALL
8 X 12 X 1.5 = 144 CF — 145 CF

S.O.G.

50 X 30 (INCL PIT)	= 1500	
52 X 20	1040	
44 X 10	440	
	2980 SF	3000 SF

SUPERSTRUCTURE
USE 2 STORY OFFICE, MEANS 2.460
@ 5.79 PER S.F. FLOOR
2.70 PER SF ROOF
1.5 X 3995 PER STAIR FLIGHT

ROOF	44 X 12 X 2.70	1426	
ROOF	1500 X 2.70	4050	
2ND FLOOR	20 X 30 X 5.79	3474	
STAIR		6000	
CANOPY @ ENTRY		2000	USE @ 17,000
		16950	

EXTERIOR WALLS
PRECAST CONC

2 X 32 X (27 - 12)	= 832	
(50 - 12) X (27 - 12)	570	
(50 - 30) X 27	540	
	1942	USE 2000 # @

WINDOW WALL

30 X 27	810	
2 X 44 X (14 - 5)	792	
	1602	USE 1600 #

PRECAST ENTRY
30 X 8.33 = 250 #

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE — CDR PHASE 2 — UTILITIES	PROJECT NO. 2-5-6	DATE APRIL 1988	REVISION DATE WBS 1.1.2.1	PAGE 1/6

SECTION CES	QUANTITIES BY TP	PRICES BY TP	CHECKED BY WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

SITEWORK	$ 87,200	
ELECTRICAL & NEW SUBSTATION	128,200	
SUBTOTAL	$ 215,400	
O + P @ 20%	44,600	
SUBTOTAL	$ 260,000	JAN. 88 DOLLARS
ESCALATION TO JULY 1991 @ .186	50,000	
TOTAL	$ 310,000	JULY 1991 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
UTILITIES PHASE 2

PROJECT NO. 2-5-6 | DATE APRIL 1988 | REVISION DATE WBS 1.1.2.1 | PAGE 2/6

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
1.0	SITEWORK								
	ERECT DUST PARTITIONS	1200	SF	1.50	1800				
	DEMOLISH PARTITIONS	800	SF	1.18	1000				
	DEMOLISH CEILING	1440	SF	.60	900				
	REMOVE LIGHTING FIXTURES	40	EA	16.65	700				
	SAWCUT FLOOR (8" THICK)	170	LF	8.-	1400				
	REMOVE 8" S.O.G. (24 X 60) (W/ MESH)	1440	SF	10.-	14400				
	EXCAVATION (LOW HEAD MACHINE)	310	CY	15-	4700	42 X 11 X 18 X 1/27			
	EXCAVATION (STD BACKHOE)	120	CY	5-	600	11 X 288 X 1/27			
	HAUL TO STOCKPILE	520	CY	4-	2100				
	SHORE 3 FLOOR JOISTS		LS	-	300				
	SAWCUT 12" WALL (2 SIDES ONLY)	22	LF	50.-	1300				
	DEMOLISH ENDS OF JOISTS + WALL	80	CF	15-	1200				
	REMOVE DEBRIS + HAUL AWAY	1040	CF	1.50	1600				
	HAND DIG UNDER FRAMED FLOOR	90	CY	25-	2300				
	PLACE 24 - 5" CONDUITS (2 X 12) PVC	600	LF	3-	1800				
	BREAKOUT HOLES IN 8" SLAB	3	EA	150-	500				
	CONCRETE ENCASEMENT	25	CY	150-	3800				
	SAND FILL	65	CY	20	1300				
	CONC. BASE SLAB	20	CY	180-	3600				
	WALLS (INCL END WALLS)	62	CY	280	17400				
	BEAM AT JOIST SUPPORTS	1	CY	500	500				
	SLAB OVER VAULT (6")	1	CY	350	400				
	SLAB OVER TUNNEL 42 X 9.5 X 1.0 X 1/27	15	CY	350	5300				
	GRANULAR BACKFILL	350	CY	20	7000				
							75,900		

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR PHASE 2
UTILITIES

PROJECT NO.: 2-5-6 | DATE: APRIL 1988 | REVISION DATE: WBS 1.1.2.1 | PAGE: 3/6

SECTION: CES | QUANTITIES BY: TP | PRICES BY: TP | CHECKED BY: WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
1.0	SITEWORK CONT								
	REPLACE 8" S.D.G. 3.20-.40 GRANULAR	1440	SF	2.80	4000				
	PAINT WALLS & CEILING	1200	SF	.50	600				
	LIGHTING & CONVENIENCE POWER	348	SF	6.-	2100	(40+7) X 7.25 = 341			
	6 TIERS OF CABLE TRAYS W/ BRACKETS	252	LF	16-	4500	18" WIDE			
	REMOVE TEMP. PARTITIONS		LS		100				
							11,200		
		SUBTOTAL			87,200				
	NOTE: CONSIDER SINGLE BORED TUNNEL 66' LONG FOR UTILITIES IN FINAL DESIGN.								

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
UTILITIES PHASE 2

PROJECT NO. 2-5-6 | DATE APRIL 1988 | REVISION DATE WBS 1.1.2.1 | PAGE 4/6

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
14.	ELECTRICAL								
	EXTEND 13.8 KV POWER DUCTS (2-5"P)	350	LF	15	5300				
	480 V POWER DUCTS (2-5"P)	400	LF	15	6000				
	SAWCUT BOOSTER ROAD (2 PLACES)	80	LF	2.50	200				
	90° RIGID ELBOWS	10	EA	200	2000				
	SUBSTATION PADS (2@ 12'x16'x8")		—		—				
	EXCAVATION	20	CY	5	100				
	GRANULAR	8	CY	18	200				
	CONC & REBAR	12	CY	300	3600				
	GROUNDING 600 + 2(20+15)x3 + (4x10x3)		LS		1200	$50/200 + $3/FT		+ CADWELD	
	REPLACE PAVING	30	SY	6.-	200				
	DEMOLISH EXISTING PAD	192	SF	9.-	1700				
	PULL OUT EXISTING CABLE (100') CUT CONDUIT (20')		LS		500				
	REMOVE SUBSTSTATION, TRANSPORT & RESET		LS		3600	E2 CREW + 2 ELECT (6 HRS)			
	NEW 1500 KVA UNIT SUBSTATION		LS		42,000				
	SET NEW SUBSTATION		LS		1200	E2 CREW + 2 ELECT (2 HRS)			
	PULL 15 KV CABLE (750 AL TRIPLEXED)	500	LF	10	5,000	(100' EXISTING 4" DUCT)			
	PULL 480V CABLE 750 AL x 3 + GR + NEUT	450	LF	16	8100	(3@750 1@350 1@250)			
	15 KV TERMINATIONS	6	EA	300	1800				
	TESTING		LS		500				
		SUBTOTAL			83,200				
	SUBSTATION				45,000				
					128,200				

FERMILAB

ENGINEERING NOTE

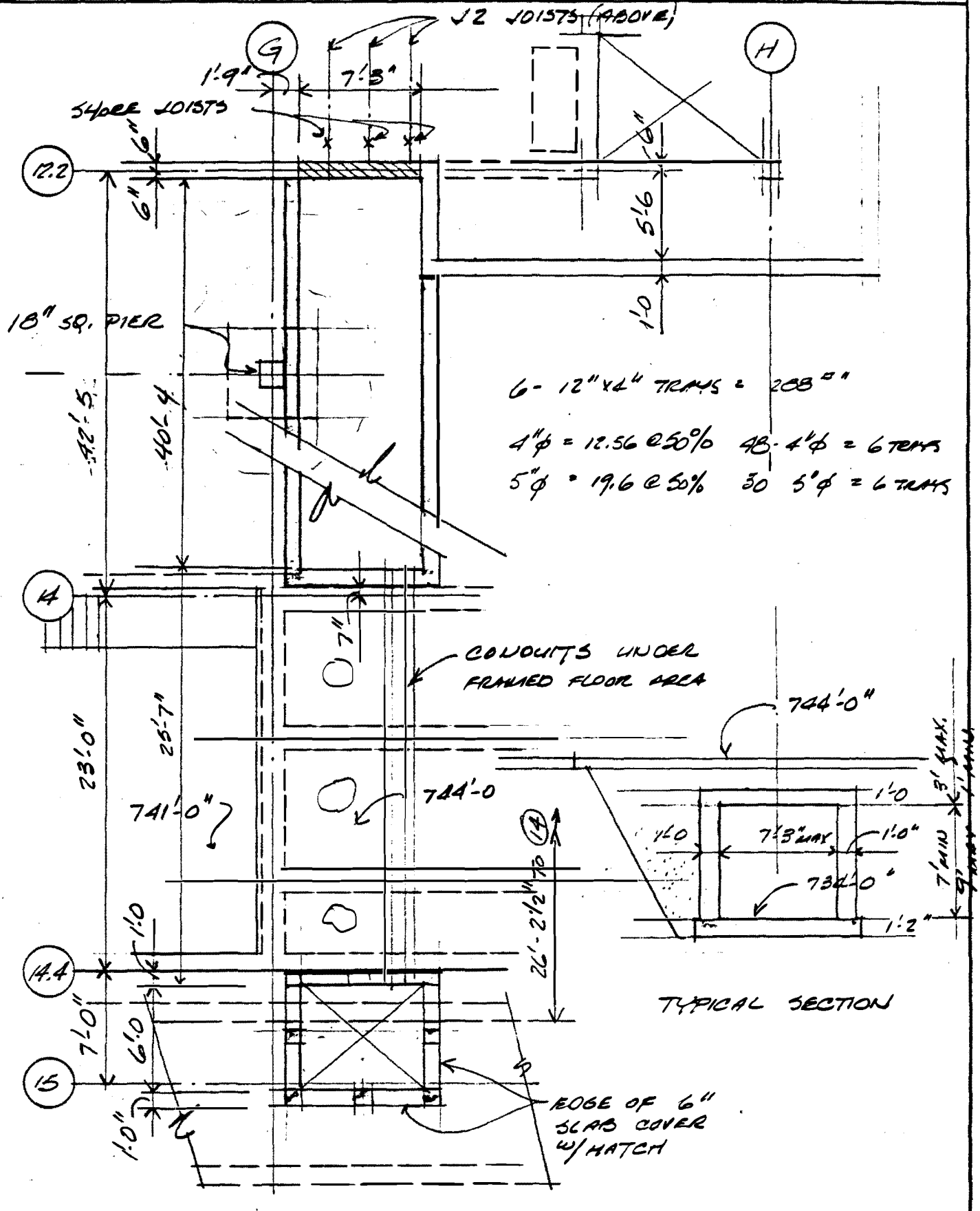
SECTION	PROJECT	SERIAL-CATEGORY	PAGE
CES	2-5-6	WBS 1.1.2.1	5/6

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
UTILITIES — PHASE 2

NAME: TP

DATE: APRIL 88

REVISION DATE:



FERMILAB

ENGINEERING NOTE

SECTION	PROJECT	SERIAL-CATEGORY	PAGE
CES	2-5-6	WBS 1.1.2.1	6/6

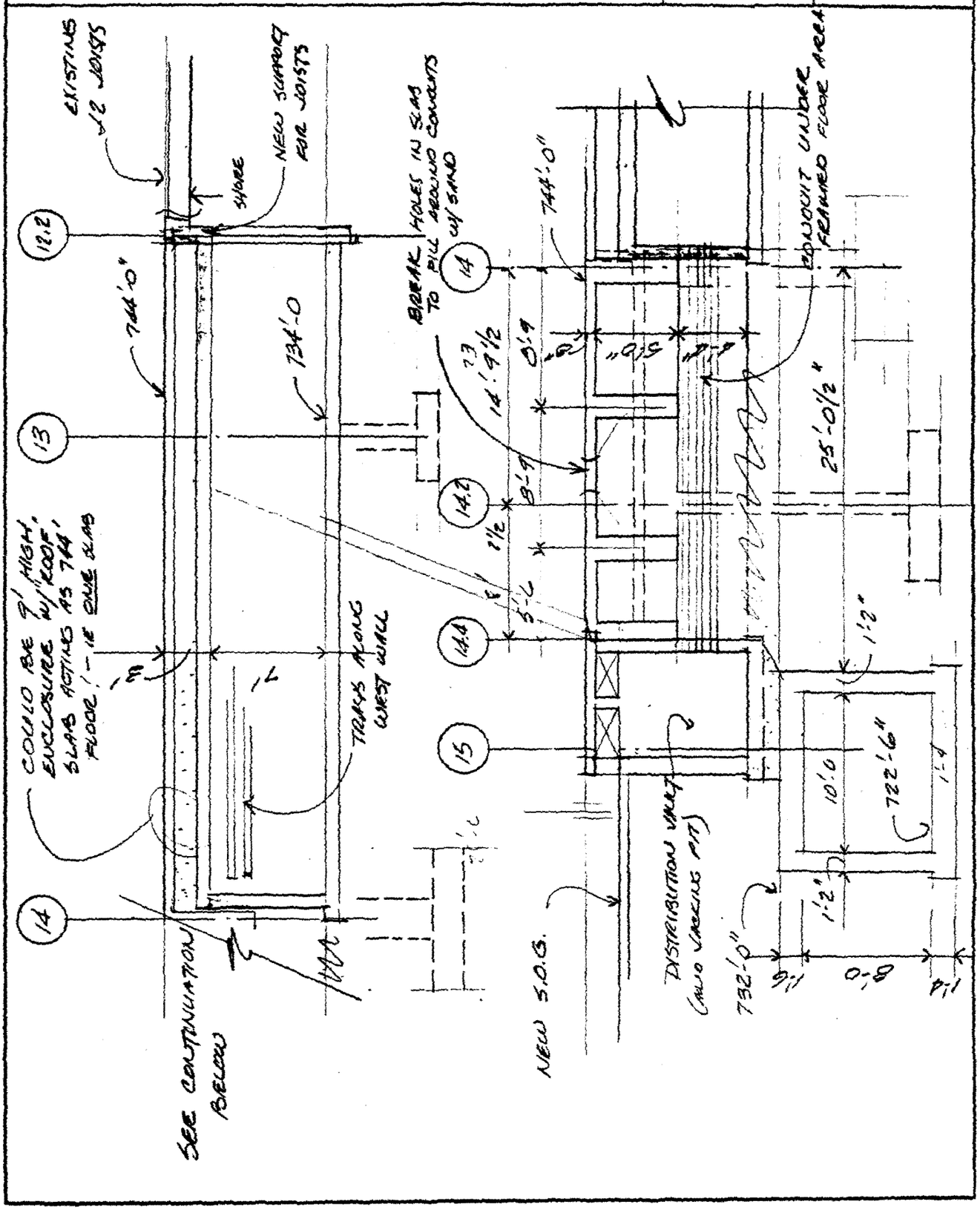
SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR

UTILITIES — PHASE 2

NAME: TP

DATE: APRIL 88

REVISION DATE:



FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR CROSS GALLERY SOUTH ADDITION PHASE 2	2-5-7	APRIL 1988	1.1.2.2	1/11

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

CROSS GALLERY SOUTH ADDITION		
19,200 SF @ 68.84	$ 1,321,800	
O + P @ 20%	263,200	
SUBTOTAL	$ 1,585,000	JANUARY 1988 DOLLARS
ESCALATION TO JULY 1991 @ .186	295,000	
TOTAL	$ 1,880,000	JULY 1991 DOLLARS

FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT-GALLERY UPGRADE - CDR CROSS GALLERY SOUTH ADDITION PHASE 2	2-5-7	APRIL 1988	1.1.2.2	2/11

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	SUMMARY								
	DEMOLITION & SITE WORK		19,200	6.51	125,000				
	FOUNDATIONS			4.90	94,200				
	SUPERSTRUCTURE			7.49	143,800				
	EXTERIOR CLOSURE			10.92	209,700				
	ROOFING			3.03	58,200				
	INTERIOR CONSTRUCTION			11.16	214 200				
	ELECTRICAL			8.26	158,600				
	MECHANICAL			13.65	262 100				
	ELEVATOR			2.92	56,000				
		SUBTOTAL		68.04	1,321,800				
		O/H + P @ 20%			263 200				
					1,585,000		SF		
				USE	#1,585,000				(#82.55/SF)

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

PROJECT NO. 2-5-7 | DATE APRIL 1988 | REVISION DATE 1.1.2.2. | PAGE 3/11

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	DEMOLITION & SITE WORK								
	DEMOLISH CONC. CURBING	184	LF	3.70	700				
	DEMOLISH BITUMINOUS PAVING	1000	SY	3.15	3200				
	DEMOLISH CONC SIDEWALKS	65	SY	5.10	300				
	DEMOLISH SIDEWALK RETURN WALL	168	CF	4.50	800	192 x .42 x 2.08 =			
	DEMOLISH RETAINING WALL	—	—	—	—				
	FOOTING (1'-0")	192	SF	12.—	2300				
	WALL (0'-8")	268	SF	9.—	2400				
	EXCAVATE BOOSTER BERM	200	CY	3.00	600	5 x 20.5 x 50 x 1/27			
	EXCAVATE FOR STEEL SHEETING	615	CY	4.00	2500	24 x 52 x 13.33 x 1/27			
	STEEL PLATE OVER BOOSTER 2'x15'x 46'	340	T	250	85,100	210 LF + 40 LF =			
	REROUTE STORM SEWER	—	—	—	—				
	REMOVE SEWER & BACKFILL TRENCH	300	LF	6	1800				
	FILL EXISTING MH OR CB	6	EA	200	1200	(RELISE FRAME & LID)			
	NEW STORM SEWER	300	LF	32.—	9600				
	NEW MH OR CB	6	EA	1000	6000				
	REROUTE SANITARY SEWER	—	—	—	—				
	REMOVE SEWER & BACKFILL TRENCH	150	LF	6.—	900				
	FILL EXISTING MH	3	EA	300	900	(RELISE FRAME & LID			
	NEW SEWER	250	LF	25.—	6300				
	NEW MH	5	EA	1000	5000				
	EXCAVATE FOR COL FTG (8) & SLAB AREA	570	CY	3.00	1700	13 x 13 x 6 x 8 x 1/27 = 300 + 270			
	EXCAVATE FOR WALL FTGS	335	CY	4.00	1300	32 x 2.50 x 1/27			
	EXCAVATE FOR TRANSFER BUS OVER TUNNEL	20	CY	4.00	100				
	EXCAVATE FOR ELEVATOR PIT	30	CY	4.00	100				
							132,700		

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

PROJECT NO. 2-5-7 | DATE APRIL 1988 | REVISION DATE 1.1.2.2 | PAGE 4/11

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	REMOVE PRECAST CONC WALL PANEL	420	SF	5.00	2100	COL LINE 14 BET. H & J (14x30)			
	—"— —"— (41.7 and 10'-10"	465	SF	5.00	2300	COL LINE 14 BET D & E (15.42 x 30			
	REMOVE TEMP PLYWOOD & STUD ENCLOSURE		LS		300				
	REMOVE PRECAST CONC WALL @ DOOR (2)	160	SF	5.00	800	5.5 x 14.42 =			
	REMOVE ASBESTOS @ PRECAST 420+325	745	SF	2.50	1900				
	REMOVE WINDOW WALL 4.5 x 30	135	SF	1.80	200				
	DEMOLISH SOFFIT 5x60	300	SF	1.00	300				
	REMOVE STREET FRAMING		LS		500				
	REMOVE STEEL STAIR 19R@15"		LS		800				
	HAUL DEBRIS (CONC, ETC)		LS		500				
	PATCH PAVING	30	SY	6.-	200				
	NEW PAVING & SUBBASE	50	SY	9.-	500				
	HAUL EXCESS EXCAVATED MATERIAL	1500	CY	3.60	5300	200+165-52+955-93-120			
	NEW SIDEWALK 2 x 65 x 8'	1040	SF	2.60	2600				
	TOPSOIL, SEEDING, LANDSCAPING, ETC @ ENTRY		LS		10,000				
							28,300		
	SUBTOTAL (SHEETS 1 & 2)				104,200				
	OH & P @ 20%				20 800				
	SITEWORK + DEMOLITION TOTAL				125,000	+80			

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

PROJECT NO. 2-5-7 | DATE APRIL 1988 | REVISION DATE 1.1.2.2 | PAGE 5/11

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	FOUNDATIONS								
	WALL FOOTING & RET. WALL FTG	31	CY	180	5600	280	LF X 1' X 3' X 1/27		
	CONCRETE TRANSFER BINS 2'X2'X4'X14	8	CY	300	2400				
	ELEV PIT CONC INCL BASE SLAB	6	CY	280	1700				
	PIERS 8'X2'X2'X4' AVE X 1/27	5	CY	350	1800				
	FOUNDATION WALL (12")	42	CY	280	11,800	280 X 1'X4'X 1/27			
	PLINTH WALLS (12")	26	CY	280	7,300	(4'X6'X16') + (2'X9'X18') ÷ 27			
	SLAB @ PLINTH (8")	580	SF	3.20	1,900	2'X18'X16'			
	RETAINING WALL BET. PLINTH WALLS	13	CY	300	3900	6'X5'6"X1'X 1/27			
	GRANULAR BACKFILL	1620	CY	18-	29,200				
	S.O.G. (8") NOT INCL GRANULAR	10,200	SF	2.80	28,600				
						94,200			
	SUPERSTRUCTURE								
	FRAMED FLOOR & COLUMNS	10,200	SF	9.00	91,800				
	ROOF FR	12,300	SF	3.50	43,000				
	STAIRS	2	EA	4500	9,000				
						143,800	(@ 7.48/SF)		

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

PROJECT NO. 2-5-7 | DATE APRIL 1988 | REVISION DATE 1.1.2.2 | PAGE 6/11

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	EXTERIOR CLOSURE								
	STAIR TOWER ENCLOSURE (900 SF @ #14)	2	EA	12,600	25,200				
	S. WALL BET STAIRS 56'X22'	1232	SF	22.75	28,000				
	S. WALL @ E. & W. ENDS 2X28X30	1680	SF	30.-	50,400				
	E. WALL 78X28 - 10X14	2044	SF	30.-	61,300				
	N. WALL 10'X152'	1520	SF	14.-	21,300				
	CORRIDOR 2X14X28	784	SF	30	23,500				
						209,700	(# 10.92/SF)		
	ROOFING								
	4 PLY BUR W/ INSULATION	10,600	SF	4.10	43,500	{ INCLUDES METAL DECK			
	4 PLY BUR W/O INSULATION	1,700	SF	2.40	4 100				
	COPING & FLASHING (78+152+28+28+60)/2	692	LF	6.-	4200				
	SKYLIGHTS	400	SF	16.-	6400				
						58,200	(# 4.73/SF)		
	INTERIOR CONSTRUCTION								
	CEILING 9000 + 10,600 - (90X35) - (90X40)	12,850	SF	1.50	19,300				
	FLOOR FINISHES (EXCL ACCESS FLOOR AREA	12,450	SF	2.-	24,900	19,200 - (90X35) - (90X40)			
	FINISH EXISTING EXT. WALLS (NOW INT)	31600	SF	1.50	47,400	(108X28) + (238 X 20)			
	DRYWALL	9840	SF	2.50	24,600				
	MASONRY (8")	1558	SF	5.50	8,600				
	WINDOW WALL @ COMPUTER & CONTROL RM	3300	SF	8.-	26,400				
	DOORS (OFFICE) 23 + 23	46	EA	600	23,000				
	DOORS @ COMP + CONTROL RMS (DOUBLE)	4	EA	1000	4,000				

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

PROJECT NO. 2-5-7 | DATE APRIL 1988 | REVISION DATE 1.1.2.2 | PAGE 7/11

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	RAILING 90+70+90+80+60	400	LF	30	12,000				
	PAINTING 60,000 X .4		LS		24,000				
						214,200	(11.16/SF)		
	ELECTRICAL								
		19200	SF	5.60	107 500				
	DIMMING & LOCAL CONTROL @ CONTROL RM	3600	SF	2.-	7200				
	UNDER DOCK ROOF AREA	1700	SF	2.-	3400				
	GROUNDING AT CONTR & COMP ROOMS	6750	SF	6.-	40,500	(1/2 COST OF COUNTING HSE GRID)			
						158,600	(8.26/SF)		
	MECHANICAL (EXCLUDE HVAC FOR COMP & CONT ROOMS)	19200 - 6750 = 12450							
	SPRINKLERS	19200	SF	1.50	28,800			$	
	PREACTION @ 2 AREAS		LS		5,000	45,300/19,200		= 2.36	
	DRY PIPE @ DOCK AREA	1700	SF	2.75	4700				
	UNDERFLOOR HALON	6750	SF		—	(SUBSEQUENT COSTS)			
	CORRIDOR & OFFICES (BOOSTER GALLERY)	12450	SF	12.10	150,600	(EXCLUDING COMP & CONT. ROOMS)			
	MODIFY AIR INTAKES		LS		5,000				
	MODIFY EXISTING MECH ROOM		LS		50,000				
	TOILETS @ $1,000/FIXTURE	18	FIX	1000	18,000	($.93/SF ≈ 1.00)			
						262,100/19200 =		($13.65)	
	ELEVATOR	1	EA		56,000				

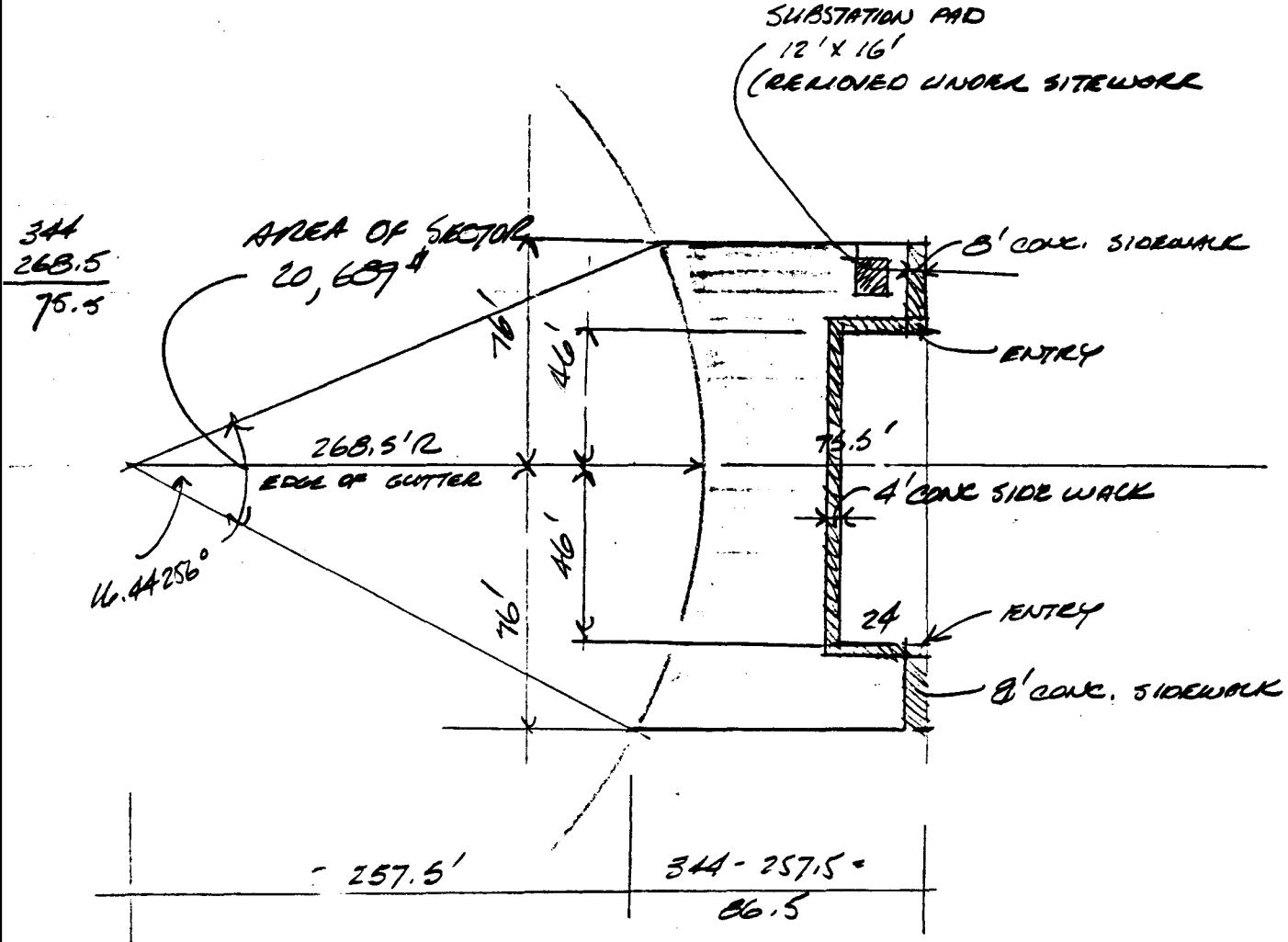
FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-7	1.1.2.2	8/11

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

NAME: TP

DATE: APRIL 88 REVISION DATE:

PAVEMENT REMOVAL



TOTAL AREA:

$(2 \times 1/2 \times 257.5 \times 76) + (2 \times 76 \times 86.5) - (24 \times 92)$

$= 19570 + 13,150 - 2210 = 30,510$ #'

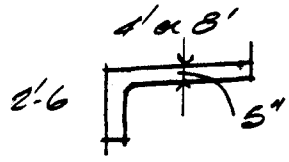
$- 20690$

9820 □'

SIDEWALK $(2 \times 8 \times 30) + 4 \times (92 + 40) = -574$

SUBSTATION PAD -192

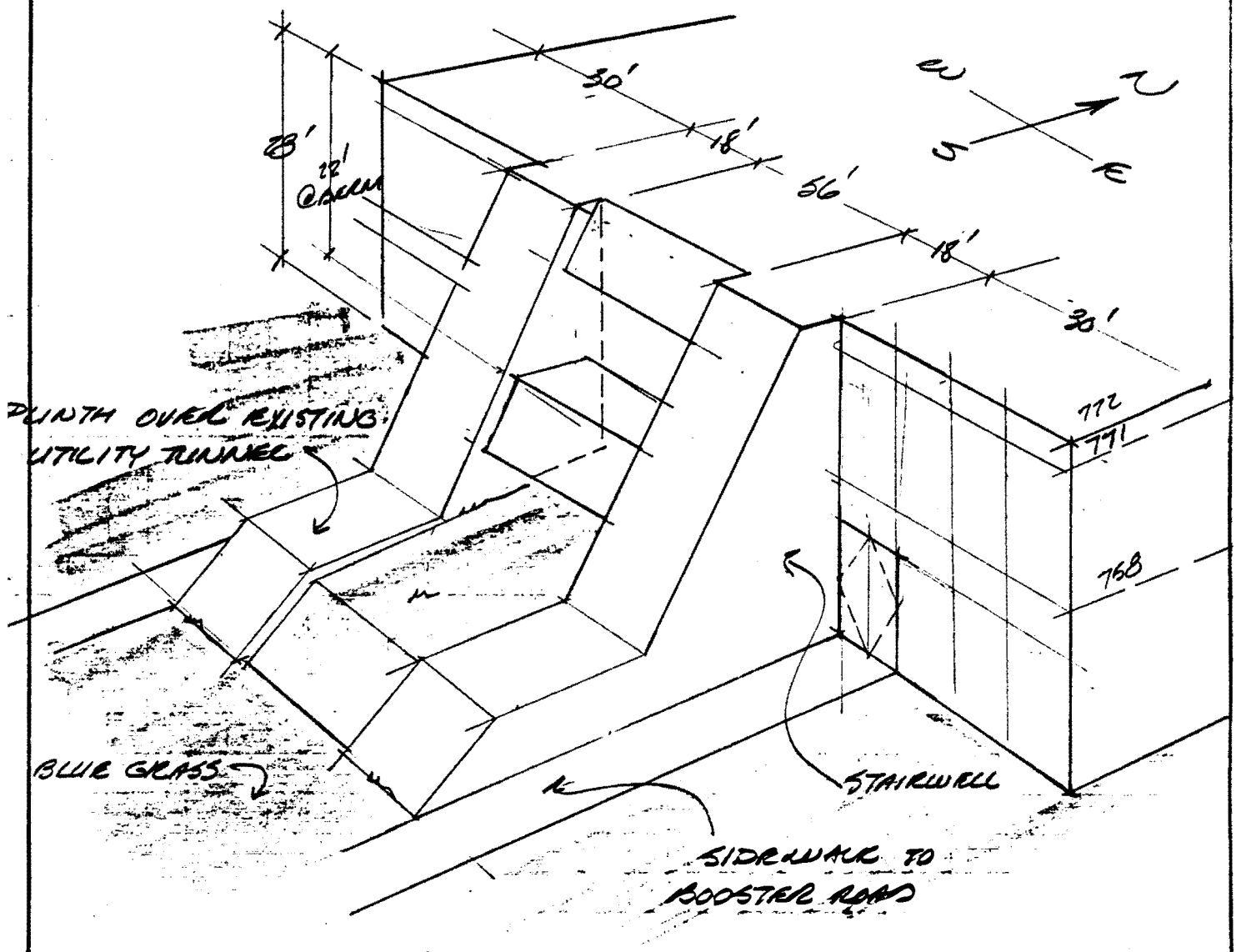
9054 □' $= 1000$ S.Y.



FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-7	1.1.2.2	9/11

SUBJECT	NAME	
FOOTPRINT GALLERY UPGRADE - CDR CROSS GALLERY SOUTH ADDITION PHASE 2	TP	
	DATE: APRIL 88	REVISION DATE:

"ISOMETRIC" OF SOUTH FACADE (N.T.S.)



T/FIN. FL, EL. = 744'-0
T/PRECAST (OR COPING) EL. = 772'-0" (28')

AREAS: GROUND FLOOR: 10,200 SF INCL 90'x35' COMPUTER RM
2ND FLOOR: 9,000 SF INCL 90'x40' CONTROL RM AND 10'x28' "BRIDGE" @ CORRIDOR
ATRIUM OPNG: 28'x52' - 5'x22' RAMP = 1346# NET (NOT INCL W/ 2ND FLOOR AREA)
ROOF AREA: 10,600 SF + 1700 SF @ DOOR

FOR UNIT COSTS USE 19,200 SF FLOOR AREA & 12,300 SF ROOF AREA.

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

NAME: TP
DATE: APRIL 88
REVISION DATE:

USE "MEANS SQUARE FOOT COSTS" ABOVE EL. 744'-0"

USE 2 STORY OFFICE BLDG W/ MODS FROM W.B.S. 1.1.2

SUPERSTRUCTURE

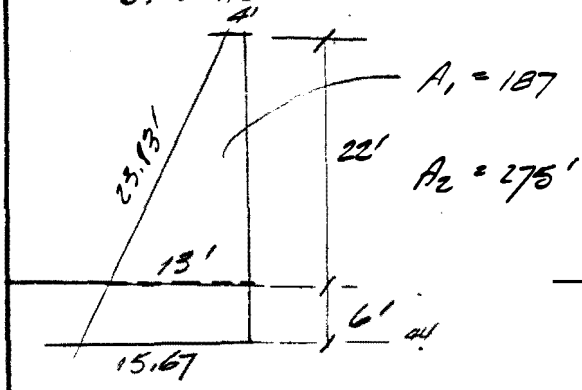
FOR 30'x30' BAYS, DEPRESSED ACCESS FLOOR AREAS
CONNECTIONS TO EXISTING BLDGS & SLOPED S. WALL
USE $9.00/SF VS MEANS $5.79 FOR FLOOR + COL
USE 3.50/SF VS MEANS 2.70 FOR ROOF
USE $4,500 PER STAIR FLIGHT (SLOPED CONFIG)

FOR TOTAL FLOOR AREA OF 10,200 + 9,000 = 19,200 SF

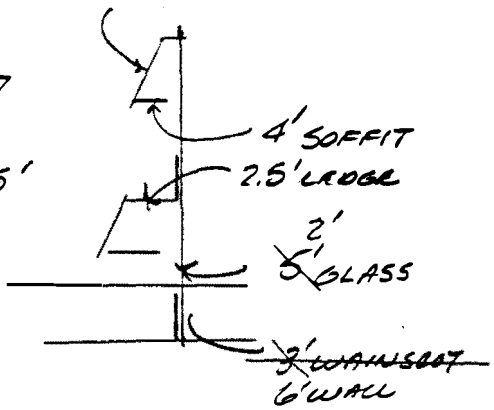
143,800 ÷ 19,200 = $7.48/SF VS $6.14/SF MEANS
5.24 + .90

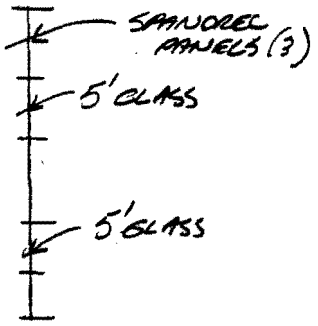
EXTERIOR CLOSURE

S. WALL



6.75' FASCIA





STAIR ENCLOSURE

187
275
429 (23.83 x 18)
891

Say 900 x $14 = $12,600
$14/SF

BET. STAIRS (22' HIGH)

19 x 14 $ = 266
2 x 4 x $6.50 = 52
6' x $30 = 180
498

Say $500/LF
$22.75/SF

GLASS + SANDREL

28 x 30 $ = 840

Say $840/LF
$30/SF

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-7	1.1.2.2	11/11

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY SOUTH ADDITION PHASE 2

NAME: TP

DATE: APRIL 88 | REVISION DATE:

N. WALL

ASSUME 10' PRECAST CONC PANEL

PARTITIONS

BLOCK @ STAIRS	2 X 275 =	550 #
BLOCK @ ELEVATOR	28 X 36	1008 #
		1558 #

INTERIOR DRYWALL

GR. FL.	10 X (96 + 80 + 36 + 78 + 60 + 144) =	4940 #
2ND FL	10 X 490	4900 #
		9840 #

GLASS WALL = (4' + 4' + 2')

GR FL	(90 + 70) GLASS X 10	1600 #
2ND FL	(90 + 80) X 10	1700
		3300 #

(6 X 2.50) + (4 X 12) = 63 # / 10 = 6.30 #

USE

MEANS 5.85 to 12.50

FERMILAB COST ESTIMATE	PROJECT TITLE				PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR CONTROL & COMPUTER ROOM PHASE 2				2-5-8	APRIL 1988	WBS 1.1.2.3	1/3
SECTION CES	QUANTITIES BY TP	PRICES BY TP	CHECKED BY WN		DISTRIBUTION OF ITEMIZED COST			
ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT		(1) UNIT / AMOUNT	(2) UNIT / AMOUNT	(3) UNIT / AMOUNT	

SUMMARY OF COSTS:

CONTROL & COMPUTER ROOM OCCUPANCY	$ 253,900	
SUBTOTAL	$ 253,900	
O + P @ 20%	51,100	
SUBTOTAL	$ 305,000	JAN. 1988 DOLLARS
ESCALATION TO JULY 1991 @ .186	55,000	
TOTAL	$ 360,000	JULY 1991 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CONTROL & COMPUTER ROOM PHASE 2

PROJECT NO. 2-5-8 | DATE APRIL 1988 | REVISION DATE WBS 1.1.2.3 | PAGE 2/3

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	UNDERFLOOR CABLE TRAYS (18"WIDE)	990	LF	13.45	13,300				
	HVAC INCL UNDERFLOOR PIPING	6750	SF	15.-	101,300				
	UNDERFLOOR HALON SYSTEM	6750	SF	1.50	10,100				
	ACCESS FLOORING	6750	SF	11.-	74,300				
	CEILING	6750	SF	1.50	10,100				
	PULL CABLES		LS		44,800	6 WKS W/ 4 MEN			
		SUBTOTAL			253,900				
	GROUNDING INCL IN WBS 1.2.2								

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-8	WBS 1.1.2.3	3/3

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
CONTROL & COMPUTER ROOM PHASE 2

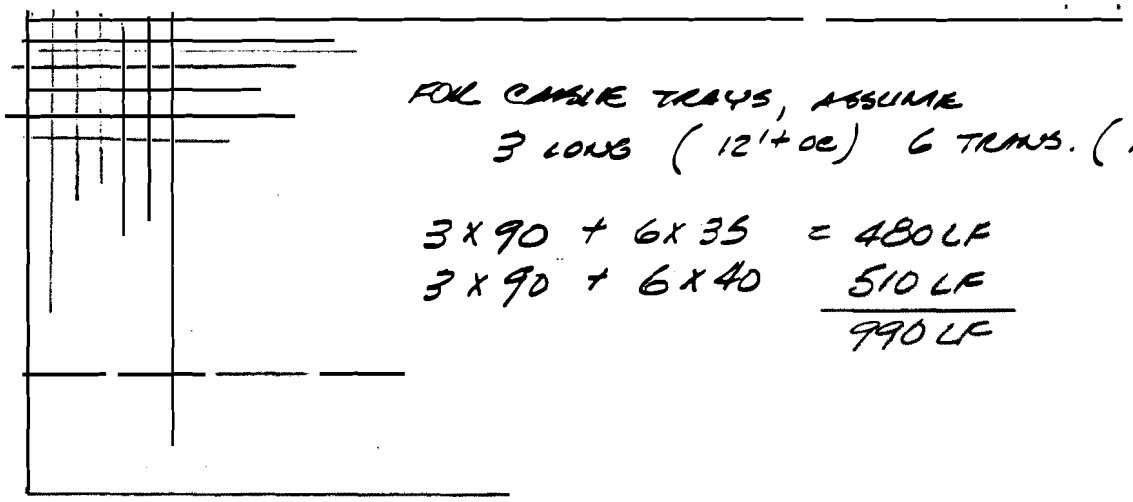
NAME: TP

DATE: APRIL 88

REVISION DATE:

AREA:

90 x 35 = 3150 #
90 x 40 = 3600 #
} 6750 # TOTAL



FOR CABLE TRAYS, ASSUME
3 LONG (12'+ OE) 6 TRANS. (15'±)

3 x 90 + 6 x 35 = 480 LF
3 x 90 + 6 x 40 = 510 LF
990 LF

FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR SOUTHWEST PARKING LOT EXTENSION PHASE 2	2-5-9	APRIL 1988	1.1.2.4	1/5

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

PARKING LOT	$ 220,300	
COOLING RING DEMOLITION	45,000	
SUBTOTAL	$ 265,300	
O + P @ 20%	54,700	
SUBTOTAL	$ 320,000	JAN. 1988 DOLLARS
ESCALATION TO JULY 1991 @ .186	60,000	
TOTAL	$ 380,000	JULY 1991 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
SOUTHWEST PARKING LOT EXTENSION PHASE 2

PROJECT NO. 2-5-9 | DATE APRIL 1988 | REVISION DATE 1.1.2.4 | PAGE 2/5

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	PARKING LOT								
	EXCAVATION				40,400				
	DRAINAGE				11,600				
	GRANULAR				66,900				
	PAVING				88,000				
	SIDEWALKS				5,400				
	MISC				8,000				
			SUBTOTAL		220,300				

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
SOUTHWEST PARKING LOT EXTENSION PHASE 2

PROJECT NO. 2-5-9 | DATE APRIL 1988 | REVISION DATE 1.1.2.4 | PAGE 3/5

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	EARTHWORK								
	EXCAVATION 4X200X200	6000	CY	2.50	15,000				
	HAUL 6000 CY/16/2.5	160	HRS	55	8,800				
	GRADING NEW W. LOT 180'X330'	6600	SY	1.40	9,200				
	GRADING NEW E. LOT 60'X130'	1200	SY	2.-	2400				
	DITCHES		LS		5,000				
							40,400		
	DRAINAGE								
	12" CMP	400	LF	12.-	4800				
	CB W/ FRAME & COVER	3	EA	1600	4800				
	MISC, TRENCHING		LS		2000				
							11,600		
	ROADS & WALKS								
	BASE COURSE - WEST LOT 1'X 66,900 #	2500	CY	14-	35,000				
	SURFACE COURSE 6"X 66,900 #	1250	CY	16-	20,000				
	BASE COURSE - EAST LOT 1X8300 #	320	CY	14-	4500				
	SURFACE COURSE 6"X8300 #	160	CY	16	2600				
	GRADE FOR PAVING - W. LOT	7500	SY	0.60	3800				
	GRADE FOR PAVING E. LOT	1000	SY	1.00	1000				
							66,900		

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
SOUTHWEST PARKING LOT EXTENSION PHASE 2

PROJECT NO. 2-5-9 | DATE APRIL 1988 | REVISION DATE 1.1.2.4 | PAGE 4/5

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	PAVING								
	TACK COAT - W. LOT	7500	SY	0.50	3800				
	TACK COAT E. LOT	950	SY	0.75	700				
	BINDER COURSE - W. LOT (1½")	7500	SY	3.20	24,000				
	SURFACE (1½")	7500	SY	3.40	25,500				
	SURFACE NW LOT (1½")	7700	SY	3.40	26,200		(SURFACE EXISTING LOT)		
	BINDER COURSE - E. LOT (1½")	950	SY	3.30	3100				
	SURFACE (1½")	950	SY	3.50	3300				
	STRIPING	800	LF	.18	1400				
							88,000		
	SIDEWALKS								
	6" WALK w/ CURB 12' WIDE X 150'	1800	SF	2.60	4700				
	4" GRANULAR BASE	1800	SF	1.40	700				
							5400		
	SITE IMPROVEMENTS								
	TIMBER STILE @ E. LOT 80'		LS		4000				
							4000		
	CLEANUP & MISC		LS		4000				
							4000		
			SUBTOTAL		220,300				

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR SOUTHWEST PARKING LOT EXTENSION PHASE 2	PROJECT NO.: 2-5-9	DATE: APRIL 1988	REVISION DATE: 1.1.2.4	PAGE: 5/5

SECTION: CES	QUANTITIES BY: TP	PRICES BY: TP	CHECKED BY: WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	DEMOLITION OF COOLING RING								
	REMOVE & TURN OVER TO FERMILAB								
	POWER PANELS & TRANSFORMERS								
	AIR COMPRESSOR								
	FLUORESCENT FIXTURES								
	EMERG. BATTERY PACK & LIGHTS								
	SMOKE DETECTORS								
	ELECTRIC UNIT HEATERS								
	A/C CONDENSER UNIT		LS		3,000				
	DEMOLISH & HAUL AWAY DEBRIS								
	ELECTRICAL CONDUIT	1000	LF	1.14	1100			020	708 0020
	TIMBER STRUCTURE (11' AVE HGT)	75,000	CF	0.25	18800	TRUSSES, BRACES		020	604 0700
	CONCRETE SLAB	6700	SF	3.31	22,100			020	754 0420
		SUBTOTAL			45,000				

FERMILAB COST ESTIMATE	PROJECT TITLE			PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR CROSS GALLERY NORTH ADDITION PHASE 3			2-5-10	APRIL 1988	WBS1.1.3.1	1/5
SECTION CES	QUANTITIES BY TP	PRICES BY TP	CHECKED BY WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

NORTH ADDITION	$ 198,700	
SUBTOTAL	$ 198,700	
O + P @ 20%	41,300	
SUBTOTAL	$ 240,000	JANUARY 1988 DOLLARS
ESCALATION TO OCTOBER 1992 @ .271	65,000	
TOTAL	$ 305,000	NOVEMBER 1992 DOLLARS

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY NORTH ADDITION PHASE 3

PROJECT NO.	DATE	REVISION DATE	PAGE
2-5-10	APRIL 1988	WBS 1.1.3.1	2/5

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	CROSS GALLERY NORTH ADDITION								
	DEMOLITION				13,400				
	WINDOW ALTERATIONS				69,300				
	EXCAVATION / FOUNDATIONS + S.O.G.			7.93	11,900				
	SUPERSTRUCTURE			9.30	14,000				
	EXTERIOR			25.-	37,500				
	ROOFING			4.10	6 200				
	INTERIOR FINISHES			12.50	18,800				
	MECHANICAL			12.80	19,200				
	ELECTRICAL			5.60	8,400				
		SUBTOTAL			198,700				

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR CROSS GALLERY NORTH ADDITION PHASE 3			PROJECT NO. 2-5-10	DATE APRIL 1988	REVISION DATE WBS 1.1.3.1	PAGE 3/5
SECTION CES	QUANTITIES BY TP	PRICES BY TP	CHECKED BY WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	SITEWORK								
	* CURB REMOVAL	340	LF	3.70	1300				
	PAVEMENT REMOVAL 190 X 22 X 1'/9	465	SY	3.15	1500	* INCLUDE W/ DEMO BELOW			
	* DEMOLISH SIDEWALK (80 X 10) + (10 X 13)	105	SY	5.10	600				
	* UTILITY RELOCATION (HYDRANT)	1	EA		1000				
	* SAWCUTTING, MISC DEMO		LS		600				
							5000		
	* NEW CURBING	270	LF	10.—	2700				
	* PATCH PAVEMENT 270 X 1' X 1/9	30	SY	MIN.	500				
	* NEW SIDEWALK 160 X 10' AVE	1600	SF	3.—	4800	(2.60 + 0.40)			
	* BACKFILL W/ TOPSOIL 190 X 22 X 2 X 1/27	310	CY	14.—	4300				
							12,300		
	DEMOLISH EXISTING N. WALL			—					
	PRECAST FASCIA 10.83 X 62	672	SF	5.00	3400				
	PRECAST WAINSCOTE 4 X 62	248	SF	5.00	1200				
	SOFFIT 4 X 62	248	SF	1.00	300				
	WINDOW WALL 5 X 62	310	SF	1.80	600				
	STEEL FRAMING		LS		500				
	REMOVE ASBESTOS @ FASCIA	435	SF	2.50	1100				
	HAUL DEBRIS		LS		500				
	MISC DEMOLITION, PATCHING, DOORS		LS		800				
	TEMPORARY PARTITION 62 X 16'	992	SF	3.50	3500				
							11,900		
	* INCLUDE WITH WBS 1.3.3 No. 2-5-12								

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY NORTH ADDITION PHASE 3

PROJECT NO. 2-5-19 | DATE APRIL 1988 | REVISION DATE WBS 1.1.3.1 | PAGE 4/5

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	GENERAL EXCAVATION 1500 X 1.17 X 1/27	65	CY	3.-	200				
	EXCAVATION FOR FOUNDATION 100 LF	100	CY	5.-	500	INCLUDES FOOTING FOR 3 COLS			
	FOOTING	12	CY	200	2400				
	FOUNDATION WALL + PIERS	12	CY	300	3600				
	GRANULAR BACKFILL	40	CY	18.-	700				
	SLAB ON GRADE (8")	1500	SF	2.40	4500	LESS GRAN. FILL			
						11,900			
	FOR NEW 1500 S.F. OFFICE AREA USE BOOSTER GALLERY UNIT COSTS!								
	SUPERSTRUCTURE	1500	SF	9.30	14,000				
	EXTERIOR (22' PANELS, 16' HGT)			25.-	37,500	(CREDIT FOR 4 EXIST. PANELS)			
	ROOFING			4.10	6,200				
	INTERIOR FINISHES			12.50	18,800				
	MECHANICAL, PLUMBING & F.P.			12.80	19,200	(NO TOILET)			
	ELECTRICAL			5.60	8400				
						104,100			
			SUBTOTAL		145,200				
		OH+P@	20%		29800				
					175,000	($116.67/SF)			
	NOTE: WITHOUT SITEWORK				129,400				
					25,600				
					145,000	($96.67/S.F) ←			

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY NORTH ADDITION PHASE 3

PROJECT NO. 2-5-10 | DATE APRIL 1988 | REVISION DATE WBS 1.1.3.1 | PAGE 5/5

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	LUNDOKN CHANGES								
	REMOVE 18 WINDOWS + DEMOLISH @ 44"	792	SF	1.80	1400				
	REMOVE 9 PRECAST CONC PANELS	891	SF	5.00	4500				
	DEMOLISH 5 PANELS + HAUL DEBRIS 5X4.5X22	495	SF	2.-	1000	(4 TO BE REUSED)			
	RE-ERECT 4 PRECAST CONC PANELS	396	SF	5-	2000				
	GLASS + SPANDRELS @ EXIST. BLDGS	1848	SF	30.-	55,400	6 x 11' x 21			
	PRECAST SILL PIECES 8X11	88	LF	18.-	1600				
	FLASHING 100 X 3	300	SF	6.-	1800				
	ROOF PATCHING	200	SF		1000				
	BLINDS 8 X 6 X 11	525	SF		600				
			SUBTOTAL		69,300				
	NORT ADDITION	SUBTOTAL			129,400				
		-			198,700				
		USE			$200,000				
		OH+P @ 20%			40,000				
		TOTAL			240,000				

FERMILAB COST ESTIMATE	PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR CROSS GALLERY REMODELING PHASE 3	PROJECT NO.: 2-5-11	DATE: APRIL 1988	REVISION DATE: WBS 1.1.3.2	PAGE: 1/9
SECTION: CES	QUANTITIES BY: TP / PRICES BY: TP / CHECKED BY: WN	DISTRIBUTION OF ITEMIZED COST			

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

CROSS GALLERY REMODELING	$ 784,800	
SUBTOTAL	$ 784,800	
O + P @ 20%	155,200	
SUBTOTAL	$ 940,000	JANUARY 1988
ESCALATION TO OCTOBER 1992 @ .271	255,000	
TOTAL	$1,195,000	OCTOBER 1992

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
GROSS GALLERY REMODELING PHASE 3

PROJECT NO. 2-5-11 | DATE APRIL 1988 | REVISION DATE WBS 1.1.3.2 | PAGE 2/9

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	REMODELING								
	CONCRETE FLOOR @ MTG ROOM				54,000				
	COLUMN REMOVAL				32,000				
	CUTTING AREA TO BE REMODELED		20,600		82,400				
	INTERIOR, INCL SEATING & PROJECTION RM				216,400				
	MECHANICAL				285,000				
	ELECTRICAL				115,000				
			SUBTOTAL		784,800				
			OH&P @ 20		155,200				
			TOTAL (15.63)		940,000				

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY REMODELING PHASE 3

PROJECT NO.	DATE	REVISION DATE	PAGE
2-5-11	APRIL 1988	WBS 1.1.3.2	3/9

SECTION: CES | QUANTITIES BY: TP | PRICES BY: TP | CHECKED BY: WN

DISTRIBUTION OF ITEMIZED COST

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	(1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	MEETING ROOM FLOOR & PROJ. ROOM								
	ASSUME STRUCTURAL CONC. FILL W/ VOIDS								
	TO CANTILEVER OVER FRANCO FLOOR AREA								
	CONCRETE FILL								
	PROJ. ROOM 320 X 3 X 1/27	36	CY	200	7200	} VOIDS COULD BE USED			
	MTG ROOM 3500 X 1.5 X 1/27	194	CY	200	38800	} INCL REBAR & FINISHING			
	FORMS (POURED IN QUARTERS	—	—		—				
	3(10+10+30+10+10)	210	SF	3.-	600				
	(1.5(70) X 2 X 1.5) + (50 X 1.5)	390	SF	3.-	1200				
	5 X 50 X 0.5	125	SF	6.-	800	RISER FORMS (HANGING)			
	BOTTOM FORM	1015	SF	5.-	5100				
					53,700				
				USE	54,000	(#14.14/SF)			
	FIXED SEATING @ MEETING ROOM								
	RANGE #100 to #170	200	EA	120	24,000				
	PROJECTION ROOM SPECIALTIES								
	PROJ SCREEN -								
	SOUND SYSTEM, ETC				16,000				
				USE	40,000	(#1.44/SF)			

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY REMODELING PHASE 3

PROJECT NO.: 2-5-11 | DATE: APRIL 1988 | REVISION DATE: WBS 1.1.3.2 | PAGE: 4/9

SECTION: CES | QUANTITIES BY: TP | PRICES BY: TP | CHECKED BY: WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	REMOVAL OF MARSHALLING ROOM COLUMNS								
	SHORE EXISTING BMS @ F13 + G13	4	EA	250	1000	200 JACKS + 2 MEN		X8 = 16 JACKS	
	BRACE TOP OF COLUMNS	2	EA	200	400				
	CUT ROOF OPENINGS (5 LOCATIONS)		LS		500				
	EXTEND COLUMNS ABOVE ROOF	6	EA		2400	200 MAT, 3 MEN X 2 DAYS			
	NEW BEAMS 2 X 60 X 150 (MAT. ONLY)	9	T	2,000	18,000	(SPACE SHIPPING, ETC			
	CRANE + CREW (80T, 100' BOOM)	8	HRS		6,600				
	BRACING 5 X 2	10	EA	200	2,000				
	CUT COLUMNS	2	EA	50	100				
	PATCH ROOF	10	LOCATIONS	50	500				
	COVER BUS + WATERPROOF SUPPORTS	120	LF	25	3000				
	REMOVE DEBRIS		LS		600				
					32,000		(1.55/SF)		

FERMILAB COST ESTIMATE

PROJECT TITLE: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY REMODELING PHASE 3

PROJECT NO. 2-5-11 | DATE APRIL 1988 | REVISION DATE WBS 1.1.3.2 | PAGE 5/9

SECTION CES | QUANTITIES BY TP | PRICES BY TP | CHECKED BY WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT
	TOTAL AREA: 20,600 SF								
	CEILING			0.60					
	FLOORING			0.40					
	PARTITIONS & DOORS .23 x 9 X 15/150			0.21					
	ELECTRICAL POWER			0.40					
	LIGHTING #18/25 SF			0.72					
	SPRINKLERS			0.45					
	PER MEANS "REPAIR & REMODELING COST DATA" UNDER "GUTTING" PG 17	20,600	SF	3.51		MIN.	COMMERCIAL		
				4.91		MAX	COMMERCIAL		
	ASSUME SOME SPRINKLERS, DUCTWORK & ELECT DIST. TO REMAIN	20,600	SF	4.00	82,400		82,400		
	PARTITIONS 185 SF/SF FLOOR	17,500	SF	2.60	43,800				
	EXTERIOR WALL, REPAIR OF PARTY WALL		LS		10,000				
	FLOORING	20,600	SF	2.00	41,200				
	CEILINGS			1.50	30,900				
	DOORS	64	EA	600	32,000				
	PAINTING (1.7 ± 0.3 + MISC) X 0.4			.90	18,500				
							176,400		(8.56/SF)
	MECHANICAL (BOOSTER INCL TOILET)			13.80	285,000				
	ELECTRICAL (BOOSTER			5.60	115,000				
							400,000		(#19.42/SF
		SUBTOTAL			784,800				
					155,200				
		TOTAL			940,000				

FERMILAB

ENGINEERING NOTE

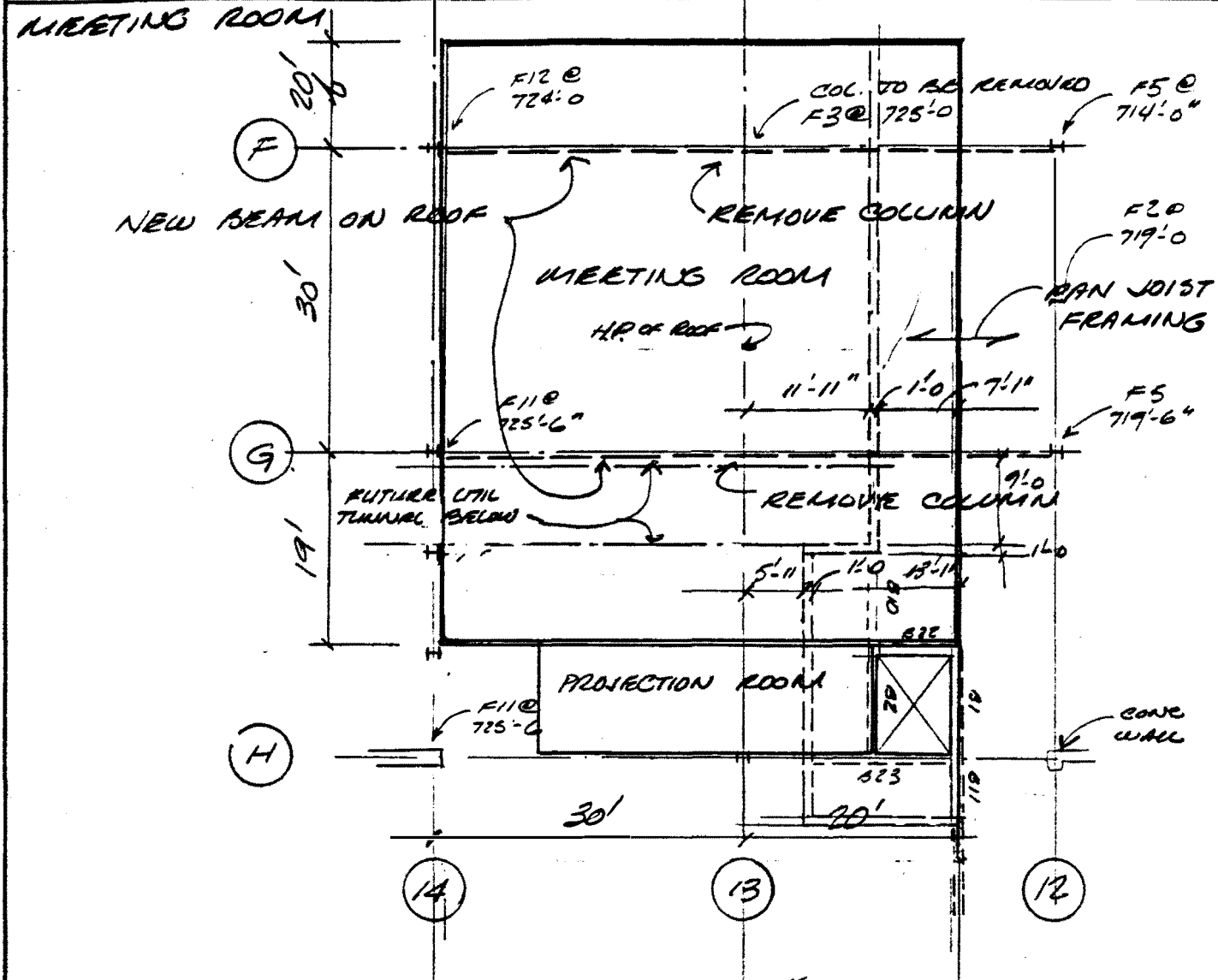
SECTION	PROJECT	SERIAL-CATEGORY	PAGE
CES	2-5-11	WBS 1.1.3.2	6/9

SUBJECT: FOOTPRINT-GALLERY UPGRADE - CDR

CROSS GALLERY REMODELING — PHASE 3

NAME: TP

DATE: APRIL 88 — REVISION DATE:



A ROOF LOAD = 30 X 15 X 0.05 = 23.25 K @ EXISTING COLUMN

F3 = 5'-6" SQ FTG @ 3 KSF = 91 K

14B22 @ 5'oc ON 30' SPAN M_{ALL} = 29 X 24 X 1/12 = 58 K w = .103 KSF

21WF68 M_{ALL} = 280 w_{ALL} = 0.082 KSF (OVERDESIGNED)

NOTE: ROOF WAS DESIGNED FOR INSULATING CONCRETE ASSUMING 103 #/CF — BUT SPECIFIED DENSITY WAS ONLY 22 #/CF

DL

ROOFING	5
DECK	3
INSUL	6 (3" AVE @ .022)
CEIL	1
FRAMING	5
	30

SNOW 25

MECH 5 (490 X 5 = 2500 #)

30

50 NOW VS 80 THEN

SUBJECT FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY REMODELING PHASE 3

NAME TP

DATE APRIL 88 | REVISION DATE

COLS F12 AND G12
CONTRIB AREA NOW (ROOF ONLY)

$15' \times (30 + 7.5) + (7.5 \times 9.5) = 634^{\#} \times .080 = 50.7^{K}$

COLS F14 and G14

$30' \times (15 + 7.4) = 672^{\#} \times .080 = 53.8^{K}$

IF COLS F13 AND G13 REMOVED, ASSUMED LOAD @ 50 #/SF

COLS F12 AND G12 (ACTUAL FTG LOAD DES = 117.1; CAPACITY 126.7^{K})

$(15 \times 7.5) + (7.5 \times 9.5) + (30 \times 30) = 1084^{\#} \times .05 = 54.2^{K}$ OK (1.07%)

COLS F14 AND G14 F14 – 266.6 DES 270.6 CAP; G14 202.1 DES 242.8 CAP

$(30 \times 7.4) + (30 \times 30) = 1122^{\#} \times .05 = 56.1^{K}$ OK (1.04%)

FOR $w = .05$ $L = 60$ @ 30' c to c.

$w = .05 \times 30 = 1.5^{K/L}$ $W = 90^{K}$ $V = 45^{K}$ $M = 675^{IK}$

$S_{REQ'D} = 338\ IN^3$

(10 x .64)
(8¼ x .685)

24 x 76
21 x 83
27 x 84
21 x 68

FOR CENTER CONNECTION ONLY

$P = 45^{K}$ $M = 45 \times 60 \times 1/4 = 675^{IK}$

$A_{MIN} = 60^2 \times 1/8 \times .1$ 45

MUST STABILIZE TOP FLANGE, 720^{IK} $S_{SUPPLIED} = 360$

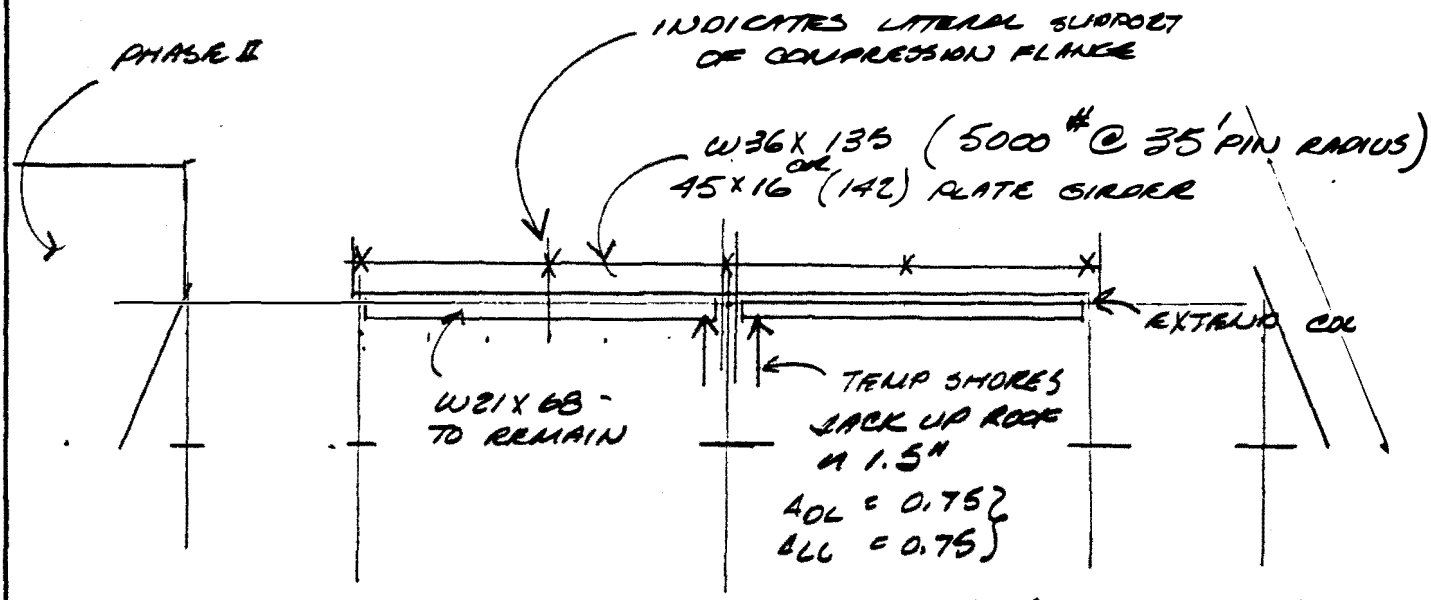
USE W36 x 135 OK

$\Delta_{TOTAL} = \frac{PL^3}{48EI} = \frac{45 \times 60^3 \times 1728}{48 \times 29 \times 10^3 \times 7800} = 1.5''$ OK (LLD 0.75" OK)

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-11	WBS 1.1.3.2	8/9

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY REMODELING PHASE 3

NAME: TP
DATE: APRIL 88
REVISION DATE:



WITH NO SNOW, SHORING LOAD
= 15 X 30 X .025 = 11.25K EA SIDE
(22.5K TOTAL)

ASSUME:
80T TRUCK MOUNTED CRANE
100' BOOM - ONE DAY

$\frac{12 \times 00}{360} = 2''$ LL DEF ALLOWED
6

USE 150 #/L.F

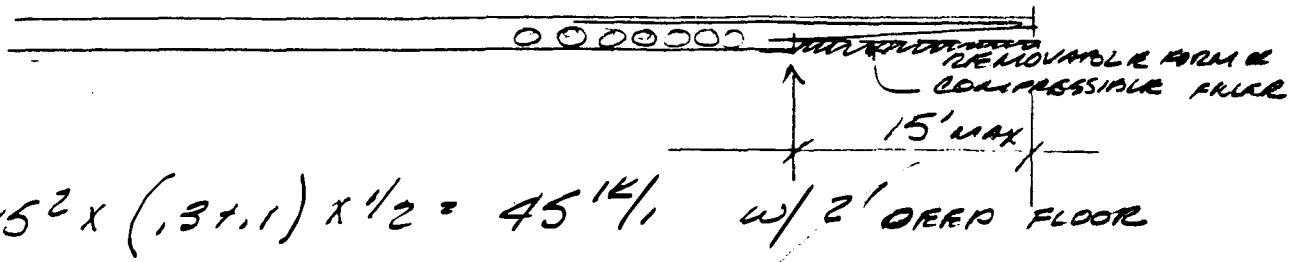
COLUMNS & FTGS OK BY INSPECTION OF DESIGN CALCS
(OVERDESIGN FOR ROOF @ 80#)
(NO L.L. REDUCTION @ FRAMED FLOOR)
(FTGS SLIGHTLY OVERSIZED)

FERMILAB ENGINEERING NOTE	SECTION	PROJECT	SERIAL-CATEGORY	PAGE
	CES	2-5-11	WBS 1.1.3.2	9/9

SUBJECT: FOOTPRINT GALLERY UPGRADE - CDR
CROSS GALLERY REMODELING PHASE 3

NAME: TP
DATE: APRIL 88
REVISION DATE:

MEETING ROOM FLOOR



$15^2 \times (.3+.1) \times 1/2 = 45^{1\#}/_{1}$ w/ 2' DEEP FLOOR

TOTAL AREA: $70 \times 50 = 3500$ SF (PROJ. ROOM = 320)
FRAMED FLOOR AREA: $(7.08 \times 59) + (14.92 \times 11) = 1015$ SF
SURCHARGE THICKNESS: $(3+0) 1/2 = 1.5$ "

FERMILAB COST ESTIMATE	PROJECT TITLE	PROJECT NO.	DATE	REVISION DATE	PAGE
	FOOTPRINT GALLERY UPGRADE - CDR LANDSCAPING PHASE 3	2-5-12	APRIL 1988	WBS 1.1.3.3.	1/1

SECTION	QUANTITIES BY	PRICES BY	CHECKED BY
CES	TP	TP	WN

ITEM NO.	DESCRIPTION OF WORK ITEMS	QUANTITY	UNIT	DISTRIBUTION OF ITEMIZED COST (1) UNIT	(1) AMOUNT	(2) UNIT	(2) AMOUNT	(3) UNIT	(3) AMOUNT

SUMMARY OF COSTS:

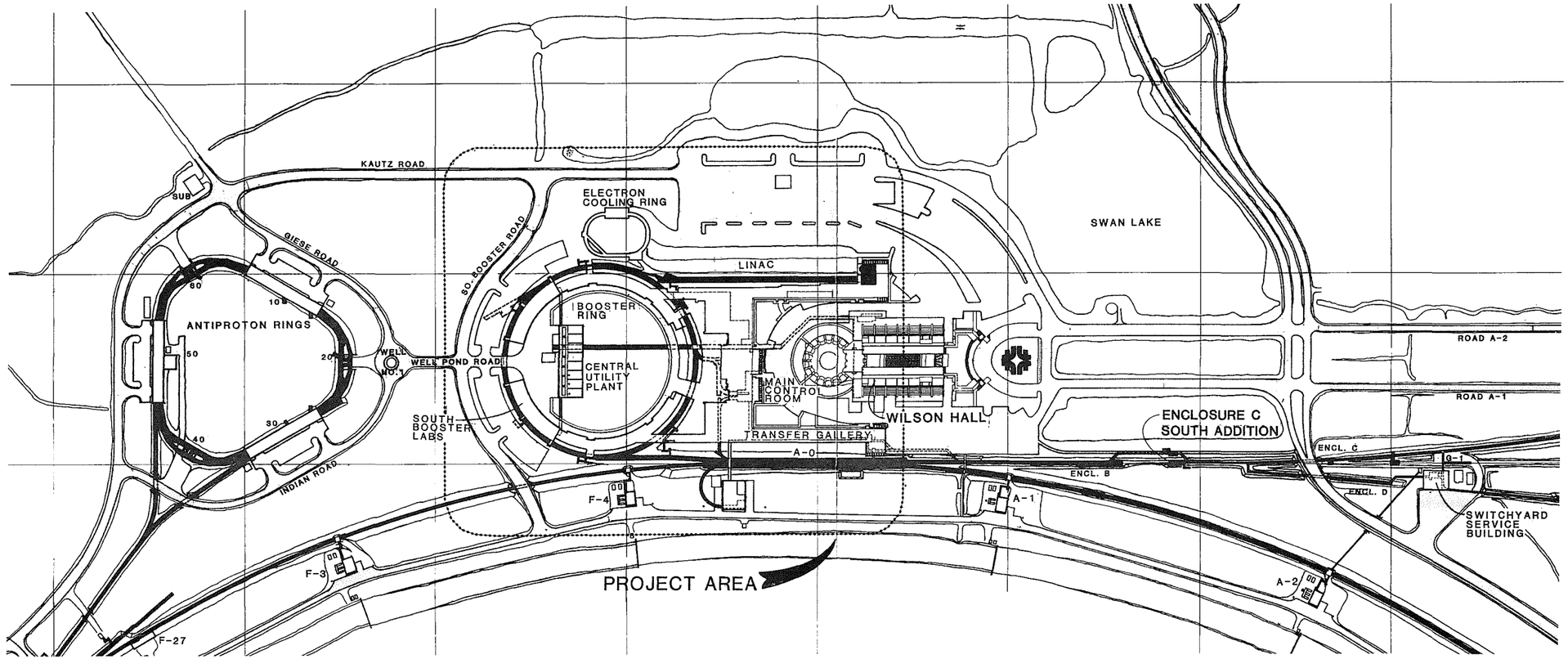
DEMOLITION AT N. CROSS GALLERY PARKING	$ 5,500	
NEW CURBING, SIDEWALKS	14,300	
LANDSCAPING @ NORTH CROSS GALLERY	12,000	
LANDSCAPING @ LINAC BERM AND REGRADE	52,000	
SUBTOTAL	$ 83,800	
O + P @ 20 %	16,200	
SUBTOTAL	$ 100,000	JANUARY 1988 DOLLARS
ESCALATION TO OCTOBER 1992 @ .271	30,000	
TOTAL	$ 130,000	OCTOBER 1992 DOLLARS

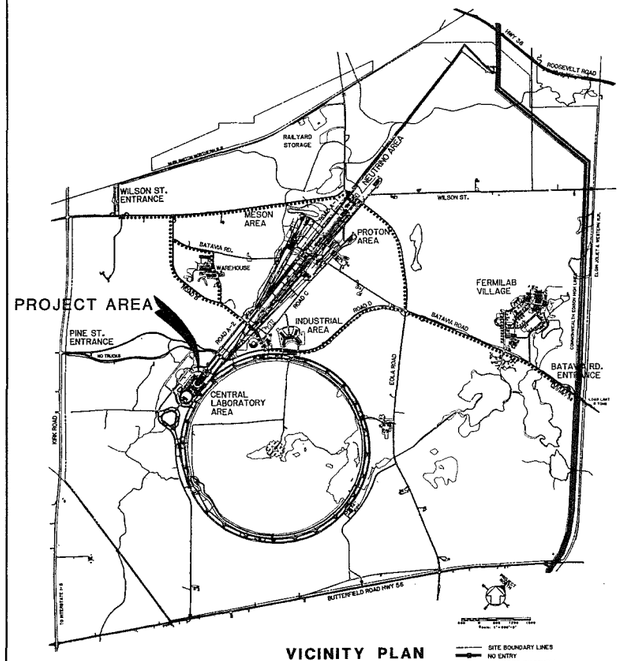
APPENDIX D

LIST OF DRAWINGS

Conceptual Design Report

Drawing No.	Drawing Title
CDR-1	Location and Vicinity Plans
CDR-2	Existing Site Plan and Demolition
CDR-3	Proposed Site Plan
CDR-4	Circulation Plans Ground Level
CDR-5	Circulation Plans Second Floor
CDR-6	Circulation Plans Lower Level
CDR-7	Construction Plans Phase I
CDR-8	Construction Plans Phase II
CDR-9	Construction Plans Phase III
CDR-10	Building Sections Sheet 1
CDR-11	Building Plans Sheet 2
CDR-12	Design Criteria Heating, Ventilating and Conditioning
CDR-13	Design Criteria Fire Suppression
CDR-14	Design Criteria Electrical





VICINITY PLAN

FOOTPRINT GALLERY UPGRADE

2-5-1

LIST OF DRAWINGS

REV.	DATE	DESCRIPTIONS REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY
CHECKED		
APPROVED		
SUBMITTED		

PROJECT NORTH

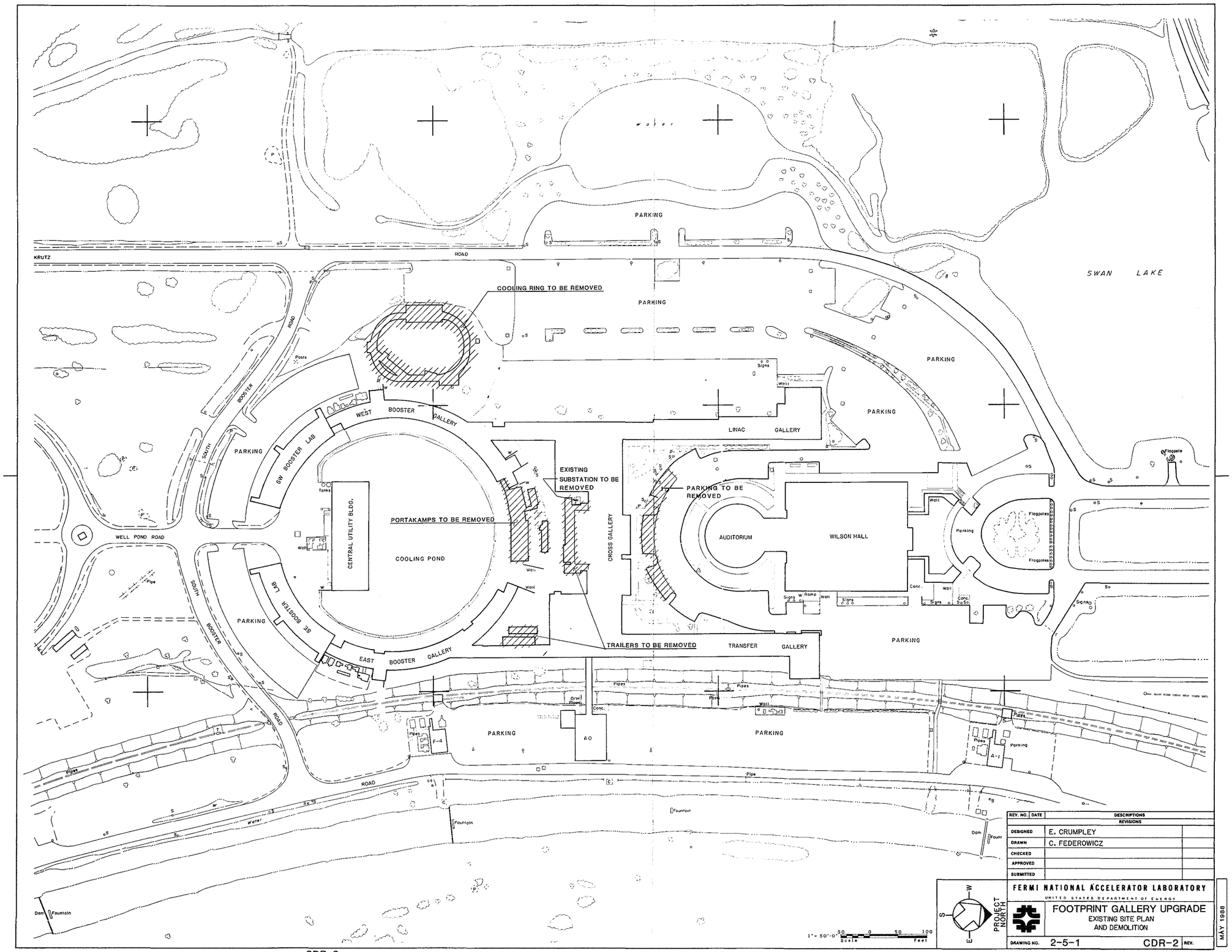
1" = 100'-0" Scale 100 0 100 200 Feet

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

FOOTPRINT GALLERY UPGRADE
LOCATION AND VICINITY PLANS

DRAWING NO. 2-5-1 CDR-1 REV.

MAY 1988



REV. NO.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		C. FEDEROWICZ
CHECKED		
APPROVED		
SUBMITTED		

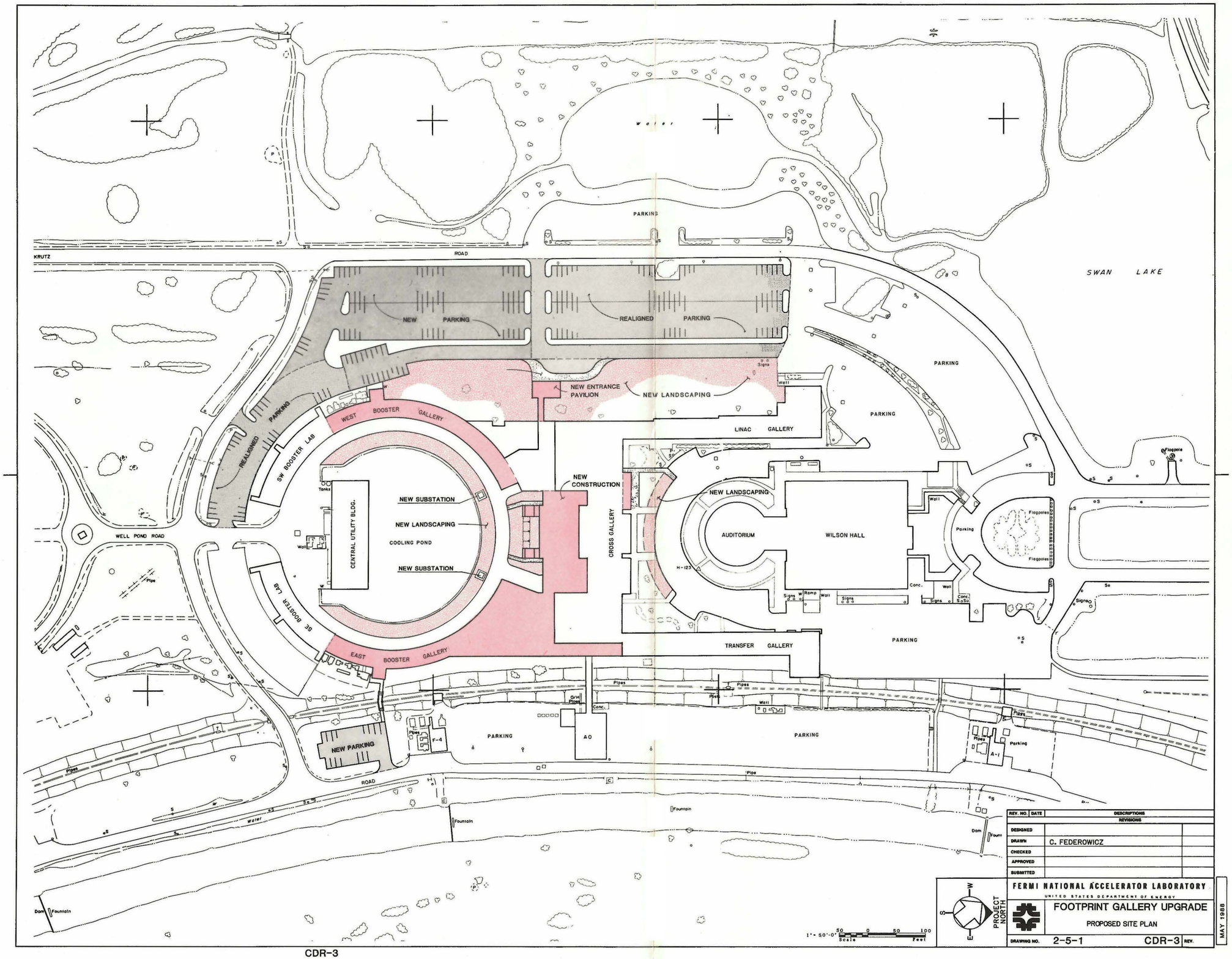
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

FOOTPRINT GALLERY UPGRADE
EXISTING SITE PLAN
AND DEMOLITION

DRAWING NO. 2-5-1 CDR-2 REV.

MAY 1988

CDR-2



REV. NO.	DATE	DESCRIPTIONS REVISIONS
DESIGNED		
DRAWN		C. FEDEROWICZ
CHECKED		
APPROVED		
SUBMITTED		

PROJECT NORTH

1" = 50'-0" Scale 50 0 50 100 Feet

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

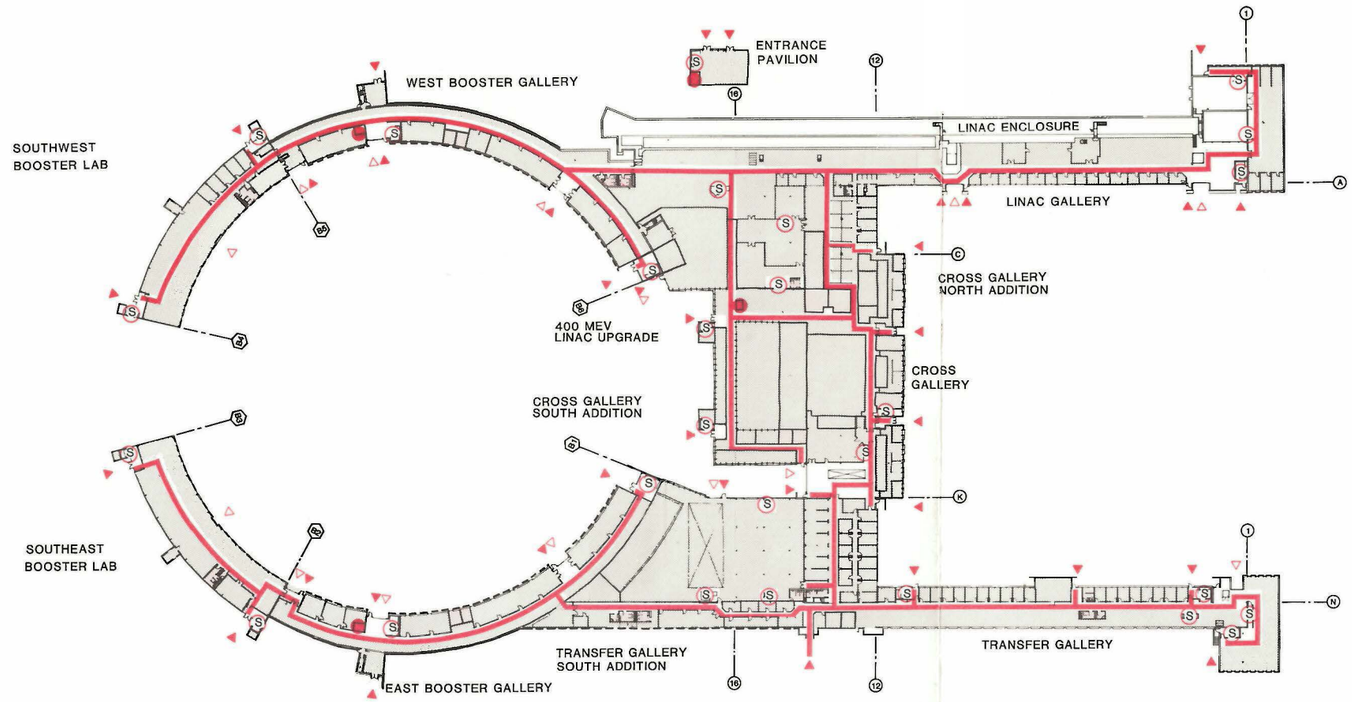
FOOTPRINT GALLERY UPGRADE

PROPOSED SITE PLAN

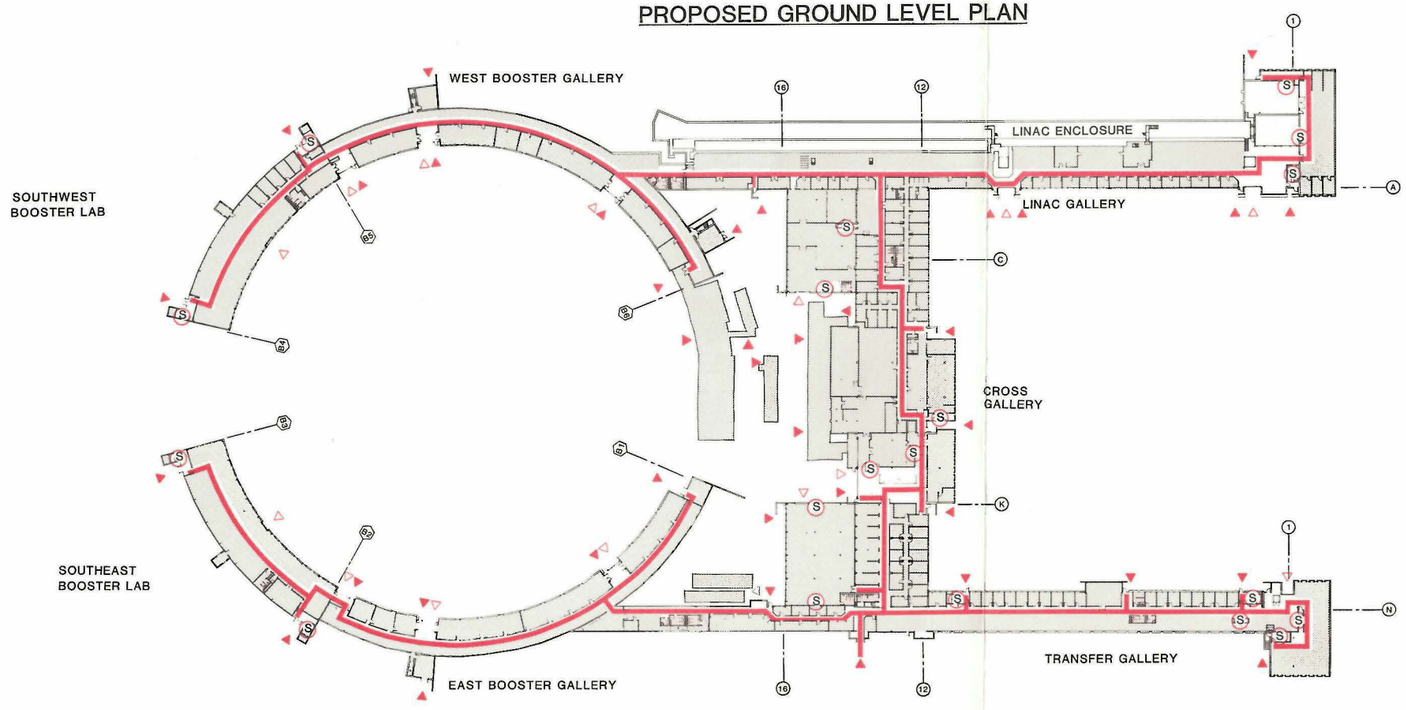
DRAWING NO. 2-5-1 CDR-3 REV.

MAY 1988

CDR-3



PROPOSED GROUND LEVEL PLAN



EXISTING GROUND LEVEL PLAN

LEGEND

- OCCUPIED AREA
- TOILET ROOMS
- MAIN CIRCULATION ROUTES
- (S) STAIR
- ▲ PERSONNEL ENTRY
- △ TRUCK ENTRY
- ● ELEVATOR

1"=40'-0" Scale — 40 0 40 80 Feet

PROJECT NORTH

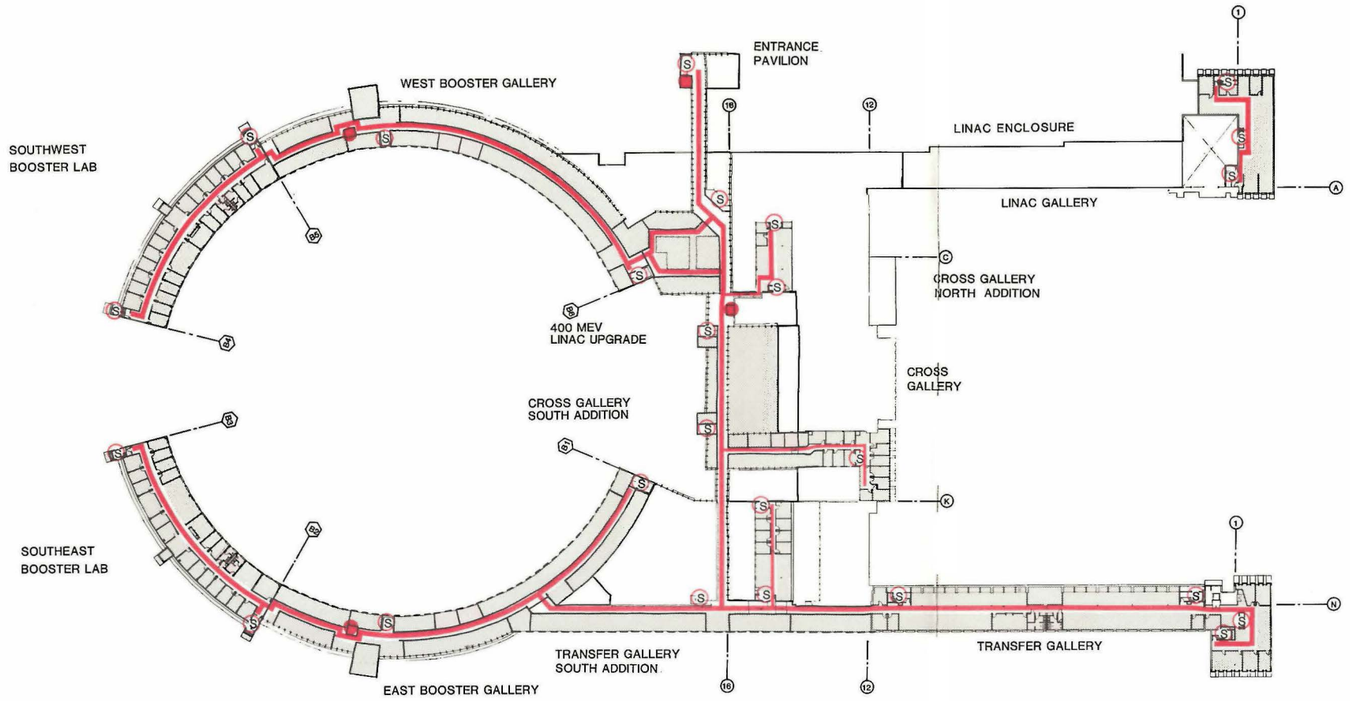
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY/ D. WAGNER/ J. WEBBER
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

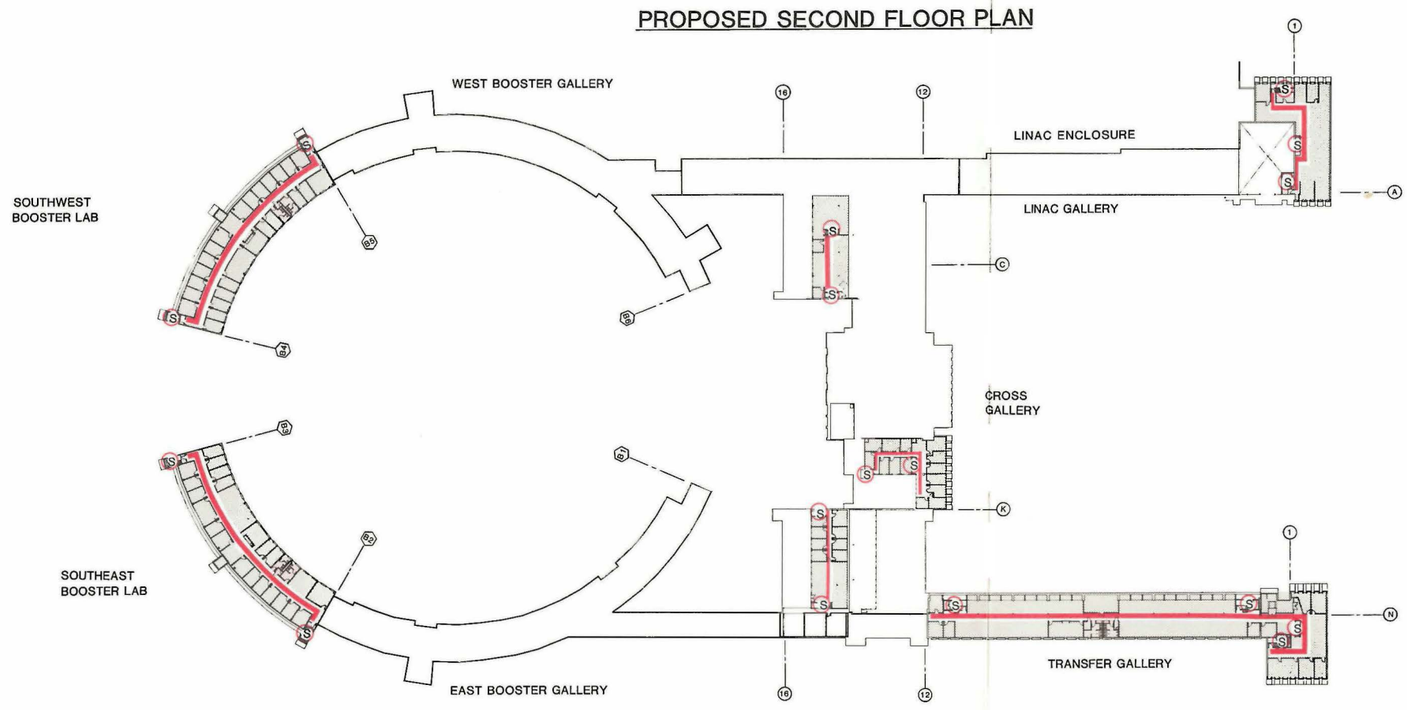
FOOTPRINT GALLERY UPGRADE
CIRCULATION PLANS GROUND LEVEL

DRAWING NO. 2-5-1 CDR-4 REV.

MAY 1988



PROPOSED SECOND FLOOR PLAN



EXISTING SECOND FLOOR PLAN

LEGEND

- OCCUPIED AREA
- TOILET ROOMS
- MAIN CIRCULATION ROUTES
- STAIR
- PERSONNEL ENTRY
- TRUCK ENTRY
- ELEVATOR

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

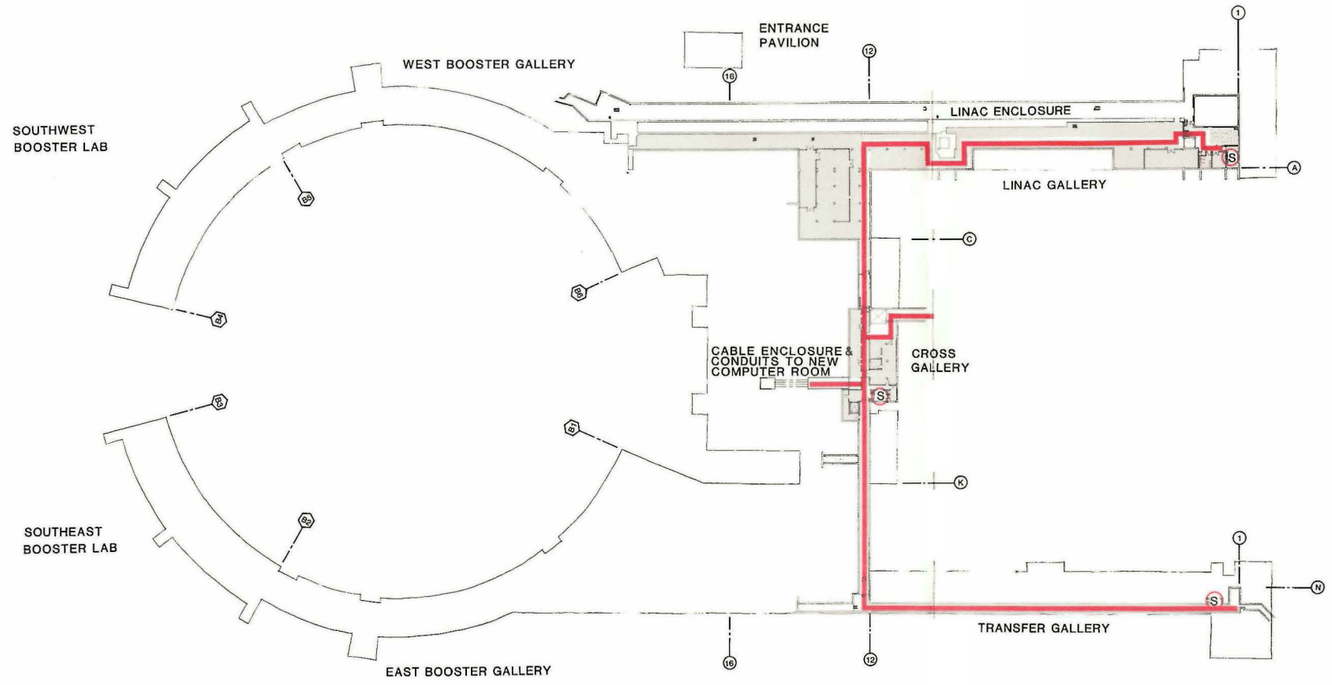
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY/ D. WAGNER/ J. WEBBER
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

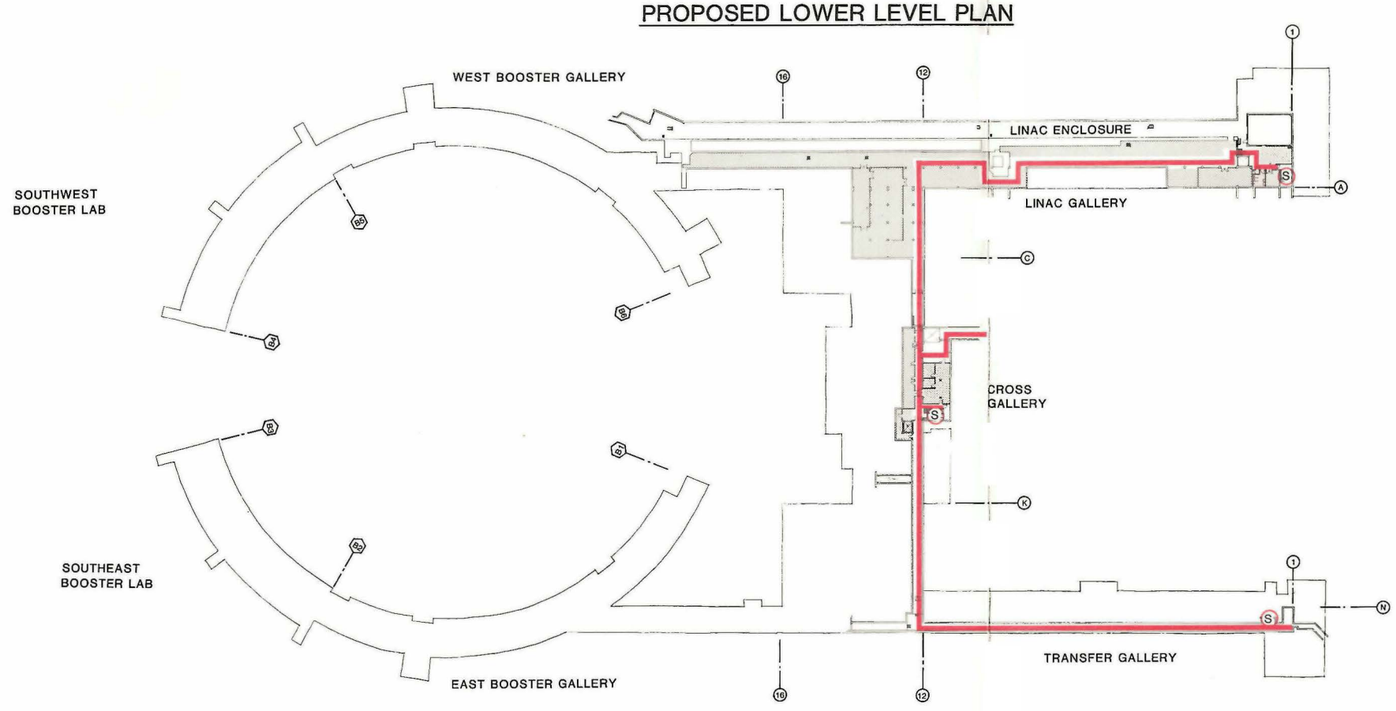
FOOTPRINT GALLERY UPGRADE
CIRCULATION PLANS
SECOND FLOOR

DRAWING NO. 2-5-1 CDR-5 REV.

MAY 1988



PROPOSED LOWER LEVEL PLAN



EXISTING LOWER LEVEL PLAN

LEGEND

- OCCUPIED AREA
- TOILET ROOMS
- MAIN CIRCULATION ROUTES
- (S) STAIR
- ▲ PERSONNEL ENTRY
- △ TRUCK ENTRY

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

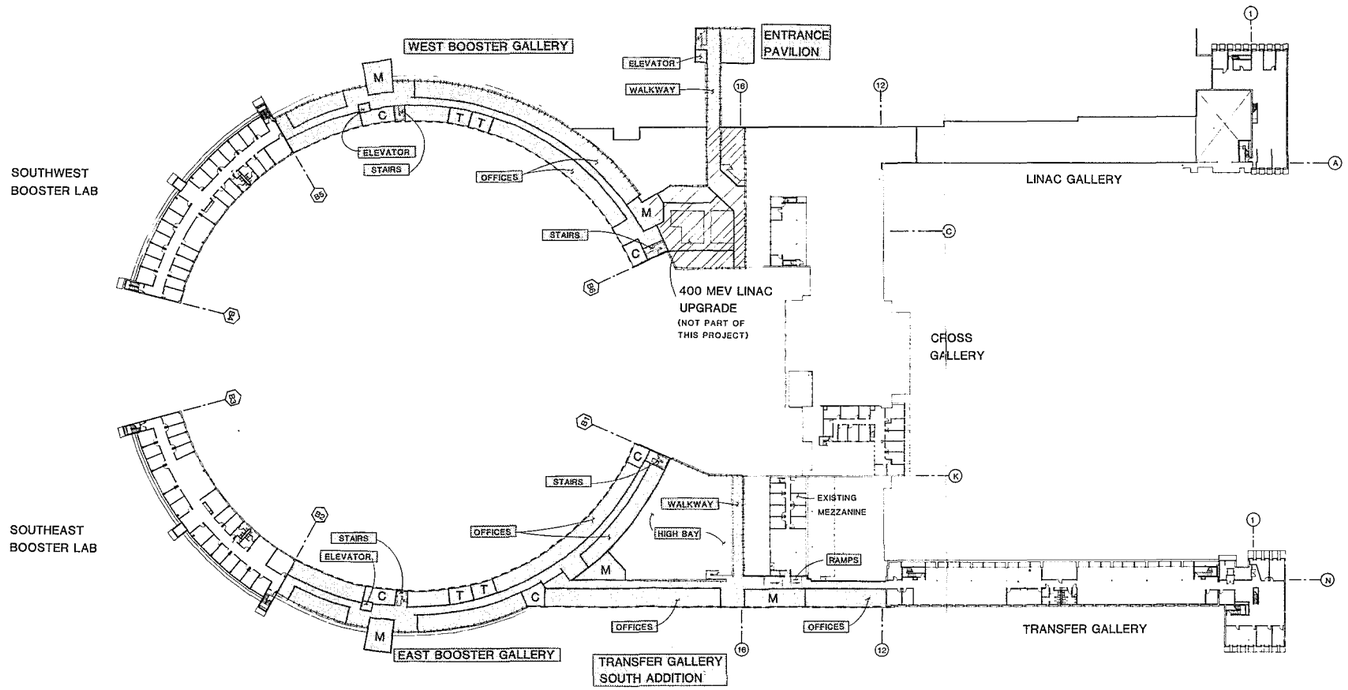
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY/ D. WAGNER/ J. WEBBER
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

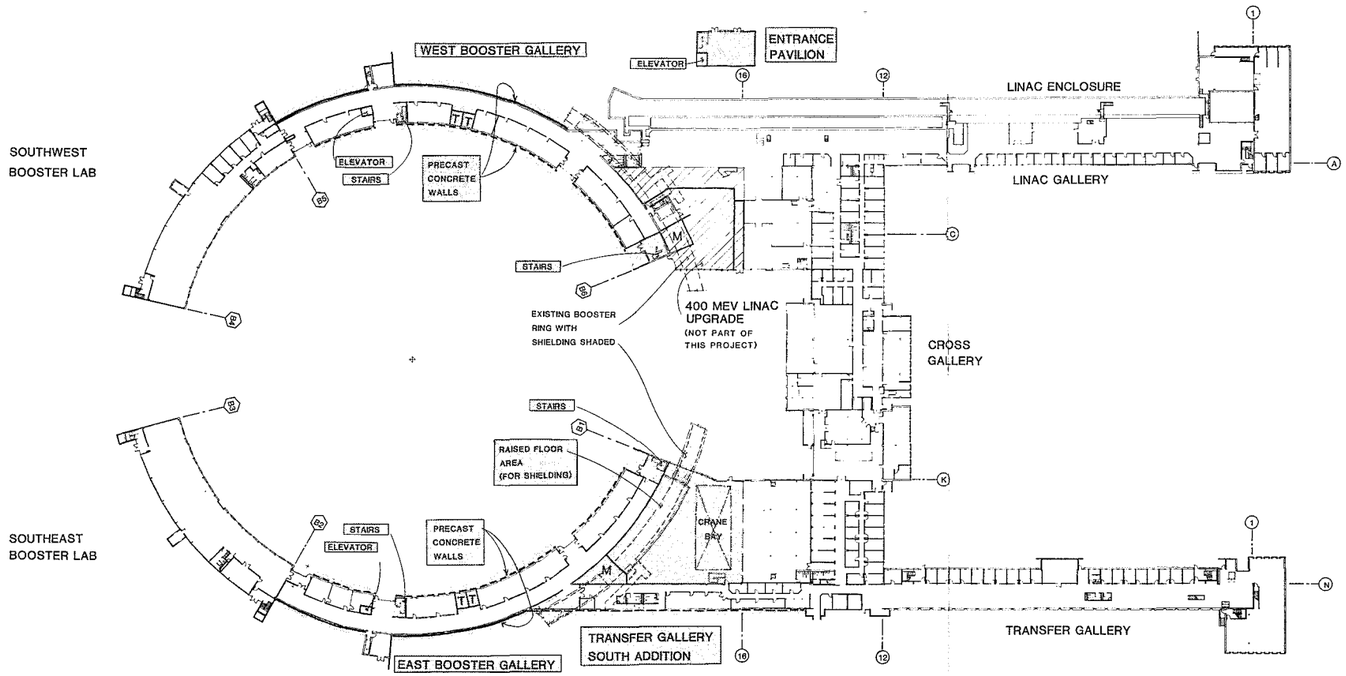
FOOTPRINT GALLERY UPGRADE
CIRCULATION PLANS
LOWER LEVEL

DRAWING NO. 2-5-1 CDR-6 REV.

MAY 1988



SECOND FLOOR PLAN



GROUND LEVEL PLAN

LEGEND

	WORK INCLUDED IN THIS PHASE
M	MECH. EQUIPT.
T	TOILET ROOMS
C	CONFERENCE ROOM

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

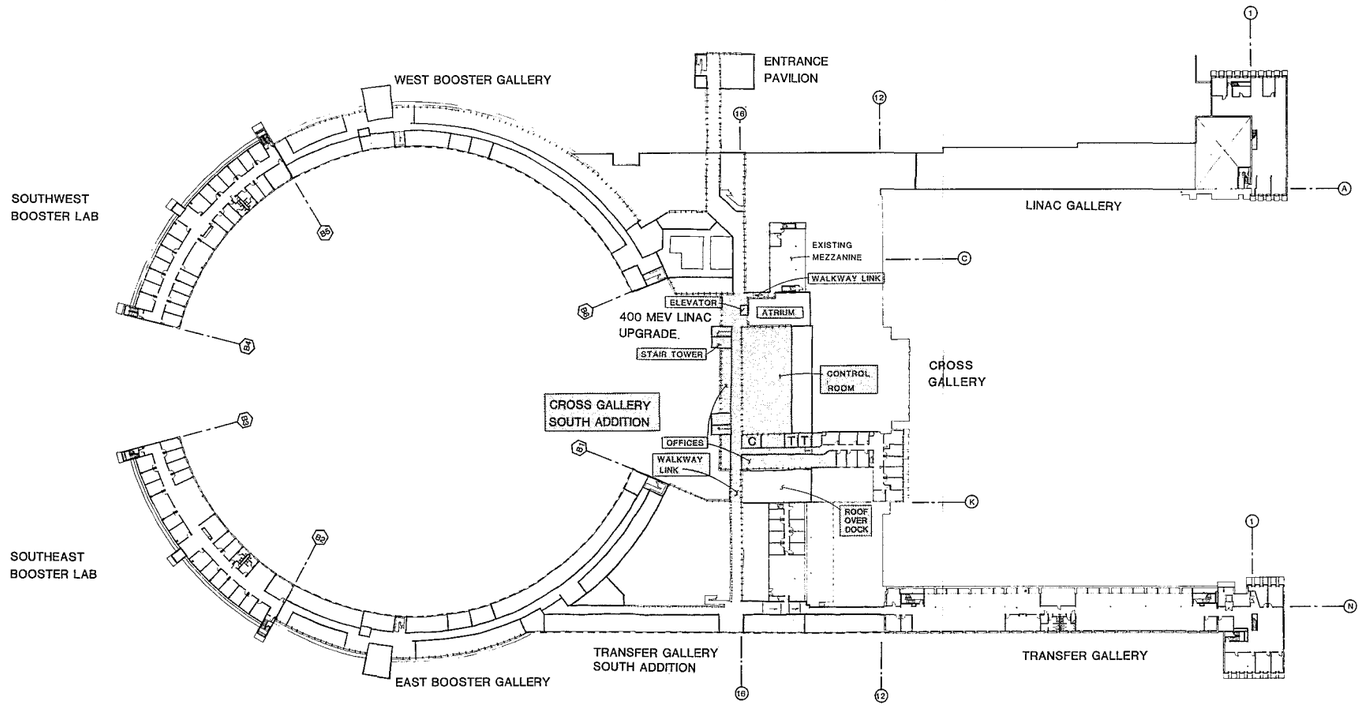
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY/ D. WAGNER/ J. WEBBER
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

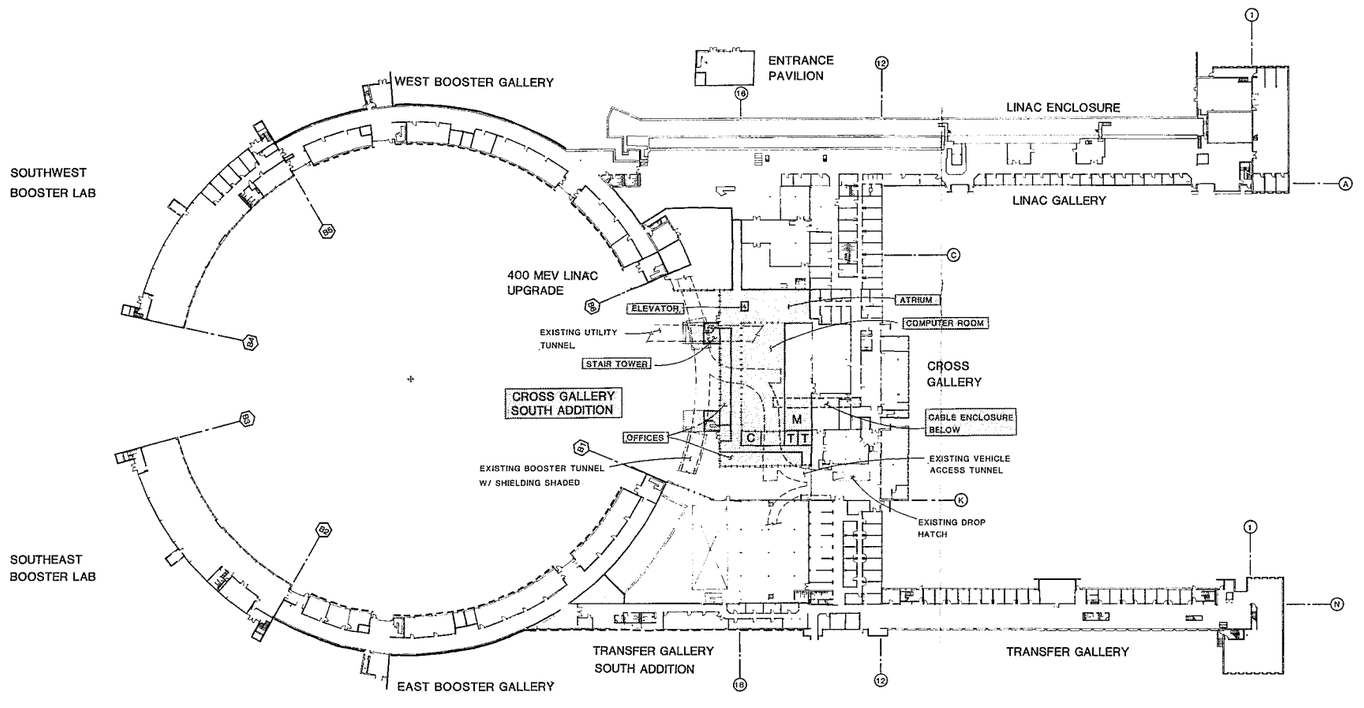
FOOTPRINT GALLERY UPGRADE
CONSTRUCTION PLANS
PHASE I

DRAWING NO. 2-5-1 CDR-7 REV.

MAY 1988



SECOND FLOOR PLAN



GROUND LEVEL PLAN

LEGEND

	WORK INCLUDED IN THIS PHASE
M	MECH. EQUIPT.
T	TOILET ROOMS
C	CONFERENCE ROOM

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

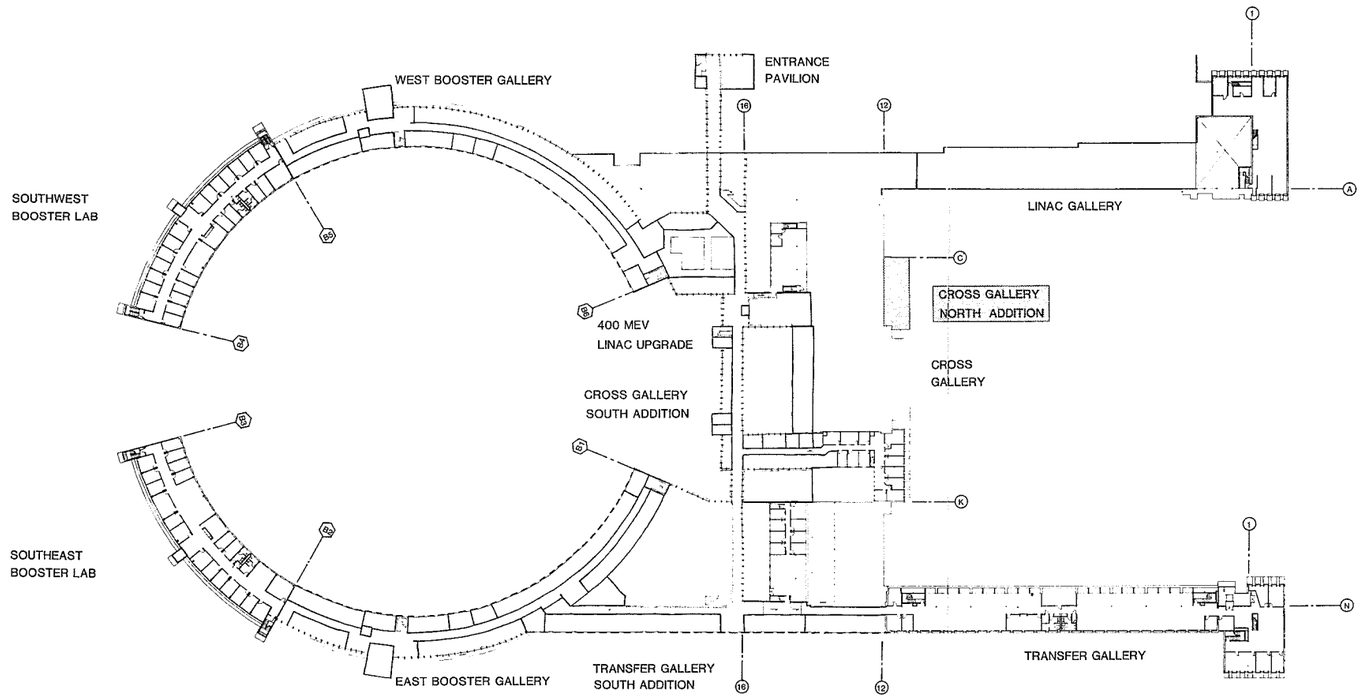
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY/ D. WAGNER/ J. WEBBER
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

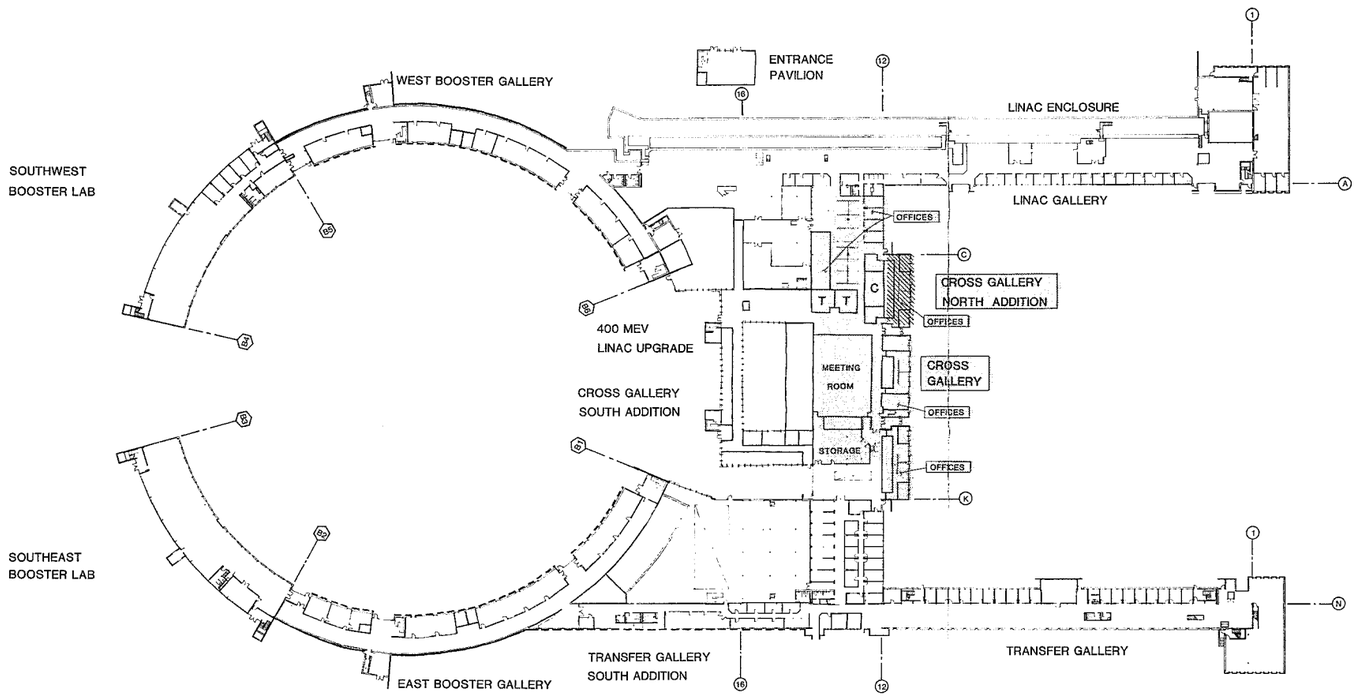
FOOTPRINT GALLERY UPGRADE
CONSTRUCTION PLANS
PHASE II

DRAWING NO. 2-5-1 CDR-8 REV.

MAY 1988



SECOND FLOOR PLAN



GROUND LEVEL PLAN

LEGEND

	WORK INCLUDED IN THIS PHASE
M	MECH. EQUIPT.
T	TOILET ROOMS
C	CONFERENCE ROOM

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

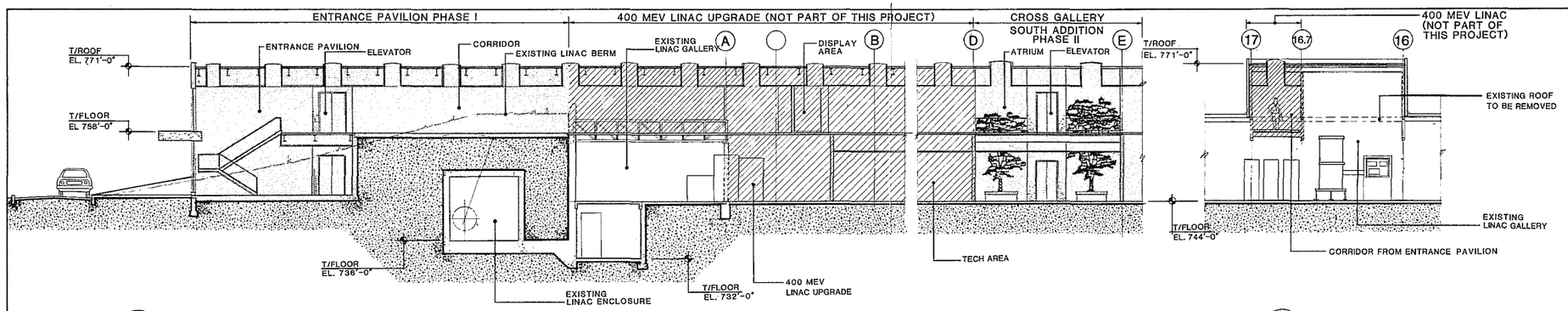
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E. CRUMPLEY
DRAWN		E. CRUMPLEY/ D. WAGNER/ J. WEBBER
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

FOOTPRINT GALLERY UPGRADE
CONSTRUCTION PLANS
PHASE III

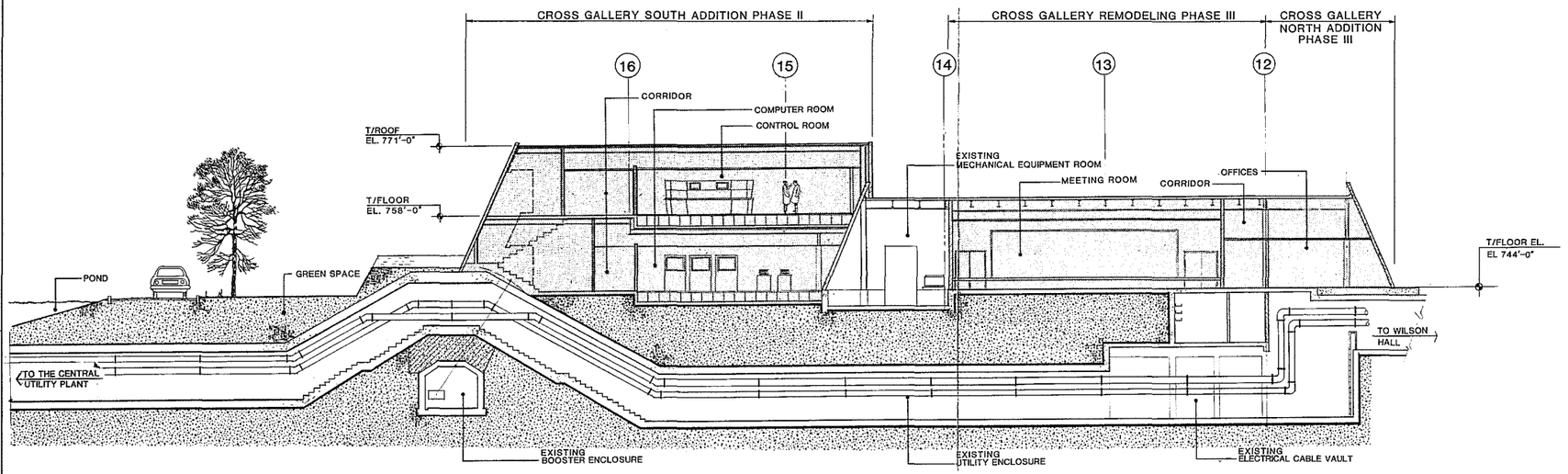
DRAWING NO. 2-5-1 CDR-9 REV.

MAY 1988

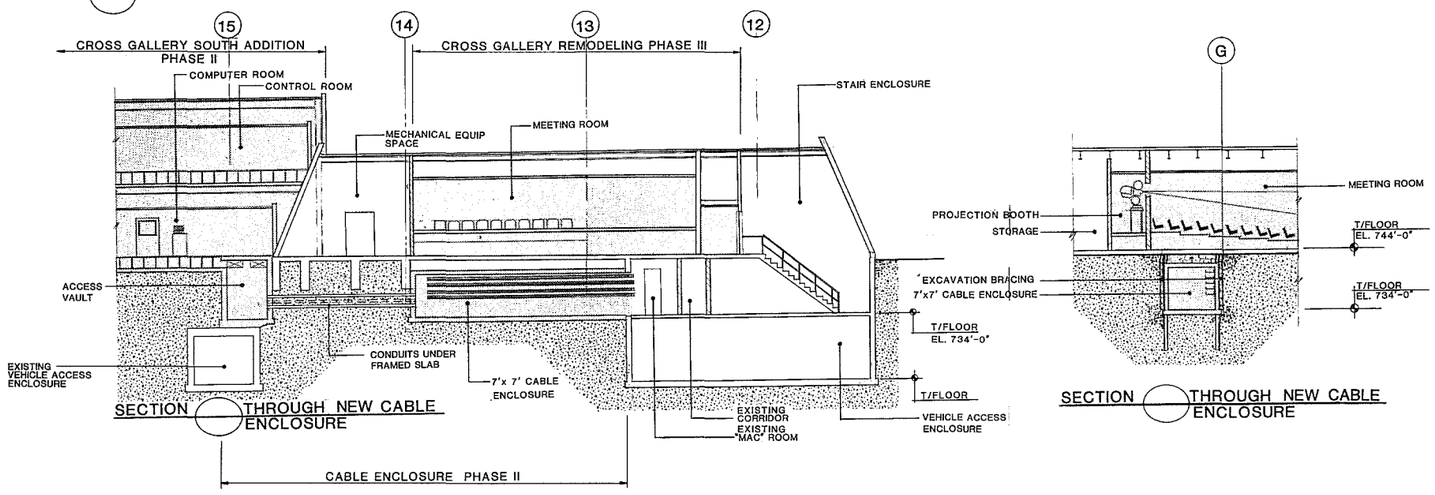


SECTION THROUGH ENTRANCE PAVILION AND ATRIUM

SECTION THROUGH PEDESTRIAN CORRIDOR AT LINAC GALLERY



SECTION THROUGH CROSS GALLERY AT UTILITY ENCLOSURE



SECTION THROUGH NEW CABLE ENCLOSURE

SECTION THROUGH NEW CABLE ENCLOSURE

1/8"=1'-0" SCALE 0 4 8 12 16 20 FEET

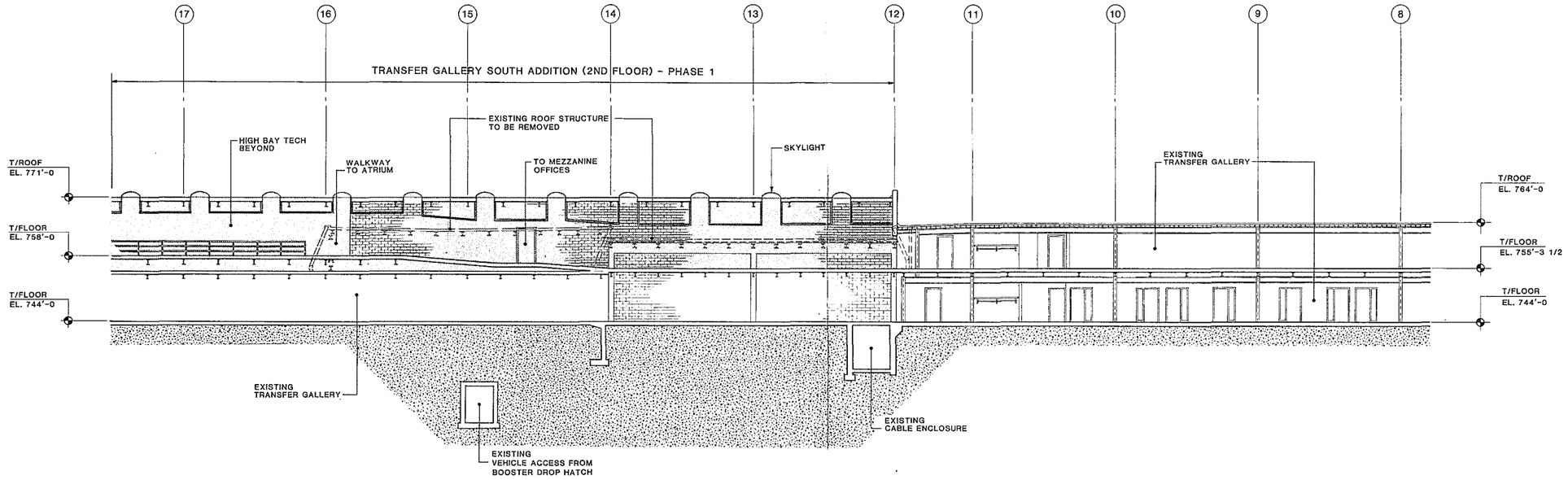
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		M. GRIMSON
DRAWN		D. KILLIAN
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

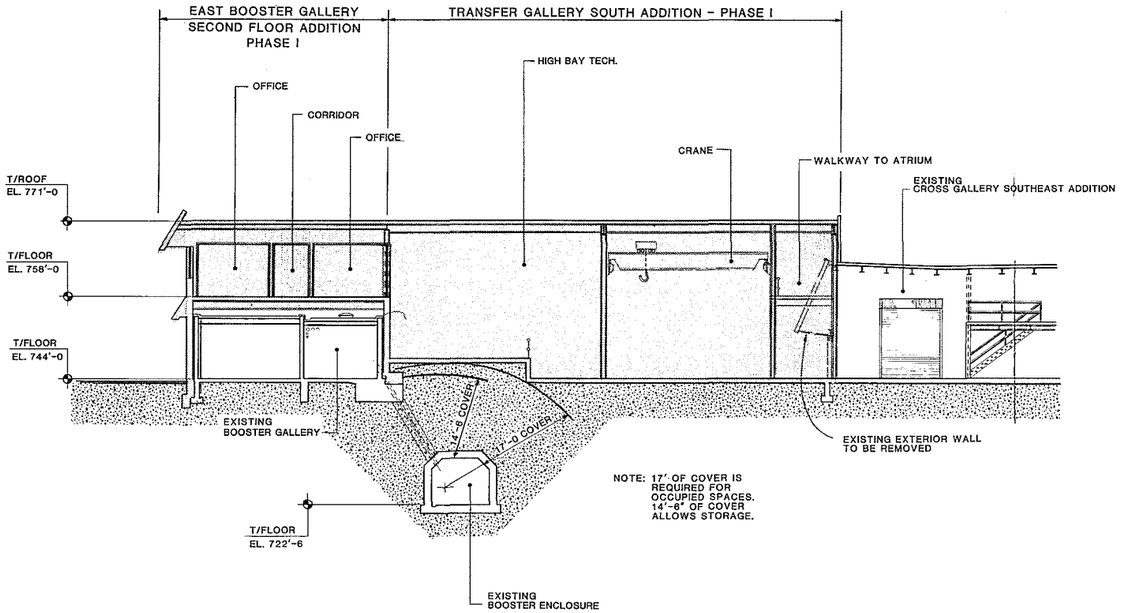
FOOTPRINT GALLERY UPGRADE
BUILDING SECTIONS
SHEET I

DRAWING NO. 2-5-1 CDR-10 REV.

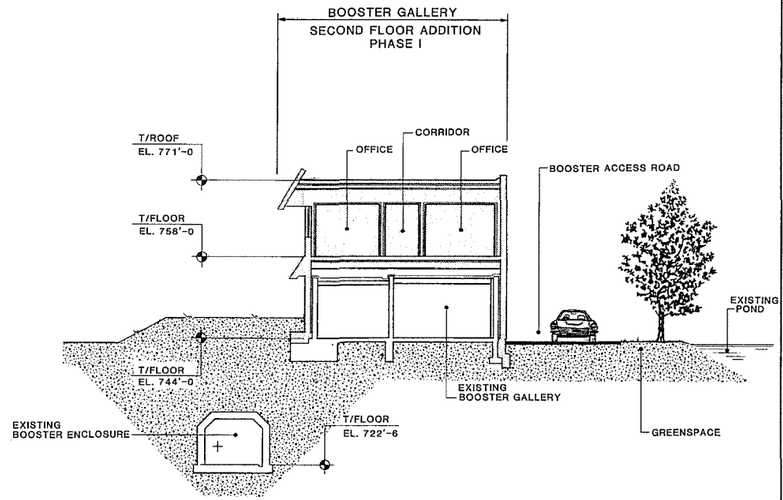
MAY 1988



SECTION ⌀ THROUGH TRANSFER GALLERY AND TRANSFER GALLERY SOUTH ADDITION



SECTION ⌀ THROUGH BOOSTER GALLERY AND TRANSFER GALLERY SOUTH ADDITION



SECTION ⌀ THROUGH BOOSTER GALLERY

REV.	DATE	DESCRIPTIONS
		REVISIONS

DESIGNED	M. GRIMSON	
DRAWN	D. KILLIAN	
CHECKED		
APPROVED		
SUBMITTED		

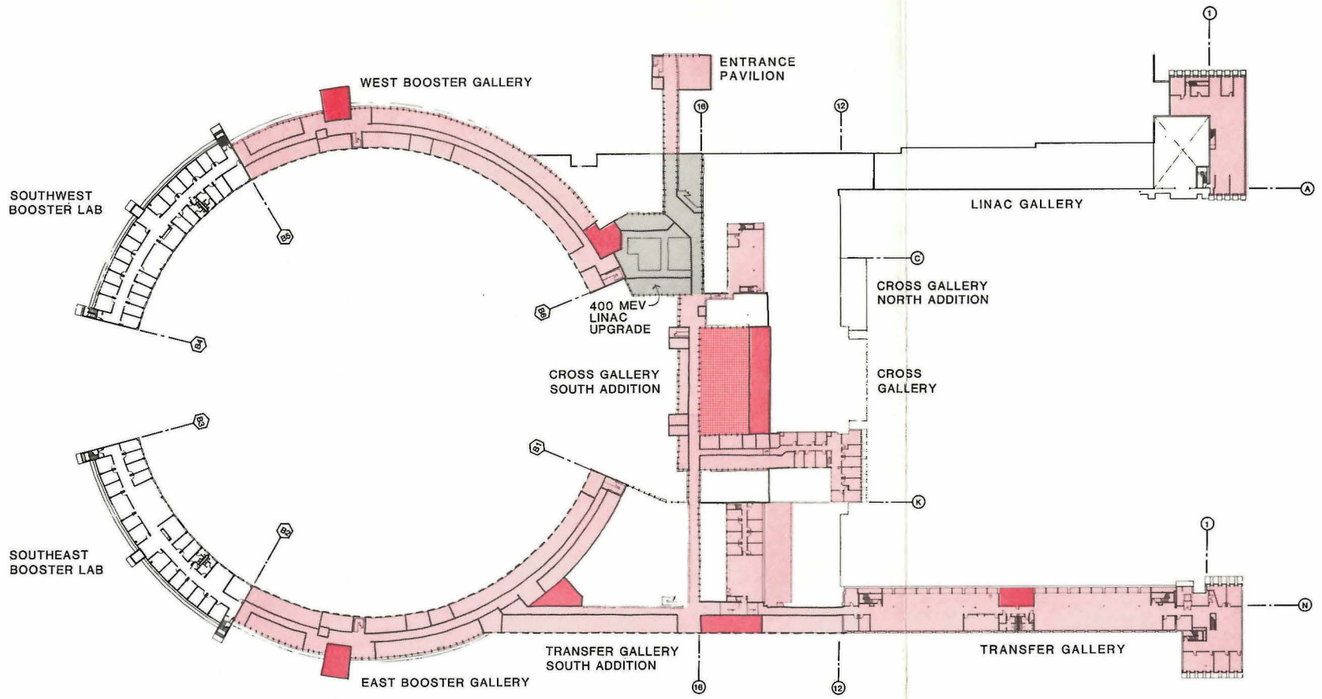
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

FOOTPRINT GALLERY UPGRADE
BUILDING SECTIONS
SHEET 2

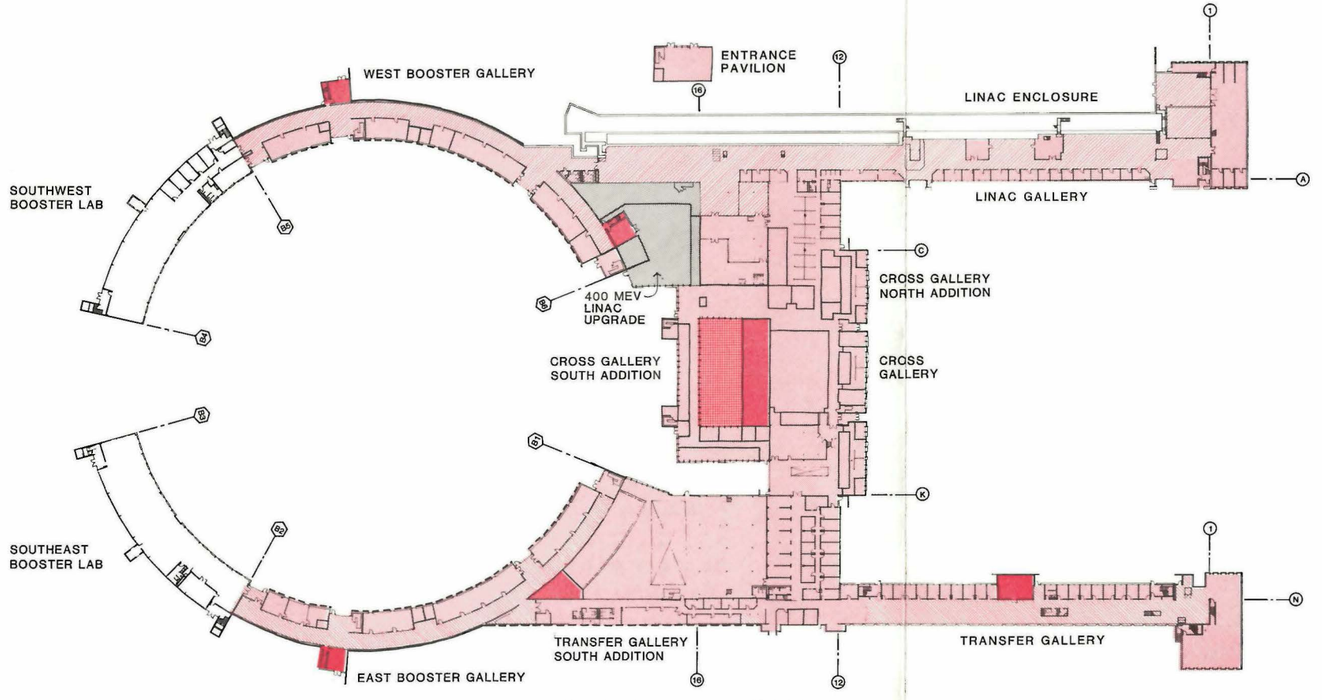
DRAWING NO. 2-5-1 CDR-11 REV.

MAY 1988

1/8"-1'-0" SCALE 0 4 8 12 16 20 FEET



SECOND FLOOR PLAN



GROUND LEVEL PLAN

LEGEND

GENERAL OFFICE AREAS AND TECH SPACES
SUMMER ROOM CONDITIONS: 72°f AND 50% RH
WINTER ROOM CONDITIONS: 68°f AND 35% RH
VENTILATION AIR: 30 CFM / PERSON
SUPPLY AIR: 1 TO 1.5 CFM / SQ.FT. AREA
ROOM PRESSURE: POSITIVE TO OUTDOOR

COMPUTER AREAS
SUMMER ROOM CONDITIONS: 68°f AND 45% RH
WINTER ROOM CONDITIONS: 68°f AND 45% RH
VENTILATION AIR: .10 CFM / SQ.FT. AREA
ROOM PRESSURE: POSITIVE TO OUTDOOR

ACCELERATOR SUPPORT AREAS
SUMMER ROOM CONDITIONS: 72°f AND 50% RH
WINTER ROOM CONDITIONS: 68°f AND 35% RH
VENTILATION AIR: 30 CFM / PERSON
SUPPLY AIR: 1.5 TO 2.0 CFM / SQ.FT.
ROOM PRESSURE: POSITIVE TO OUTDOOR

MECHANICAL ROOMS
SUMMER ROOM CONDITIONS: VENTILATION ONLY (± 90°f)
WINTER ROOM CONDITIONS: 68°f

NOT PART OF THIS PROJECT

EXISTING - NO CHANGE

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

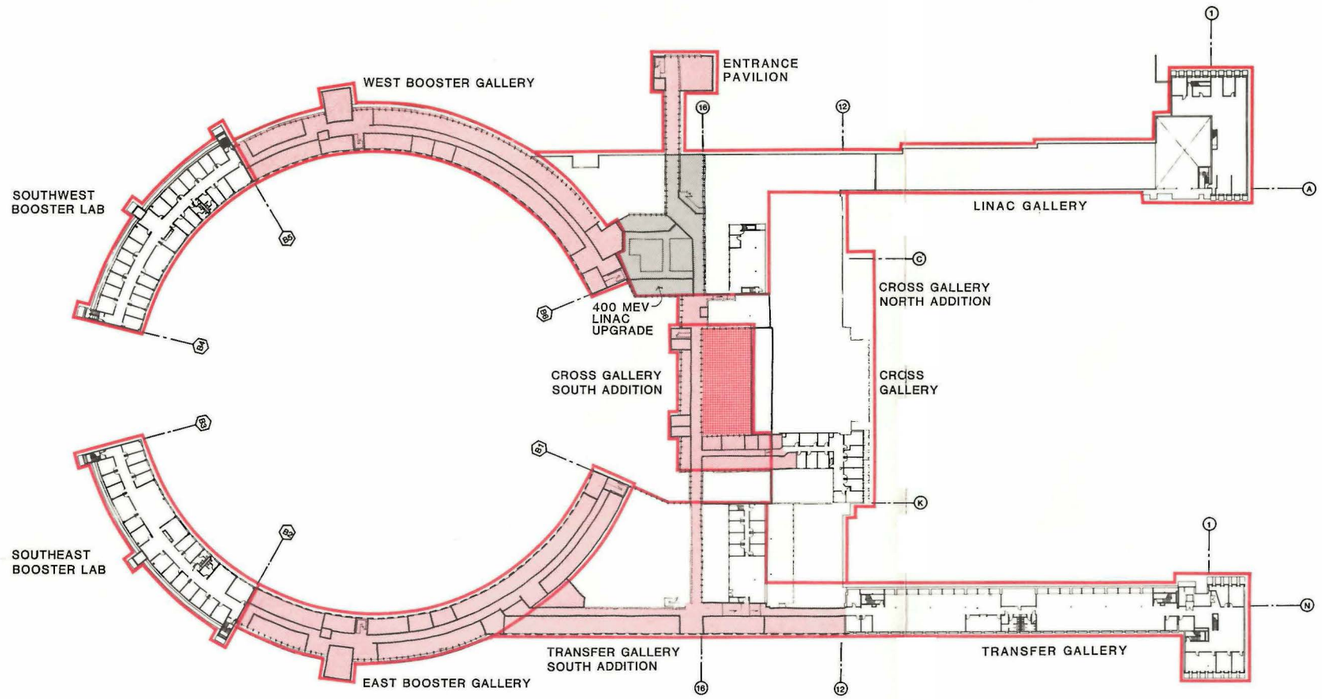
REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		S.KRSTULOVICH
DRAWN		M. OLSON
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

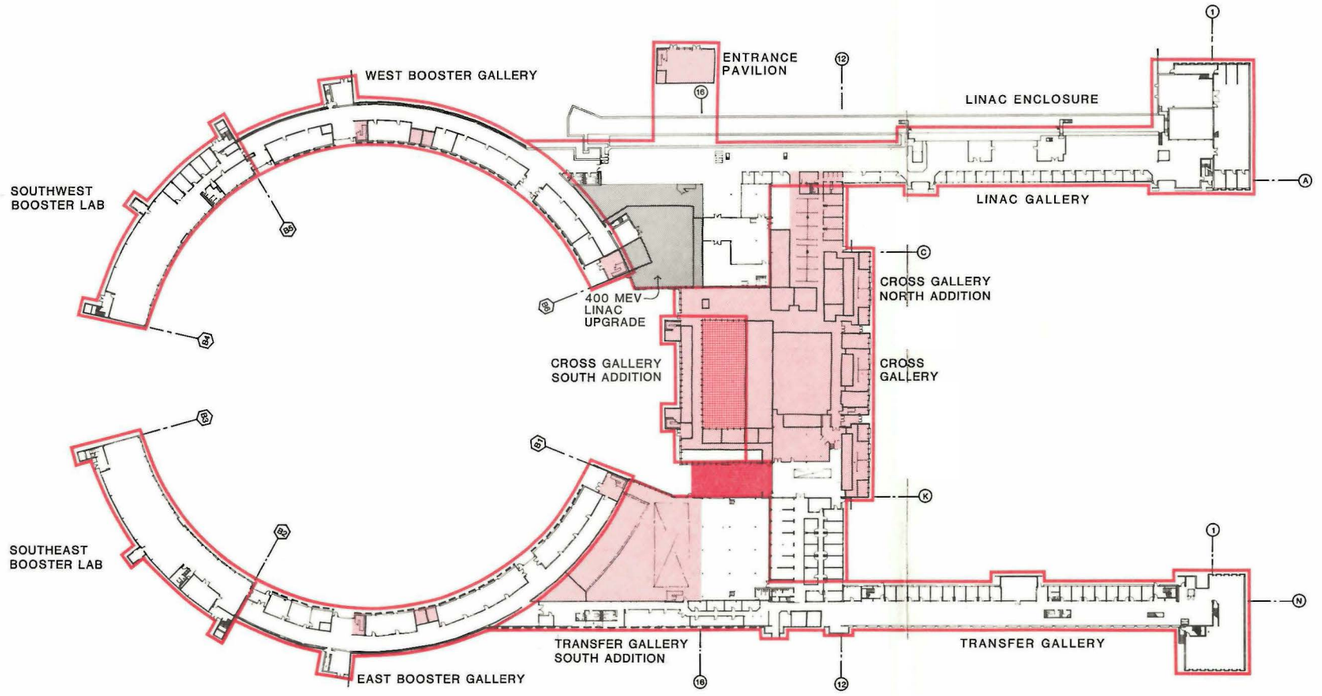
FOOTPRINT GALLERY UPGRADE
DESIGN CRITERIA
HEATING, VENTILATING AND CONDITIONING

DRAWING NO. 2-5-1 CDR-12 REV.

MAY 1988



SECOND FLOOR PLAN



GROUND LEVEL PLAN

1"=40'-0" Scale 40 0 40 80 Feet

LEGEND

SUPPRESSION
WET SPRINKLER SYSTEM - ORDINARY HAZARD
DETECTION
PULL STATIONS

SUPPRESSION
WET SPRINKLER SYSTEM - ORDINARY HAZARD
HALON 1301 - 5% CONCENTRATION
FLOOD SYSTEM BELOW RAISED FLOOR
DETECTION
SMOKE DETECTORS & PULL STATIONS

SUPPRESSION
DRY PIPE SYSTEM - ORDINARY HAZARD

NOT PART OF THIS CONTRACT

EXISTING - NO CHANGE

FIRE AREA SEPERATIONS

REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		S. KRSTULOVICH
DRAWN		M. OLSON
CHECKED		
APPROVED		
SUBMITTED		

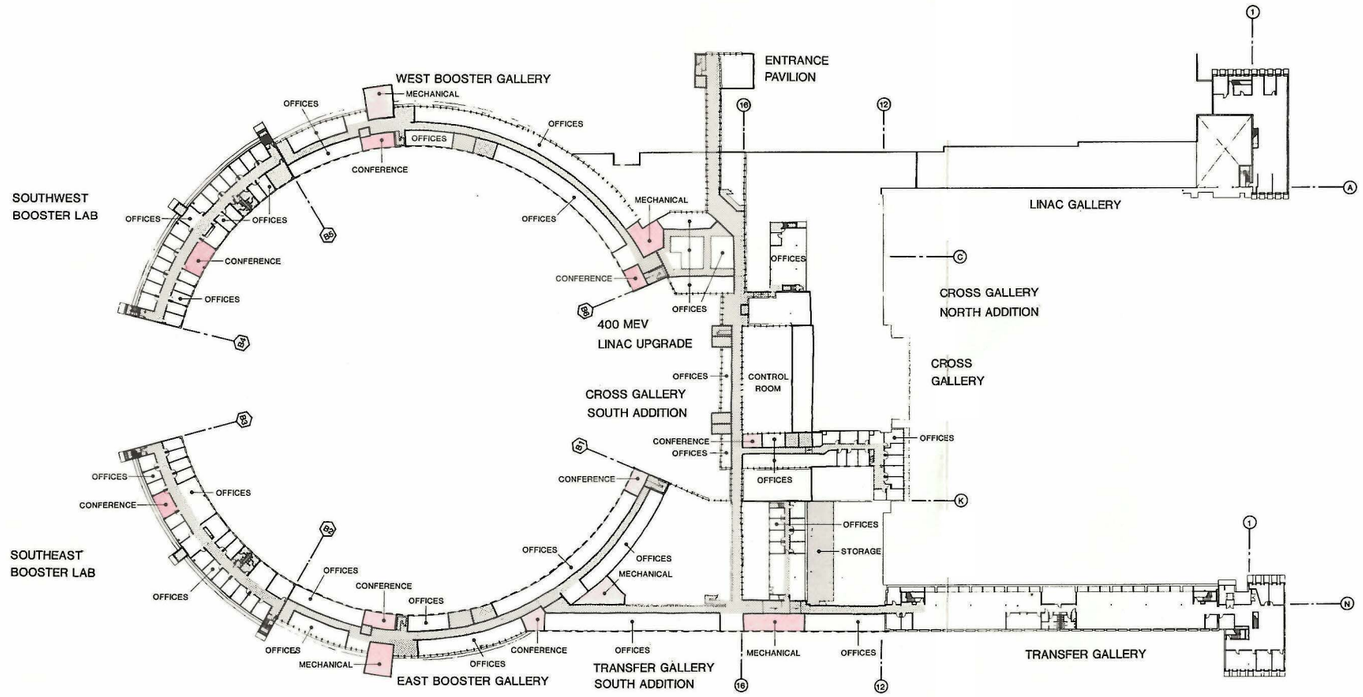
PROJECT NORTH

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

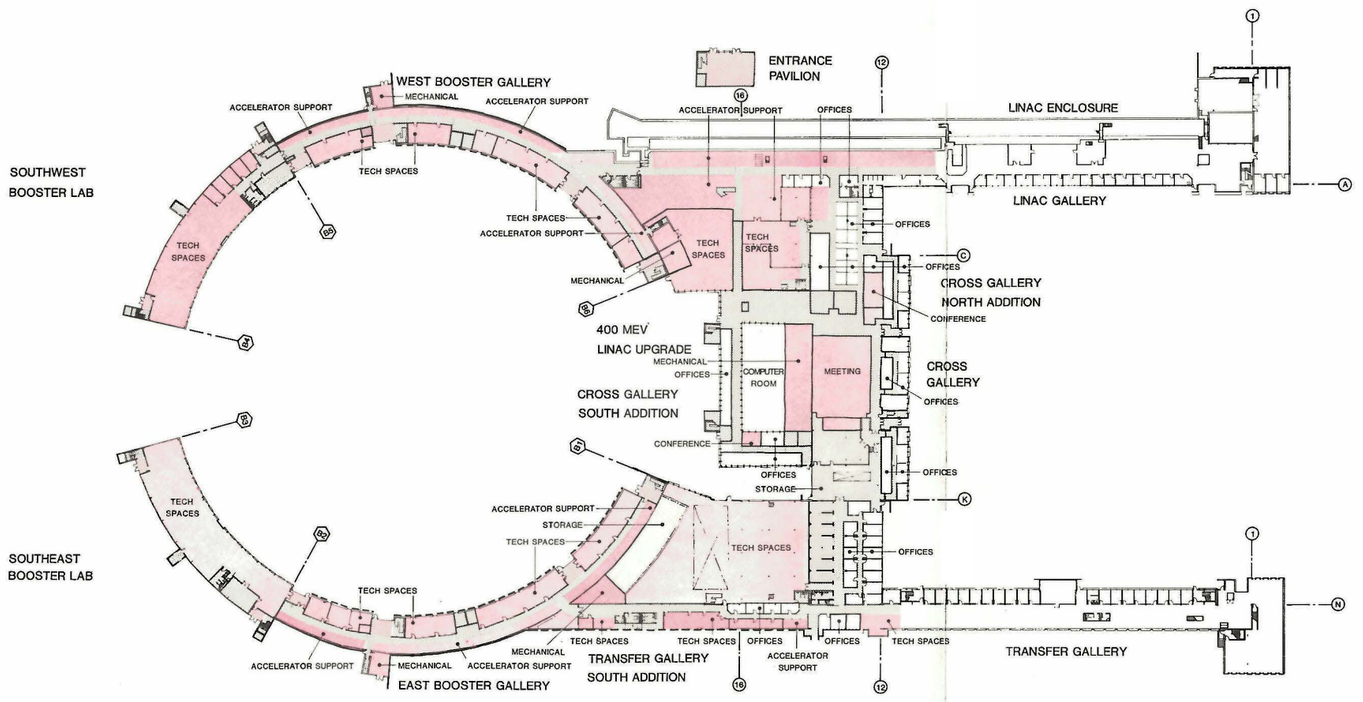
FOOTPRINT GALLERY UPGRADE
DESIGN CRITERIA
FIRE SUPPRESSION

DRAWING NO. 2-5-1 CDR-13 REV.

MAY 1988



SECOND FLOOR PLAN



GROUND LEVEL PLAN

LEGEND

- 75 FOOTCANDLES
- 50 FOOTCANDLES
- 40 FOOTCANDLES
- 30 FOOTCANDLES
- 20 FOOTCANDLES

PARKING AREA – 2 FOOTCANDLES

THE ABOVE IS LIGHTING LEVELS RECOMMENDED BY ILLUMINATING ENGINEERING SOCIETY (IES).

1"=40'-0" Scale 40 0 40 80 Feet

PROJECT NORTH

REV.	DATE	DESCRIPTIONS
		REVISIONS
DESIGNED		E.VALDES/A.R.FLOWERS
DRAWN		E.CRUMPLEY/A.R.FLOWERS
CHECKED		
APPROVED		
SUBMITTED		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

FOOTPRINT GALLERY UPGRADE
DESIGN CRITERIA
ELECTRICAL

DRAWING NO. 2-5-1 CDR-14 REV.

MAY 1988