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Conceptual Design Report

Building 77—Rehabilitation of Building Structure and Systems, Phase 2

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BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

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CONCEPTUAL DESIGN REPORT
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Date of CDR: FEBRUARY 2001 Project Location: BERKELEY LAB

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1)	1-3	Project justification.
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3)	Section 2	Performance requirements (facility/building/system/ process).
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47)	6-1 to 6-4	List of major standard equipment and special facilities.
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49)	Section 6	Construction types and materials.
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52)	Not Included	Design loads (facility/building/system/process).
53)	N/A	Subsurface/geotechnical requirements.
54)	N/A	Strategic Facilities Initiative form.
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BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 1

SUMMARY AND JUSTIFICATION

Summary

The Berkeley Lab Engineering Division designs and constructs a full range of advanced scientific equipment and components for DOE research projects nationwide. Key to the Division's mission are its main fabrication and assembly facilities in Buildings 77 and 77A.

This project is the second phase of a two-phase project intended to fully rehabilitate Buildings 77 and 77A as high-precision fabrication, testing and assembly facilities. Phase 1, funded in 1999, will correct structural deficiencies in Building 77. Phase 2 will rehabilitate mechanical, electrical, and architectural deficiencies in 77 and 77A.

Building 77 is a 68,500 sq ft high-bay, industrial facility. Its specialized technical capabilities include numerically controlled precision machining, structural and precision welding of both common and exotic metals, sheet metal fabrication, metal sandblasting and painting, ultra-high-vacuum cleaning and testing, ceramics, machine tool repair, advanced metrology, and large-apparatus precision assembly. Building 77A, a 10,000-sq ft high-bay facility adjacent to Building 77, is used primarily for assembly of large scientific apparatus.

These capabilities are in high demand within the DOE research and development community, and are not readily available from commercial vendors. Consequently, the buildings currently operate at capacity, and double shifts are necessary to handle the workload. Current projects at Buildings 77 and 77A include the DARHT[1] accelerator for Los Alamos National Laboratory (LANL), SNS[2] components for Oak Ridge National Laboratory (ORNL), and robotic components for the Joint Genome Institute (JGI). Programs with recent projects at Buildings 77 and 77A include the Office of High Energy and Nuclear Physics, the Office of Health and Environmental Research, the National Institutes of Health, and the Office of Basic Energy Sciences.

This high level of demand is a clear indication that Buildings 77 and 77A will continue fabricating leading-edge scientific equipment for DOE researchers well into the future. However, deficiencies stemming from age, deterioration, and obsolescence in the buildings' mechanical, electrical, and architectural systems severely constrain operations and impact the ability to meet the increasingly rigorous requirements of 21st-century science.

Precision manufacturing of unique scientific equipment requires room temperatures to be constant and precise in large areas of Buildings 77 and 77A. Temperature

[1] Dual Axis Radiographic Hydrodynamic Test facility.

[2] Spallation Neutron Source.

fluctuations make it more difficult to achieve the close tolerances required for high-precision scientific experimental apparatus, thus reducing productivity. The existing air distribution systems and building envelopes cannot provide the temperature controls desirable for state-of-the-art precision fabrication and testing. On one recent project, for example, a large horizontal milling machine in the Machine Shop was used to shape the center of the Silicon Vertex Tracker, the detector for the BaBar[3] experiment at the Stanford Linear Accelerator (SLAC). To achieve the required tolerances of 0.0001 in. (0.0025 mm), machinists kept a thermometer next to the milling machine and regulated room temperature by opening and closing building doors.

New scientific programs such as SNS, ATLAS[4], LHC[5], and SNAP[6] will require even greater precision and sophistication in both fabrication and assembly. In addition, genomics, nanotechnology, and environmental science are adding to the complexity of Berkeley Lab's engineering portfolio. To meet these new mission demands, provision of the temperature controls now lacking in Buildings 77 and 77A will be mandatory.

The purpose of this project is to rehabilitate mechanical, electrical, and architectural infrastructure systems in Buildings 77 and 77A. Systems will be added or upgraded to allow full exploitation of both facilities to meet current and future programmatic needs. New heating, ventilating, and air conditioning (HVAC) systems will provide effective temperature and air quality controls in Building 77—replacing a 30-year-old system that cannot deliver the temperature control required for high-accuracy machining—and will provide cooling for the first time in 77A. New thermal insulation on the roof and walls will help control the interior temperature at Building 77 while minimizing energy use, and sound-absorbing baffles on walls in selected shop areas will keep sound levels within OSHA limits to minimize hearing hazards for employees.

This project also includes electrical system upgrades to support the new mechanical systems in both buildings, a lightweight roof for Building 77 that will permit the additional roof loads associated with new rooftop mechanical equipment, and architectural improvements needed to meet current building code exiting requirements.

In Building 77A, lighting systems will be upgraded to increase light levels and reduce glare. Domestic water and compressed air distribution piping will be extended to serve all areas of the building, and a new crane will be installed on the current crane support system in Room 105.

Specifically, the following work is proposed:

- Building 77:
  - Upgrade heating, ventilating and air-conditioning (HVAC) to achieve ambient temperature control necessary for precision fabrication, assembly and testing processes.

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[3] B-Factory detector.

[4] A Toroidal LHC ApparatuS—for the European Laboratory for Particle Physics (CERN).

[5] Large Hadron Collider (CERN).

[6] Supernova/Acceleration Probe—for the Supernova Cosmology Project (LBNL).

- Upgrade the environmental exhaust systems in the welding shop to meet current standards for safety.
- Install new lightweight roofing to reduce weight and permit installation of mechanical equipment on the roof.
- Install new exit lights, battery-powered emergency lights, and fire detection and alarm systems.
- Install thermal insulation on the roof and walls to help control the interior temperature while minimizing energy use.
- Install sound-absorbing baffles on walls in the welding and sheet metal shops to minimize hearing hazards for employees.
- Upgrade fire-rated exit paths to meet building code requirements by installing fire-rated doors, frames, and hardware, as well as one-hour-rated partitions at selected locations.
- Provide disabled access to toilet rooms.

- Building 77A:
  - Add air conditioning to the existing heating and ventilating systems.
  - Upgrade electrical distribution system.
  - Upgrade lighting system.
  - Extend the domestic water and compressed air distribution systems.
  - Upgrade overhead material handling system in Room 105.

Project Justification

This project will modernize Building 77 and 77A mechanical electrical and architectural systems. These upgrades will provide environmental controls appropriate to precision fabrication processes; increase the reliability and maintainability of building systems; provide flexibility to meet future programmatic challenges; and extend the life of the building systems by 20 years, allowing the buildings to continue supporting DOE's scientific mission.

This project will address health and safety concerns by reducing noise levels to below OSHA-allowable maximums and providing safe exiting that meets current building code requirements. Moreover, the building system upgrades will enable these valuable engineering facilities to be used to their full potential, improving the level of support for current DOE programs and ensuring a high level of support for the next generation of science.

If this project is not supported, continued use of these facilities in their present condition will involve operational inefficiencies. All DOE missions currently supported by Buildings 77 and 77A, such as DARHT, SNS, JGI, and the Advanced Light Source, will be impacted with longer schedules, lower quality, and higher costs. Because of their inadequate environmental controls these facilities will be incapable of providing the

level of precision required for the next generation of science, resulting in their diminishment or loss as productive DOE assets.

Need for Mechanical and Electrical Upgrade

Precision manufacturing of unique scientific equipment requires room temperatures to be constant and precise in large areas of Buildings 77 and 77A. The buildings, completed in 1963 and 1988, respectively, lack the temperature controls necessary for state-of-the-art precision fabrication and testing. Temperature fluctuations make it more difficult to achieve the close tolerances required by leading-edge scientific experimental apparatus, thus reducing productivity.

The mechanical systems in Building 77 have reached the end of their design life. They were not designed with provisions for the increase in capacity required to provide cooling, and the air handling systems are in locations that are both difficult to access and unsafe for maintenance work. This project will replace the obsolete HVAC system with systems that provide the capacity and controls appropriate for the building's current mission, easier and safer maintenance access, and the flexibility to meet future needs.

The Building 77A air handling systems were designed with provisions for adding cooling. This project will add the chilled water coils, cooling systems, and controls appropriate for the building's current mission, and the flexibility to meet future needs. The domestic water and compressed air distribution system extensions will provide properly located outlets for these utilities, so that long, temporary, unsafe extension hoses (which are currently used) can be eliminated. Installation of an additional crane in Room 105 will permit five people currently on swing shift to return to the day shift, saving approximately $50,000 annually in differential pay.

The electrical systems in both buildings will be upgraded to accommodate the new HVAC system. Electrical safety system features in Building 77—such as exit lights, battery-powered emergency lights, and the fire detection and alarm system—will be upgraded as required by rehabilitation modifications or to meet current standards. The Building 77A electrical system will be upgraded to provide 800-ampere service to accommodate additional loads due to the building rehabilitation and future loads. The building lighting system will be upgraded to provide even, glare-free coverage at the appropriate lighting levels.

Need for Architectural Upgrade

The existing Building 77 envelope is not adequately insulated to support an upgraded HVAC system. Rigid R-38 insulation will be installed below the new lightweight roof membrane, and R-19 insulation protected by metal panels and gypsum wallboard will be installed at exterior walls. The insulation systems will bring the building envelope into compliance with state and federal energy codes, and will minimize the size and energy use of the new HVAC system.

To accommodate the added weight of new rooftop mechanical equipment, the existing built-up tar and gravel roof will be replaced with a lightweight roof.

Some fabrication activities in Building 77 generate sound levels that can exceed OSHA-allowable limits. OSHA allows up to 90 decibels (dB) per 8-hour work day before

hearing protection is required. Existing acoustical provisions in the welding and sheet metal shops (Rooms 107 and 108) do not reduce noise levels adequately. Noise levels reach 115 dB, which can activate administrative controls that limit work time in high-noise areas. To reduce hearing hazards for employees, the project will remove old baffles, and new enhanced sound-absorbing baffles will be installed on walls and ceilings.

Many exit doors and partitions do not meet building code requirements. Some of these doors will be replaced with new smoke- and fire-rated assemblies. Others will receive new hardware to provide safe egress and meet building code requirements. Certain walls and partitions will be upgraded to provide 1-hour-rated exiting enclosures.

ADA-mandated upgrades to provide handicapped-accessible toilet facilities will be provided when this project is completed.

Dust control is a requirement in Room 101 of Building 77A. The concrete floor sealer intended for dust control has deteriorated. A new epoxy coating will be laid down to enhance dust control.

CAMP and RPM Ratings

This project was rated using the Capital Asset Management Process (CAMP) evaluation criteria and scored 67 points.

This score indicates that there are serious concerns regarding the ability of these buildings to meet mission requirements. The primary driver for this project was identified within the Mission & Investment criteria, with a strong secondary driver in the area of Health & Safety. The project will address each of the identified concerns. Residual Health & Safety risk will not be significant, as the rehabilitated systems will conform with generally accepted safety and engineering standards. The full text of the rating analysis is included in Section 9 of this conceptual design report.

The Risk-Based Priority Model (RPM) was not applied to this project.

Evaluation of Alternatives

Alternatives to the proposed project were evaluated in a cost-effectiveness analysis conducted according to guidelines established in OMB Circulars No. A-11 and No. A-94. Five alternatives were considered in the analysis:

1. Maintaining status quo (no rehabilitation).

   This alternative is unacceptable because:

   - The obsolete HVAC systems cause operational downtime when fluctuating temperatures interfere with precision operations.
   - The deterioration of Building 77's mechanical and architectural systems results in unacceptably high maintenance costs and unsatisfactory working conditions.

2. Replacing the existing building with a new structure.

   Replacing Building 77 with a new building would cost $42.1 million, more than the proposed rehabilitation of $13 million, which also includes Building 77A.

   In addition, moving and reinstalling the process equipment would be very expensive because of the precision millwright work necessary to maintain the working tolerance capability of the various machines. For example, one of the large, numerically controlled milling machines has 100 cubic yards of concrete in its specially engineered support base.

   Finally, Building 77 operations would be shut down for two years, requiring procurement of services from outside vendors at considerably higher costs. (See alternative 4 below.)

   The current project would extend the life of Building 77 by 20 years at considerably lower cost than replacing the building.

3. Leasing comparable space.

   Space comparable to the facilities in Building 77 and 77A is not readily available in the Berkeley area. Relocation of the facilities in Building 77 and 77A at any appreciable distance from the Laboratory will degrade the cooperative research environment, which is key to Berkeley Lab's success. It is estimated that leasing the same area (if suitable space could be found) would cost $3 million per year and require a $2-million build-out. Assuming no increase in lease rates, a four-year lease would cost $14 million. The rehabilitation would result in 20 years of availability for less than the cost of a four-year lease.

4. Subcontracting custom fabrication services.

   Contracting with outside suppliers for custom design, fabrication, and assembly services would result in dramatically increased costs for many DOE research programs because of reduced efficiency, higher administration and transportation costs, more opportunities for cost overruns, and diminished opportunities for scientists and design engineers to collaborate with technicians.

   Buildings 77 and 77A are used by the Engineering Division to produce unique equipment and components for specific research projects. Engineering does not manufacture items that are available off the shelf; does not do large production runs; and does not duplicate services readily available through outside vendors. Much of the work done in 77/77A consists of what is variously called prototype, model shop, or R&D shop services—i.e., developing and testing prototypes, then working up production specifications. When large production runs are needed, fabrication is performed by outside vendors.

   Unlike many fabrication shops, Engineering does not expect scientists to know exactly what they need when they walk in the door. Engineering's work process encourages scientists and design engineers to collaborate directly with machinists and other technicians to find the most effective solutions to problems. Some items are “reverse engineered”—i.e., technicians help engineers and scientists select the design option that is most feasible from a fabrication standpoint early in the design

process. This collaboration, along with Engineering's experience with scientific projects, maximizes production efficiency and component reliability.

It would be difficult if not impossible to find a single vendor who could match the broad capabilities available in 77/77A. Outsourcing would most likely require multiple vendors and decentralization of these services, resulting in logistical problems, higher transportation costs, longer design/manufacturing cycles, higher administrative costs, and reduced opportunities for collaboration between scientists, engineers, and technicians.

The additional costs of outsourcing cannot be quantified for two reasons: (1) There is no "typical" job. Most items produced by Engineering are unique, and what equipment researchers will need in the future is unpredictable. (2) There is no way to directly compare costs. Building 77 charges for parts and materials plus hourly rates for labor and overhead. Outsourced custom fabrication is typically procured at a fixed price, either through negotiation or competitive bidding—not at an hourly rate. The continuous design changes involved in prototype development would require frequent change orders for outsourced work, increasing the administrative burden and the potential for cost overruns.

Finally, the work typically undertaken by the machine shops in Building 77 is often unattractive to commercial vendors because of the risk involved in machining costly components to very precise tolerances.

Outsourcing of services now provided in 77/77A would be significantly more expensive. This conclusion is based on the inherent efficiency of an in-house "one-stop shop," the experience and availability of Engineering staff to contribute to design efficiency and effectiveness, and the fact that 77/77A only has to meet costs, not turn a profit.

5. Rehabilitating the existing building systems.

   The proposed project will extend the life of the building systems by 20 years at a significantly lower cost than competing alternatives. This rehabilitation project represents the most economical use of capital funds to preserve a vital capital asset.

Basis of Conceptual Design

The Conceptual Design was done by the Berkeley Lab Facilities Department with support of mechanical, architectural, civil/structural, electrical, and energy management engineering sections.

The cost estimate was prepared by a professional estimator of the Berkeley Lab Facilities Department.

Method of Performance

Engineering and Design

Berkeley Lab will assign a project manager who will be responsible for managing the project and reporting status data relative to schedule and cost. All subcontractors will be required to prepare and maintain current schedules and budget plans for their work.

A design program will be prepared by the Berkeley Lab Facilities Department to provide direction to an architect-engineer firm. It will include project scope and schedule requirements and design criteria for all aspects of the rehabilitation work, special facilities, and equipment to be included in the construction subcontract documents.

An architect-engineer firm experienced in this type and size project will be selected, and a lump-sum subcontract will be negotiated and awarded by the University of California. Contract administration will be accomplished by the Berkeley Lab Procurement Department. Inspection of construction will be accomplished by the Berkeley Lab Facilities Department. Some minor design of alterations and modifications to existing utilities will be accomplished by Berkeley Lab.

Construction and Procurement

Construction and procurement will be accomplished by fixed-price subcontracts awarded on a competitive basis using best-value selection criteria that will include price and technical considerations. Some work associated with tie-ins and startup may be accomplished by Berkeley Lab crafts to ensure operational continuity.

Phasing Considerations

Construction will be planned and scheduled to mitigate program disruptions through careful sequencing of the work.

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 2

PROJECT DESCRIPTION

General

The rehabilitation of Building 77 mechanical, electrical, and architectural systems will correct deficiencies stemming from age and deterioration of these systems and extend the life of the building by 20 years. Building 77A life expectancy will be similarly extended by improvements to mechanical and electrical systems.

Design and construction will comply with applicable codes and ordinances. This section describes the scope of work.

Building 77 Mechanical and Electrical

The mechanical and electrical scope of work includes upgrading the heating, ventilating, and air-conditioning (HVAC) and the welding shop exhaust system to meet current standards for control of environmental conditions affecting safety and process control.

HVAC equipment and systems to be upgraded include:

- Air-handling units (AHUs)
- Air supply, and return ducts, diffusers, and grilles
- Chillers, cooling tower, and boilers
- Chilled water (CHW), tower water (TW) and heating hot water (HHW) piping
- CHW, TW, and HHW circulating pumps.
- Fume and dust removal equipment
- Facilities monitoring and control system (FMCS).

The electrical system will be upgraded to accommodate the new HVAC system and new feeders for the new switchgear extension. Electrical safety system features—such as exit lights, battery-powered emergency lights, and the fire detection and alarm system—will be upgraded as required by the rehabilitation modifications and to meet current standards.

Specific mechanical improvements in each area of the building are described in the subsections that follow.

Welding Shop, Room 107

- Removal of existing AHUs, heating hot water piping, and sections of ductwork, and industrial exhaust system.

- Replacement of existing industrial exhaust fan, ductwork, manifold, and flexible duct exhaust drops.
- Installation of a new roof-mounted air handling unit with heating coil and ducting modifications.

Heating will be actuated when the temperature sensor in the working area reads less than 70°F when it is occupied and less than 65°F during the unoccupied period.

Sheet Metal Shop, Room 108

- Removal of existing AHUs, heating hot water piping, and sections of ductwork.
- Installation of a new roof-mounted air handling unit with heating coil and ducting modifications.

Heating will be provided when the temperature sensor in the working area reads less than 70°F when it is occupied and less than 65°F during the unoccupied period.

Machine Shop, Room 123

- Removal of existing AHUs and all of the ductwork.
- Installation of: supply and return ductwork connected to the two new central AHUs, reheat coils, HHW piping, diffusers, exhaust vents, and controls.

Heating and cooling will be provided to maintain a temperature setpoint of 72°F year-round.

Offices, Room 125

- Removal of existing air conditioning units and ductwork.
- Installation of: supply ductwork connected to the two new central AHUs, reheat coils, HHW piping, diffusers, exhaust vents, and controls.

Heating will be provided when the temperature sensor reads less than 70°F during the occupied period and less than 65°F during the unoccupied period. Cooling will be provided when the temperature sensor reads greater than 74°F during the occupied period and greater than 80°F during the unoccupied period.

Assembly Shop, Room 141

- Removal of existing AHU and sections of ductwork.
- Installation of supply and return ductwork connected to the two new central AHUs, reheat coils, HHW piping, diffusers, exhaust vents, and controls.

Heating and cooling will be provided to maintain a temperature setpoint of 72°F year-round.

Precision Shop, Rooms 142, 142A, and 142C

- Removal of existing AHU and sections of ductwork.
- Installation of supply and return ductwork connected to the two new central AHUs, reheat coils, HHW piping, diffusers, exhaust vents, and controls.

Heating and cooling will be provided to maintain a temperature setpoint of 72°F year-round.

Ultra High Vacuum Cleaning Facility, Room 156

- Removal of existing ductwork connection to Room 141.
- Installation of new AHU with filter, ductwork, HHW coil, HHW piping, and controls.

Heating will be provided when the temperature sensor in the working area reads less than 70°F during the occupied period and less than 65°F during the unoccupied period.

Precision Measurement Shop, Room 158

- Removal of existing AHU and sections of ductwork.
- Installation of supply and return ductwork connected to the two new central AHUs, a reheat coil, HHW piping, and controls.

Heating and cooling will be provided to maintain a temperature setpoint of 72°F year-round.

Paint Shop, Room 165

- Removal of existing ductwork connection to Room 123.
- Installation of new AHU with filter, ductwork, HHW coil, HHW piping, exhaust vents, and controls.

Heating will be provided when the temperature sensor in the working area reads less than 70°F during the occupied period and less than 65°F during the unoccupied period.

Mechanical Room 239

- Removal of existing HHW boilers, HHW pumps, stack breaching, domestic hot water (DHW) heater and pumps, industrial hot water (IHW) heater and pumps, chillers, CHW pumps, and associated piping.
- Installation of two new central air handling units, two new chillers, and chilled water pumps.

Shops and Offices, Rooms 244 - 244E

- Removal of existing AHU and partial ductwork.
- Installation of supply and return ductwork connected to the two new central AHUs, a reheat coil, HHW piping, and controls.

Heating will be provided when the temperature sensor reads less than 70°F when a room is occupied and less than 65°F during the unoccupied period. Cooling will be provided when the temperature sensor reads greater than 74°F when a room is occupied and greater than 80°F during the unoccupied period.

Exterior Equipment Pad

- Installation of: 7 HHW boilers, DHW heater, IHW heater, and cooling tower.
- Installation of HHW, DHW, IHW, and TW pumps and piping.
- Installation of controls for all equipment.

Building 77 Structural

The structural scope of work includes:

- Modifications to the existing roof structure and installation of new structural supports for roof mounted mechanical equipment and ductwork.
- Construction of a new mechanical equipment support pad and associated retaining walls on the hillside adjacent to the building.

The planned replacement boilers, new cooling tower and associated pumps cannot be supported on the roof or within the building. The closest available site is on the adjacent hillside.

Building 77 Architectural

The architectural scope of work includes:

- Installation of thermal insulation to roof and walls to help control the interior temperature while minimizing energy use.
- Installation of new lightweight roof membrane to maintain allowable roof loads imposed by new mechanical equipment.
- Installation of sound-absorbing baffles on walls to minimize hearing hazards for employees.
- Upgrade of fire-rated exit paths to meet building code requirements by installing fire-rated doors, frames, and hardware, as well as 1-hour-rated partitions at selected locations.
- Provision of disabled access to toilet rooms.

Rigid R-38 insulation will be installed below the new lightweight roof membrane, and R-19 insulation protected by metal panels and gypsum wallboard will be installed at exterior walls. The insulation systems will bring the building envelope into compliance with state and federal energy codes and will minimize the size and energy use of the new HVAC system.

The weight of the existing tar and gravel roof with new rooftop equipment and ducts would exceed the load capacity of the superstructure and foundations. The combined weight of the new lightweight roof and equipment would be within the allowable loads.

Existing sound baffles in Rooms 107 and 108 are insufficient in number to reduce sound levels adequately. Existing baffles will be removed, and new, enhanced sound-absorbing baffles will be installed on walls.

Many exit doors do not meet building code requirements. Some of these doors will be replaced with new smoke- and fire-rated assemblies, and others will receive new hardware, as required to meet building code requirements. The required 1-hour enclosure of Stair 192 will be achieved by extending the existing walls to the deck above. Plywood partitions in rated corridors will be replaced with 1-hour construction.

The vestibule in Women's Toilet Room 117 will be enlarged to allow wheelchair access. An accessible toilet compartment and urinal will be provided in Men's Toilet Room 119.

Building 77A Mechanical and Electrical

The mechanical scope of work includes:

- Upgrading the air-conditioning system to meet current standards for control of environmental conditions for process control. HVAC equipment and systems to be upgraded include:
  - Air-handling units (AHUs) will have chilled water coils added
  - Chiller and cooling tower
  - Chilled water (CHW) and tower water (TW) piping
  - CHW and TW pumps
  - Facilities monitoring and control system (FMCS).
- Upgrading the material handling system in Room 105 with a second 15-ton crane to meet current needs for heavy equipment movement.
- Extending of domestic city water and compressed air distribution and providing outlets for these utilities every 40 ft throughout the length of the building.

Specific mechanical improvements in each area of the building are described in the subsections that follow.

Room 101

- Extending of compressed air and domestic city water utility piping with outlets every 40 ft to fully service the room.
- Installation of a chilled water coil in the air handler serving this room.

Heating will be provided when the temperature sensor reads less than 70°F during the occupied period and less than 65°F during the unoccupied period. Cooling will be provided when the temperature sensor reads greater than 74°F during the occupied period and greater than 80°F during the unoccupied period.

Room 103

- Extending of compressed air and domestic city water utility piping with outlets every 40 ft to fully service the room.
- Install a chilled water coil in the air handler serving this room.

Heating will be provided when the temperature sensor reads less than 70°F during the occupied period and less than 65°F during the non-occupied period. Cooling will be provided when the temperature sensor reads greater than 74°F during the occupied period and greater than 80°F during the unoccupied period.

Room 105

- Extending of compressed air and domestic city water utility piping with outlets every 40' to fully service the room.
- Installation of a second 15-ton crane on the existing runway to meet current needs for heavy equipment movement.
- Installation of a chilled water coil in the air handler serving this room.

Heating will be provided when the temperature sensor reads less than 70°F during the occupied period and less than 65°F during the unoccupied period. Cooling will be provided when the temperature sensor reads greater than 74°F during the occupied period and greater than 80°F during the unoccupied period.

Exterior Equipment Pad

- Installation of new chiller, cooling tower, chilled water (CHW) and tower water (TW) circulating pumps, and CHW and TW piping. Installation of controls for all equipment.

Electrical rehabilitation includes:

- Upgrade of power service feeder from Building 77 Substation to Building 77A to accommodate additional loads due to building rehabilitation and future loads.
- Upgrade of power distribution to accommodate additional HVAC equipment, lighting improvements and future loads.
- Upgrade of lighting system in Rooms 101, 103 and 105 to provide even coverage and eliminate glare at appropriate illumination levels.
- Upgrade of fire detection and alarm systems as necessary to accommodate the rehabilitation modifications.

The rehabilitation of the HVAC system will significantly add to the building's power demand. To meet this demand the electrical service to the building will upgrade the ductbank and feeder from the Building 77 Substation to Building 77A to provide an 800-ampere, 480/277-volt service. The electrical distribution system of Building 77A will be upgraded to accommodate the HVAC rehabilitation and lighting improvements, provide better distribution of power within the building, and accommodate future loads.

The illumination level and quality of the lighting in Rooms 101, 103, and 105 is inadequate for the precision fabrication and assembly tasks performed in those areas. The lighting system in these rooms will be rehabilitated to provide the required illumination levels and eliminate uneven coverage and glare.

The building fire detection and alarm system will be upgraded to remain compatible with the Laboratory's sitewide fire detection and alarm system and to accommodate the HVAC rehabilitation modifications.

Building 77A Architectural

The architectural scope for Building 77A includes an epoxy floor finish in Room 101 for dust control. Precision assembly in Room 101 requires a cleanliness level not presently available. Cleanliness will be significantly improved by coating the existing concrete floor with epoxy to reduce dusting.

Disposition of Demolished Materials and Equipment

Demolition will produce significant quantities of contaminated debris. Hazardous materials to be abated are expected to include asbestos (in acoustical tiles, gypsum and taping products, pipe insulation, flues, and equipment), lead paint and settled lead dust. The subcontract documents will require the subcontractor to turn these materials over to Berkeley Lab for disposal at an approved disposal site.

Relocation of Building 77 Equipment

Some Building 77 fabrication and testing equipment will need to be temporarily relocated to allow proper working access. Relocated equipment will be stored onsite. This project will not bear any consequential costs relating to lost productivity or opportunity while the building rehabilitation is in progress.

APPLICABLE CODES AND DESIGN REFERENCES

Applicable requirements and recommendations in the following codes and references will be followed in the design. These codes, as listed, will be included in the construction specifications as applicable. Codes and references will be the latest editions except where specifically noted otherwise:

California Building Code (CBC)

California Electrical Code, (CEC)

California Mechanical Code (CMC)

California Plumbing Code (CPC)

California Energy Code (CEC)

California Fire Code (CFC)

California Code of Regulations; Title 8, Title 19

NFPA National Fire Codes

National Electrical Safety Code, ANSI C2

Occupational Safety and Health Act (OSHA)

General Services Administration 41 CFR Part 101-19

Americans with Disabilities Act (ADA)

Energy Conservation Performance Standards, 10 Code of Federal Regulations (CFR), Part 435 (Mandatory for Federal Buildings)

Occupational Safety and Health Standards, 29 CFR Part 1910, Department of Labor

Safety and Health Regulations for Construction, 29 CFR Part 1926, Department of Labor

Environmental Protection Agency, 40 CFR Parts 264 and 265

American National Standards Institute (ANSI) Standards

The American Society of Heating and Air Conditioning Engineers (ASHRAE) Handbooks and Standards

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Standards

American Institute of Steel Construction (AISC) Manual of Steel Construction

American Concrete Institute (ACI) Manual of Concrete Practice; Parts 1 through 5

LBNL Long Range Site Development Plan

Factory Mutual Global KSM (FM) Approval Guide and Loss Prevention Data Sheets

Underwriters' Laboratories, Inc. (UL) Standards and "Building Materials, Fire Protection Equipment, and Fire Resistive Directories"

Lawrence Berkeley Laboratory Health and Safety Manual, Publication 3000

"Lateral Force Design Criteria", RD3.22 of LBNL Design Management Procedures Manual

QUALITY ASSURANCE PROCEDURES FOR DESIGN, CONSTRUCTION, FACILITY ACCEPTANCE AND PROJECT CLOSEOUT

Quality assurance procedures during project development, design, and construction assure that all safety, operational and Subcontract requirements will be met. The established system to review, inventory, and document facility construction, acceptance, and project closeout includes the following elements:

Engineering

- The Berkeley Lab Facilities Department, assisted by selected consultants, provides quality control and assurance measures during design and construction.
- The Architecture and Engineering Group of the Facilities Department includes multidisciplinary design and project management sections. Each significant project is assigned to a Project Manager (PM) who is responsible for the management of cost, scope and schedule. The PM is also responsible for quality assurance during project formulation and implementation, and is assigned a staff that includes a design coordinator (the Technical Coordinator, or TC), a multidisciplinary design support team, a construction manager if necessary, a contract administrator, and a construction inspector. The TC is responsible for design and technical quality control. The work of each member of the TC's support team is reviewed by the appropriate discipline Section Chief. The PM develops a Project Execution Plan that is reviewed and approved by Facilities Management and DOE/BSO.
- Design and cost estimates are reviewed, and a plan check is carried out by Berkeley Lab, at completion of schematics and during and after Title I and Title II designs are completed. An independent third party plan check is made of the seismic design, and an independent cost estimate is made by a consulting cost estimator at completion of Title I and Title II to compare with the A&E's cost estimate. Plans and specifications are also reviewed by the Berkeley Lab Fire protection engineer, the Berkeley Lab Environment, Health and Safety (EH&S) Division, the Berkeley Lab Energy Conservation Engineer, and the Berkeley Lab Facilities Maintenance and Operations Group at each stage of design development. When applicable, a consulting geotechnical firm provides appropriate geotechnical data and reviews the design at each stage of design and during construction.
- An internal sign-off sheet covering all Berkeley Lab design disciplines, TC, PM, Fire protection engineer , EH&S, Facilities Management, and the Client is completed at the end of Title II. (A sample form follows.)

Construction

- Subcontract documents are reviewed by Berkeley Lab's technical staff for compliance with DOE and Berkeley Lab design criteria.

- The Construction Inspector reviews, and the Executive Architect and Engineer (A&E of Record) and Facilities' staff of engineers accept or reject, all materials and workmanship in accordance with Subcontract documents.
- A submittal control system for materials, shop drawings, test reports, and certifications assures that all necessary reviews for compliance with specifications, codes, environmental mitigation measures and other requirements—including provisions for the handicapped and energy conservation—have been made.
- A Construction Inspector observes construction activities and reports discrepancies to Berkeley Lab's Project Manager (or Construction Manager, if applicable) and the TC. Daily inspection reports are maintained in a file or a project logbook.
- A Contract Administrator (from the Purchasing Department) reviews documentation for compliance with Subcontract provisions.
- A Safety Inspector (from Berkeley Lab's Environment, Health and Safety Division) and the Fire protection engineer make periodic inspections of construction to assure compliance with safety and fire codes and regulations.
- Specialty inspections are made of rebar, structural steel, welding, concrete, and geotechnical conditions to assure compliance with codes and specifications. Appropriate testing laboratories are utilized for support as necessary. The A&E of Record is required to inspect the construction during appropriate times and provide interpretation of the Subcontract documents whenever necessary.

Subcontract Change Orders

- The Berkeley Lab A&E team and Executive Architect and Engineer review any proposed change and provide justification and an independent cost estimate. The Subcontractor's proposed cost is evaluated relative to Berkeley Lab's cost estimate, and a Subcontract price is negotiated. Availability of project funds is verified. If all project and Subcontract requirements are met, a Change Order is executed.

Final Inspection and Acceptance

The following items are accomplished by the Inspector and the A&E of Record working together:

- Preliminary inspection and list of incomplete work.
- Equipment testing and operational instruction of Berkeley Lab personnel.
- Final inspection walk-through and punch list.
- Inspection of correctional and completion work (punch list work).
- Inventory of all operational manuals, instructions, guarantees.
- Internal sign-off sheet: Acknowledgment of completion and acceptance of all work under construction Subcontract by the PM, Inspector, Client and Facilities Management.

Project Closeout

- After final acceptance of the facility, Berkeley Lab audits all charges to assure that all costs are in proper accounts.
- Berkeley Lab sends the cost closing statement to DOE/BSO.
- Project authorization closed by DOE/BSO

PROJECT PLAN REVIEW
(LINE ITEM & GP PROJECTS)

Project Title

Job Number | Subcontract No/PB No | Documents Prepared by

☐ **FINAL DESIGN** (Title II - Construction Documents)

Title II signatures confirm that Plan Review[1] has been performed, construction documents are complete, ready for construction, signed, stamped, and comply with applicable codes. Signatures also confirm that administrative and engineering controls to prevent and mitigate environmental, safety and health hazards have been incorporated into the design.

☐ **DRAWINGS**

☐ **SPECIFICATIONS**

		FINAL DESIGN
1. Architectural Section Chief	Print Name	Signature/Date
2. Structural Section Chief	Print Name	Signature/Date
3. Mechanical/IHEM Section Chief	Print Name	Signature/Date
4. Electrical Section Chief	Print Name	Signature/Date
5. EH&S Coordinator	Print Name	Signature/Date
6. Fire Marshal	Print Name	Signature/Date
7. Maintenance Manager (O&M)	Print Name	Signature/Date
8. Client	Print Name	Signature/Date
9. Project Manager	Print Name	Signature/Date
10. Deputy Facilities Manager	Print Name	Signature/Date

[1]See "Plan Review Manual" (ICBO, 1994) for definitions, legal implications and limitations of plan reviews.

PROJECT CONSTRUCTION COMPLETE REVIEW

(LINE ITEM & GP PROJECTS)

Project Title

Job Number | Subcontract No/PB No | Documents Prepared by

☐ **CONSTRUCTION COMPLETE** (Title III - Construction Administration)
Title III signatures confirm that construction has been completed in accordance with construction documents, complies with applicable codes, and as-built drawings have been completed.

☐ **BENEFICIAL OCCUPANCY**

☐ **KD4**

CONSTRUCTION COMPLETE

	Print Name	Signature/Date
1. Inspector		
2. EH&S		
3. Fire Marshal		
4. Client		
5. Project Manager		
6. Deputy Facilities Manager		

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 3

BASIS OF COST ESTIMATE

The construction cost estimate was prepared by John Eastman, a Berkeley Lab Facilities Department professional estimator. The estimate is based upon quantity take-offs from conceptual design drawings and specifications.

Cost estimates are dated January 2001, and represent current prices. Summary cost estimates are included in this section. Detailed cost estimates are included in Section 9. Escalation is based upon "Anticipated Economic Escalation Rates for DOE Construction Projects" updated January 2000 namely, 2.5% in FY 2001, 2.6% in FY 2002, 2.8% in FY 2003, 2.8% in FY 2004, and 2.9% in FY2005. Escalation rates are compounded from January 2001 to the midpoint of construction, March 2005.

Cost estimate details for ED&I are located at the end of Section 9. Both the Estimate Summary shown in this section and the Detailed Cost Estimate in Section 9 have been correlated with the Work Breakdown Structure (WBS) shown in the BA/BO Schedule.

03-LBNL, Bldg 77—Rehabilitation of Building Structure and Systems, Phase 2 Lawrence Berkeley National Laboratory, Berkeley, California

1. Construction Schedule History

	Fiscal Quarter				Total Estimated Cost ($000)	Total Project Cost ($000)
	A-E Work Initiated	A-E Work Completed	Physical Construction Start	Physical Construction Complete		
FY 2003 Budget Request *(Preliminary Estimate)*	1Q2003	2Q2004	3Q2004	2Q2006	$13,360	$13,495

2. Financial Schedule

(dollars in thousands)

Fiscal Year	Appropriations	Obligations	Costs
2003	1,100	1,100	980
2004	11,290	11,290	3,175
2005	970	970	7,605
2006	000	000	1,600

4. Details of Cost Estimate[a]

	(dollars in thousands) Current Estimate
Design Phase	
Preliminary and Final Design costs (Design Drawings and Specifications)	640
Design Management costs (1.6 % of TEC)	215
Project Management costs (0.4 % of TEC)	60
Total, Design Costs (6.8% of TEC)	915
Construction Phase	
Buildings, Rehab	9,360
Inspection, design and project liaison, testing, checkout and acceptance	485
Project Management (3.0% of TEC):[b]	400
Total, Construction Costs	10,245
Contingencies	
Design Phase (1.1 % of TEC)	150
Construction Phase (15.3 % of TEC)	2,050
Total, Contingencies (16.5 % of TEC)	2,200
Total, Line Item Costs (TEC)	13,360

[a] The annual escalation rates assumed for FY 2001 through FY 2005 are 2.5, 2.6, 2.8, 2.8 and 2.9 percent, respectively.
[b] Includes Construction Management costs.

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

CONSTRUCTION COST ESTIMATE SUMMARY

Div	1	Special Conditions		470,763
Div	2	Site Work		817,010
Div	3	Concrete		90,262
Div	5	Metals		101,815
Div	6	Wood & Plastics		21,055
Div	7	Thermal & Moisture Prot		1,031,230
Div	8	Doors & windows		5,904
Div	9	Finishes		274,210
Div	10	Specialties		1,675
Div	13	Specialty Construction		221,957
Div	15	Mechanical		3,206,774
Div	16	Electrical		649,548
Subtotal Direct Cost				6,892,203
General Conditions/Mobilize			9%	620,298
Safety Program Mgmt (~2.5% of Labor Cost)				82,199
Estimating Contingency				*In Project Contingency*
Subtotal				7,594,700
Bond			2.0%	151,894
Prime Contractor OH & Fee			8%	607,576
Total Estimated Construction Cost at January 2001				8,354,170
Total Escalation to Midpoint of Construction in March, 2005			11.83%	988,425
Subtotal Escalated Construction Cost				$9,342,595
Berkeley Lab Overhead				20,000
Construction Cost				$9,362,595
SAY				**$9,360,000**

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 3

ESCALATION ANALYSIS

Based on DOE "Anticipated Economic Escalation Rates" (updated January 2000)

Start Construction:	April 2004
Construction Period:	24 Months
Finish Construction:	March 2006
Midpoint Construction:	March 2005
Latest Estimate:	January 2001

											%
FY	2001	Jan	2001	-	Sep	2001	8	mo	@	2.5	= 1.7
FY	2002	Oct	2001	-	Sep	2002	12	mo	@	2.6	= 2.6
FY	2003	Oct	2002	-	Sep	2003	12	mo	@	2.8	= 2.8
FY	2004	Oct	2003	-	Sep	2004	12	mo	@	2.8	= 2.8
FY	2005	Oct	2004	-	Mar	2005	6	mo	@	2.9	= 1.5

Total Compounded Escalation **11.83%**

BUILDING 77--REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

2003-LBNL OBLIGATIONS AND COSTS SCHEDULE DETAIL*

($K)

DESCRIPTION	TOTAL	FY 2003 O	FY 2003 C	FY 2004 O	FY 2004 C	FY 2005 O	FY 2005 C	FY 2006 O	FY 2006 C
LBNL Activities									
Engineering	350	185	185	75	75	60	60	30	30
Inspection	184			64	64	90	90	30	30
Consultants	16	0	0	11	11	5	5		
Subtotal	550	185	185	150	150	155	155	60	60
Architect/Engineer									
Title I & II	640	640	585	0	55				
Title III	150			150	80	0	50	0	20
Subtotal	790	640	585	150	135	0	50	0	20
Construction									
Building Systems	9,360	0	0	9,360	1,200	0	7,000	0	1160
Project Management	460	60	60	190	190	150	150	60	60
Subtotal	11,160	885	830	9,850	1,675	305	7,355	120	1,300
Contingency (20%)	2,200	150	150	1500	1500	250	250	300	300
TOTAL	13,360	1,035	980	11,350	3,175	555	7,605	420	1,600

* Represents Berkeley Lab Obligations & Costs

BUILDING 77 - REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

Jan-01
2003-LBNL
BA/BO SCHEDULE ($K)

WBS NO.	WBS ELEMENT	TOTAL BUDGET	F Y 2003				F Y 2004				F Y 2005				F Y 2006			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
			O N D	J F M	A M J	J A S	O N D	J F M	A M J	J A S	O N D	J F M	A M J	J A S	O N D	J F M	A M J	J A S
1																		
1.1	Engineering, Design & Inspection																	
1.1.1	LBNL Activities																	
1.1.1.2	Title I	75		75/75														
1.1.1.2	Title II	140			50/50	60/60	30/30											
1.1.1.3	Title III	135						15/15	15/15	15/15	15/15	15/15	15/15	15/15	15/15	15/15		
1.1.1.4	Inspection	184						20/20	14/14	30/30	20/20	25/25	25/25	20/20	15/15	15/15		
1.1.1.5	Consultants	16						3/3	4/4	4/4	2/2	3/3						
1.1.2	Architect/Engineer																	
1.1.2.1	Title I	225		225/225														
1.1.2.2	Title II	415		415/0	0/180	0/180	0/55											
1.1.2.3	Title III	150		0/0			150/0	0/26	0/28	0/26	0/15	0/15	0/10	0/10	0/10	0/10		
1.2	Construction																	
1.2.1	Building Rehab	9360							9360/500	0/700	0/1750	0/1750	0/1750	0/1750	0/750	0/410		
1.3	Project Management	460		25/25	15/15	20/20	40/40	50/50	50/50	50/50	50/50	40/40	40/40	20/20	20/20	20/20	20/20	
	Subtotal	11160		885/830				9850/1675				305/7355				120/1300		
1.4	Contingency by Year	2200/2200		150/150				1500/1500				250/250				300/300		
	Total BA/BO by Year	13360/13360		1035/980				11350/3175				555/7605				420/1600		
	Cumlative BA/BO by Year			1035/980				12385/4155				12940/11760				13360/13360		
	Current Funding Plan	13360		1100				11290				970				0		
	Cumlative Funding Plan by Year			1100				12390				13360				13360		

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

CONTINGENCY ANALYSIS

	Estimated Cost ($K)	Contingency (%)	Contingency ($K)
LBL Activities			
Engineering	350	25	88
Inspection	184	10	18
Consultants	16	10	2
Architect/Engineer			
Titles I & II	640	20	128
Title III	150	15	23
Construction			
Building Rehabilitation	9,360	20	1,895
Project Management	460	10	46
Subtotal	11,160		2,200
Contingency ~20%	2,200		
TOTAL	13,360		

BUILDING 77--REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

MAJOR COMPONENTS OF COST ESTIMATE

Site Support Overhead 19.5% Procurement ($0,-$500k) 3.9% Mtl Handling 4.2%

		Base Cost	Escalated @ 11.83%	Overhead/ Burden	Cost	Rounded
A.	**ED & I**	1,089	1,218		1,341	1,340
	1) ENGINEERING & DESIGN (IN HOUSE)	414	463	88	551	0
	Title I	56	63	12	75	
	Title II	106	118	23	141	
	Title III	100	112	22	134	
	Inspection	138	154	30	184	
	Consultants	14	16	1	16	
	2) ENGINEERING & DESIGN (A/E)	675	755	35	790	
	Title I	192	215	10	225	
	Title II	354	396	18	415	
	Title III	129	144	7	151	
B.	**Construction**	8,349	9,337	23	9,360	9,360
	Building Rehab	8,349	9,337	23	9,360	0
C.	**Project Management**	344	384	75	459	460
	SUBTOTAL (A, B, & C)	9,782	10,939	221	11,160	11,160
	CONTINGENCY (~20%)					2,200
	TOTAL ESTIMATED COST (TEC)					**13,360**

Overhead is 2.0%
of escalated cost

0.02022526

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 4

BASIS OF PROJECT TIME SCHEDULE

It is assumed that project funding will be made available for commitments by Berkeley Lab on November 1, 2002.

Prior to that time Berkeley Lab will evaluate environmental conditions and prepare recommendations for NEPA documentation for DOE consideration beginning in October 1, 2001 for completion by July 1, 2002. It is anticipated that a categorical exclusion recommendation will be prepared for this project.

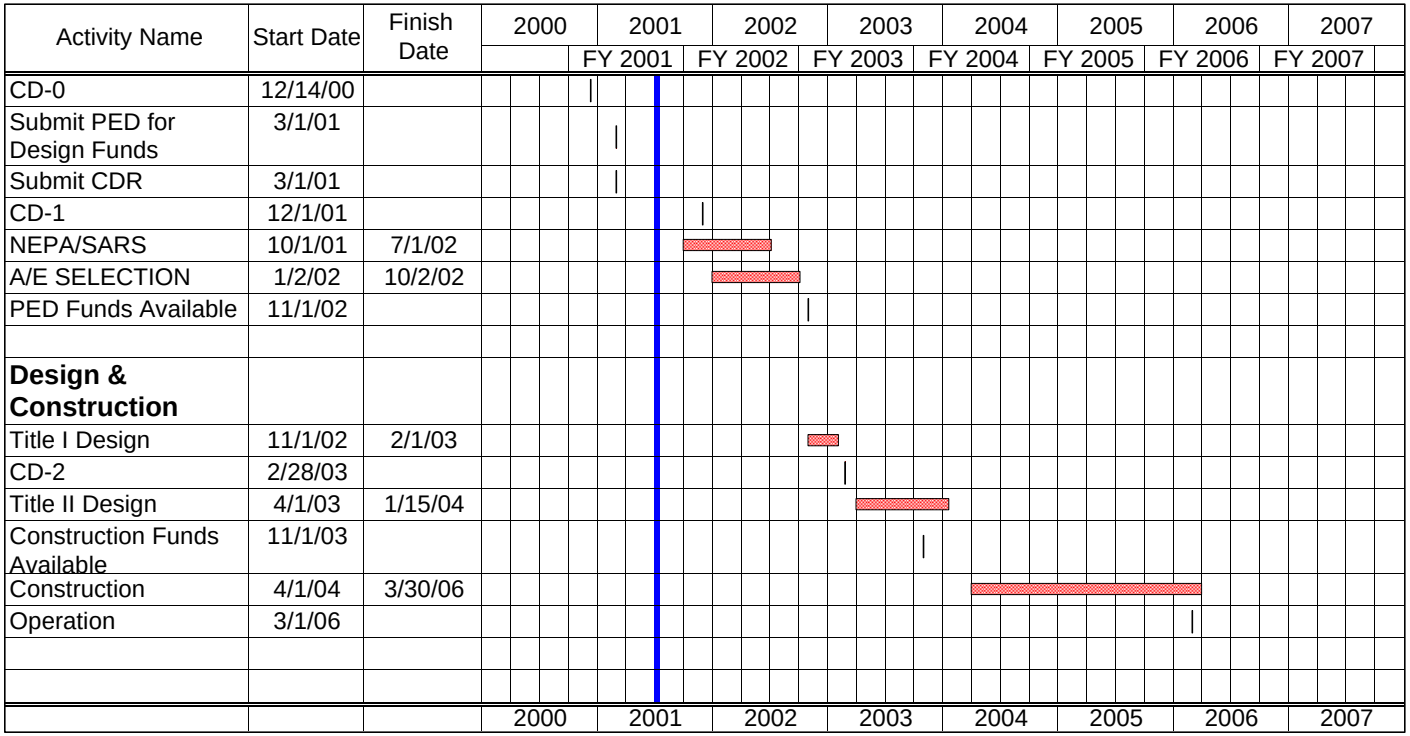
A/E selection will take place between January and October 2002, during which time the Design Program necessary for A/E fee negotiations and a Project Execution Plan for DOE will be completed.

A/E fee negotiations will take place between November 1, 2002 and December 1, 2002, contingent upon assurance by DOE/OAK that the project is in the FY 2003 budget.

The Project Time Schedule that follows is based upon the foregoing assumptions.

Building 77 Rehabilitation of Building Structure and Systems, Phase 2

Activity Name	Start Date	Finish Date
CD-0	12/14/00	
Submit PED for Design Funds	3/1/01	
Submit CDR	3/1/01	
CD-1	12/1/01	
NEPA/SARS	10/1/01	7/1/02
A/E SELECTION	1/2/02	10/2/02
PED Funds Available	11/1/02	
Design & Construction		
Title I Design	11/1/02	2/1/03
CD-2	2/28/03	
Title II Design	4/1/03	1/15/04
Construction Funds Available	11/1/03	
Construction	4/1/04	3/30/06
Operation	3/1/06	



BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 5

PROJECT DRAWINGS

T-1	Location Plan
A-1	First Floor Plan
A-2	Second Floor Plan
M-3.1	Air Flow Diagram
M-3.2	Condenser Water System Diagram
M-3.3	Chilled Water System Diagram
M-3.4	Hot Water System Diagram
M-3.5	Industrial Cold Water Flow Diagram
M-6.1	Floor Plan Col A-I/1-3
M-6.2	Floor Plan Col I-Q/1-3
M-6.3	Floor Plan Col Q-Y/1-5
M-6.4	Floor Plan Welding Exh. System
M-7.1	Floor Plan I-J/2-3
M-7.2	Mezzanine Plan Col Q-Y/1-4
M-7.3	Enlarged Mech Rm Floor Plan
M-8.1	Roof Plan HVAC Col A-I/1-3
M-8.2	Roof Plan HVAC Col I-Q/1-5
M-8.3	Roof Plan HVAC Col Q-Y/1-5
M-9.1	Outdoor Mechanical Equipment Plan
MP-1	Site Plan
MP-2	Crane & Piping Distribution Floor Plan
E-1	First Floor Electrical Plan
E-2	Second Floor Electrical Plan
E-3	Building 77A One Line Diagram - Sheet 1
E-4	Building 77A One Line Diagram - Sheet 2
E-5	Building 77A One Line Diagram - Sheet 3

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 6

OUTLINE SPECIFICATION

Division 0 BIDDING AND SUBCONTRACT REQUIREMENTS

00200 Information Available to Bidders
00500 Agreement Form
00600 Bonds and Certificates
00700 General Conditions of the Subcontract

Division 1 GENERAL REQUIREMENTS

01010 Summary of Work
01060 Regulatory Requirements
01200 Project Meetings
01300 Submittals
01400 Quality Control
01510 Temporary Utilities
01525 Construction Aids
01530 Barriers
01570 Construction Waste Management
01590 Field Offices and Sheds
01730 Cutting and Patching
01735 Selective Demolition

Division 2 SITE WORK

02200 Earthwork
02510 Asphalt Paving
02605 Manholes
02710 Site Drainage

Division 3 CONCRETE

03100 Concrete Formwork
03200 Concrete Reinforcement
03250 Concrete Accessories
03300 Cast-In-Place Concrete

Division 4 MASONRY

Not Used

Division 5 METALS

05120 Structural Steel and Miscellaneous Metal
05400 Cold Formed Metal Framing

Division 6 WOOD AND PLASTIC

06100 Rough Carpentry

Division 7 THERMAL AND MOISTURE PROTECTION

07210 Building Insulation
07530 Elastomeric Membrane Roofing
07600 Flashing and Sheet Metal
07840 Firestopping
07900 Sealants

Division 8 DOORS AND WINDOWS

08110 Steel Doors and Frames
08710 Hardware
08800 Glazing

Division 9 FINISHES

09100 Non-Load-Bearing Wall Framing
09250 Gypsum Wallboard
09310 Ceramic Tile
09500 Acoustical Treatment
09900 Painting

Division 10 SPECIALTIES

10160 Metal Toilet Compartments
10800 Toilet Accessories

Division 11 EQUIPMENT

Not Used

Division 12 FURNISHINGS

Not Used

Division 13 SPECIAL CONSTRUCTION

13281 Hazardous Materials Remediation – Lead-Based Paint and Dust
13285 Hazardous Materials Remediation – Asbestos

Division 14 CONVEYING SYSTEMS

14633 Top Riding Crane

Division 15 MECHANICAL

15010 Basic Mechanical Requirements
15121 Expansion Compensation
15140 Supports and Anchors
15170 Motors
15190 Mechanical Identifications
15242 Vibration Isolation
15260 Piping Insulation
15280 Equipment Insulation
15290 Ductwork Insulation
15310 Fire Protection Piping
15330 Wet-Pipe Sprinkler Systems
15410 Plumbing Piping
15430 Plumbing Specialties
15440 Plumbing Fixtures
15510 Hydronic Piping
15515 Hydronic Specialties
15540 HVAC Pumps
15545 Chemical (Water) Treatment
15558 Water Heaters
15559 Water Tube Boilers
15681 Water-Cooled Chillers
15712 Cooling Tower
15790 Air Coils
15855 Air Handling Units with Coils
15860 Centrifugal Fans
15890 Ductwork
15910 Ductwork Accessories
15936 Air Inlets and Outlets
15975 Facilities Monitoring and Control System
15990 Testing, Adjusting and Balancing
15992 Cleaning, Testing and Disinfecting Piping

Division 16 ELECTRICAL

16010 Basic Electrical Requirements
16110 Conduit
16114 Cable Tray, Wireway, and Surface Raceway

16120 Wire and Cable
16122 Low Voltage Wire and Cable (24 volts or less)
16130 Boxes
16141 Wiring Devices
16400 Low Voltage Switchgear
16450 Grounding and Bonding
16460 Dry Type Transformers
16470 Panelboards
16481 Variable Frequency Drives
16482 Motor Control Centers
16500 Lighting
16622 Automatic Transfer Switch with Bypass Isolation Feature
16721 Fire Alarm Detection Systems

DIVISION 0—BIDDING AND SUBCONTRACT REQUIREMENTS

SECTION 00200: INFORMATION AVAILABLE TO BIDDERS

A. Soil-investigation data.
B. Lead, asbestos, and other data associated with building components or existing construction materials.

SECTION 00500: AGREEMENT FORM

A. Furnished by the University.

SECTION 00600: BONDS AND CERTIFICATES

A. Performance Bond, AIA Document A3ll.

B. Labor and Material Payment Bond, AIA Document A311.

SECTION 00700: GENERAL CONDITIONS OF THE SUBCONTRACT

A. Furnished by the University.

DIVISION 1—GENERAL REQUIREMENTS

SECTION 01010: SUMMARY OF WORK

A. Work Covered by Subcontract Documents: Rehabilitation of a two-story industrial building, including rehabilitation of architectural, mechanical and electrical systems.

B. Subcontracts: Single, lump-sum Subcontract.

SECTION 01060: REGULATORY REQUIREMENTS

A. Codes and Design References listed in Section 2 shall be included in the construction specifications; codes and references shall be latest editions except where specifically noted otherwise.

SECTION 01200: PROJECT MEETINGS

A. Preconstruction conference.

B. Billing meetings, at the last progress meeting each month.

C. Periodic progress meetings, twice each month.

D. Guarantees, bonds, and service and maintenance Subcontracts meetings.

SECTION 01300: SUBMITTALS

A. Schedules

1. Progress schedule.

2. Proposed cash-flow schedule.

3. Schedule of values.

4. Submittal schedule.

B. Products list.

C. Shop drawings, product data, and samples.

D. Certificates of compliance.

E. EH&S Submittals

SECTION 01400: QUALITY CONTROL

A. Soils engineer's services.

B. Testing laboratory's services.

C. Testing agency's services.

SECTION 01510: TEMPORARY UTILITIES

A. Provide the following temporary utilities as part of the work of this Subcontract:

1. Heat and ventilation.

2. Sanitary facilities.

3. Telephone service.

4. Fire protection.

B. Water will be provided by the University.

SECTION 01525: CONSTRUCTION AIDS

A. Provide the following construction aids as part of the work of this Subcontract:

1. Construction elevators and hoists.

2. Temporary enclosures.

3. Swing staging.

4. Scaffolding and platforms.

SECTION 01530: BARRIERS

A. Fences.

B. Barricades.

SECTION 01570: CONSTRUCTION WASTE MANAGEMENT

A. Waste Management Plan.

B. Minimize Landfilling of Construction Waste.

1. Salvage.

2. Re-use.

3. Recycle.

SECTION 01590: FIELD OFFICES AND SHEDS

A. Field offices and sheds may be specially constructed for the work of this Subcontract, or may be portable or mobile buildings.

SECTION 01730 CUTTING AND PATCHING

A. Provide all cutting, fitting and patching required to complete the work.

SECTION 01735: SELECTIVE DEMOLITION

A. Demolition work shall include sawcutting and removal of existing underground utilities, pavement, concrete, structural steel, metal panels, roof membrane and insulation, partitions, doors, mechanical equipment and ducts, and electrical equipment.

B. Demolition shall be conducted in a safe and timely manner.

C. All non-contaminated / non-hazardous waste material shall become the property of the Subcontractor and shall be promptly removed and properly disposed of offsite.

DIVISION 2—SITE WORK

SECTION 02200: EARTHWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Earthwork shall include all excavation, fill, and backfill, as well as site mobilization. Work also encompasses fine grading for pads and walls, street coarse preparation, backfilling of trenches, foundations, and retaining walls, and placement of base materials for slabs on grade and roadways.

B. All earthwork and related testing shall conform to ASTM standards.

C. Testing will be done by an independent laboratory selected by the Lawrence Berkeley Laboratory.

D. Shoring and lagging shall be the responsibility of the Subcontractor.

E. Building grounding grid.

PART 2 PRODUCTS

2.01 MATERIALS

A. Base material under slabs on grade and roadways shall be Class 2 aggregate base/sub-base, conforming to specifications of the State of California Division of Highways.

B. All backfill shall be nonexpansive material, free of deleterious materials and large rocks. Materials of suitable composition excavated on site may be utilized as backfill material when approved by the Geotechnical Engineer.

PART 3 EXECUTION

A. All fill and backfill shall be compacted to a relative density of 95% (modified proctor) of maximum optimum density.

B. Backfill shall be compacted by impact and/or vibration methods.

SECTION 02510: ASPHALT PAVING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes all patch paving for roadways, swales, and access driveways.

B. Materials, including paving materials, shall conform to the Standard Specifications of the State of California, Division of Highways.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt concrete surfacing shall consist of a two (2) inch minimum layer of Type B aggregate 85-100% penetration, steam-refined asphalt.

B. Penetration prime coat, asphalt paint binder, and seal coat shall conform to the standard specifications.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Batching, placing, and compacting of asphalt concrete surfacing shall conform to the standard specifications.

SECTION 02605: MANHOLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Manholes and handholes for below-ground electrical and telephone service.

PART 2 PRODUCTS

2.01 MATERIALS

A. Precast reinforced concrete boxes, sectional type manholes, and handholes for underground service, complete with cast iron cover, neck, ladders, cable racks and traffic lids shall conform to ASTM C-478 specifications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install manholes on a 150mm base of crushed rock. Backfill around manholes shall be compacted sand to allow for drainage.

SECTION 02710: SITE DRAINAGE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work includes concrete-lined interceptor trench drains, installation of perforated pipe subsurface drains (hydraugers), erosion control sedimentation traps and basins, storm-water inlet structures and junction boxes, and all storm-water conduits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Perforated pipe shall be PVC with 25% minimum recycled post consumer industrial plastic.

B. Catch basins, field inlet, and junction boxes shall be cast-in-place units. Precast units may be substituted as specified on the plans or as approved by the engineer. All lids and grading will sustain H-20 wheel loading for boxes susceptible to such loading.

C. Storm drain shall be schedule 80 PVC drainage piping with 25% minimum recycled post consumer industrial plastic.
Storm-water piping at depths greater than 1.2m or contained within a private street right of way shall be reinforced concrete pipe.

PART 3 EXECUTION

3.01 INSTALLATION

A. All piping shall be installed in sand-bedded trenches.

B. All piping installation shall be inspected before backfilling.

DIVISION 3—CONCRETE

SECTION 03100: CONCRETE FORMWORK

PART 2 PRODUCTS

2.01 MATERIALS

A. Form Lumber: Douglas fir, construction grade.

B. Plywood Forms: Douglas fir plywood, Grade B-B, Class 1, exterior type, 5/8 inch thick maximum.

C. Form Sealer: Nonbonding and nonstaining.

D. Form Accessories: Standard types, as required.

SECTION 03200: CONCRETE REINFORCEMENT

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel: ASTM A615, Grade 40 for No. 4 bars and smaller, Grade 60 for No. 5 bars and larger.

B. Welded-Wire Fabric: ASTM A185 or ASTM A497.

C. Tie Wire: No. 16 AWG or heavier, black annealed.

D. Spirals: ASTM A82.

SECTION 03250: CONCRETE ACCESSORIES

PART 2 PRODUCTS

2.01 MATERIALS

A. Expansion-Joint Fillers

1. Exposed Joints: ASTM D1751.

2. Sealed Joints: ASTM D1752.

B. Water Stops: Preformed polyvinyl chloride, "Hydrocide Vinylstop," manufactured by Sonneborn-Contect, or equal.

SECTION 03300: CAST-IN-PLACE CONCRETE

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement Concrete

1. Compressive Strength, 28-day minimum.

a. All concrete: 4,000 psi.

2. Portland Cement: ASTM C150, Type II.

3. Aggregates: ASTM C33. Coarse aggregates shall be either granite or limestone.

4. Water: Clean and potable.

5. Admixtures: ASTM C494 or C290, as approved.

B. Concrete Curing

1. Liquid Membrane-Forming Compound: ASTM C309, Type I.

2. Sheet Materials: ASTM C171.

3. Clean, nonstaining burlap.

C. Patching Mortar: Concrete materials, except with coarse aggregate omitted.

D. Grout

1. Regular: Concrete materials, except with coarse aggregate omitted.

2. Metallic Nonshrink: "Embeco 153," manufactured by Master Builders, or approved equal.

PART 3 EXECUTION

3.01 PLACEMENT AND CURING

A. Place concrete in accordance with ACI 301.

B. Cure freshly placed concrete until concrete has reached its 28 day strength.

C. Testing will be done by an independent laboratory selected by the Lawrence Berkeley National Laboratory.

DIVISION 5—METALS

SECTION 05120: STRUCTURAL STEEL AND MISCELLANEOUS METAL

PART 2 PRODUCTS

2.01 MATERIALS

A. All structural steel and miscellaneous metal, unless otherwise specified: ASTM A36.

B. Pipe: ASTM A53, Type S, Grade B.

C. High-Strength Bolts: ASTM A325.

D. Standard Bolts and Nuts: ASTM A307, Grade A.

E. Washers for Standard Bolts: ANSI B27.2 and B27.4.

F. Welding Electrodes: E70.

G. Welding: Shielded-arc method.

H. Galvanizing

1. Structural shapes and plates: ASTM A123.

2. Hardware and threaded components: ASTM A153.

I. Primer: Solvent-based, inorganic zinc paint.

SECTION 05400 COLD FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDED

A. Load bearing formed steel stud exterior wall, and interior wall, framing.

B. Formed steel slotted channel, framing and bridging.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Studs: ASTM C955, formed to channel shape, punched web, 1.2 mm thick.

2.02 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered.

B. Touch-Up Primer for Galvanized Surfaces: SSPC - Paint 20 Type I Inorganic.

2.03 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: ASTM A123, hot dip galvanized to 380 gm/sq m.

B. Anchorage Devices: Drilled expansion bolts.

C. Welding: In conformance with AWS D1.1 and AWS D1.3.

PART 3 EXECUTION

3.01 ERECTION OF STUDDING

A. Install components in accordance with manufacturer's instructions.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 in. oc.

C. Place studs at 16 in. oc; not more than 2 in. from abutting walls and at each side of openings.

D. Construct corners using minimum three studs. Double stud wall openings, door and window jambs.

E. Erect load bearing studs one piece full length. Splicing of studs is not permitted.

F. Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

DIVISION 6—WOOD AND PLASTIC

SECTION 06100: ROUGH CARPENTRY

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber: Douglas Fir, Construction Grade, WCLIB No. 16, S4S.

B. Plywood: Douglas Fir, Exterior and Interior Types.

C. Telephone Terminal Boards: Fire-retardant treated Douglas Fir plywood, exterior glue, Grade B face veneer.

D. Fireproofing: Clean, odorless, paintable, noncorrosive pressure process using mineral salts; use on all lumber and plywood.

E. Rough Hardware: Types, strengths, materials, and sizes suitable for the intended purposes; galvanized, cadmium-plated, or noncorrosive metal for exterior use.

DIVISION 7—THERMAL AND MOISTURE PROTECTION

SECTION 07210: BUILDING INSULATION

PART 2 PRODUCTS

2.01 MATERIALS

A. Thermal: Inorganic glass-fiber or mineral-fiber blankets, foil-faced, flame Spread 0-25, Class A; Owens Corning, Johns Manville International, Inc., or approved equal.

07530: ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Membrane roofing and base flashings.

1.02 SYSTEM DESCRIPTION

A. Roofing System:, Single-ply copolymer alloy (CAP), Class A, heat-welded membrane system with factory-fabricated base flashings, and rigid insulation.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall be the products of one manufacturer. Products of Duro-Last are listed below to establish system requirements.

B. Membrane: Coplymer alloy (CAP).

1. Thickness: 50 mils.

2. Color: Gray.

C. Insulation: R-38 polyisocyanurate rigid insulation, mechanically attached.

D. Tapered Insulation: Polyisocyanurate rigid tapered insulation.

E. Base Flashings: Standard and custom factory pre-fabricated base flashings.

F. Approved fasteners and plates.

G. Roof Vents: Approved two-way roof vents.

SECTION 07600: FLASHING AND SHEET METAL

PART 2 PRODUCTS

2.01 MATERIALS

A. Flashing, and Interior and Exterior Trim: 22-gauge sheet metal, galvanized in conformance with ASTM A361, G90 coating designation.

B. Fasteners: Types, strengths, and sizes suitable for the intended purposes, galvanized or of non-corrosive materials compatible with flashing material.

C. Solder: ASTM C32, alloy Grade 50A.

D. Flux: FS 0-F-506.

SECTION 07840: FIRESTOPPING

PART 2 PRODUCTS

2.01 MATERIALS

A. Fire-rated Sealant: 3M "CP 25WB", Hilti "FFS-605", or approved equal.

SECTION 07900: SEALANTS

PART 2 PRODUCTS

2.01 MATERIALS

A. General Exterior Building Sealant: Single-component gun-grade non-sag paintable polyurethane-based elastomeric; FS TT-S-00230C, Type II, Class A; Sika "Sikaflex -15LM", or approved equal.

B. General Interior Building Sealant, Except as Otherwise Specified: Single-component gun-grade paintable acrylic or latex-rubber modified acrylic water-based gun grade, ASTM C384; Pecora Corp. "AC-20", Sonnoborn Building Products "Sonolac", or approved equal.

C. Sanitary Sealing: FS TT-S-001543A, Class A single-component primerless flexible mildew-resistant silicone rubber.

D. Primers/Sealers: Non-staining types as recommended by sealant manufacturer and compatible with sealant backup.

E. Sealant Backup: Compatible with sealant material.

DIVISION 8—DOORS AND WINDOWS

SECTION 08110: STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hollow metal doors.

B. Rolled steel frames.

PART 2 PRODUCTS

2.01 MATERIALS

A. Interior Doors: Commercial quality, cold-rolled sheet steel, heavy-duty, seamless, flush panel doors, 16-gauge, minimum, fire ratings as required.

B. Interior Frames: Cold- or hot-rolled sheet steel, one-piece, welded construction, 16-gauge for openings 4'-0" or less in width, 14-gauge for openings wider than 4 feet, fire rated as required.

C. Finish: Hot phosphate treated followed by shop applied rust inhibitive primer.

2.02 MANUFACTURERS

A. Ceco, Forderer, Fenestra, Steelcraft, or equal.

SECTION 08710: HARDWARE

PART 2 PRODUCTS

2.02 MANUFACTURERS

A. Hinges: Hager, McKinney, or equal.

B. Locksets: Schlage, no substitutions.

C. Closers: Norton, no substitutions.

D. Panic Exit Hardware: Von Duprin, no substitutions.

E. Thresholds and gaskets: Pemko, Reese, or equal.

SECTION 08800: GLAZING

PART 2 PRODUCTS

2.01 MATERIALS

A. Clear wire glass.

B. Clear safety-and-fire rated glass: "Firelite Plus"; Nippon Electric Glass Co., or approved equal, no known equal.

C. Glazing materials and accessories.

DIVISION 9—FINISHES

SECTION 09100: NON-LOAD-BEARING WALL FRAMING

PART 2 PRODUCTS

2.01 MATERIALS

A. Non-Load-Bearing Wall-Framing and Ceiling Framing Systems:

1. Metal studs and furring channels, galvanized or painted with a rust-inhibitive primer.

2. Accessories: Standard; as required.

3. Metal Backing Plates: Galvanized or painted with a rust-inhibitive primer.

SECTION 09250: GYPSUM WALLBOARD

PART 2 PRODUCTS

2.01 MATERIALS

A. ASTM C36, Type X, fire-rated gypsum wallboard, 5/8 inch thick, with tapered edges; US Gypsum Co., Gold Bond, or approved equal.

B. Cement Board: 5/8 inch thick Portland cement board, fiberglass reenforced.

C. Accessories: Standard fasteners and joint-treatment materials; as required.

SECTION 09310: CERAMIC TILE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Repair of ceramic tile floor and base finish using the setting bed method.

B. Repair of ceramic tile wall finish using the setting bed method.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. American Olean.

B. Dal-Tile

2.02 MATERIALS

A. TCA A137.1, standard grade, ceramic floor tile, 2" x 2" x 1/4" thick.

B. TCA A137.1, standard grade, ceramic wall tile, 4" x 4" x 1/4" thick.

C. Cove base to match floor tile.

SECTION 09500: ACOUSTICAL TREATMENT

PART 2 PRODUCTS

2.01 MATERIALS

A. Metal Acoustical Baffle Panels: Metal frame, perforated aluminum skin, sound absorbing media protectively wrapped against high humidity, having a noise reduction coefficient (NRC) of 1.0 or greater, rated "Class A" per ASTM 84; Alpro Acoustical, or equal.

B. Mounting Devices: As recommended by panel manufacturer.

C. Trim: Aluminum, color to mach panels.

SECTION 09900: PAINTING

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ICI Paints, Sinclair Paint Company, Fuller O'Brien, or equal.

2.02 MATERIALS

A. Exterior Metal (Except Metal Panels): Semigloss, three-coat paint system.

B. Interior:

1. Metal: Semigloss, three-coat paint system.

2. Gypsum Wallboard: Low-luster, three-coat paint system.

3. Horizontal Overhead Surfaces (Excluding Structural Steel): Flat, three-coat paint system.

4. Exposed Conduit, Ducts and Piping: Three-coat paint system, sheen to match adjacent surfaces.

C. Shop Primed Metal: Two-coat paint system.

DIVISION 10—SPECIALTIES

SECTION 10160: METAL TOILET COMPARTMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Metal toilet compartments, floor hung.

B. Urinal screens, wall mounted.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Global Steel Products Corp.

B. Sanymetal Products Co., Inc.

2.02 MATERIALS

A. Sheet Steel: Hot-rolled, stretcher leveled and bonderized.

B. Hardware, Fittings, Fasteners and Accessories: Stainless steel and chrome-plated, non-ferrous castings.

C. Finish: Manufacturer's baked-on enamel, color to match existing.

SECTION 10800: TOILET ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Toilet and washroom accessories, recessed.

B. Attachment hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bobrick.

2.02 MATERIALS

A. Stainless Steel Sheet: ASTM A167, Type 304.

B. Tubing: Stainless steel.

2.03 FINISH

A. Stainless Steel: Satin luster finish.

2.04 ACCESSORY ITEMS

A. Toilet paper dispenser.

B. Grab bars.

C. Mirror and shelf.

D. Toilet seat cover dispenser.

DIVISION 13—SPECIAL CONSTRUCTION

SECTION 13281: HAZARDOUS MATERIALS REMEDIATION – LEAD-BASED PAINT AND DUST

PART 1 GENERAL

1.01 WORK INCLUDED:

A. All lead-based paint and settled lead dust abatement work as required for this Project.
B. Lead Work Plan.

1.02 REGULATORY REQUIREMENTS:

A. All lead-based paint and settled lead dust abatement work shall be performed in accordance with all applicable Federal, state, and local requirements.

B. Worker training shall be current and in accordance with requirements of OSHA and California DHS lead regulations.

PART 3 EXECUTION

3.01 WORKER PROTECTION

3.02 WORK AREA PREPARTION.

3.03 SURFACE PREPARATION AND PAINT FILM STABILIZATION.

3.04 PROJECT DECONTAMINATION.

3.05 PROJECT CLEARANCE.

3.06 DISPOSAL OF WASTE MATERIALS

SECTION 13285: HAZARDOUS MATERIALS REMEDIATION – ASBESTOS

PART 1 GENERAL

1.01 WORK INCLUDED

A. All asbestos abatement work as required for this Project.

B. Asbestos Work Plan.

1.02 REGULATORY REQUIREMENTS:

A. All asbestos abatement work shall be performed in accordance with all applicable Federal, state, and local requirements.

B. Worker training shall be current and in accordance with requirements of AHERA regulations.

PART 3: EXECUTION

3.01 PERSONNEL PROTECTION.

3.02 PREPARATION.

3.03 DECONTAMINATION ENCLOSURE SYSTEMS.

3.04 SEPARATION OF WORK AREA FROM NONWORK AREAS.

3.05 NEGATIVE AIR PRESSURE.

3.06 WORK AREA ENTRY AND EXIT PROCEDURES.

3.07 REMOVAL OF ASBESTOS-CONTAINING MATERIALS.

3.08 POST ABATEMENT ENCAPSULATION.

3.09 INSPECTIONS.

3.10 CLEARANCE TESTING.

3.11 DISPOSAL OF WASTE MATERIALS.

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14633: TOP RIDING CRANE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. 15-ton top riding double bridge crane system at Building 77A.

PART 2 - PRODUCTS

2.01 BRIDGE GIRDERS

A. The center-to-center dimension of the runway rails shall be approximately 37 feet 4 inches.

2.02 CRANE DRIVE

A. The crane speed shall be controlled through a variable frequency drive from 2 to 80 feet per minute.

2.03 HOIST CARRIER

A. The carrier speed shall be controlled through a variable frequency drive from 2 to 40 feet per minute.

2.04 HOIST

A. The hoist and appurtenances shall be designed to withstand all stresses imposed under safe operating conditions while handling loads within the rated capacity. The hoist speed shall be controlled through a variable frequency drive from 2 to 20 feet per minute.

2.05 HEIGHT

A. The top of the existing crane rail is 17 feet, 9 inches above the finished floor. The bottoms of the existing ductwork and lights are 21 feet, 6 inches above the finished floor. The crane shall have a maximum height of 3 feet, 6 inches from the top of the trolley to the top of the crane rail. The crane lift height shall be long enough to pick loads up off of the floor, 17 feet, 9 inches below the top of the existing crane rail.

2.06 MOTORS

A. All variable speed motors shall be squirrel cage type, totally enclosed.

2.08 PENDANT

A. The pendant shall be a Telemotive SBP-12-WBTX or equal.

2.08 STAND-OFF DEVICES

A. The crane end trucks shall be furnished with stand-off devices which will provide a physical separation of greater than seventeen (17) feet between the end trucks of the existing 15T crane and the crane specified herein.

PART 3 - EXECUTION

3.01 TESTING

A. The crane shall be certified in accordance with ANSI 830.2.0 - 1976; California Administrative Code Title 8, Article 99; and OSHA Title 29, Chapter 17, Part 1910.

DIVISION 15—MECHANICAL

SECTION 15010: BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all services, skilled and common labor, and all apparatus and materials required for the complete installation as shown and within the intent of the drawings and/or these Specifications.

1.05 CODES AND STANDARDS

A. Comply with General Requirements, Section 01010, Part 1.03 – Codes, and Section 01900 – Lateral Force Anchorage Provisions.

SECTION 15121: EXPANSION COMPENSATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Flexible pipe connections, Expansion joints and compensators, .

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Metraflex or equal.

2.02 FLEXIBLE PIPE CONNECTIONS

2.03 EXPANSION JOINTS

2.04 CONNECTIONS

SECTION 15140: SUPPORTS AND ANCHORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe, duct, and equipment hangers and supports.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

2.02 HANGER RODS

2.03 INSERTS

2.04 FLASHING

2.05 EQUIPMENT CURBS

2.06 SLEEVES

SECTION 15170: MOTORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Three phase electric motors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Baldor, Dayton, General Electric.

2.02 THREE PHASE POWER - SQUIRREL CAGE MOTORS

2.03 MOTOR EFFICIENCY

2.04 MOTOR POWER FACTOR

SECTION 15190: MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Identify all installed mechanical distribution piping and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. W. H. Brady or Westline Products.

SECTION 15242: VIBRATION ISOLATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Inertia bases and vibration isolation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Vibrax, Mason or equal.

2.02 INERTIA BASES

2.03 VIBRATION ISOLATORS

SECTION 15260: PIPING INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping insulation, jackets and accessories.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manville Corporation, Certain-Teed, or Owens Corning Fiberglass.

2.02 INSULATION

2.03 JACKETS

2.04 ACCESSORIES

SECTION 15280: EQUIPMENT INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Equipment insulation, Covering, Breeching insulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manville Corporation, Owens-Corning, Knauf.

2.02 INSULATION

2.03 ACCESSORIES

SECTION 15290: DUCTWORK INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Ductwork insulation, Insulation jackets.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manville Corporation, Knauf, Owens-Corning, or equal.

SECTION 15310: FIRE PROTECTION PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe, fittings, valves, sleeves, and connections for fire protection systems.

PART 2 PRODUCTS

2.01 PIPE AND TUBE

2.02 PIPE FITTINGS

2.03 JOINT MATERIALS

2.04 UNIONS, FLANGES, AND COUPLINGS

2.05 VALVES

2.06 SPRINKLER HEADS

SECTION 15330: WET-PIPE SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Design and installation of wet-pipe sprinkler system.

PART 3 EXECUTION

3.01 INTERFACE WITH OTHER PRODUCTS

3.02 PREPARATION

3.03 INSTALLATION - PIPING

3.04 INSTALLATION - SPRINKLER HEADS

3.05 SYSTEM ACTIVATION

3.06 CLEANING

3.07 SYSTEM TESTS

SECTION 15410: PLUMBING PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping for City Water, Sanitary Sewer, Natural Gas, and Compressed Air systems include pipe, fittings, valves, and sleeves.

PART 2 PRODUCTS

2.01 PIPE CLASS BS1: BLACK STEEL PIPE AND FITTINGS: FOR NATURAL GAS

2.02 PIPE CLASS C1: COPPER TUBE AND FITTINGS (TYPE K OR L) : FOR DOMESTIC HOT AND COLD WATER, FOR INDUSTRIAL HOT AND COLD WATER.

2.03 PIPE CLASS CI2: CAST-IRON SOIL PIPE, HUBLESS : FOR SANITARY SEWER, STORM DRAIN AND VENT

2.04 GATE VALVES

2.05 GLOBE VALVES

2.06 CHECK VALVES

SECTION 15430: PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Floor drains and floor sinks, Trap primers, Cleanouts, Backflow preventers, Water-hammer arresters, Hose bibbs

PART 2 PRODUCTS

2.01 FLOOR DRAINS (FD)

A. Floor Drain: ANSI A112.21.1M; lacquered cast-iron two-piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer; J.R. Smith, Wade, or equal.

2.02 FLOOR SINKS (FS)

A. Floor Sink (FS-1): Lacquered cast-iron body with dome strainer and seepage flange; J.R. Smith, Wade or equal.

2.03 TRAP PRIMERS

A. Precision Plumbing “P-2,” J. R. Smith, or equal.

2.04 CLEANOUTS

A. Interior Finished Floor Areas: Lacquered cast-iron, two-piece body with double drainage flange, J.R. Smith, Wade or equal.

2.05 BACKFLOW PREVENTION

A. Atmospheric Vacuum Breakers: Wilkins, FEBCO or equal, Double Check Valve Assemblies: Wilkins, FEBCO or equal.

2.06 WATER-HAMMER ARRESTERS

A. ANSI A112.26.1M for material, PDI WH-201 for size; ZURCH, J.R. SMITH, OR EQUAL.

2.07 HOSE BIBBS

A. Horizontal Pipe: 3/4-inch male NPT inlet, 3/4-inch hose connection, brass body with rough brass finish; Price-Pfister ”85-110,” Wolverine “Brass 50244,” or equal.

SECTION 15440: PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Water closets, Urinals, Lavatories.

PART 2 PRODUCTS

2.01 FIXTURES

A. American Standard, Kohler.

2.02 FIXTURE TRIM

A. American Standard, Kohler.

2.03 FLUSH VALVES

A. Sloan, Delaney.

2.04 WATER CLOSET SEATS

A. Olsonite, Church.

2.05 WATER CLOSET

A. American Standard, Kohler, or equal.

2.06 LAVATORY

A. Basin: ANSI A112.19.2; vitreous-china wall-hung lavatory, with 4-inch high back, drillings on 4 -inch centers, rectangular basin with splash lip, and front overflow.

SECTION 15510: HYDRONIC PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hot water piping system, Chilled water piping system, Condenser water piping system, Condensate drain.

PART 2 PRODUCTS

2.01 PIPE CLASS BS1: BLACK STEEL PIPE AND FITTINGS

2.02 PIPE CLASS BS2: BLACK STEEL PIPE AND FITTINGS

2.03 PIPE CLASS C1: COPPER TUBE AND FITTINGS (TYPE L)

2.04 VALVE SCHEDULE

2.05 GATE VALVES

2.06 GLOBE VALVES

2.07 DUAL-FUNCTION BALANCING AND SHUT-OFF VALVES

2.08 CHECK VALVES

2.09 AIR VENT VALVES

2.10 PRESSURE-RATED LINE VALVES

SECTION 15515: HYDRONIC SPECIALTIES

1.01 WORK INCLUDED

A. Expansion tanks, Air vents, Air separators, Strainers, Pump suction fittings, Combination fittings, Flow indicators, controls, meters, Relief valves.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

A. Bell and Gossett, Wessels, Co., Taco, Inc.,

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Bell and Gossett, Wessels. Co., Taco, Inc.

2.03 AIR VENTS

A. Bell and Gossett, Taco, Inc.

2.04 AIR SEPARATORS

A. Bell and Gossett, Taco, Inc.

2.05 STRAINERS

A. Bell and Gossett, Taco, Inc.

2.06 PUMP SUCTION FITTINGS

A. Bell and Gossett, Taco, Inc.

2.07 RELIEF VALVES

SECTION 15540: HVAC PUMPS

PART 1 GENERAL

1.01. WORK INCLUDED

A. In-line pumps, Base mounted pumps.

PART 2 PRODUCTS

2.01. MANUFACTURERS

A. ITT Bell & Gossett, PACO, Taco

SECTION 15545: CHEMICAL (WATER) TREATMENT

PART 1 GENERAL

1.01. WORK INCLUDED

A. Cleaning of piping systems, Treatment for closed systems, Treatment for open systems.

1.02. CODES AND STANDARDS

A. Comply with Section 15010, Part 1.05 - Codes and Standards, Applicable EPA codes for addition of non- potable chemicals to building mechanical systems, and for delivery to public sewage systems.

PART 2 PRODUCTS

2.01. MANUFACTURERS

A. Garratt-Callahan Company, Aqua Treat Chemicals, Inc., Chem Treat, Inc.

SECTION 15558: WATER HEATERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Water Heater, Water Heater Trim, Fuel burning equipment and connections, Controls, Storage Tank.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. A.O. Smith, Water Heater HW-200M

2.02 MANUFACTURED UNITS

2.03 WATER HEATER SHELL

2.04 HOT WATER HEATER TRIM

2.05 FUEL BURNING EQUIPMENT AND OPERATING AND SAFETY CONTROLS FOR WATER HEATER WITH GROSS RATING OF 40 HORSEPOWER (30 KW) AND OVER

2.06 OPERATING AND SAFETY CONTROLS

2.07 ALARM SYSTEM

2.08 STORAGE TANK

SECTION 15559: WATER TUBE BOILERS

PART 1 GENERAL

1.01. WORK INCLUDED

A. Boilers, for outdoor installation, Boiler trim, and vent. Fuel burning equipment and connections, Controls with two “MOD-U-PAK”.

PART 2 GENERAL

2.01. MANUFACTURERS

A. Lochinvar, Copper Fin II.

2.02. MANUFACTURED UNITS

2.03. BOILER SHELL

2.04. HOT WATER BOILER TRIM

2.05. FUEL BURNING EQUIPMENT

2.06. OPERATING AND SAFETY CONTROLS

2.07. ALARM SYSTEM

SECTION 15681: WATER-COOLED CHILLERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Chiller package, Initial refrigerant and oil charge, Manufacturer's field services.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane Company.

2.02 CHILLERS

2.03 COMPRESSORS

2.04 EVAPORATOR

2.05 CONDENSER

2.06 REFRIGERANT CIRCUIT

2.07 CONTROL PANEL

SECTION 15712: COOLING TOWER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Cooling tower, Controls, Ladder and handrails.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ceramic Cooling Tower Co.

2.02 COOLING TOWER

SECTION 15790: AIR COILS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Water coils, Coil piping and accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane (Haakon), United Metal Products, McQuay.

2.02 WATER HEATING COILS

2.03 COOLING COILS

SECTION 15855: AIR-HANDLING UNIT WITH COILS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Packaged air-handling units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane (Haakon), United Metal products, McQuay

2.02 OVERALL UNIT

2.03 CASING

2.04 INSULATION

2.05 FAN

2.06 FACE AND BYPASS DAMPERS

2.07 FILTERS

2.08 COILS

SECTION 15860: CENTRIFUGAL FANS

PART 1 GENERAL

1.01 SECTION INCLUDED

A. Backward-inclined centrifugal fans, Forward-curved centrifugal fans, Airfoil centrifugal fans, Plug-type unhoused centrifugal fans, Utility/vent sets,

Motors and drives, Belt guards, Inlet/outlet screens, Access doors, Scroll drains.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane (Haakon), United Metal Products, McQuay, Greenheck.

2.02 WHEEL AND INLET

2.03 HOUSING

2.04 MOTORS AND DRIVES

2.05 ACCESSORIES

SECTION 15890: DUCTWORK

PART 1 GENERAL

1.01 SECTION INCLUDED

A. Low-pressure ducts, Casings, Duct cleaning.

PART 2 PRODUCTS

2.01 GENERAL

A. Rectangular: Shop-fabricate of prime grade lock form quality galvanized steel sheet per SMACNA Manual.

B. Round: Factory-fabricated duct and fittings: United Sheet Metal, Sheet Metal Products or equal.

2.02 LOW-PRESSURE DUCT FABRICATION

2.03 MEDIUM PRESSURE DUCT FABRICATION

2.04 CASING FABRICATION

SECTION 15910: DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Volume-control dampers, Fire dampers, Combination fire and smoke dampers, Smoke dampers, Backdraft dampers, Air-turning devices, Flexible duct connections, Duct access doors, Duct test holes.

PART 2 PRODUCTS

2.01 VOLUME-CONTROL DAMPER FABRICATION

2.02 FIRE DAMPERS AND COMBINATION FIRE AND SMOKE DAMPERS

A. Ruskin, or equal.

2.03 BACKDRAFT DAMPERS

2.04 AIR-TURNING DEVICES

2.05 FLEXIBLE DUCT CONNECTIONS

2.06 DUCT ACCESS DOORS

2.07 DUCT TEST HOLE FABRICATION

SECTION 15936: AIR INLETS AND OUTLETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Diffusers, Grilles and registers, Outside louvers, Door grilles, Diffuser boots, Roof hoods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Titus, Krueger, or equal.

2.02 SUPPLY GRILLES

2.03 LOUVERED SUPPLY GRILLES

2.04 RETURN AND EXHAUST GRILLES

2.05 GRID CORE RETURN AND EXHAUST GRILLES

2.06 RECTANGULAR SUPPLY DIFFUSERS

2.07 PERFORATED FACE DIFFUSERS

SECTION 15975: FACILITIES MONITORING AND CONTROL SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Facilities Monitoring And Control System (FMCS) components, software, and communications equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Facilities Monitoring and Control System (FMCS) shall be Johnson Controls, Inc. Metasys™.

2.02 MATERIALS

2.03 EXISTING PC WORKSTATIONS DESCRIPTION

2.04 OPERATOR WORKSTATION INTERFACE

2.05 FIELD PROCESSING UNITS (FPUS)

2.06 NETWORK CONTROL UNITS (NCUS)

2.07 APPLICATION SPECIFIC CONTROLLERS (ASCS)

2.08 ENCLOSURES AND ELECTRONIC ACCESSORIES

2.09 CONTROL VALVES

2.10 ACTUATORS

2.11 TEMPERATURE SENSORS

2.12 DIFFERENTIAL PRESSURE SENSORS

2.13 HUMIDITY SENSORS

2.14 LIQUID FLOW METERS

PART 3 EXECUTION

3.01 FIELD PROCESSING UNIT(S) INSTALLATION

3.02 APPLICATION SPECIFIC CONTROLLERS

3.03 ENCLOSURE-MOUNTED COMPONENTS INSTALLATION

3.04 SENSOR/TRANSDUCER INSTALLATION

3.05 DAMPER ACTUATOR INSTALLATION

3.06 FIELD WIRING

3.07 COMMUNICATION SUB-SYSTEM

3.08 FMCS COMMUNICATIONS

3.10 SOFTWARE

3.11 OPERATORS WORKSTATION SOFTWARE

3.12 TESTING

3.13 OPERATOR TRAINING

SECTION 15990: TESTING, ADJUSTING & BALANCING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Component check, System balancing, Operating tests and training.

PART 3 EXECUTION

3.01 COMPONENT CHECK PRIOR TO BALANCING

3.02 AIR-SYSTEM BALANCE PROCEDURE

3.03 HYDRONIC-SYSTEMS BALANCE PROCEDURE

3.04 OPERATING TEST

SECTION 15992: CLEANING, TESTING, AND DISINFECTING PIPING

DIVISION 16 - ELECTRICAL

SECTION 16010: BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. New electrical duct bank containing 12,470 volt power feeders from the Original Lab Site Switching Substation to the Molecular Foundry Building secondary unit substations.

B. Two new secondary unit substations each consisting of a medium voltage load break selector switch, a cast-coil, dry type transformer and a 480/277 volt switchgear section.

C. 480Y/277 volt and 208Y/120 volt distribution panels and interior power distribution system.

D. Electrical system grounding, building and equipment grounding.

E. Motor control center and wiring to mechanical equipment.

F. Interior and exterior lighting, including emergency egress lighting.

G. Photovoltaic system including photovoltaic panels, inverters, and distribution equipment.

H. New communications duct bank containing cables and raceways for the Integrated Communication System (ICS), fire alarm, Energy Monitoring and Control (EMCS) and the hillwide public address system.

I. Building fire protection and hazard alarm systems with remote annunciation at the Lawrence Berkeley Laboratory fire station.

J. Conduit and wiring for local Energy Monitoring and Control System with a connection to the Lawrence Berkeley Laboratory hillwide system.

K. All electrical equipment shall be tested prior to energization.

SECTION 16110: CONDUIT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Interior conduits, installed concealed whenever possible: 20 mm nominal electrical metallic tubing (EMT).

B. Conduit in floor slab or under floor: 25 mm nominal hot-dip galvanized, rigid steel with corrosion protection.

C. Power and communication branch circuit conduits, below grade: Underwriters' Laboratories, Inc. (UL) listed, Plastic, Carlon PVC, schedule 40, 100mm conduit size, Concrete encased, 75mm minimum all sides, with rebar reinforcement. Power and communications ducts shall be separated by 600mm.

D. Power and communication within open office areas will be distributed by Walker Duct imbedded within the concrete floor and floor receptacles for feeds to office panels.

SECTION 16114: CABLE TRAY, WIREWAY, AND SURFACE RACEWAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Cable Tray and Fittings

B. Wireway and Fittings

C. Surface Raceway Systems

SECTION 16120: WIRE AND CABLE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Conductors for interior electrical systems shall be solid copper. No. 12 AWG minimum size for power and lighting branch circuits. Use solid No. 14 AWG for motor control wiring, No. 16 AWG for security, paging and fire alarm.

B. Conductors

1. No. 12 AWG and smaller: Solid copper.

2. No. 8 AWG and larger: Class B stranded copper.

C. Wire Types

1. Power and lighting conductors shall be 600 volt, XHHW or THHN.

2. Bonding and grounding conductors shall be ASTM B1, solid, bare copper for sizes No. 8 AWG and smaller, and shall be ASTM B8 Class B stranded copper for sizes No. 6 AWG and larger.

SECTION 16122: LOW VOLTAGE WIRE AND CABLE (24 volts or less)

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wire and Cable for instrument and control systems operating at 24 volts DC and lower.

B. Wiring connections, terminations and labeling.

C. Electrical connections to equipment specified under other Sections.

SECTION 16130: BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pull and Junction Boxes.

B. Wall and Ceiling Outlet Boxes

C. Floor Boxes.

SECTION 16141: WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wall Switches.

B. Receptacles.

C. Floor-mounted service fittings.

D. Wall Dimmers.

E. Device Plates and Box Covers.

SECTION 16400: LOW VOLTAGE SWITCHGEAR

PART 1 GENERAL

1.01 GENERAL SCOPE

A. Low voltage switchgear extension to the existing switchgear.

B. Equipped with one draw-out power circuit breaker and three (3) spaces equipped and ready to accept a draw-out power circuit breaker.

C. Furnish the switchgear with an outdoor, walk-in enclosure extension to the existing switchgear enclosure. Provide with light(s) and space heaters.

SECTION 16450: GROUNDING AND BONDING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Grounding System Resistance: Five (5) ohms.

B. Conform to requirements of ANSI/NFPA 70 and IEEE 142.

C. Furnish products listed and classified by Underwriters' Laboratories, Inc. as suitable for purpose specified and shown.

D. Provide service ground at main circuit breaker section of low-voltage switchgear.

E. Ground secondary neutral point of all transformers.

F. Provide building column and water main grounding.

G. Ground all electrical equipment enclosures.

SECTION 16460: DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type, energy efficient transformers.

B. Insulation system and average winding temperature rise for rated kVA as follows:

Rating (kVA)	Class	Rise (degree C)
1- 15	185	115
16-500	220	80

C. Winding Taps, Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

D. Winding Taps, Transformers 15 kVA and Larger: ANSI/NEMA ST 20.

SECTION 16470: PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Main and Distribution Panelboards.

B. Main Panel Metering

C. Lighting and Appliance Branch Circuit Panelboards.

SECTION 16481: VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and Install Variable Frequency Drives.

B. Provide all wiring and interconnection, applications programming, and start-up and test services.

SECTION 16482: MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Motor Control Centers: NEMA ICS 2; Class II, Type B.

B. Motor Starter Units: Plug-in combination starters with motor circuit protectors and ground fault protection.

C. Feeder Tap Units: Molded case thermal-magnetic circuit breakers.

D. Voltage Rating: 480 volts, three-phase.

E. Horizontal Bussing: Copper, with a continuous current rating of 60 amperes. Include copper ground bus entire length of control center.

F. Vertical Bussing: NEMA ICS 2; copper.

G. Integrated Equipment Short Circuit Rating: 35,000 amperes rms symmetrical at 480 volts.

SECTION 16500: LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Interior and exterior lighting systems shall comply with the IES Lighting Handbook. Lighting energy requirements shall conform to the DOE Energy Conservation Manual.

B. Emergency Lighting Units

1. LED exit sign lights with battery backup.

2. Fluorescent egress lighting.

C. Fluorescent fixtures shall have specular reflectors, acrylic lenses and high-frequency electronic ballasts.

D. Provide task lighting, where required.

E. Provide combination ultrasonic infrared occupancy sensors in restrooms and office spaces.

SECTION 16622: AUTOMATIC TRANSFER SWITCH WITH BYPASS FEATURE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Automatic Transfer Switch.

B. Bypass Isolation Feature.

C. Metering and Interconnections with the Standby Generator Set.

SECTION 16721: FIRE ALARM DETECTION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Flow switches to indicate sprinkler zone water flow.

B. Tamper switches on all sprinkler water valves.

C. Alarm signal, on sprinkler water flow, to central fire station.

D. Manual fire call boxes.

E. Building fire alarm bells with strobe lights.

F. Equipment must be compatible with existing Lawrence Berkeley Laboratory fire alarm system.

G. Supervision on all fire alarm circuits.

H. Ionization smoke detectors for HVAC units, elevator recall and document storage areas.

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 7

ENERGY MANAGEMENT

Design Policy

It is the policy of Lawrence Berkeley National Laboratory (LBNL) to design and specify the most life-cycle cost effective systems and equipment in compliance with our contract with the Department of Energy, and Federal and State laws, regulations, and codes. Though it will be the responsibility of the Designer to determine the specific requirements stipulated by these statutes, LBNL In-House Energy Management will provide guidance and oversight throughout the design and construction process for this project.

The systems and equipment to be designed and constructed during this project will include the following components: high efficiency boilers, chillers, cooling towers, fans, and pumps; a facilities monitoring and control system (FMCS); premium-efficiency motors, variable speed drives where applicable, and energy-efficient lighting systems.

High Efficiency Boilers

The boilers to be designed and constructed for this project will be based on a high efficiency, modular design to minimize the consumption of natural gas. This design also provides the best method of matching boiler capacity to the heating demand, production of the hot water required at the highest efficiency, and the elimination of standby losses when the boilers are not needed.

High Efficiency Chillers

The chillers to be designed and constructed for this project will be based on a high efficiency, rotating screw design to minimize the consumption of electricity. This design also provides the best method of matching chiller capacity to the cooling demand, and production of the chilled water required at the highest efficiency.

Cooling Towers

The cooling towers to be designed and constructed for this project will be based on a high efficiency, fiberglass design to minimize the consumption of electricity and reduce maintenance. In addition, the cooling tower fan speed will be controlled through a variable speed drive to minimize energy consumption and provide the best method of matching cooling capacity to the demand.

Fans

The fans to be designed and constructed for this project will be based on a high efficiency design to minimize the consumption of electricity and reduce maintenance. In

addition, the fan speed for the central air handlers will be controlled through a variable speed drive to minimize energy consumption and provide the best method of matching air volume to the demand.

Pumps

The pumps to be designed and constructed for this project will be based on a high efficiency design to minimize the consumption of electricity and reduce maintenance.

Facility Monitoring and Control System (FMCS)

All mechanical systems will be monitored and controlled by the site-wide Johnson Controls, Inc. Metasys FMCS. The FMCS employs a multi-level distributed processing architecture connected by a local area network. Microprocessor-based field processing units will perform data acquisition, steady-state control, control functions of timed events, conditional control sequences, and notification of off-normal conditions.

Premium Efficiency Motors

Premium Efficiency Motors: Motors of one half horsepower and larger will be three-phase, 460 volt. All motors will be highest efficiency available.

Solid State Motor Starters: Motor starters will use solid state technology for overload protection. Thermal overload protection devices will be prohibited.

Lighting Systems

Light Levels: The lighting levels provided will be the minimum required, depending on the programmatic use of each area.

Lamps and Ballasts: Fluorescent fixtures will include T-8 lamps with solid state high frequency ballasts. When available, 277-volt power will be used for lighting. Exit signs will be low-wattage, light-emitting-diode (LED) type. Outdoor lighting will be either fluorescent or high pressure sodium. Incandescent lighting will be prohibited unless proven to be life cycle cost effective.

Occupancy Controlled Lighting: Occupancy sensors that combine both infra-red and ultrasonic technologies will be used (in addition to local manual switches) to control lighting in office areas.

Metering

The building is currently metered for both electricity and natural gas use. No changes to the metering is anticipated.

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 8

ENVIRONMENT, HEALTH, AND SAFETY CONSIDERATIONS

Integrated Safety Management

All project activities will be governed by the Lawrence Berkeley National Laboratory (LBNL) Integrated Safety Management System (ISMS). The LBNL project team will incorporate the core ISM principles and guiding functions from project conceptual development through completion of construction. Following completion, the responsible management will fold the operation and maintenance of the completed facility and installed equipment into the existing LBNL safety management infrastructure. Contractors performing work will be compelled to embrace LBNL's safety philosophy.

Safety Considerations

Systems and operational environmental, health, and safety considerations will be integral to all project elements. Project elements will include planning, design, demolition, construction, and operational safety of new building components, systems, and equipment; relocation of existing utilities and equipment; and disposal and recycling of deconstructed materials and wastes. Lawrence Berkeley National Laboratory will design and execute this project to maintain a workplace that does not compromise the safety or health of workers, the public or the environment consistent with the standards promulgated under Section 19 of the Occupational Safety and Health Act of 1970, the provisions of Executive Order No. 12196, and the related Safety and Health Provisions for Federal Employees of the Secretary of Labor (CFR Title 29, Chapter XVII, Part 1960), and the University of California – DOE LBNL contract Necessary and Sufficient Standards contained in the Work Smart Standards set.

Specific environment, health, and safety (EH&S) requirements for design and engineering, construction, and operations will be derived from LBNL Publication 3000 (EH&S Safety Manual) and guided by the standards and codes within the Necessary and Sufficient Work Smart Standards set.

The Project Execution Plan will provide the overall framework for instituting LBNL Integrated Safety Management in all project phases and at all tiers of project participation, including lower tier subcontractors.

Design

Design and engineering will be conducted as a collaborative multi-disciplinary effort by a team that includes Facilities architects, engineers and project management as well as EH&S industrial hygiene, environmental protection, design and construction safety, ergonomics, fire protection and radiation protection professionals. Key planners, management, and technical or user representatives of the Engineering Division will provide critical input into the design process. Initial systems safety objectives will be

preliminary identification, evaluation, and analysis of hazards with the goal of maximizing mitigation of potential EH&S issues during the design of all new building components, systems, and equipment - both from a constructability and operations perspective.

For example, equipment or structures conveying, storing, or otherwise integral to the handling or processing of hazardous materials, such as corrosive, toxic or reactive chemicals or flammable or combustible substances, will be reviewed by EH&S subject matter experts and the Berkeley Lab Fire Protection Engineer.

Seismic anchoring of new building components, systems, and equipment in accordance with the requirements of Chapter 23, LBNL Health and Safety Manual additionally exemplifies the design phase systems safety efforts undertaken.

The preliminary safety and hazard assessment generated during design phase will serve as the overall safety basis for design, construction, and operation of renovated or installed facility attributes.

Demolition and Construction Safety

A review of the structural and occupational safety and health hazards associated with the demolition process will be conducted by LBNL Facilities structural and EH&S professionals as part of the systems safety design effort and again at the time of demolition activities. Identification and mitigation of existing asbestos, lead paint, radiation hazard potential, other hazardous waste, electrical, structural failure, and heavy or awkward material handling hazards will be critical in developing and executing the necessary demolition activities. All demolition activities will be conducted in accordance with the requirements of the Berkeley Lab Health and Safety Manual as well as applicable federal, state, and local regulations.

Construction safety issues that will require hazard assessment and control measures include crane and rigging operations, excavation and related shoring, heavy equipment utilization, welding and torch cutting, coating application, and other potential hazards normally associated with a large-scale construction project. The construction contract will require the contractor to comply with the requirements of federal and state OSHA, LBNL Publication 3000 Health and Safety Manual, Uniform Building Codes, and any other applicable regulations in our LBNL Necessary and Sufficient Work Smart Standards or otherwise identified prior to or during performance under the contract.

Contractors performing demolition and construction will be required by contract to develop and implement a project specific health and safety plan (HASP) that serves as their safety basis for performing specified work. The HASP will document how the contractor implements ISM in their work process and will provide detailed provisions for work site inspection, hazard identification and mitigation, and safe work execution. The HASP will be submitted to and reviewed by LBNL prior to commencement of work.

Construction monitoring activities will be shared by several LBNL organizations. Facilities Department personnel will serve as LBNL project and construction management representatives, will be responsible for successful execution of the work including quality assurance and safety, and will be the Laboratory's prime contact with the contractor. The LBNL Construction Safety Engineer will monitor the construction

site for compliance with LBNL, DOE, CAL/OSHA and federal OSHA safety requirements. This compliance monitoring will be carried out in concert with LBNL Facilities Department, Procurement, and Engineering Division line management. Monitoring activities will include validation of the contractor's ISMS, apprising contractor of safety criteria pertaining to the construction project, conducting and documenting periodic surveys to verify contractor safety compliance, stopping contractor work if imminent danger situations are noted, and ensuring that the construction contractor meets ongoing submittal requirements.

Operational Safety

Hazard identification and mitigation will be an integral step in the development of the operational procedures for all systems and equipment installed during this project. This process will be started during the design phase as part of the systems safety analysis, continue through construction as specific conditions materialize, and conclude with a final round of evaluation after installation and any startup modifications have been made. A hazardous materials management plan, including required emergency training and response plans, will be merged into the existing Building 77 and Building 77A programs.

Waste Management

Demolition and excavation activities may result in accumulation of waste materials such as contaminated or chemically treated wood; materials with asbestos, lead, or other hazardous substance content; or contaminated soil. If waste materials are suspected to be hazardous, they will be handled in accordance with governing federal and state requirements by appropriately trained workers. LBNL EH&S professionals will take custody of management (characterization, packaging, storage, transport, and disposal) of hazardous waste derived from existing LBNL property. Contract specifications will hold contractors responsible for the legal and proper management (characterization, packaging, storage, transport, and disposal) of contractor owned or generated wastes associated with their own equipment or work processes.

Unless otherwise noted by LBNL, removed equipment, deconstructed materials, demolition debris and excavated soils, classified as non-hazardous, will become the property of the contractor, and the contract documents will require that it promptly be removed from the site. LBNL will review deconstruction and recycling alternatives, submitted by the contractor, for building components, materials and equipment slated for demolition. The contract will specify requirements and or benchmarks for recycling alternatives where viable.

The contract will stipulate that the contractor immediately notify LBNL if contractor suspects materials, that are identified in the contract as non-hazardous, of being hazardous or if materials or substances are encountered that have not been addressed in the contractual scope of work.

Environmental Considerations

The project will present standard construction problems, including temporary parking and traffic interruptions during construction. Project coordination with LBNL Security

and the LBNL Fire Department will ensure continued safe emergency vehicle routing and minimize general site traffic interruptions. There will be no net change in parking.

The project will have no archaeological impact and no significant impact upon atmosphere, climate, flora or fauna. Current site remediation data indicates that an existing plume of contaminated (but non-regulated) groundwater beneath the hillside should not impact the proposed cooling tower and equipment pad site construction. To ensure that special design considerations or schedule or cost impacts are avoided, the EH&S Division Site Remediation group will be tasked with validation of this during Title 1 design efforts.

The project is not located in a critical habitat, a floodplain, or wetland. Where existing exterior conditions are disturbed by construction activity, the area will be restored to its original condition. No conflict with local ecological planning or community organization is expected.

This project will be designed and constructed in accordance within the LBNL Necessary and Sufficient Work Smart Standards set and any other identified applicable federal, state, or local code requirements for environmental protection.

LBNL has an approved Categorical Exclusion on file dated April 13, 1998, for Phase 1 of this project. LBNL will further evaluate Phase 2 to determine if additional NEPA documentation or approval will be needed. It is anticipated that any additional project tasks would be categorically excludable.

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 9

DETAILED SUPPORTING DATA

Cost Estimate Discussion

Detailed Cost Estimate

ED&I Analysis

CAMP & RPM Ratings

BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

SECTION 9

COST ESTIMATE DISCUSSION

Direct Costs

The direct costs are developed from current cost estimating guides (published by R.S. Means), vendor quotes and recent job experience.

A. Cost Estimating Guides:

Material costs are based on bare rates adjusted to reflect local cost multipliers. To these are added 8.25% for sales tax, 10% for subcontractor overhead and profit and 5% for material handling.

Labor costs are based on productivity rates (manhours per unit) times the local labor rates for each craft. Labor rates have been determined from the current Davis-Bacon rates for Alameda County, and from the Alameda County Trade Union Locals. Rates from the sources include benefits, payroll taxes, workers compensation and a typical subcontractor's overhead and profit.

B. Vendor's Data:

Quotes were obtained from vendors on specialized major equipment. Sales tax (8.25%), subcontractor's overhead and profit (10%) and material handling (5% if not FOB site) have been added. Costs for manufacturer's representatives and vendor installation are included when applicable.

C. Recent Job Experience:

In a few instances, primarily large capacity specialized mechanical and electrical equipment, recent experience has been used in estimating equipment and installation costs. Such costs have been escalated to current dollars.

General Contractor's Mark-Ups

The following mark-ups have been added to the direct costs to reflect the General Contractor's expenses:

A. General Conditions:

A mark-up of 9% has been added to the direct costs to reflect CSI Division 1 costs such as field office expenses, general contractor provided equipment, temporary utilities, safety programs, etc. The job difficulty was considered in developing this percentage.

B. Bonds:

The general contractor's bond cost is estimated at 2%, and is added as a separate line item to the estimate.

C. General Contractor's Overhead and Profit:

The General Contractor's Overhead and Profit is estimated at 8%. This rate takes into account the following factors:

1) The standard G.C. overhead and profit experienced in the local area for projects of this size.
2) Consideration of the complexity of the project and the job conditions likely to be experienced.
3) The risk associated with retrofit and renovation work.

References

Means Building Construction Cost Data, 2000

A/E FEE PROPOSAL ESTIMATE

THIS INFORMATION IS REQUIRED TO EVALUATE FEE PROPOSALS AND
COMPLY WITH DOE AUDIT REQUIREMENTS ON NEGOTIATED CONTRACTS

A/E Firm Name:

S.C. No.:

Est. Construction Cost: $ 9,360,000

Project Name
Building 77--Rehabilitation of Building Structure and Systems, Pha

Project Manager:

Task Description:

Requester:

SECTION A DESIGN SERVICES		Design Discipline	Est. No. Dwgs.	Hourly Rate	Title I Est. Hrs.	Title I Estimated Cost A/E	Title I Estimated Cost Consultant	Title II Est. Hrs.	Title II Estimated Cost A/E	Title II Estimated Cost Consultant	Total Design Est. Hrs.	Total Design Estimated Cost
	DRAWINGS	Project Architect		45	120	5,400		224	10,080		344	15,480
		Architect		40	96	3,840		152	6,080		248	9,920
		Struct Engineer		40	80	3,200		152	6,080		232	9,280
		Mech Engineer		40	368	14,720		632	25,280		1000	40,000
		Elec Engineer		40	256	10,240		472	18,880		728	29,120
		Civil Engineer		0	0	0		0	0		0	0
		Fire Engineer		40	16	640		24	960		40	1,600
		Coord Consults				0			0		0	0
						0			0		0	0
						0			0		0	0
						0			0		0	0
						0			0		0	0
						0			0		0	0
		Arch Draftsman	12	25	120	3,000		152	3,800		272	6,800
		Struct Draftsman	9	25	72	1,800		152	3,800		224	5,600
		Mech Draftsman	40	25	352	8,800		672	16,800		1024	25,600
		Elec Draftsman	25	25	208	5,200		496	12,400		704	17,600
		Civil Draftsman	0	0	0	0		0	0		0	0
		Fire Draftsman	3	25	16	400		24	600		40	1,000
						0			0		0	0
						0			0		0	0
						0			0		0	0
						0			0		0	0
		Total Drawings	89			57,240			104,760			162,000
	SPECS	Spec Writer				0			0		0	0
		Typist				0			0		0	0
		Total Specs	0			0			0			0
		Total Est. Cost A/E & Consultant				57,240	0		104,760	0		162,000
		OH % - A/E 150			150	85,860	0		157,140	0		243,000
					Subtotal	143,100	0		261,900	0		405,000
		Profit %		5		7,155	0		13,095	0		20,250
					Subtotal	150,255	0		274,995	0		425,250
							$3,086 /sheet		5% ECC			
		Total cost of section A (Design)				425,250						

ENGINEERING SERVICES SUMMARY SHEET		TITLE I	TITLE II	TITLE III	TOTAL
Section B Post Construc-tion Award Ser-vices (PCAS)	Review of Shop Drawing Submittals			80,000	80,000
	Inspection Services			55,000	55,000
	Prepare As-Built Drawings			15,000	15,000
					0
					0
	Total Cost of Section B			150,000	150,000
SECTION C DESIGN SUPPORT SERVICES	Interior Design				0
	Conferences	10,000	20,000		30,000
	Reproduction of Plans and Specs	3,000	10,000		13,000
	Field Work	17,000	64,000		81,000
	Soil Borings and Analysis	5,000			5,000
	Topographic Survey	5,000			5,000
	Concept Submission	8,000	10,000		18,000
	Storm Water Management Report				0
	Economic Analysis	2,000	4,000		6,000
	Energy Conservation Study	4,000	6,000		10,000
	Total Energy Study				0
	Energy Conservation Report				0
	Energy Systems Operation Guide				0
	Environmental Permits Report				0
	Fire Protection Analysis	2,000	5,000		7,000
	Model or Rendering				0
	Cost Engineer	5,000	6,000		11,000
	Project Engineering Documentation (PED)				0
	Value Engineering Services	5,000			5,000
	Test & Quality Assurance Plans	3,000	7,000		10,000
	Environmental, Health & Safety Analysis	6,000	8,000		14,000
					0
					0
					0
					0
					0
					0
	Travel and Per Diem				0
	Total Cost of Section C	75,000	140,000	0	215,000

SCHEDULE	30% Submit/Rev = ____ wks	Total Section A (Titles I-II, Line	150,255	274,995	N/A	425,250
	60% Submit/Rev = ____ wks	Total Section B (PCAS)			150,000	150,000
	90% Submit/Rev = ____ wks	Total Section C (Engr Serv)	75,000	140,000	0	215,000
	Final Submit/Rev = ____ wks					
	Total = 0 wks	GRAND TOTAL Fee Proposal	225,255	414,995	150,000	790,250

SIGNATURE	APPROVAL	DATE

CAMP RATING OF
FY 2003 CANDIDATE
MEL-FS LINE ITEM PROJECTS

Ernest Orlando Lawrence Berkeley National Laboratory
Berkeley, California

Project: BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

MEL-FS PROJECT ASSESSMENT AND SCORING:

Capital Asset Management Process (CAMP) and ES&H Risk-based Priority Model (RPM)

The following pages summarize the CAMP and RPM scoring assessments for the BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2, project.

Included are:

Page 1:	Summary of the CAMP/RPM Scoring Assessment Process.
Page 2 - 3:	The Project's CAMP Score, A Brief Summary of the Project's CAMP and RPM Ratings, Summary Description of the Project and the Project Justification.
Page 4:	The Basis for Application of the CAMP Rating Criteria to this Project.
Page 5:	The CAMP Scoring Calculation Sheet.

THE CAMP / RPM SCORING ASSESSMENT PROCESS

MEL-FS Line Item projects are rated using the US Department of Energy's Capital Asset Management Process (CAMP) evaluation criteria. The CAMP rating was determined using the DOE's September 30, 1994 guidance.

A second rating system, the US Department of Energy's ES&H Risk-based Priority Model (RPM), is also employed if the primary CAMP rating criterion is either a Health and Safety, or an Environmental & Waste Management factor. This second system is used in order to establish the urgency of the risks associated with this project relative to all other ES&H issues.

The RPM system was not applied for the BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2 project as a Mission & Investment criterion was identified as the primary scoring factor in the CAMP analysis.

Ernest Orlando Lawrence Berkeley National Laboratory

CAMP RATING OF
FY 2003 CANDIDATE MEL-FS LINE ITEM PROJECTS

PROJECT: BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

CAMP and RPM Scores:

CAMP - 67

RPM – Not Applicable

Summary of Project CAMP & RPM Ratings:

This CAMP score indicate that there are serious concerns regarding the condition and reliability of certain of the mechanical, electrical and architectural systems of Buildings 77 and 77A, and that these systems pose significant impediments to attainment of mission objectives. The primary CAMP driver for this project was identified in the *Mission and Investment* factors. A summary of the project and the CAMP rating analysis follow.

Summary of Project Definition and Justification:

Building 77 and the adjacent annex (77A) are high-bay buildings that provide specialized technical services and assembly space. The technical services are provided in shops and clear-room facilities and include numerically controlled precision machining, structural and precision welding of both common and exotic metals, sheet metal, metal sandblasting and painting, ultra-high-vacuum cleaning and testing, ceramic shop, machine tool repair, advanced metrology, and large-apparatus precision assembly. Because of the high-demand for these services, building occupant load is currently at capacity and double shifts are often necessary to handle the workload.

These technical services rely on specialized building utilities to ensure cleanliness and appropriate temperature and air circulation. Because many of the specialized processes performed in Buildings 77 and 77A are interdependent, contiguous space occupancy is essential for effective and efficient daily service operations.

Precision manufacturing of unique scientific equipment requires room temperatures to be constant and precise in large areas of Buildings 77 and 77A. These buildings lack the temperature and humidity controls desirable for state-of-the-art precision fabrication and testing. Temperature and humidity fluctuations make it more difficult to achieve the close tolerances required by leading-edge scientific experimental apparatus, thus reducing productivity.

Building mechanical systems have not been upgraded since their original installation and have reached the end of their design life. This project will replace the obsolete HVAC systems with systems that provide controls appropriate for the current mission of these buildings and which provide the flexibility to meet future mission needs.

The electrical systems will be upgraded to accommodate the new HVAC systems. Electrical safety system features – exit light, battery –powered emergency lights, and the fire detection and alarm systems will be upgraded to meet current standards.

The existing air distribution systems and building envelopes cannot provide the required temperature control. R-38 insuraltion protected by lightweight commercial-use board will be installed below the roof, and R-19 insulation protected by gypsum wallboard will be installed at exterior walls. The insulation systems will bring

the building envelopes into compliance with sate and federal energy codes and will minimize energy use of the new HVAC systems.

Some fabrication activities generate sound levels that can exceed OSHA-allowable maximums. OSHA allows up to 90 decibels (dB) per 8-hour workday before hearing protection is required. Existing acoustical provisions in the welding and sheet metal shops do not reduce noise levels adequately. Noise levels vary up to 115 dB, requiring shop personnel to wear hearing protection. Old baffles will be removed, and new enhanced sound-absorbing baffles will be installed on walls and below ceilings to assist in minimizing hearing hazards for employees.

Many exit doors and partitions do not meet building code requirements. Some of these doors will be replaced with new smoke-and fire-rated assemblies, and others will receive new hardware as required to provide safe exiting and to meet building code requirements. Certain walls and partitions will be upgraded to provide 1-hour rated exiting enclosures.

Duct control is a requirement in many of the operations in these buildings. The concrete floor, the walls and ceiling will be painted with appropriate materials to protect the finishes and reduce dust accumulation.

Ernest Orlando Lawrence Berkeley National Laboratory

CAMP RATING OF
FY 2003 CANDIDATE MEL-FS LINE ITEM PROJECTS

PROJECT: BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

BASIS FOR APPLICATION OF CAMP RATING CRITERIA

CATEGORY	SCORE	SUBCATEGORY
Health & Safety Criteria	**55**	**Infrastructure**
	55	**Fire Protection**
		These buildings have significant life safety deficiencies in their emergency egress systems. Injuries have been associated with similar situations at other locations.
Environmental & Waste Management Criteria		No **Environmental & Waste Management** criteria were found to be applicable to this project.
Safeguards & Security Criteria		No **Safeguards & Security** criteria were found to be applicable to this project.
Mission & Investment Criteria	**65**	**Mission Capability, Capacity & Quality**
	60	**Asset Condition**
	60	**Infrastructure**
		These buildings house unique engineering and assembly capabilities which are used daily by Laboratory researchers. Inadequacies in the mechanical and architectural systems currently make performance of high-tolerance assembly work difficult and threaten the ability to meet some critical mission requirements. The mechanical system asset condition is poor and these systems are not able to meet all research tolerance requirements without manual intervention and shifting of ventilation and heating from various portions of the buildings to the particular assembly areas where work is being performed. Operations are at risk under these conditions.

CAMP RATING OF
FY 2003 CANDIDATE MEL-FS LINE ITEM PROJECTS

PROJECT: BUILDING 77—REHABILITATION OF BUILDING STRUCTURE AND SYSTEMS, PHASE 2

CAMP SCORING CALCULATION

TABLE SHOWING APPLICABLE CAMP FACTORS

CAMP EVALUATION FACTORS:	*MAJOR CAMP CATEGORIES:* *Health & Safety*	*Env & Waste Mgt*	*Safeguards & Security*	*Mission & Investment*
1				
2				
3				
4				65
5	55			60
6				60
7				
8	55			
9				
10				
High or Default Score:	55	20	20	65

CALCULATION OF CAMP SCORE

CAMP Categories & Raw Scores:	H&S	55.00	Added Factor
	E&WM	0.00	Added Factor
	S&S	0.00	Added Factor
	M&I	65.00	Highest Score
Tabulation:	Highest Factor(M&I):	65.00	
	Added Factor (H&S)		Calculation per CAMP Formula
	Score:	2.3	3 x (55 – 20)/(65 – 20) = 3.0
	Total Score:	67.3	
	CAMP SCORE	**67**	