

TITLE I REPORT  
ON  
CENTRAL LABORATORY

REPORT TO STANFORD LINEAR ACCELERATOR CENTER - NO. ABA-54  
STANFORD UNIVERSITY - ABA SUBCONTRACT S-128  
UNDER STANFORD - AEC CONTRACT AT (04-3)-363

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I. INTRODUCTION

A. SCOPE

This report presents the Title I work performed in regard to the Central Laboratory Building. Included are preliminary drawings of site plan, building plans and elevations, and mechanical and electrical schematics. Also included are outline specifications, schedule of work and a preliminary construction cost estimate.

B. FACILITY

The Central Laboratory will be located east of the Test Laboratory, within the Administration-Engineering Complex, on the Stanford Linear Accelerator site.

The building is intended to be a multiple use facility housing 179 persons in 49,672 gross square feet of area. Space will be provided for the Director's offices, Research Group offices, light laboratories, Administration Service Group Reports Division and Library in a one, two and three story structure.

AREA ANALYSIS

ITEM	3-STORY WING				2-STORY WING			1-STORY WING			BUILDING TOTAL
	1st Fl.	2nd Fl.	3rd Fl.	TOTAL	1st Fl.	2nd Fl.	TOTAL	1st Fl.	Roof Walk	TOTAL	
Gross Area sq. ft.	7,380	8,544	8,544	24,468	7,223	7,669	14,892	9,899	413	10,312	49,672
Net Usable Area sq.ft.	5,570	4,634	6,187	16,391	5,085	5,593	10,678	8,663	-	8,663	35,732
Cubage, cu.ft.	-	-	-	-	-	-	-	-	-	-	620,918
Persons	28	41	33	102	27	27	54	23	-	23	179
Efficiency = $\frac{\text{Net Usable}}{\text{Gross}} \times 100$	75.6	54.3	72.5	67.0	70.4	72.9	71.7	87.5	-	84.0	71.9
Gross Area per Person, sq.ft.	263.5	208	259	240	267.8	284	275.5	430	-	448	277.8
Net Area per Person, sq.ft.	199	113	187.6	160.6	188.3	207	197.7	376	-	376	199.4

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## II BASIS FOR DESIGN

### A. SITE

#### 1. Location

Since the building is to have the multiple type occupancy mentioned in the Introduction, it was necessary to locate it with consideration for the interests of each occupant group. Consequently, the Central Laboratory is situated within the area encompassed by the Test Laboratory, Auditorium, Heavy Assembly, and End Station buildings.

#### 2. Preparation

The site will be graded under the building contract. Paving of the Service Yard and area west of the one-story laboratory wing will also be accomplished under this contract. The west area paving serves a dual purpose in that it will be used as an outside work area and will also provide paved access to the electric substation adjacent to the building.

### B. BUILDING

#### 1. General

The Central Laboratory Building is designed around the requirements of its occupants with due consideration for expansion of each area. The three basic elements and expansion potential are:

- a. A three-story office wing expandable to the east.
- b. A two-story physics laboratory wing expandable to the east.
- c. A one-story light laboratory (special services) wing expandable to the south and to a second floor.

The office wing shall be designed so that there will be minimum conversion cost for future light laboratory use.

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## 2. Architecture

The Architectural vocabulary utilized in the design of the building is that proposed to and approved by the Stanford University Board of Trustees. Components of the vocabulary include textured concrete tile facing on vertical structural members, typical walls of pressed metal siding and standard architectural sash between columns, sight barriers of pressed metal siding around mechanical equipment on the two-story and three-story roofs, and roof overhangs for protection from sun and rain.

There are no ceilings in the laboratory and shop areas. Ceilings can be added where needed if light or vapor tight areas are required.

Integral ceilings incorporating diffusers and lighting, similar to those used in the Administration and Engineering Building, will be used in the office areas. Rooms such as toilet rooms and laboratories will not use the integral ceilings. Toilet rooms, however, will receive furred dry wall ceilings.

## 3. Structure

The building will be a framed, monolithic reinforced concrete structure supported on spread footings.

The roof of the one-story lab area will be designed as a future second floor laboratory. The roofs of the two and three story wings will be designed for conventional roof loading plus an allowance for sight screens and mechanical equipment.

## 4. Mechanical

Areas within the building will be heated, cooled, ventilated, humidity controlled or otherwise air conditioned as indicated in the drawings and Outline Specifications. Heating and cooling will be by roof mounted forced air units supplied with hot and chilled water from Utility Building A. Units will be located on the roofs of the two and three-story wings.

Distribution of demineralized cooling water, domestic water, compressed air and natural gas for laboratory use will be as noted in the Outline

5. Electrical

Office, Shop and laboratory areas will be illuminated to 60 foot-candle level. All other areas will have a 25 foot-candle level.

In order to permit flexibility in location of intermediate office partitions, electrical (and telephone) outlets will be located in corridor partitions and exterior walls wherever possible. The convenience outlets of each office will be on separate circuit breakers. Grounding will be provided to one point in each laboratory.

6. Health and Safety

All applicable codes, including the Uniform Building Code and AEC Design Criteria, have been followed regarding health, safety and fire protection.

The building will be constructed of non-combustibles and have automatic water sprinklers throughout. The fire protection system also includes an alarm system, hand extinguishers (provided under another contract) and hose racks.

A Safety Committee has been formed to develop personnel safety policies applicable to the Central Laboratory as well as the entire Accelerator project. Among the practices to be adopted will be color coding of pipelines, safety aisle painting and first aid measures.

C. SUBSTATION

1. General

The substation building houses two 1000 kva unit-substations and is located outside of and to the west of the Central Laboratory. One unit-substation is for normal building services and the other is available for laboratory research loads.

2. Building Power

Of the 1000 kva designated for normal building services, estimated maximum demands have been calculated to be 430 kva for use in the Central Laboratory, 60 kva for the Auditorium and 175 kva for the Cafeteria.

### 3. Research Power

The 1000 kva for research use will not be extended into the Central Laboratory at this time. Underground ductwork for future distribution of this power will be provided from the substation to the central first floor corridor in the 2-story wing. Overhead cable trays will be provided in the central corridor for distribution of the research power to first and second floor laboratories in this wing.

III OUTLINE SPECIFICATIONS

A GENERAL - (Per Uniform Building Code, 1961 Edition)

1. Occupancy - Group F-2
2. Type of Construction - Type IV (N)
3. Number of Stories - 1, 2 and 3
4. Location on Property - Separated on four sides
5. Area Limitations - (per UBC)

Type IV (N)	Fire Zone III
Basic Area (One Story)	12,000 square feet allowable
Basic Area (Multi-Story)	2 x 12,000 = 24,000 square feet allowable

Condition A (per UBC - sprinklered, without separation)

An increase of 100% allowable basic area is permitted due to location on property. No added increase in allowable area is permitted when sprinklered since building is Type IV (N), three-story.

Total building area = 2 x 24,000 = 48,000 square feet allowable.

Total building area = 49,672 square feet actual. Separation required.

Condition B (per UBC - sprinklered, with 2-hr. separation between Three-Story Wing and Laboratory Wings)

Three-Story wing: Total area = 2 x 24,000 = 48,000 square feet allowable.

Total area = 24,468 square feet actual.

Laboratory wings: Total area = 2 x 24,000 x 2 = 96,000 square feet allowable

Total area = 25,204 square feet actual

Condition C (per AEC)

AEC criteria limits non-combustible separated areas to 15,000 square feet unsprinklered and 40,000 square feet sprinklered. Separation required since actual area is 49,672 square feet.

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B. FOUNDATION

Reinforced concrete spread footings.

Concrete slab on grade designed for 150 pounds per sq. ft.

C. STRUCTURAL FRAME

Reinforced concrete columns, roof and floor systems.

Live Loads:

Office areas	100 psf
Laboratory areas	150 psf
Roof, one-story wing	150 psf
Roof, two and three story wings	30 psf
Wind and seismic	UBC

Wind and seismic loads to be taken by reinforced concrete shear walls.

D. ROOF

4 ply built up tar and gravel (colored granular material) on 2 inch rigid insulation.

E. EXTERIOR WALLS

Pressed metal panels similar to Robertson, Mahon, or other equal, insulated. Interior finish surface of painted drywall.

Windows - fixed Architectural projected aluminum sash with horizontal muntin bars. Exterior sun screens over sash in west wall of the three-story wing.

Exterior structural columns faced with precast concrete tile veneer.

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F. PARTITIONS

Building separation at first floor between three-story office and Laboratory wings - 2 hour drywall.

All interior, non load-bearing partitions - incombustible materials, such as drywall on metal studs or 3-inch hollow drywall. All corridors to have 1-hour rating.

NOTES: Certain interior walls will be constructed of reinforced concrete to act as shear walls. Interior surfaces smooth "sack finish" and painted.

An alternate will be included calling for Unistrut partitions in place of drywall partitions in the 12 laboratories of the 2-story wing and for attaching Unistruts to the face of concrete walls in these laboratories at 4 ft. c.c.

G. FLOORS

Offices - Asphalt tile on concrete, rubber base.

Toilets - Unglazed ceramic tile, glazed ceramic base.

Laboratories - Vinyl asbestos tile, rubber base.

H. CEILINGS

Offices - Suspended acoustic, integral, incorporating diffusers and lighting.

Toilet Rooms - Sheet rock.

Exterior soffits - Painted concrete.

Laboratories - Exposed

Nine foot ceilings, typical, with eight foot over toilet stalls.

NOTE: An alternate will be included calling for Unistruts attached at 4 ft. c.c. to the concrete ceilings of the 12 laboratories in the 2-story wing.

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I. DOORS

Hollow core wood flush panel doors between offices. Metal and glass and solid core wood doors where required for legal exits such as corridor and exit access doors, and through 1 and 2-hour rated partitions and separation walls. Wire glass will be provided in the upper half of all laboratory and shop doors.

J. WINDOWS

See exterior walls.

DSB glass for typical sash with 1/4" plate in public entrance doors and 3/16" crystal in fixed entrance area sash.

K. MECHANICAL

Heated, cooled & ventilated - offices.

Heated, cooled humidity controlled and ventilated - Emulsion processing, film processing, scanning and dark rooms.

Heated and ventilated - shops and laboratories. 100% make-up air will be provided in the twelve laboratories of the two-story wing.

Hot water and cooling water for mechanical equipment to come from Utility Building A. Boilers and water chillers are considered under separate proposals for Utility Building A.

Distribution of the following utilities for laboratory use will be limited to main headers in lab corridors under the second floor with provision for future extension into the laboratories:

1 MW of closed loop demineralized cooling water at 100 psig

Domestic water

Compressed air at 80 psig

Natural gas

Main utility systems will be designed for future extension to laboratories in the three story office wing.

Domestic hot water heaters will be fired with natural gas.

L. ELECTRICAL

60 foot-candle illumination in office, shop and laboratory areas; 25-foot candles in all other areas.

Building load requirements

Lighting	50 kva
Power for integral ceilings	135 kva
Convenience outlets	50 kva
Heating, ventilating, air conditioning	135 kva
Elevators	<u>10 kva</u>
	380 kva
Special equipment loads	50 kva
Substation	2000 kva

Two open dry type unit-substations each rated 1000 kva,  
12 kv to 480 volts, 3-phase.

M. FIRE PROTECTION

Automatic water sprinkler system throughout. Also, alarm system and hose racks. Hand extinguishers are provided under another contract.

N. COMMUNICATIONS SYSTEMS

Project telephone switchboard is in Administration and Engineering Building.

Telephone outlets will be located in corridor partitions and exterior walls wherever possible.

O. UTILITIES

All utilities to the building will be underground. Circulating hot water for heating and chilled water for air conditioning are considered as utilities. The supply and return lines from the central boiler/chiller installation in Utility Building A will be installed to a valve box west of the building as part of the site utilities.

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SITE UTILITIES

<u>Service</u>	<u>Off-- Site Location</u>	<u>Direction of On - Site Supply</u>
Electricity	12 kv distribution system	Substation, West
Telephone	Utility trench running north and south, west of building	West
Fire Alarm	Utility trench running north and south, west of building	West
Domestic Water	Water main running north and south, west of building	West
Fire Protection Water	Water main running north and south, west of building	West
Demineralized Cooling Water	Buried line to valve box west of building	West
Hot Water	Central installation in Utility Building A	West
Chilled Water	Central installation in Utility Building A	West
Sanitary Line	Main sewer running north and south, west of building	West
Compressed Air	Central installation in Utility Building A	West
Natural gas	Gas main running north and south, west of building	West

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P. SUBSTATION BUILDING

Foundations - concrete slab on grade, thickened edges.

Structural frame - light steel frame.

Roof - built up tar and gravel (colored granular material) on one-inch rigid insulation over metal deck.

Exterior Walls - pressed metal siding, ventilation louvers.

Floor - exposed concrete with hardener.

Ceiling - exposed metal deck.

Doors - hollow metal flush panel.

Q. PAVING

IV SCHEDULE

	<u>DATE</u>
Title I Submittal (Preliminary)	8-24-62
Title I Submittal (Final)	11-1-62
Completed Review and Approval by SLAC and AEC	11-23-62
Start of Title II	11-23-62
Title II 50% Submittal	2-19-63
Title II 90% Submittal	5-1-63
Completed Review and Comments by SLAC and AEC	5-20-63
Revisions and Review Completed	6-4-63
Start Reproduction of Contract Documents	6-4-63
100% Submittal	6-11-63
Issue Bid Documents	6-13-63
Bid Opening	7-12-63
Bid Review and Recommendation	7-17-63
Notice to Proceed	8-9-63
Construction Completed	8-17-64

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V DRAWING LIST

SK-540-001	Site and Location Plan
SK-540-101	First and Second Floor Plans and Roof Plan
SK-540-102	Third Floor Plan and Roof Plans
SK-540-103	Exterior Elevations and Building Sections
SK-540-601/701	Schematic Plans and Single Line Diagram

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COST ESTIMATE - CENTRAL LABORATORY

Contract No.	Account No.	Description	Units	Unit Cost	Cost	Total Cost
540	540	Basic Structure				
		Earthwork-Reinf. Concrete	50,000 SF	6.25	312,000	
		Steel & Misc. Iron	-	L.S.	37,000	
		Metal Wall Facing, Incl. Mullions	22,800 SF	0.83	19,000	
		Sheet Metal	-	L.S.	10,000	
		Aluminum Sash-Glazing	8,150 SF	3.70	30,000	
		Concrete Tile on Columns	6,000 SF	3.50	21,000	
		Roofing & Insulation	31,500 SF	0.47	15,000	
		Integrated Ceilings	27,000 SF	2.20	59,000	
		Lath & Plaster	8,000 SF	1.25	10,000	
		Interior Partitions	51,500 SF	1.00	51,500	
		Doors, Frames, Hardware	243 EA	105.00	25,600	
		Resilient Floor & Base	45,000 FT	0.33	14,700	
		Ceramic Tile	2,500 SF	3.00	7,500	
		Toilet Partns., Bldg. Specialties	-	L.S.	10,500	
		Painting	200,000 SF	0.15	30,000	
		Elevators (Hydraulic)	2 EA	13,000	26,000	
		Sub-Total				678,800
		Alternate-Unistrut System in 12 Labs				13,300
	540	Mechanical				
		Plumbing			38,000	
		Heating & Ventilating			97,400	
		Piping			22,000	
		Sprinkler System			33,000	
		Sub-Total				190,400
	540	Electrical & Instrumentation				
		House Loads			53,500	
		Special Equipment Loads			5,000	
		Telephone & Fire Alarm			19,500	
		Sub-Total				78,000
		Total, Account No. 540				\$961,500

Note: Budget for Account No. 540 = \$962,000

540	410	Site Preparation				8,000
	420	Storm Drainage				4,000
	440	Roads, Parking, Walks				10,000
	613	Substation Building			5,000	
	614	Primary Duct System			2,000	
		Sub-Total				7,000
		Site Utilities				
	631	Natural Gas			200	
	651	Sanitary Sewer & Drain			750	
	662	Hot Water			800	
	664	Chilled Water			1,350	
	671	Water-Domestic & Fire			1,650	
	672	Low Conductivity Water			2,000	
	682	Compressed Air			350	
		Sub-Total				7,100
		Total Contract Bid				\$996,600
540-1	613	Unit Substations				\$ 61,000

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