

TITLE I REPORT
ON
HEAVY ASSEMBLY BUILDING

REPORT TO STANFORD LINEAR ACCELERATOR CENTER - NO. ABA-55
STANFORD UNIVERSITY - ABA SUBCONTRACT S-128
UNDER STANFORD - AEC CONTRACT AT (04-3)-400

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I. INTRODUCTION

A. SCOPE

This report presents the Title I work performed in regard to the Heavy Assembly 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 Heavy Assembly Building will be located east of the Fabrication Building, within the Shops Complex, on the Stanford Linear Accelerator site.

The building will provide facilities for direct support of the experimental physics program. Approximately one-third of the building area will be devoted to heavy machine tools and support and two-thirds to assembly of heavy physics gear.

Space will be provided within the building for assemblies used with high energy accelerators such as analyzing magnets, magnetic spectrometers, spark chambers, bubble chambers, mass separators and similar equipment.

The building will also be equipped with overhead cranes.

A substation will be located outside the Heavy Assembly building in a separate building.

II. BASIS FOR DESIGN

A. SITE

1. Location

The Heavy Assembly Building has been positioned to facilitate the flow of personnel and materials from the principal users which are the Test Laboratory, Central Laboratory, Beam Switchyard, End Stations and Accelerator.

The area east of the Heavy Assembly Building is available for future expansion to both the building and the Shops Complex.

2. Preparation

The site will be graded under the Electronic & Stores Building and Fabrication Building contract. Paving will be under the Heavy Assembly Building contract.

B. BUILDING

1. General

The building consists of three longitudinal bays; a high center bay having a gross area of 11,000 sq. ft. between two lower bays each with a gross area of 10,000 sq. ft.

A mezzanine office area of 1,000 sq. ft. will be located over the toilets and washrooms at the north end of the west low bay.

The normal full-time population of the building will be 25 persons. Visitors from adjacent buildings will increase this figure to 75 at times. Sanitary facilities will be provided for 75 persons.

Pertinent Data

Length	250 ft.
Width	130 ft.
Gross Area, ground floor	31,000 sq. ft.
Gross Area, mezzanine floor	1,000 sq. ft.
Height, High Bay	44.5 ft.
Height, Low Bay	28 ft.
Building Volume	1,064,000 cu. ft.

2. Architecture

The industrial type design of the building is similar to that adopted for the Electronic & Stores and Fabrication Buildings in the Shops Complex.

The architectural vocabulary utilized in the design is that proposed to and approved by the Stanford Board of Trustees. Components of the vocabulary used include typical walls of pressed metal siding and standard metal sash between exposed steel columns, pressed metal sight screens for concealment of mechanical equipment on the roof, and roof overhangs for protection from sun and rain.

The mezzanine office area has no partitions other than those enclosing the area. If needed, interior partitions will be added by the occupants.

The toilet and washroom and office area will be provided with ceilings. All other areas will have exposed construction overhead.

Large roll-up doors are provided to permit passage of heavy equipment in and out of the building.

The crane rails in the high bay are extended 25 ft. beyond the south end of the building to permit exterior crane loading of special vehicles which carry experimental equipment to the End Stations and Yards.

3. Structure

The building will have a rigid structural steel frame supported on spread footings.

4. Mechanical

Shop and work areas will be heated and ventilated year around. Due to the size and function of the building, mechanical means will be used to insure adequate ventilation at all times. Fresh air will be provided by operable sash in the summer and by a fresh air make-up unit in the winter.

Incorporation of the fresh air make-up unit into the heating and ventilating system will permit the future addition of air consuming equipment such as welding fume collectors and soldering bench hoods.

Year around heating and ventilating for the office area will be done with filtered air. There are no requirements or provisions for air conditioning.

Provision of hot water, low conductivity water, domestic water and 100 psig air will be as noted in the outline specifications and drawings.

5. Electrical

The office area will be illuminated to 100-foot candle level, the shop areas to 50 foot-candle level in the west bay and 40 foot-candles in the center and east bays, and toilet and washroom areas will be illuminated to 30 foot-candle levels.

Exterior lighting will be provided by fixtures mounted on the exterior walls.

Electrical convenience outlets, as well as telephone outlets, will be located in partitions and exterior walls enclosing the office area. Electrical outlets in the main work areas will be located on portable panels.

Plug-in bus ducts will be located in the shop area. All loads except the 277 volt lighting will be served from these bus ducts.

6. Health and Safety

All applicable codes, including the Uniform Building Code, AEC Design Criteria, and standards of the State of California Division of Industrial Safety 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. An automatic fire detection system will be installed in the substation.

C. SUBSTATION

1. General

The substation building is located outside and west of the Heavy Assembly Building. It houses a 1500 kva double ended unit substation for building and magnet testing power.

Design of the substation building will be in accordance with the architectural vocabulary established for the site.

2. Building Power

The 1500 kva double ended unit substation with two 750 kva transformers is designed to accommodate the building loads plus an equipment load of approximately 10 volt amperes per square foot and the magnet testing power. The lead is evenly distributed between these two services.

3. Magnet Testing Power

The power for magnet testing will not be extended into the Heavy Assembly Building at this time. However, an underground duct system will be installed for future use between the substation and two locations within the Heavy Assembly Building.

D. CRANES

Cranes will be provided under separate contract as follows:

1. The center bay shall be provided with a 50-ton crane having a hook height of 30' - 0" to lifting surface of hook.
2. The two side bays shall each have a 20-ton crane with hook heights of 20' - 0" to lifting surface of hook.

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III OUTLINE SPECIFICATIONS

A. GENERAL

1. Occupancy - Shops Group F-2
2. Type of Construction - IV (n)
3. Number of Stories - One with mezzanine
4. Location on Property - Separated on four sides.
5. Area Limitations

a. Per Uniform Building Code, 1961 Edition.

Occupancy Group F-2, Type IV (n), Fire Zone III, Sprinklered.

Sprinklered buildings of this group are allowed unlimited area if separated on all four sides by public spaces, streets or yards not less than sixty feet in width.

b. Per Atomic Energy Commission Criteria.

AEC Criteria limits non-combustible separated areas to 15,000 sq. ft. unsprinklered and 40,000 sq. ft. if sprinklered. Gross area of Heavy Assembly Building at 32,000 sq. ft. sprinklered conforms to AEC requirements.

B. FOUNDATIONS

Reinforced concrete spread footings. Concrete slab on grade designed for 5000 pounds per sq. ft. Separate foundations under heavy equipment.

C. STRUCTURAL FRAME

Rigid steel frame carrying metal deck roof system. Mezzanine to be steel frame with floor of concrete on metal deck. Structural steel crane girders and columns.

Live Loads:

Roof	20 psf
Mezzanine Office Floor	100 psf
Shop Area Floor	5000 psf
Wind and Seismic	UBC

Wind and seismic loads to be taken by the rigid frames in the lateral direction and by reinforced concrete shear walls in the longitudinal direction.

D. ROOF

Built up tar and gravel (colored granular material) on 1 inch rigid insulation.

E. EXTERIOR WALLS

Pressed metal panels similar to Robertson, Mahon, or other equal. Panels are insulated and provided with interior finish of plaster in toilet rooms and painted drywall in the office area. Other areas within the building have an 8 ft. high cement asbestos laminate wainscoting with the inside surface of the metal siding above the wainscoting exposed and painted. Certain exterior walls will be of reinforced concrete intended to serve as wind and seismic shear walls.

Windows - operable aluminum sash to be used as part of summer ventilation system.

Structural columns are exposed rolled steel sections, painted.

F. INTERIOR WALLS AND PARTITIONS

Office area enclosure to be of incombustible materials such as drywall on metal studs.

Toilet rooms and washrooms to have ceramic tile walls, bases, and wainscot over cement plaster.

G. FLOORS

Offices - Asphalt tile on concrete, rubber base.

Toilets and washrooms - Ceramic tile.

Shops - Exposed concrete with hardener.

H. CEILINGS

Offices - Suspended acoustic tile.

Toilets and washrooms - sheetrock.

Shops - Exposed metal deck, painted.

I. DOORS

Interior - Hollow core flush panel wood doors

Exterior - Metal and glass and solid core wood doors.

Metal roll-up doors.

J. WINDOWS

See exterior walls.

DSB clear glass in sash.

K. MECHANICAL

Summer ventilation by means of operable sash in exterior walls and motor driven ventilators on the roof of the center bay.

Winter ventilation by means of a fresh air make-up unit with hot water coils.

Heating provided by hot water unit heaters.

Office area to be heated and ventilated year around with filtered air.

Natural gas to be brought to the building but not distributed within it.

Hot water for unit heaters to come from Utility Building A.

1 MW of cooling to be provided by cooling water from the cooling towers adjacent to Utility Building A and distributed by means of headers along main bay crane columns.

Compressed air to be provided from Utility Building A and distribution will be limited to main headers within the building.

Domestic water to be distributed by means of main headers at column lines.

L. ELECTRICAL

50 foot-candle illumination in west bay of shop area.

40 foot-candle illumination in center and east bays of shop area.

100 foot-candle illumination in office area.

30 foot-candle illumination in toilets and washrooms.

Building Load Requirements in Connected kva

Lighting		100
Bus duct loads		
Heating and Ventilating	17	
Cranes	150	
Electric door operator	3	
Power panels	630	
Power receptacles	300	
Machine Shop equipment	<u>600</u>	
	1700	1700
Magnet testing		<u>1000</u>
		2800

Estimated operating load = 2800 x 0.6 demand factor = 1680 kva

Transformer Capacity:

Self-cooled rating	1500 kva
Forced-air cooled rating	2000 kva

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 the walls of offices located on the mezzanine.

A minimum amount of conduit only will be installed for the public address and intercom systems.

O. UTILITIES

All utilities to the building will be underground. Hook-up to all utilities to be done by Heavy Assembly Building Contractors.

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 I.C. & P.A.	Branch Duct bank running north and south, north of building	North
Fire Alarm	Branch Duct bank running north and south, north of building	North
Domestic Water	Water main running east and west, north of building	North

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SITE UTILITIES (Cont.)

<u>Service</u>	<u>Off-Site Location</u>	<u>Direction of On-Site Supply</u>
Cooling Water	Water main from cooling tower running east and west, north of building	North
Fire Protection Water	Water main running east and west, west of building	North
Hot Water	Central installation in Utility Building A	North
Shop Air	Central installation in Utility Building A	North
Sanitary Line	Main sewer running east and west, north of building	North
Natural Gas	Gas main running east and west, north of building	North

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, painted.

Floor - exposed concrete with hardener

Ceiling - exposed metal deck, painted

Doors - hollow metal flush panel

Q. PAVING

Asphaltic concrete on aggregate base.

R. CRANES

One 50-ton capacity bridge crane with hook height of 30 ft. to lifting surface of hook and two 20-ton capacity bridge cranes with hook height of 20 ft. to lifting surface of hooks. All cranes to be cab and pendant operated.

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IV SCHEDULE

	<u>DATE</u>
Title I Submittal (Preliminary)	10/5/62
Title I Submittal (Final)	12/14/62
Completed Review and Approval by SLAC and AEC	12/31/62 *
Start of Title II	12/31/62
Title II 50% Submittal	2/14/63
Title II 90% Submittal	3/25/63
Completed Review and Comments by SLAC and AEC	4/11/63
Revisions and Review Completed	4/25/63
Start Reproduction of Contract Documents	4/25/63
100% Submittal	5/2/63
Issue Bid Documents	5/6/63
Bid Opening	6/4/63
Bid Review and Recommendation	6/7/63
Notice to Proceed	7/10/63
Construction Completed	3/10/64

* Based on expeditious approval of Title I Submittal

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V. DRAWING LIST

SK-526-001 - Site and Location Plans

SK-526-101 - Floor and Roof Plans

SK-526-102 - Exterior Elevations and Building Sections

SK-526-601/701 - Schematic Plan and Single Line Diagram

TITLE I

COST ESTIMATE - HEAVY ASSEMBLY BUILDING

Contract No.	Account No.	Description	Units	Unit Cost	Cost	Total Cost
526	5-260	Basic Structure				
		Earthwork	2,000 cy	6.00	12,000	
		Reinforced Concrete	2,000 cy	50.00	100,000	
		Structural Steel	585 Tons	360.00	211,000	
		Misc. Iron	-	L.S.	15,000	
		Metal Siding-Decking	57,000 SF	0.58	33,000	
		Roofing & Insulation	35,000 SF	0.34	12,000	
		Sheet Metal	-	L.S.	8,000	
		Partitions-Wainscot	-	L.S.	14,000	
		Flooring Allowance	-	L.S.	2,000	
		Mtl. Doors, Frames, Hardware	15.Ea.	200.00	3,000	
		Roll Up Doors	3,400 SF	6.75	23,000	
		Metal Sash - Glazing	5,000 SF	4.00	20,000	
		Painting - Caulking	-	L.S.	25,000	
		Building Specialties	-	L.S.	3,000	
		Sub Total				\$ 481,000
	5-260	Mechanical				
		Plumbing			7,000	
		Heating & Ventilating			54,000	
		Piping			29,000	
		Sprinkler System			27,500	
		Sub-Total				\$ 117,800
	5-260	Electrical & Instrumentation				
		Electrical			121,500	
		Telephone & Fire Alarm			5,400	
		Sub-Total				\$ 126,900
		Total, Acct. No. 5-260				\$ 725,700

Note: Budget for Account No. 5-260 = \$726,000

526	4-100	Site Preparation				1,000
	4-400	Roads, Parking & Walks				20,000
	6-010	Telephone				150
	6-030	Intercommunication				150
	6-134	Substation Building & Electrical				15,000
	6-140	Primary Duct System				5,000
	6-210	Fire Alarm				1,400
	6-310	Natural Gas Distr.				400
	6-510	Sanitary Sewer & Drain				380
	6-620	Hot Water Distribution System				1,520
	6-710	Water Supply - Domestic & Fire				1,100
	6-732	Low Conductivity Water Distr.				9,600
	6-820	Compressed Air Distr.				8,900
		Sub-Total				64,600
		Total, Contract 526				\$ 790,300
526-	7-932	Cranes				\$ 100,000
613-X-1	6-134	Unit Substation				\$ 34,500

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