

research lab

ENGINEERING

A RESEARCH LABORATORY FACILITY FOR THE
BIO-ENVIRONMENTAL AND MECHANICAL
ENGINEERING DEPARTMENT
Oklahoma State University
Stillwater, Oklahoma

BY

TAKAZI OKUDA

in partial fulfillment of the requirements
for the Degree of
MASTER OF ARCHITECTURE
May 1981

Professional Project
Architectural Program and Design



Takazi Okuda

Professor Alexander Erdely
Graduate Committee

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to Prof. Alexander Erdely as my professional project adviser. His guidance, patience, counsel, encouragement and inspiration have been great contributions not only in completing this project but also in advancing my knowledge.

I would like to thank sincerely Prof. Alan Brunken and Prof. John Bryant. Their cordinal advice and counsel have helped me at various phases of this project.

I would also like to express my gratitude to Dean Kenneth McCollom and Prof. Ray Chapel as clients and consultants. Their help, time and encouragement, during this project from initial research through design, have been greatly appreciated.

I extend my thanks to Mike Tague, Mike Harrington, Sterling Little, Kristi Allen and other people at School of Architecture for their encouragement, help and advice.

Finally, special thanks to my wife, Keiko, and family, Yakichi, Aiko, Masahiro, Taeko for their support, encouragement and understanding, over the past five years, which have made my graduation possible.

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PART 1

DESIGN PROGRAMMING

INTRODUCTION

PROJECT DESCRIPTION

In the Division of Engineering at Oklahoma State University, research projects provide an ideal training ground for engineering students by giving them the opportunity to learn marketable research skills under the guidance of professional researchers. Also, faculty members who are involved in research efforts are provided an opportunity to keep abreast of the latest developments in their professional fields, and at the same time, permitted to incorporate this information into their teaching/instructional programs.

At Department of Mechanical Engineering, students and faculty will participate in research and design projects in the areas of fluid mechanics and aerodynamics, thermal and environmental sciences, engineering acoustics and vibrations, mechanisms and

systems design, energy conversion and utilization, structures, solid mechanics and material behavior, systems dynamics and automatic control, fluid control systems, and biomedical and medical engineering. Especially as the research activities in this facility, they emphasize fluid mechanics, biomechanics and human performance, materials, thermal science and energy conversion, CAD/CAM (Computer Aided Design/Computer Aided Manufacturing.)

On the other hand, Environmental Engineering is an important part of the field of Civil Engineering. Environmental Engineering provides the technical basis for maintaining and improving the quality of the life support system of the planet Earth. Primarily, this system embraces air, water, food, and shelter. Research activities include: the response of biological

waste treatment processes to changes in the environment and the control of such responses, kinetics and mechanisms governing the behavior of activated sludge processes, metabolic controls applicable to biological treatment systems, oxygen diffusion in semiquiescent waters, hydrologic study of the Arkansas River in Oklahoma leading to comprehensive river basin development for multiple water uses, optimization of treatment design using computer techniques, aerobic digestion of sludge, use of tracers for predicting dispersion of air pollutants, field study of naturally occurring air pollution loads in Oklahoma, and factors affecting flow through porous media.

The project that this report is concerned with is the research facility for Mechanical Engineering and Bio-Environmental Engineering at Oklahoma State

University. At present, Department of Mechanical and Aerospace Engineering is housed on second floor and basement of Engineering North with administration offices, classrooms, graduate stations and research laboratories, and also in Mechanical Engineering Lab building with machine shops, offices and laboratories, located on the north of Baseball Field. Department of Bio-Environmental Engineering is housed on first floor of Engineering South and Civil Engineering Lab building.

Under such conditions, the needs of Engineering Research facility, which will bring primarily department of Mechanical Engineering together with department of Bio-Environmental Engineering in one structure, have been increasing up to present and are predicted to expand considerable throughout the future.

PEOPLE

PROJECT CLIENT

Dr. Kenneth McCollom, Dean of Engineering.

111 Engineering North 624-5140

1107 W. Knapp 372-5356

Raymond Chapel, Director of Engineering Research.

110 Engineering North 624-5185

1024 Graham Drive 372-4037

RESOURCE PEOPLE

Dr. James Parcher, Head of Civil Engineering

206 Engineering South 624-5190

1024 W. Knapp 372-5727

Dr. Don Kincannon, Prof. of Bio-Environment Eng.

107 Engineering South 624-5264

4606 Fairfield 372-4414

Dr. Kayl Reid, Head of Mechanical Engineering.

218 Engineering North 624-5900

2824 N. Lincoln 372-5398

Bill Halley, University Architect

123 Physical Plant Administration 624-7131

1023 W. Knapp Avenue 372-8213

FACTS

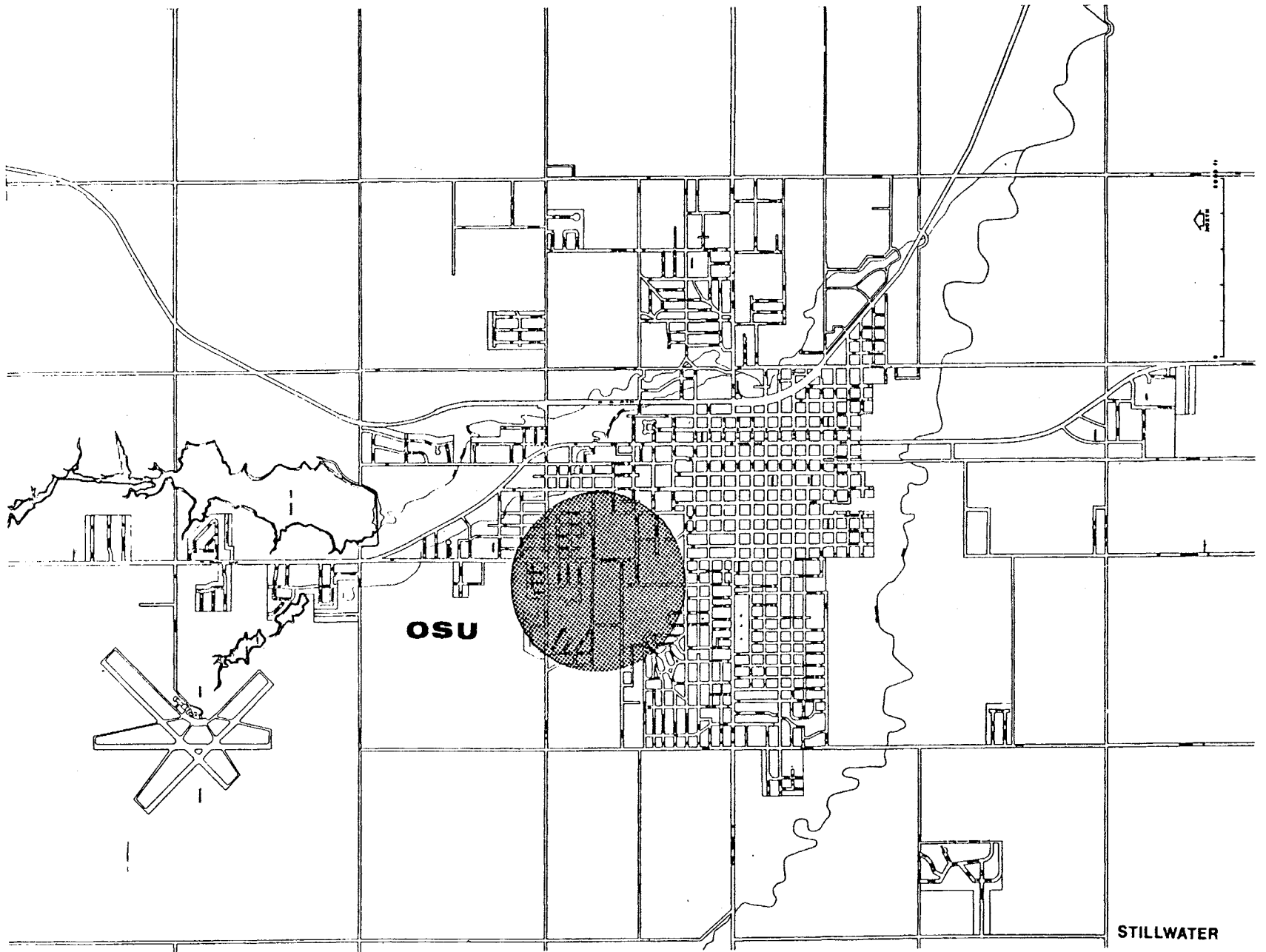
SITE DESCRIPTION

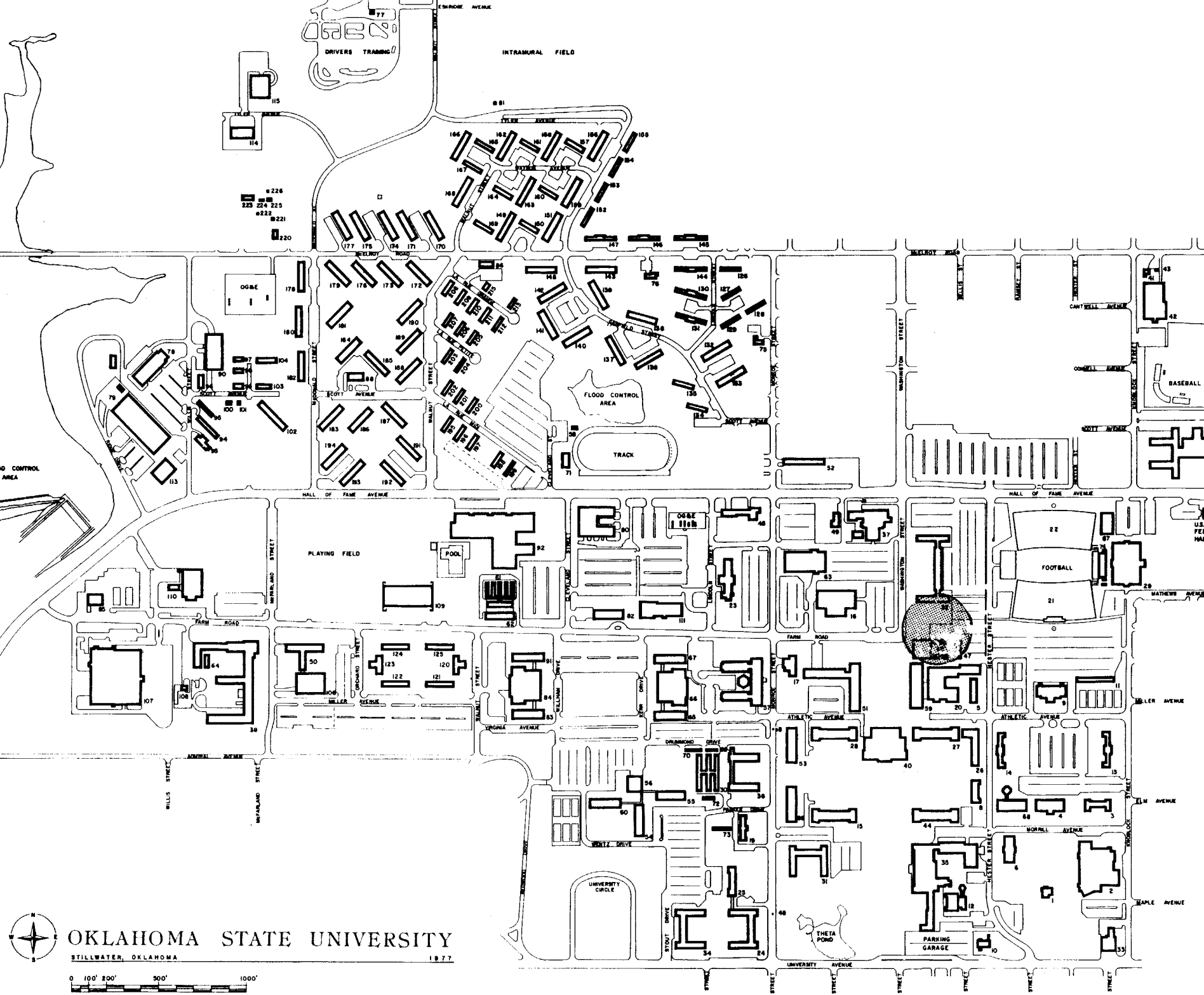
The proposed site for this facility is located in the center section of the Oklahoma State University campus. This site is bounded on the north by Cordell Hall; on the east by Hester Street; on the south by Engineering North and Industrial Building; on the west by International Mall and Farm Avenue. On this particular site, Harzardous Reaction Building stands presently.

The Campus Master Plan shows one future building on this site which is lined up with Engineering North designated as Animal Science. The Master Plan also shows Industrial Building replaced by two new Engineering.

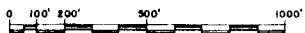
The site provides an excellent view of the Library to the southwest and an adjoining green space

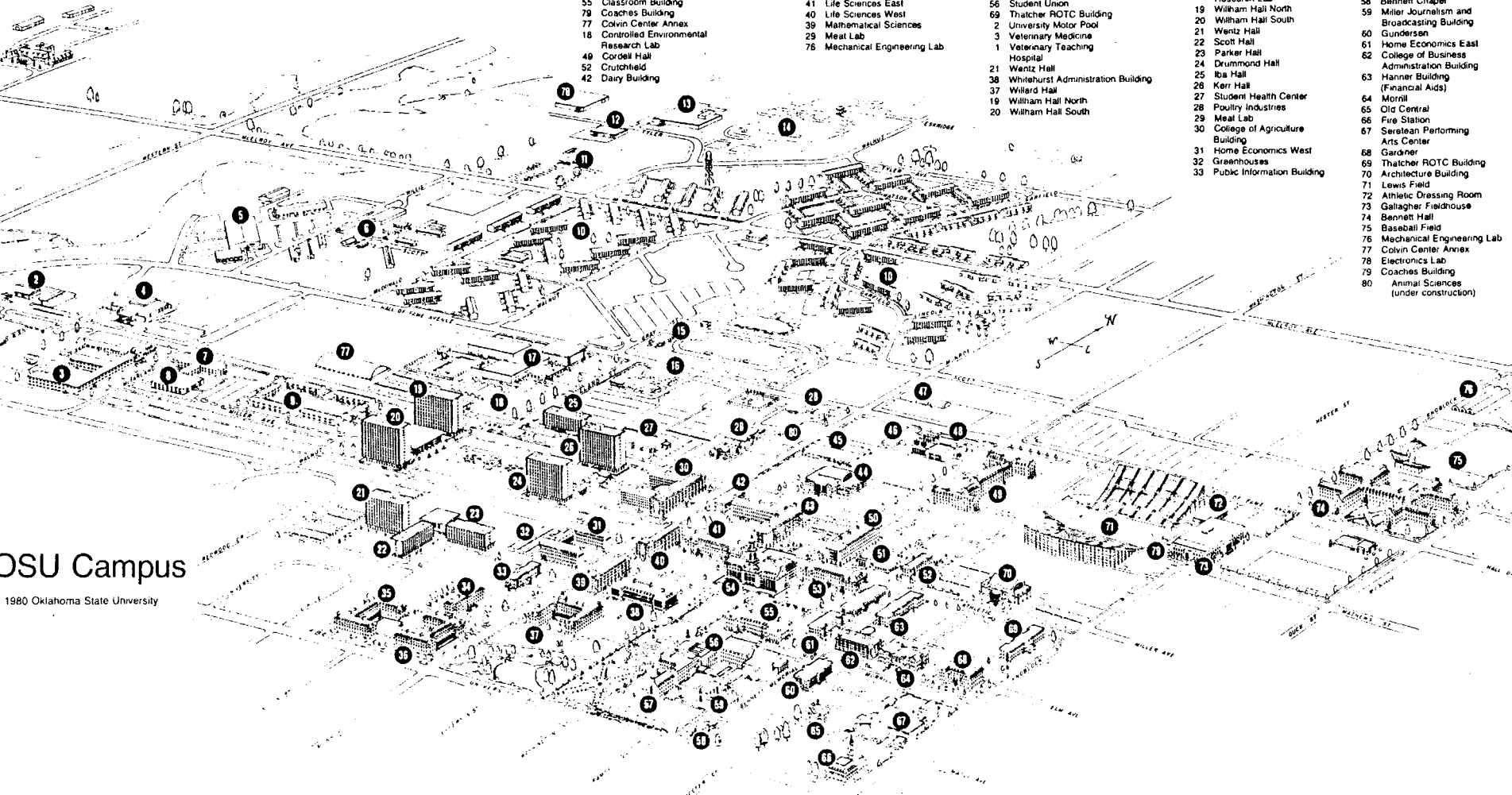
to the west, which is the International Mall. The site also is available to the campus environment. Vehicular circulation and parking around the site is available for service and visitors from Hester Street, making the site easily accessible from off campus roadways, and the feasibility of expanding this facility could be a consideration. All the utilities are available to the site running across and along Washington Street and International Mall.





OKLAHOMA STATE UNIVERSITY
 STILLWATER, OKLAHOMA
 1977





Alphabetical Index

- 38 Administration Building (Whitehurst)
- 16 Agricultural Engineering
- 8 Agricultural Center
- Office Building
- 30 College of Agriculture Building
- 4 Animal Disease Diagnostic Lab
- 24 Animal Husbandry
- 80 Animal Sciences (under construction)
- 10 Apartment Housing
- 70 Architecture Building
- 72 Athletic Dressing Room
- 75 Baseball Field
- 58 Bennett Chapel
- 74 Bennett Hall
- 9 Brumley Apartments
- 62 College of Business Administration Building
- 47 Ceramics Lab
- 55 Classroom Building
- 79 Coaches Building
- 77 Colvin Center Annex
- 18 Controlled Environmental Research Lab
- 49 Cordell Hall
- 52 Crutchfield
- 42 Dairy Building

- 15 Droke Track Building
- 14 Driver Education Range
- 24 Drummond Hall
- 36 Edmon Low Library
- 78 Electronics Lab
- 50 Engineering North
- 53 Engineering South
- 12 Fire Publications and Training
- 66 Fire Station
- 13 Fluid Power Research
- 73 Gallagher Fieldhouse
- 68 Gardner
- 32 Greenhouses
- 60 Gundersen
- 63 Hanner Building (Financial Aids)
- 46 Hazardous Reactions Lab
- 61 Home Economics East
- 31 Home Economics West
- 25 Iba Hall
- 51 Industrial Building
- 26 Kerr Hall
- 71 Lewis Field
- 41 Life Sciences East
- 40 Life Sciences West
- 39 Mathematical Sciences
- 18 Meat Lab
- 29 Meat Lab
- 78 Mechanical Engineering Lab

- 59 Miller Journalism and Broadcasting Building
- 64 Morrill
- 34 Murray Hall
- 34 North Murray
- 65 Old Central
- 11 Outdoor Construction Lab
- 23 Parker Hall
- 57 Parking Garage
- 67 Seretean Performing Arts Center
- 17 Colvin Physical Education Center
- 5 Physical Plant
- 43 Physical Sciences
- 6 Poultry Farm
- 28 Poultry Industries
- 48 Power Plant
- 45 Printing Services
- 33 Public Information Building
- 22 Scott Hall
- 7 Security/Police
- 35 Stout Hall
- 27 Student Health Center
- 56 Student Union
- 69 Thatcher ROTC Building
- 2 University Motor Pool
- 3 Veterinary Medicine
- 1 Veterinary Teaching Hospital
- 21 Wentz Hall
- 38 Whitehurst Administration Building
- 37 Willard Hall
- 19 Witham Hall North
- 20 Witham Hall South

Numerical Index

- 1 Veterinary Teaching Hospital
- 2 University Motor Pool
- 3 Veterinary Medicine
- 4 Animal Disease Diagnostic Lab
- 5 Physical Plant
- 6 Poultry Farm
- 7 Security/Police
- 8 Agricultural Center Office Building
- 9 Brumley Apartments
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- 75 Baseball Field
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- 77 Colvin Center Annex
- 78 Electronics Lab
- 79 Coaches Building
- 80 Animal Sciences (under construction)

OSU Campus
1980 Oklahoma State University

GEOGRAPHY & CLIMATE

GEOGRAPHY

The site is located on the campus of Oklahoma State University in Stillwater. This region is characterized by rolling plains with scattered trees and various vegetation. Stillwater is located in the north central part of the state, which is easily accessible by automobile from the northeast and central part of the state.

CLIMATE

The climate of this region is characterized by a variety of moderate extremes mixed with a prevailing condition of a pleasant continental climate; however, it can at time be unpredictable and harsh. Summer temperatures extremes occasionally reach and exceed 100°F, while Arctic air masses cause December and January temperatures to dip well below the freez-

ing point. The hottest months are July and August, and the coldest months are January and February.

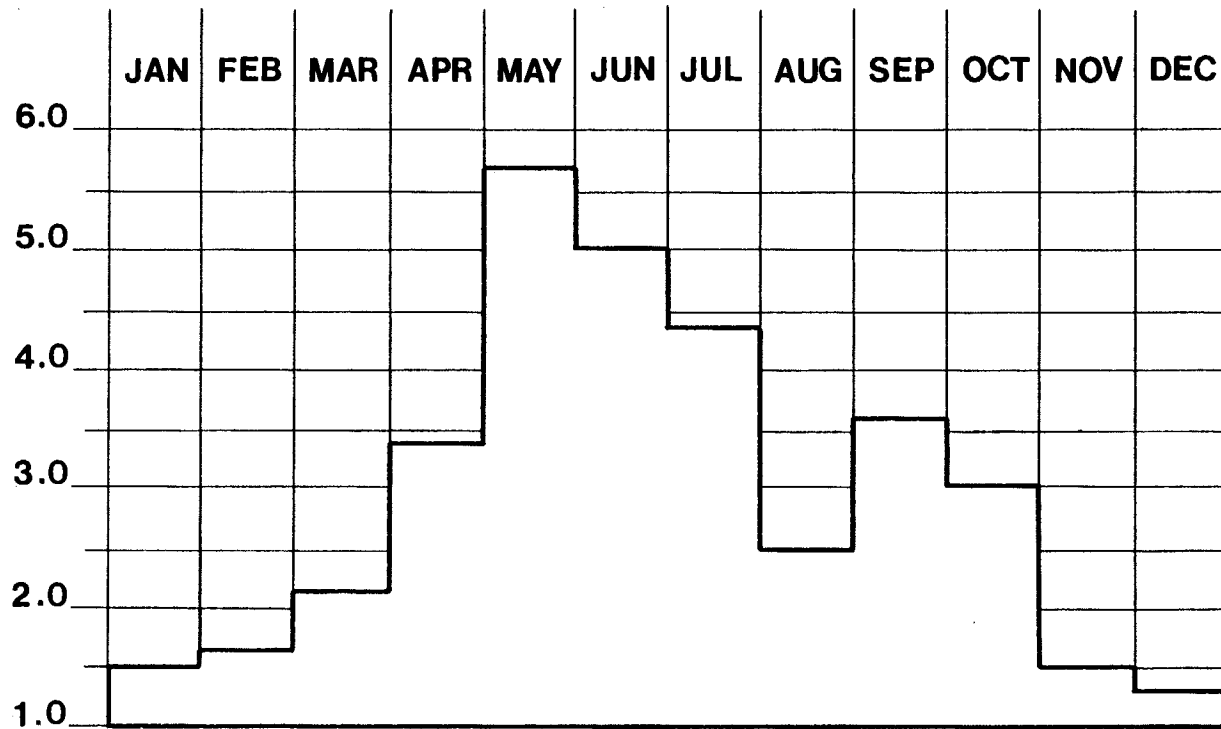
The mean annual precipitation in this region is 33". Highest rainfall is usually in May with a monthly average of 5.75", and the lowest in January with an average 1.5". Average mid-day and early-evening humidities in July range from 60 to 70%, in January 70 to 80%. The annual mean relative humidity is 75%.

Wind velocities in North Central Oklahoma among the highest in the continental United States. The average wind velocity is about 14.0 mph. The prevailing direction of wind is from the southwest in the summer months, while in winter months it is from the northwest. In the spring, front of warm moist Gulf

air often trigger sudden brief thunderstorms and high winds. Significant accumulations of snow are rare except these past 2 or 3 years. Sunshine is predominant in all seasons with September having the highest index of clear skies. The critical sun angles are 30° on December 21 (Winter Solstice) and 80° on June 21 (Summer Solstice).

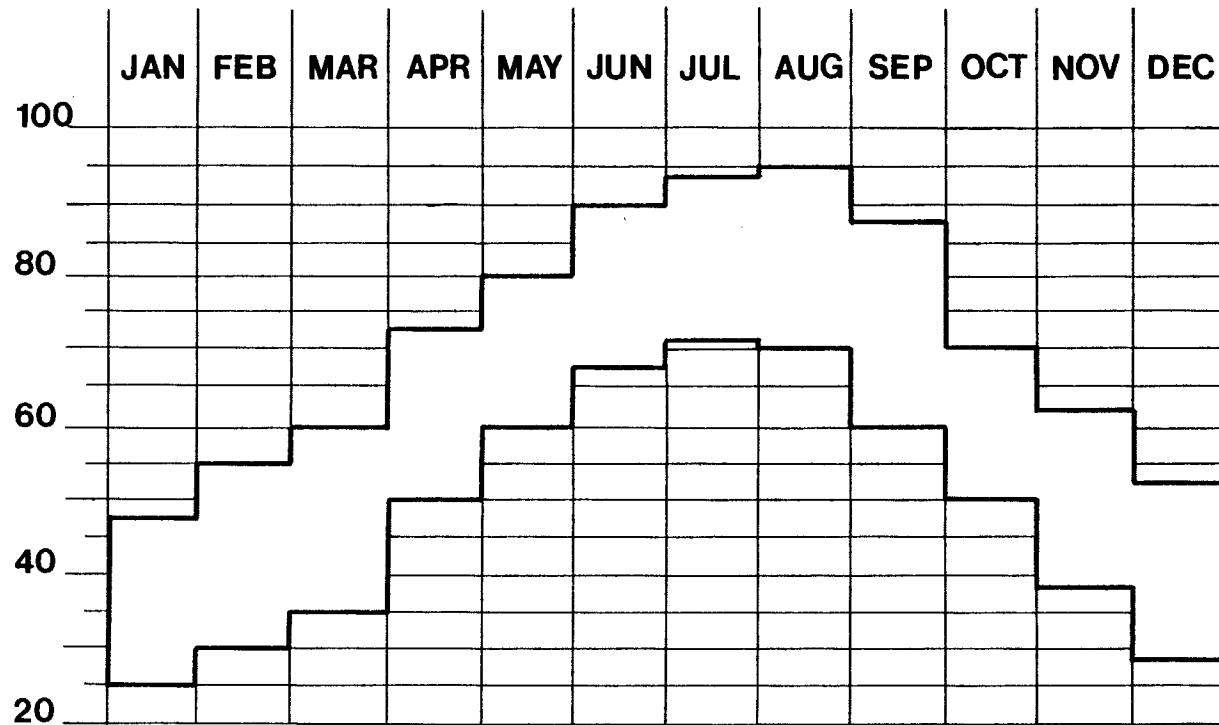
MONTHLY PRECIPITATION

(inches)



AVERAGE MONTHLY TEMPERATURE

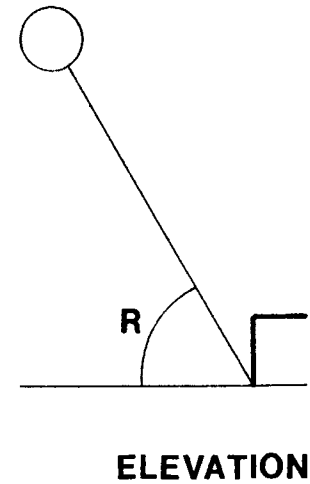
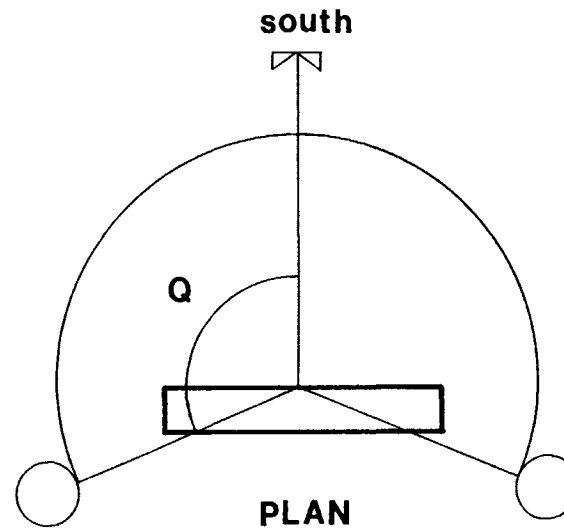
[°f]



SUN POSITION

(degrees) RELATIVE TO SOUTH WALL

21ST	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SUN-RISE Q	64	57	60	64	68	72	74	72	68	64	60	57
SUN-SET Q	-	-	-	-	-	-	-	-	-	-	-	-
SUN-ALT. R	33	42	48	54	60	64	64	60	54	48	42	33



SOIL CHARACTERISTICS

The soil on campus of Oklahoma State University has been found to be an over-consolidated, dessicated, Permian clay, red or yellow in color, and mingled with layers of shaley clay and sandstone. From test samples taken from core borings an accurate estimation of the soil profile can be made. It consists of clay and top soil up to an approximate depth of 10 feet, a layer of badly jointed, hard red clay extending to a depth of 15 to 30 feet, near the existing library and to a depth of at least 80 feet beneath the power plant, and a layer of sandstone whose depth has not been consistantly determined as the borings that have been made generally extend to a depth of not more than 25 feet. The water table varies from a depth of 13 to 25 feet, depending on the location and the conditions involved.

There are relatively few problems with construction on a soil of this type, but one of these is critical and merits. This is due to the fact that clay shrinks or swells with the addition or removal of water. If the clay is saturated with water, the tension is reduced and the clay is subjected to swelling. When a building is constructed on a clay strata, an equilibrium is eventually reached between this swelling and the load induced on the clay by the building and the excess water. If the equilibrium is upset by the occurance of more or less water, the clay is subjected to periodic shrinking and swelling. As would be expected, a great deal of damage has occurred to buildings whose foundations have rested on such an expansive soil. The major ways of combatting this problem are as follows: 1) Load the building heavy enough to exceed the pressure of the wet clay.

- 2) Locate the foundation at a depth where the moisture content is not affected by the addition of water.
- 3) Use a mat or slab foundation strong enough to resist the deflection caused by the expansion.

CODES & ORDINANCES

The 1976 edition of the Life Safety Code and the 1967 edition of the National Building Code are used for all buildings in Stillwater and at Oklahoma State University. Other legal requirements, such as zoning ordinances, easements and deed restrictions, are not applied to the campus of Oklahoma State University.

CAMPUS MASTER PLAN

The Master Plan of Oklahoma State University is proposing the accented focal points, green spaces, and vistas:

Industrial Building to be demolished and replaced by new Engineering building;

New Animal Science to be located in the north of Engineering North, presently existing Harzardous Reaction Building;

Closing of Hester Street from Morrill Street to Athletic Avenue;

Closing of Farm Road from Monroe Street to Washington Street developing pedestrian circulation paths, which is the expansion of Inter-

national Mall;

New Continuing Education Center to be located in the east of Animal Husbandry, existing parking lot for staff.

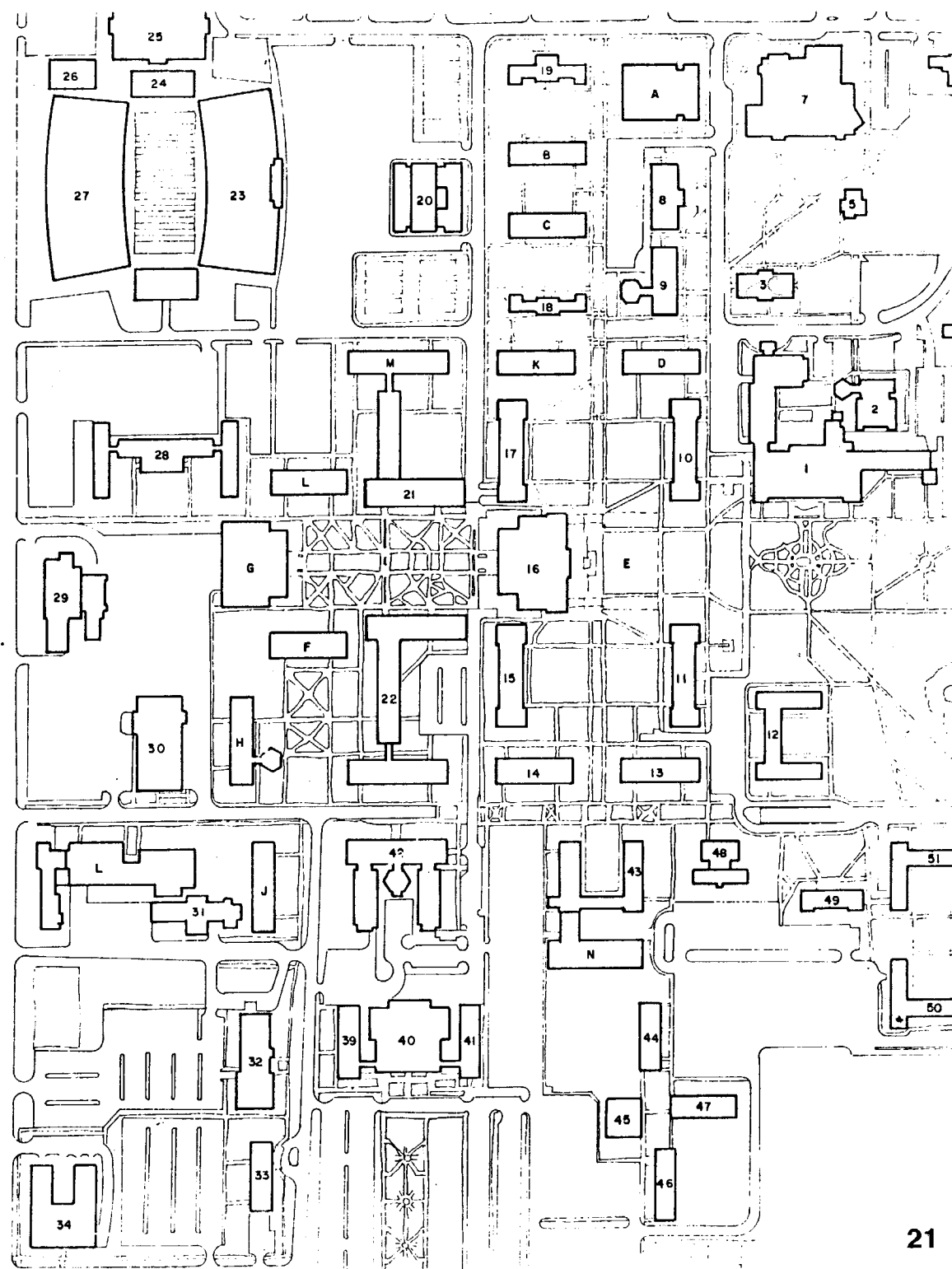
CAMPUS MASTER PLAN

EXISTING BUILDINGS

1. STUDENT UNION AND HOTEL
2. PAUL MILLER JOURNALISM AND BROADCASTING
3. GUNDERSON HALL
4. BENNETT MEMORIAL CHAPEL
5. OLD CENTRAL
6. CAMPUS FIRE STATION
7. SERETEAN CENTER
8. MORRILL HALL
9. BUSINESS
10. CLASSROOM
11. WHITEHURST
12. WILLARD HALL
13. MATHEMATICAL SCIENCES
14. LIFE SCIENCES WEST
15. LIFE SCIENCES EAST
16. LIBRARY
17. ENGINEERING SOUTH
18. HANNER HALL
19. THATCHER HALL
20. ARCHITECTURE BUILDING
21. ENGINEERING NORTH
22. PHYSICAL SCIENCES
23. SOUTH STADIUM
24. FOOTBALL OFFICES
25. GALLAGHER HALL
26. ATHLETIC DRESSING
27. NORTH STADIUM
28. CORDELL HALL
29. POWER PLANT
30. PUBLISHING AND PRINTING
31. MEAT LABORATORY
32. STUDENT HEALTH CENTER
33. IBA HALL
34. AGRICULTURAL ENGINEERING SHOPS
35. COLVIN PHYSICAL EDUCATION CENTER
36. WILLHAM HALL NORTH
37. WILLHAM CAFETERIA
38. WILLHAM HALL SOUTH
39. KERR HALL
40. KERR-DRUMMOND CAFETERIA
41. DRUMMOND HALL
42. AGRICULTURE HALL
43. HOME ECONOMICS WEST
44. PARKER HALL
45. SCOTT-PARKER-WENTZ CAFETERIA
46. WENTZ HALL
47. SCOTT HALL
48. PUBLIC INFORMATION
49. NORTH MURRAY HALL
50. STOUT HALL
51. SOUTH MURRAY HALL

NEW BUILDINGS






- A. AUDITORIUM
- B. HUMANITIES TWO
- C. HUMANITIES ONE
- D. EDUCATION AND CLASSROOMS
- E. LIBRARY (UNDERGROUND)
- F. LIFE SCIENCE
- G. LEARNING RESOURCES
- H. LIFE SCIENCE
- J. AGRICULTURE
- K. ENGINEERING
- L. ANIMAL SCIENCE
- M. ENGINEERING
- N. CHILD DEVELOPMENT LAB



SITE UTILITIES

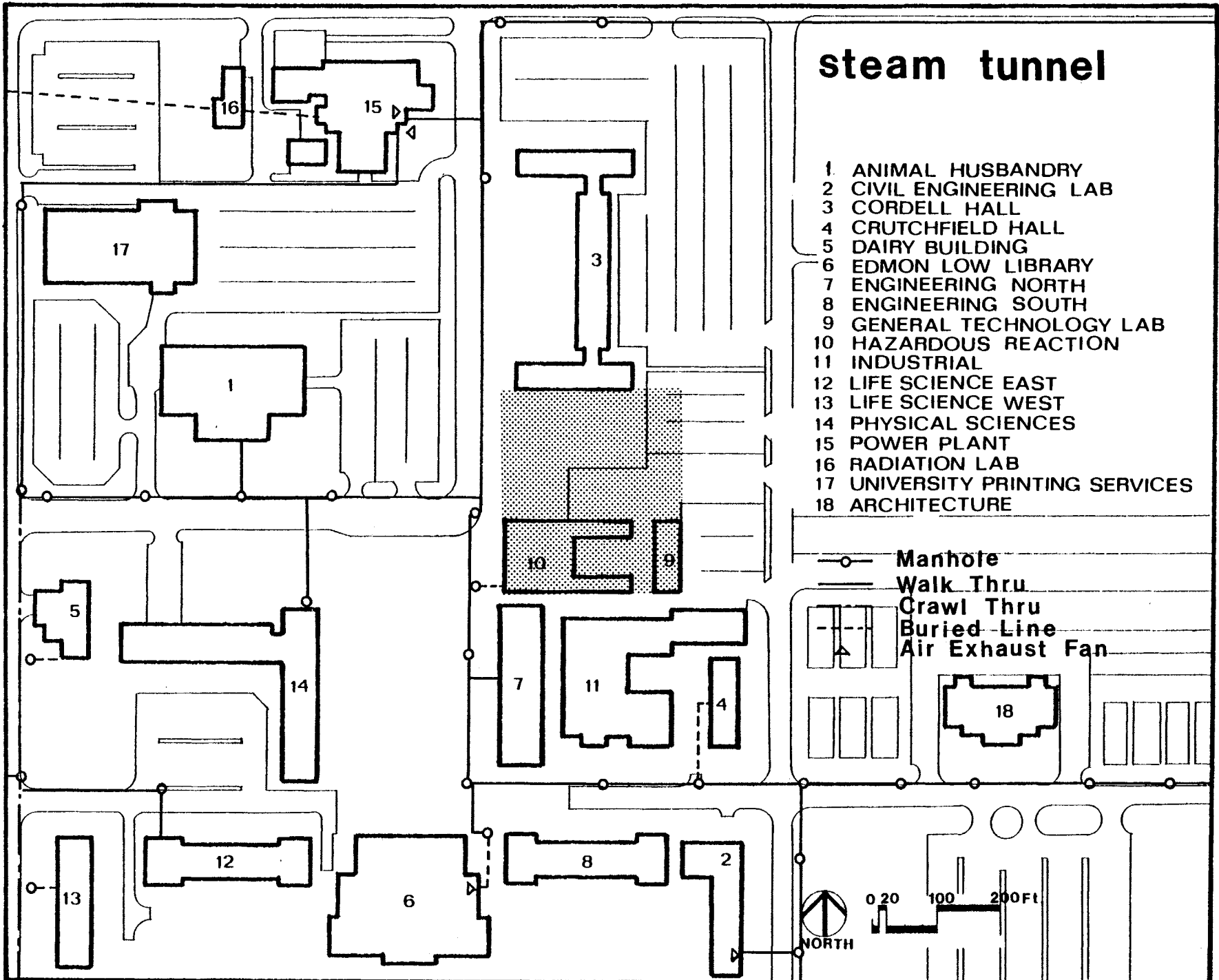
steam tunnel

- 1 ANIMAL HUSBANDRY
- 2 CIVIL ENGINEERING LAB
- 3 CORDELL HALL
- 4 CRUTCHFIELD HALL
- 5 DAIRY BUILDING
- 6 EDMON LOW LIBRARY
- 7 ENGINEERING NORTH
- 8 ENGINEERING SOUTH
- 9 GENERAL TECHNOLOGY LAB
- 10 HAZARDOUS REACTION
- 11 INDUSTRIAL
- 12 LIFE SCIENCE EAST
- 13 LIFE SCIENCE WEST
- 14 PHYSICAL SCIENCES
- 15 POWER PLANT
- 16 RADIATION LAB
- 17 UNIVERSITY PRINTING SERVICES
- 18 ARCHITECTURE

-  Manhole
-  Walk Thru
-  Crawl Thru
-  Buried-Line
-  Air Exhaust Fan



0 20 100 200 Ft



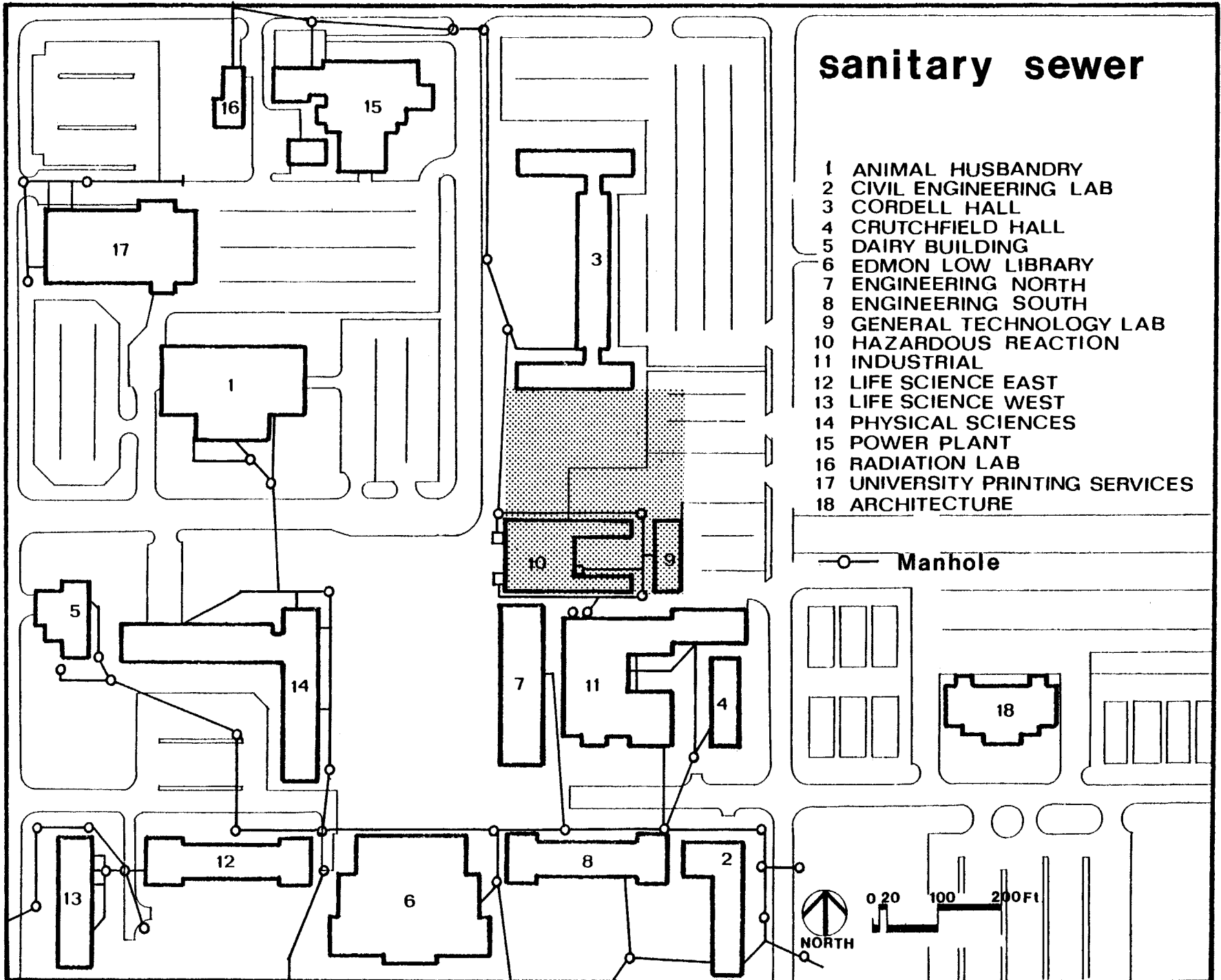
sanitary sewer

- 1 ANIMAL HUSBANDRY
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○— Manhole



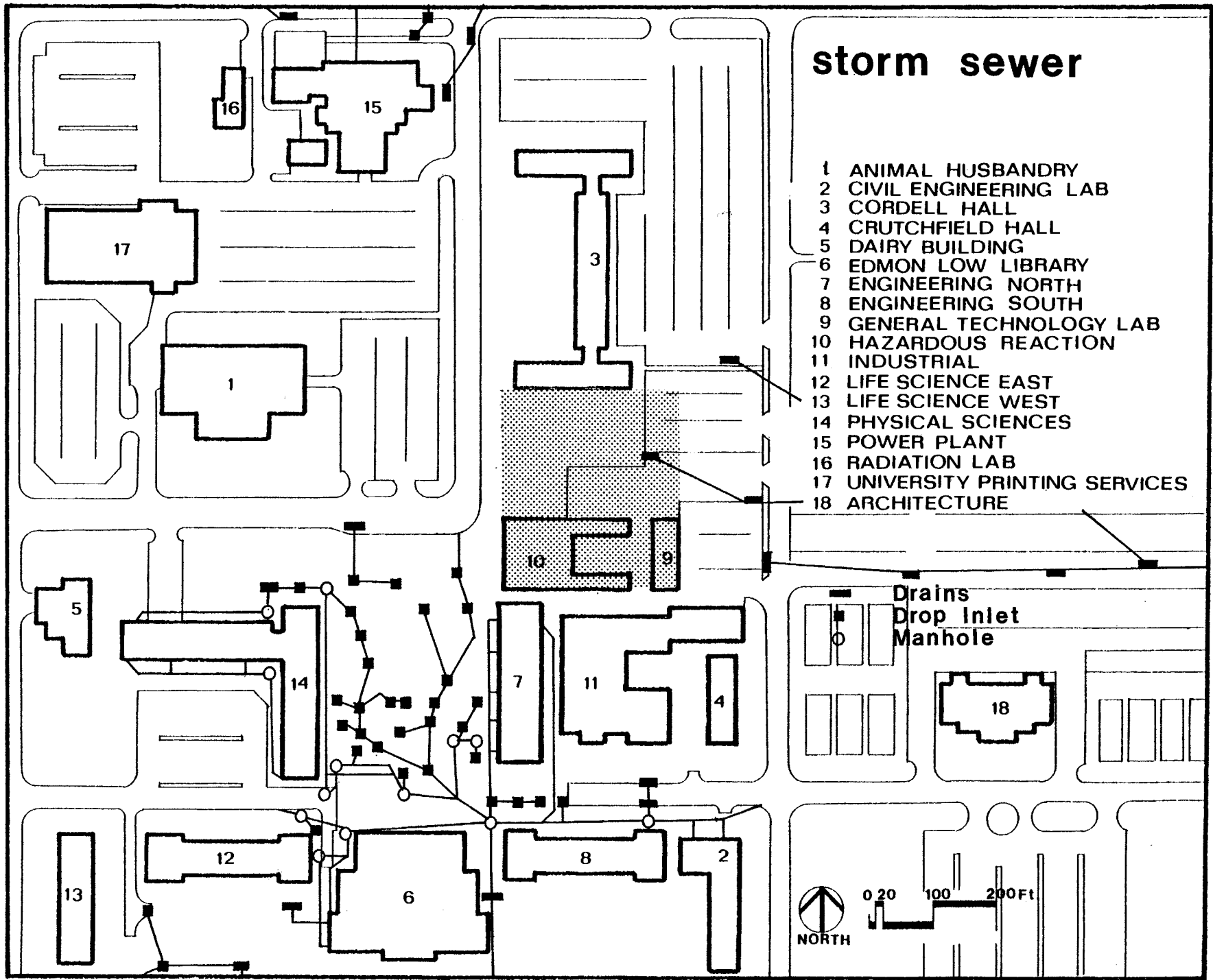
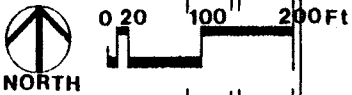
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storm sewer


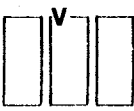
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- 16 RADIATION LAB
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- 18 ARCHITECTURE

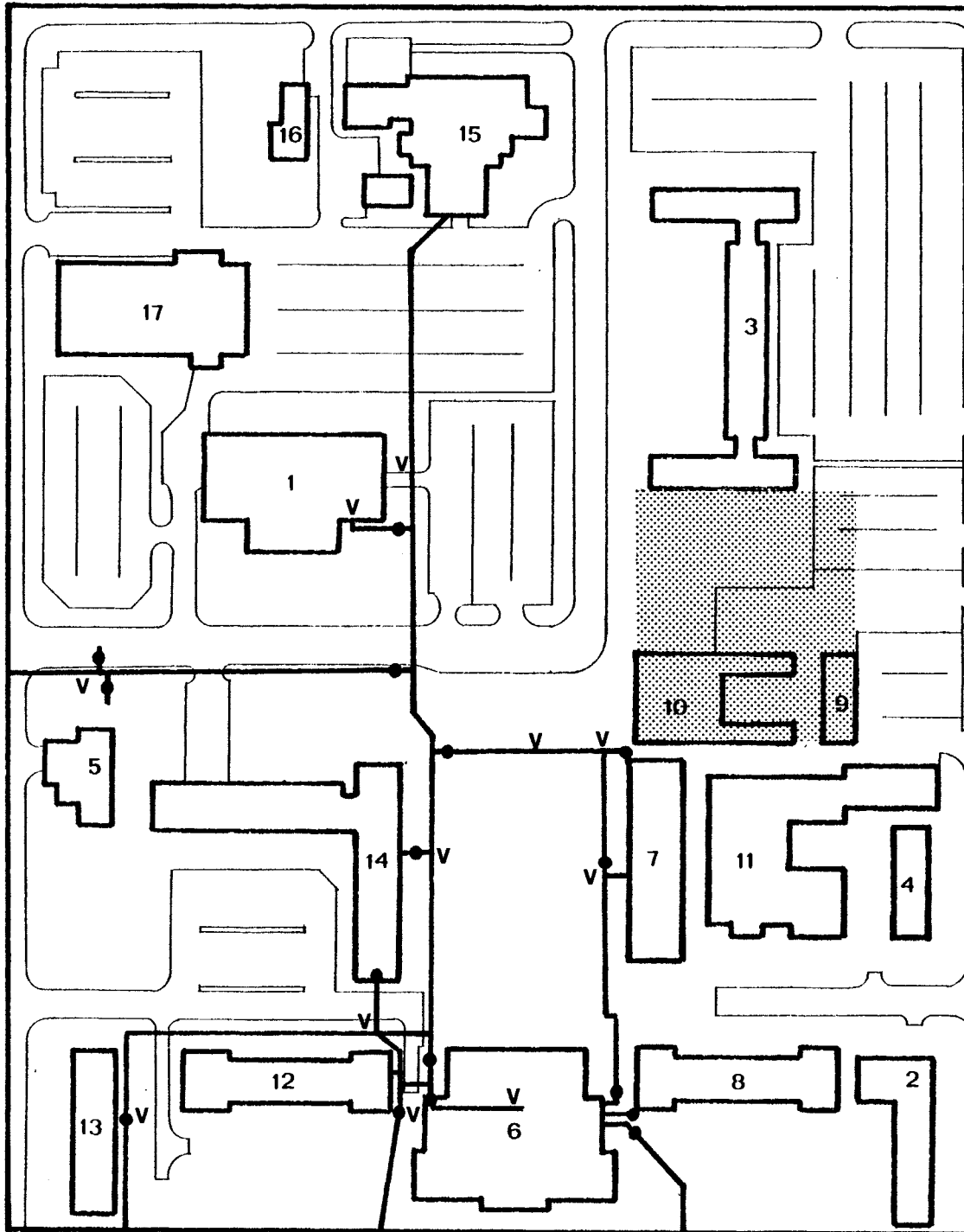
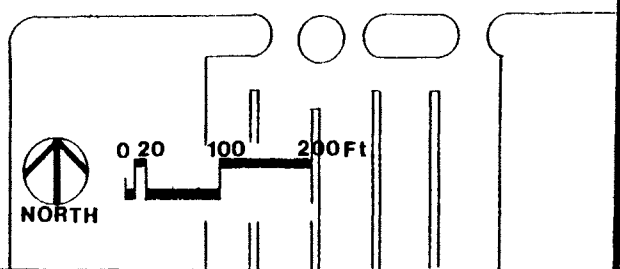
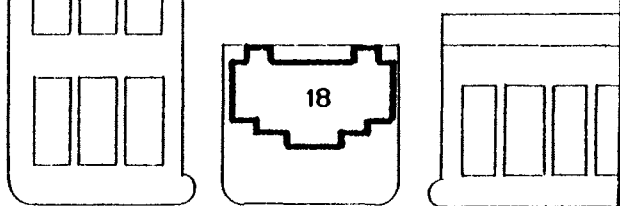
Drains
Drop Inlet
Manhole



chilled water





1. ANIMAL HUSBANDRY
2. CIVIL ENGINEERING LAB
3. CORDELL HALL
4. CRUTCHFIELD HALL
5. DAIRY BUILDING
6. EDMON LOW LIBRARY
7. ENGINEERING NORTH
8. ENGINEERING SOUTH
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13. LIFE SCIENCE WEST
14. PHYSICAL SCIENCES
15. POWER PLANT
16. RADIATION LAB
17. UNIVERSITY PRINTING SERVICES
18. ARCHITECTURE

 Valves located outside each building
 Vents: (to purge air out of lines)



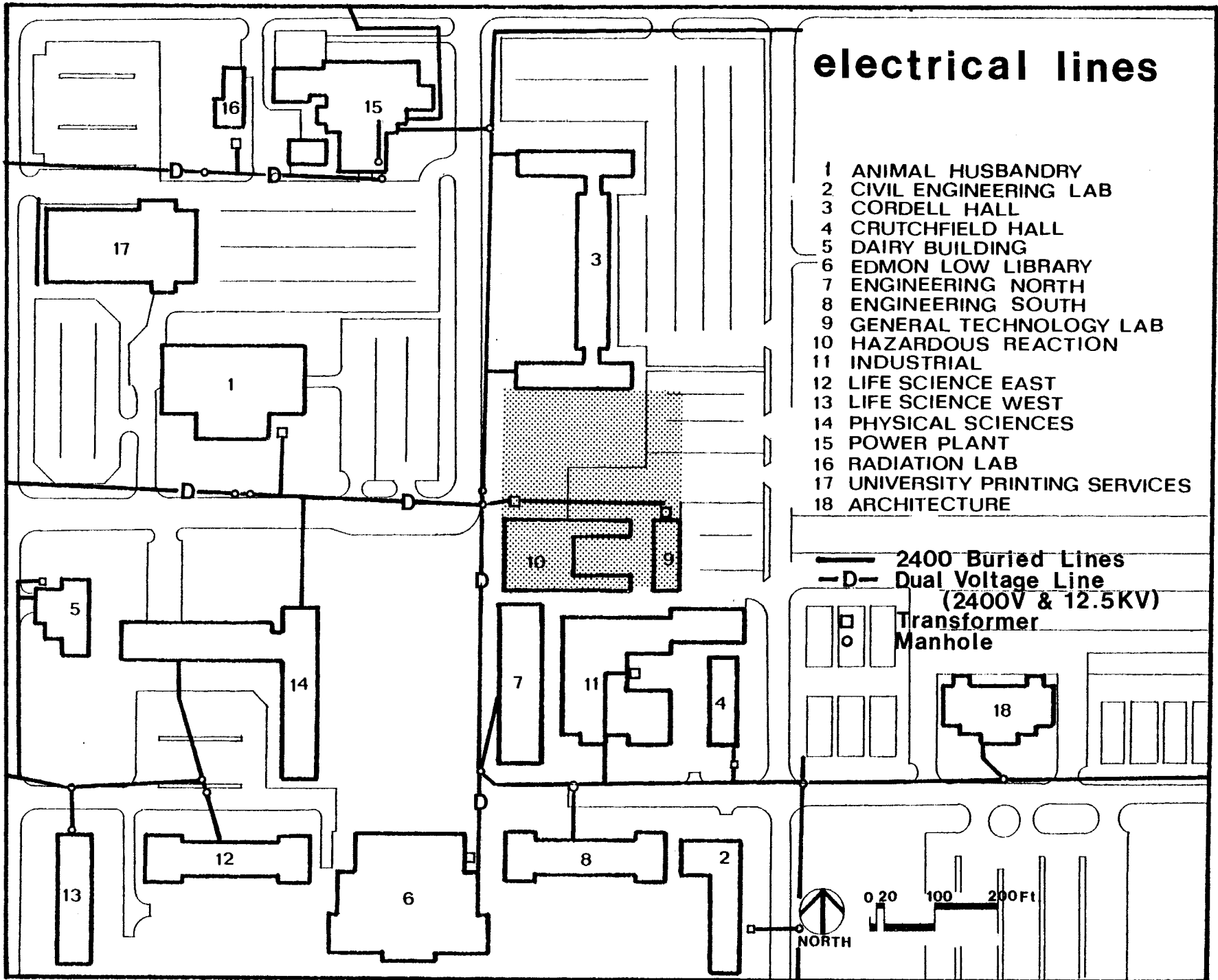
electrical lines

- 1 ANIMAL HUSBANDRY
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 2400 Buried Lines
 Dual Voltage Line
 (2400V & 12.5KV)
 Transformer
 Manhole



0 20 100 200 Ft



SITE CIRCULATION

pedestrian campus master plan

- 1 ANIMAL HUSBANDRY
- 2 CIVIL ENGINEERING LAB
- 3 CORDELL HALL
- 4 CRUTCHFIELD HALL
- 5 DAIRY BUILDING
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- 18 ARCHITECTURE



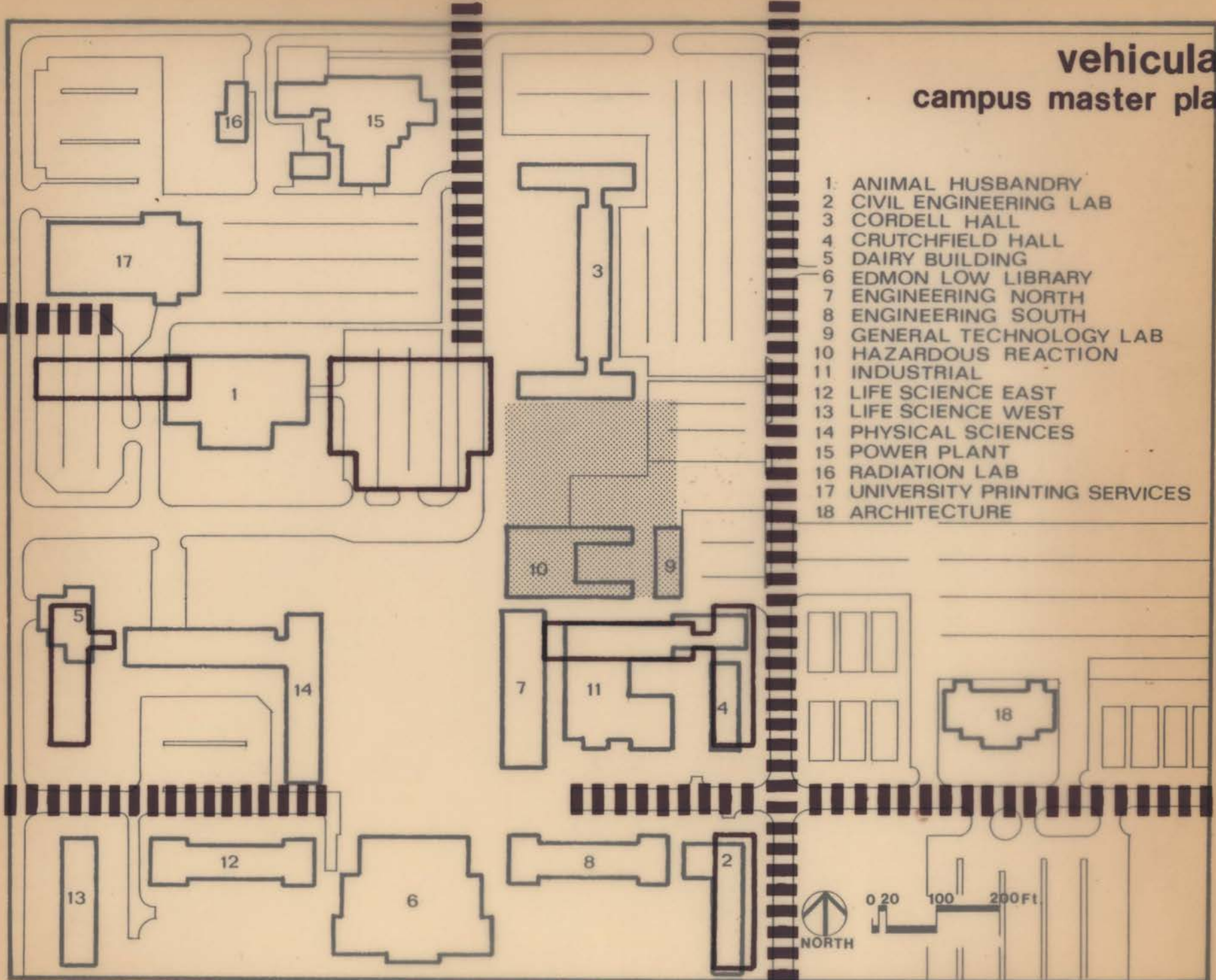
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vehicular campus master plan

- 1 ANIMAL HUSBANDRY
- 2 CIVIL ENGINEERING LAB
- 3 CORDELL HALL
- 4 CRUTCHFIELD HALL
- 5 DAIRY BUILDING
- 6 EDMON LOW LIBRARY
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- 16 RADIATION LAB
- 17 UNIVERSITY PRINTING SERVICES
- 18 ARCHITECTURE



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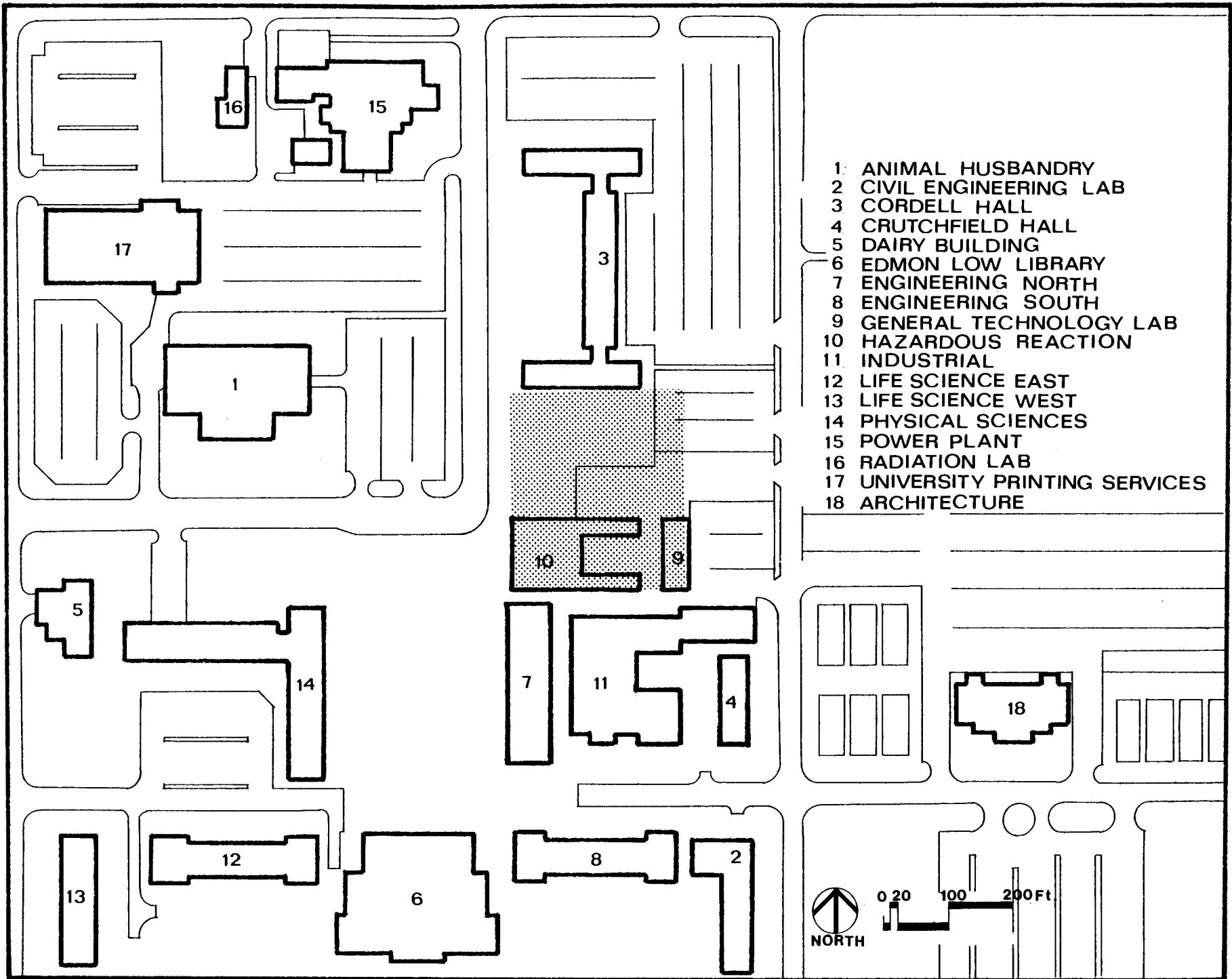
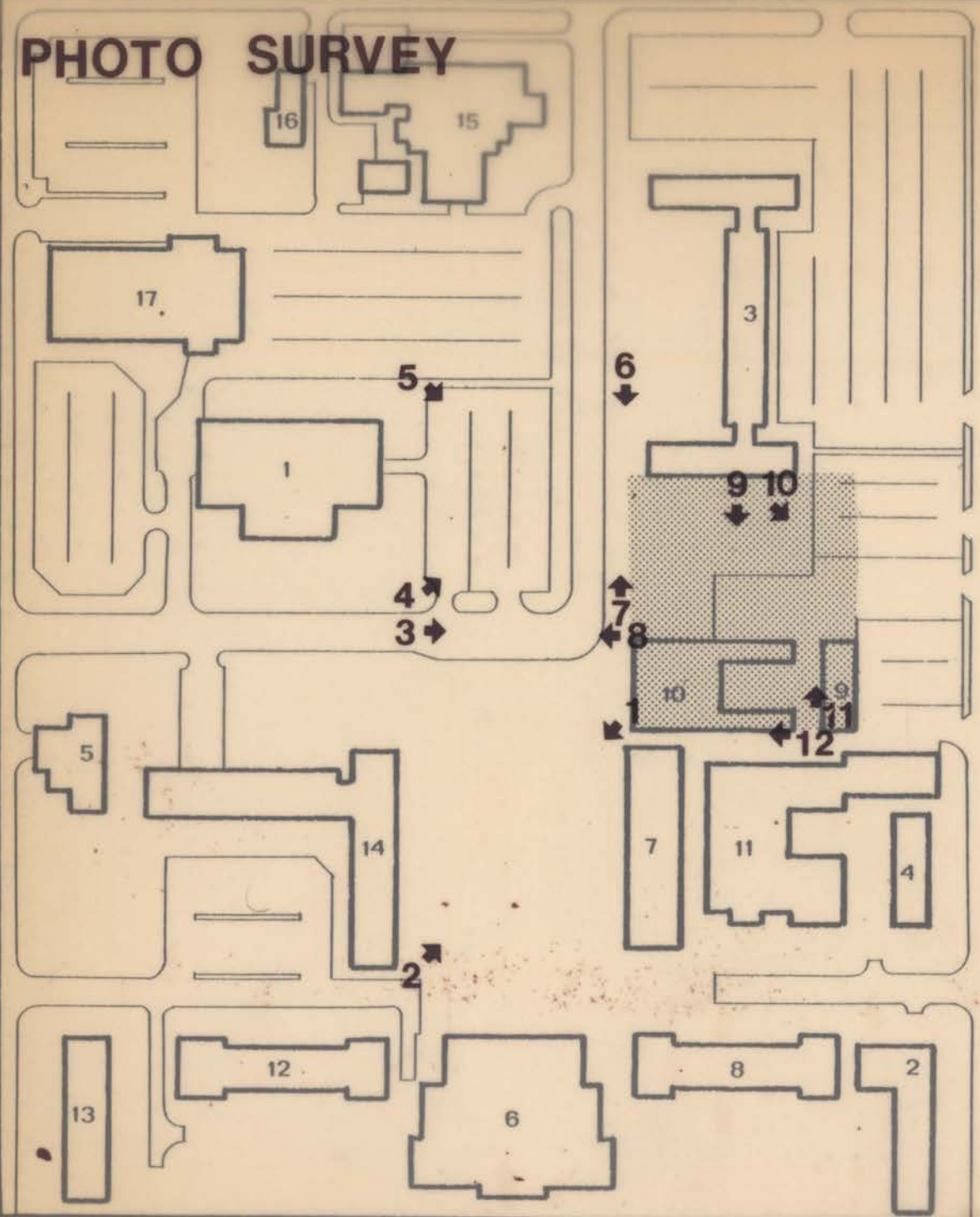
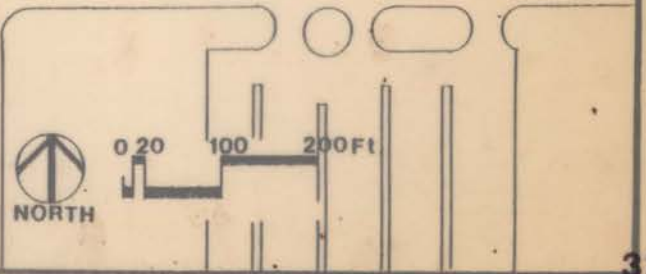
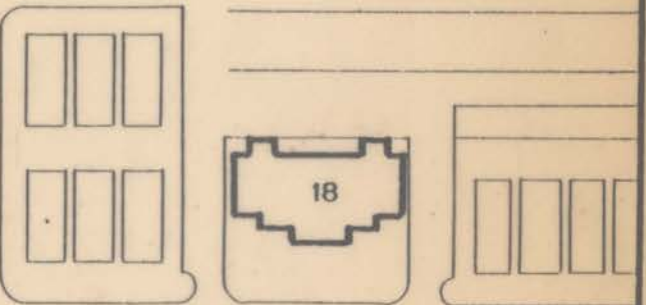
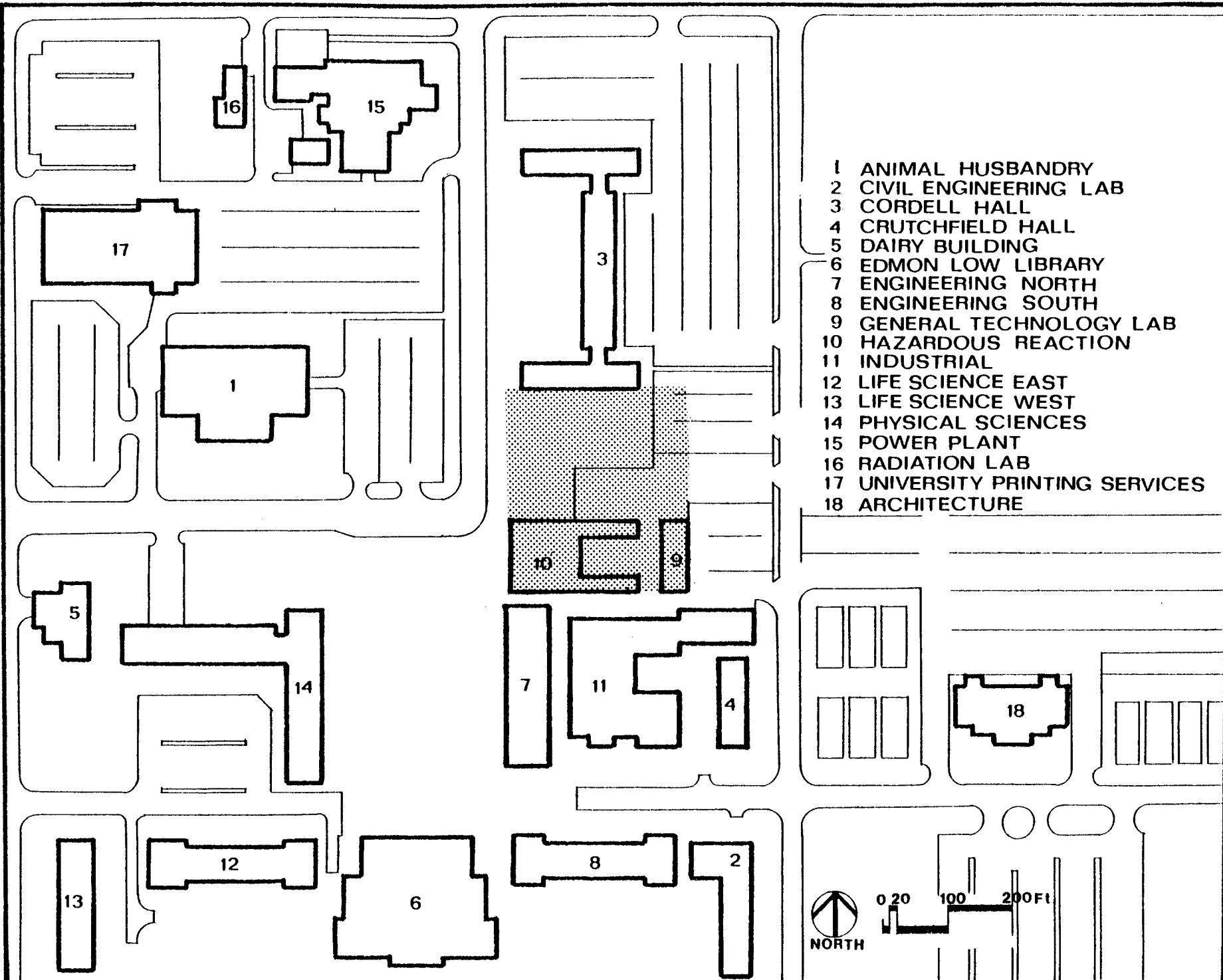


PHOTO SURVEY



- 1 ANIMAL HUSBANDRY
- 2 CIVIL ENGINEERING LAB
- 3 CORDELL HALL
- 4 CRUTCHFIELD HALL
- 5 DAIRY BUILDING
- 6 EDMON LOW LIBRARY
- 7 ENGINEERING NORTH
- 8 ENGINEERING SOUTH
- 9 GENERAL TECHNOLOGY LAB
- 10 HAZARDOUS REACTION
- 11 INDUSTRIAL
- 12 LIFE SCIENCE EAST
- 13 LIFE SCIENCE WEST
- 14 PHYSICAL SCIENCES
- 15 POWER PLANT
- 16 RADIATION LAB
- 17 UNIVERSITY PRINTING SERVICES
- 18 ARCHITECTURE

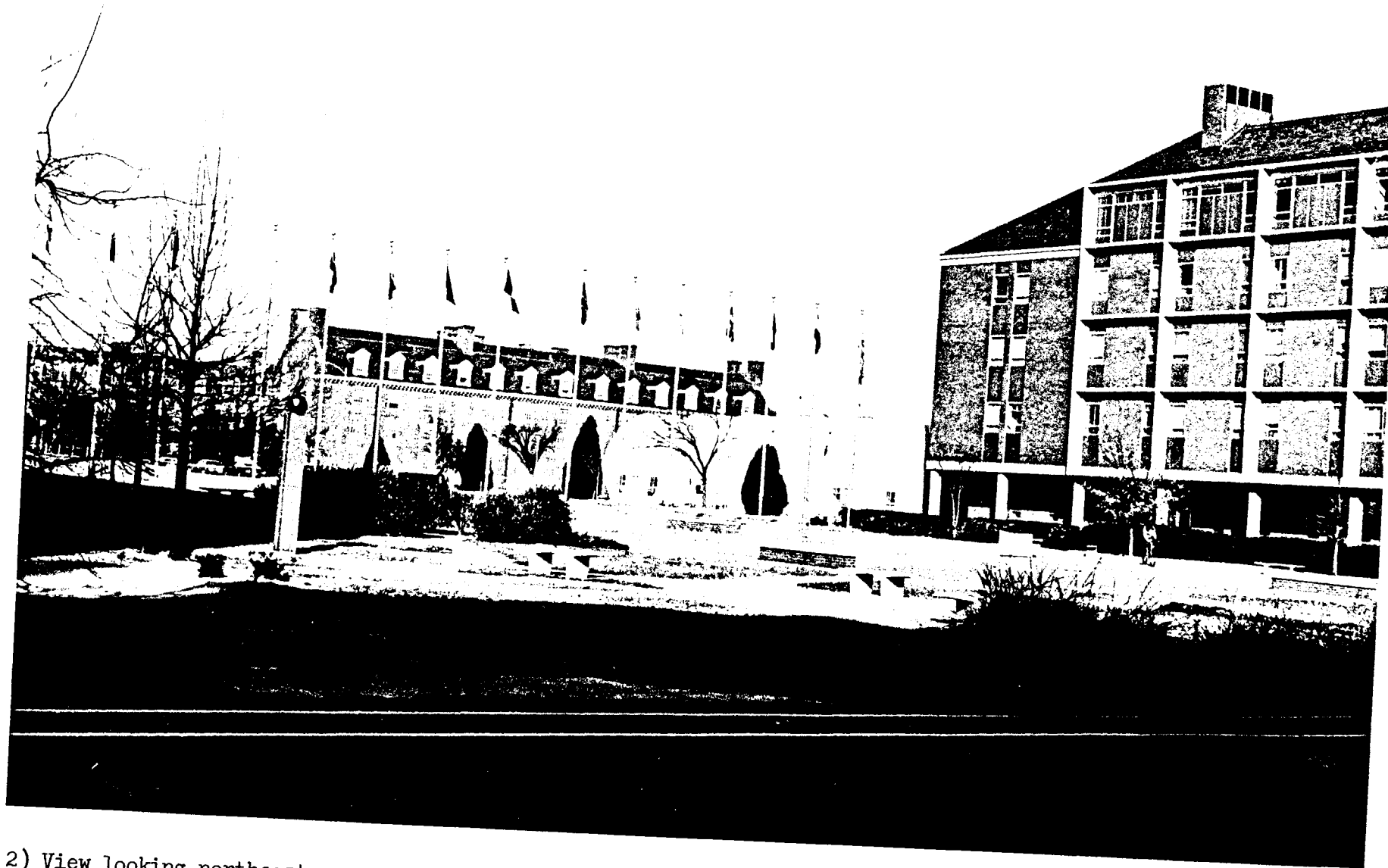




- 1 ANIMAL HUSBANDRY
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- 16 RADIATION LAB
- 17 UNIVERSITY PRINTING SERVICES
- 18 ARCHITECTURE



1) View looking southwest from site



2) View looking northeast across site from International Mall



3) View looking east across site from Farm Road



4) View looking northeast from Farm Road



5) View looking southeast from the east side of Animal Husbandry



6) View looking south from the west side of Cordell Hall



7) View looking north up Washington Street



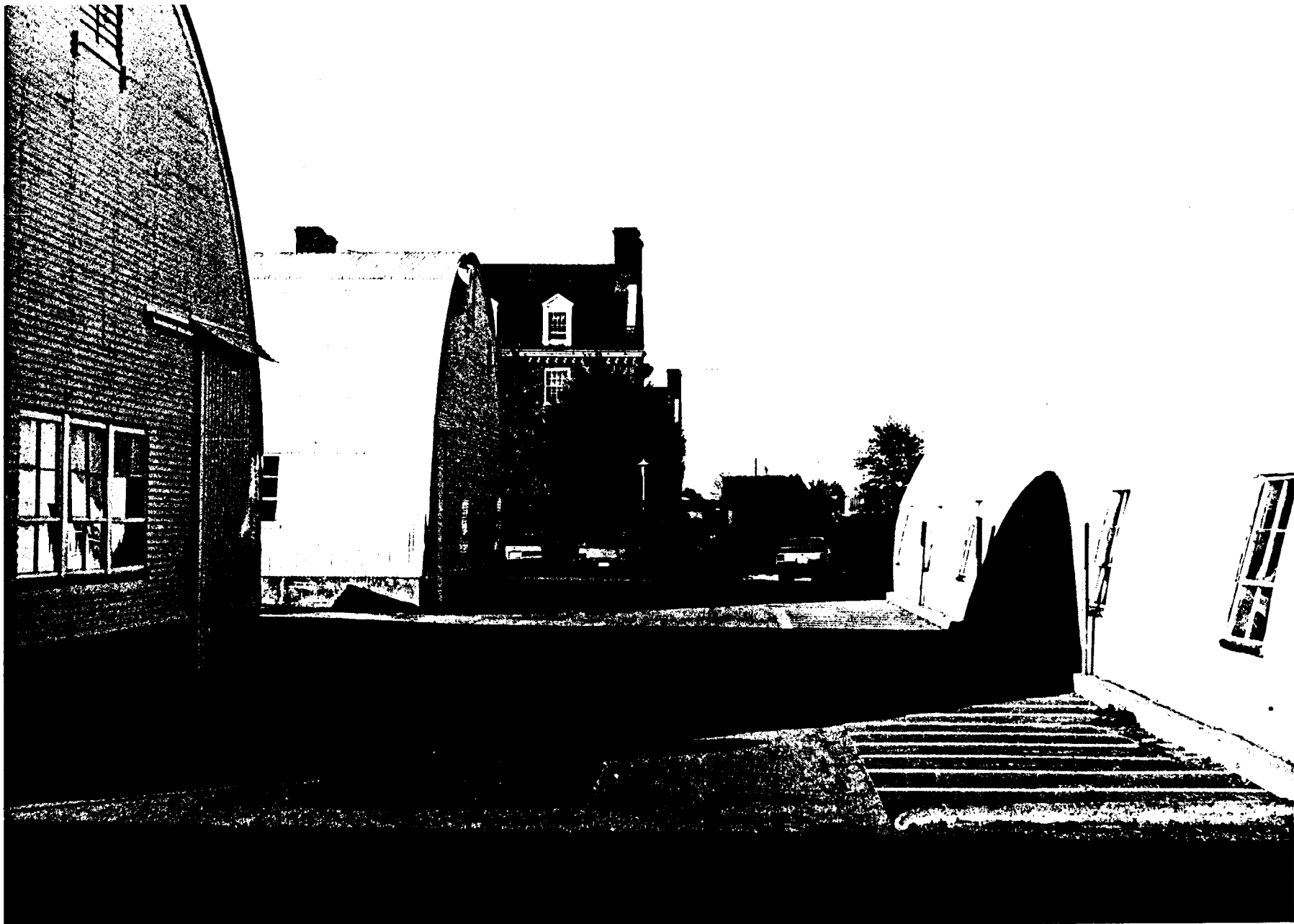
8) View looking west down Farm Road



9) View looking southeast across site



10) View looking south across site from Cordell Hall



11) View looking north across site from Industrial Building



12) View looking west across site

NEEDS

USERS

ENGINEERING MAJORS

Engineering Majors are students majoring in Bio-Environmental or Mechanical Engineering, primarily graduate research assistant students. These students are the primary users of all spaces in this facility. Their need as engineering students should be given special attention in office and laboratory spaces as research activity.

NON-MECHANICAL AND CIVIL ENGINEERING MAJORS

Non-Mechanical and Civil Engineering majors, but other engineering or science majors are enrolled in engineering courses for credit. These people primarily use the lecture class rooms. And also, as multidisciplinary research, students or faculty from other field may use the research laboratory facility.

FACULTY AND ADMINISTRATION

Individuals engaged in the teaching of the various engineering courses offered by primarily Mechanical Engineering department, as well as with the administration of Mechanical Engineering department. And also individuals involved in research of the Bio-Environmental Engineering department. As users of the total facility, special attention should be given to their needs as researchers as well as educators and administrators.

MAINTENANCE AND SERVICE

Individuals who are primarily concerned with the maintenance and service of the facility. Special attention should be given to give these people the efficient service with insured maximum work.

AREA TABULATIONS

LOBBY:		Conference/Seminar rooms	4 @ 200
			13700
	Net Area (Sq.Ft.)		
Waiting/Display	1200	Bio-Environmental Engineering	
		Laboratories with 30'	
		high-bay	5 @ 800
		Graduate stations	10 @ 100
		Conference/Seminar rooms	200
			5200
ADMINISTRATION/STAFF:		Utility Supports	9 @ 50
Head office	250	Lounges	800
Head secretary	150		20150
Faculty offices	25 @ 150		
Reception area	300		
Secretaries	600		
Administrative offices	2 @ 200		
Copy/Work room	2 @ 150		
Lounge/Mail room	250		
Seminar/Conference room	2 @ 300		
Computer room	2 @ 150		
Storages	3 @ 50		
	7050	COMMON AREAS:	
		45 person lecture rooms	2 @ 400
		75 person lecture rooms	2 @ 600
		Teaching assistant offices	7 @ 100
		Computer space	600
			3300
RESEARCH:			
Mechanical Engineering		SERVICE/SUPPORT/STORAGE:	
Laboratories with 30'		Machine shop	2000
high-bay	13 @ 800	Offices @ Machine shop	2 @ 100
Graduate stations	25 @ 100		

General storage	400
Toilets	6 @ 200
	3800

TOTAL NET AREA 35500 sq. ft.

30% Circulation

TOTAL GROSS AREA 46150 sq. ft.

LOBBY

Space Title: Lobby/Waiting/Display

Function: The beginning of the main channel of people movement
Provide for gathering and interaction
Exhibit research activities of this facility to public

Area: 1200 sq. ft.

Occupant:

Users: Students, faculty and visitors

Special Requirements: Near main entrance to administration area

Furniture: Lounge chairs, coffee tables, sofas

Equipment: Track lighting panels

ADMINISTRATION/STAFF

Space Title: Head Office

Function: Office for Head of Mechanical Engineering

Area: 250 sq. ft.

Occupant: 1

Users: Head of Mechanical Engineering

Special Requirements: Locate adjacent to executive secretary, easy access to conference/seminar room

Furniture: Executive desk (3' x 6') and chair, two visitor chairs, couch, book shelves, two file cabinets

Equipment: Phone, tackboard

Space Title: Head Secretary

Function: Office for executive secretary of Head of Mechanical Engineering, receiving of guests and visitors for Head

Area: 150 sq. ft.

Occupant: 1

Users: Secretary

Special Requirements: Locate adjacent to department Head office, reception and mail/lounge room

Furniture: Secretary desk (3' x 5') and chair, work table, file cabinet, two visitor chairs

Equipment: Phone, tackboard, typewriter

Space Title: Faculty Office

Function: Office space for study of research project, class preparation and student counseling

Area: 25 offices @ 150 sq. ft. = 3750 sq. ft.

Occupant: 1 person per each office

Users: Faculty for Mechanical Engineering, few for Bio-Environmental Engineering

Special Requirements: Easy access from reception area and/or laboratory areas

Furniture: One desk and chair, visitor chair, lay table along one wall, file cabinet

Equipment: Phone, tackboard

Space Title: Reception

Function: Greeting and directing incoming visitors and performance of clerical work for this facility

Area: 300 sq. ft.

Occupant: 2 - 4

Users: Secretaries, receptionist, clerical staff, students, faculty, visitors

Special Requirements: Locate adjacent to main entrance/lobby, and classrooms and laboratories, easy access to mail/lounge room and copy/work room

Furniture: Counter (14' L.F.), two desks with typing tables, three desk chairs, file cabinet, lounge chairs for four people

Equipment: Phone, two typewriters, tackboard

Space Title: Secretary

Function: Provide function as the secretarial/bookkeeping and clerical area

Area: 600 sq. ft.

Occupant: 4

Users: Secretaries, clerical staff

Special Requirements: Locate adjacent to faculty offices, easy access to reception and copy/work room

Furniture: Secretary desk (3' x 5') and chair, work table, file cabinet, one visitor chair

Equipment: Phone, tackboard, typewriter

Space Title: Administrative Office

Function: Office space where facility operations are controlled
Performance of the management coordination and administrative support for their research activities

Area: 2 offices @ 200 sq. ft. = 400 sq. ft.

Occupant: 1

Users: Administrators

Special Requirements: Locate adjacent to reception area, easy access to research laboratory areas

Furniture: Executive desk and chair, two visitor chairs, bookshelves, two file cabinets

Equipment: Phone, tackboard

Space Title: Copy/Work room

Function: Work space by secretary and faculty for the preparation of paper work and duplication

Area: 2 @ 150 sq. ft. = 300 sq. ft.

Occupant: 5

Users: Faculty, secretaries, students

Special Requirements: Locate adjacent to reception area and secretary area

Furniture: Work table, supply closet

Equipment: Copy machine, paper cutter, tackboard, book binding equipment

Space Title: Lounge/Mail room

Function: Space by faculty for relaxing, conversation, snacking and picking up mail

Area: 250 sq. ft.

Occupant: 10

Users: Faculty, secretaries

Special Requirements: Locate adjacent to faculty offices and secretary areas

Furniture: Lounge chairs, coffee tables

Equipment: Phone, tackboard, coffee maker, small sink and counter

Space Title: Seminar/Conference

Function: Space for faculty to discuss research projects, sessions and administration

Area: 2 @ 300 sq. ft. = 600 sq. ft.

Occupant: 20

Users: Faculty for Mechanical Engineering

Special Requirements: Locate adjacent to reception area

Furniture: Table and chairs

Equipment: Phone, tackboard, slide projector screen, chalkboard

Space Title: Computer

Function: Space to facilitate computer equipments for research analysis

Area: 2 @ 150 sq. ft. = 300 sq. ft.

Occupant: 5

Users: Faculty for Mechanical Engineering

Special Requirements: Locate adjacent to faculty offices, easy access to graduate stations

Furniture: Counter, chairs, supply closet

Equipment: Set of computer terminal, stand-alone desk top computers and other computer equipments, phone, tackboard

RESEARCH

Space Title: Laboratory

Function: Space for research activity of Mechanical Engineering and Bio-Environmental Engineering

Area: 12 labs (Mech. Eng.) @ 800 sq. ft. = 9600 sq. ft.
4 labs (Bio-Env.) @ 800 sq. ft. = 3200 sq. ft.
= 12800 sq. ft.

Occupant:

Users: Faculty and graduate research assistants of Mechanical and Bio-Environmental Engineering

Special Requirements: Locate adjacent to graduate research assistant offices, easy access to utility support areas and service elevator
Require control temperature room, steam, 160°F hot water, 40°F chilled water, deionized water, natural gas, compressed air, vacuum 100mm and 1mm, nitrogen and industrial waste lines

Furniture: Bench facilities, chairs

Equipment: Testing machines and instrumentation (Biomechanics and Human Performance)
Materials testing system (Materials)
Temperature and radiation measurement system
(Thermal Science and Energy Conversion)

Space Title: High-Bay Laboratory

Function: Space of pilot plant for Bio-Environmental Engineering, fluid mechanics for Mechanical Engineering

Area: 800 sq. ft. (Mech. Eng.) + 800 sq. ft. (Bio-Env.) = 1600 sq. ft.

Occupant: 40

Users: Faculty and graduate research assistants of Mechanical and Bio-Environmental Engineering

Special Requirements: Locate adjacent to graduate research assistant offices, direct access from outside for service
30 feet high-bay

Furniture: Bench facilities, chairs

Equipment: Crane, low-speed wind tunnel, flow and velocity measurement system (Fluid Mechanics)

Space Title: Utility Support

Function: Provide an utility access area for plumbing and electricity

Area: 9 spaces @ 50 sq. ft. = 450 sq. ft.

Occupant:

Users: Service maintenance staff

Special Requirements: Locate adjacent to each lab Module
Utility support area must be capable of being modified without disturbing the operation of other lab Modules

Furniture:

Equipment:

Space Title: Graduate Station

Function: Office space for research preparation and study for graduate research assistants

Area: 30 offices @ 100 sq. ft. = 3000 sq. ft.

Occupant: 2 persons per each office

Users: Graduate research assistants for Mechanical and Bio-Environmental Engineering

Special Requirements: Locate adjacent to laboratory areas

Furniture: Two desks and chairs, file cabinets

Equipment: Phone, tackboard

Space Title: Conference/Seminar

Function: Provide meeting, presentation and discussion of research

Area: 5 confs @ 200 sq. ft. = 1000 sq. ft.

Occupant: 10 persons per each space

Users: Faculty and students for Mechanical and Bio-Environmental Engineering

Special Requirements: Locate adjacent to laboratory areas and graduate station areas

Furniture: Table and chairs

Equipment: Phone, tackboard, slide projector screen, chalkboard

Space Title: Lounge

Function: Place for students and faculty to relax

Area: 8 lounges @ 100 sq. ft. = 800 sq. ft.

Occupant: 6

Users: Students and faculty

Special Requirements: Locate adjacent to laboratory areas and graduate station areas

Furniture: Lounge chairs, coffee tables

Equipment: Vending machines

COMMON AREAS

Space Title: Lecture Room

Function: Classrooms for lectures, slide shows and miscellaneous functions for primarily Mechanical Engineering, but also Bio-Environmental Engineering

Area: 2 rooms @ 400 sq. ft. + 2 rooms @ 600 sq. ft. = 2000 sq. ft.

Occupant: 2 @ 45 people, 2 @ 75 people

Users: Faculty and students

Special Requirements: Locate adjacent to teaching assistant offices, easy access to Entrance

Furniture: Lecture seating with writing or drawing surface

Equipment: Chalkboard, slide projector screen

Space Title: Teaching Assistant Office

Function: Office space for class preparation and grading

Area: 7 offices @ 100 sq. ft. = 700 sq. ft.

Occupant: 1

Users: Graduate teaching assistants for Mechanical Engineering

Special Requirements: Locate adjacent to lecture rooms

Furniture: Desk and chair, visitor chairs, bookshelf

Equipment: Phone, tackboard

Space Title: Computer Space

Function: Provide a computer access for CAD/CAM (Computer Aided Design—
Computer Aided Manufacturing)

Area: 600 sq. ft.

Occupant:

Users: Students and faculty for Mechanical Engineering

Special Requirements: Locate adjacent to laboratory areas and graduate station areas

Furniture: Counter, supply closet

Equipment: Vector General interactive refresh graphics terminals,
PDP 11/70 computer system, flat-bed plotter, graphics
tablets

SERVICE/SUPPORT/STORAGE

Space Title: Machine Shop

Function: Project construction, set-up and fixing for metal and wood work

Area: 2000 sq. ft.

Occupant: 20 - 30

Users: Students and faculty

Special Requirements: Locate adjacent to service freight
Provide acoustic considerations for noiseproof

Furniture: 4 x 8 work tables, storage racks

Equipment: Carpentry tools, table saw, drill press, fire extinguishers, sink, dollies, carts

Space Title: Machine Shop Office

Function: Office space for manager and staff of machine shop

Area: 2 offices @ 100 sq. ft. = 200 sq. ft.

Occupant: 1

Users: Manager and staff of machine shop

Special Requirements: Locate adjacent to machine shop area

Furniture: Desk and chair, visitor chairs, bookshelf, file cabinet

Equipment: Phone, tackboard

Space Title: General Storage

Function: Housing equipments from machine shop and laboratory areas

Area: 400 sq. ft.

Occupant:

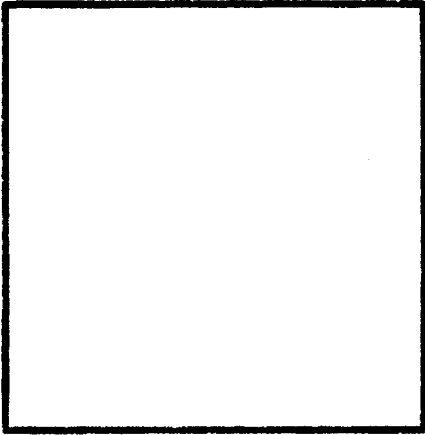
Users: Faculty, students and staff

Special Requirements: Locate adjacent to machine shop and service freight

Furniture: Storage racks

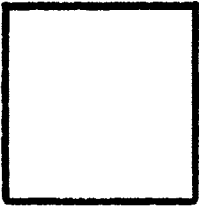
Equipment:

LIST OF AREAS

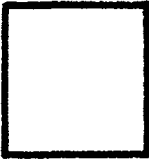


Waiting/Display
1200 sq. ft.

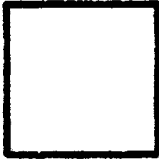
administration / staff



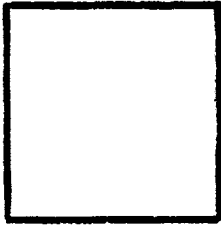
Head Office
250 sq. ft.



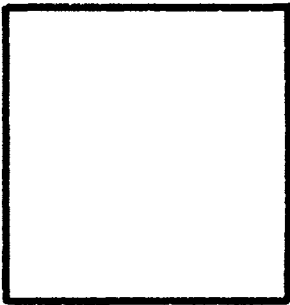
Head Secretary
150 sq. ft.



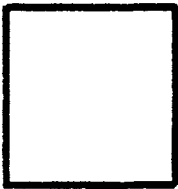
Faculty Office
25 @ 150 sq. ft.



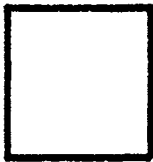
Reception
300 sq. ft.



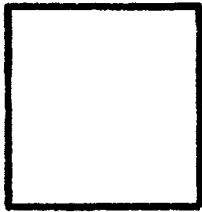
Secretary
600 sq. ft.



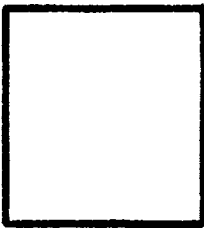
Administrative Office
2 @ 200 sq. ft.



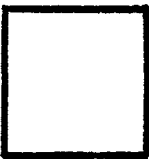
Copy/Work
2 @ 150 sq. ft.



Lounge/Mail
250 sq. ft.



Seminar/Conference
2 @ 300 sq. ft.

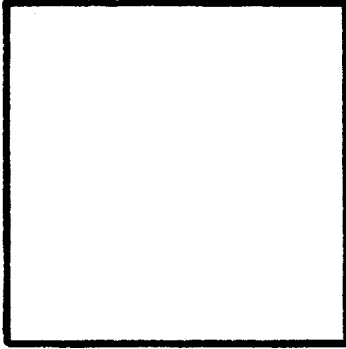


Computer
2 @ 150 sq. ft.



Storage
3 @ 50 sq. ft.

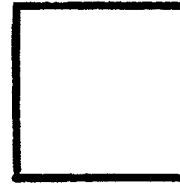
research mechanical engineering



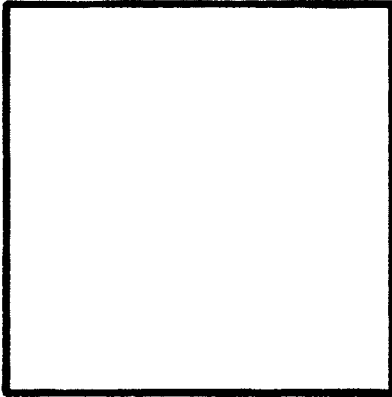
Laboratory
13 @ **800** sq. ft.



Graduate Station
25 @ **100** sq. ft.

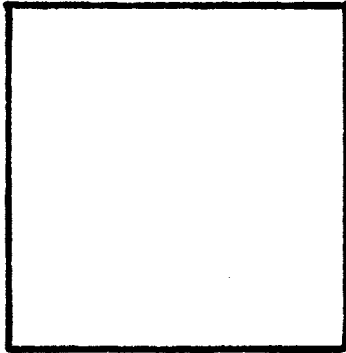


Conference/Seminar
4 @ **200** sq. ft.

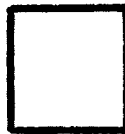


1 Lab + 2 Graduate Stations = 1 Module
1000 sq. ft.

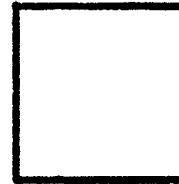
research
bio-environmental engineering



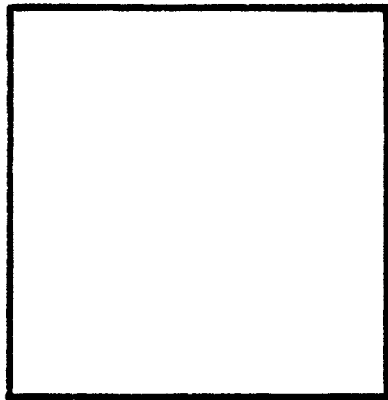
Laboratory
5 @ **800** sq. ft.



Graduate Station
10 @ **100** sq. ft.



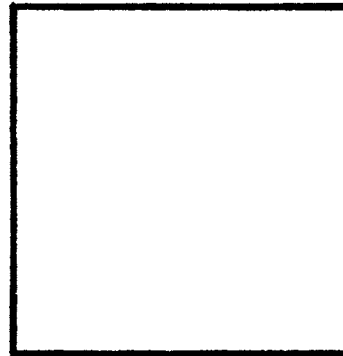
Conference/Seminar
200 sq. ft.



1 Lab + 2 Graduate Stations
= 1 Module **1000** sq. ft.

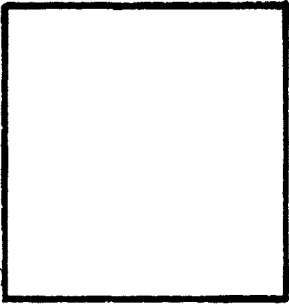


Utility Support
9 @ **50** sq. ft.

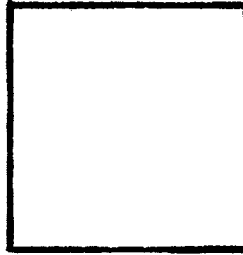


Lounge
800 sq. ft.

common areas



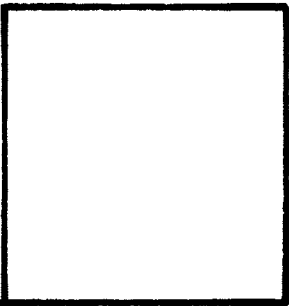
75 Person Lecture
2 @ **600** sq. ft.



45 Person Lecture
2 @ **400** sq. ft.

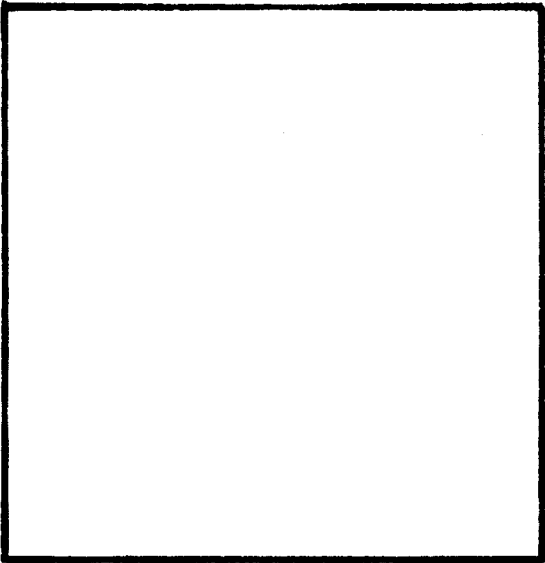


Teaching Assistant Office
7 @ **100** sq. ft.



Computer
600 sq. ft.

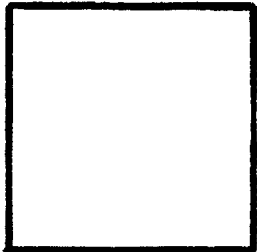
service/support / storage



Machine Shop
2000 sq. ft.



Office of Machine Shop
2 @ **100** sq. ft.

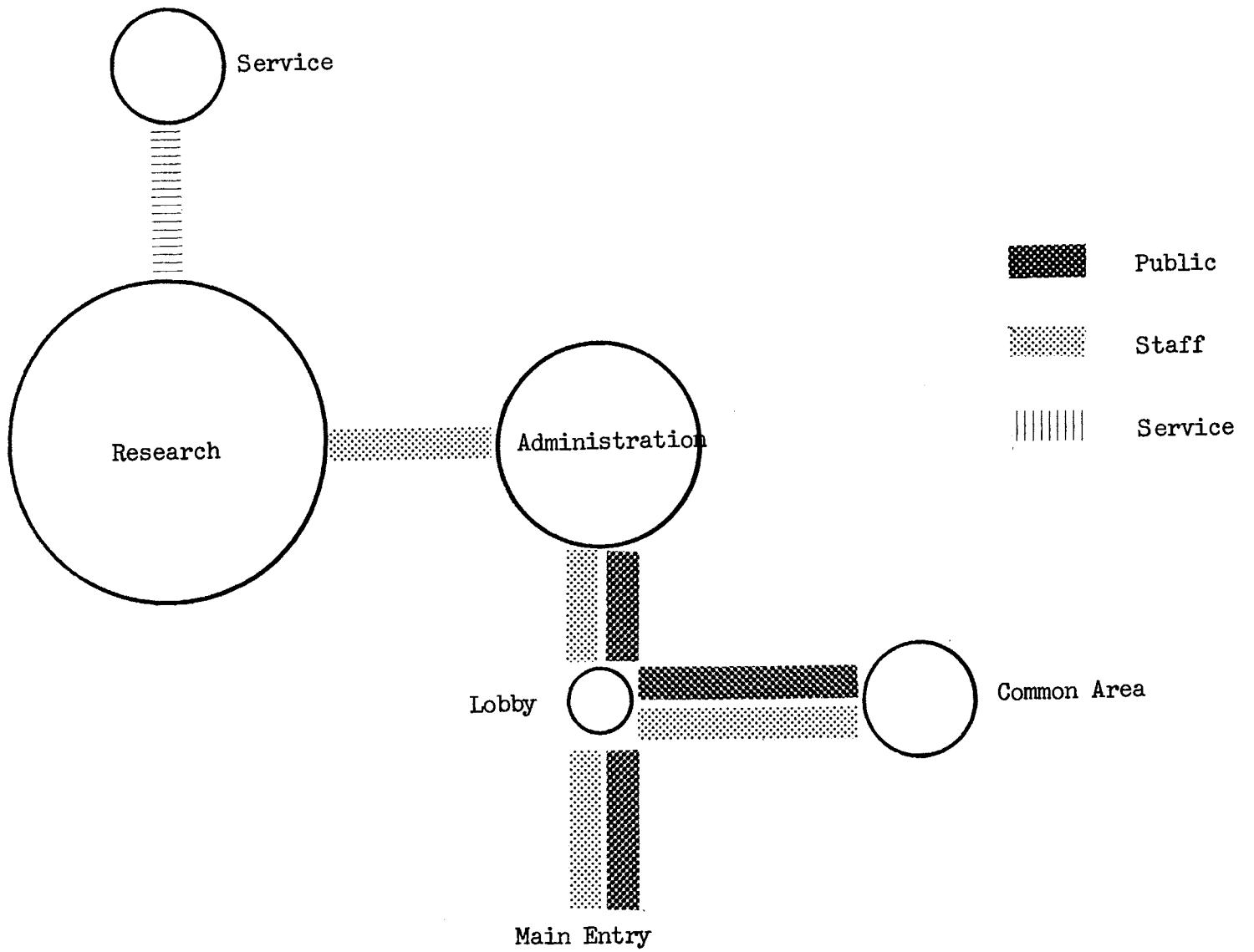


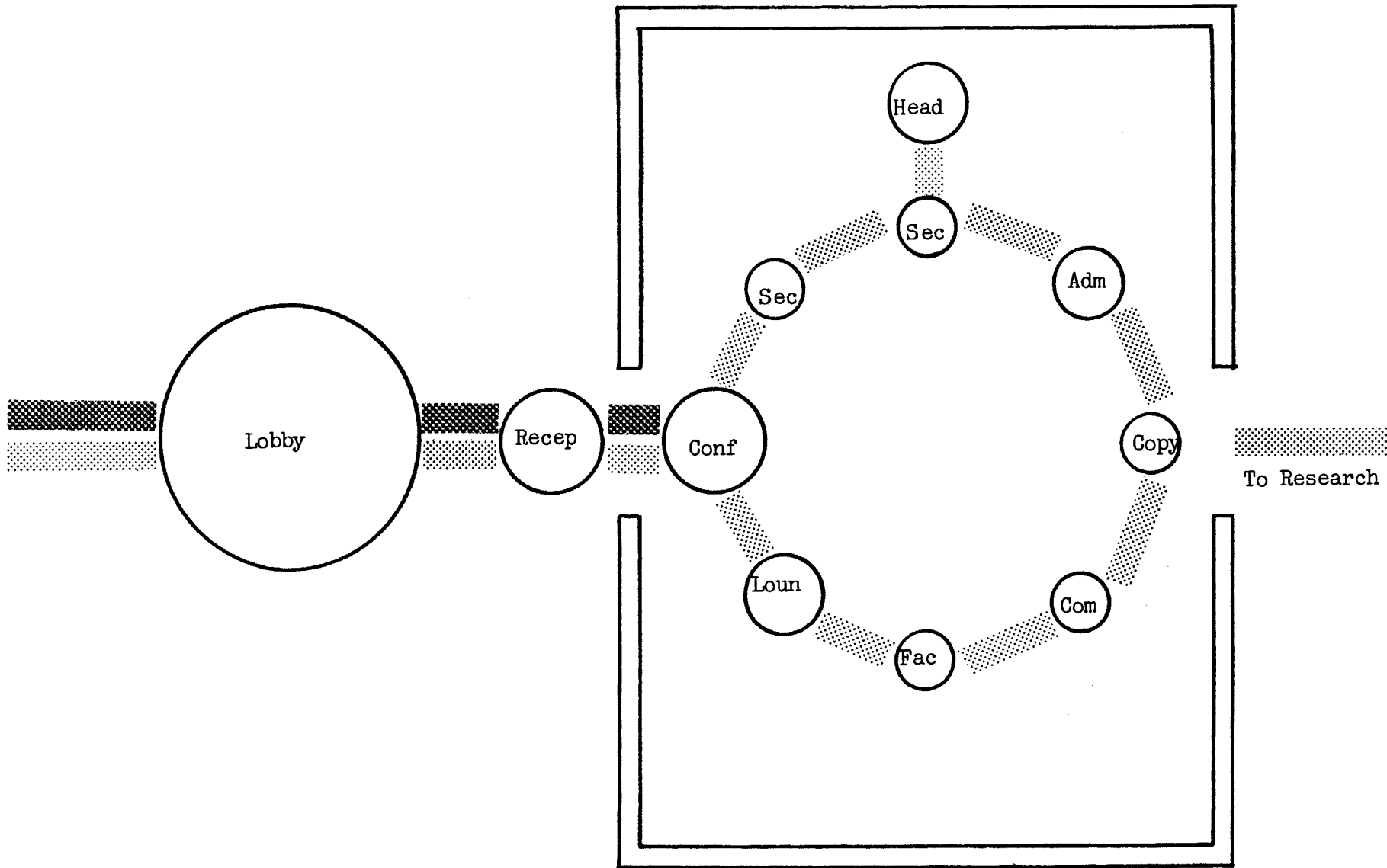
General Storage
400 sq. ft.

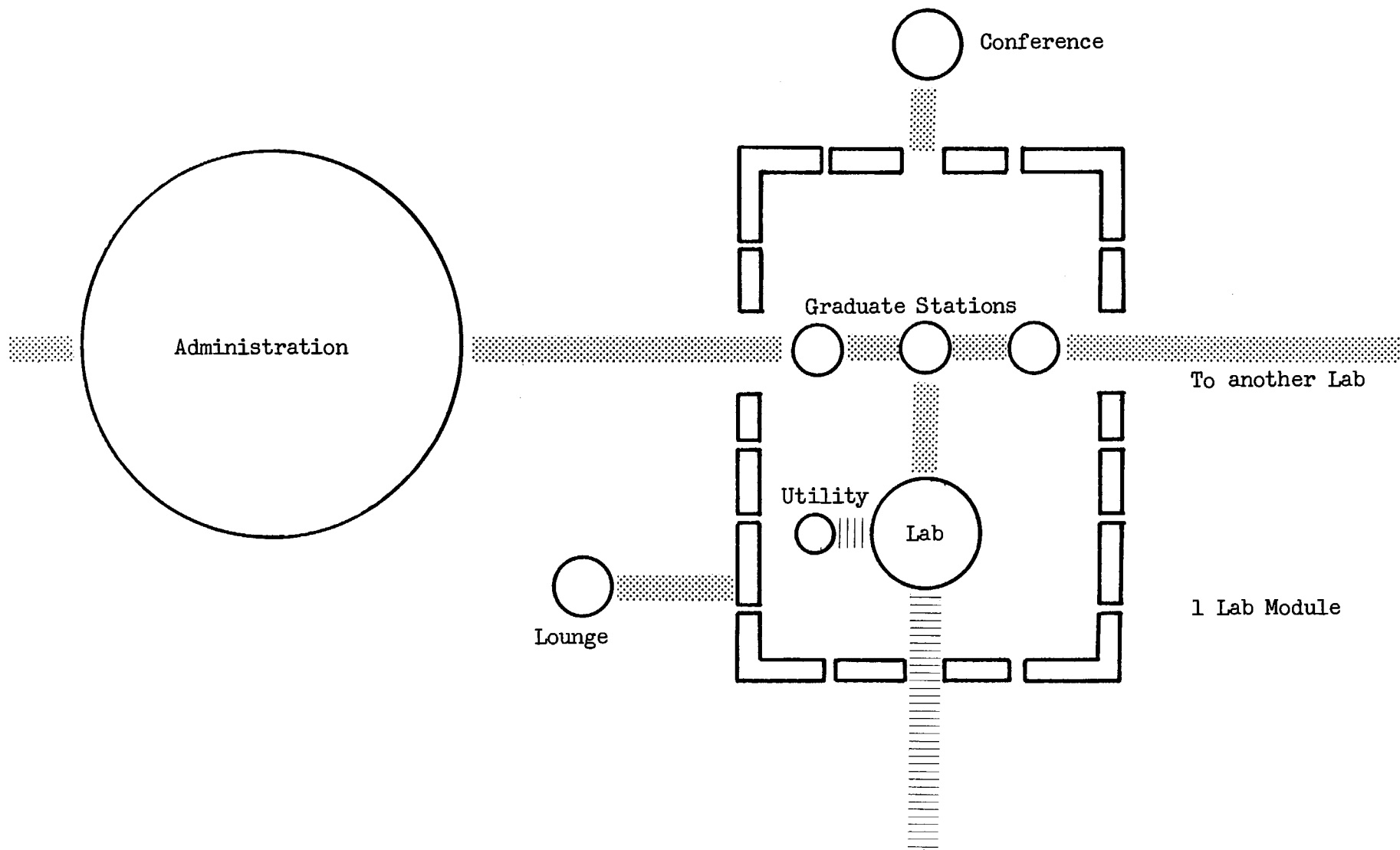


Toilet
6 @ **200** sq. ft.

FUNCTION DIAGRAM



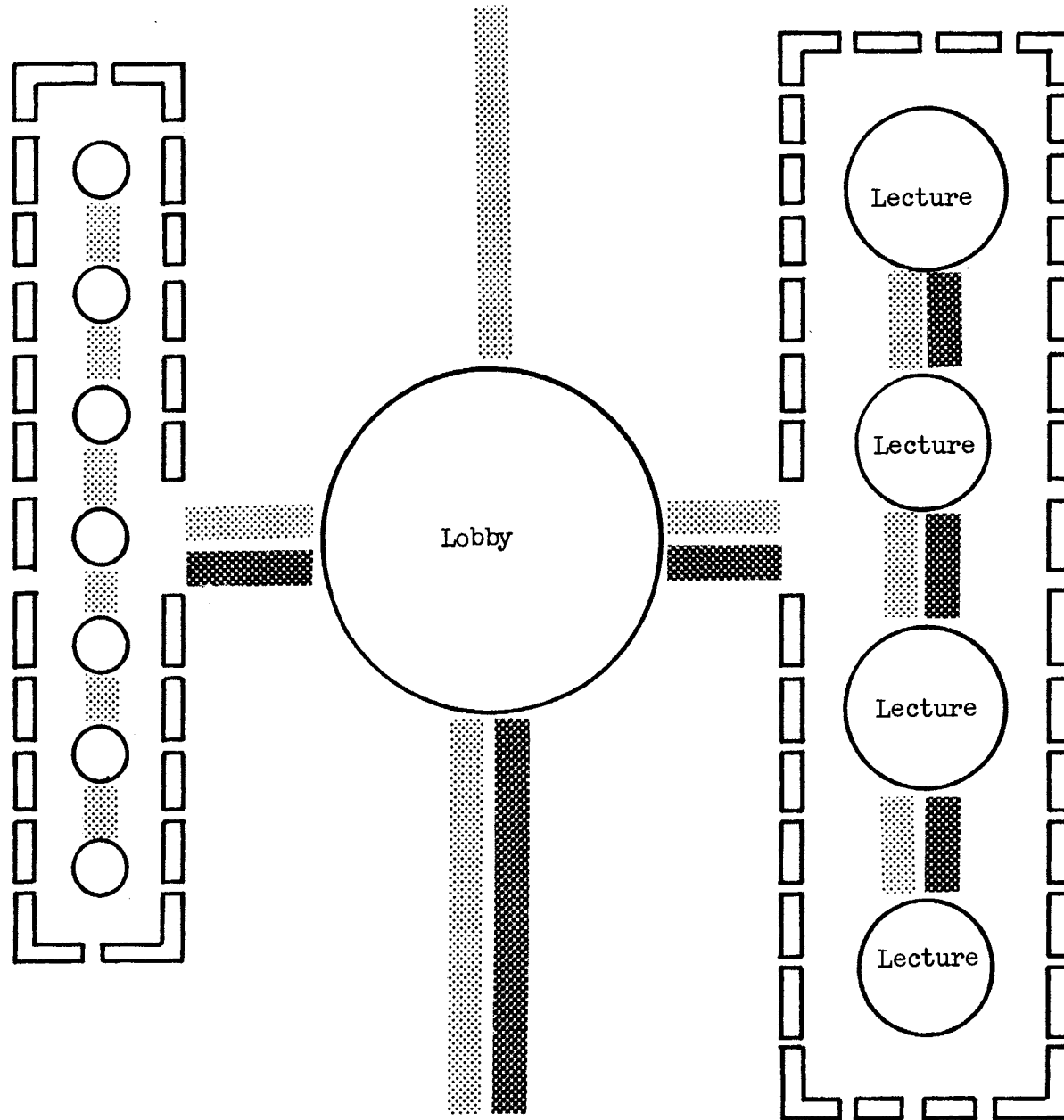




To Labs/Administration

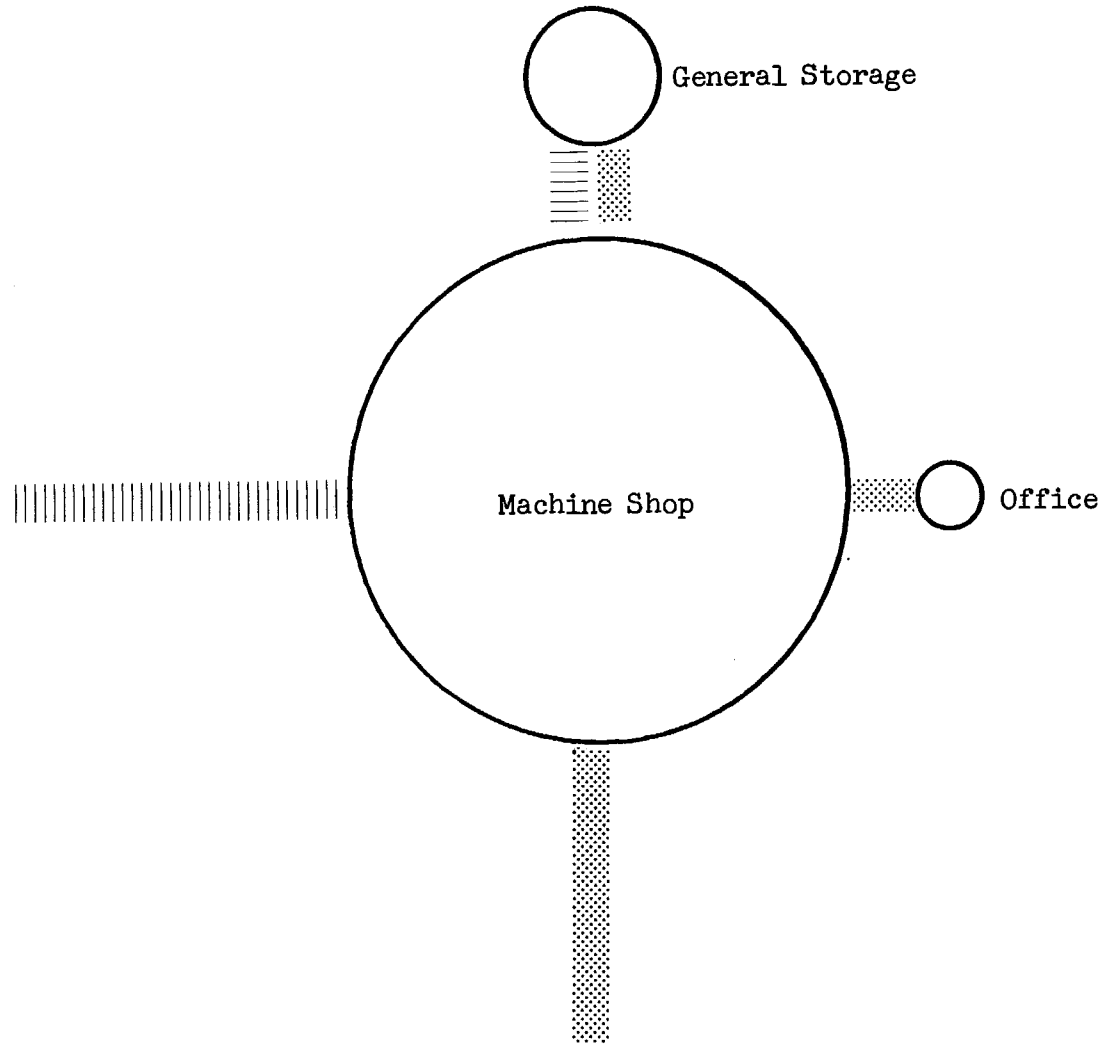
common areas

Teaching
Assistant
Offices



Main Entry

service/support /storage



GOALS

FUNCTION

To provide for efficient flow of people and service (materials).

To provide for security against damage to research work by fire, theft, or vandalism.

To help students and faculty become more efficient in their research work.

To promote research work efficiency and clarity.

To utilize, to their utmost capacity, the resources of the campus environment.

To provide opportunities for interdisciplinary advancement on campus.

To provide for the increasing needs of engineering research in Oklahoma State University.

To provide more flexible for research activities without any destruction.

To allow the individual student a sense of individual identity among a large mass of people.

FORM

To respect the existing architecture as well as axis, circulation patterns, and materials on and around the site, and yet an image of this facility.

To promote efficiency of vistas and focal points on campus.

To provide more efficient energy conservation.

To provide a strong sense of entry in this facility.

To create an academic and research atmosphere.

To generate the link between Engineering and this facility while creating its own image on campus.

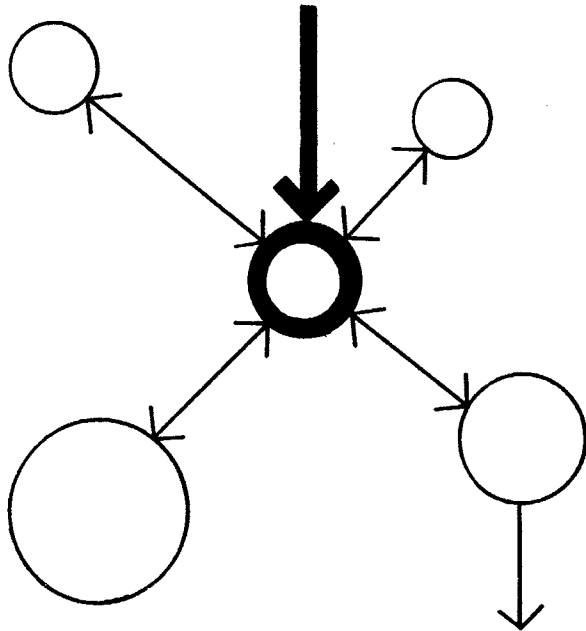
CONCEPTS

FUNCTION

SERVICE GROUPING

A centralized mechanical system seems to be the most advantageous solution.

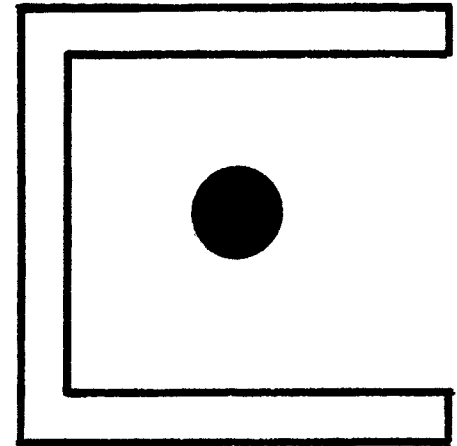
A centralized vertical circulation with separated traffic flow patterns (service) might best solve this problem.



PEOPLE GROUPING

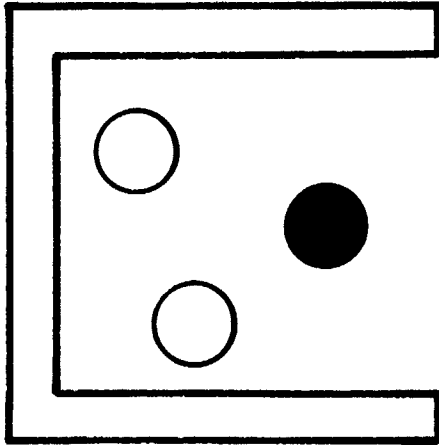
Individual spaces:

Individual spaces are needed outside the general circulation and environment. Places of contemplation and privacy are needed.



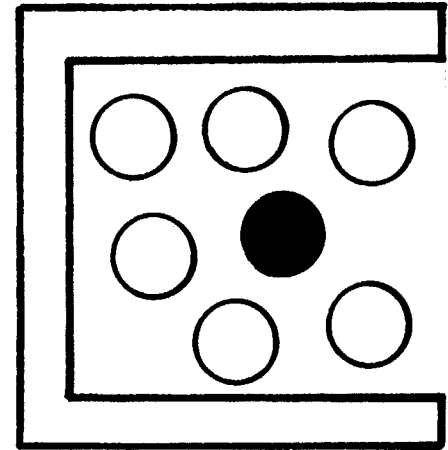
Small groups:

Provision for small group interaction is necessary; this is a strong aspect of laboratories and graduate students offices.



Large groups:

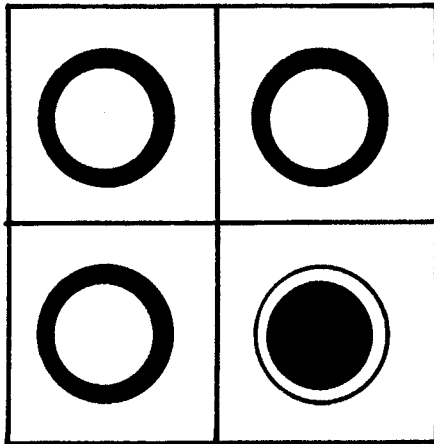
Large groups require the ability for every individual to take part in the process of the conference/seminar and lecture rooms. Interaction must be comfortable.



ACTIVITY GROUPING

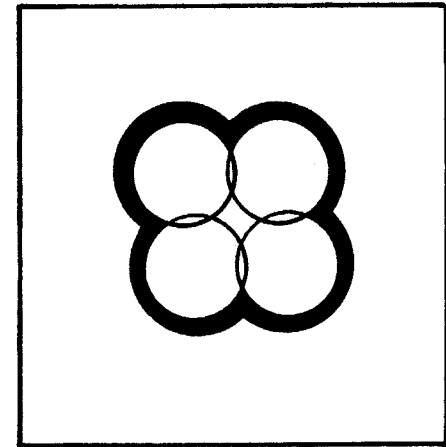
Compartmentalization of spaces:

Laboratory and office groups may subdivide into small interaction groups requiring visual or audio privacy.



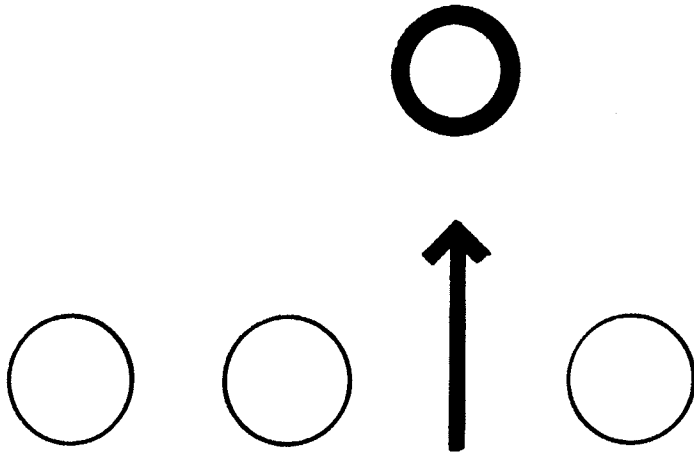
Intragation of spaces:

Laboratory groups also require group interaction. This interaction was also pointed out in people grouping.



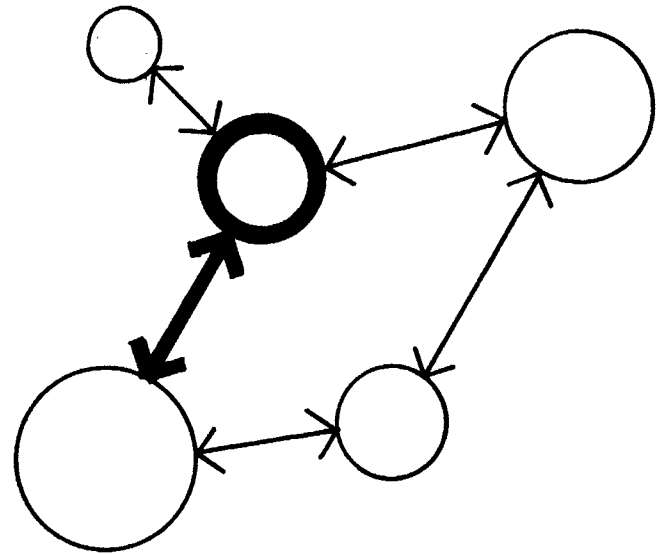
PRIORITY

A higher value should be placed on pedestrian traffic than on vehicular traffic.



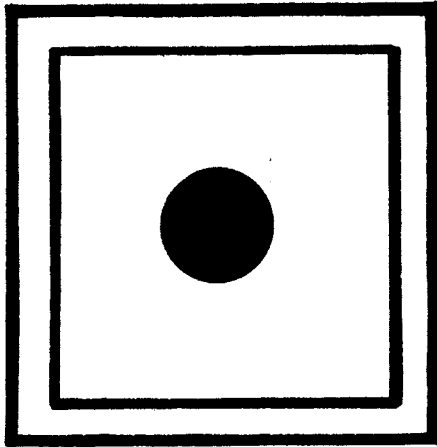
RELATIONSHIPS

The interrelation of spaces will help promote efficiency and effectiveness of people and the research activities.



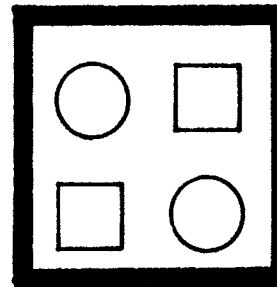
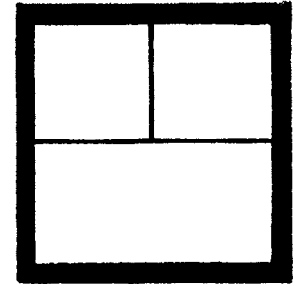
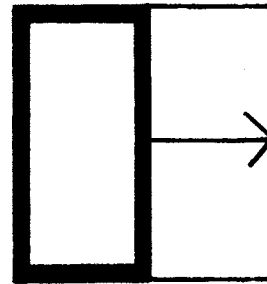
SECURITY CONTROLS

The security in the laboratory spaces and office spaces should be of a high value to protect property and to control personnel movement.



FLEXIBILITY

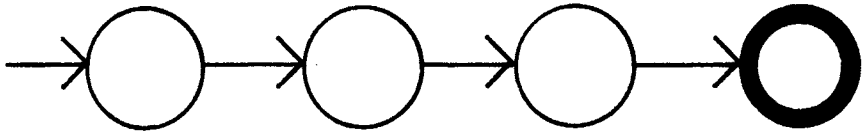
Laboratory spaces should be adaptable to varying individual needs and growth through expansibility, convertibility and versatility.



SEQUENTIAL FLOW

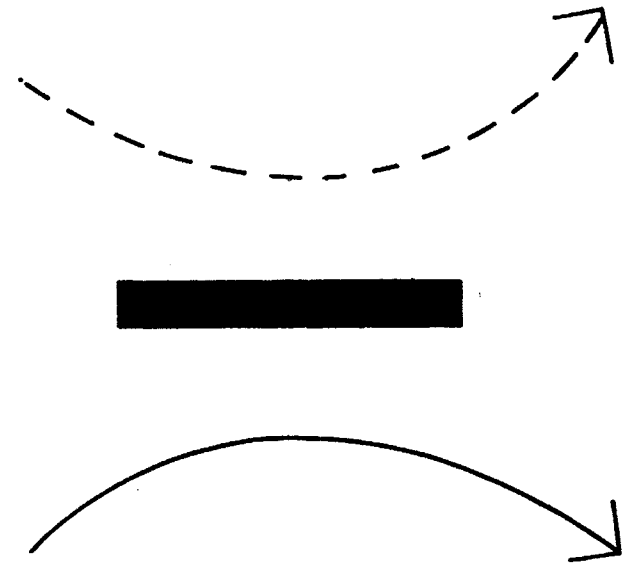
Progression of things:

Incoming equipment and maintenance must distribute from service and storage to intended destination.



SEPARATED FLOW

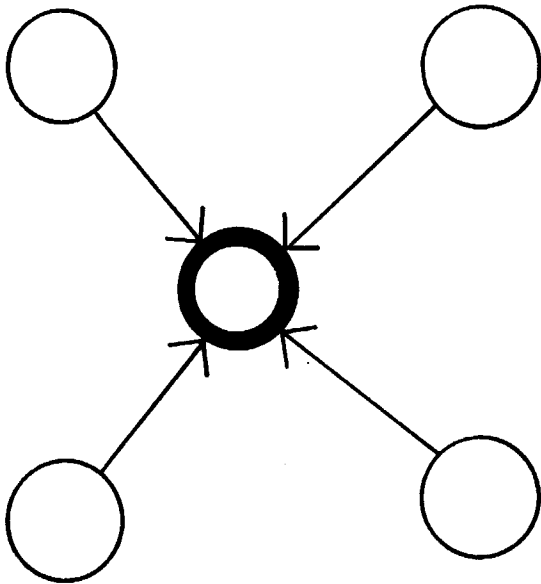
Vehicular and pedestrian traffic should be separated to prevent psychological discomfort.



FORM

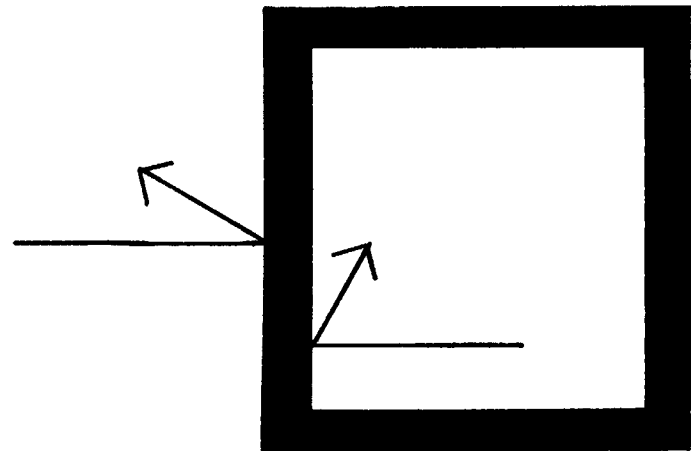
ORIENTATION

A point of reference within the building will prevent a feeling of being lost.



ENERGY CONSERVATION

The form, construction, and orientation of the building should be related to passive energy systems used in this facility.



PROBLEM STATEMENTS

FUNCTION

Since the major users are the adult full-time faculty and part-time student (Graduate Research Assistant) spending a long time in this research facility, careful consideration should be given to orientation and to circulation system.

Since there is a heavy emphasis upon a "researching atmosphere," the architecture should respond by being an efficient and pleasant place to research and by incorporating a very high quality of flexibility.

Since this facility serve for an academic function as well as a research function, special consideration should be given to the segregation of research laboratory spaces from more public spaces.

Since the nature of this facility is variable in

content and size, several laboratory spaces should be flexible to function single occupancies for large groups or simultaneous occupancies by segregate small groups.

Since this facility is to be supportive to the Engineering North operation, the solution should provide pedestrian linkage for students and faculty to circulate between this facility and the Engineering North or future engineering buildings.

Since the facility should provide for the total needs of the students and faculty, the design should facilitate the unscheduled social interaction of them as well as the scheduled educational and research activities.

Since the research requirements will change many times during the life of this facility, this facility should accommodate change in educational philosophy, researching methods and techniques.

FORM

Since the facility site is located close to Georgian Architecture and Contemporary Architecture, this facility should respect and strengthen the major campus axis and respond to the scale and masses of the existing structures.

Since the projected image of this facility should reflect research values of strength, order and discipline on campus, this facility should respond to this image.

The climate attitudes will call for a regional architectural response.

This facility will require a flexible plan with emphasis on expansibility and convertibility.

PART 2

DESIGN

SCHEMATIC DESIGN

SITE ANALYSIS

campus master plan

PARKING

Parking and service circulation for new Education Center.

PATH

Service on Washington Street

VIEW

Maintain visual and physical link

CONT. EDUCATION ENTRANCE

Maintain link between site and this entrance

VIEW

Maintain this view to International Mall/Library

LANDMARK

ACTIVITY REGION / INTERNATIONAL MALL

International flags

Maintain circulation/observation in International Mall

LIBRARY NORTH ENTRANCE

ACTIVITY NODE

Pedestrian circulation link to Library/International Mall

1 PARKING HUSBANDRY

2 CIVIL ENGINEERING LAB

3 Parking for Cordell Hall

4 CRUTCHFIELD HALL

5 DAIRY BUILDING

6 CORDELL HALL ENTRANCE

7 ENGINEERING NORTH

8 ENGINEERING SOUTH

9 GENERAL TECHNOLOGY LAB

10 HAZARDOUS REACTION

11 PATH INDUSTRIAL

12 Service on West Street

13 LIFE SCIENCE WEST

14 PHYSICAL SCIENCES

15 SITE COVER PLANT

16 RADIATION LAB

17 Demolish Hazardous Reaction bldg. north of Engineering North

18 UNIVERSITY PRINTING SERVICES

19 STRUCTURE

Utilize for the site and service circulation

ENGINEERING ENTRANCE

ENGINEERING ENTRANCE

ENGINEERING ENTRANCE

ENGINEERING ENTRANCE

ENG. SOUTH ENTRANCE

ACTIVITY NODE

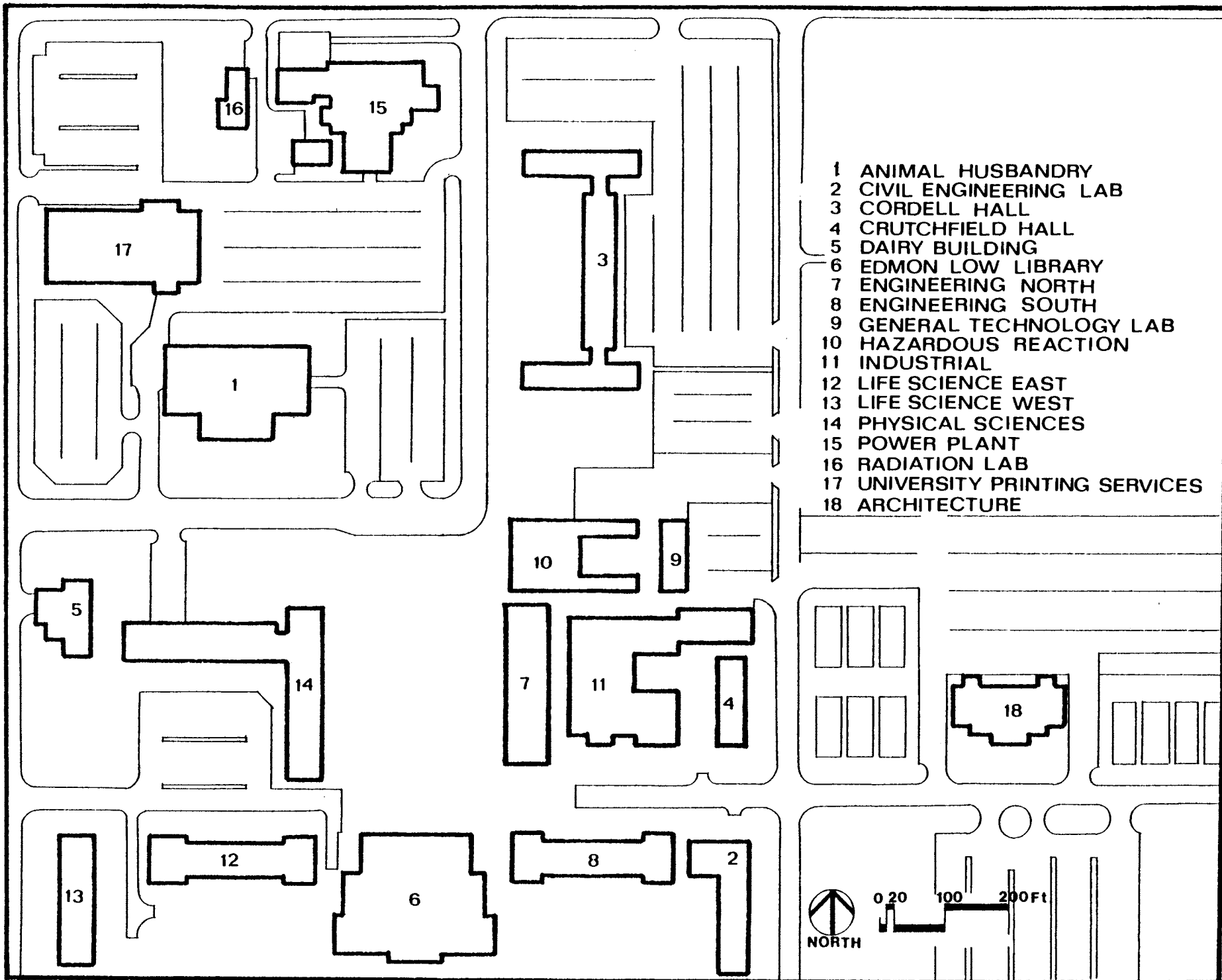
Pedestrian circulation link to Library/International Mall

Pedestrian circulation link to Library/International Mall

Pedestrian circulation link to Library/International Mall

Pedestrian circulation link to Library/International Mall

Pedestrian circulation link to Library/International Mall



SCHEME DEVELOPMENT

SCHEMES a

campus master plan

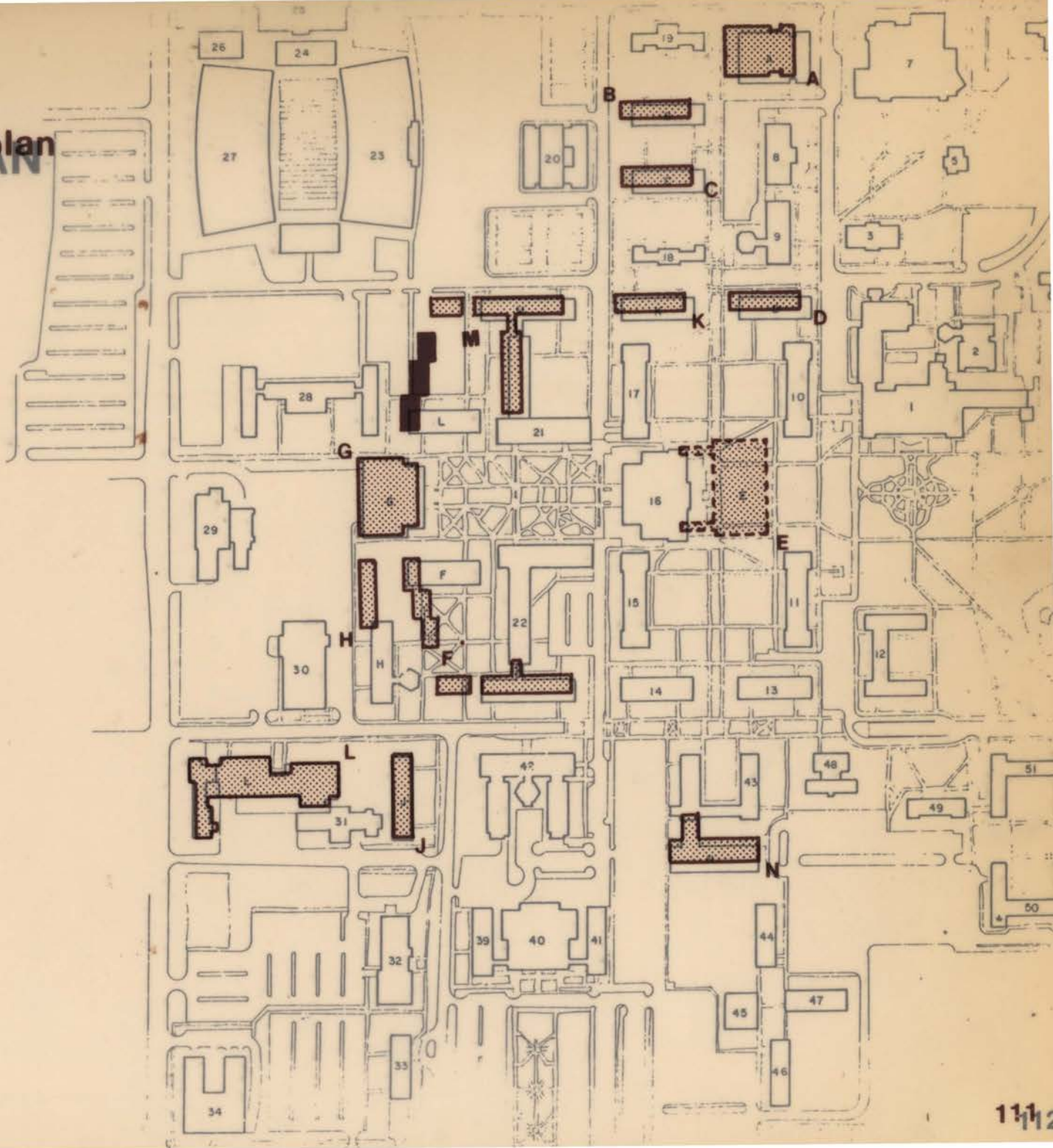
MASTER PLAN

EXISTING BUILDINGS

- 1 STUDENT UNION AND HOTEL
- 2 PAUL MILLER JOURNALISM AND BROADCASTING
- 3 GUNDERSON HALL
- 4 BENNETT MEMORIAL CHAPEL
- 5 OLD CENTRAL
- 6 CAMPUS FIRE STATION
- 7 SERETEAN CENTER
- 8 MORRILL HALL
- 9 BUSINESS
- 10 CLASSROOM
- 11 WHITEHURST
- 12 WILLARD HALL
- 13 MATHEMATICAL SCIENCES
- 14 LIFE SCIENCES WEST
- 15 LIFE SCIENCES EAST
- 16 LIBRARY
- 17 ENGINEERING SOUTH
- 18 HANNER HALL
- 19 THATCHER HALL
- 20 ARCHITECTURE BUILDING
- 21 ENGINEERING NORTH
- 22 PHYSICAL SCIENCES
- 23 SOUTH STADIUM
- 24 FOOTBALL OFFICES
- 25 GALLAGHER HALL
- 26 ATHLETIC DRESSING
- 27 NORTH STADIUM
- 28 CORDELL HALL
- 29 POWER PLANT
- 30 PUBLISHING AND PRINTING
- 31 MEAT LABORATORY
- 32 STUDENT HEALTH CENTER
- 33 IBA HALL
- 34 AGRICULTURAL ENGINEERING SHOPS
- 35 COLVIN PHYSICAL EDUCATION CENTER
- 36 WILLHAM HALL NORTH
- 37 WILLHAM CAFETERIA
- 38 WILLHAM HALL SOUTH
- 39 KERR HALL
- 40 KERR-DRUMMOND CAFETERIA
- 41 DRUMMOND HALL
- 42 AGRICULTURE HALL
- 43 HOME ECONOMICS WEST
- 44 PARKER HALL
- 45 SCOTT-PARKER-WENTZ CAFETERIA
- 46 WENTZ HALL
- 47 SCOTT HALL
- 48 PUBLIC INFORMATION
- 49 NORTH MURRAY HALL
- 50 STOUT HALL
- 51 SOUTH MURRAY HALL

NEW BUILDINGS

- A AUDITORIUM
- B HUMANITIES TWO
- C HUMANITIES ONE
- D EDUCATION AND CLASSROOMS
- E LIBRARY (UNDERGROUND)
- F LIFE SCIENCE
- G LEARNING RESOURCES
- H LIFE SCIENCE
- J AGRICULTURE
- K ENGINEERING
- L ANIMAL SCIENCE
- M ENGINEERING
- N CHILD DEVELOPMENT LAB



CAMPUS MASTER PLAN

EXISTING BUILDINGS

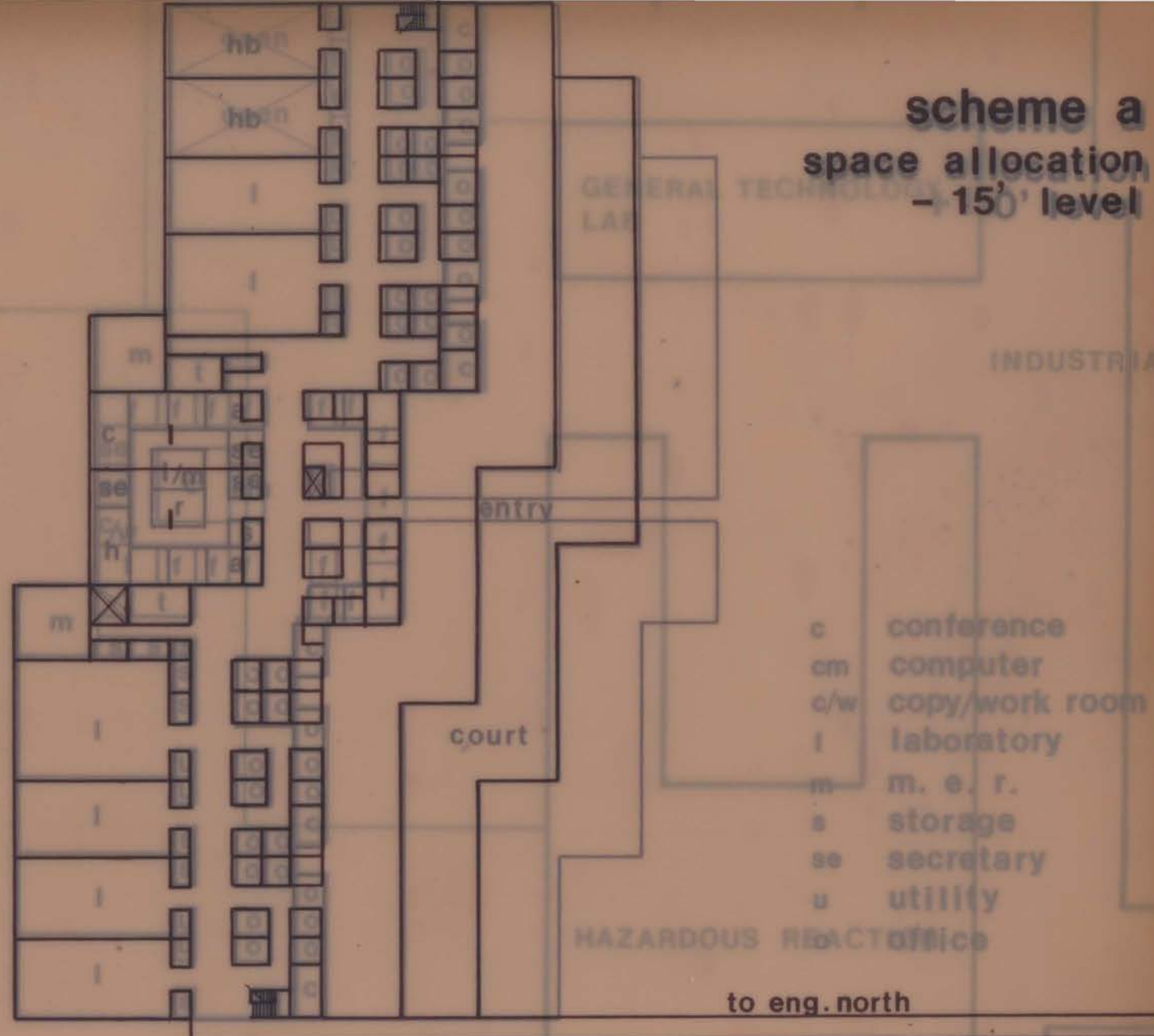
1. STUDENT UNION AND HOTEL
2. PAUL MILLER JOURNALISM AND BROADCASTING
3. GUNDERSON HALL
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5. OLD CENTRAL
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19. THATCHER HALL
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NEW BUILDINGS

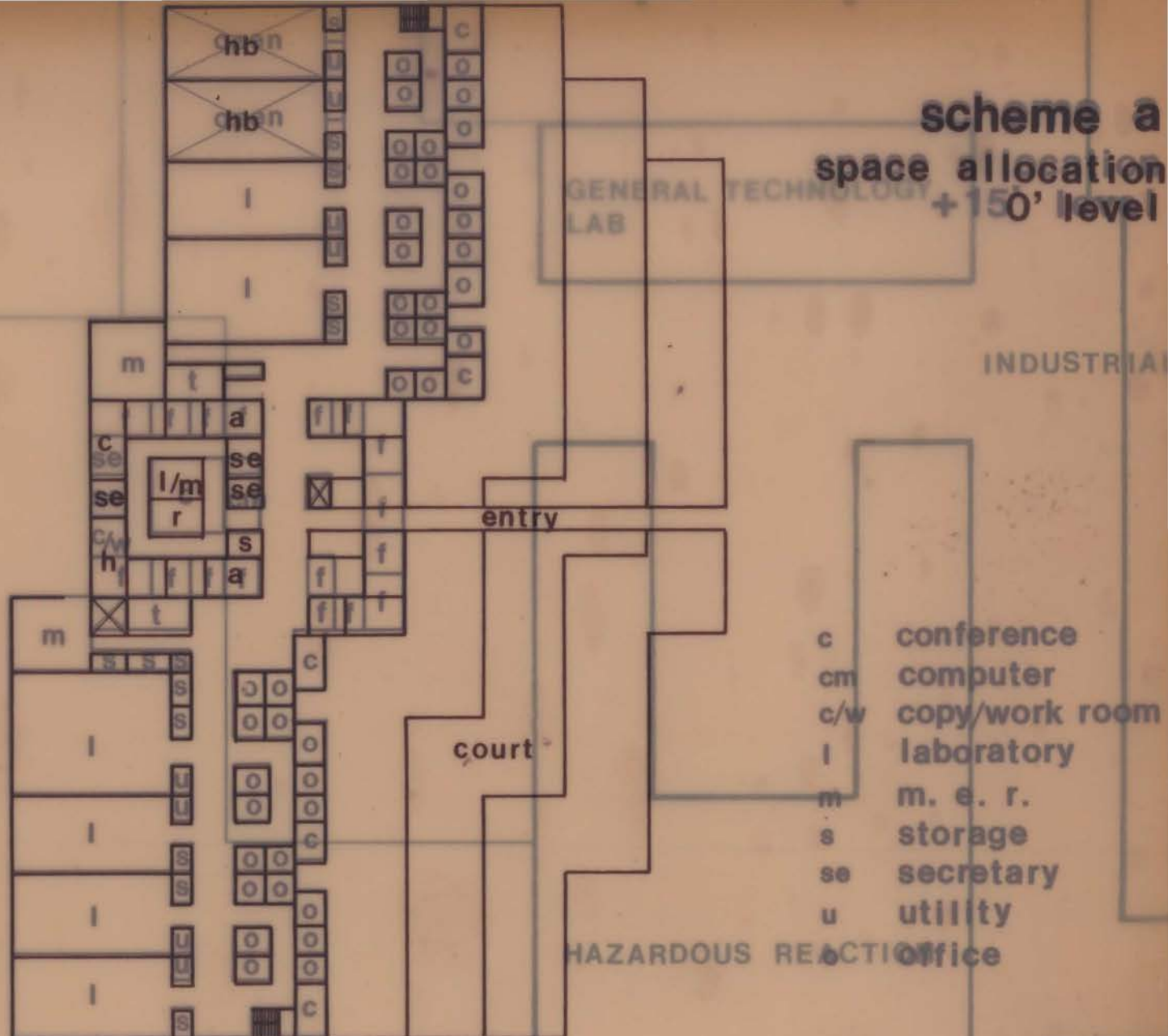
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- L. ANIMAL SCIENCE
- M. ENGINEERING
- N. CHILD DEVELOPMENT LAB



scheme a
space allocation
- 15th level



scheme a
space allocation
+150' level



- c conference
- cm computer
- c/w copy/work room
- l laboratory
- m m. e. r.
- s storage
- se secretary
- u utility
- office office



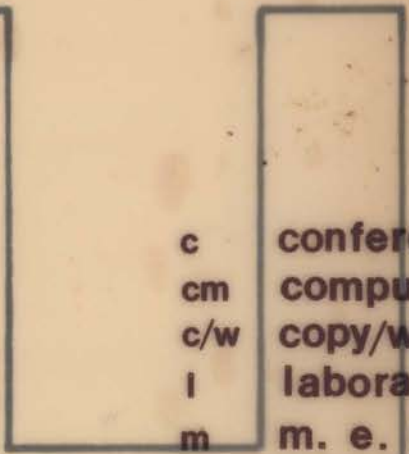
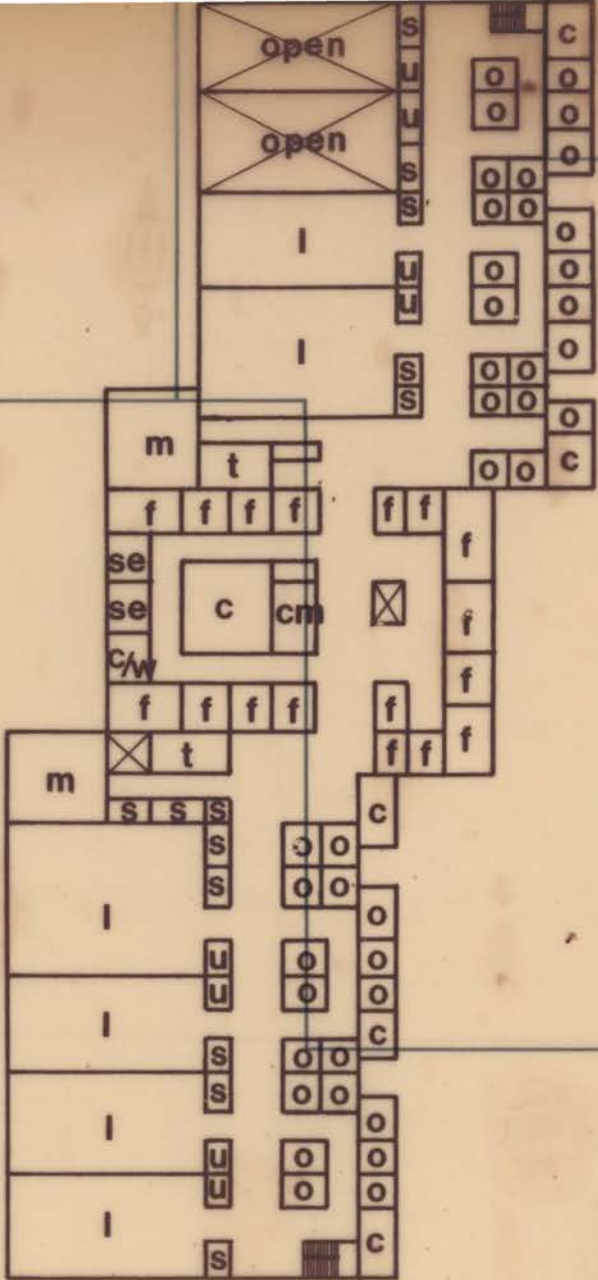
ENGINEERING NORTH

scheme a
space allocation
+15' level

GENERAL TECHNOLOGY
 LAB

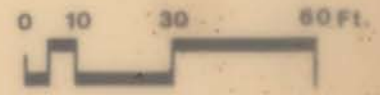
INDUSTRIAL

ORDELL
 ALL



- c conference
- cm computer
- c/w copy/work room
- I laboratory
- m m. e. r.
- s storage
- se secretary
- u utility
- o office

HAZARDOUS REACTOR



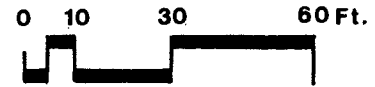
ENGINEERING
 NORTH

GENERAL TECHNOLOGY
LAB

INDUSTRIA

CORDELL
HALL

HAZARDOUS REACTION



ENGINEER
NORTH

SCHEME b

Master Plan

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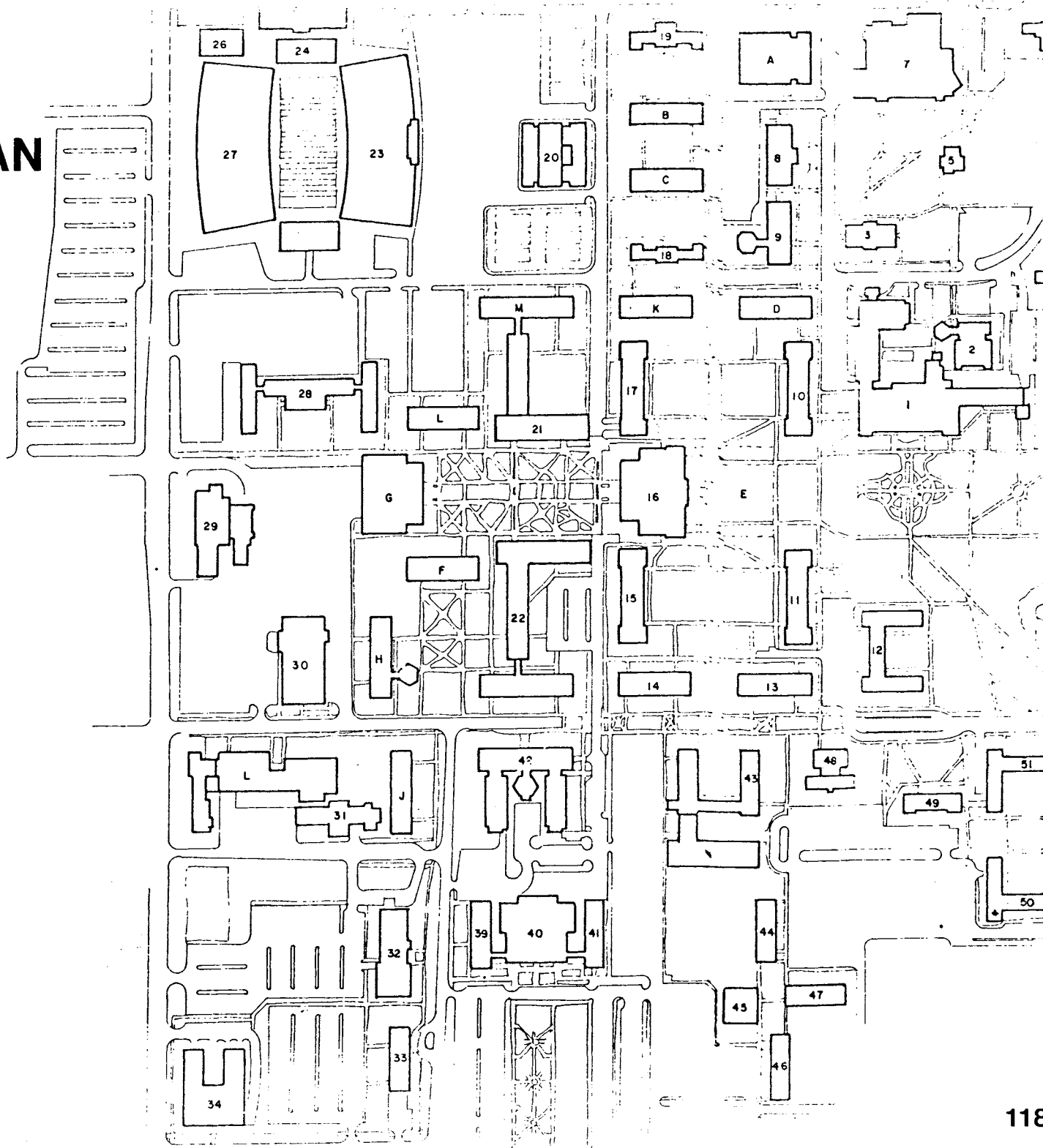
CAMPUS MASTER PLAN

EXISTING BUILDINGS

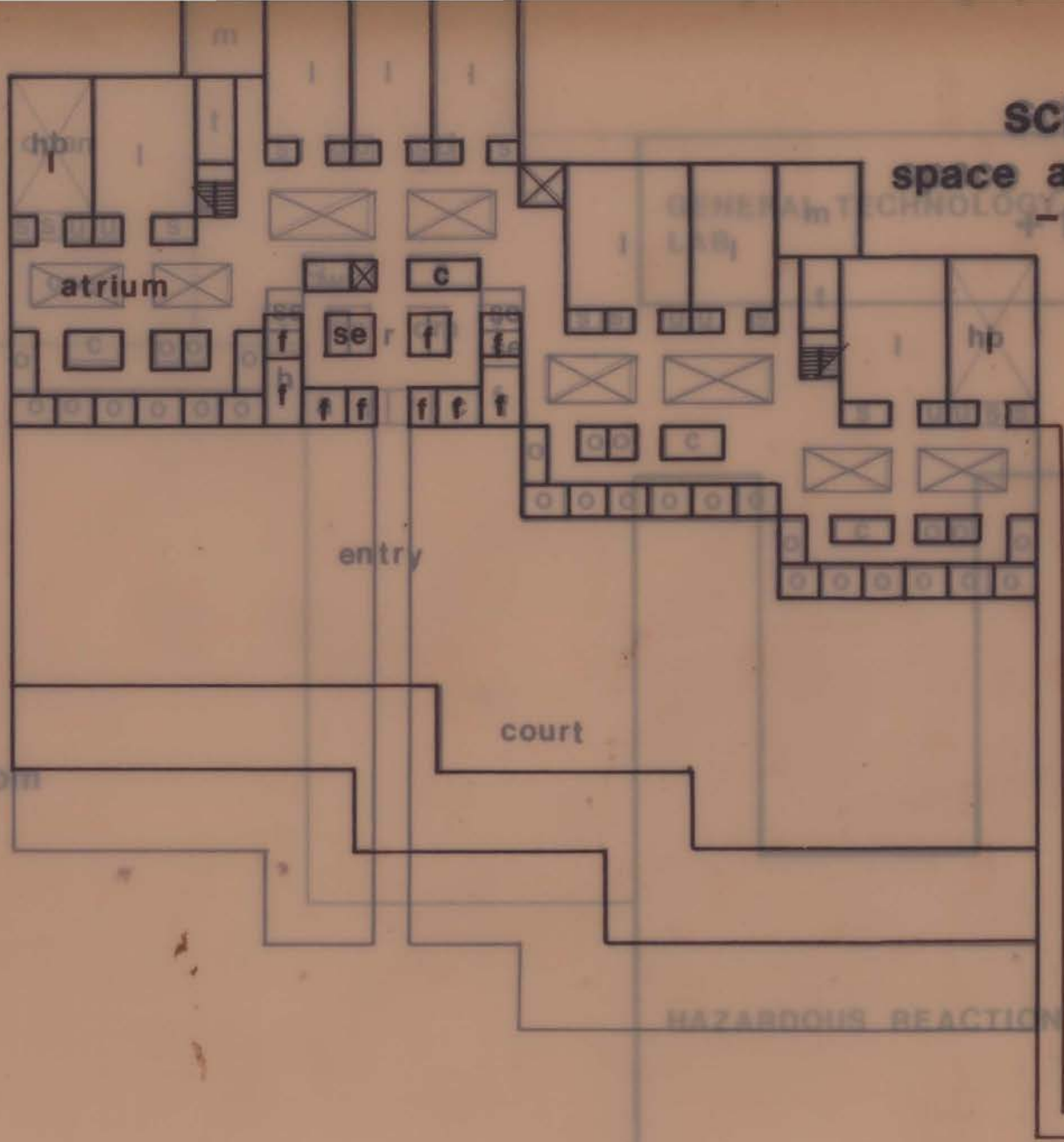
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scheme b
space allocation
- 15' level



- c conference
- CORDON computer
- FALL copy/work room
- c/w laboratory
- l m. e. r.
- m storage
- s secretary
- se utility
- u office
- o

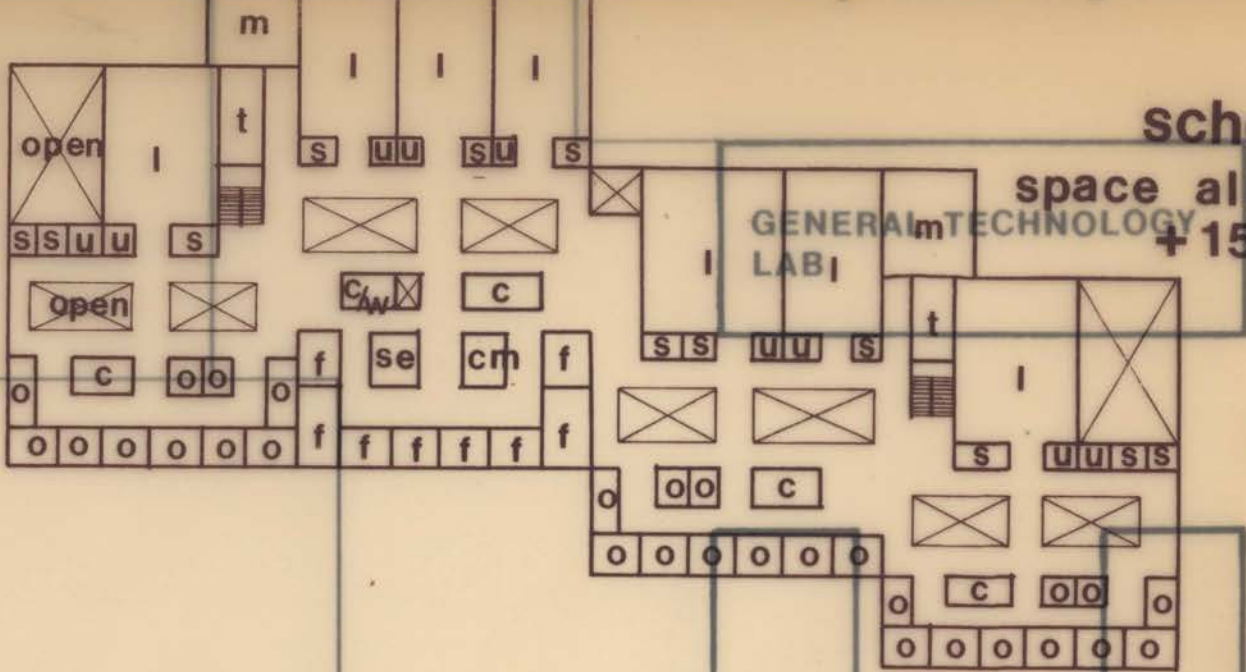
HAZARDOUS REACTION

to eng. north



ENGINEERING NORTH

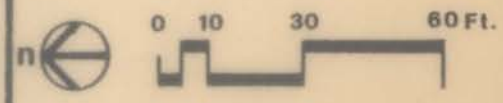
scheme b
space allocation
+15' level



INDUSTRIAL

- c conference
- cm computer
- c/w copy/work room
- l laboratory
- m m. e. r.
- s storage
- se secretary
- u utility
- o office

HAZARDOUS REACTION



ENGINEERING
 NORTH

**GENERAL TECHNOLOGY
LAB**

INDUSTRIAL

**CORDELL
HALL**

HAZARDOUS REACTION



0 10 30 60 Ft.



**ENGINEERING
NORTH**

DESIGN DEVELOPMENT

DESCRIPTION OF DESIGN SOLUTION

The development of Schematic Scheme A proceeded with careful attention to Design Goals and Design Concepts established in the Design Program.

Since the site is in the center of the campus, the form and exterior materials were chosen to harmonize with the existing structures in the area. Red brick is the main material used for the exterior and some of the interior walls. Because the whole campus is laid out on a very formal system of axes and vistas, the existing axes on the site were used and emphasized in the design of this facility. The pedestrian axis which forms the west-east axis on the site is developed as the outdoor plaza and mall of Engineering department, and besides, the north-south pedestrian axis from Cordell Hall is an

important connection to the center of campus.

In order to maintain setback between Cordell Hall providing penetration, the building has been limited to two story level. Open courtyard on the south side plays an important form role, by its location in front of the building at the main entry. It strengthens the entire entry sequence by acting as a focal point for this facility.

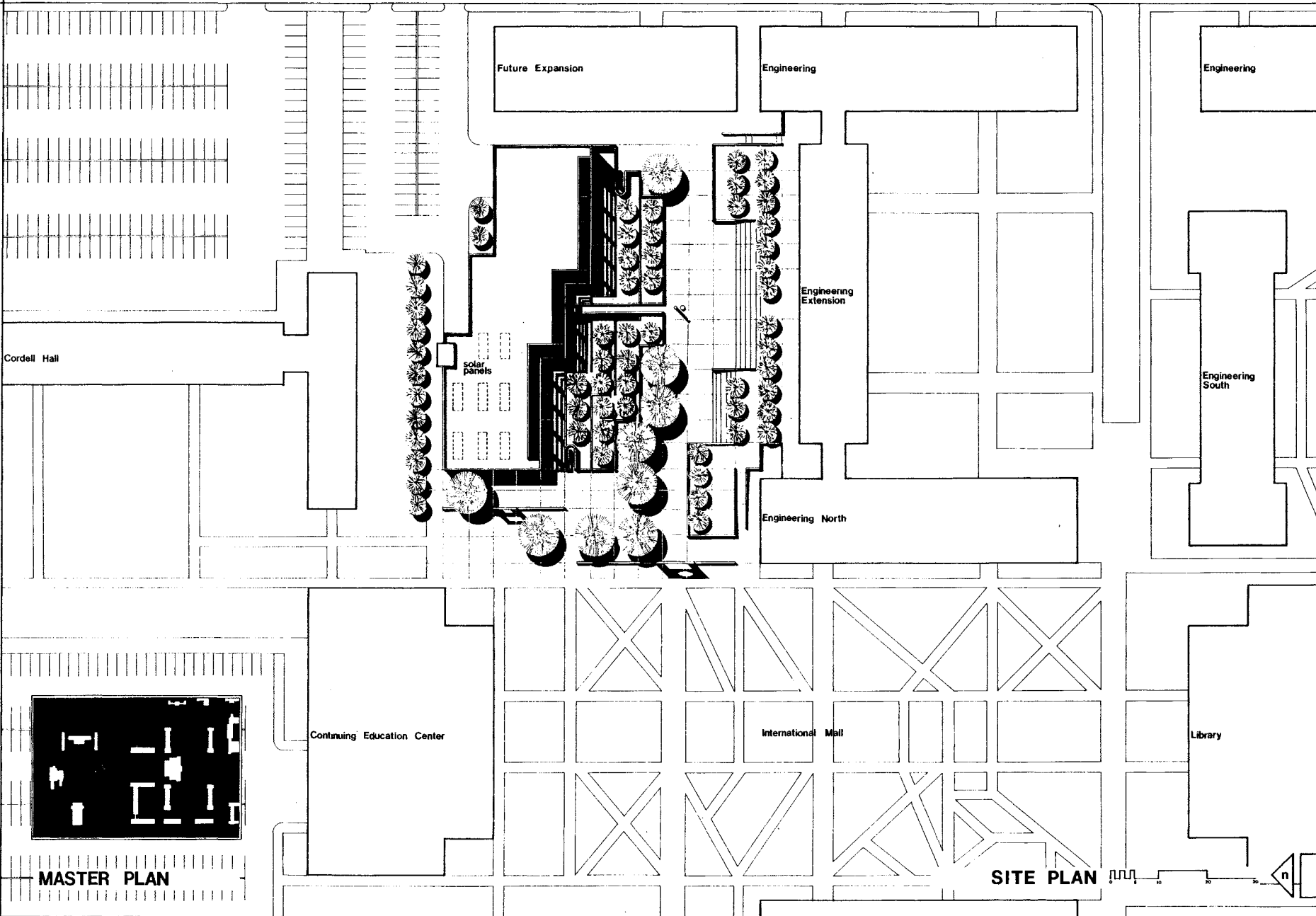
In addition the brick gate on the west side allows passers-by to experience the entire main entry space (to plaza) as a series of views through providing a sense of intimacy with an invitation to join the experience of "Engineering Plaza." Besides its functional purpose, the brick gate acts as a new visual landmark around at International Mall. The

entire entry space "Engineering Plaza" is literally united by a plaza of brick paving.

In the facility, the basement connecting with Engineering North includes laboratories/graduate stations for Mechanical Engineering, machine shop which require very large space producing the high noise levels and general storage. The second floor houses classrooms with teaching assistant offices, administration offices for Mechanical Engineering and high-bay laboratories with direct access from outside, for Mechanical Engineering and Bio-Environmental Engineering. The second floor contains laboratories/offices for Bio-Environmental Engineering, faculty offices/laboratories/graduate stations for Mechanical Engineering. Flexibility has been provided for in

the design of laboratory modules that will change and adopt as required by using of the movable partition.

Energy conservation is another important factor and is enhanced by the benefits of "Sun Screen" on the south facade, which is brick wall and services as a shading device to provide natural lighting and ventilation for office areas, and yet this creates transition space between office areas and outside court yard.



Future Expansion

Engineering

Engineering

Cordell Hall

solar panels

Engineering Extension

Engineering South

Engineering North

Continuing Education Center

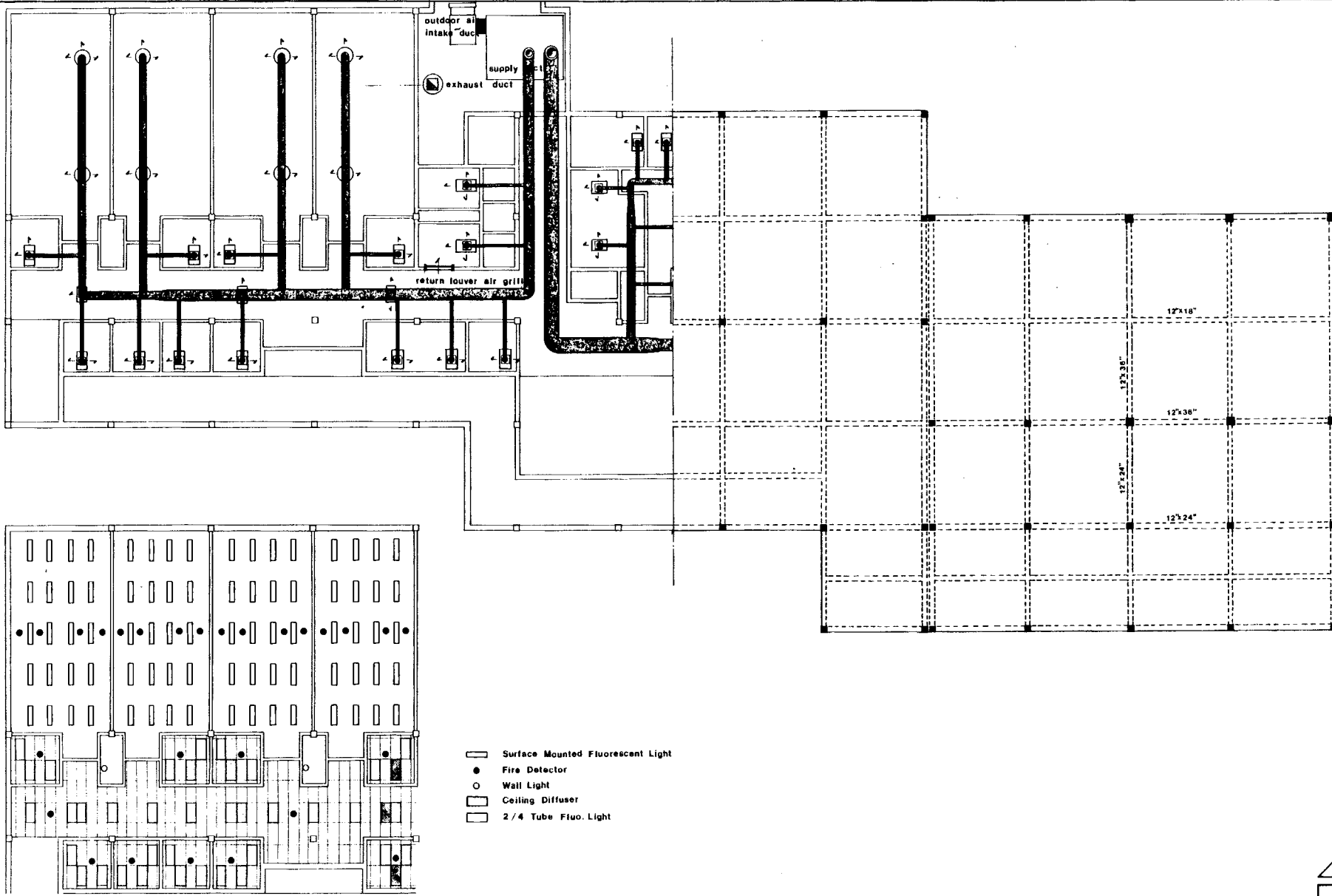
International Mall

Library

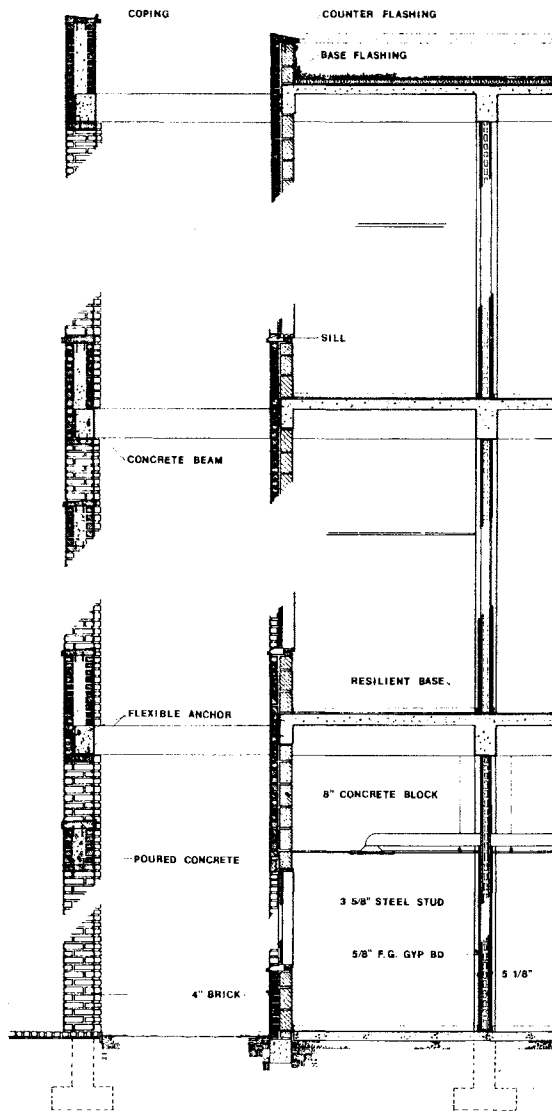
MASTER PLAN

SITE PLAN

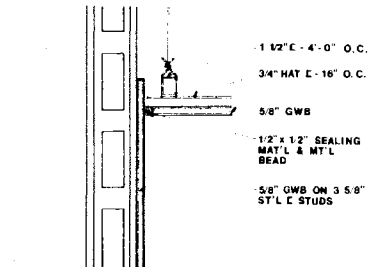




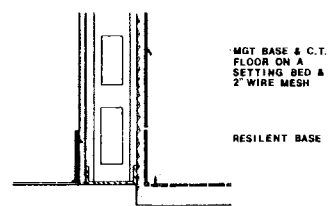
REFLECTED CEILING PLAN



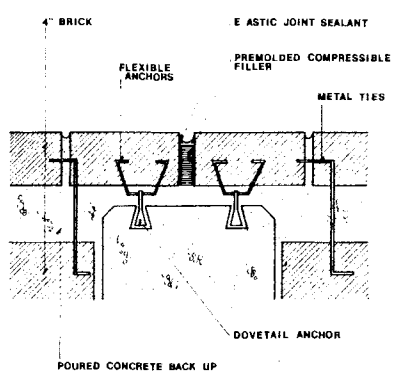
EXT. & INT. WALL SECTION



GWB WALL/GWB CLG.

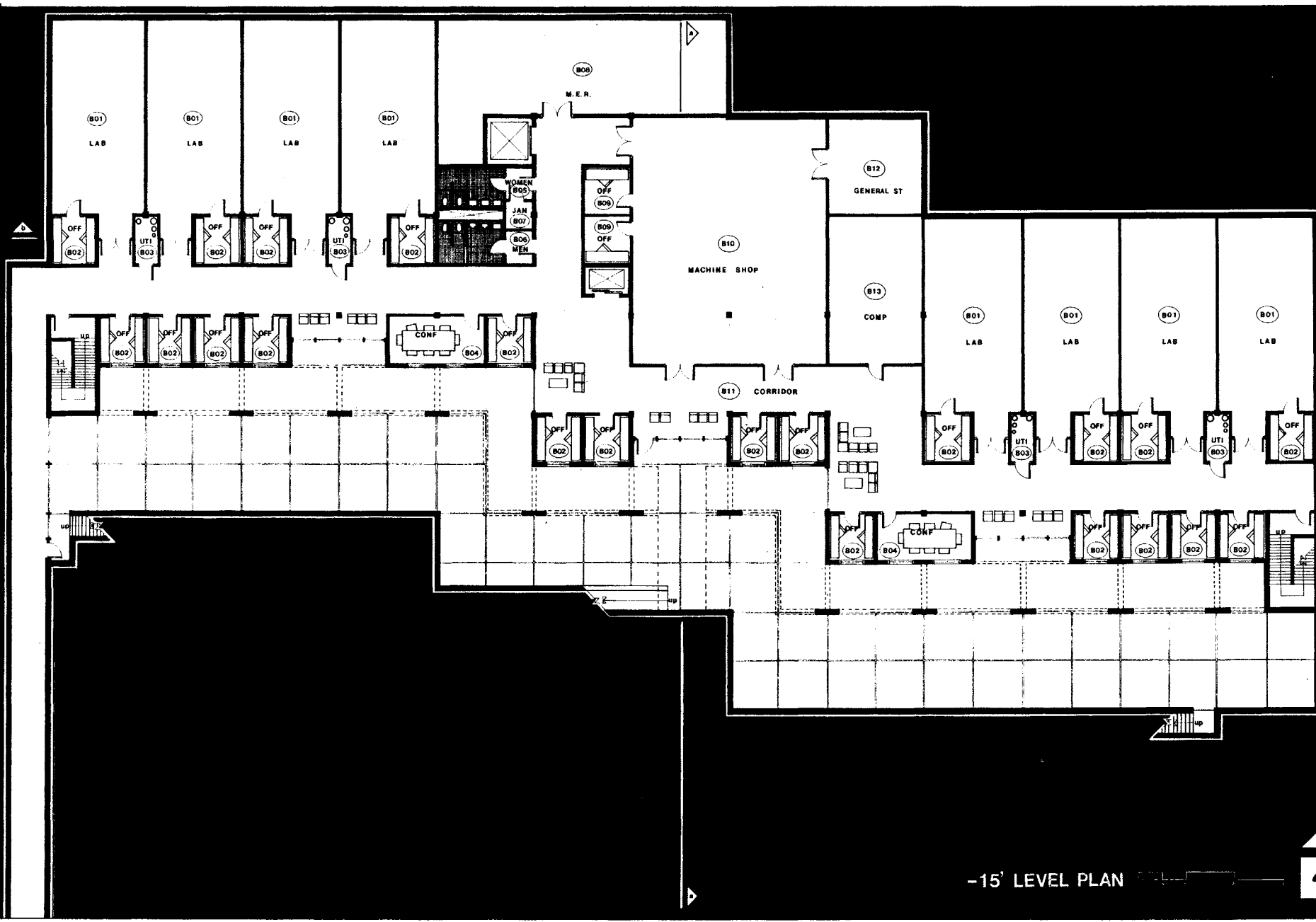


MGT BASE/C.T. FLOOR

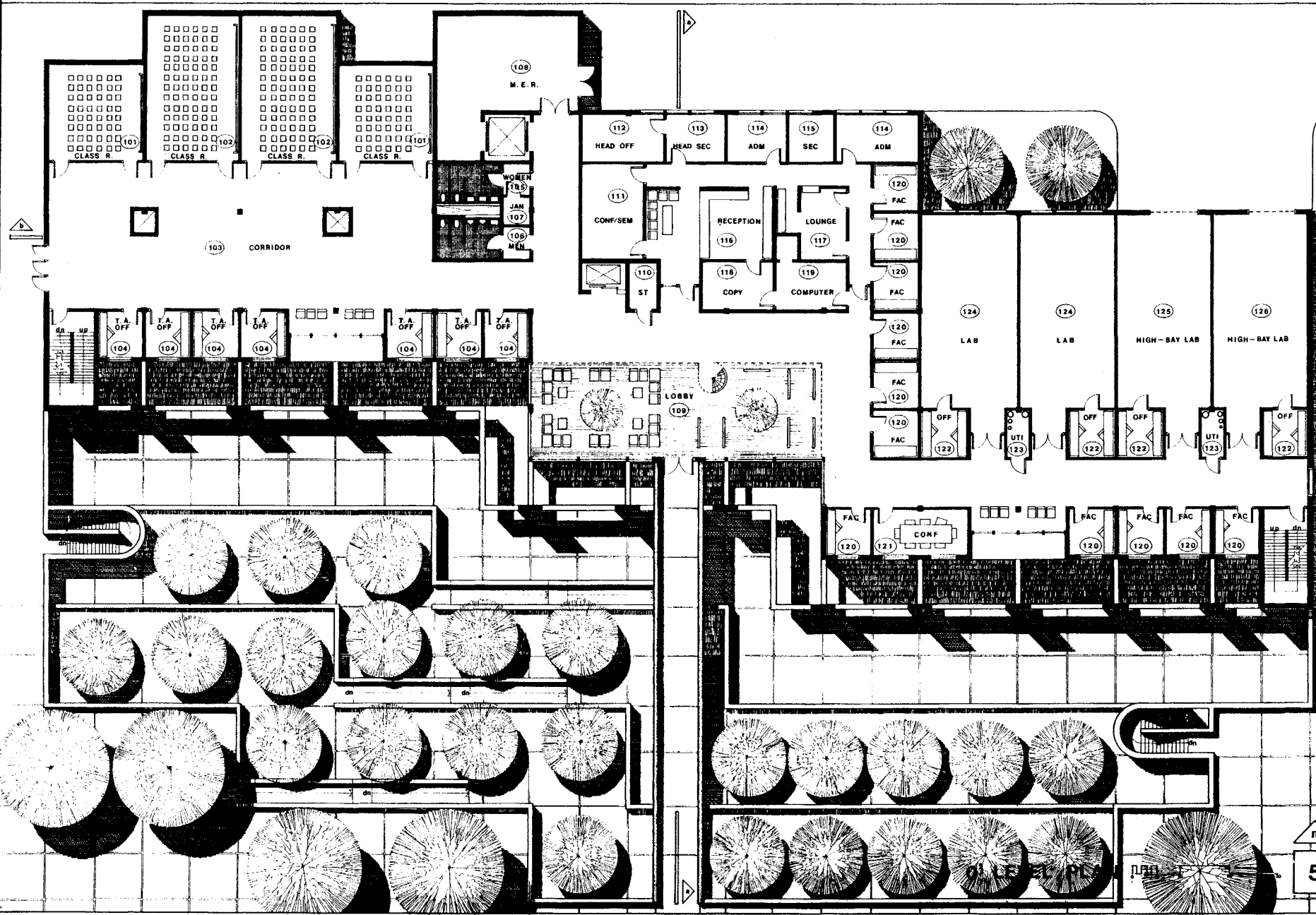


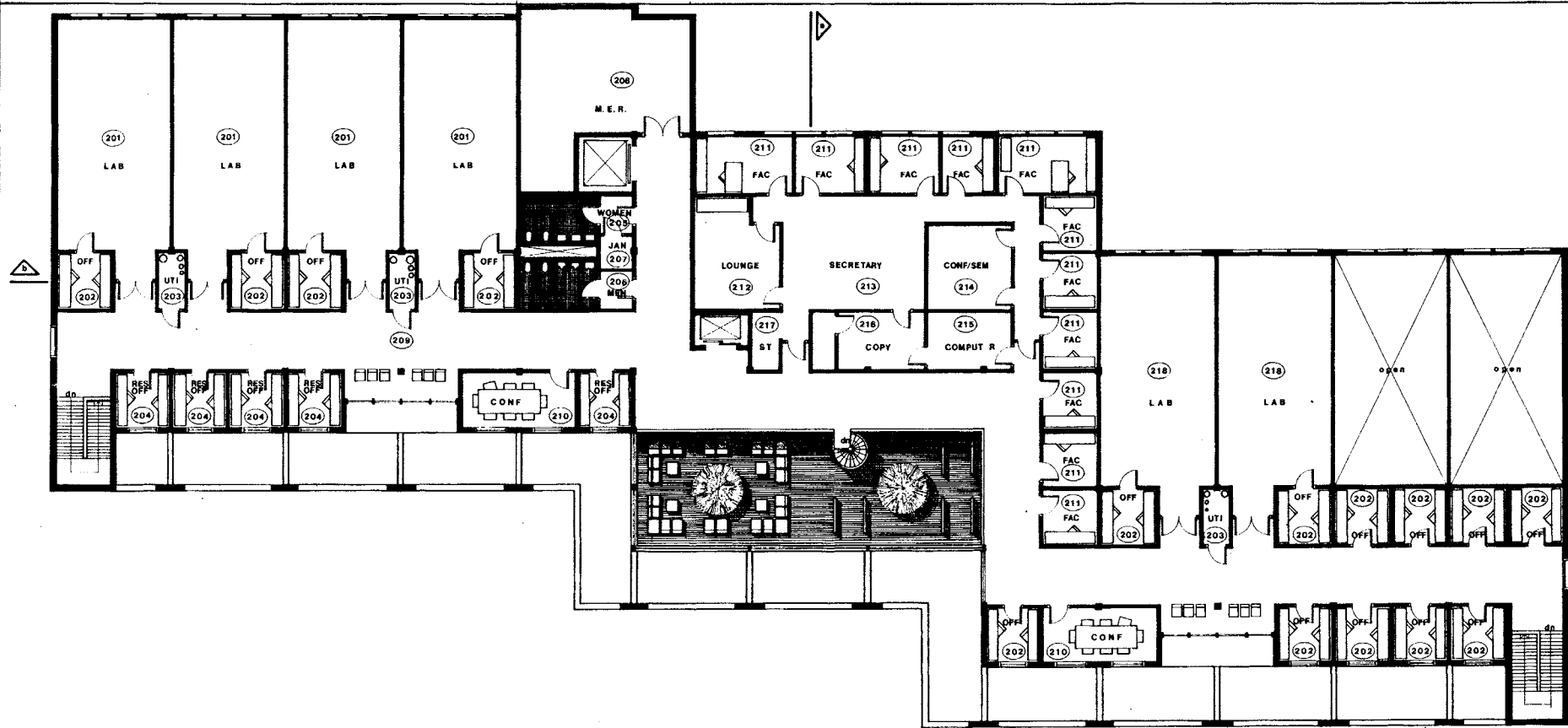
EXPANSION JOINT

ROOM FINISH SCHEDULE															
RM #	NAME	FLOORS			BASE		WALLS		CEILING		WNS'CT				
		VINYL ASB/TILE	CONCRETE	CERAMIC	BRICK	CARPET	RUBBER TILE	CERAMIC TILE	PLASTER	CONCRETE B/L	CERAMIC TILE	CONCRETE		EXPOSED ACOUSTICAL	HT.
B01	Laboratory														
B02	Graduate Ass. Office														
B03	Utility														
B04	Conference														
B05	Women														5'
B06	Men														
B07	Janitor														
B08	Mach. Room														
B09	Off. - Mach. Shop														
B10	Mach. Shop														
B11	Corridor														
B12	General Storage														
B13	Computer Facility														
101	Class Room (45 pe pl)														
102	Class R. (75)														
103	Corridor														
104	Teaching Ass. Off.														
105	Women														
106	Men														
107	Jan.														
108	M. E. R.														
109	Lobby														
110	St.														
111	Seminar/Conf. Rm.														
112	Head Off.														
113	Head Secretary														
114	Administrator Off.														
115	Sec.														
116	Reception Area														
117	Lounge														
118	Copy/Work Rm.														
119	Comp.														
110	Faculty Off.														
121	Conf.														
122	Grad. Ass. Off.														
123	Utility														
124	Laboratory														
125	High - Bay Labo./Mech.														
126	High " /Bio-Eng.														
201	Labo./Bio-Eng.														
202	Grad. Ass. Off.														
203	Util.														
204	Reseach Off.														
205	Women														
206	Men														
207	Jan.														
208	M. E. R.														
209	Crdd.														
210	Conf.														
211	Fac. Off.														
212	Lnge.														
213	Sec. Area														
214	Conf./Sem. Rm.														
215	Cmpt.														
216	Copy/Work														
217	St.														
218	Labo.														

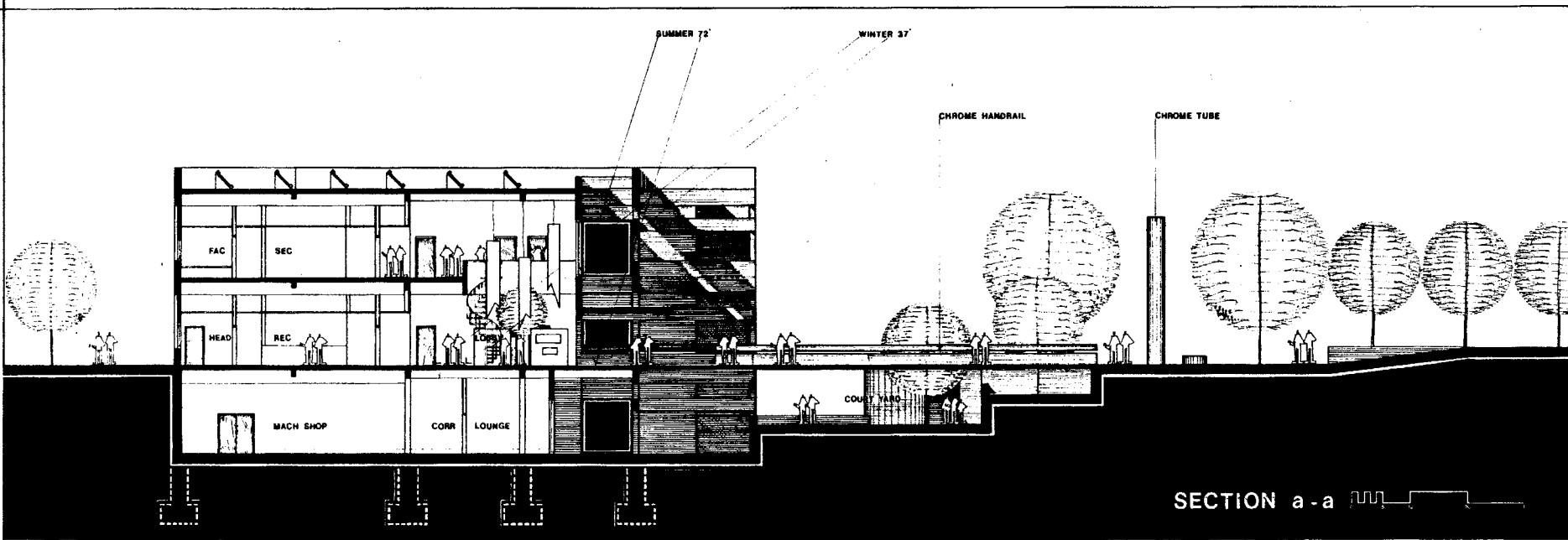


-15' LEVEL PLAN

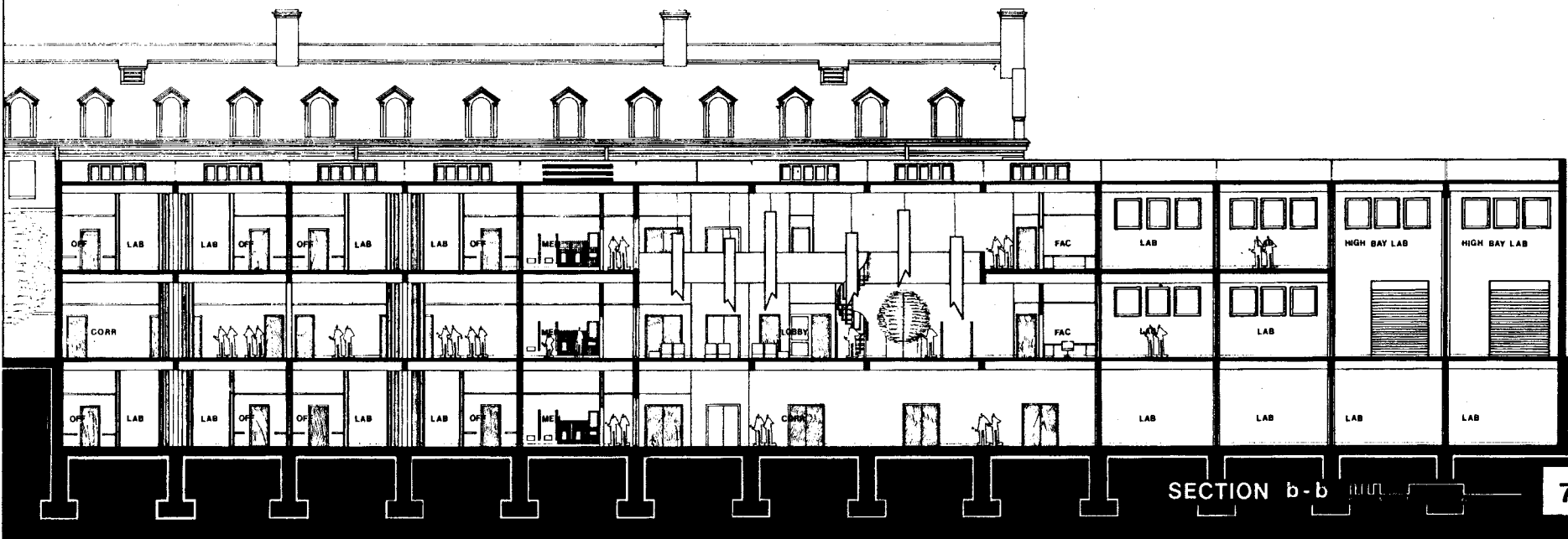




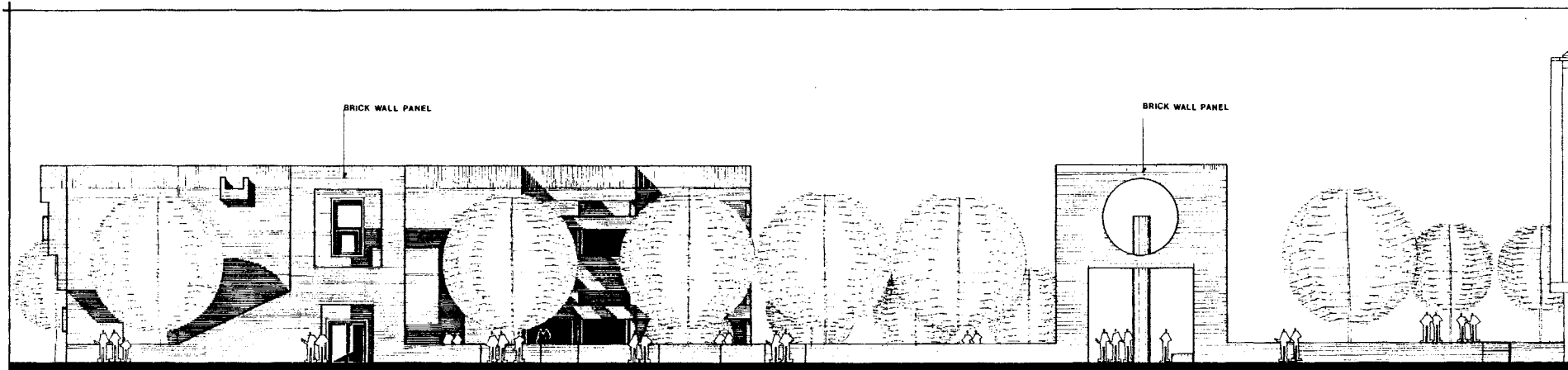
+15' LEVEL PLAN



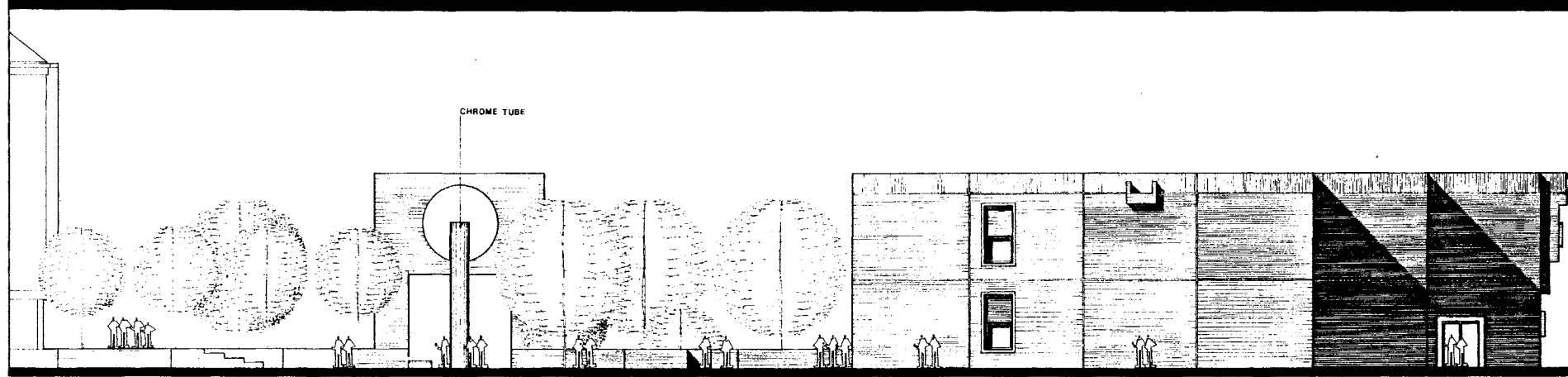
SECTION a-a



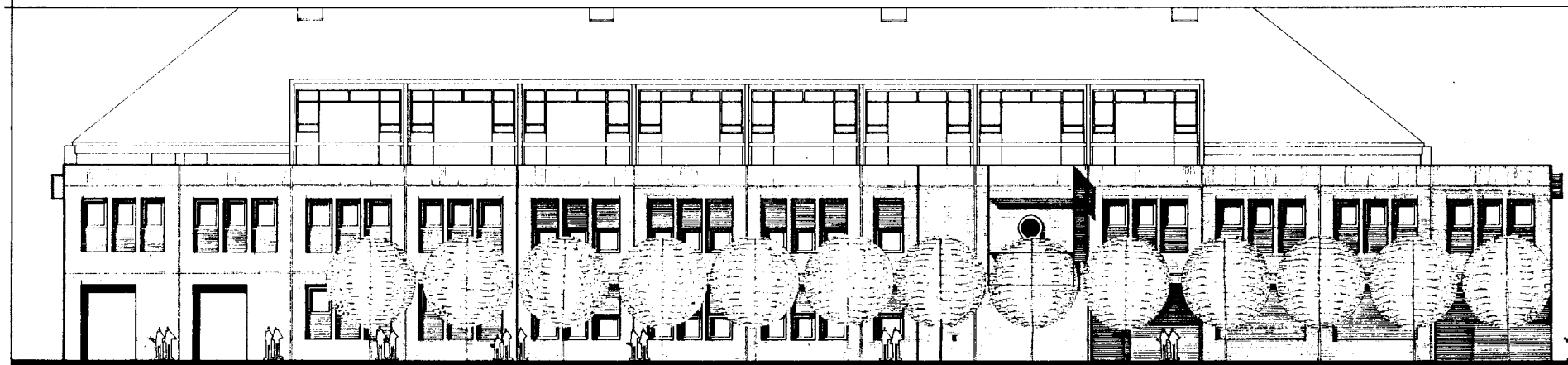
SECTION b-b



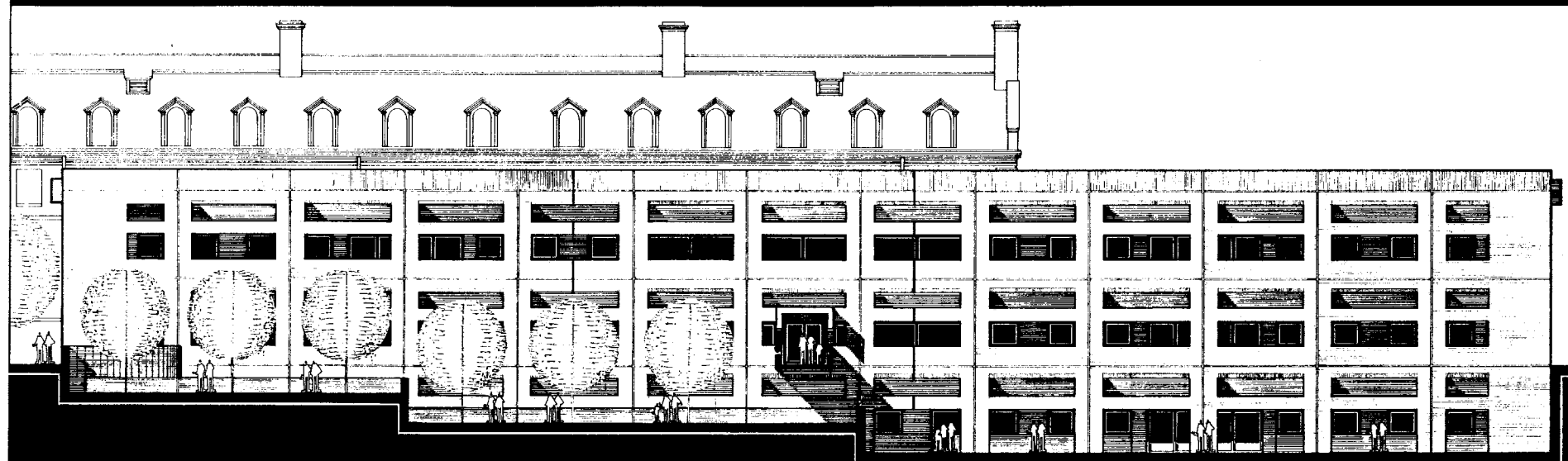
WEST ELEVATION 



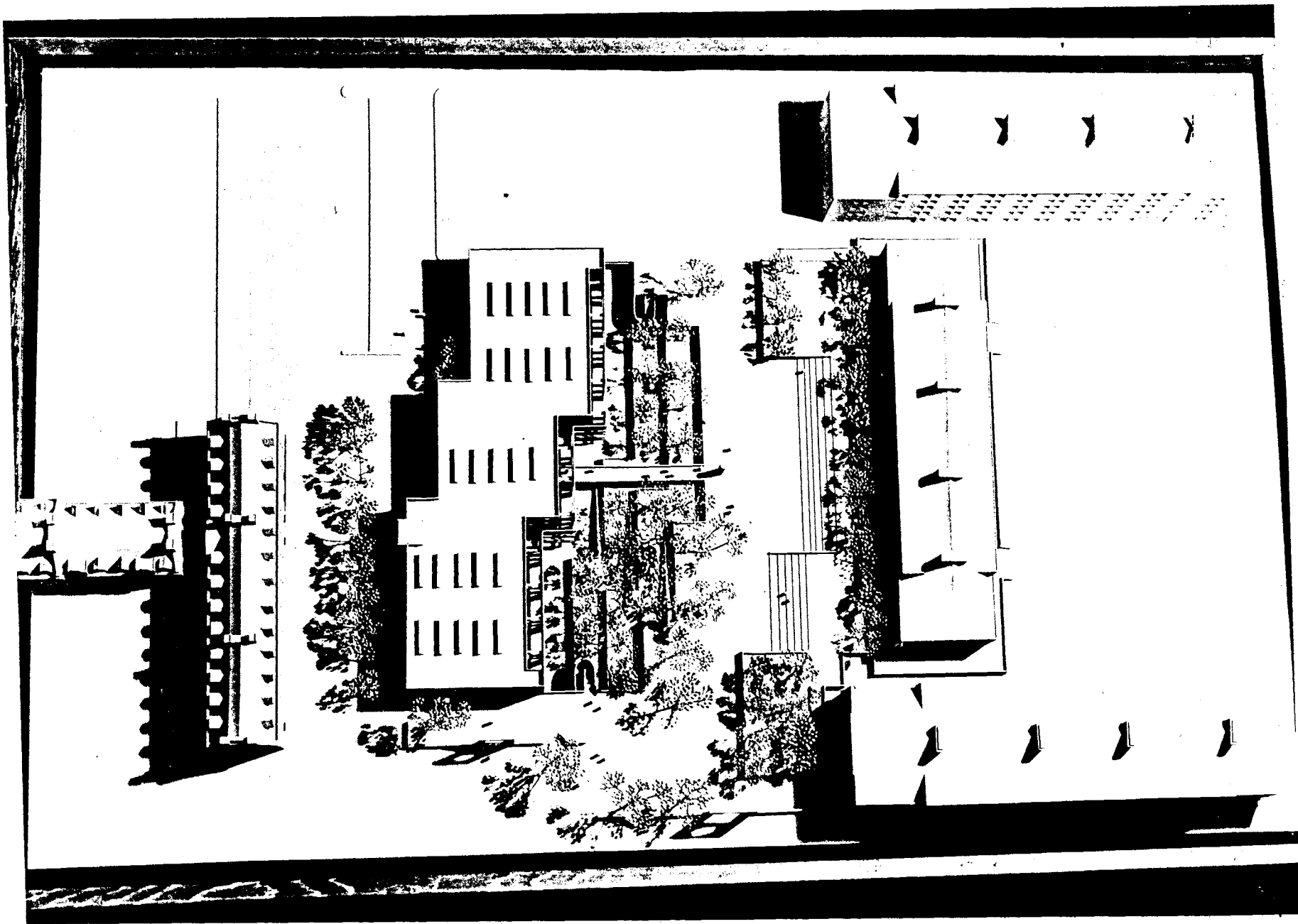
EAST ELEVATION 

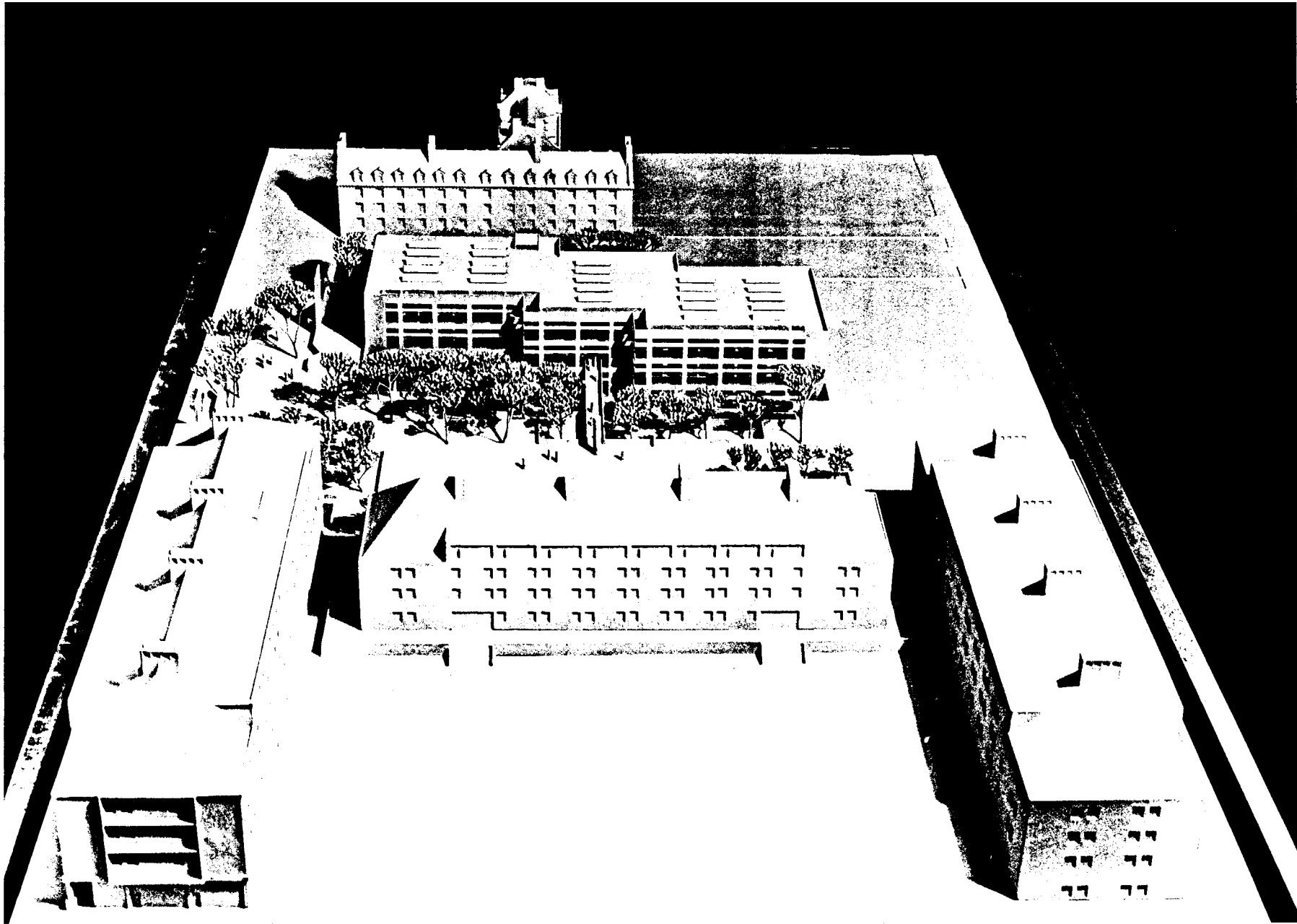


NORTH ELEVATION

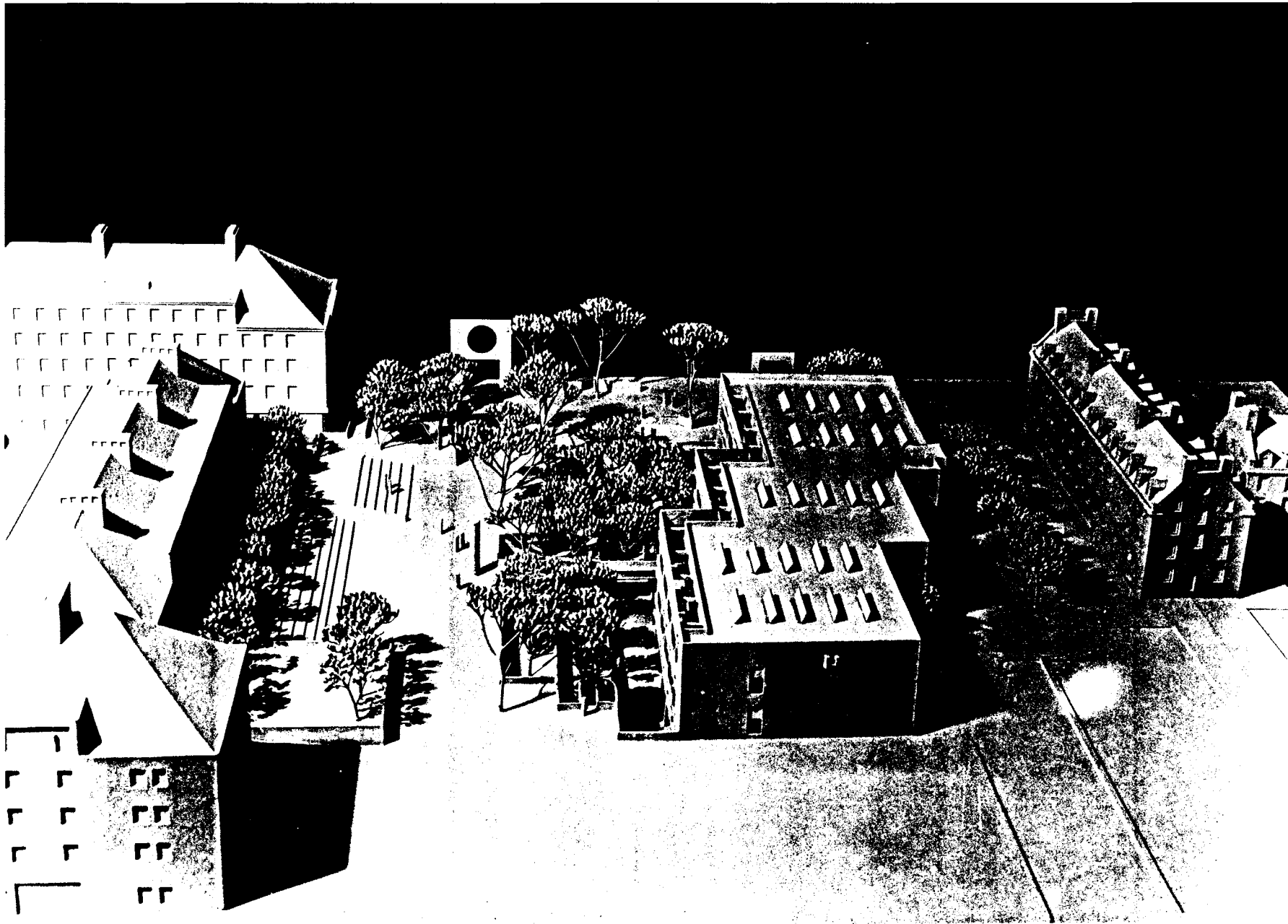


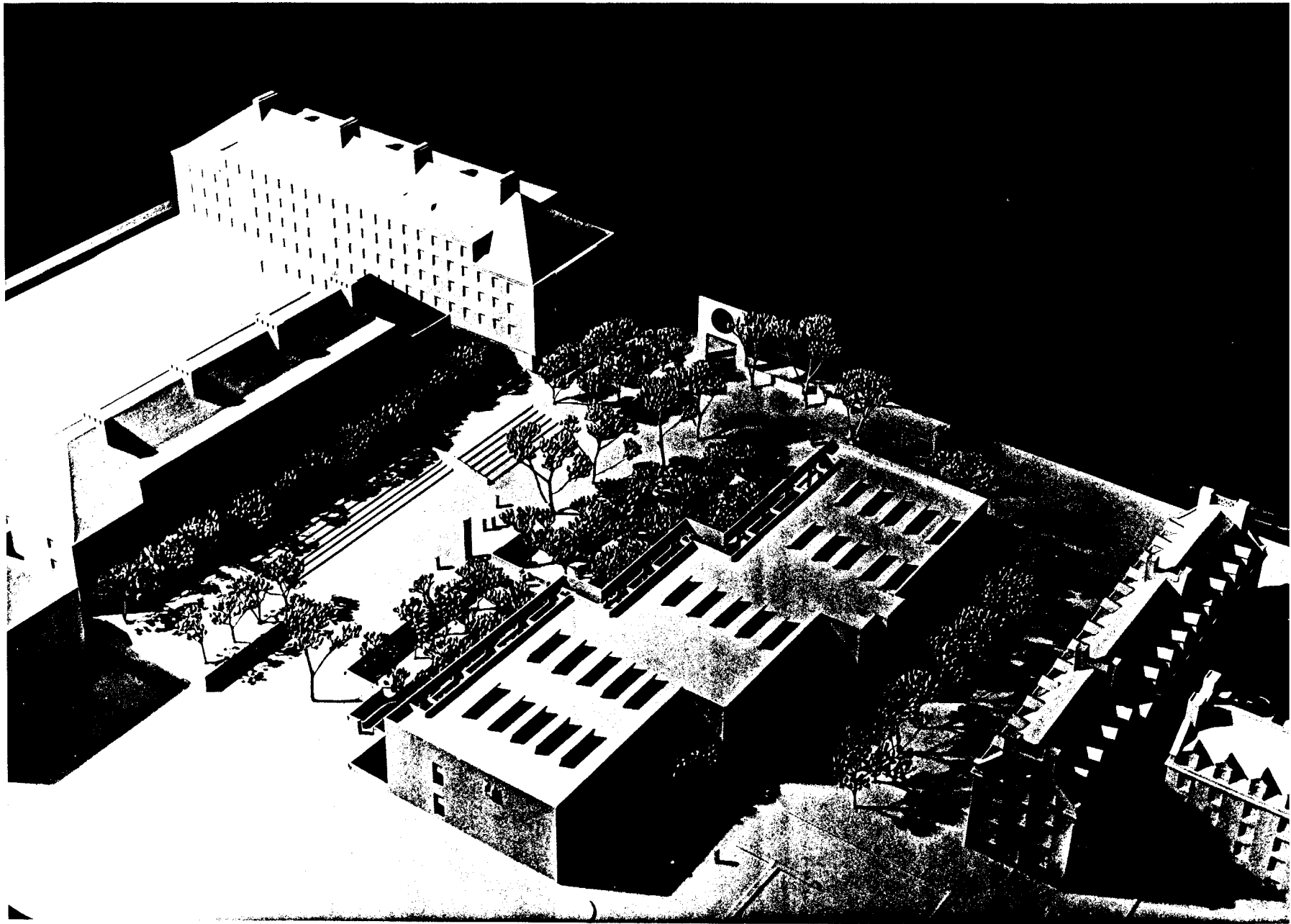
SOUTH ELEVATION



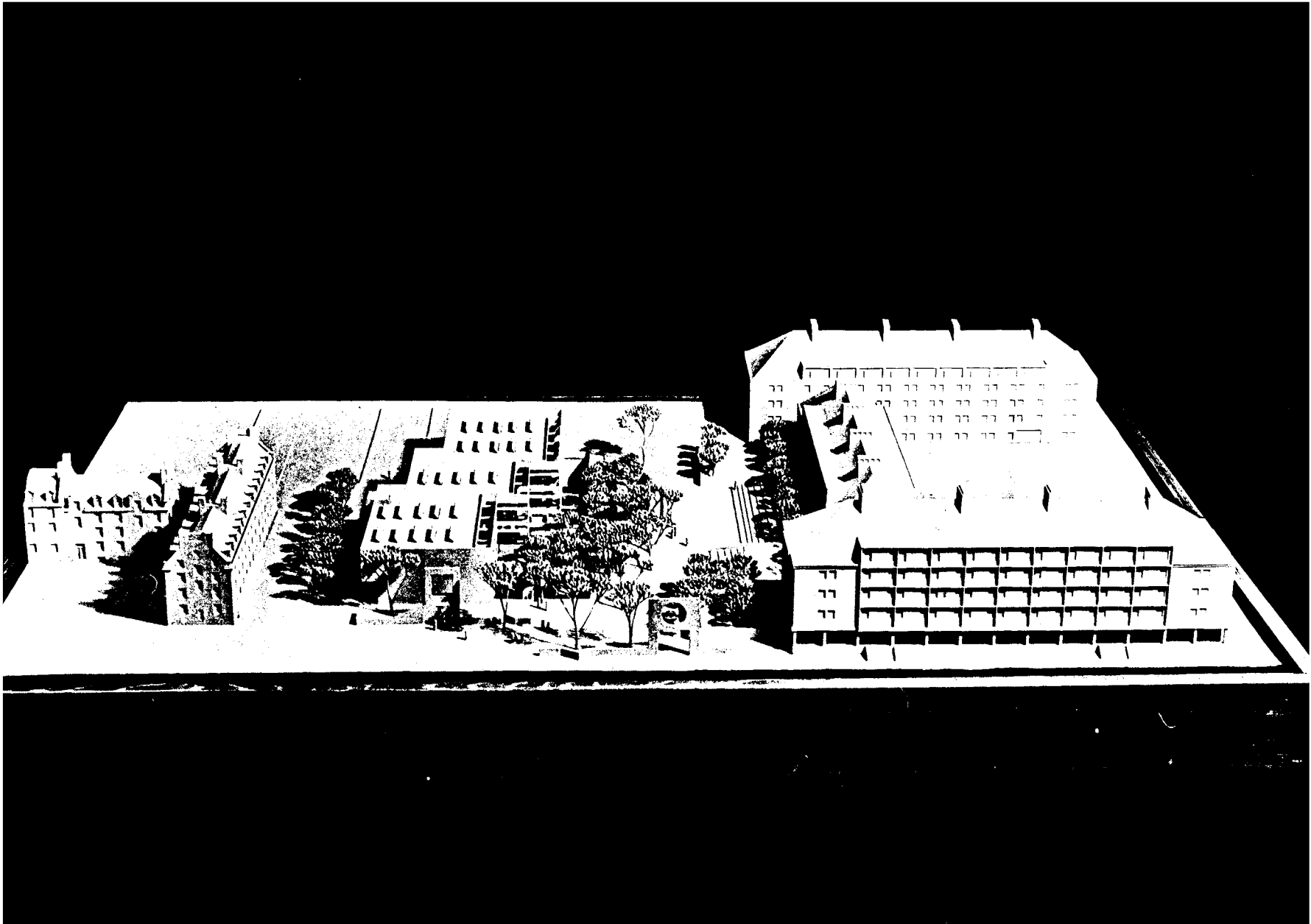












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