GEORGE MASON COLLEGE

F A I R F A X , V I R G I N I A

SAUNDERS & PEARSON
ARCHITECTS
3636 KING STREET - ALEXANDRIA, VIRGINIA

P R O G R A M

D E S I G N   A N A L Y S I S

R E C O M M E N D A T I O N S

O U T L I N E   S P E C I F I C A T I O N S

GEORGE MASON COLLEGE

Of The

University of Virginia

Fairfax, Virginia

SAUNDERS & PEARSON, ARCHITECTS
Alexandria, Virginia

Anderson, Beckwith & Haible, Consulting Architects
Boston, Massachusetts

Holland Engineering, Consulting Site Engineers
Alexandria, Virginia

Paul L. Geiringer & Associates, Consulting Mechanical Engineers
Arlington, Virginia

Fortune Engineering Associates, Consulting Structural Engineers
Alexandria, Virginia

October 26, 1960
Rev. December 30, 1960
Rev. August 1, 1961

C O N T E N T S

The following program, revised August 8, 1960, is that furnished by The University. This program has been met with minor modifications agreed to by the University and the Architect:

BUILDING PROGRAM IN GROSS SQUARE FEET PER STAGE

	Stage I	Stage II	Stage III	Total I, II, III
Administration	7,677	0	0	7,677
Academic	19,769	3,538 (10,461 converted from Stage I Library)	14,155	37,462
Library	10,461	32,563	33,750	76,774 (Stage I Library converted to Acad. use)
Science	36,308	5,461	20,369	61,907
Physical Education	1,700	59,186	16,950	77,836
Union	0	23,560	24,050	47,610
Maintenance	0	12,325	0	12,325
Temporary Lounge and Kitchen Facilities	3,846	0	0	3,846
Totals	79,761	136,633 (plus 10,461 converted)	109,274	325,437

REVISED STAGE I PROGRAM
August 8th, 1960
Part 1

NOTE: Asterisks (*) indicate spaces to be air conditioned initially or provision made for future air conditioning.

			Square Feet
A.	ADMINISTRATION SPACE:		
1.	General Lobby		250*
2.	a) Director's Reception and Secretary		200*
	b) Inner Office		200*
3.	a) Dean's Reception and Secretary		200*
	b) Inner Office		200*
4.	a) Assistant Dean's Reception and Secretary		200*
	b) Inner Office		200*
5.	Executive Conference Room for 30 Persons		850*
6.	a) Business and Registrar's Reception and Secretaries		900*
	b) Inner Office - Registrar		120*
	c) Inner Office - Business Manager		120*
7.	a) Adviser to Men Students' Reception and Secretary		150*
	b) Inner Office		100*
8.	Rest Area - Men		75*
9.	Rest Area - Women		75*
10.	Toilet		15*
11.	Office Supply Room		185
12.	Office Machine, Records and Files Room		400
13.	Storage Room for Records and Files		400
14.	a) Maintenance and Building Director's Reception and Secretary (located in basement-150 sq.ft. total)		75*(taken at 1/2)
	b) Inner Office (located in basement-150 sq.ft. total)		75*(taken at 1/2)
	Net Total	(65%)	4,990
	Circulation, toilets, Walls, Service, etc.	(35%)	2,687
	Gross Total	(100%)	7,677

B. ACADEMIC SPACE:

			Square Feet
1.	Lecture Room with platform (capacity 250 stadium seating)		3,000*
2.	Lecture Room - (capacity 100)		1,600*
3.	Lecture Room - (capacity 100)		1,600*
4.	Lecture Room - (capacity 50)		1,000*
5.	Lecture Room - (capacity 50)		1,000*
6.	Classroom - (capacity 32)		800*
7.	Classroom - (capacity 32)		800*
8.	Language Laboratory - (capacity 40)		1,000*
9.	a) English Chairman's Office		150*
	b) Instructor's Office		100*
	c) Instructor's Office		100*
	d) Instructor's Office		100*
10.	a) Math. Chairman's Office		150*
	b) Instructor's Office		100*
	c) Instructor's Office		100*
11.	a) Language Chairman's Office		150*
	b) Instructor's Office		100*
	c) Instructor's Office		100*
	d) Instructor's Office		100*
12.	a) Humanities Chairman's Office		150*
	b) Instructor's Office		100*
13.	a) Social Sciences Chairman's Office		150*
	b) Instructor's Office		100*
14.	Secretarial Pool		300*
	Net Total	(65%)	12,850
	Circulation, Toilets, Walls, Service, etc.	(35%)	6,919
	Gross Total	(100%)	19,769

C. LIBRARY SPACE: Square Feet

The space used for the Library at this stage will be converted to Academic use at Stage II. The space allocation for the Stage II development will be:

Lecture Room - (capacity 100)		1,600*
Lecture Room - (capacity 100)		1,600*
Lecture Room - (capacity 50)		1,000*
Lecture Room - (capacity 50)		1,000*
Lecture Room - (capacity 50)		1,000*
Faculty Office		100*
Faculty Office		100*
Faculty Office		100*
Faculty Office		100*
Faculty Office		100*
Faculty Office		100*
Stage II - Academic - Net Total	(65%)	6,800
Circulation, Toilets, Wall, Service, etc.	(35%)	3,661
Stage II - Academic - Gross Total	(100%)	10,461

As a temporary measure this space will be adapted so as to provide the following Library space for Stage I:

1. Reading Areas: 7,000*
   a) History Reading Area
   b) General and Literature Reading Area
   c) Social Sciences Reading Area
   d) Science and Technology Reading Area
   e) Reference Area
   f) Periodical and Newspaper Reading Area to be separated from one another by bookstacks.

The areas together should have a capacity of 200 readers and 30,000 volumes. Using a standard of 25 sq.ft. per reader and 15 volumes per sq.ft., the area of the reading and stack space will total 7,000 sq.ft. (5,000 sq.ft. plus 2,000 sq.ft.).

LIBRARY SPACE (cont'd)		Square Feet
2. Lobby, Circulation Desk Area and Catalogs		400*
3. Office with Working Library with Science and Bibliography Collections		200*
4. Work Room		350*
5. Supply Room		100
6. Typing Room (located in basement - 100 sq.ft. total)		50*(taken at 1/2)
7. Audio-visual Equipment Room (located in basement-150 sq.ft. total)		75*(taken at 1/2)
8. Book Store (located in basement-100 sq.ft. total)		50*(taken at 1/2)
Net Total	(80%)	8,225
Circulation, Toilets, Walls, Service, etc.	(20%)	2,056
Gross Total	(100%)	10,281

D. SCIENCE SPACE:	Square Feet
1. Classroom - (capacity 64)	1,600*
2. Classroom - (capacity 32)	800*
3. Classroom - (capacity 32)	800*
4. Chairman's Reception and Secretary	150*
a) Inner Office	150*
5. Instructor's Office	100*
6. Instructor's Office	100*
7. Instructor's Office	100*
8. Instructor's Office	100*
9. Instructor's Office (may be postponed to a later stage for budgetary reasons)	100*
10. Instructor's Office (may be postponed to a later stage for budgetary reasons)	100*
11. Instructor's Office (may be postponed to a later stage for budgetary reasons)	100*
12. Instructor's Office (may be postponed to a later stage for budgetary reasons)	100*
13. a) Chemistry or Biology Laboratory - (capacity 32)	1,200
b) Storage Room	400
c) Preparation Room	400
d) Chemistry or Biology Laboratory - (capacity 32)	1,200
14. a) Chemistry or Biology Laboratory - (capacity 32)	1,200
b) Storage Room	400
c) Preparation Room	400
d) Chemistry or Biology Laboratory - (capacity 32)	1,200
15. a) Chemistry or Biology Laboratory - (capacity 32)	1,200
b) Storage Room	400
c) Preparation Room	400
d) Chemistry or Biology Laboratory - (capacity 32)	1,200

SCIENCE SPACE (cont'd)	Square Feet
16. a) Chemistry or Biology Laboratory - (capacity 32)	1,200
b) Storage Room	400
c) Preparation Room	400
d) Chemistry or Biology Laboratory - (capacity 32)	1,200
17. a) Physics and General Science Laboratory - (capacity 32)	1,200
b) Storage Room	400
c) Preparation Room	400
d) Physics and General Science Laboratory - (capacity 32)	1,200
18. a) Drawing Laboratory - (capacity 32)	1,200*
b) Connecting Office	150*
19. Balance Room	300*
20. a) General Storeroom Receiving, etc. with freight elevator or dumbwaiter to 100 sq.ft. storeroom on each floor (not included in square footage)	800
b) Adjoining Office, Storeroom Manager	150*
21. Science Work Shop	400*
22. Greenhouse	300
Net total (65%)	23,600
Circulation, Toilets, Walls, Service, etc. (35%)	12,708
Gross Total (100%)	36,308

E. TEMPORARY PHYSICAL EDUCATION SPACE		Square Feet
1. a) Men's Locker Room and Dressing Area (200 lockers) (located in basement - 600 sq.ft. total)		300 (taken at 1/2)
b) Shower and Drying Rooms (located in basement - 260 sq.ft. total)		130 (taken at 1/2)
2. a) Women's Locker Room and Dressing Area (200 lockers) (located in basement - 680 sq.ft. total)		340 (taken at 1/2)
b) Shower and Drying Rooms (located in basement - 260 sq.ft. total)		130 (taken at 1/2)
3. Equipment Storage Room (located in basement - 410 sq.ft. total)		205 (taken at 1/2)
Net Total	(65%)	1,105
Circulation, Toilets, Walls, Service, etc.	(35%)	595
Gross Total	(100%)	1,700

F. TEMPORARY LOUNGE AND KITCHEN FACILITIES:		
1. Lounge and Kitchen (located in basement - 5,000 sq.ft. total)		2,500 (taken at 1/2)
Net Total	(65%)	2,500
Circulation, Toilets, Walls, Service, etc.	(35%)	1,346
Gross Total	(100%)	3,846

GEORGE MASON COLLEGE

Revised Program for Stages II and III

August 8, 1960

Note that air conditioned spaces are not indicated

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ADMINISTRATION SPACE:

STAGE II
No new construction

STAGE III
No new construction

ACADEMIC SPACE:		Square Feet
STAGE II		
10,461 sq.ft. converted to Academic use from Stage I Library.		
Lecture Room with platform - (capacity 200)(stadium seating)		2,300
Net Total	(65%)	2,300
Circulation, Toilets, Walls, Service, etc.	(35%)	1,238
Gross Total	(100%)	3,538
Stage III		
Lecture Room - (capacity 100)		1,600
Lecture Room - (capacity 100)		1,600
Lecture Room - (capacity 50)		1,000
Lecture Room - (capacity 50)		1,000
Seminar Room - (capacity 25)		750
Seminar Room - (capacity 25)		750
Seminar Room - (capacity 25)		750
Seminar Room - (capacity 25)		750
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Net Total	(65%)	9,200
Circulation, Toilets, Walls, Service, etc.	(35%)	4,955
Gross Total	(100%)	14,155

LIBRARY SPACE:		Square Feet
STAGE II		
100,000 Volume Stack Area @ 15 vol./sq.ft.		6,666
Reading Space - (capacity 500)		12,500
Librarian Space, Offices, Control Counter, etc.		2,000
Net Total	(65%)	21,166
Circulation, Toilets, Walls, Service, etc.	(35%)	11,397
Gross Total	(100%)	32,563
STAGE III		
100,000 Volume Stack Area @ 15 vol./sq.ft.		6,667
Reading Space - (capacity 700)		17,500
Visual Aids, Offices, etc.		2,833
Net Total	(80%)	27,000
Circulation, Toilets, Walls, Service, etc.	(20%)	6,750
Gross Total	(100%)	33,750

SCIENCE SPACE:

STAGE II

		Square Feet
Lecture Demonstration Auditorium - (capacity 200) (stadium seating)		2,300
Adjoining Preparation Room - Biology		150
Adjoining Preparation Room - Chemistry		150
Adjoining Preparation Room - Physics		150
Classroom - (capacity 32)		800
Net Total	(65%)	3,550
Circulation, Toilets, Walls, Service, etc.	(35%)	1,911
Gross Total	(100%)	5,461

STAGE III

Lecture-Demonstration Room - (capacity 200)		2,300
Adjoining Preparation Room		150
Adjoining Preparation Room		150
Lecture-Demonstration Room - (capacity 100)		1,600
Adjoining Preparation Room		200
Lecture-Demonstration Room - (capacity 100)		1,600
Adjoining Preparation Room		200
Laboratory - (capacity 32)		1,200
Laboratory - (capacity 32)		1,200
Laboratory - (capacity 32)		1,200
Laboratory - (capacity 32)		1,200
Storage Room		600
Storage Room		600
Executive Office		150
Reception and Secretary		150
Inner Office		120
Inner Office		120
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Instructor's Office		100
Net Total	(65%)	13,240
Circulation, Toilets, Walls, Service, etc.	(35%)	7,129
Gross Total	(100%)	20,369

PHYSICAL EDUCATION SPACE:		Square Feet
STAGE II		
Men's Locker Room and Dressing Area (800 lockers)		2,400
Shower and Drying Rooms		390
Women's Locker Room and Dressing Area (800 lockers)		2,720
Shower and Drying Rooms		390
Cage w/2000 Spectators		36,000
Office Space		700
Equipment Storage Space		1,790
Net Total	(75%)	44,390
Circulation, Toilets, Walls, Service, etc.	(25%)	14,796
Gross Total	(100%)	59,186

STAGE III		
Equipment Storage		1,500
Team Lockers		3,000
Indoor Pool 100' x 65'		6,500
Net Total	(65%)	11,000
Circulation, Toilets, Walls, Service, etc.	(35%)	5,950
Gross Total	(100%)	16,950

CAMPUS UNION SPACE:		Square Feet
STAGE II		
Faculty Lounge		600
Lunch Room to serve 500 at one time		9,000
Kitchen		2,700
Student Lounge		3,000
Net Total	(65%)	15,300
Circulation, Toilets, Walls, Service, etc.	(35%)	8,260
Gross Total	(100%)	23,560
STAGE III		
Student Lounge		3,000
Faculty Lounge		600
Lunch Room to serve 500 at one time		9,000
Kitchen		3,000
Net Total	(65%)	15,600
Circulation, Toilets, Walls, Service, etc.	(35%)	8,450
Gross Total	(100%)	24,050

MAINTENANCE SPACE:

STAGE II

			Square Feet
Shops	Approximately		3,500
Truck Storage	Approximately		1,500
Equipment Storage	Approximately		3,000
Net Total		(65%)	8,000
Circulation, Toilets, Walls, Service, etc.		(35%)	4,325
Gross Total		(100%)	12,325

It is anticipated that the indicated auditorium of approximately 20,000 square feet would be needed.

A chapel might also be erected at this stage.

Site Development:

Extensive study of the site, survey and geological data pertaining thereto, in consultation with Anderson, Beckwith and Haible and Holland Engineering, has resulted in the arrangement shown by the Master Site Plan.

The Town of Fairfax has recently built a new Principal street, named University Drive, through town terminating at a point on the north boundary of the site as indicated and, upon the start of construction of this project, they plan to extend this new street along the north line of the site to Chain Bridge Road (Route 123).

After study and consultation with Town, County and State officials, and after consideration of the direction from which a large, if not the largest percentage of enrollment would come, it became clearly evident that the main approach to the site is via this new University Drive. The future widening of Chain Bridge Road and development of other traffic ways south and west of the College will demand a second approach to the site from Chain Bridge Road. The road pattern is thus arranged for accomplishment of this second approach road at the Stage II development of the College.

Together with the approach roads, the principal site circulation is by means of a loop road in order to serve the various elements around the ultimate building complex independently, allowing room for expansion beyond that forseen at this time. This loop connects all parking, and service roads connect the service areas as indicated.

Facilities for activities involving participation by the public have been arranged to afford maximum access by such public without having to cross the circulation of Campus activity.

The buildings are so dispersed as to assign the main branches of the curricula by buildings, so composed and related to each other as to facilitate proper instructional activity in the most favorable environment possible. Maximum attempt has been made to create a complex which affords pleasant courts and gardens, and interesting vistas and mass compositions from a maximum number of positions in and around the grounds and various courts.

A minimal amount of landscape planting is contemplated in the Stage I program for economy reasons. However, it is expected that only a minimal amount of grading will be done in Stage I allowing for a maximum amount of the natural growth on the site to remain until such time as further development takes place.

The bulk of the car parking (500 in Stage I, 3000 ultimately) has been arranged to the east and northeast portions of the site where the terrain slopes off to the east. These slopes provide opportunity to semi-hide the parked cars from the buildings. Such hiding is further advanced by means of leaving some of the natural growth, supplemented by new materials to be planted in the areas where grading would destroy natural growth.

The building complex arrangement and orientation has come about as a result of studies involving several intertwined considerations. These sought to achieve reasonable and logical use of land, and maximum economy in site grading and utility lines, and at the same time to accomplish the maximum in variety, interest and beauty from the total composition of buildings and grounds.

Building Design:

As in all building design, the exterior form of these proposed buildings generates from and is a direct reflection of the simple concrete structural framing system proposed, and a direct reflection of the plans and the function of the various rooms. Effort has also been made to reflect the materials and scale that Thomas Jefferson employed in the University buildings at Charlottesville. Further, since the design expression made in Stage I will establish that for the entire development in the years to come, considerable study has been made and care taken to create a design with College character, one with the same kind of freshness, straight forwardness and honesty of purpose as found in the Jeffersonian works at Charlottesville, yet one of simplicity, permanence and economy.

The materials then are brick with white or off-white trim of white vinyl coated smooth concrete, enameled steel windows and masonry panels. These materials are inexpensive, yet relatively maintenance free.

Preliminary structural investigations of structural framing systems indicate that concrete construction with concrete plate slabs will be the most economical and logical method of building. This frame would then be enclosed with brick and the panel-window assembly indicated above.

Sloping roofs have been employed in order to provide attic spaces for housing the various pieces of unsightly mechanical equipment. And what with the extremely hot and humid summer climate of the Washington area, these roofs have been raised approximately 18" above the cap slabs as indicated to effect an umbrella-like arrangement for circulating natural breezes under them through screened louvers or grilles. Exhaust and intake ducts would also terminate through portions of these louvered or grilled attic enclosures.

Mechanical Design:

Preliminary mechanical studies by engineering consultants, Paul L. Geiringer & Associates, engaged for the purpose, have led to the provision for a year-round airconditioning and controlled humidity system, as the hot, humid summer weather of the Washington area makes cooling during this period a "must" in order for this institution to compete with other colleges of the area which are now so airconditioned.

Preliminary electrical studies in consultation with the power and telephone companies have led to the provision for high voltage underground electric service from Chain Bridge Road and underground telephone service from University Drive. Distribution within the building complex will be underground also.

See detailed engineering report following the Outline Specifications hereinafter for the details of studies and recommendations by the consulting mechanical engineers.

Site:

(1) That test borings, soil percolation and ground water temperature tests be authorized as soon as possible in order that detailed structural and mechanical investigations, necessary to proper development of these facets of the project, can be advanced.

(2) That, in view of the fact that the topographic survey prepared by the Virginia Department of Highways is based upon aerial interpolative methods and may therefore contain inaccuracies, a field check be made, and if found necessary, a complete topographic survey based upon field instrumentation be authorized as soon as possible.

(3) That, in view of the favorable one cent ($0.01) per KW electric power rate available to the State which makes electricity competitive with coal and gas, heating be accomplished by means of a heat pump system and that in view of the hot, humid summer climate of the Washington metropolitan area, the cooling cycle of the heat pump unit be employed, all in accordance with the mechanical engineering recommendations by Paul L. Geiringer & Associates bound hereinafter.

Note: All three of the above recommendations were approved by the State and have been or are being performed.

Excavation, Grading: Per contour plan to extent necessary for Stage I only.

Footings, Foundations: Reinforced concrete per ACI, CRSI standards; as determined by structural engineering and design.

Exterior Walls: Face brick masonry with white vinyl coated concrete columns, other trim; masonry spandrel panels.

Floor, Stair Construction: Ground floor slabs of Concrete on membrane, on gravel capillary bed; upper floors of reinforced concrete per ACI, CRSI standards; as determined by strucutural engineering studies and design.

Roof Construction: Combustible frame and deck with slater's felt and slate shingles. (Alternate for concrete shingles) (Alternate for incombustible frame and deck).

Partitions: Masonry non-bearing, exposed and painted or plastered in various locations as required by detailed requirements to be determined later.

Floors: Resilient tile on concrete throughout except in corridors, stairs, toilets, locker rooms, special areas to be determined from detailed requirements. Terrazzo in corridors and stairs, terrazzo and/or quarry tile in toilets.

Windows: Factory enameled steel sash with neoprene gasketed ventilating sections.

Clear glass all openings except in special locations which would require special glass.

Utilities: Storm and sanitary lines and structures per Fairfax County and State codes. Water service per water company, Code requirements; main sized for ultimate development; hydrants as required by County, State and insurance regulations. Electric and telephone service per power company, telephone company and Code requirements, regulations.

Plumbing: Per State, County Codes, best engineering practice, per engineering report bound herewith.

Heating, Ventilating, Air Conditioning: Heat pump system, supplying year-round humidity controlled air heating (and cooling for certain areas), supplemented as and when necessary with convected heating under windows. Mechanical ventilation as required to meet detailed requirements in various spaces. All per engineering report bound herewith.

Electrical: Per National Electric Code; per engineering report bound herewith. Alternate bid for inclusion of conduit for future paging system.

Roads & Walks: Medium duty standard highway specification bituminous pavements with gravel shoulders for all roads and parking areas shaded in yellow on site plan. (Alternate for adding concrete curbs and gutters). Scored concrete with brick insert pattern as indicated for all walks throughout.

STUDY

of

HEATING, VENTILATING, AIR CONDITIONING

PLUMBING, AND ELECTRICAL SERVICES

for

THE GEORGE MASON COLLEGE

NORTHERN VIRGINIA BRANCH OF THE UNIVERSITY OF VIRGINIA

* * * *

PAUL L. GEIRINGER AND ASSOCIATES

PROFESSIONAL ENGINEERS

10-55 Jackson Avenue
Long Island City 1, N.Y.

1515 N. Court House Rd.
Arlington 1, Virginia

October 26, 1960

Rev. December 30, 1960

C O N T E N T S

INTRODUCTION

The following preliminary report presents our initial investigation of utility requirements for the George Mason College of the University of Virginia.

The information contained in this report, as well as the conclusions which have led to this outline design and outline specification, are based on preliminary data supplied by Saunders & Pearson, Architects; the Governor's Office of the State of Virginia, and utility companies which would supply basic utility services at the Fairfax, Virginia, site.

The purpose of this report is to give direction to the engineering work which will be required for the successful conclusion of the design stage of this project.

Upon approval of this Preliminary Outline Design and Specification by the Architects, it will be possible to proceed with the final engineering.

G E N E R A L

The Master Plan for George Mason College shows the expansion of the College in several stages, or phases. At present, three or four stages are planned. The first stage comprises five buildings which will form the nucleus around which the future college will expand. It is foreseen that, as the college grows, a central heating plant might be installed in a service area apart from the academic sections, where the shops of the physical plant would also be housed. Later, still other facilities may be added.

On the other hand, notwithstanding the overall future size of the college expansion, the present thinking has to deal primarily with the first stage. A solution must be found which is self-sufficient and economical for a number of years, and which still permits later integration in an overall scheme with a minimum of cost.

PRELIMINARY RECOMMENDATIONS

HEATING, VENTILATING AND AIR CONDITIONING

1. Primary Heat Source

A heat pump system for heating and cooling purposes is recommended to carry the base load because of its great advantages in flexibility and operating economy, with a standby and peak-load auxiliary to meet the maximum demand. This preliminary recommendation is subject to more detailed data and economic analysis, particularly in regard to the well water availability at the site, which would be preferred for a heat pump installation.

2. Secondary Interior Air Distribution

A dual duct, high velocity air distribution system is recommended for circulation inside each of the buildings. Individual room control will be by thermostically controlled mixing boxes.

3. Fan Room

A fan room located in attic space of each building will supply air to the rooms, with perimeter heating to reduce cold downdrafts, particularly in spaces with large glass areas.

4. Ventilation

Ventilation will be controlled and introduced at the fan room to take full advantage of regenerative heat exchanger.

5. Accessories

An air-to-air regenerative heat exchanger in each fan room is recommended to increase system efficiency.

ELECTRICAL SERVICE

1. Overall Power Distribution System

a. Capacity required for Stage 1 is approximately 500 KVA.

b. Primary service voltage is 7200/12500 wye, 3 phase grounded neutral.

c. Site distribution voltage is 2400 delta, 3 phase.

d. Utilization voltage within buildings is 120/208 wye, 3 phase, grounded neutral.

e. Use underground distribution feeders.

f. Capacity required for future Stages 11, 111 and 1V will be approximately 1000 KVA additional; all other factors b, c, d, & e will remain the same.

2. Interior Electrical System

a. Loads to be determined when design criteria, e. g. type and location of lighting fixtures, become available.

b. National Electrical Code, together with local codes where applicable, to be regarded as minimum standard.

c. Use 208 volt 3 phase motors.

3. Exterior Area Lighting System

a. Power supply from adjacent building sources.

b. Minimum area lighting to be provided under Stage 1.

c. Time switch control.

4. Communications and Signaling System

a. Requires further study and conference with the University to analyze exact requirements.

PLUMBING SERVICES

1. Water Distribution System

The use of a single metered service line and a water distribution system between buildings is recommended. Either brass or copper piping and fittings are suggested for interior water distribution.

2. Drainage System

A sanitary house sewer system of cast iron bell & spigot pipe and fittings should be provided and only a limited storm sewer system primarily serving the asphalt surfaced parking lot shall (at least initially) be installed.

3. <u>Gas System</u>

Provided a municipal gas main is furnished to the site at the utility company's expense, a gas distribution system is favored over the use of bottled gas both from the standpoint of future expanding requirements as well as from the point of view of reliability.

4. <u>Fire Protection System</u>

A system of fire hydrants located close to buildings on the Campus in combination with wall-hung soda-acid type hand fire extinguishers inside buildings is suggested provided local code and Fire Underwriters requirements are thereby fulfilled.

5. <u>Miscellaneous</u>

Laboratory fixtures and equipment require determination prior to establishing final plumbing requirements. Future pool drainage and pool sanitation depends upon size and design of pool.

PART I

HEATING, VENTILATING AND AIR CONDITIONING

In multi-building projects a degree of centralization becomes possible, with location of heat generating equipment at a central point convenient to the cluster of buildings being served. As the size of a project increases, the advantages of centralization become more apparent with a few large units in a single central heating plant replacing numerous small units scattered over a sizable area. The size of the plant generally dictates whether or not cantralization of the primary system is advantageous.

For the ultimate phase, a central heating plant is recommended in the physical plant area, reserved for this purpose in the MasterPlan. The Master Plan shows the stages in which the College will be expanded. However, it is presently unclear what timing is proposed for the various stages. Our present thinking has to be concentrated on the most favorable solution for the first stages only, but should be compatible with the general scheme applicable to the entire College.

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3. Gas System

Provided a municipal gas main is furnished to the site at the utility company's expense, a gas distribution system is favored over the use of bottled gas both from the standpoint of future expanding requirements as well as from the point of view of reliability.

4. Fire Protection System

A system of fire hydrants located close to buildings on the Campus in combination with wall-hung soda-acid type hand fire extinguishers inside buildings is suggested provided local code and Fire Underwriters requirements are thereby fulfilled.

5. Miscellaneous

Laboratory fixtures and equipment require determination prior to establishing final plumbing requirements. Future pool drainage and pool sanitation depends upon size and design of pool.

PART I

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GENERAL CONSIDERATIONS

Analysis of a heating system for a new group of buildings - or conversion of an existing heating plant to incorporate latest technological improvements - invariably concerns itself with the economics of the project. While there may be peripheral considerations, the final selection or improvement of the plant must be based on procuring the greatest return for the money spent.

A logical investigation must consider the following factors: the required investment, operating costs, and space requirements. Each of these factors must be considered as they apply to the various alternate systems available.

A. Investment

Proper appraisal of investment costs requires a sufficiently complete initial survey to show the various technically feasible systems. Actual investment costs can then be estimated with a high degree of accuracy for each of the alternates which appear technically sound. Finally, investment costs will have to be determined on the basis of expected life of each of the alternate systems under consideration.

B. Operating Costs

In the category of operating costs, initial consideration must be given to fuel selection. There are four common fuels available; gas, fuel oil, coal, and electricity. Because of an extremely favorable electric rate under a basic agreement between the Commonwealth of Virginia and the Virginia Electric & Power Company, electrical energy, which can generally be summarily dismissed as an economical fuel, must be given serious consideration, along with the more conventional fuels.

1. Coal

Information from State authorities quotes coal costs of \$9.25 per ton delivered to a rail siding in Vienna, Virginia. Local trucking to the Fairfax site would average approximately \$1.50 per ton. Site handling and ash removal charges add approximately \$0.17 per ton of delivered coal. This gives \$10.92 per ton which, on the basis of 13,000 Btu/lb, is equivalent to 26.0×10^6 Btu. With a boiler efficiency of 80%, we arrive at:

$$\frac{10.92}{0.80 \times 26.0 \times 10^6} = \$0.53 \text{ per million Btu of boiler output.}$$

2. <u>No. 6 Fuel Oil</u>

Price of No. 6 oil is $0.0889 per gallon which, on the basis of 0.150×10^6 Btu per gallon and 81% boiler efficiency, gives:

$$\frac{0.0889}{0.81 \times 0.15 \times 10^6} = \$0.73 \text{ per } 10^6 \text{ Btu of boiler output.}$$

3. <u>Gas</u>

Gas rates follow a sliding scale based on the local monthly consumption and therefore vary depending upon demand. There is also a summer "air conditioning" rate which provides more favorable rates during periods of low system demand. For computation, we have used as a base the price of gas if the monthly consumption is 6000 therms (600×10^6 Btu). On this basis, the winter rate would be $0.1080 per therm. With boiler efficiency of 82%, we get:

$$\frac{0.1086}{0.82 \times 0.1 \times 10^6} = \$1.32 \text{ per million Btu of boiler output}$$

4. <u>Electricity</u>

The basic agreement between the Commonwealth of Virginia and the Virginia Electric & Power Company provides a rate of 1¢ per Kw hr for State agencies with installations having a demand of 25Kw or more. The George Mason College will undoubtedly be served under this agreement.

This favorable rate gives added interest to electric resistance heat or a heat pump installation. At 1¢ per Kw hr, energy is available at $2.93 per million Btu. Even with transmission efficiency of 100% for resistance heating, the cost would be the full $2.93 per million Btu of delivered heat. Hence, resistance heating can be eliminated from consideration. However, the heat pump, based on coefficients of performance of 3.0 or above, gives the following heating costs per million Btu delivered heat:

Coefficient of Performance	Heating Cost/10^6 Btu
3.0	$0.977
3.5	0.837
4.	0.733
5.	0.586
6.	0.489

Summary: Cost of Heating per 10^6 Btu

Electric Heat Pump	Coal	Oil	Gas
$0.489 to $0.977	$0.53	$.73	$1.32

3 - .977
4 - .733
.244

4 - .733
6 - .489
.244

Based on the fact that air conditioning in the warm climate of Virginia seems to be an urgent requirement for a modern school, the possibility of using electricity for winter and summer should be seriously considered.

The above analysis of fuel costs may indicate that, of the conventional fuels, coal has an edge over the others for the following reasons:

Based on a budget computation of 1600 hours at full load, as equivalent to the total load for a heating season in Virginia, and assuming a 4 million Btu per hour peak demand for Phase I, we arrive at the following:

Coal Budget

$1600 \times 4 \times 10^6 \times \$0.53 = \$3,328$ Total Annual Fuel Cost

To this cost must be added the cost of ash removal and certain additional expenses for coal handling, which can be approximated at about equal to the fuel budget. Also, because coal trucking and ash removal in the central educational area of the College will be unwelcome, coal as fuel for Phase I has to be eliminated.

As the next best alternates, the heat pump, and then oil, can be selected.

However, as the building program continues and the winter and summer loads become greater and more uniform throughout the entire year, coal may have to be given careful consideration, particularly when a central heating plant is constructed away from the main academic areas. The economic advantages of coal might then outweigh the difficulties of coal storager and handling.

For the present Phase I, electricity by means of a heat pump, is suggested. While heat pump installations were once an oddity with limited application, often unsound from both an engineering and economical standpoint, their increased use in the last 15 years has given operating experience which proves their soundness in certain areas of application.

The essential criterion in selection of heat pump is the Coefficient of Performance (COP), which is actually realizable in a given installation. Generally, heat pump systems are either of the air source or water source type. With air source units, a COP of 3.0 to 3.5 can be realized. With a water source system, the COP depends on supply water temperature. A 50° to 55°F water temperature is to be assumed around Fairfax, so that a COP of 4.0 can be estimated, ranging the heat pump cost about equal to that of coal.

It is impossible to predict the relative economic position of the various fuels at some future date. Prices can vary, technological refinements can alter desirability of one fuel over another. It is, therefore, recommended that equipment selected to meet Stage I requirements incorporate any flexibility which will assist its utilization in future stages.

C. Space Requirements

Space is an important consideration. In new construction, service areas detract from the primary function of the building. Any reduction in space requirements of one alternate over another must be considered as an investment saving equivalent to the cost of construction of a building volume equivalent to that saved.

In existing installations, any space saved by conversion of the heating system must be considered as added income in an amount equal to rental costs for equivalent space in the same locality.

Alternate systems which have been considered do not vary appreciably in terms of space requirements during Stage 1 developments. As the initial load during Stage 1 is of moderate size, a degree of centralization can be procured by having the basic components of the system centrally located in a service area of one of the Stage 1 buildings.

As the College grows and the heating load becomes larger, the possibilities of centralizing at least part of the heating equipment should be considered. The desirability of centralization increases with the heating load and the advantages which would accrue to the College can only be assessed as the building program progresses.

PRIMARY SYSTEMS

By a primary system, we mean the basic heat generating and cooling equipment and the required distribution system, as well as the heat carrying medium. It is best to select, as location for this basic equipment, a service area of a building or building group to be heated.

The distance over which the distribution lines must run to supply outlying buildings will, to a large degree, govern the type of system which is feasible, as well as the temperature level at which the system will operate. Thus, a system which has a very extended distribution system will operate at high temperature levels to minimize the circulation requirements. High temperature water systems have been particularly successful for both large installations and those with long distribution runs. The Air Force makes it mandatory to use central plant high temperature water systems for new installations over 1000 HP, (33 million Btu/hr).

The following alternate primary systems have been considered.

1. Conventional boilers fired with fossil fuels generating low pressure steam.

2. Forced circulation hot water generators fired with conventional fuels to produce low temperature water at temperatures from 160 to 200°F.

3. High temperature hot water generators, producing forced circulated hot water at temperatures up to 400°F.

4. Electrically driven heat pumps with air or water sources supplying low temperature hot water during the heating season and chilled water of 42-48°F. during cooling season.

5. Combination of the above which would increase comfort standards and allow maximum reliability of the system with minimum investment.

A final selection cannot be made at present. The design for Phase I shall be so arranged that any one of the five primary systems can be selected and the equipment presently installed can be modified in case of future centralization, and would not need to be discarded.

RECOMMENDATIONS FOR PRESENT PHASE I

Based on all of the information we have available, and subject to a more detailed analysis of well water available at the site, we make the following preliminary recommendations for Phase I:

A. Primary System

We recommend installation of a heat pump system to serve the 5 buildings of Phase I. This equipment would be installed in the basement of Building "C", with supply lines running to the other four buildings at some convenient sub-surface level. These heat pumps would be sized to meet the base load of the buildings during the heating and cooling season, with some spare capacity.

It is not possible in northern Virginia, to match the winter and summer loads, thereby bringing equipment size to balance. Invariably, the summer load is the smaller of the two. We therefore recommend a peak load standby unit or enlargement of the summer heat pumps required in order to also carry the peaks during inclement winter weather.

B. Secondary System for Balanced Cooling

We recommend as a secondary system, a central fan room located in the attic area of each of the 5 buildings. The heating or cooling medium from the centrally located heat pump system would be circulated to the individual fan room. At this point, air will be passed over coils to condition the air for delivery to the rooms inside the building. Air circulation would be through two ducts, one each supplying heated and chilled air. Mixing boxes located in each room will control various quantities of hot and cold air for proper conditioning of the air to the individual rooms. Each room will, therefore, have its independent control which can be regulated depending on occupancy and use of the room.

To maximize efficiency we recommend air-to-air heat exchanger in each fan room to utilize the waste heat during both heating and cooling seasons.

The hot water supplied by the heat pump will be circulated through perimeter convector surfaces or baseboard heating units, to increase efficiency by decreasing the load on the air system, and at the same time to increase comfort by preventing cold downdrafts, often a source of discomfort in rooms with considerable glass areas.

PART II

ELECTRICAL SERVICES

GENERAL REQUIREMENTS

To obtain a power distribution system which is adequate to meet the service reliability requirements of the college plant and yet which is lowest in cost, requires that the power system engineer plan the power distribution system on an overall inclusive basis. While the electrical system is installed in parts, such as substations, cable, bus switchgear, transformers, etc., the system nevertheless functions as a complete integral unit. There are many factors which must be considered in the overall planning of a power system. Some of the more important aspects to be considered are safety, economics, planning for future load growth, simplicity, flexibility, and service reliability. Of course, the consideration of all factors must be tempered by judgment.

In the course of designing the power system, the following will be checked:

1. Nature and magnitude of loads.
2. Source of power.
3. Cost of power system.

4. Selection of voltage levels.

5. Circuit arrangement.

6. Economical substation size.

7. Secondary distribution within buildings.

8. Short-circuit protection.

9. Overcurrent protection.

10. Grounding.

The electrical system design for the George Mason College project will consist of four major divisions: the overall power distribution system, the interior electrical system for each building, the exterior area lighting system, and communication and signaling systems.

A. Overall Power Distribution System

From the preliminary site plan we learn the George Mason College is to be built in stages. The first stage will require about 500 KVA of power based on preliminary estimate. The service for Stage I will be brought into the site by the utility company at 7200/12500 Y volts, 3 phase, 4 wire and will be transformed to 2400 volt, 3 phase, 3 wire for distribution between buildings. The choice of 2400 volts as distribution voltage is based upon the great distances between extreme buildings on the site and upon our present preliminary knowledge of the loads. This distribution voltage is subject to change at the time of system design depending upon final load information and building arrangements.

Transformers substations would be used at each building to transform the voltage to 120/208 Y, 3 phase, 4 wire for utilization within buildings. The type of distribution circuit arrangement contemplated is a radial type in view of the low cost of such a system. Yet, this system provides adequate service reliability and easy operation. The method of distribution would be underground duct banks between buildings for present and future feeders. The use of overhead feeders on pole lines, though somewhat less expensive, would mar the effects of the landscaping and would also present a hazard to personnel and buildings. The substations would consist of either dry-type transformers within buildings or liquid-cooled transformers in underground vaults adjacent to each building, depending on relative costs. Subdistribution within each building would be by means of 209/120 volt switchboards, feeders, and panelboards.

When building construction progresses to Stages II, III, and IV, a new service could be brought in. This service would require approximately 1000 KVA additional capacity and also would be transformed from 12500 volts to the intermediate voltage for site distribution.

The choice of 2400 volts as distribution voltage, mentioned above, is based on the ultimate size of the college plant in order to be adequate for Stages II, III, and IV in addition to the present Stage I. This will give the completed college plant a single voltage distribution system, with typical substation units at each building. This system offers the advantage of interchangeability of equipment and reduction in the complexities and cost of maintenance, and spare parts inventory.

B. Interior Electrical System

The electrical design of the interior of each building would depend upon the type of lighting fixtures, possible maximum electric loads on the respective floors, the duration of the peak loads, the additions of load by various appliances, special requirements such as laboratories and the probable increases due to changes in use of the floors. The electrical design also involves a knowledge of the number, location, and maximum loading of all utilization outlets required. With this information, it is possible by using approximate demand factors, to compute the number and size of circuits and feeders required. The exercise of judgment becomes a design factor only in determining which circuits should have spare capacity and in what amount their current carrying capacity should exceed the calculated load. This provides for increased load capacity which is likely to be experienced during the useful life of the building. Of course, specific requirements of the university regarding spare capacity will also be included in the design.

The National Electrical Code will be regarded as the minimum standard for the interior design, with any local codes or ordnances adhered to when applicable. In view of the small number of motors required, it is feasible to use 208 volt, 3 phase motors within the buildings to avoid the expense of additional voltage levels.

C. Exterior Area Lighting System

The design of the exterior area lighting system must be based on the Architectural and Landscaping design. The source of power for the area lighting can be obtained from a central location or from the buildings nearest the area to be lit. We understand that a minimum of area lighting is to be installed under Stage I. In this case, due to the minimum program and stages of construction, it would be more advantageous to feed adjacent area lighting from the nearest buildings. Additional power capacity for this purpose must be built into the electrical system of each building so that the area lighting can be expanded in the future, paralleling Stages II, III and IV. Control of outdoor lighting will be accomplished by using an astronomical dial time switch as a pilot device to energize lighting contactors. By a suitable relaying system, outdoor lighting will automatically be turned on throughout the site. This system allows complete flexibility as outdoor lighting demands increase in future building phases.

D. Communication and Signaling Systems

Consideration must be given to the installation of various systems of communications and signaling for safety of personnel and property, to facilitate the conduct of school business and to implement education through audio-visual means. Many aspects of these communications and signaling facilities are controlled by state laws and/or local ordinances which must be adhered to. The following systems are usually employed within school buildings:

a. Telephone System

b. Fire and Sprinkler Alarm Systems

c. Watchmen's System

d. Central Control Time System

e. Paging and Announcing System

f. Radio and Television System

g. Closed-Circuit Television System

Facilities for housing these systems provided during construction period make possible the concealment of cables which will improve the general appearance of the building. The mechanical protection afforded the cables and wires serves to prevent service interruptions. The flexibility provided by such facilities makes possible rearrangements and changes in the various communication circuit terminations without the need for drilling holes through finished floors and walls, exposing cables in halls and rooms, and marring walls and trim by wire attaching devices.

The actual type and extent of the systems required will depend on the requirements of the university. They should be analyzed carefully so they will be specified accurately in the final design to meet the school's requirements.

PART III

PLUMBING SERVICES

GENERAL REQUIREMENTS

The general requirements for plumbing facilities to satisfy present and future construction phases for the George Mason College plant call for the following provisions:

Cold water, hot water, hot water recirculation, gas, sanitary and storm water drainage; the selection of fixtures and determination of total number of fixture units; the disposal of chemical and bacteriological wastes coming from the science laboratories; and adequate fire-fighting means. With the addition of a swimming pool in phase III, chlorination and admixture of chemicals, filtration and, possibly, ultraviolet ray treatment for the sterilization of pool water will be needed.

A. Water Distribution System

It is our understanding that the Town of Fairfax will provide a water supply main to the College Site, and that the Consulting Site Engineer will provide for bringing the water supply line to a location at a building mutually agreed upon.

We recommend the use of a single metered service line and a water distribution system between buildings with its point of origin downstream of the metering station.

Each building would be furnished with a stop and waste valve to permit individual isolation of buildings in the event of repairs.

The materials used for water-supply pipes within a building include wrought iron and steel, usually galvanized; brass; and copper. Galvanized iron, wrought iron and steel pipes with threaded malleable iron fittings, have given satisfactory service, experience with them is wide, and their first cost is relatively low when compared with other acceptable materials. Copper and brass pipe using sweat or soldered copper fittings are more resistant to corrosion than are galvanized pipes and they are sufficiently smoother to effect a comparable economical installation by somewhat reducing their size in relation to galvanized steel. The use of brass or copper will also result in a longer life and greater reliability. We therefore suggest that for interior water distribution within buildings either brass or copper piping and fittings be considered first. Detailed material take-off and an economic comparison of material and labor (installation) costs will be one of the decisive factors in the final selection of these materials. Such factors as longer life, greater reliability, lower maintenance and repair costs deserve close consideration, however, particularly where comparable cost estimates are so close to each other as to make above variables the prime basis for material selection. It is suggested that specifications state that all piping 6" and smaller for cold, hot and circulation water, except underground distribution piping shall be brass pipe, standard iron pipe size, conforming to the standards of the A.S.T.M. current edition with a minimum copper content of 85%. All lengths shall have identifying name stamped on metal.

Piping for underground domestic water distribution shall be cast iron, such as AWW Class 150 corporation pipe conforming with the standard specifications of the American Water Works Association except piping 2" and smaller shall be copper tubing.

We recommend that all cold water piping, except riser branches in enclosed shafts and vertical furring, shall be covered with heavy duty 1" thick sectional wool felt covering with tar paper lining on the inside and heavy glazed asbestos jackets. All hot water and hot water circulation piping throughout, except riser branches in enclosed shafts shall be covered with heavy duty 1" thick 4-ply air cell sectional pipe covering with heavy glazed asbestos jackets.

B. Sanitary Drainage System

It is our understanding that the Consulting Site Engineer will provide a sanitary sewer system to which the work to be designed by American Hydrotherm Corporation will tie in. We will determine the location of tie-in points at each building in consultation with the site engineer and provide the design for all interior plumbing. We recommend that all leaders, soil, waste, vent and drainage lines 2" and larger shall be extra heavy cast iron soil pipe and fittings. Galvanized steel screwed pipe and fittings can be substituted in lieu of cast iron specified.

It is suggested that all sanitary house sewer piping shall be extra heavy cast iron Bell & Spigot pipe and fittings.

A very limited storm sewer system, primarily serving the asphalt surfaced parking lot, will be provided by the site planning consultant. Roof drains of cast iron, copper, lead or other corrosion-resisting materials furnished with strainers and proper flashing shall serve to drain building roofs. Leaders shall carry the roof drainage to ground level where it will be dissipated either through a properly graded runoff, subsoil or foundation drains.

C. Gas System

Points of location requiring gas services are the laboratories and the kitchen. It is conceivable that the Gas Utility Company will not install a gas main to the College Site at the Utility's expense because of the low anticipated gas consumption. The use of bottled gas should then be given consideration. The installation of a municipal gas main would, however, be preferable, considering future expanding requirements and greater reliability.

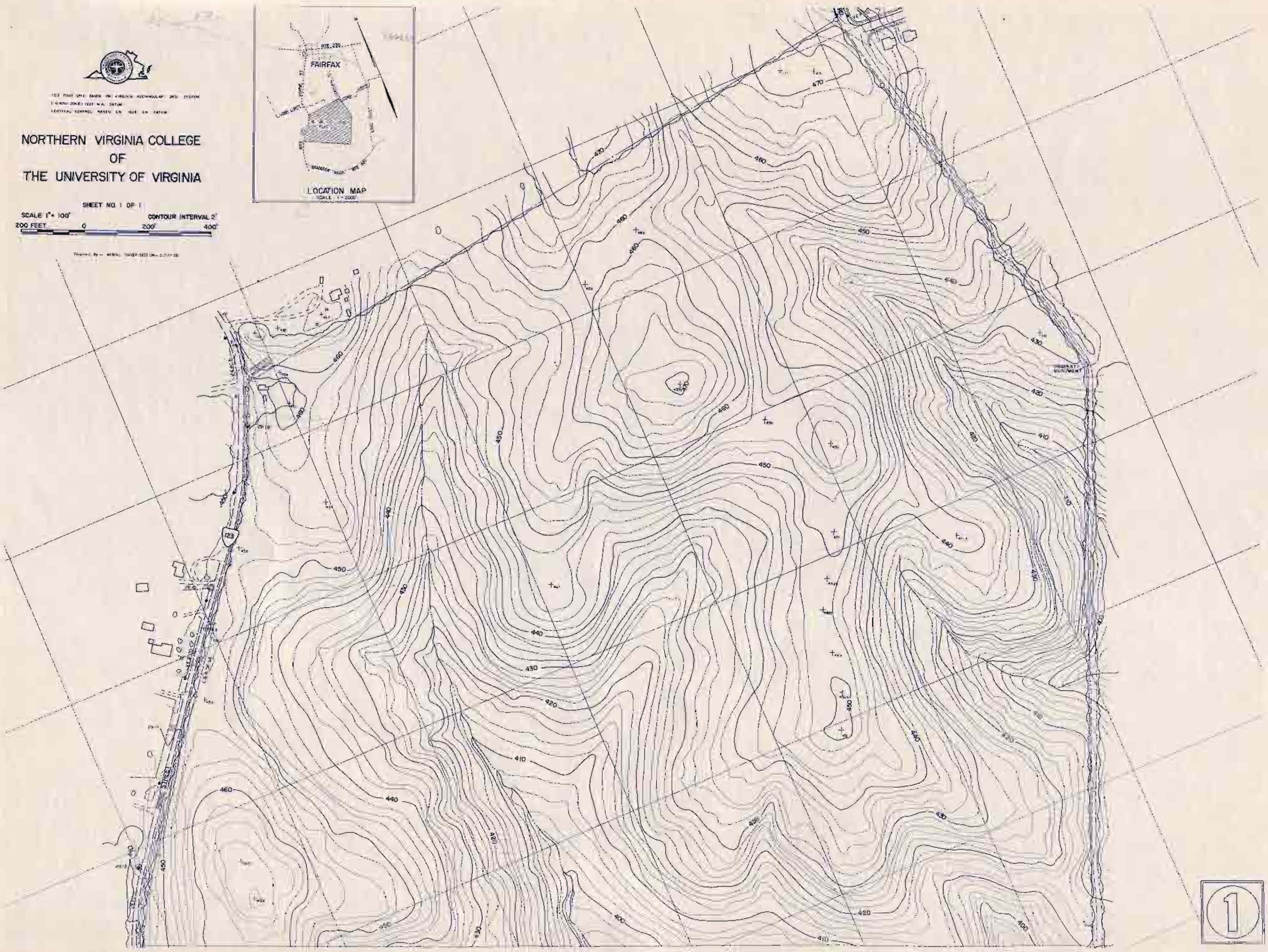
If a municipal gas main is available, suitable service line connection and distribution as well as interior building piping will be designed by the Engineer. Necessary arrangements will have to be made with a utility company to bring service connections to the property line or other suitable points and to provide the necessary pipe, fittings, drip pots, valves, service cocks, governors, etc. to extend these services into the building. Wherever possible, gas service lines should pitch toward the gas main, otherwise, if pitching toward buildings, they should be provided with drip legs. We recommend that gas piping inside buildings shall be standard weight black steel pipe with malleable iron fittings. We also suggest that at the outside of the wall at the entrance and exit point of gas service to each building, a gravel vent pit and a $1\frac{1}{2}$" galvanized vent pipe be installed. Because of greater economics attained through conjunctional metering, we recommend that a single gas meter be installed and a gas distribution system between buildings be provided.

D. Fire Protection.

All buildings will be of fire resistant construction. It is a matter of mutual co-ordination between local authorities, the owner's insurance underwriter and recommendations by the National Board of Fire Underwriters or Factory Mutual to establish adequate fire protection. It is anticipated at this preliminary planning stage that a system of fire hydrants properly located around the Campus site in conjunction with wall-hung soda-acid type hand fire extinguishers might fulfill overall requirements excepting such locations as laboratories and kitchen which might call for special treatment.

E. Miscellaneous

After determination of laboratory requirements means for the disposal of chemical and bacteriological wastes can be selected, if necessary. Consideration will then be given to the application of special traps, interceptors, acid resistant fittings and basins as required. The necessity for the disposal of solid garbage also deserves investigation in the overall plumbing scheme as does the future pool drainage and pool sanitation problem during the third phase.


NORTHERN VIRGINIA COLLEGE
OF
THE UNIVERSITY OF VIRGINIA
SHEET NO. 1 OF 1
SCALE 1" = 100'
CONTOUR INTERVAL 2'
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FAIRFAX
LOCATION MAP
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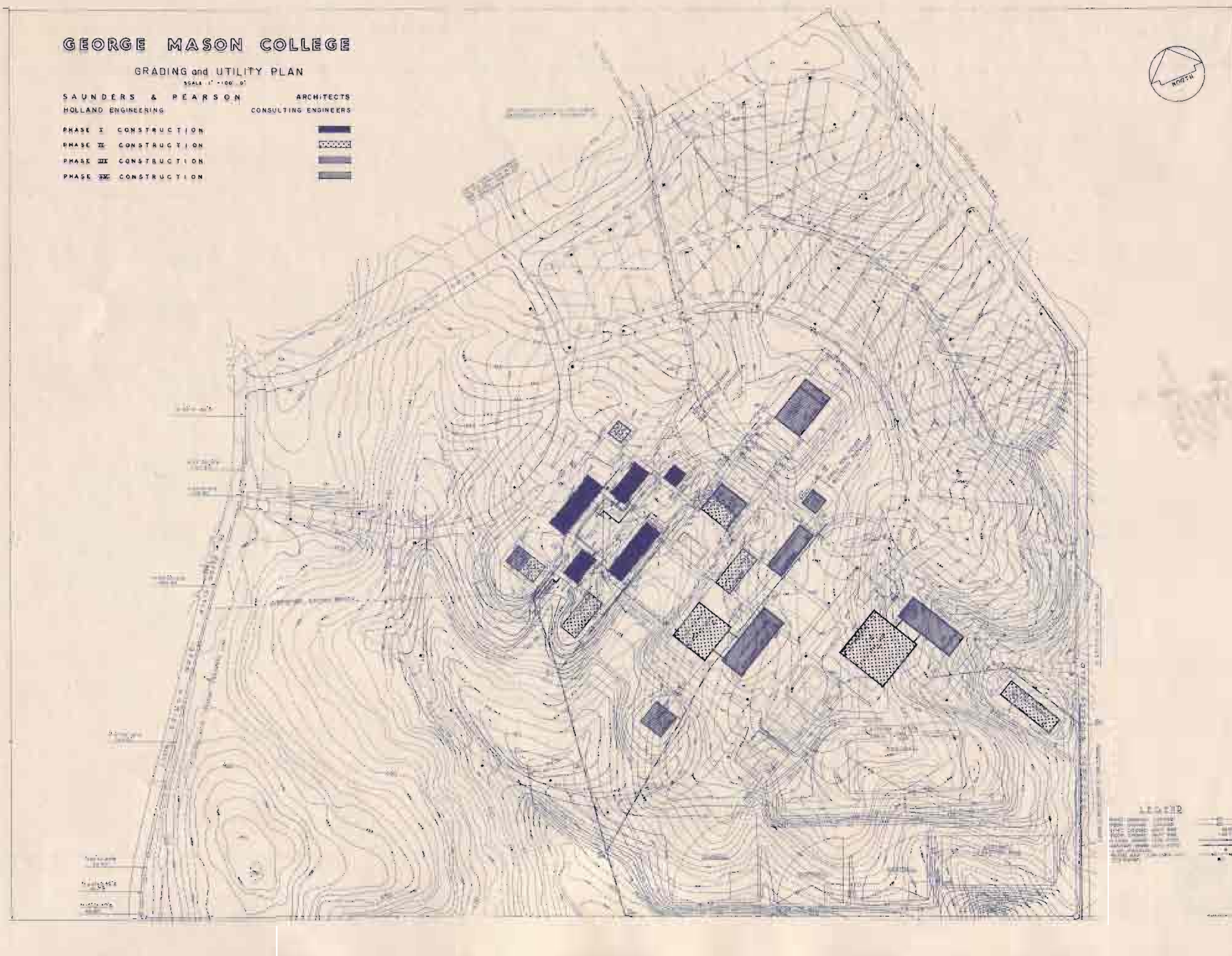
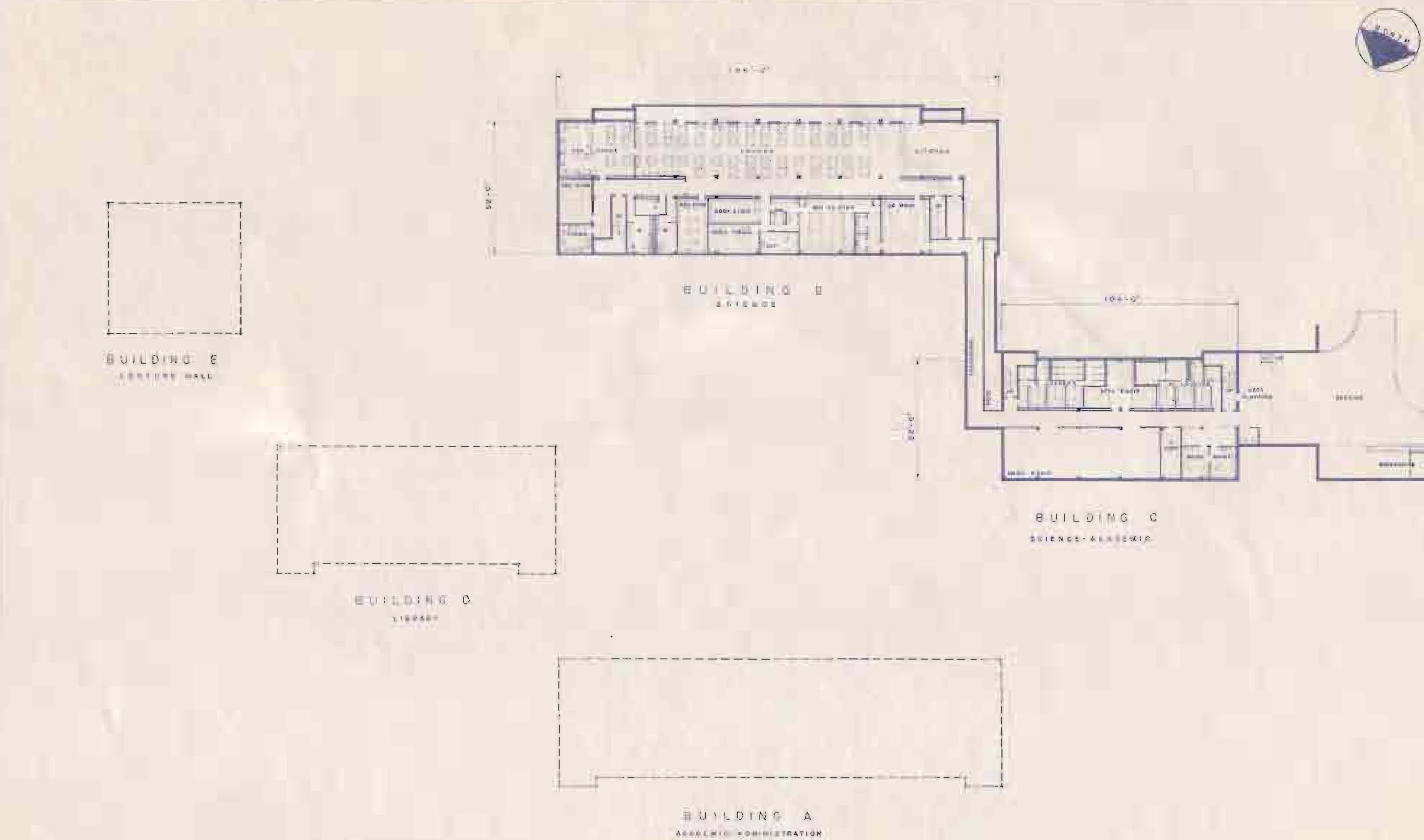
GEORGE MASON COLLEGE
MASTER SITE PLAN
CONSULTING ARCHITECTS


GEORGE MASON COLLEGE
GRADING and UTILITY PLAN
SCALE 1" = 100'-0"
SAUNDERS & PEARSON ARCHITECTS
HOLLAND ENGINEERING CONSULTING ENGINEERS
PHASE I CONSTRUCTION
PHASE II CONSTRUCTION
PHASE III CONSTRUCTION
PHASE IV CONSTRUCTION
NORTH
LEGEND



BASEMENT LEVEL

SCALE: 1/16" = 1'-0"

GEORGE MASON COLLEGE

SAUNDERS & PEARSON, ARCHITECTS, ALEXANDRIA, VIRGINIA

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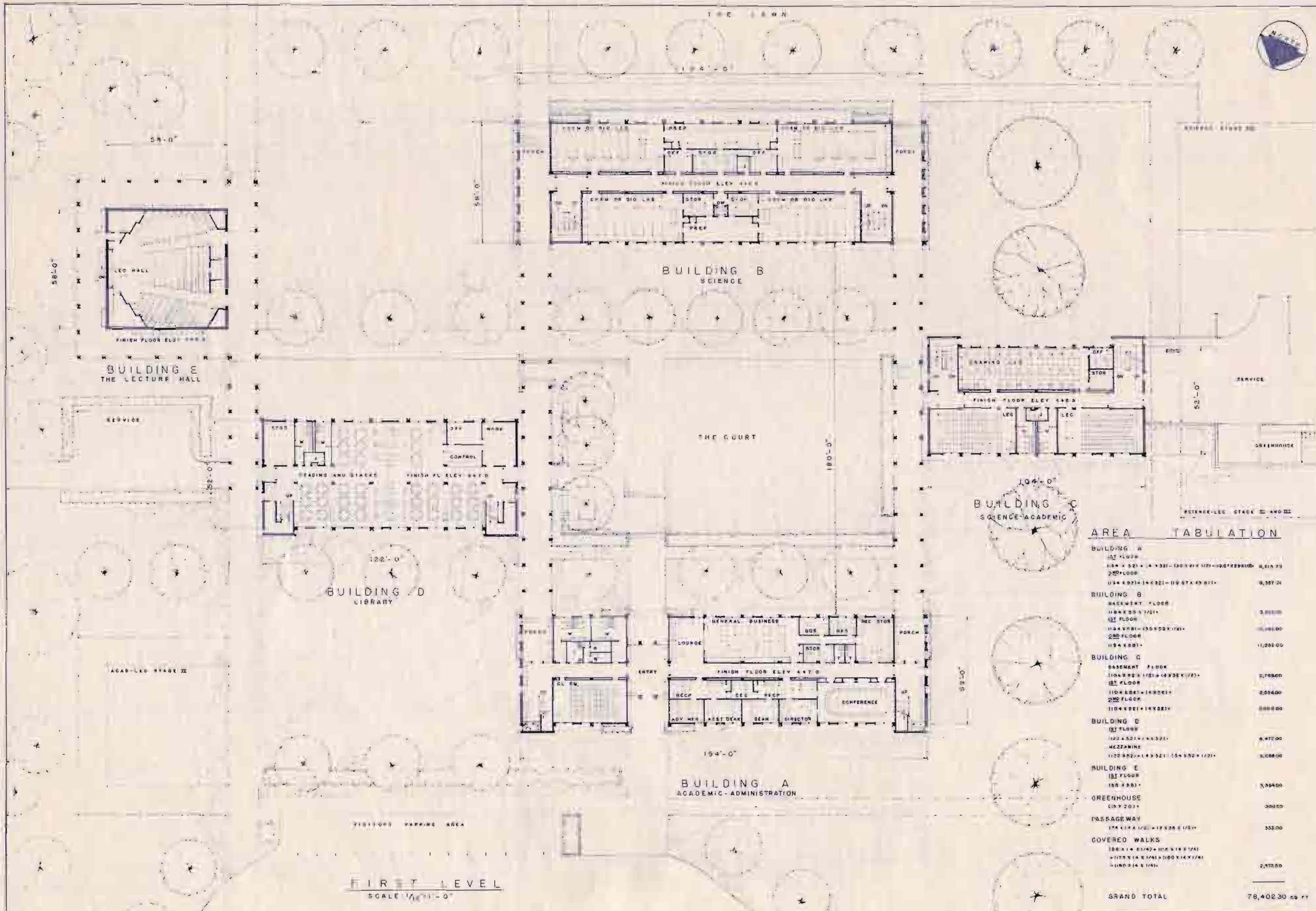

G E O R G E M A S O N C O L L E G E

SAUNDERS & PEARSON, ARCHITECTS, ALEXANDRIA, VIRGINIA

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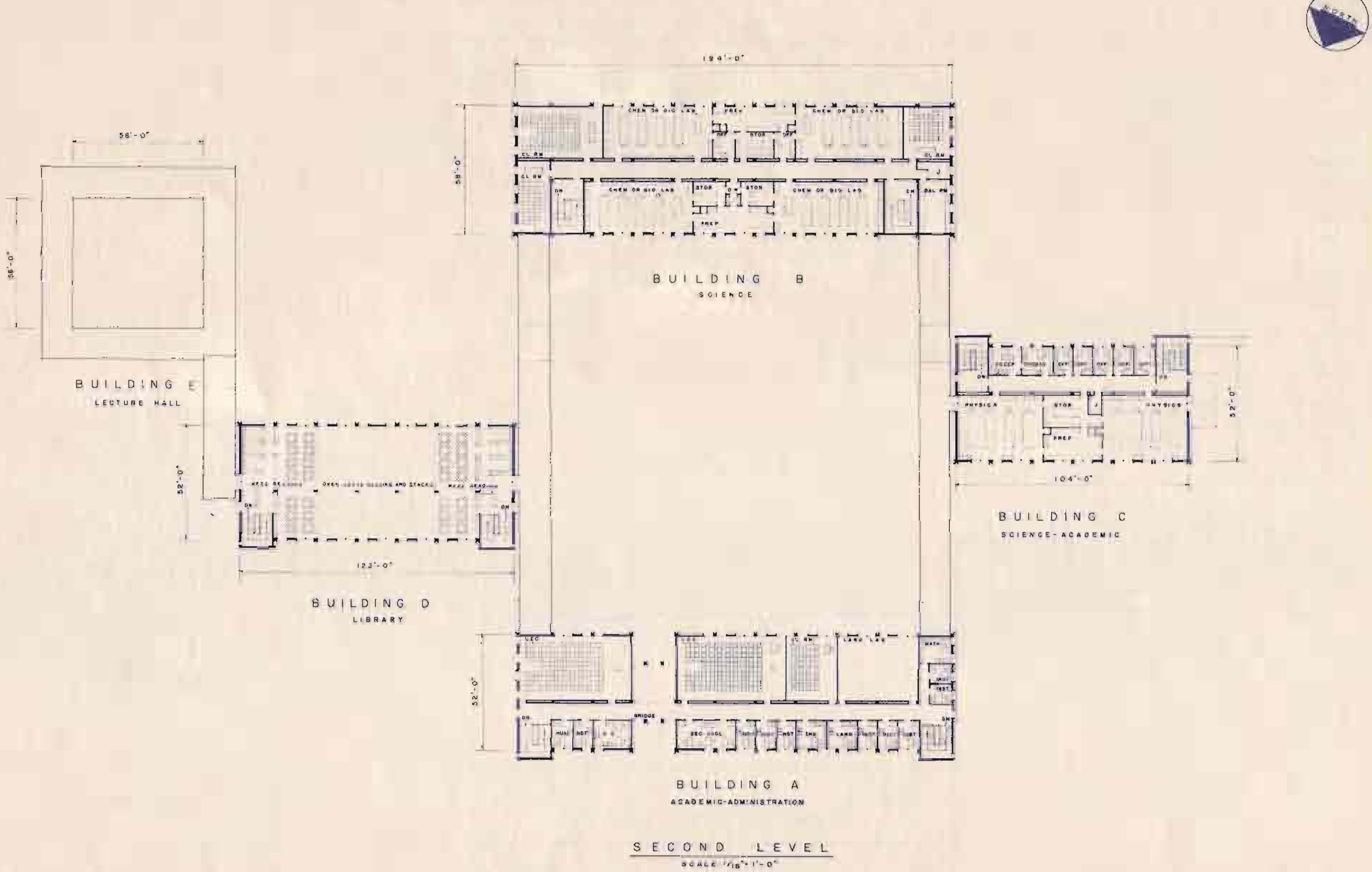

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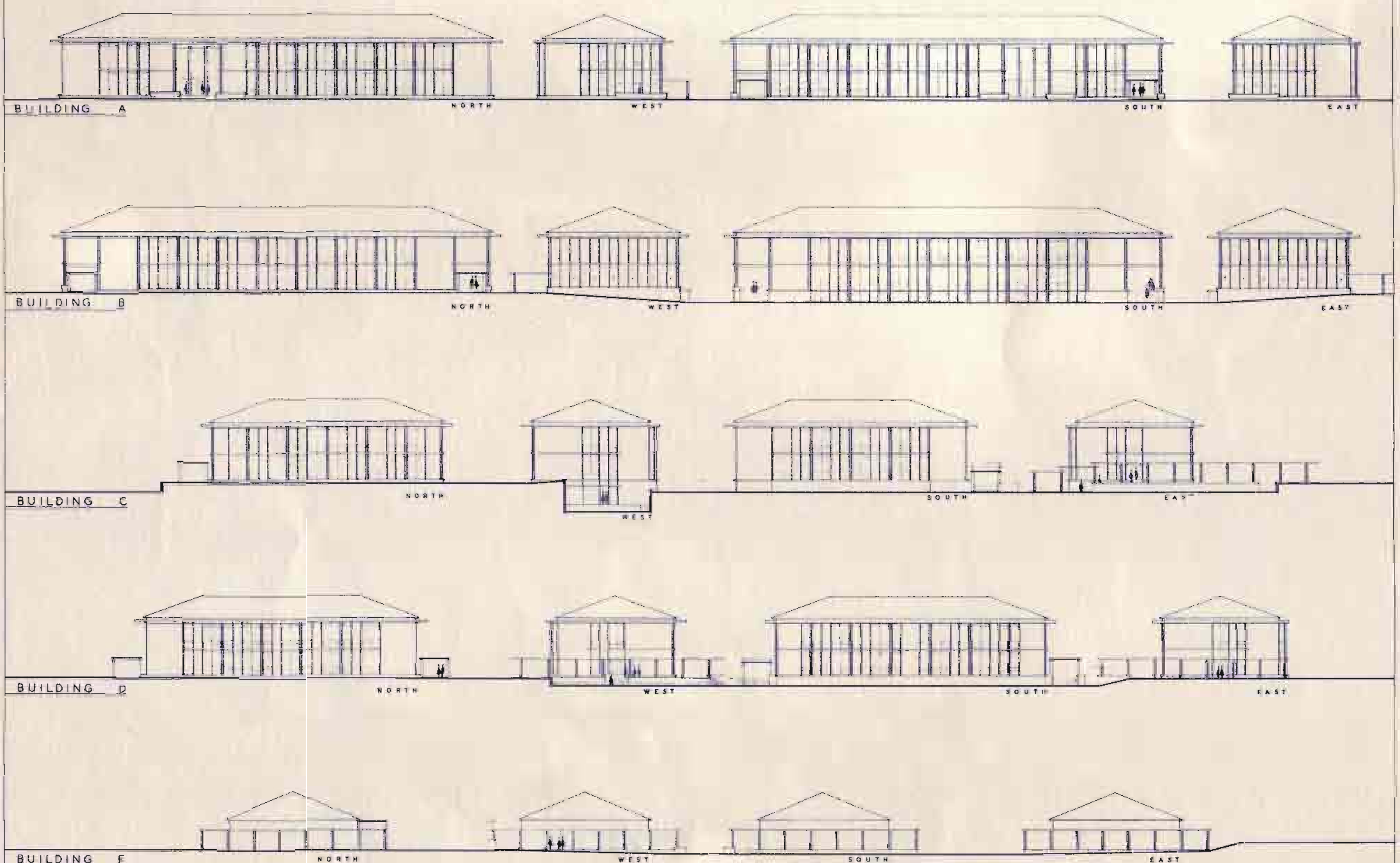

G E O R G E M A S O N C O L L E G E

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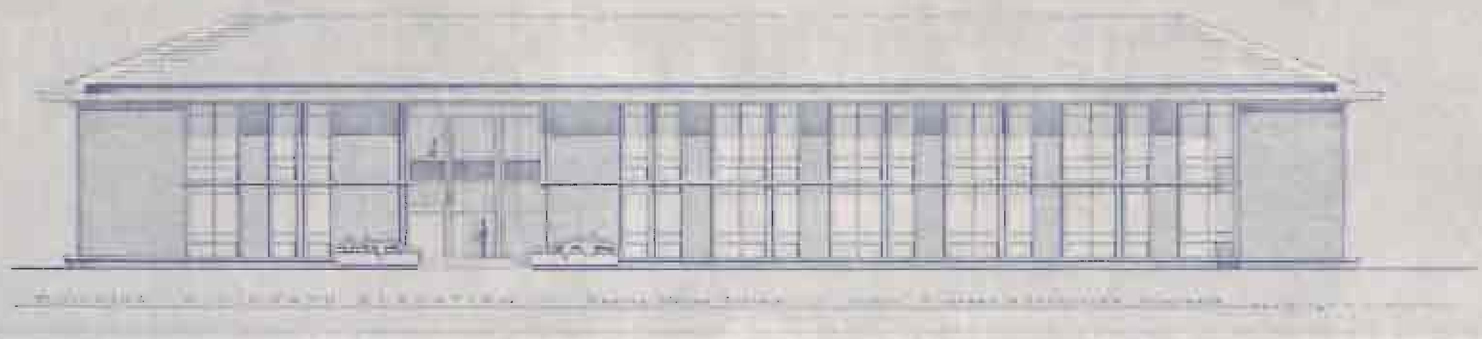

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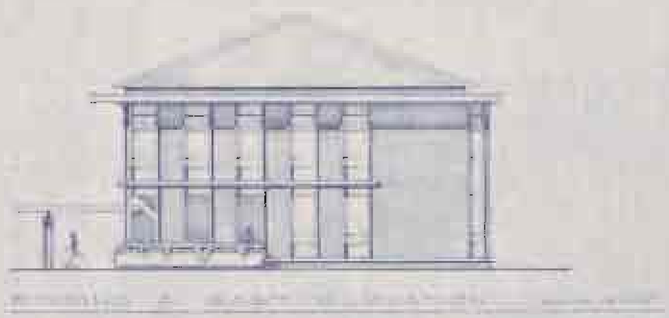

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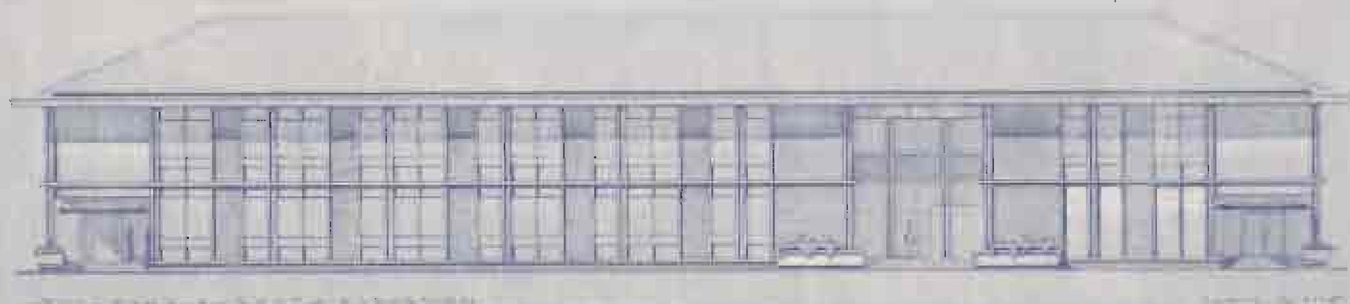

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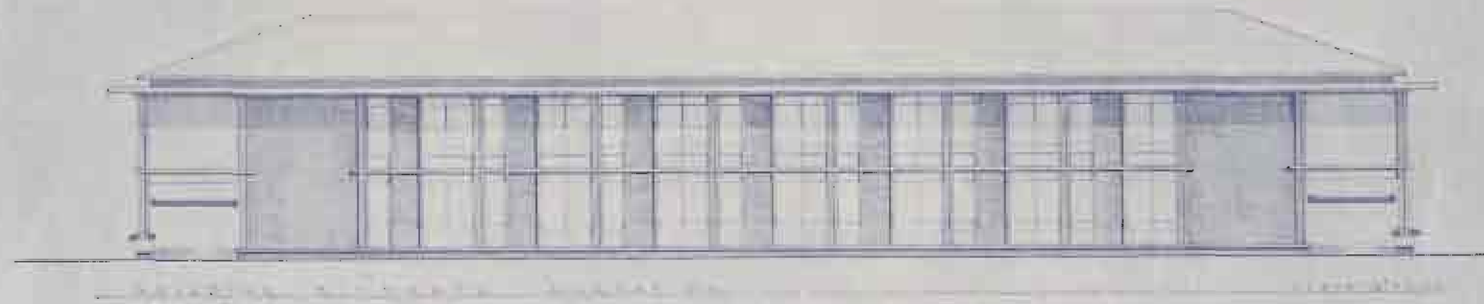

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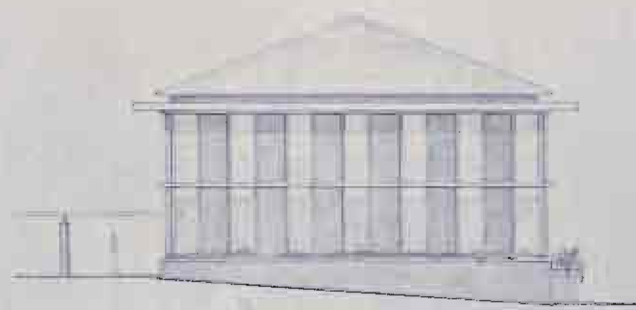

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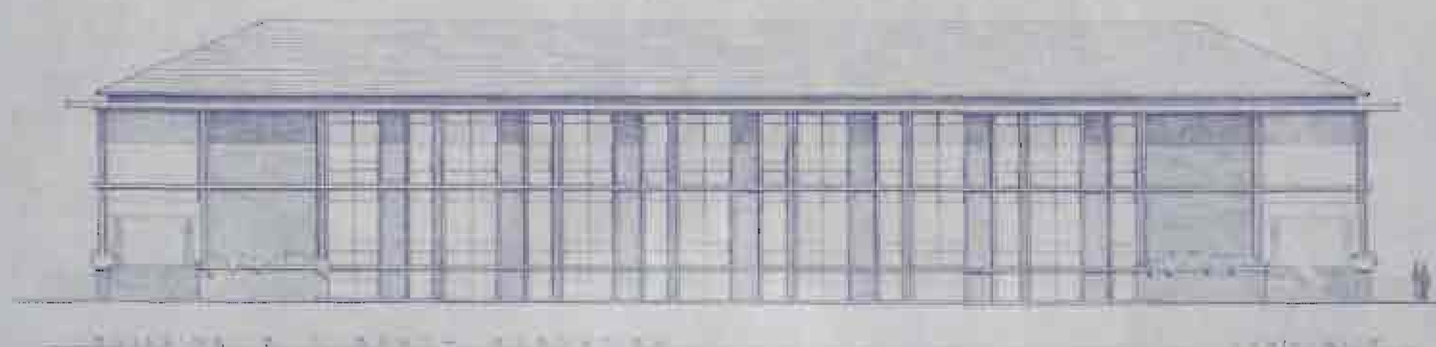

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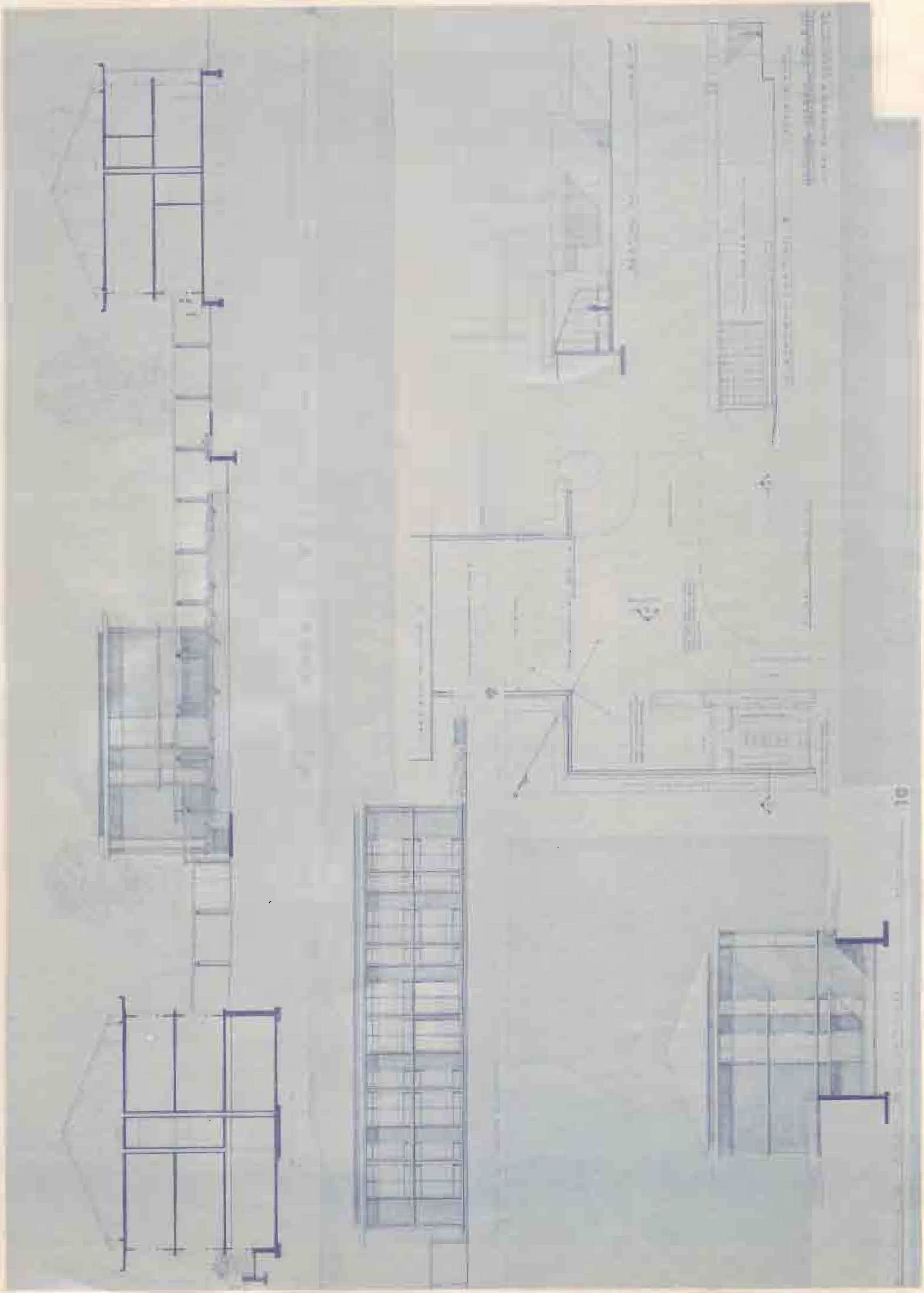

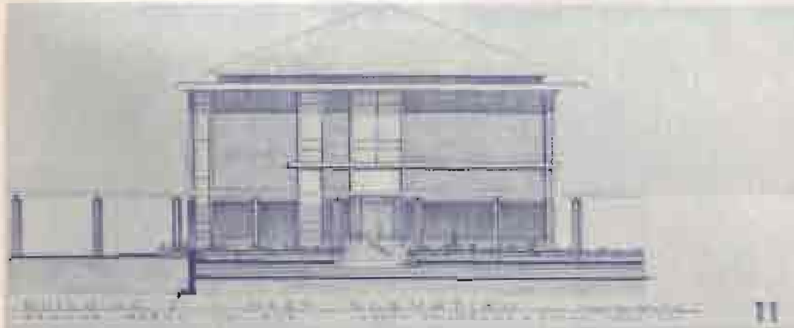

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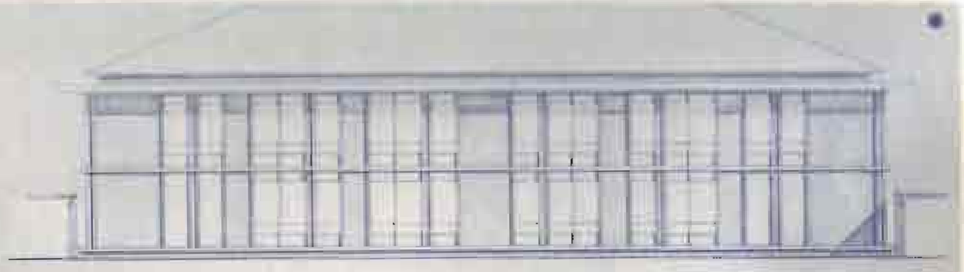

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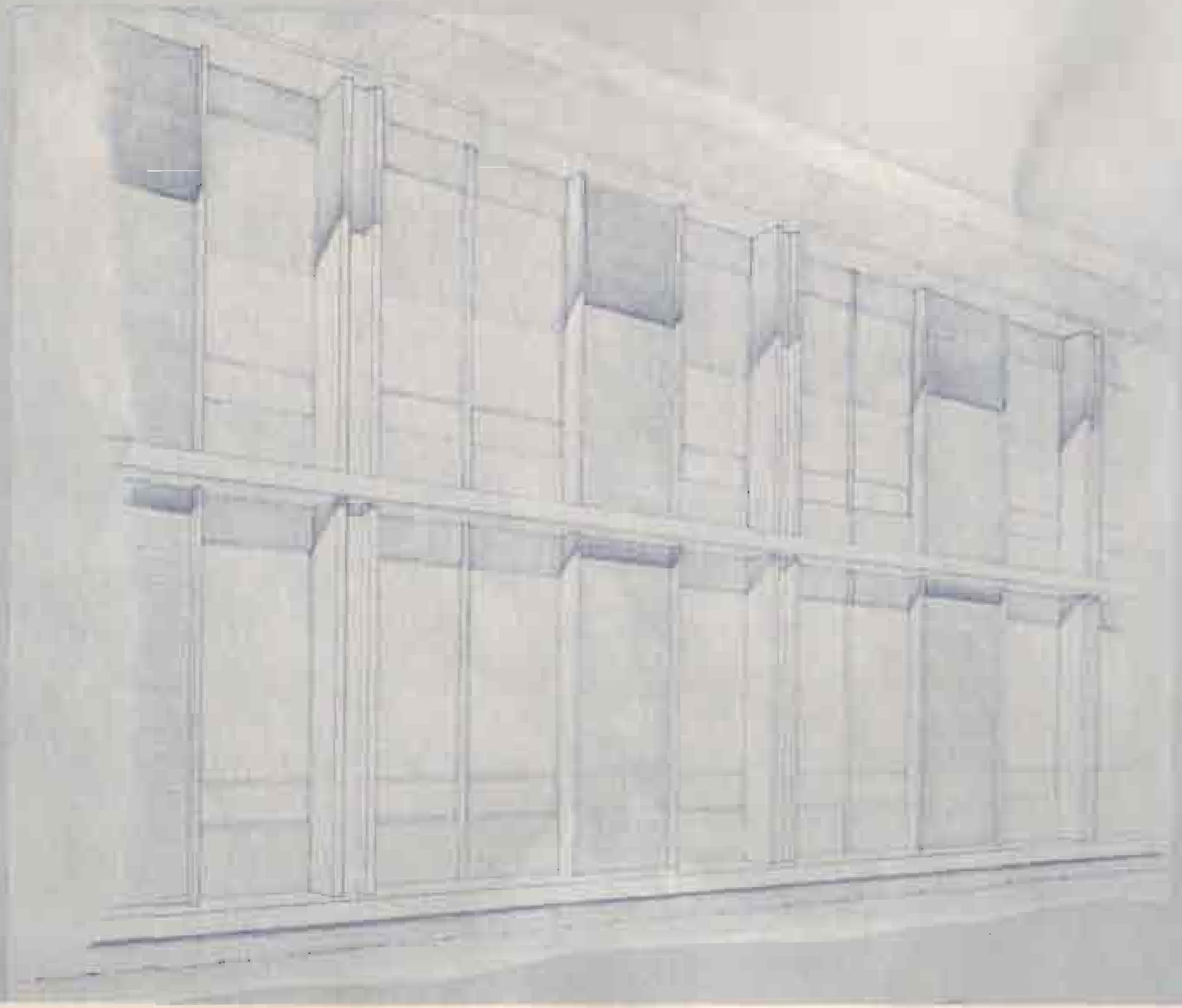

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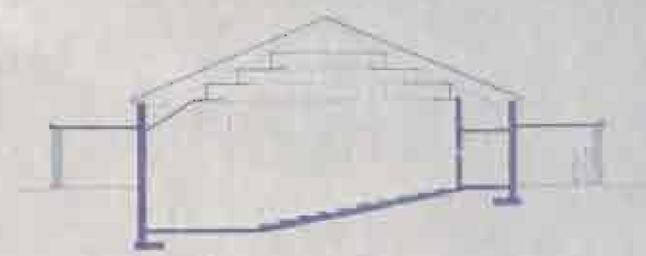

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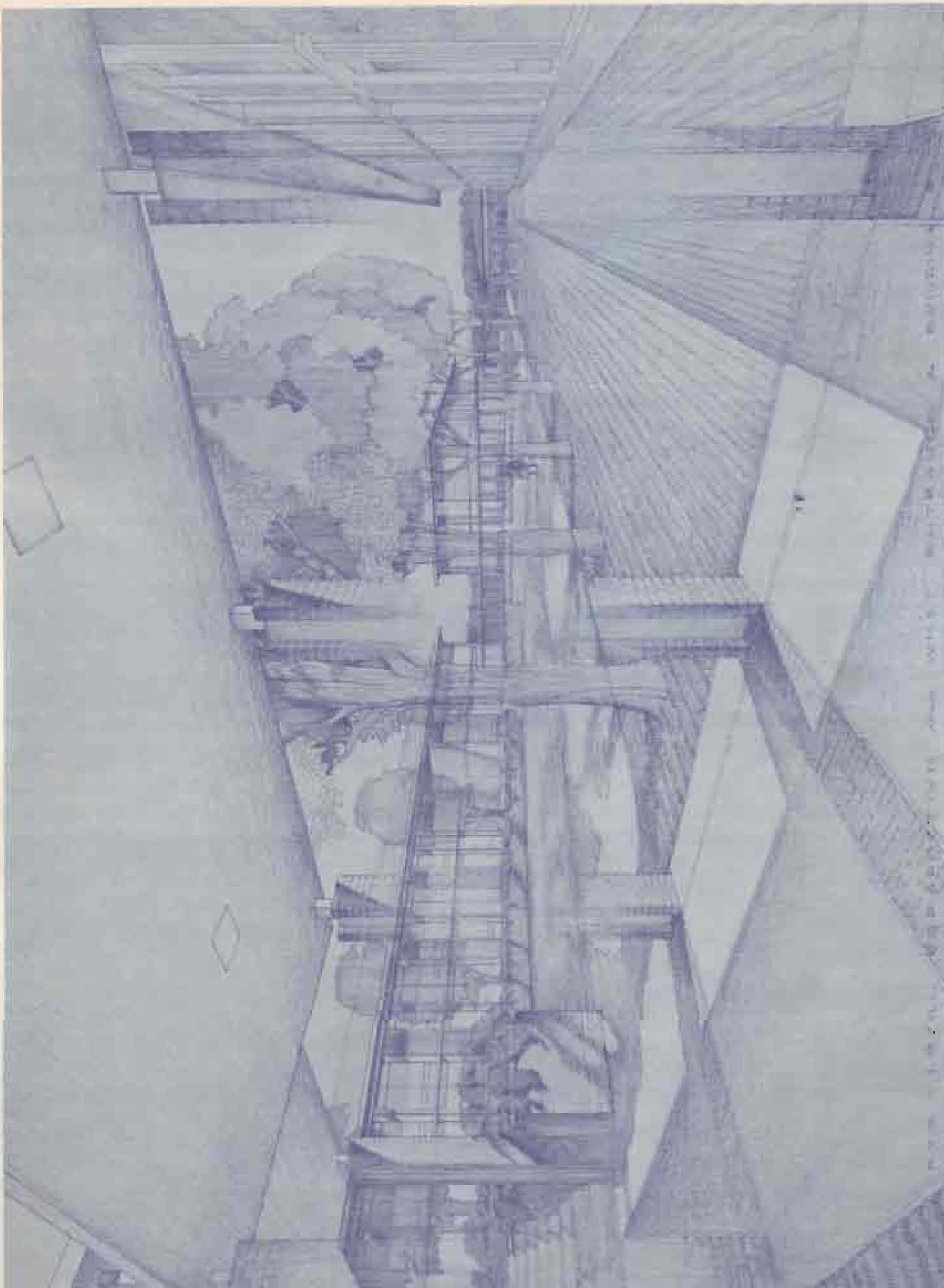

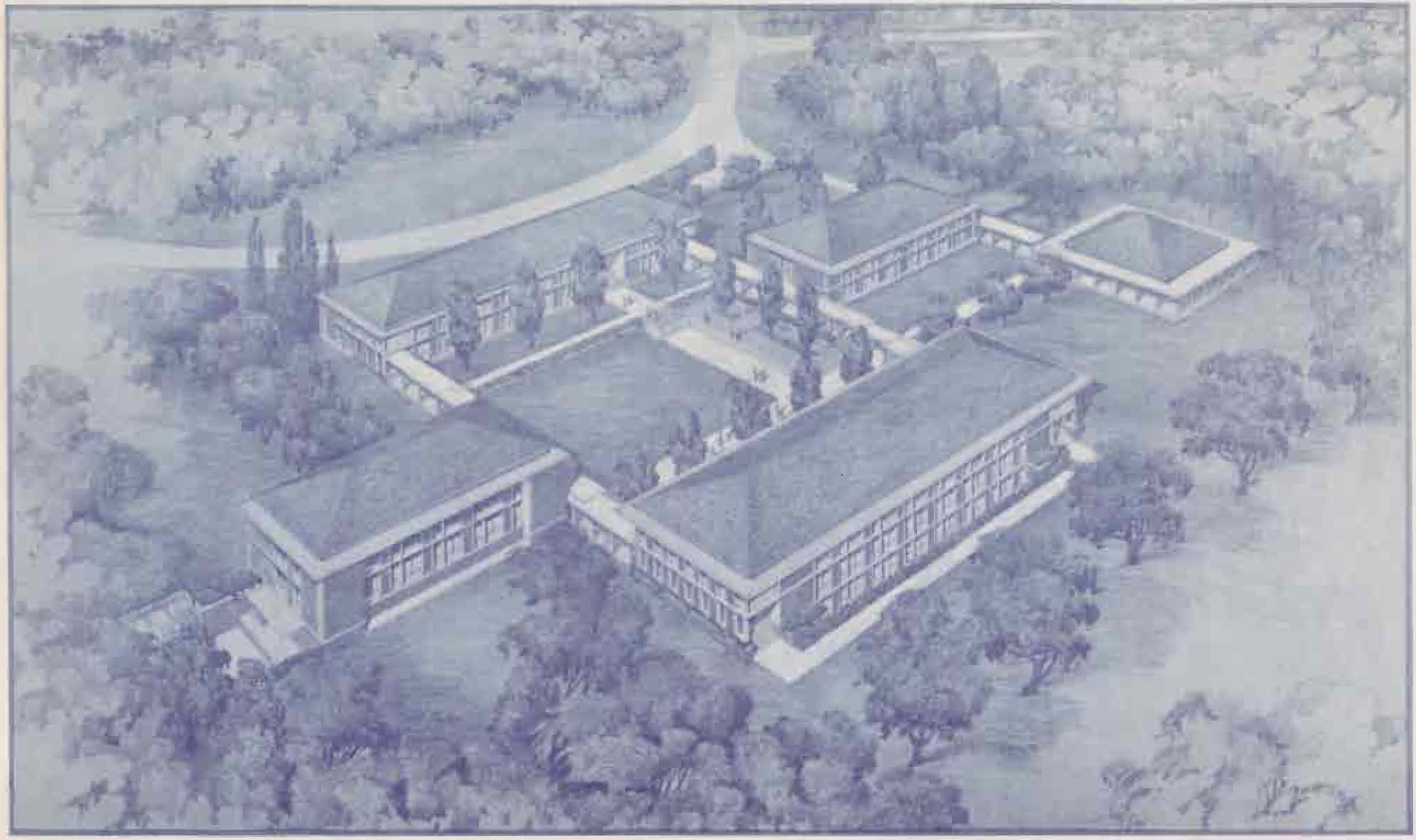

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VIEW OF STAGE I CONSTRUCTION

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