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Site Analysis for Capitol Annex Building

MEMORANDUM

To: Capitol Area Architectural and Planning Board

From: John Harkness and Clark Wold, Architectural Advisors

Date: November 26, 1975

Subject: Site Analysis for Proposed Capitol Annex Building

Enclosed is the Report and related appendix of the Site Analysis for the proposed Capitol Annex Building requested of the CAAPB by the Legislative Annex Building Committee.

The analysis is presented in the form of pros and cons, drawings, and other relative information to assist the Board and the Committee to select a proper site for this building which has a major impact on the function and aesthetics of the Capitol complex.

We have been requested to analyze two sites:

Site B - located immediately west of the Capitol

Site C - located immediately south of the Capitol

The currently programmed building is relatively small and can be accommodated on either site. No information came forth in this study that would immediately preclude one site over the other.

A sincere and strong concern has been expressed that Site C will alter the present approach to the Capitol and thus harm the vista of the Capitol building from the south. The same concern must be felt for Site B which could alter the grand approach and vista from the west, and the current aesthetically pleasing relationship of the Capitol, State Office Building and Christ Church.

For the above reasons, consideration should be given to requiring a sub-surface building on Site B as well as C, where such is required by the zoning ordinance. Accordingly, we have analyzed two options for Site B: B_1 with building above grade within the restrictions of the comprehensive plan, and B_2 with the building below grade.

For either site, restrictions and objectives should be carefully outlined in the competition program to assure the preservation, dignity and appearance of the Capitol. Either site demands an introvertive, sensitive architectural solution that will enhance the Capitol complex.

Site selection should be made after careful consideration of all the above factors and with assurance that an appropriate aesthetic solution can be achieved through both programming and the selection of design talent by the required competition process.

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Analysis

CRITERIA

1. CIRCULATION

Premise: Circulation patterns should enforce or relate to future enforcement of Comprehensive Plan

a. Automobile

b. Traffic Flow

c. Transit Routes

d. Pedestrian Circulation

e. Service Access

SITE B_1 (ABOVE GRADE)

1. CIRCULATION

a. Ingress/egress at Rice Street somewhat difficult. Traffic count on Rice = 14,300 vehicles/day.

b. Requires closing of Wabasha diagonal, Park Avenue, and Aurora Avenue between Rice and Wabasha. Is in accord with Comprehensive Plan.

c. Revision of MTC bus routes required. Circulation in accord with Comprehensive Plan.

d. Pedestrian circulation either through tunnel or across plaza to west Capitol entrance. Tunnel or plaza entrance to State Office Building.

e. Service off Rice Street per Comprehensive Plan.

SITE B_2 (UNDERGROUND)

1. CIRCULATION

a. Ingress/egress at Rice Street somewhat difficult. Traffic count on Rice = 14,300 vehicles/day.

b. Requires closing of Wabasha diagonal, Park Avenue, and Aurora Avenue between Rice and Wabasha. Is in accord with Comprehensive Plan.

c. Revision of MTC bus routes required. Circulation in accord with Comprehensive Plan.

d. Pedestrian circulation either through tunnel or across plaza to west Capitol entrance. Tunnel or plaza entrance to State Office Building.

e. Service off Rice Street per Comprehensive Plan.

SITE C (UNDERGROUND)

1. CIRCULATION

a. Ingress/egress at Wabasha circle less difficult. Traffic count on Wabasha = 7700 vehicles/day.

b. Requires closing of Aurora Avenue to through vehicular traffic in front of Capitol. Cedar and Wabasha may close if needed in accord with Comprehensive Plan.

c. Bus routes would change if Wabasha and Cedar are closed.

d. Pedestrian circulation either through tunnel to Capitol or up front steps to rotunda area. Tunnel on surface to State Office Building and Minnesota Historical Society.

e. Service off Cedar Street per Comprehensive Plan.

CRITERIA

2. BUILDABLE AREAS

Premise: Adhere to Comprehensive requirements

a. Area

b. Expansion

3. ARCHITECTURAL CONSIDERATIONS

Premise: Revised program implies minimal exterior light requirements for museum/gallery and hearing rooms since these spaces dictate very controlled lighting.

4. VISITOR'S CONSIDERATIONS

Premise: Visitors entry to Capitol should occur through front into rotunda area as intended. Visitors in mall centroid as per Comprehensive Plan.

SITE B_1 (ABOVE GRADE)

2. BUILDABLE AREAS

a. Allowable building above grade with setbacks and height restrictions. Approx. 5 stories - 250,000 sq.ft. Parking below grade could extend to Capitol.

b. Expansion into parking possible requiring special construction to accommodate same. Expansion could occur on site C.

3. ARCHITECTURAL CONSIDERATIONS

Building not requiring window area is difficult to handle aesthetically - although it is possible and perhaps even exciting if well done.

4. VISITOR'S CONSIDERATIONS

Visitors entry is indirect - through side entrance or tunnel.

SITE B_2 (UNDERGROUND)

2. BUILDABLE AREAS

a. New program could be accommodated in building totally underground. Parking at west edge with facility connecting State Office Building/ Capitol tunnel.

b. Expansion either above grade in space envelope prescribed by Comprehensive Plan or into parking area requiring special construction to accommodate same. Expansion could also occur on site C.

3. ARCHITECTURAL CONSIDERATIONS

Minimal light requirements relates well to undergrade building. Skylights or sunken courts could provide needed exterior light.

4. VISITORS CONSIDERATIONS

Visitors entry is indirect - through side entrance or tunnel.

SITE C (UNDERGROUND)

2. BUILDABLE AREAS

a. Per Comprehensive Plan, the building must be entirely below grade. Area between Wabasha circle and Aurora, Cedar and Wabasha would easily accommodate new program.

b. Expansion to sides or into parking area requiring special construction to accommodate same. Expansion could also occur on site B.

3. ARCHITECTURAL CONSIDERATIONS

Minimal light requirements relates well to undergrade building. Skylights or sunken courts could provide needed exterior light.

4. VISITORS CONSIDERATIONS

Visitors entry to Capitol somewhat indirect through tunnel, excellent up front steps. Bringing visitors into mall centroid considered excellent.

CRITERIA

5. PARKING REQUIREMENTS

Premise: Parking for either 200 or 440 automobiles with space for bus loading. Buses to park off site.

6. ENVIRONMENTAL CONSIDERATIONS

Premise: Sites B and C are considered equal in importance and impact on their effect on the Capitol complex. Its image and symbolism should be maintained or improved by any additional building in the area.

a. Visual impact

a. Visual impact

Premise: Most of the large elms in the Capitol complex will be lost to Dutch Elm disease. A replanting program will be necessary on either site.

b. Site lines

c. Open Space

Premise: Preserve open space in Capitol Complex.

SITE B_1 (ABOVE GRADE)

5. PARKING REQUIREMENTS

Site will accommodate either 200 or 440 vehicles all below grade. Would eliminate 139 surface parking spaces now available.

6. ENVIRONMENTAL CONSIDERATIONS

a. Symmetrical arrangement of period buildings at malls' end (i.e. the Capitol, Minnesota Historical Society, and State Office Building) is disturbed by above grade building.

a. Many large existing trees would be removed, could be replaced between building and Capitol by smaller planting.

b. Building mass above grade would eliminate important University Avenue vista.

c. An above-grade building would infringe on present open space.

SITE B_2 (UNDERGROUND)

5. PARKING REQUIREMENTS

Site will accommodate either 200 or 440 vehicles all below grade. Would eliminate 139 surface parking spaces now available.

6. ENVIRONMENTAL CONSIDERATIONS

a. Symmetrical arrangement remains.

a. Many large existing trees will be removed. Top of building should be landscaped to enhance Capitol complex.

b. A building below present grade would not interfere with site lines.

c. An underground building would not change present open space.

SITE C (UNDERGROUND)

5. PARKING REQUIREMENTS

Site will accommodate either 200 or 440 vehicles all below grade. Would eliminate 64 surface parking spaces now available.

6. ENVIRONMENTAL CONSIDERATIONS

a. Symmetrical arrangement may be reinforced.

a. Many large trees between Aurora and Wabasha would be removed. Trees between Aurora and Capitol can remain. Top of structure should be landscaped to enhance and improve mall use and overview.

b. A building below present grade would not interfere with site lines.

c. An underground building would not change present open space.

CRITERIA

7. GEOLOGY/SOIL

General stratigraphic profile is glacial drift overlying bedrock which may be as much as 200 feet below.

8. UTILITIES

9. ADJACENT STRUCTURES

10. COST: ABOVE GRADE VS. BELOW GRADE

SITE B_1 (ABOVE GRADE)

7. GEOLOGY/SOIL

Surface fill with some rubbel: 1 to 14 feet
Medium and fine grained sand to 51.5 feet.
Ground water at approximately 26 feet.

8. UTILITIES

Sewer and water in abandoned St. Peter. Sewers and water in Park Avenue. Sewer and gas in Wabasha. Main telephone cable in Wabasha and Aurora Streets. A major (30") water main is planned for Park Avenue in 1977. All utilities must be rerouted to accomplish either scheme. Steam and electricity from power house is more indirect.

9. ADJACENT STRUCTURES

None other than connections to existing tunnel between State Office Building and Capitol which will be removed by construction on site.

10. COST: ABOVE GRADE VS. BELOW GRADE

Construction cost equal within 5%.

SITE B_2 (UNDERGROUND)

7. GEOLOGY/SOIL

Surface fill with some rubble: 1 to 14 feet. Medium and fine grained sand to 51.5 feet. Ground water at approximately 26 feet.

8. UTILITIES

Sewer and water in abandoned St. Peter. Sewer and water in Park Ave. Sewer and gas in Wabasha. Main telephone cable in Wabasha and Aurora Streets. A major (30") water main is planned for Park Ave. in 1977. All utilities must be rerouted to accomplish either scheme. Steam and electricity from power house is more indirect.

9. ADJACENT STRUCTURES

None other than connections to existing tunnel between State Office Building and Capitol which will be removed by construction on site.

10. COST: ABOVE GRADE VS. BELOW GRADE

Construction cost equal within 5%.

SITE C (UNDERGROUND)

7. GEOLOGY/SOIL

Surface fill 2 to 10.5 feet. Silty sands and medium grained sands to 51.5 feet. Ground water at approximately 35 feet.

8. UTILITIES

A 12" sewer runs between and parallel to Capitol and Aurora. Would require rerouting at tunnel connection. Sprinkler system on mall. Electrical conduit at perimeter. Steam and electrical from powerhouse more direct.

9. ADJACENT STRUCTURES

The Capitol building is adjacent to Site C. Care must be taken not to disturb Capitol foundations.

10. COST: ABOVE GRADE BS. BELOW GRADE

Construction cost equal within 5%. This site might require more elaborate circulation system and landscaping treatment due to its location.

CRITERIA

11. OPERATING COSTS

12. CONSTRUCTION INCONVENIENCES

SITE B_1 (ABOVE GRADE)

11. OPERATING COSTS

See note on B_2 and C and Appendix E.

12. CONSTRUCTION INCONVENIENCES

Tunnel connection from State Office Building to Capitol would be closed during construction.

SITE B_2 (UNDERGROUND)

11. OPERATING COSTS

A below grade building would require approximately 48% of the heating load and 78% of the cooling load necessary for an above grade building.

12. CONSTRUCTION INCONVENIENCES

Tunnel connection from State Office Building to Capitol would be closed during construction.

SITE C (UNDERGROUND)

11. OPERATING COSTS

A below grade building would require approximately 48% of the heating load and 78% of the cooling load necessary for an above grade building.

12. CONSTRUCTION INCONVENIENCES

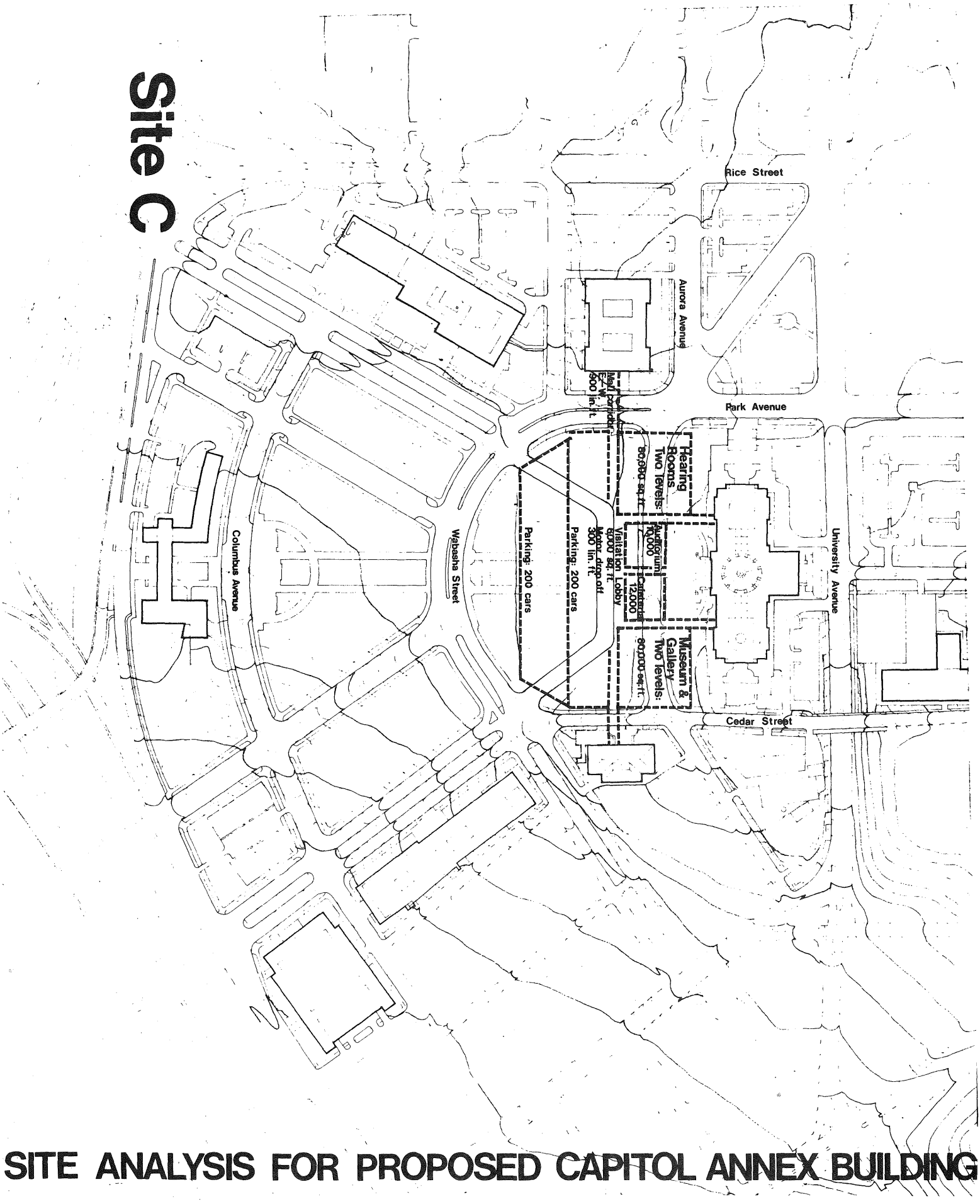
Entrance and exit at front of Capitol would be affected during construction period. Mall would be disturbed for that period.

SITE ANALYSIS FOR PROPOSED CAPITOL ANNEX BUILDING

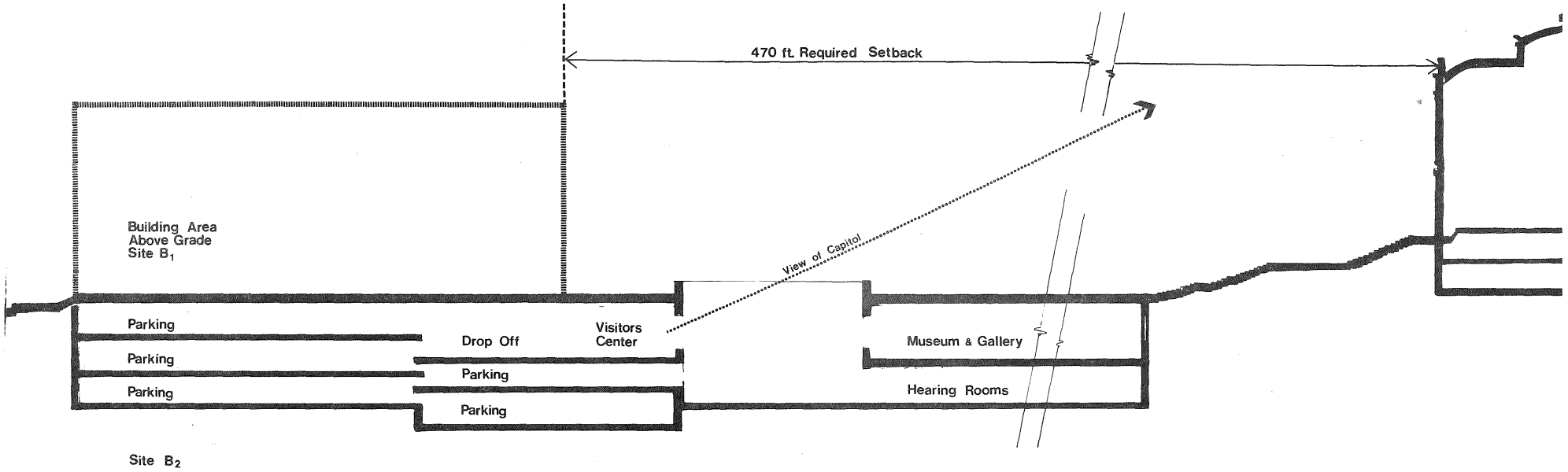
Site B_1

SITE ANALYSIS FOR PROPOSED CAPITOL ANNEX BUILDING

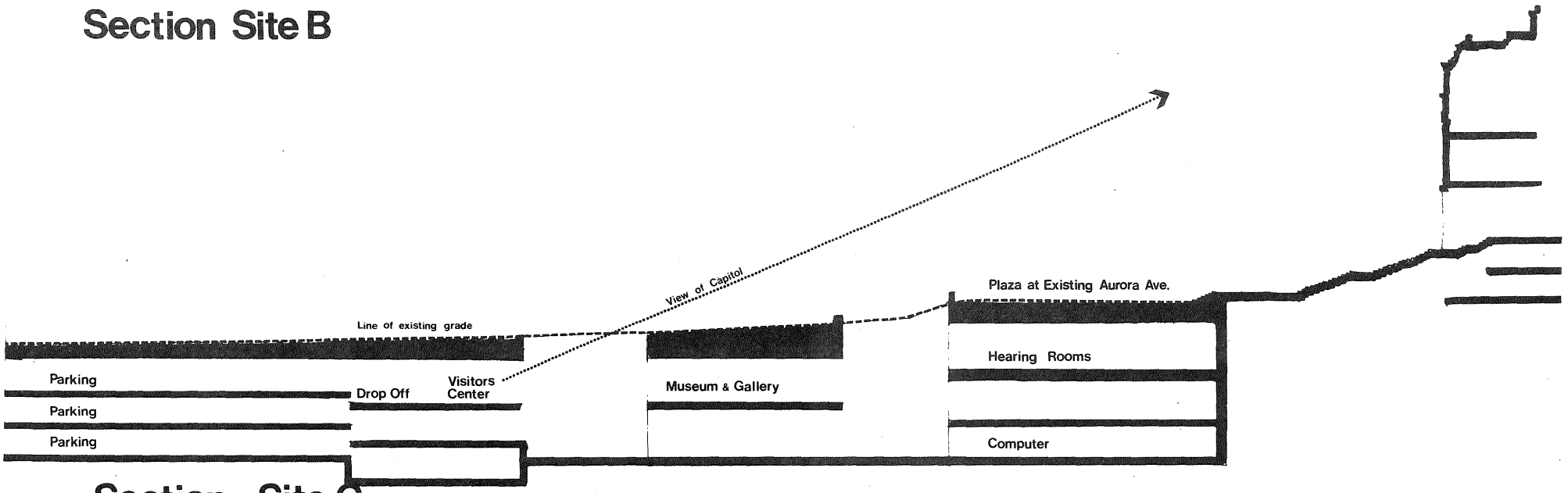
Site B_2



SITE ANALYSIS FOR PROPOSED CAPITOL ANNEX BUILDING



Section Site B



Section – Site C

Appendix

A

October 13, 1975

STAFF REPORT

PRELIMINARY PROGRAM RECOMMENDATIONS FOR A NEW PUBLIC BUILDING

Pursuant to the motion adopted at the committee's September 16th meeting, the staff has developed recommendations for a facility comprised of the following spaces:

		Net Square Feet	Gross Square Feet
I.	Public Hearing Rooms	35,200	
II.	Food Service Facility	5,400	
III.	Joint Services	5,700	
	Sub-Total -	46,300	74,080
IV.	Public Parking (minimum)	30,000	37,500
	TOTAL -	76,300	111,580

V. Auditorium (Included in the Historical Society request.)

This summary does not include the historical museum or state computer proposals.

The following is an explanation of how these recommendations were developed.

I. PUBLIC HEARING ROOMS

The staff recommends that:

1. All primary hearing room facilities be located in the new building because the Capitol hearing rooms are not adequate in size and quality and may be needed for future expansion of other Capitol occupants.

2. The hearing rooms retained in the Capitol are best suited for use by conference committees, caucus meetings during floor session periods, legislative ceremonial functions, and for overflow during periods of peak hearing room needs.

3. The new hearing rooms must have the flexibility to accommodate varying configurations of committees and subcommittees now and in the future.

4. Their use would be primarily legislative but they should be available to meet the increasing hearing room needs of executive branch agencies.

5. The State Office Building, when remodeled, should be used primarily as an office facility and should include no major public hearing rooms.

The following proposal recommends the same number of hearing rooms contained in the Cerny Report; however, unlike the sizes recommended in the Cerny Report, this staff recommends four typical sizes of rooms.

HEARING ROOM GROUPS
(Each with 75 sq. ft. storage)

GROUP "A"	CAPACITY	3,400 net sq. ft.
	150 Public	
	40 Members	
	10 Staff	
	5 Press	
	205 Total	

GROUP "B"		3,000 net sq. ft.
Type 1	140 Public	
	35 Members	
	5 Staff	
	5 Press	
	185 Total	
Type 2	160 Public	
	22 Members	
	5 Staff	
	5 Press	
	192 Total	

GROUP "C"		2,000 net sq. ft.
Type 1	112 Public	
	10 Members	
	3 Staff	
	5 Press	
	130 Total	
Type 2	95 Public	
	20 Members	
	5 Staff	
	5 Press	
	125 Total	
Type 3	80 Public	
	30 Members	
	5 Staff	
	5 Press	
	120 Total	

GROUP "D"		1,600 net sq. ft.
Accommodations:		
	65 Public	
	15 Members	
	5 Staff	
	5 Press	
	90 Total	

RECOMMENDED HEARING ROOMS

House of Representatives Hearing Rooms

1	(One)	Group "A"	3,400 sq. ft.
2	(Two)	Group "B" Type 1	6,000 sq. ft.
3	(Three)	Group "C" Type 3	6,000 sq. ft.
3	(Three)	Group "D"	4,800 sq. ft.
9	(Nine)		20,200 sq. ft.

Senate Hearing Rooms

3	(Three)	Group "B" Type 2	9,000 sq. ft.
2	(Two)	Group "C" Type 1	4,000 sq. ft.
1	(One)	Group "C" Type 2	2,000 sq. ft.
6	(Six)		15,000 sq. ft.

Total Hearing Rooms

1	(One)	Group "A"	3,400 sq. ft.
5	(Five)	Group "B"	15,000 sq. ft.
6	(Six)	Group "C"	12,000 sq. ft.
3	(Three)	Group "D"	4,800 sq. ft.
15	(Fifteen)		35,200 sq. ft. (net)

II. FOOD SERVICE FACILITY

There is a need for a coffee shop and fast food facility in both the Capitol and the State Office Building; however, the staff recommends that the primary food facility for the Legislature, its staff, other Capitol employees, and members of the public visiting the Capitol area be located in the new facility.

The following population could be served by a cafeteria-style facility of 5,400 net square feet with a seating capacity of 160 plus five semi-private eating areas.

Legislators	201
Staff	600
Other Capitol employees	200
Visitors	200 or more
	1,200 or more persons

The recommended size is based on the following assumptions:

---That one-third of that population would eat in the facility

---That each occupant requires 15 net square feet

---That 2.5 meals can be served per chair each day

---That an area equal to 35 percent of the eating area is required for food preparation

NOTE: If an Historical Society museum becomes a part of this building, an additional 2,300 net square feet of dining area would be needed. This is based on the following projections:

Daily number of museum visitors in need of an eating facility --

300	children
100	adults
400	

Based on the assumption that three meals could be served daily for each chair, another 130 chairs and another 300 net square feet of food preparation space should be added to the dining facility.

Therefore, if the museum is included, the food service facility would be 7,700 net square feet.

III. JOINT SERVICES

The staff recommends that the following spaces to house some joint Senate-House Services be located in the new building:

A.	Lobby, Coat Room and Reception Area	2,500
B.	Storage and Materials Handling Dock	2,000
C.	Multi-Media Area (Press Conference Room, Press Phones, T. V. and Sound Equipment)	700
D.	Legislative Information Services (Auxiliary Index, Bill Copy Service, Other Legislative Information)	500
	TOTAL -	5,700

IV. PARKING

Public

Regardless of the determination of needs for legislative parking or the site selected, the staff recommends that at least one hundred public parking stalls be built, and, if possible this parking be incorporated with the new public meeting building. Sheltered bus loading and unloading areas should also be incorporated into this facility.

Based on 300 sq. ft. per stall, this would require a total of 30,000 net sq. ft. and approximately 37,500 gross square feet.

If the Historical Society proposal is adopted, the staff concurs with their recommendation that approximately 100 public parking stalls be added to this proposal.

Legislative

At this point, the staff makes no specific recommendation regarding the legislative parking problem. There are a number of alternatives, such as --

(a) Build the minimum legislative need in the new facility. (approximately 230 stalls)

(b) Build a parking facility on the west side of the Capitol Complex as suggested by the Department of Administration and the Barton-Aschman Parking Study.

(c) Build a parking facility to the capacity of whatever site is selected.

V. AUDITORIUM

The committee directed the staff to include an auditorium with a seating capacity of 300 to 500 for the public. This facility would provide ample space for large joint meetings and other hearings on issues of high public interest; however, it would be primarily used to serve the needs of the Historical Society and other executive branch agencies. The staff concurs with the Historical Society recommendation that an auditorium be built with a capacity of 400 seats for the public and a net size of 6,000 square feet. If the historical museum does not become a part of the new building, the staff recommends that the auditorium be included in the construction of the public meeting facility.

VI. RECOMMENDED PROCEDURES

The staff recommends that the members of this committee:

1. Request that the Capitol Area Architectural and Planning Board report to this committee their assessment of the relative advantages and disadvantages of the two primary sites under consideration.

2. Visit facilities which illustrate the potential designs for this building prior to deciding on a site.

3. Instruct the Commissioner of Administration to take initial steps in preparation of the competition documents.

HISTORICAL MUSEUM PROPOSAL

PREPARED BY THE MINNESOTA HISTORICAL SOCIETY

Four studies of the need for an adequate museum for the Minnesota Historical Society have been conducted during the past 8 years. They are:

1967 - - Minnesota Historical Society

1968 - - Wold & Associates

1970 - - SUA

1974 - - Cerny & Associates (as part of the overall study of Capitol area space needs)

All of the studies agreed that the present museum facility in the Historical Society Building is grossly inadequate, that there is a need for an up-to-date museum facility and it should be located in the Capitol area.

MUSEUM FACILITIES

The new museum should include the following facilities:

1. Museum exhibit space

This large open space should be designed to meet flexible needs over a long future. It should accommodate large and small items ranging in size all the way from Colonel Josiah Snelling's watch to the 4-car (including Minnesota's first locomotive) "William Crooks" train.

The Historical Society has hundreds of unique items which should be displayed for public benefit. Examples of these are:

a) Charles A. Lindbergh's first airplane -- a "Jenny" -- which flew around Minnesota in 1923. It was used to fly his father in a political campaign -- one of the earliest uses of the airplane for this purpose.

b) Survey equipment used by Joseph Nicollet in 1836 to definitively prove Lake Itasca to be the source of the Mississippi.

c) The first electric automobile in St. Paul -- a Waverly.

d) Library and Law Office equipment of Ignatius Donnelly -- probably Minnesota's most many-faceted public figure.

e) Compass and survey equipment of George Stuntz, used to explore and map the Vermillion Iron Range in the 1860s.

f) Altar and interior furnishings of the Chapel of St. Paul (1841).

These are only a few of the superb items that should be on long-term exhibit to illuminate the history of the state.

2. Gallery for Historical Art Collection

This display area is needed to exhibit the Historical Society's collection of paintings by Minnesota artists, including the works of Seth Eastman, Frank Mayer, Wanda Gag, Adolph Dehn, Cameron Booth and many others. It would also be the place where other visual collections --- including photographs --- would be displayed.

3. Auditorium -- 400 seats

An auditorium is needed for a variety of uses -- lectures, conferences, film showings and other audio-visual presentations to other groups and, above all, for continued orientation programs for tours of the State Capitol and the Historical Museum. The auditorium would be available to the Legislature and other agencies of state government, but its scheduling and use should be under the administration of the Historical Society.

4. Audio-Visual/Classrooms

Three meeting rooms, each with a capacity of 100 persons (similar to hearing room size "D") and equipped for all types of audio-visual presentations are needed. These would meet a variety of demands for public programs and would receive extensive use.

Legislative hearing rooms, when not in use for legislative and other purposes, also would be utilized for this purpose when the volume of visitation required it.

5. Offices/Workshop

This area would house the museum and educational services staff and provide space for the design, construction and assembling of exhibits.

6. Book Store/Gift Shop

The merchandise sold would be limited to Minnesota books and authentic Minnesota souvenir items.

MUSEUM SPACE NEEDS

(in gross square feet)

1.	Display Area	50,000 sq. ft.
2.	Art Gallery	10,000 sq. ft.
3.	Auditorium (400 seats)	9,600 sq. ft.
4.	Audio Visual/Class Rooms (3)	7,700 sq. ft.
5.	Offices/Museum Workshop	5,000 sq. ft.
	a) Offices --- 2,900 sq. ft.	
	b) Workshop -- 2,100 sq. ft.	
6.	Bookstore/Gift Shop Included in Display Area	--
7.	Food Service Facility (see section of committee staff report)	3,700 sq. ft.
	TOTAL -	86,000 gross sq. ft.
8.	100 Parking Stalls	37,500 gross sq. ft.

OTHER FACILITIES

Public visitation at the new museum is estimated to be 500,000 persons almost immediately. This sizeable number of Minnesotans and visitors from elsewhere to Minnesota would be dependent upon other facilities programmed for legislative and other uses -- parking, restaurant, hearing rooms, restrooms, etc. -- and this volume of traffic should be anticipated in the planning, design and location of these support facilities.

Because the Historical Museum would be a 7-day operation, a vending machine would be highly desirable. Also, it may be necessary to provide for the operation of the restaurant -- or a part of it -- on a 7-day schedule.

B

AREA STUDY AND PRELIMINARY COST ESTIMATES

A. Proposed Areas

1. Public Legislative Facilities						
Hearing Rooms	35,200	Net Sq. Ft.	(1.6) =	56,330	Gr. Sq. Ft.	
Joint Services (Lobby, etc.)	5,700	" " "	(1.6) =	9,130	" " "	
Food Services	5,400	" " "	(1.6) =	8,640	" " "	
	46,300	" " "		74,000	" " "	
2. Public Auditorium (400 Seats)	6,000	Net Sq. Ft.	(1.6) =	9,600	Gr. Sq. Ft.	
3. Historical Museum Facilities						
Exhibit/Display	31,500	Net Sq. Ft.	(1.6) =	50,000	Gr. Sq. Ft.	
Art Gallery	6,250	" " "	(1.6) =	10,000	" " "	
A/V Classroom	4,800	" " "	(1.6) =	7,700	" " "	
Offices/Workshop	3,600	" " "	(1.4) =	5,000	" " "	
Food Service	2,300	" " "	(1.6) =	3,700	" " "	
	48,450	" " "		76,400	" " "	
4. Computer Facilities (Department of Administration)	30,000	Net Sq. Ft.	(1.4) =	42,000	Gr. Sq. Ft.	
5. Public Parking (Minimum Requirements)						
Legislative (100 Stalls)	30,000	Net Sq. Ft.	(1.25) =	37,500	Gr. Sq. Ft.	
Historical (100 Stalls)	30,000	" " "	(1.25) =	37,500	" " "	
	60,000	" " "		75,000	" " "	
TOTAL PROPOSED STRUCTURE	190,000	Net Sq. Ft.		277,000	Gr. Sq. Ft.	

B. CONSTRUCTION COST ESTIMATES
(Means Building Construction Cost Data 1975, 33rd Edition)

1. Public Legislative Facilities					
Hearing Rooms	56,330	Gr Sq. Ft.	x	$90	$5,069,700
Joint Services	9,130	" " "	x	$90	821,700
Food Services (W/equip.)	8,640	" " "	x	$95	820,800
					$6,712,200
2. Public Auditorium	9,600	" " "	x	$70	$ 672,000
3. Historical Museum Facilities					
Exhibit/Display	50,000	Gr Sq. Ft.	x	$70	$3,500,000
Art Gallery	10,000	" " "	x	$70	700,000
A/V Classroom	7,700	" " "	x	$90	693,000
Offices/workshop	5,000	" " "	x	$50	250,000
Food Services (W/Equip.)	3,700	" " "	x	$95	351,500
					$5,494,500
4. Computer Facilities	42,000	Gr Sq. Ft.	x	$60	$2,520,000
5. Public Parking Facilities					
Legislative (100 Stalls)	37,500	Gr Sq. Ft.	x	$30	$1,125,000
Historical (100 Stalls)	37,500	" " "	x	$30	1,125,000
					$2,245,000
TOTAL PROPOSED STRUCTURE					$17,645,000
ARCHITECTURAL COMPETITION					150,000
PROFESSIONAL CONSULTANT FEE (7%)					1,235,000
					$18,030,000

Note: Cost estimates are established for January 1, 1976
Consider escalation factor of .6%/month thereafter (or 7.5%/year)

C. ADDITIONAL PARKING FACILITIES TO SITE CAPACITY

1. Site "B" Alternates No. 1 and No. 2

Parking area below grade (2 levels at 130,000 sq. ft.)	260,000 Gr.Sq.Ft.
260,000 - 75,000 (200 stalls) : Remaining	185,000 " " "
185,000 /375 (Gr. sq. ft. per stall) : Additional Stalls	493
185,000 x $30 = $5,550,000 additional funds required	

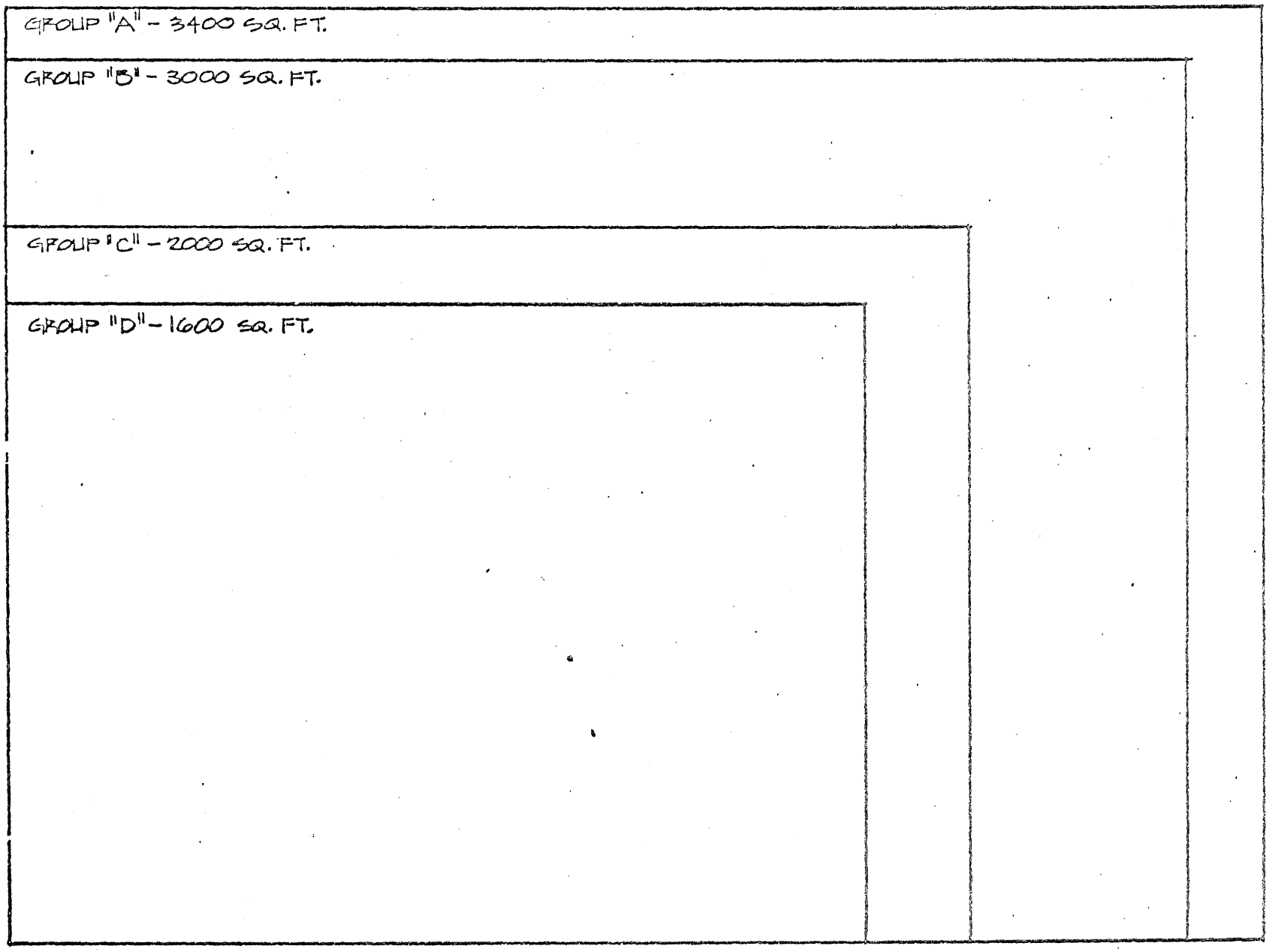
2. Site "C" Alternate No. 1

Facility Area	598,562 Gr.Sq.Ft.
Minus Proposed Structure Area	277,000 " " "
Balance for Capacity Parking	321,562 " " "
321,562 /375 (Gr. Sq. Ft. per stall) : Additional Stalls	900
321,562 x $30 = 9,647,000 Additional Funds Required	

3. Site "C" Alternate No. 2

Facility area	364,215 Gr.Sq.Ft.
Minus proposed structure area	277,000 " " "
Balance for capacity parking	87,215 " " "
87,215/375 (sq. ft. per stall) : Additional Stalls	240
87,215 x $30 = $2,616,450 additional funds required	

PROPOSED HEARING ROOM CATEGORIES



RM. 118 CAPITOL - 1200 SQ. FT.
RM. 123 CAPITOL - 1800 SQ. FT.

RM. 107 CAPITOL - 1500 SQ. FT.
RM. 112 CAPITOL - 1500 SQ. FT.

CBW

Oliver D. Billing & Associates, Inc. ODB CONSULTING ENGINEERS

2706 WEST 7TH BOULEVARD • ST. PAUL, MINNESOTA 55116 • TEL. 698-0814

October 29, 1975

The Wold Association
600 Osborn Building
St. Paul, Mn. 55102

Re: #728 Capitol Annex Building - St. Paul, Minnesota

Gentlemen:

As requested by you we have studied the difference in heating and cooling operating costs for a proposed above ground structure compared to a similar underground structure.

In evaluating the relative difference between the two buildings we used the following information.

1. From your office we were given a 5 floor building, 202,000 square feet gross floor area, and 130,750 square feet net floor area.

2. We assumed 5 floors of equal area 13 feet elevation per floor.

3. We assumed the building would be square oriented North-South.

4. We disregarded any consideration of a parking ramp.

5. We based calculations on parameters set forth in the State of Minnesota Energy Code.

6. We assumed the maximum window area allowed by the Energy Code would be used in the aboveground structure.

7. We assumed population of one person per 100 square feet of the net building floor area.

Based on this information we determined that for a below ground structure the heating load would be 40.4% and the cooling load 78.2% of the load for a similar above ground structure.

Please advise us if any further information is required.

Very truly yours,

OLIVER D. BILLING & ASSOCIATES, INC.

Don Billing

DB/nl

ABSTRACT: "An Underground solution to the Expansion Needs of the St. Paul Governmental Complex of the State of Minnesota" Submitted by Michael Costello in fulfillment of the course requirements of Geo E 5-260 and Geo. E 5-262. June 7, 1974

Construction of a sub-surface building complex immediately south of the State Capitol in St. Paul offers a feasible solution to the need for additional administrative facilities and exhibit space for the State of Minnesota. The plan proposed has several important features which suggest that underground construction should be preferred over any equivalent above-ground structure. Among these features, for example, are

1. The complex can be situated in the ideal location - between the Capitol Building and the Veterans Administration Building serving as a hub to inter-connect existing buildings, but without damaging the attractive open-mall design in front of the Capitol.

2. Sub-surface connection between government office buildings would allow "weather-proof communication and interaction year round.

3. The design meets the specification that 160,000 sq. ft. of the estimated 600,000 sq. ft. (plus 200,000 sq. ft. parking) building must have natural lighting.

4. The energy requirements for the sub-surface structure would be less than one-half of that for an equivalent above-ground structure.

5. The cost of the sub-surface structure would be very competitive with that of a comparable above-ground structure.

6. Fire hazard would be reduced substantially.

7. The extensive tunnel system under St. Paul could be used for transportation of the excavated material so that construction would not significantly affect traffic circulation and routine events in the Capitol area.

8. Overall, the proposed sub-surface system is environmentally superior to any suitable above-ground structure that can be designed in the immediate vicinity of the Capitol.

Appreciation of the great potential of underground space development is increasing rapidly, particularly as a solution to the problem of meeting expansion needs in built-up areas where additional surface construction is likely to damage surface amenities.

Stimulating urban projects

The Society of Industrial Realtors has received a $150,000 Commerce Department grant to administer a study aimed at improving opportunities for industrial development in urban centers. Three cities—Milwaukee, Cleveland and Indianapolis—will be surveyed.

Objectives are to define the current relationships between cities and private developers, determine barriers which prevent effective development, and suggest remedies for these barriers. Attention will be given to the structure of municipal government as well as to impediments that may be the result of state and federal statutory requirements, practices of lending institutions, community attitudes, and social problems such as crime and race relations.

In each of the target cities, recent industrial development activity will be reviewed. Planned, completed, and aborted projects, and the reasons for their success or failure, will be identified. The study is expected to take six to nine months.

Milwaukee, Cleveland and Indianapolis were selected partly because of their size. It is believed that findings from medium-sized cities will have greater transferability to other cities than would findings from larger cities, which have their own peculiar characteristics.

In essence, the study will attempt to find ways of increasing the advantages of city versus suburban development despite the city's inherent negative factors such as greater congestion and higher crime rate.

Underground buildings eyed

A recent conference on earth-covered buildings was held in Fort Worth, Texas. The conference was sponsored by the University of Texas at Arlington's Center for Energy Policy Studies and School of Architecture & Environmental Design. It was supported by the National Science Foundation (NSF).

Frank Moreland, director of the energy policy center, said the conference was held at the urging of NSF because of its desire to encourage serious consideration of underground buildings due to their attractive life cycle economics in terms of energy and maintenance.

Underground structures built to date have usually been for schools, museums or libraries. One conference objective was to encourage their use for commercial and housing projects. Moreland said extensive use has been made of underground buildings in Japan, Sweden, France, and Turkey, but that the U.S. has lagged behind.

About 70 architects, engineers, planners, bankers and insurance representatives attended the conference, a number which Moreland admits was below what was desired. He blamed a lack of pre-conference publicity. A second conference is planned for May 1976.

Preservation economics

More than 460 developers, bankers, realtors, architects and municipal administrators attended a two-day conference in Seattle this summer dealing with the economic benefits of preserving old buildings. The number of attendees—more than double what had been anticipated by the National Trust for Historic Preservation, one of the sponsors—suggests a strong interest in preservation by building owners, designers and contractors.

The central theme of the conference was that older buildings can be brought back to use at less cost per square foot than for new construction. Also stressed was that general experience across the nation has shown that a well-restored old building can bring in rents and income at least equivalent to a new building.

Richard Haupt, director of the Trust's department of education, said the success of the conference was partly due to today's economic realities. He said many architects and developers are starting to view renovations as desirable because of the economic crunch and high construction costs. The ability of tenants to remain in buildings while renovation work proceeds, coupled with a savings in shutdown costs due to immunity to weather-related problems, also makes renovation work desirable.

The conference was held in Seattle because of the city's concrete example of what the meeting was all about. Its Pioneer Square, covering 25 blocks, is a former blighted area renovated and redeveloped into a high rental district which now makes a solid contribution to the tax rolls.

A state energy 'first'

The Florida State Division of Building Construction and Maintenance has implemented a computer program that projects lifetime operating costs of any proposed state building. According to the Federal Energy Administration, Florida is the first state to have such a program.

The Florida Life Cycle Energy Evaluation Technique (FLEET) Program is used to assess the efficiency of new building designs in terms of energy use as well as to evaluate energy use in existing state buildings. The Florida Energy Conservation in Buildings Act of 1974, which became law July 1, 1974, mandated development of the program and gave the building division 270 days to implement it.

The FLEET program sets a bottom line energy budget for all proposed state-financed construction. At the schematic design phase, the program evaluates how energy use compares to the budget. Usage over the budget may require design changes such as lower lighting levels, reduced window area, or a change in building orientation. The program is used again at the preliminary design phase when other design changes to energy-using systems may be made.

The program is mandatory for all state funded and constructed buildings. About eight buildings have been constructed using the program, and Thomas Sechler of the divison's Bureau of Construction said each has shown a significant energy savings when compared to earlier state buildings of similar size. He also said architects and engineers in the state would like to see the program move into the private sector. There would be one design program standard with which all professionals in the state could become familiar.

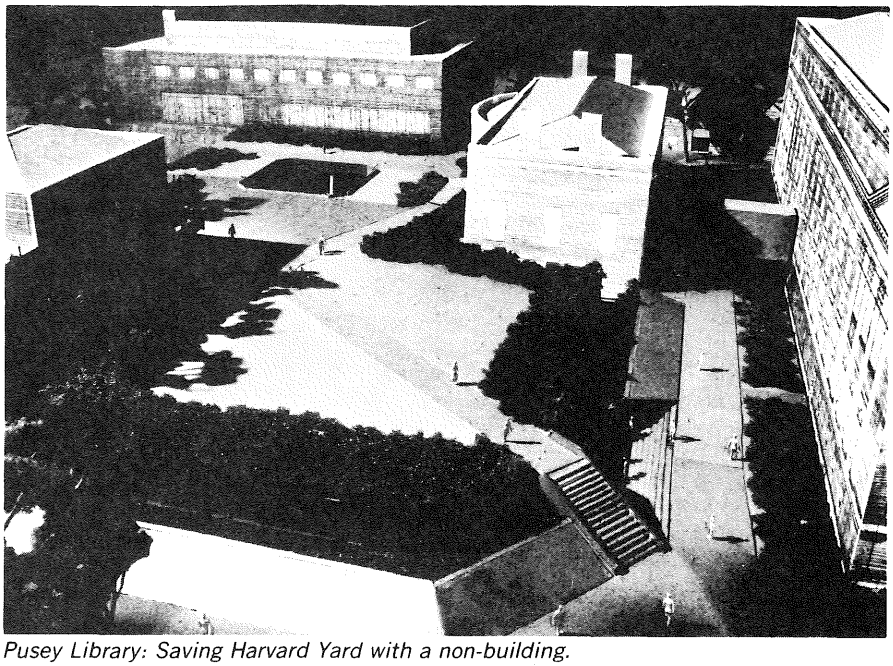
INSTITUTIONAL

Low-key design for Harvard's new library

The design of Harvard University's Pusey Library, scheduled for completion next year, posed two major problems for Hugh Stubbins & Associates of Cambridge, Mass. The firm had to figure out how to provide the initial space for the school's map and theater collections, as well as an archives, without violating the venerated Harvard Yard. And the design also had to allow for library expansion programs in later phases while maintaining environmental integrity.

The solution actually is a non-building—a three-level structure largely below grade. By making use of an existing grade change in the Yard and landscaping the roof of the library, Stubbins was able to keep the area's basic topography and preserve a diagonal student walkway across the space.

Cutting back the northern and western edges allows sunlight to enter reading rooms and work areas. Grass-covered berms and granite fascias are used to screen these windows so that from at least some angles, the building looks like a grassy plateau.



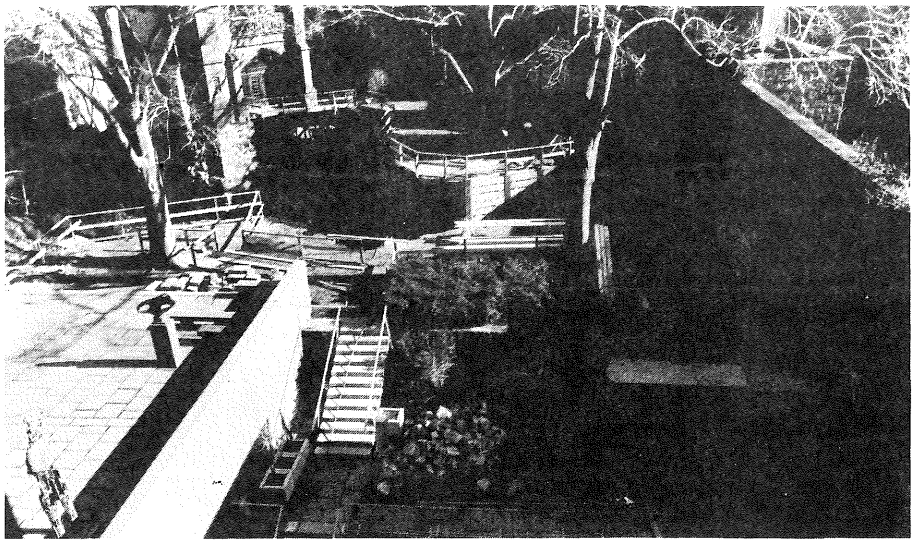
Pusey Library: Saving Harvard Yard with a non-building.

The structure is poured-in-place and reinforced concrete with eight columns stressed to permit the possible addition of above-grade space in the future.

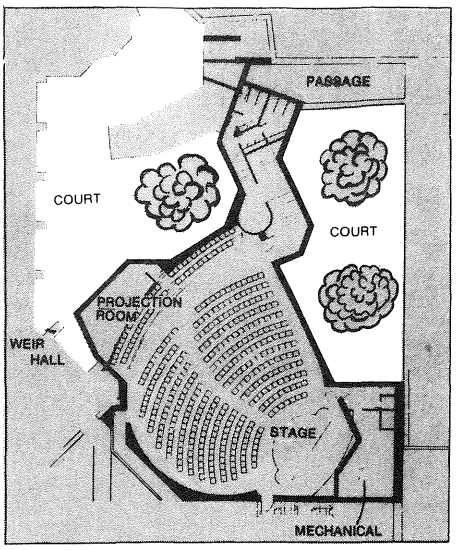
Since the building is below the water table, special foundations, waterproofing, and a large sump pump help to control subsurface water. The concrete roof—sloped similar to a normal roof—has multiple layers of neoprene sheet and liquid rubber roofing below the gravel and topsoil of its landscaped surface.

To counteract the feeling of working in a basement, the architects incorporated an interior court and light well into the center of the building. The court, which will feature landscaping and a Japanese maple, is flanked by a lounge and faculty studies area.

Structural engineers were LeMessurier Associates/SCI, with mechanical and electrical designs done by Van Zelm of Haywood, Conn. Volpe Construction Co. is building the $4.7 million library. □



Three trees ordered spared by the university, put contractors in tight spot.



Court, trees dictated lecture hall shape.

Trees, tradition govern design of underground lecture hall

Environmental and historical considerations forced the design and construction of an underground lecture hall in such a way as not to destroy trees growing on the confined site. And another phase of the project, creation of additional floor space in an existing building required use of a forklift to erect steel in tight quarters.

The project, at Yale University's Center for American Arts and Culture, involved construction of a floor about midway in the height of a 25-ft-high room in a 47-year-old stone building, construction of the new 398-seat lecture hall, and enclosure of an existing court to provide a new gallery. The last phase was the least complex, because it required only construction of a roof over a sunken court between a building on one side and the sidewalk on the other.

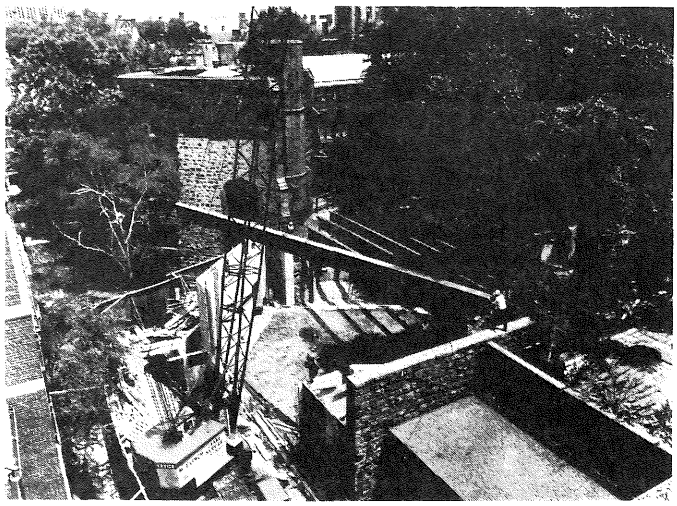
University officials complicated the $1.1-million project by specifying that three elm trees, one 4 ft in diameter and two 3 ft in diameter, remain undisturbed. Also, they required that the court that would be ripped up for the project be restored to its original character, "a serene spot for contemplation amid the city's jar."

The requirement that the designers and contractors save the trees was based as much on history and tradition as on ecology and esthetics. New Haven, known as the Elm City, lost most of that heritage to the Dutch elm disease. The Weir Court trees apparently were spared that fate because of their relative isolation in the enclave formed by two dormitories, an art gallery designed by the late Louis Kahn, another art gallery built in 1928, and Skull and Bones, one of Yale's undergraduate secret societies.

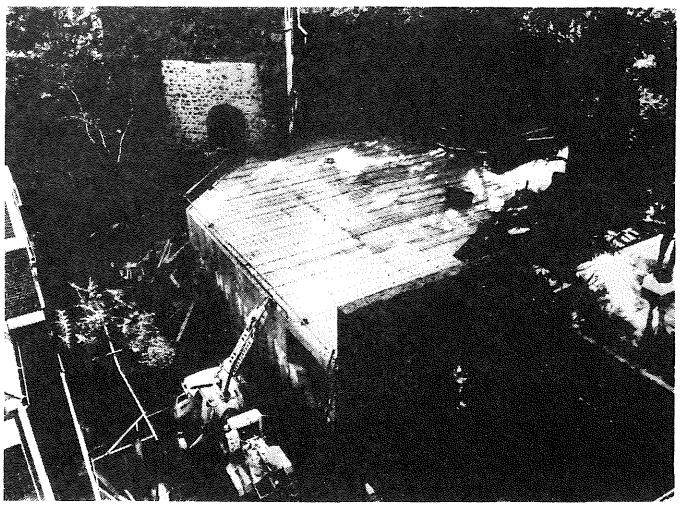
The new underground lecture hall, designed by Herbert S. Newman Associates, New Haven architect, thus takes an irregular shape. The hall, enclosing about 3,500 sq ft, is about 87 ft long from front to back. Its width varies (see auditorium plan view). A 40-ft-long corridor opens off one side at the rear of the hall.

Spiegel & Zamecnik, Inc., New Haven structural engineer, designed the structure so that it stands nearly completely independent of the two closest buildings.

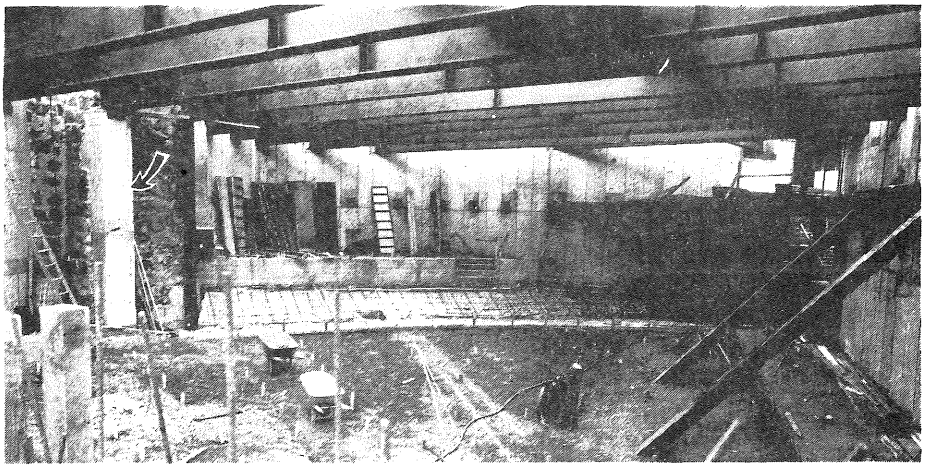
Thermal problems avoided. Herman Spiegel, a principal of the engineering firm and also dean of Yale's School of



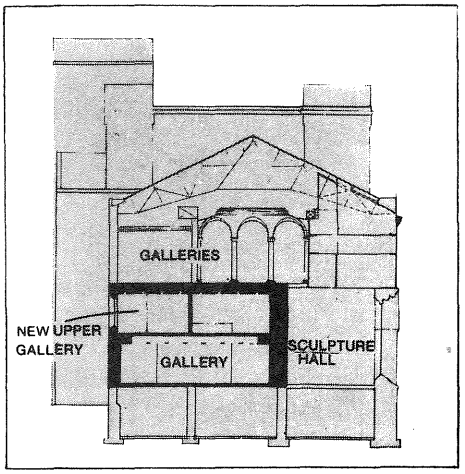
Beams, each a different size, span hall and carry court.



Concrete slab, 5.5 in. thick, can carry two 2-ton statues.



Lecture hall contacts Weir Hall where beam end lands on pier (arrow).



Floor was added in old lecture hall (left).

Architecture, says that joining the new lecture hall to its flanking neighbors would have created a structure about 300 ft long, a length that would introduce thermal expansion problems.

The building therefore is independent of them, except at one point where a corner of the dormitory protrudes slightly into the lecture hall site. There a pier carries the end of just one of the 11 beams that carry the roof of the lecture hall and the restored landscaped sculpture court. That beam rests on a Teflon sliding bearing.

To protect and restrict the roots of the three trees, steel sheetpiling was driven around them, with timber walers between the piles and diagonal steel bracing spanning between retaining walls. The excavation ranges from 19 to 30 ft deep, providing the slope for the floor of the lecture hall.

No two steel beams spanning between the walls are alike. They range in length from 52 to 65 ft under the sculpture court above the rear of the hall, from 67 to 80 ft beneath the planter area located above the hall's stage, and are as deep as 36 in.

The 80-ft beam, the one that lands on the pier at the point where Weir Hall protrudes into the lecture hall, cantilevers 10 ft off the opposite wall. One other beam, 67 ft long, projects 14 ft beyond the same wall. Those beams and their slab stop just short of the adjacent Kahn gallery.

The mechanical room is located in the approximate 40-sq-ft space under the cantilever.

Beam spacing. Spacing of the beams varies from 5 to 6.5-ft centers under the sculpture court, while under the planter area the beams are 6 to 7.5 ft c-c. The slab atop the beams is 5.5-in.-thick reinforced concrete and surfaced with a waterproof membrane to allow it to accept the stabilizing gravel and soil for the plantings when the area reverts to its use as a landscaped sculpture court.

The slab is designed to carry two sculptures of 2 tons each anywhere on its surface, since statuary of this size is frequently on display and the exhibitions are moved around in the court.

To erect the beams, the steel erector, Leake & Nelson, Inc., Bridgeport, Conn., used a 50-ton crane with an 80-ft boom. Its problems started with the arrival of the crane, for it could just barely slip in between the walls of the service court's entrance from the street.

The retaining walls of the lecture hall were designed to be supported at the upper slab, "because to design them as a pure cantilever coming out of the ground would have cost an arm and a leg," Spiegel says. This meant that the general contractor, W. J. Megin, Inc., Naugatuck, Conn., could not remove the sheetpiling because it, along with the bracing, carried the walls. In addition, some of the diagonal bracing remained in place until after the slab was cast. The braces were then cut out and the openings in the walls patched with concrete. With removal of the braces, the walls act as a simple vertical span between their footings and the roof slab.

The forklift expediency. Conversion of the old lecture hall in the old art gallery squeezed the erector from start to finish. The job itself was basically simple: Erect the beams for a new floor in a 25-ft-high room of an old building. But work space was cramped.

The building, about three and one-half stories high, is a bearing wall structure 65 ft x 110 ft in plan. The room converted from a single story to a two-story art gallery, measures 40 ft x 75 ft. Because of the thickness of the walls, no additional structural support was required to carry the beams, the job essentially being cutting pockets in both the stone exterior walls about 3.5 ft thick, and in the 2-ft-thick interior brick wall, then erecting the beams to provide a floor-to-floor height of about 13 ft. But therein lay the problem: no elbow room.

The beams, 44-ft-long, 27-in.-deep sections, spaced on 10-ft centers, are for the most part, landed in the wall pockets. But along the exterior wall, some are founded on the sills of windows.

To erect the steel, Leake & Nelson removed a door and its frame, then constructed a working surface on the existing floor of the building for a 6,000-lb forklift used to erect the steel. The vehicle pad, running the length of the building, consisted of 6-ft-long, 8-in.-wide flange beams topped by 0.25-in. steel plate.

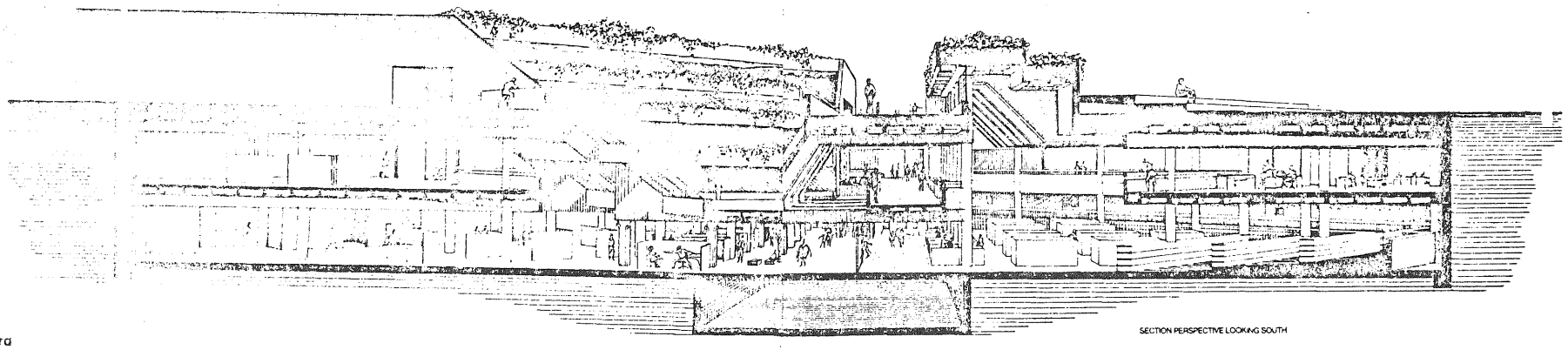
The beams were crane-lifted from a truck on the street, swung into the building at floor height through the door and placed on rollers to be moved into the general area of where they would be erected.

The forklift, picking up the beam at its center, slipped one end into a pocket on the interior wall, holding the beam in position until scaffolding was placed under the other end. Two 5 x 5-ft sections of scaffold, 6 ft high, were then lashed on to the forks of the forklift to provide another 12 ft of height for the installation of the opposite end of the beam. The truck forks and scaffolding were then run in beneath the beam, which was jockeyed into place with the help of a come-along.

Mechanical engineer for the project, which will be completed in January, is van Zeln, Heywood & Shatford, West Hartford, Conn. Sylvan R. Shemitz & Associates, Inc., West Haven, Conn., is the electrical engineer.

Vancouver

The University of British Columbia has built the underground Sedgewick Library to fit between eight steel-sided "flower pots," or caissons, 30-ft. high, each one protecting the roots of a 40-year-old Northern Red Oak tree. The tubular caissons extend 6 ft. below the two-level library's bottom floor. A four-inch air space separates the caissons from their brick casings. The red oaks form part of a border of trees on the mall at ground level. The library has room to seat 2,000 students and can accommodate 180,000 volumes. The architects are Rhone and Iredale of Vancouver.

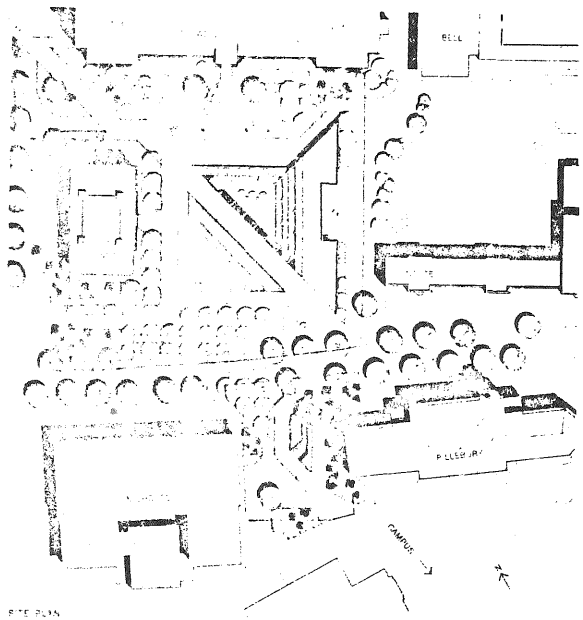


SECTION PERSPECTIVE LOOKING SOUTH

Award

Myers and Bennett Architects/BRW

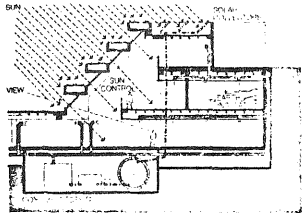
East Bank Bookstore/Admissions and Records Facility, on the Minneapolis campus of the University of Minnesota, emphasizes diagonal circulation path and preserves campus space.

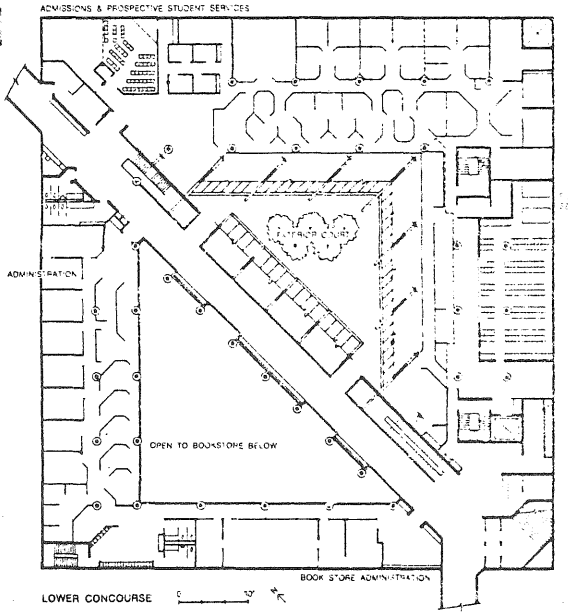


SITE PLAN

Program: Merging administrative and bookstore facilities, the 83,000-sq-ft building will contain approximately 25,000 sq ft of bookstore space, 35,000 sq ft for University Admissions and Records, and 23,000 sq ft of pedestrian circulation and student support functions.
Site: On an urban university campus, semi-enclosed by surrounding buildings, near transportation and in direct line between bus lines and campus.
Solution: To make the most of existing circulation patterns, the facility is bisected by a diagonal pedestrian concourse. In order that the new building might cause as little disruption as possible to the space it will occupy, 95 percent of the project will be below grade. In addition to their concern for preserving the campus space, the architects also wanted the building to be energy-efficient and humane. Its design, therefore, reflects the attention to proper orientation, giving building occupants light and views through a central court. Planters form sun control devices on south and west sides where direct sun could cause heat gains. Ambient light enters the store via a sloped glass east wall.
Materials and construction: Board-formed architectural concrete in buff integral color; roof decks used as courtyards or other surfaced gathering areas are either waterproofed and decked in exposed aggregate concrete, or roofed with standard built-up roofing. Glazing is tinted, insulating, laminated safety glass in anodized aluminum frames.

Jury comments
Zeidler: If you look at the orientation of the existing buildings, you see that you were really left with fragments of spaces. With this building, the spaces find their solutions. One thing I would criticize is the receiving area; it somehow seems to turn its back on this space to the east.
Eisenman: I think when you sink a building into the ground that it's very important to make a distinction between walking on a building and walking on ground. I think also that the notion of this diagonal is alien to the nature of the campus structure, in terms of its built artifacts. I think it's an imposition into the tranquility of the campus.
Rudolph: I would like to make a rebuttal to that. It seems that, for once, the diagonal makes considerable sense because of the general circulation pattern of the campus. The diagram shows that very clearly.
Chermayeff: It seems to me that the issue really is what happens at eye level. The apparent aggression of the geometry, in this case, is not aggressive at all. It's really quite a reticent building; there is no overpowering form intruding on the campus. This is not part of the "diagony" we've been joking about.
Zeidler: It's amazing the very pleasant spaces it does create inside.





Credits
Architects: David J. Bennett, principal architect; Jack A. Myers, associate architect; John S. Baymiller, architectural/urban designer; Guy R. Johns, urban designer/landscape architect; John C. Krogstad, architectural designer; Larry O. Opseth, architect.
Consultants: structural, Meyer, Borgman & Johnson, Inc.; mechanical/electrical, Oftedal, Locke, Broadston Associates, Inc.
Modelmaker: Linda A. Taggart.
Client: University of Minnesota.

SOIL INVESTIGATION

PROPOSED LEGISLATURE BUILDING

CAPITOL COMPLEX

ST PAUL, MINNESOTA

#22014

2602 CHAMBERLAIN AVENUE
ST. PAUL, MN. 55114
PHONE (612) 645-0446

a sister corporation to TWIN CITY TESTING AND ENGINEERING LABORATORY INC.

October 30, 1975

State of Minnesota - Department of Administration
Architectural and Engineering Division
Room G-10 Administration Building
St Paul, MN 55101

Attn: Mr Forrest Schultz

Gentlemen

Subj: Soil Investigation - Proposed
Legislature Building - Capitol
Complex - St Paul, Minnesota -
#22014

We have conducted a soil investigation and foundation analysis for the referenced project. We are transmitting six copies of our report.

About 50% of the soil samples will be held at this office for one month and will then be discarded unless we are notified to hold them for a longer period of time.

As part of our professional services, we have on our staff foundation and soils engineers and engineering geologists available for consultation. As the scope of the project develops, they will be available to you to discuss the specific problems as they arise or aid you in your evaluations.

Very truly yours

Gordon J Smith, P E

GJS/kr

Encs

REPORT OF SOIL INVESTIGATION

PROPOSED LEGISLATURE BUILDING

CAPITOL COMPLEX

ST. PAUL, MINNESOTA

#22014

INTRODUCTION

This report presents our findings and recommendations pertaining to the soil investigation and engineering analysis for the referenced project. The purpose of this report is to describe the soil conditions encountered at the site, to analyze and evaluate these conditions, the laboratory test results, and, based on this data, to recommend possible foundation designs and construction procedures.

FIELD INVESTIGATION PROCEDURES

Ten soil test borings were made during a period from October 6 through 9, 1975. The borings were put down approximately at the locations given on the photo map furnished to us, as shown on the attached sketch. The surface elevations were referenced to the top of the hydrant, where shown on the sketch, taken as 162.41', an elevation obtained from the City of St. Paul.

Soil sampling was performed in accordance with ASTM: D 1586-67. Using this procedure, a 2" O. D. split barrel sampler is driven into the soil by a 140 lb weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM: D 2488-69. Representative portions of all samples were then returned to the laboratory for further examination and for verification of the field classification. In addition, selected samples were submitted to a program of laboratory tests. Logs of the borings indicating the depth and identification of the various strata, the N value, water level information and pertinent information regarding the method of maintaining and advancing the drill holes are attached. Charts illustrating the soil classification procedure, the descriptive terminology and symbols used on the boring logs are also attached.

SITE AND SOIL CONDITIONS

Site Conditions

These borings were put down at two alternate building sites. Borings 1 through 5 were put down south of the capitol and borings 6 through 10 were put down west of the capitol. The borings south of the capitol are in the mall area and the surface elevations at our boring locations vary by about 17'. This area generally slopes down to the south. This is a landscaped area with shrubs, trees, sidewalks, drives, etc., within the proposed building site. The surface elevations at our boring locations west of the capitol vary by about 8' and generally this site slopes down to the southwest. The northeast portion of this site is also a landscaped area, whereas the southwest portion is an existing parking lot. There is a street running in a southeast to northwest direction through about the center of this site.

Site Geology

The general stratigraphic profile in the capitol area is glacial drift overlying bedrock. The term drift refers to any material deposited by a glacial

advance and can be divided into two categories: till and alluvium (outwash). Till generally consists of complex, unstratified mixtures of gravel, sand, silt and clay deposited in direct contact with glacial ice. Alluvium typically is composed of stratified and sorted layers of sand with lesser amounts of silt and clay. The alluvium (outwash) found in glacial drift was deposited by the melt waters of glacial ice. Alluvium may be divided according to particle size into two categories; coarse, sand and gravel; and fine, silt and clay. Alluvial deposits may also occur as mixtures of fine and coarse particles. The coarser alluvium was deposited in more rapidly moving streams while the finer material was dropped from more quiet or standing water.

The drift was deposited during successive advances and retreats of glacial ice. The Twin Cities area has been most affected by two glacial advances, both of Wisconsin age of the Pleistocene Epoch. The earlier was the Superior Lobe, which came from the northeast carrying reddish brown sandy drift. The later advance was the Grantsburg Sublobe which was an offshoot of the Des Moines Lobe. The Des Moines Lobe moved over Minnesota from the northwest, however, the Grantsburg Sublobe followed low land into the Twin Cities area from the southwest covering all but the eastern portion of the area. The Grantsburg drift, which is gray and generally contains more clay than the Superior drift, overrode and intermixed with the Superior deposits. As the Grantsburg withdrew, areas of alluvium were deposited over the till in melt-waters.

The Capitol area lies on the edge of the intersection of two glacial river valleys. To the south is the Glacial River Warren valley and to the east is another glacial valley. Both of the valleys have been partially filled by drift so the boundaries of valleys which were carved in the bedrock are

not now visible. Therefore, the thickness of the drift and the formation found beneath the drift will vary, depending upon the exact position of the valley. The bedrock profile consists from youngest to oldest, of the Platteville Formation (limestone), the Glenwood Formation (sandy shale), and the St Peter sandstone. These formations are of Ordovician Period. The rock record of events between the Ordovician sediments and the Pleistocene glacial deposits is absent.

Soil Conditions

The logs of the borings show somewhat variable soil conditions within each building site; however, the soil conditions encountered at the two sites are quite similar. The borings closest to the capitol (borings 1, 2, 3, 9 and 10) show that the predominant soil consists of lenses and layers of silt, sandy silt and fine grained sands and silty sands. At the other boring locations, medium grained or medium to fine grained sand containing varying amounts of gravel were encountered and these sands extended to a depth of about 23' at boring 4 and 18' at boring 5. The finer grained sands and silts were then encountered underlying the medium grained sands. At borings 6, 7 and 8, the medium grained sands were predominant. Glacial till, consisting of clayey sand, silty sand or lean clay were encountered near the depths of borings 2, 3, 4, 5, 6 and 8. Fill was encountered at the surface of all borings to depths ranging from about 2' to 10½' at the site south of the capitol and from about 1' to 14' at the site west of the capitol. The fill at the site west of the capitol, at least in the deeper fill areas, did contain some rubble. A layer of clayey silt or silty clay was encountered underlying the fill at borings 7 and 8.

The penetration resistance (N value) indicates the density of the cohesionless soil ranges from very loose to very dense. The consistency of the cohesive soil ranges from medium to very stiff. In general, the soils encountered in the upper 15' to 20' of the borings had the lowest penetration resistance. The loosest soil was the sandy silt encountered to a depth of about 8½' at boring 10.

GROUND WATER

Ground water entered all borings at the times and levels as shown or noted on the attached logs. The ground water elevation would appear to be quite variable over the site with water being encountered at depths ranging from about 26' to 44' below the surface. In addition, there would appear to be some areas where water may be perched at a higher elevation, such as at boring 3, where the samples recovered at about the 15' depth were wet. Both seasonal and yearly fluctuations of the ground water table can be expected.

LABORATORY TESTS

To aid in identifying the soil, a mechanical analysis was conducted on representative samples of the sandy and silty soils. The results of these tests are shown on attached data sheets.

ANALYSIS AND RECOMMENDATIONS

Project Information

No actual building details were available at the time this work was done. We understand the proposed building will probably be a multi-level structure possibly as much as five floors. Also, we understand that if the building is built south of the capitol, the majority of the building will be below grade, at least adjacent to the existing capitol. Since specific foundation

recommendations would depend on the actual location of the building, building loads and final floor elevations, our recommendations in this report will be kept very general. When more specific details are known, we suggest you contact us for a further evaluation of the soil conditions.

Spread Footing Construction

Our general recommendations would be to extend all foundations through the existing fill, silty clay or clayey silt layers and any very loose sandy or silty soils. If the building has a deep basement, it would appear that foundations would be through these soils although there may be areas where foundations would have to be extended deeper. The density of the underlying soil was quite variable, and in general, the denser soils were encountered nearer the capitol. Based on the density of the soils encountered, loadings in the range of 3000 psf (pounds per square foot) to 5000 psf could be used at either site with the actual loading depending on bottom of footing elevation. Where the looser soils are medium grained sands, the bearing capacity could be improved by surface compaction. Also, the bearing capacity could be improved by subcutting, surface compacting and then refilling with an engineered fill. By improving the density of the soils by the above methods, it would be our judgment that foundations at either site could be designed for a maximum soil bearing pressure of 5000 psf, if this magnitude of loading would be required.

Deep Foundations

If building loads are sufficiently heavy so that spread footing construction would not be feasible, then the structure would have to be supported on a deep foundation. It was not within the scope of this investigation to evaluate deep foundations and our borings were not taken sufficiently deep

for this purpose. Generally, deep foundations would consist of drilled piers to bedrock or piling. The depth to bedrock in this area can be extremely variable and our general geologic information would indicate that bedrock would probably be higher west of the capitol. Driven pile would probably not be feasible at least close to the existing capitol, since vibrations set up by this type of installation may be damaging. Additional deeper borings would have to be put down to evaluate possible deep foundation plans.

Other Foundation Considerations

If several floors of the structure are below grade, then the walls will have to be designed to withstand relatively high lateral loads. In addition, if the structure is placed close to the existing capitol and if the excavation for the new building would extend below the foundation elevation of the existing capitol, then the excavation would have to be shored and braced or tied back to prevent possible damage to the existing capitol. To further evaluate this, the actual loading conditions and bottom of footing elevations of the existing capitol, as well as the details for the proposed structure would have to be known.

REMARKS

The recommendations and/or suggestions contained in this report are our opinions based on data which are assumed to be representative of the site explored; but because the area of the borings in relation to the entire area is very small, and for other reasons, we do not warrant conditions

below the depth of our borings, or that the strata logged from our borings are necessarily typical of the entire site.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Gordon J. Smith

GORDON J. SMITH

Date 10-30-75 Reg. No. 9242

REPORT OF TESTS OF SOIL

PROJECT: PROPOSED LEGISLATURE BUILDING
CAPITOL COMPLEX
ST. PAUL, MINNESOTA

October 30, 1975

REPORTED TO: State of Minnesota

LABORATORY NO. 22014

BORING AND SAMPLE NO.		1 - 9	2 - 8	3 - 9	4 - 9
Depth Sample Taken (Ft.)		21-21	20-21	20-21	25-26
Classification (ASTM: D 2487-69)		SM	ML	SM	ML
Description (ASTM: D 2488-69)		Silty Sand, fine grained	Silt	Silty Sand, fine grained	Sandy Silt
MECHANICAL ANALYSIS:					
Dry Weight of Total Sample (grams)		140	182	163	166
Based on Total Sample:					
Gravel - %	(On #4)	0	0	1	0
Based on - #4 Material					
Sand - %	(#4 - #10)	0	0	2	TRACE
	(#10 - #40)	TRACE	TRACE	14	1
	(#40 - #100)	23	2	38	4
	(#100 - #200)	38	19	27	30
Fines - %	(#200 Down)	39	79	19	65

REPORT OF TESTS OF SOIL

PROJECT: PROPOSED LEGISLATURE BUILDING
CAPITOL COMPLEX
ST. PAUL, MINNESOTA

October 30, 1975

REPORTED TO: State of Minnesota

LABORATORY NO. 22014

BORING AND SAMPLE NO.		5 - 5	7 - 8	8 - 8	9 - 7
Depth Sample Taken (Ft.)		10-12	15-16	15-16	15-16
Classification (ASTM: D 2487-69)		SP	SP	SP	SM
Description (ASTM: D 2488-69)		Sand, medium grained	Sand, medium grained	Sand, medium grained	Silty Sand, fine grained
MECHANICAL ANALYSIS:					
Dry Weight of Total Sample (grams)		159	244	289	243
Based on Total Sample:					
Gravel - %	(On #4)	30	11	8	0
Based on - #4 Material					
Sand - %	(#4 - #10)	14	11	7	0
	(#10 - #40)	58	68	68	TRACE
	(#40 - #100)	21	16	21	29
	(#100 - #200)	2	2	1	40
Fines - %	(#200 Down)	5	3	3	31

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS

SYMBOL	DEFINITION
C.S.	Continuous Sampling
P.D.	2-3/8" Pipe Drill
C.O.	Cleanout Tube
3¼ HSA	3¼" I.D. Hollow Stem Auger
4 FA	4" Diameter Flight Auger
6 FA	6" Diameter Flight Auger
2½ C	2½" Casing
4C	4" Casing
D.M.	Drilling Mud
J. W.	Jet Water
H. A.	Hand Auger
NXC	Size NX Casing
BXC	Size BX Casing
AXC	Size AX Casing
SS	2" O.D. Split Spoon Sample
2T	2" Thin Wall Tube Sample
3T	3" Thin Wall Tube Sample

LABORATORY TEST SYMBOLS

SYMBOL	DEFINITION
W	Moisture content - percent of dry weight
D	Dry density-pounds per cubic foot
LL, PL	Liquid and plastic limits determined in accordance with ASTM D 423 and D 424
Qu	Unconfined compressive strength-pounds per square foot in accordance with ASTM D 2166-66

Additional insertions in Qu column

Pq	Penetrometer reading-tons/square foot
Ts	Torvane reading-tons/square foot
G	Specific gravity - ASTM D 854-58
SL	Shrinkage limit - ASTM D 427-61
pH	Hydrogen ion content-meter method
O	Organic content-combustion method
M.A.*	Grain size analysis
C*	One dimensional consolidation
Qc*	Triaxial compression

*See attached data sheet and/or graph

WATER LEVEL

SYMBOL – ▽

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels can be considered reliable ground water levels. In clay soil, it is not possible to determine the ground water level within the normal scope of a test boring investigation, except where lenses or layers of more pervious waterbearing soil are present and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

DENSITY

TERM	"N" VALUE
Very loose	0-4
Loose	5-8
Medium Dense	9-15
Dense	16-30
Very Dense	Over 30

CONSISTENCY

TERM	"N" VALUE
Soft	0-4
Medium	5-8
Rather Stiff	9-15
Stiff	16-30
Very Stiff	Over 30

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon.

RELATIVE PROPORTIONS

TERM	RANGE
Trace	0-5%
A Little	5-15%
Some	15-30%
With	30-50%

PARTICLE SIZES

Boulders	Over 3"
Gravel	
Coarse	¾"-3"
Fine	#4-¾"
Sand	
Coarse	#4-#10
Medium	#10-#40
Fine	#40-#200
Silt and Clay	Determined by plasticity Characteristics

Note: Sieve sizes shown are U.S. Standard

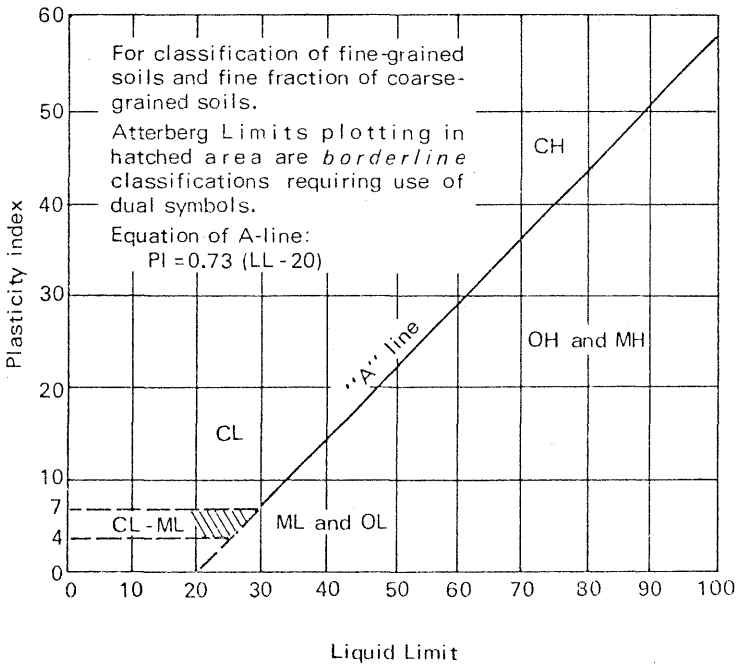
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 – 69 AND D 2488 – 69

(Unified Soil Classification System)

Major divisions			Group symbols	Typical names	Classification criteria	
Coarse-grained soils: More than 50% retained on No. 200 sieve*	Gravels: 50% or more of coarse fraction retained on No. 4 sieve	Clean gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines: Less than 5% pass No. 200 sieve . . . . . GW, GP, SW, SP; More than 12% pass No. 200 sieve . . . . . GM, GC, SM, SC; 5 to 12% pass No. 200 sieve . . . . . *Borderline* classifications requiring use of dual symbols	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_Z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are *borderline* classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
	Sands: More than 50% of coarse fraction passes No. 4 sieve	Clean sands	SW	Well-graded sands and gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_Z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
		Sands with fines	SM	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are *borderline* classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils: 50% or more passes No. 200 sieve*	Silts and clays: Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays: Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity		
	Highly organic soils		Pt	Peat, muck and other highly organic soils		

Plasticity Chart



*Based on the material passing the 3 in. (76 mm) sieve.