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FORMALISM

in Gallery Design

J. Bruce Mosher

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June 12, 1982

FORMALISM IN GALLERY DESIGN

by

J. BRUCE MOSHER

A professional paper submitted in partial fulfillment
of the requirements for the degree

of

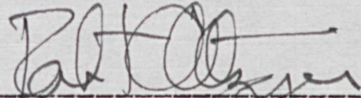
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MONTANA STATE UNIVERSITY
Bozeman, Montana

June, 1982

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TO MY FAMILY AND FRIENDS, FOR THEIR
KINDNESS, SUPPORT, AND UNDERSTANDING.

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THE CONCEPT OF FORMALISM AS AN
ARCHITECTURAL DEVICE RECURS
THROUGHOUT HISTORY IN THE FORM OF
MANY STYLES

PROJECT TOPIC

AN EXHIBITION GALLERY FOR THE CAMPUS OF
MONTANA STATE UNIVERSITY, BOZEMAN, MONTANA

INTRODUCTION

While the Vitruvian principles of firmness, commodity, and delight remained as requirements of 'good' architecture, the turn of the century was a period marked by several coexisting and conflicting architectural styles. The contrasting ideas of formalism, romanticism, mechanism, and organicism all grew in response to the new commercial institutions and the society which created them. These philosophies, although suggestive of style, offered little basis for quality. Architects and clients alike failed to realize that quality in architecture is derived from a rhythmical arrangement of spaces and masses which state a geometric theme in light and shade express a purpose, and execute that purpose well.¹

The philosophy of formalism most closely aligns with my own thoughts and feelings on architectural design. Formalism expresses a concern

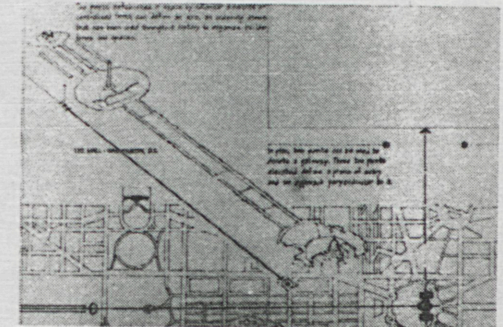
for proportion, unity, and order in design; basic principles that architects still adhere to today. It is the intent of this thesis to identify and examine the principles of formalism, not in a historical sense but in the sense of a "formal character", and apply them to my gallery design.

FORMALISM: An Overview

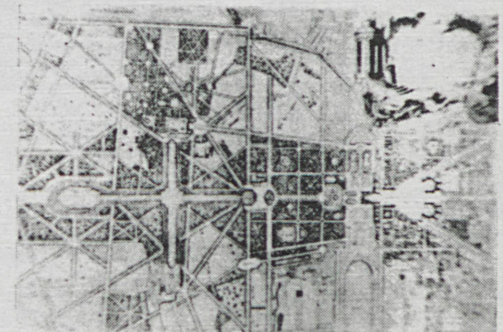
The beauty and aesthetic satisfaction of formalism was obtained through the manipulation of simple geometric forms after Greek or Roman Models arranged on axes.² Formalism was first perceived only as drawing upon classical precedents, a mere application of classical styles "to new forms dictated by new commercial, sociopolitical, and technological needs of the 19th Century."³ In fact the movement was characterized by a non-archaeological use of classical forms and traditional elements such as domes, columns, and landscaped axes. These were all evident in the plans of Paris and Washington D.C., as well as the Columbian Exposition of 1893 where compositional elements of great axes, plazas, gardens, and fountains all reflected Versailles. The Acropolis in Athens is a unique example in that formal, monumental structures of classicism are sited upon the sacred



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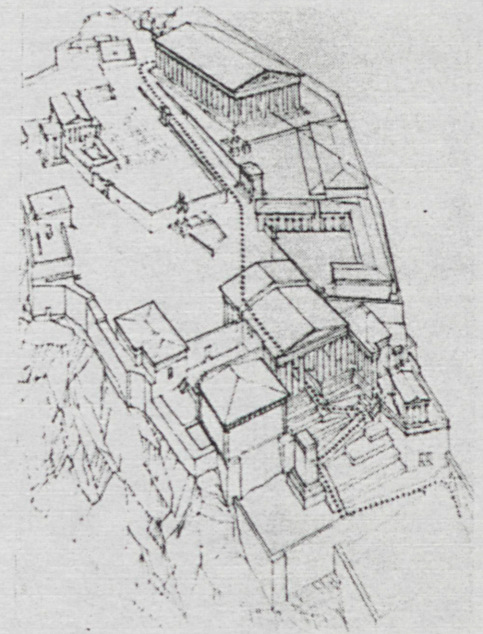
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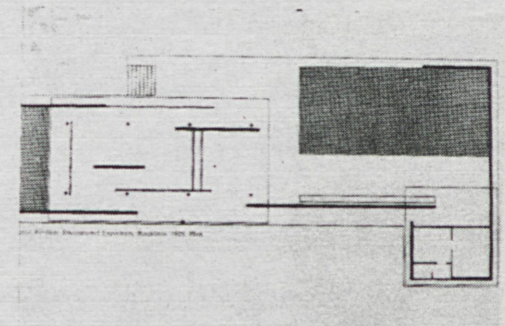
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landscape in an informal arrangement. Unity in design was achieved through concepts of composition, such as the interlocking asymmetrical masses of Mies' 1929 Barcelona Pavilion and the balancing of similar masses and voids with respect to axes.⁴

Historically the roots of formalism date back to the 15th Century Renaissance of Classic Architecture in Italy. The first origins began during the religious reformation of 1483-1546. This was a period of renaissance in literature and architecture alike. The intellectual life became the fashion with a spread of classic literature including Boccaccio and Vitruvius' Treatise on Architecture. This upswing in intellect was accompanied by an outbreak in building.⁵ The Classic style and forms were again realized, only this time within the means of Gothic construction methods. The classic orders were reintroduced and used both constructively and decoratively. However, their proportions became standardized by



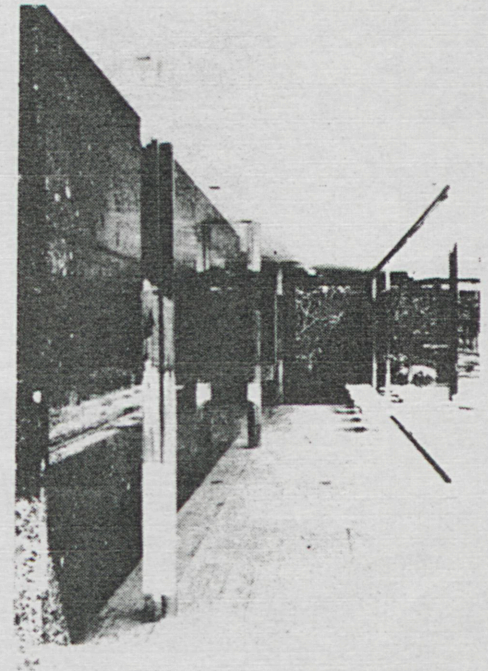
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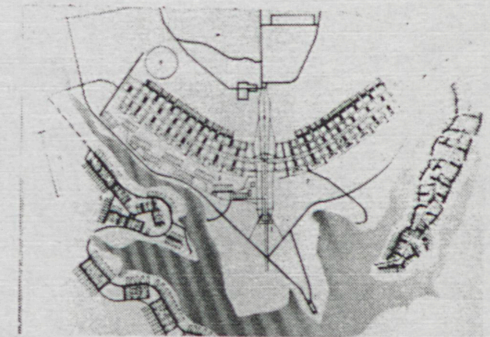
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Renaissance architects such as Palladio and others.⁶

The principles of formalism were not restricted only to the early Renaissance but continually surfaced in many of the styles throughout history, including the present. In education, universities such as Columbia were laid out in the classical Beaux-Arts image. The Dutch de Stijl movement of 1917, influenced by Cubism, presented a geometric formalism characterized by precision of line, economy of form, and purity of colour.⁷ By 1952 the advent of Modern Formalism had arrived within the modern movement with a shift from the functionalism of the International Style toward a monumental formalism of sculptural mass, as in the designs of Chandigarh and Brasilia.⁸ The formal axes are maintained, however the most notable difference between Versailles and Brasilia is the transformation of the soft, picturesque gardens of the former into a harder, more permanent concrete landscape of the later.



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In conclusion, formalism exhibits an interplay between formality and informality which instills dignity, power, unity, and order into architecture with a timeless quality and character that transcends rather than mimics history.

For the purposes of this thesis I will limit my concerns on formalism to those principles applicable to museum and gallery design. Formal axes and siting of the gallery will play a role in the procession and entry into the building. In addition, these axes will help in establishing and defining the public/private zones of the building, an important criteria for determining the success of the gallery. Careful proportioning of exhibit spaces is most beneficial to the visitor in terms of the ease in observation of exhibits and the reduction (or elimination) of 'museum fatigue'. The proposed gallery should

preserve the existing unity of the site and its surroundings. Therefore, it must develop a rapport and unity of and with the site.

Museum as Building Type

The ascendancy of the museum as a building type can be categorized into three major trends of development. Originally, collections were housed in existing monuments, palaces, and historic structures. During the interim period, the fall of the aristocracy brought forth a rise in public collections. For the first time buildings were specifically designed and built to house these collections.

Today, modern construction methods and mechanical systems have eliminated the need for a bearing wall structure. Gallery spaces have, therefore, become more flexible and sculptural in their design. They do, however, maintain a link with the past, as many modern museums still retain an essence of classicism.

HISTORICAL OUTLINE

"Just as with the content of a museum, the container itself is largely fashioned by the past ...a museums history conditions its architecture. ..."⁹ Along with this, museum buildings change through time with changing points of view.¹⁰ These two statements will help in the realization and explanation of the following historical outline.

300 B.C. Ancient Greece

The Mouselon - a grove or spot sacred to the Muses who presided over the Liberal Arts and Sciences. The best example was the Museum of Alexandria where "the learned studied and discoursed in true Platonic tradition."¹¹ Monuments such as this grew in both quality and quantity. However, collecting did not appear until after the death of Alexander.

113 Rome

The Romans, although lacking in artistic ability, were known for their capabilities in organizing and collecting as a result of their many conquests. As the nobility vied against one another for works of art, "collecting in its modern sense began."¹²

400-1400 Middle Ages

Religious treasures were kept in churches and monasteries, while royal collections were housed in palaces and castles.

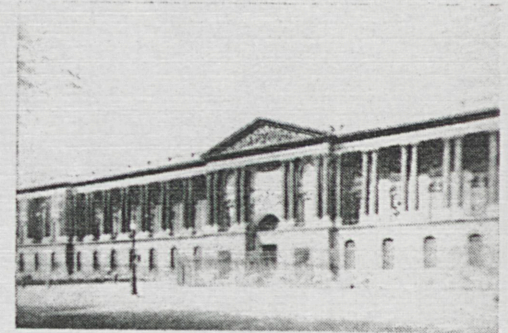
1500 Renaissance

Known as "the age of discovery and of scientific formulation."¹³ The Renaissance's curiosity with the oddities of nature would continue through the 18th Century. As a result of the formation of scientific academies, in 1683 the Ashmolean in Oxford became the first museum building in the world.¹⁴



1700's

This period resulted in the birth of the principle public collections such as the British Museum, the Louvre, and the Vatican Museum. The aristocracy lost its importance and the intellectual and cultural life became democratized. At this time museums".... broadened with the dissemination of ideas and extended to...North America."¹⁵



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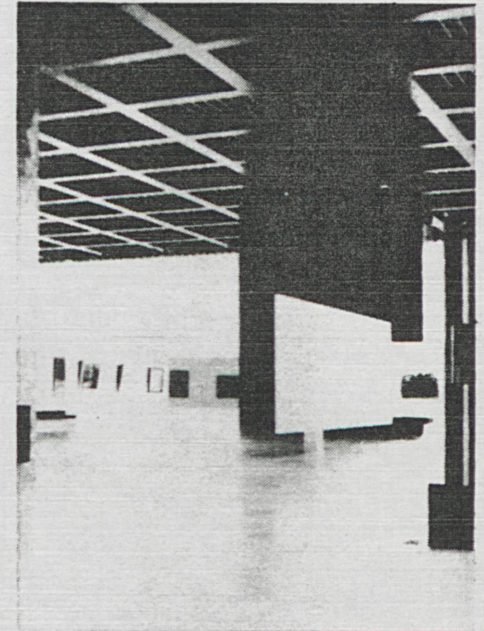
1800 Temple or Palace Museum

Due to the political and cultural democratization that developed during the 19th Century "many palaces, symbols of the old order, were transformed into museums."¹⁶ In the United States where few palaces existed, museums adopted Neoclassical or Palladian architecture to imitate temples and palaces. These were structures of monumental character which expressed Greek temples in their

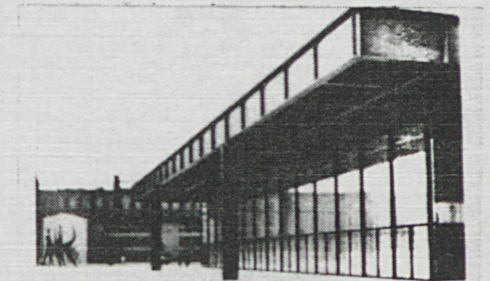
exterior appearance with colonnades, pediments, and classic ornament.

"Within are rooms covered with marble or hard stones, with lofty ceilings, vast staircases...inconvenient circuits for visitors, lighting as high up as possible - all elements designed to emphasize the value of the collections of masterpieces in a solemn and almost religious atmosphere."¹⁷

Mies' National Gallery in Berlin (1962-68) is often considered as the modern example of the temple museum. Although typical of Mies' designs, the reversion appears to be a contradiction in terms of the advances in construction methods at the time. It did, however, provide the flexibility desired in a gallery design.



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1800-1950

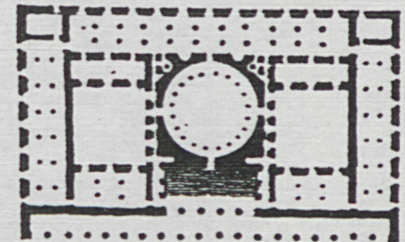
A majority of the museums were housed in existing historical monuments. Problems arise in modernizing these types of structures and adapting them to present forms of art presentation. Most have a lack of flexibility, uncontrolled daylighting, and problems with humidity damaging collections.

1824

Karl Schinkel's Altes Museum in Berlin marks the first break from the palace monument to a distinct museum plan. The plan consisted of a central space, either a court or hall, surrounded by a succession of connecting galleries. This pattern, set in plan and classical detail, lasted until the end of the century in Europe but continued in the United States.¹⁸



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1880

-The composite display; painting, sculpture, etc. "exhibited together as varying aspects of a common culture."¹⁹

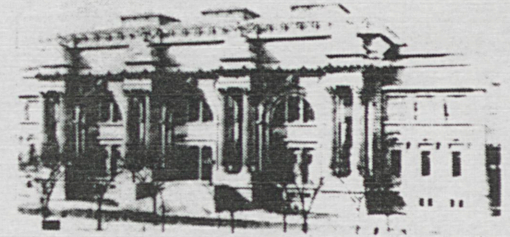
1924

-The DeForest Wing of the New York Metropolitan Museum of Art sets the American precedent.²⁰

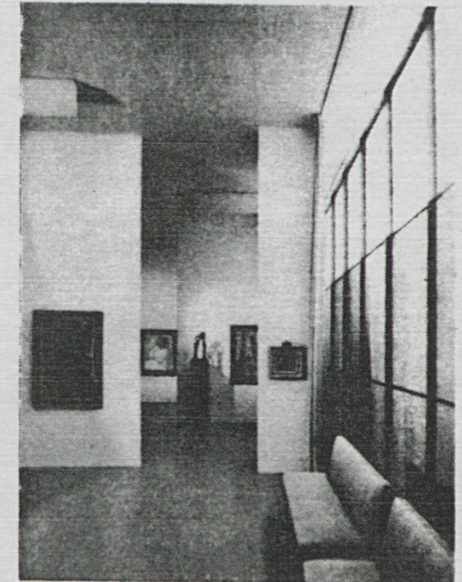
1950

In the period from 1850-1950 the emphasis was placed on the private museum. Some examples include the Met (N.Y., 1870), the Art Institute of Chicago (1879), and the MOMA (N.Y., 1929), most noted for its flexibility of exhibition spaces.

"The three principle facts of the century from 1850 to 1950 may be defined thus from the point of view of the museum concept: the idea that culture is for the



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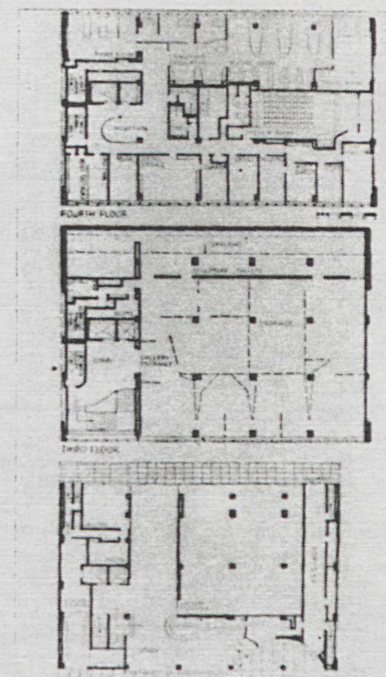


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people...; the patronage of a wealthy class at the service of the community, as can be seen in the United States in both large and small towns; the development of tourism, which has brought into favour museums of art and archaeology in countries of great cultural riches in the Mediterranean Basin and Western Europe."²¹

World War II terminated this period. Many European museums were destroyed, while the United States was able to continue acquiring collections and developing its museums.²²

1950-1970 "Saw a renaissance of museums" which retained "the major trends of the preceding period."²³ In Europe, museums were reconstructed, while in the United States, "the expansion of museums proceeded at an accelerated rate." In 1964 it was estimated that a new museum appeared every 3.3 days.²⁴

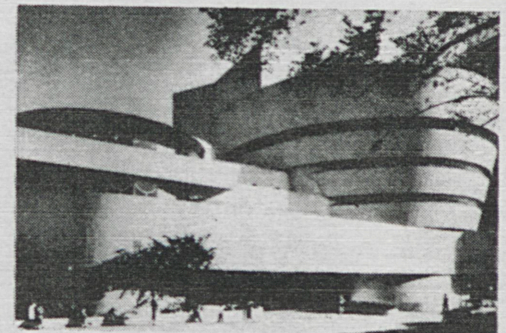


CASE STUDIES

Rather than giving a detailed description and cronology of each museum, I have chosen to present a collection of observations made by the critics of each museum around the time of their openings. I have, however, made comments where discrepancies occur in my interpretations of the articles researched.

The Guggenheim Museum - New York (1958)

While many feel that Frank Lloyd Wright's Guggenheim Museum is more of a memorial to himself than to Solomon R. Guggenheim, in Wright's statement published in the May 1958 issue of Architectural Record, he clearly states that it was his intention to design a memorial to Guggenheim. Wright was sympathetic with Guggenheim's wishes for the visitor to view a painting in the same manner in which the artist himself saw it. He stated his reason for



taking the commission was to ...

"create an atmosphere instead of a frame in which to show the painting - incorporating it as a feature of the structure of the edifice in such manner as to reveal its properties of color and design more freely - less constricted and restricted than the bolt-upright canvas on a perpendicular wall under electric light from above. . .he, Guggenheim envisioned a museum pretty much as it stands. Unique, a genuine intelligent experiment in museum - culture where pictures could be better seen with less discomfort in an atmosphere peculiarly belonging to the free forms of art he loved for itself - a true friend of the future."²⁵

Comments from a preopening critique described the interior as "being at once exciting and dismaying. Exciting in its unconventionality of form and function and its dramatic, sweeping spaces.....

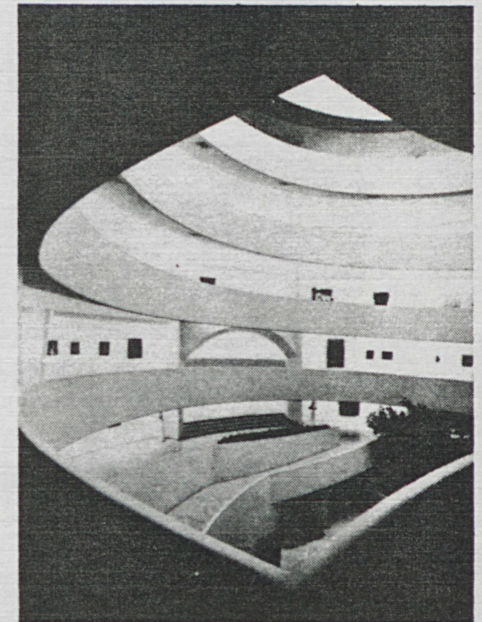
The interior is dismaying when one thinks of the probability of the museum - and not the paintings - becoming forever the cynosure."²⁶

One year later the remarks were not any more favorable. The Guggenheim continued to be the target of a rash of criticisms. In December of 1959, Interiors magazines post-opening observations were that the museum was "irrational for its purpose. . .unconcerned about its site. . . and that it infuriates museum and gallery people, painters, and all others to whom painting is a primary preoccupation. "The museum was indeed popular with the people of New York, but mostly as an oddity in which to satisfy their curiosity."²⁷ In a very real sense, the Guggenheim - our "true friend of the future"²⁸ reverts back to the age of the Renaissance as an "oddity of nature."²⁹

Even the origin of the design itself has come under attack. "The Guggenheim Museum stands today as a result of Hilla Rebay's insistence that Frank

Lloyd Wright give form to the ideas of Rudolf Bauer. Wright took these ideas and made them his own, transforming a museum into a memorial to his own ideals."³⁰ In 1938 Bauer wrote to Rebay relating his ideas for a museum of Non-Objective Art to be located in New York City. In the letter Bauer recommended that the structure be restricted to only four floors so that the exhibits might be top lighted as well as side lighted. In a later letter, Bauer clarified his ideas and noted his dissatisfaction with the possibility of "the stairs, necessary to change levels, breaking the continuity of the displays"... prompting him to suggest the use of a spiral ramp instead...."The resemblance between Bauer's description and the Guggenheim Museum as built is striking."³¹

In 1959, after Wright's death and Rebay's resignation, James Johnson Sweeney became the new museum director. Guggenheim had also passed away and the trustees began to broaden the scope of



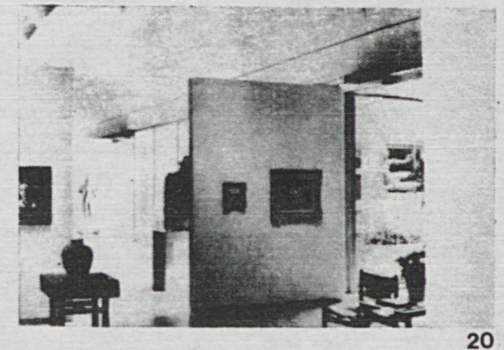
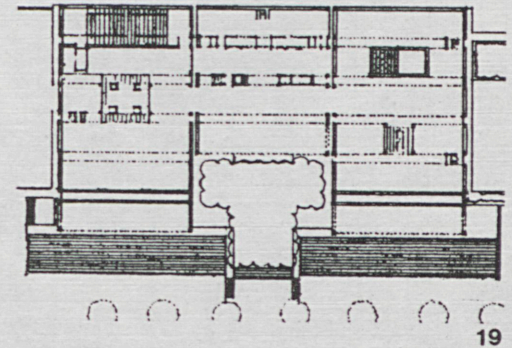
the collection. It was decided that the museum would include "an active program in all areas of modern art..... Sweeney was faced with a building designed on Rebay's specifications to hold a permanent display of a certain type of painting. The changes in the museum's program.....made the design obsolete before construction even began."³² He recognized a multitude of problems not fully considered in Wright's design, including a lack of storage and other service facilities "necessary to support a program of changing exhibition."³³ Sweeney had to go as far as hiring a firm of electrical consultants to redesign the entire lighting system. As he saw it, Wright's clerestory would have directed a glaring light right into the viewer's eyes and, therefore, "it was covered over and a set of floodlights installed in each bay on the ramp."³⁴

The Guggenheim is a fine example of sculptural form and dramatic space, yet it fails in its func-

tional aspects. Museum's that do not function as a result of poor programming, are impractical and re-design is costly.

The Kimbell Art Museum - Fort Worth, Texas (1972)

It is difficult to find anything but praise for Louis Kahn's masterful Kimbell Art Museum. Even before its opening, the museum was showered with compliments. In the December 1959 issue of Progressive Architecture, C. Ray Smith commented that while the museum was only in its second design phase, it showed a readiness to accept design parameters imposed upon it. The principal example was the forty foot height restriction, so as not to impede the view from the Amon Carter Museum. Smith felt that the pre-programming of the museum was both perceptive and painstaking. The cycloidal vaults of the museum permit uninterrupted floor space thus affording the gallery spaces the desired flexibility needed for the types of exhibits presented.³⁵



After one week of opening parties, the "reaction of the guests ranged from 'superb' to 'superlative.'"³⁶ The museum's director, Dr. Richard F. Brown, chose and arranged the collection, "which he described as 'the manner of a 14th century private, palazzo, where guests are shown objects chosen for their aesthetic quality and individual interest', his goal being to acquire definitive works in excellent condition arranged 'so that they have conversations with each other.'"³⁷ The writer of the article felt that the museum itself was, and is, the foundation's major acquisition and that "it is indeed a 'definitive work in excellent condition.'"³⁸ Brown chose to display only Non-American works because two nearby museums, the Amon Carter and the Fort Worth Art Museum, dealt only in American art.³⁹

John Anderson described the Kimbell as a "building of moods. . .living in praise of nature and in praise of the nature of light. . .with

details like integral grace notes."⁴⁰ These comments strongly reflect Kahn's own philosophy of architecture.

In May of 1975, the Kimbell Art Museum won an AIA Honor Award. Andrea Dean's remarks on the Kimbell were as follows: 1) "The building derives its simple, rhythmic quality from the repetition of cycloid, vaulted shapes... 2) the materials give definition and visual interest to the spare forms...and 3) the museum provides optimum security, flexible exhibition areas and constant climate control."⁴¹

Perhaps the most definitive critique of the Kimbell are the jury remarks. 'The intangible spiritual qualities of superb space and a timeless classical quality of siting lift this building into the realm of great architecture.'⁴²

In the buildings and landscapes presented I have discussed formalism throughout time with regard to many architectural styles. All have formal elements of columns, axes, etc. in spite of period or style. All capture the "spirit" of formalism. We as architects recognize the formality of a building due to our education and experience. I believe, however, that the layman perceives formalism in a more spiritual sense. If nothing else, formalism is a spirit or feeling within man, developed through his attachment with history, and the search for unity and order he desires.

The Final Act

At around 5 PM on March 15, 1952, the final act in the dark and tragic history of Belle Grove began. Fire broke out (possibly caused by tourists) and roared through the house till 3:30 AM the next day (Sunday). All the magnificent woodwork of the house, including the capitals, went up in the flames. This is the first picture I made on that Sunday — when the bricks were still hot. Great cavities had opened in the walls, and against them moss can be seen dripping against the distant sky — like a suppuration of doom — the whole scene having much of the emotional quality of Piranesi's engravings of Roman ruins — and indeed this house was very much like a palace of antiquity — lost in time and space."



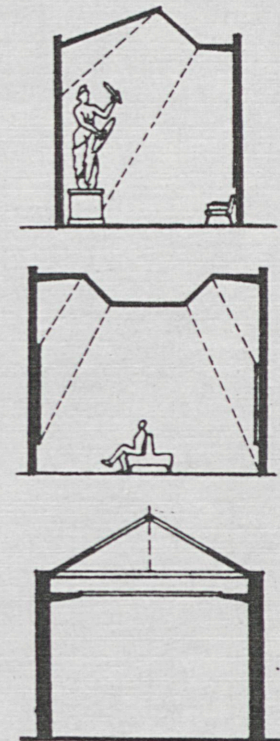
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Lighting

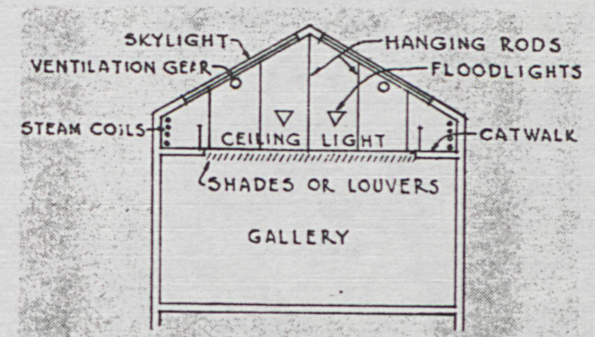
Up until the 20th Century development of electricity, natural illumination was used, not only for the lighting of the interiors, but for the objects on exhibits as well. This was mainly achieved through the use of skylights and side lighting. With todays modern light sources, a large variety of lighting effects can be provided in our art galleries.⁴³ However, the controversy over artificial versus natural illumination still remains. The following are my conclusions based on several articles that I read on the subject.

Skylighting

- | | |
|---------------|---|
| Advantages | <ul style="list-style-type: none"> - provides a steady supply of diffuse light - uniform lighting with a minimum of reflection and distortion - all walls may be used for exhibits |
| Disadvantages | <ul style="list-style-type: none"> - increase in building structure may be required - difficult to maintain - admits sun rays, harmful irradiation and produces heat |



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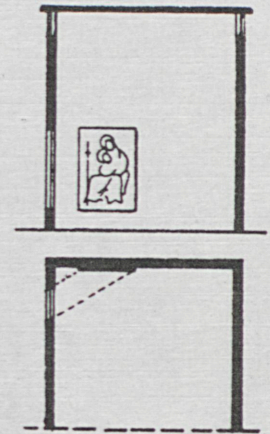


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- additional mechanical requirements
 - requires a tall gallery space
- Conclusion
- should not be used when side-lighting is available. Some of the disadvantages, however, may be overcome through the use of diffusion and UV filters, etc.

Lateral Light (Sidelight)

- Advantages
- preferred over skylighting
 - provides a means of reducing 'museum fatigue'
 - easy maintenance
 - controlled southerly side light good for paintings (hung for short duration) and sculptures
- Disadvantages
- may cause reflections and reduced visibility
 - takes up wall space



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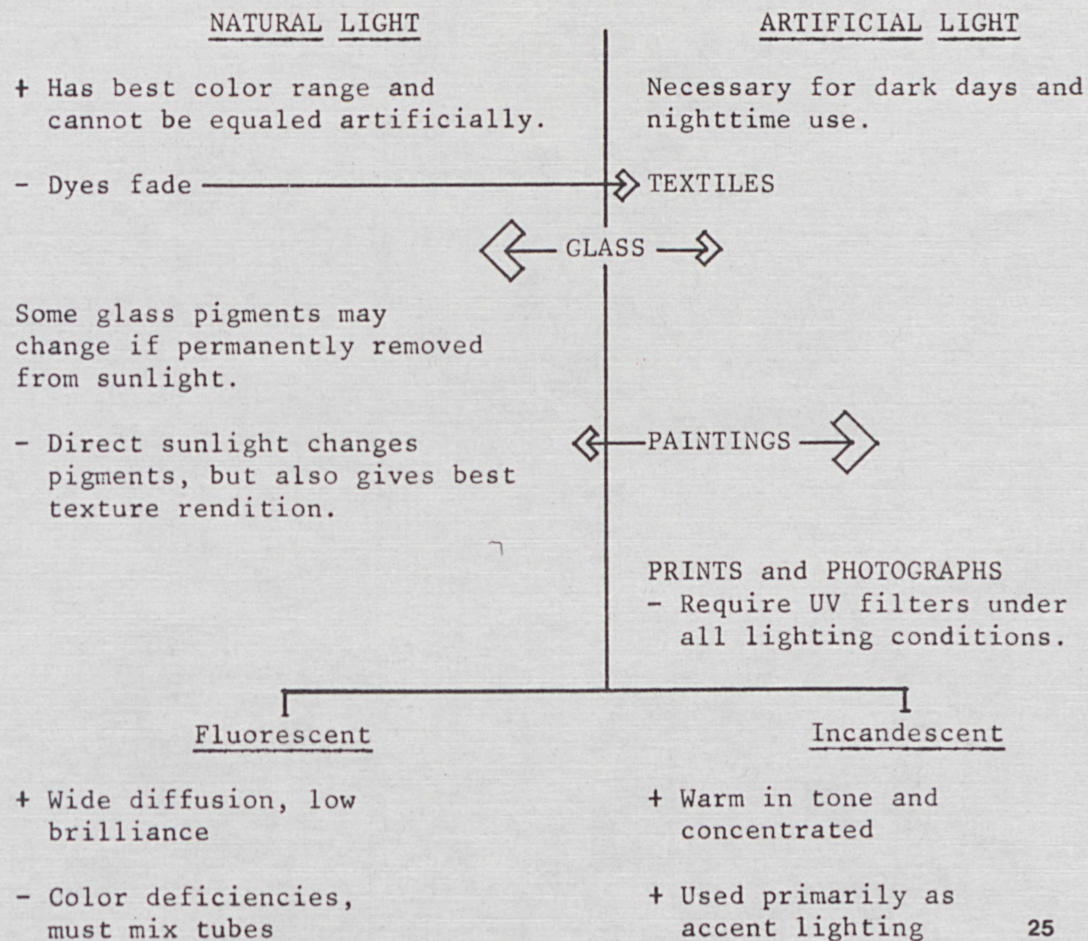
Artificial Lighting

It was made clear in the articles that as far as artificial lighting is concerned, direct, concentrated lighting was preferred over diffuse

lighting. The main concern with diffuse lighting is that it tends to desaturate the colors of paintings as well as dulling their texture. On the other hand, concentrated light provides good color saturation. Flexibility in positioning light sources is easily achieved through the use of track lighting. It is noted that concentrated lighting works best with the softening effects of diffuse lighting.⁴⁴ This suggests that diffuse lighting should be used as the general low level illumination in the gallery with concentrated light directed at the exhibits.

General guidelines emphasize the importance of maintaining low brightness ratios in the exhibit galleries. Exhibits should receive higher intensities of light than the surroundings.⁴⁵

"low-contrast surroundings produce 'tautness' and a sense of theatrical, visual drama...".⁴⁶ Doorways should be placed next to windows, which generally have the poorest overall lighting conditions.



Gallery Design Principles

Presentation of concentrated light to wall displays (tapestries, paintings, etc.) should be at an incident angle of 60 degrees with the horizontal, centered at an adult sight-line height of 5 feet 6 inches from the floor as shown in Fig. 12-23.* This angle provides a good balance between frame shadow, specular reflections from protection glass or varnishes on paintings, the "raking" of surface textures (see Fig. 12-24), and maintaining a practical width of viewing zones. These, of course, will change with the height of hanging displays. (See Fig. 12-25).

A nominal level of illumination of 30 footcandles maintained (being total flux from all sources), on both horizontal and vertical planes, is recommended to meet all normal visitor functions of gallery viewing, copying, and studying. Vertical footcandles should be figured for these purposes on a 60 per cent full wall coverage basis, but, due to variable factors, may not, in practice, average that figure.

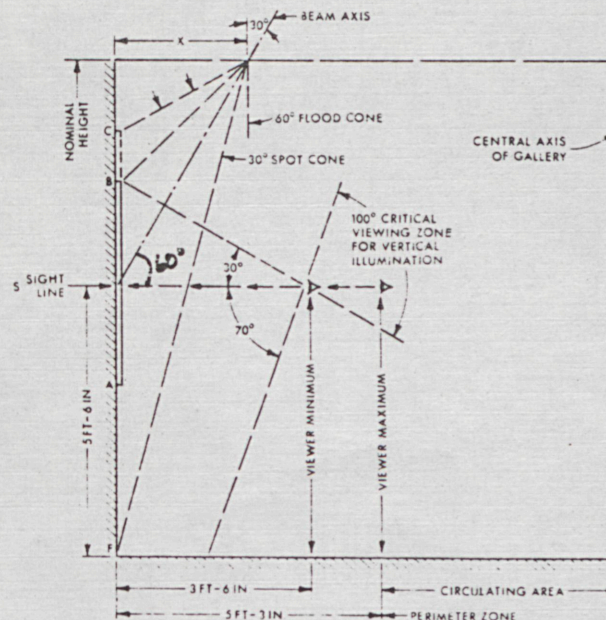
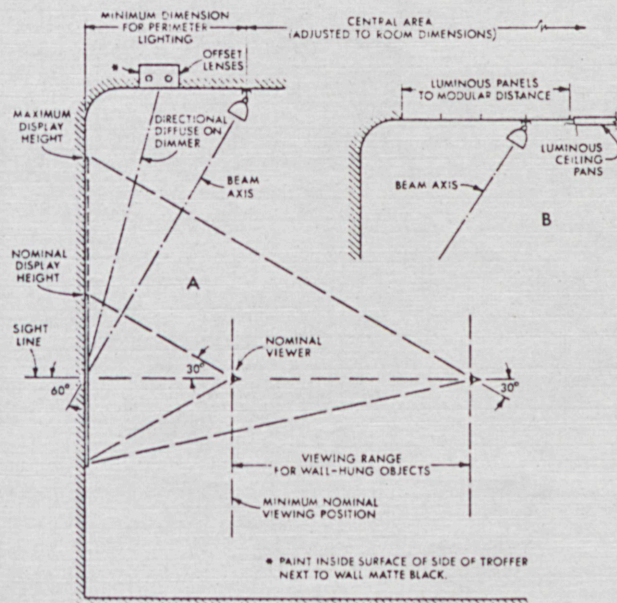


Fig. 12-23. Model perimeter (viewing) zones at nominal ceiling height. Model based on: (1) primary diffuse component (of vertical footcandles) at approximately 40 per cent of horizontal footcandles at S, (2) height of wall-hung display, (3) ideal utilization of beam cones, and (4) minimum effective viewing distance relative to a nominal height of object (A to B = 52 inches for a 30-degree cone, A to C = 65 inches for a 60-degree cone). To calculate viewing zones for higher objects, increase horizontal dimensions 1.5 inches for each 1.0 inch increase in height of object.

ADDITIONAL INFORMATION ON
SIGHT-LINES, CEILING HEIGHTS,
VIEWING ZONES, AND COLOR
OF ARTIFICIAL LIGHT SOURCES
MAY BE FOUND IN THE APPENDIX.

Fig. 12-25. Range of perimeter zone width.
A—with fully controlled wall illumination.
B—with full width luminous ceiling.

The Site

The gallery site is located on the campus of Montana State University, Bozeman, Montana. It lies adjacent to the pond and is bounded by Sherrick Hall to the north, Traphagen Hall to the east, and the new Visual Communications Building to the south. This site is in close proximity to the existing Creative Arts Complex and will help unify the Creative Arts Buildings on the west end of the campus. (Fig. 3)

The site is approximately 160 by 200 feet and, as noted, is surrounded on three sides by campus buildings. (Fig. 4). All are of masonry or concrete and masonry construction and range in height from two to four stories. Because of this, the views on the site are either inward or toward the trees and pond to the west of the site. This area has a parklike atmosphere and character and could be described as an oasis within the campus. Therefore, the scale of the gallery

building becomes very important and it should be restricted to one or two stories at most. The views of the Bridger Mountains to the north and the Spanish Peaks to the south are almost wholly obstructed by the campus buildings. However, the buildings to the north and east offer the site good protection from the northerly winter winds. Along with this, the walkway and plaza created on the north side of the Visual Communications Building will provide good solar access and allow the southwesterly summer winds to cool the site.

The site slopes gently downward from east to west (approx. 7 ft. drop total). Site drainage is more than adequate. Vegetation on and around the site is over 90% coniferous, with most trees ranging from 24-30 feet tall. See topographical map (Fig. 5). Contours are at 1 ft. intervals.

Service, delivery, and emergency access to the site is obtained from either the parking area

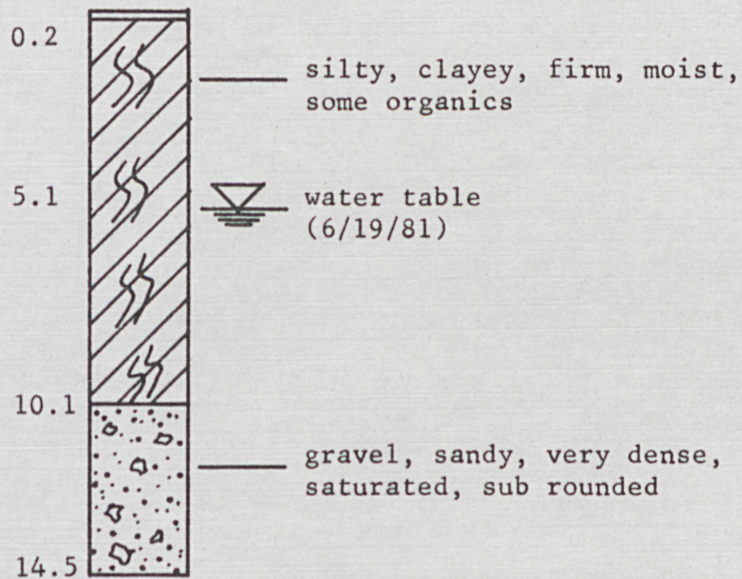
behind Traphagen Hall or the service drive and walkway between the Visual Communications Building and Gaines Hall. Visitors who reach the gallery by car will park in the north lot of the Fieldhouse parking. Handicapped parking will be provided in the lot behind Traphagen.

Soil Analysis

Data collected from core samples on both the Visual Communications Building, to the south of the site, and Sherrick Hall, to the north, indicate a soil type labeled as Bozeman silt loam, which is typical to the area. Both buildings employ a capped piling system to support the foundation wall. A modified system of this type will also be used in my gallery design.

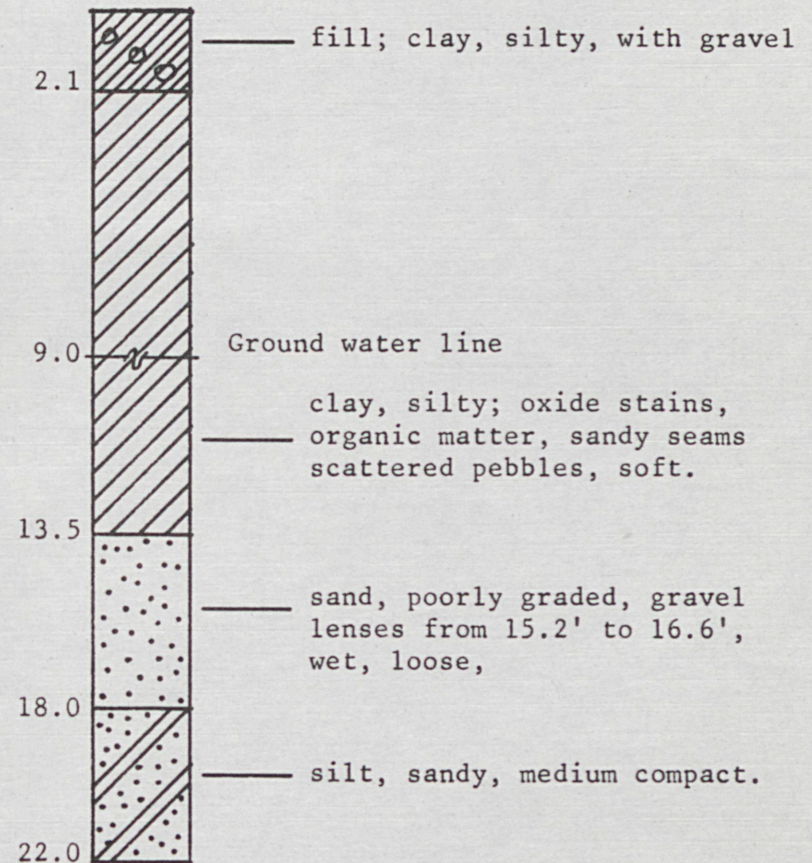
Film and T.V.

D.H. No.
Elev. 84.4



Sherrick Hall

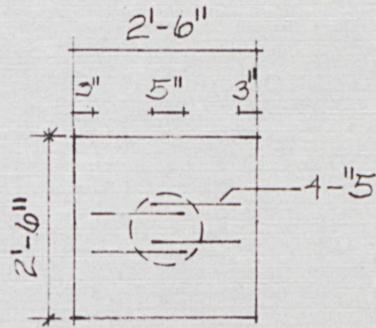
D.H. No. 7
Elev. 87.9



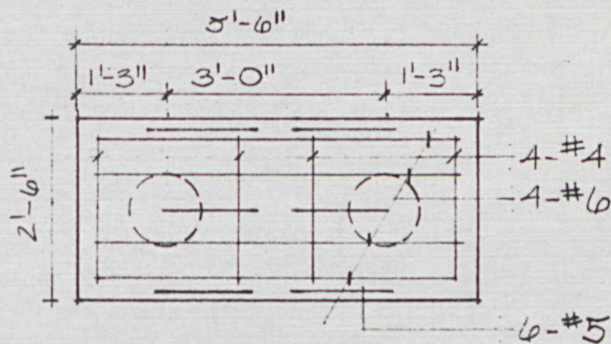
Visual Communications Building - CTA Architects

Sherrick Hall - Davidson & Kuhr Architects

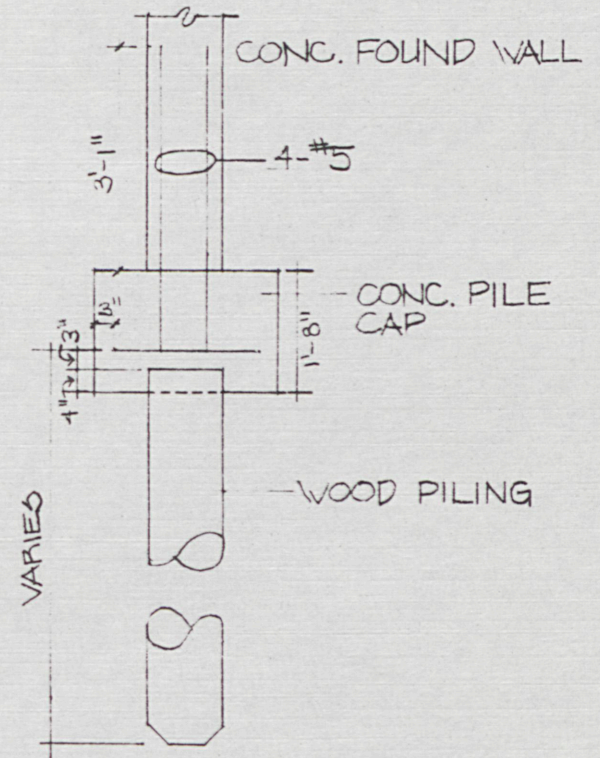
FOUNDATION DETAILS



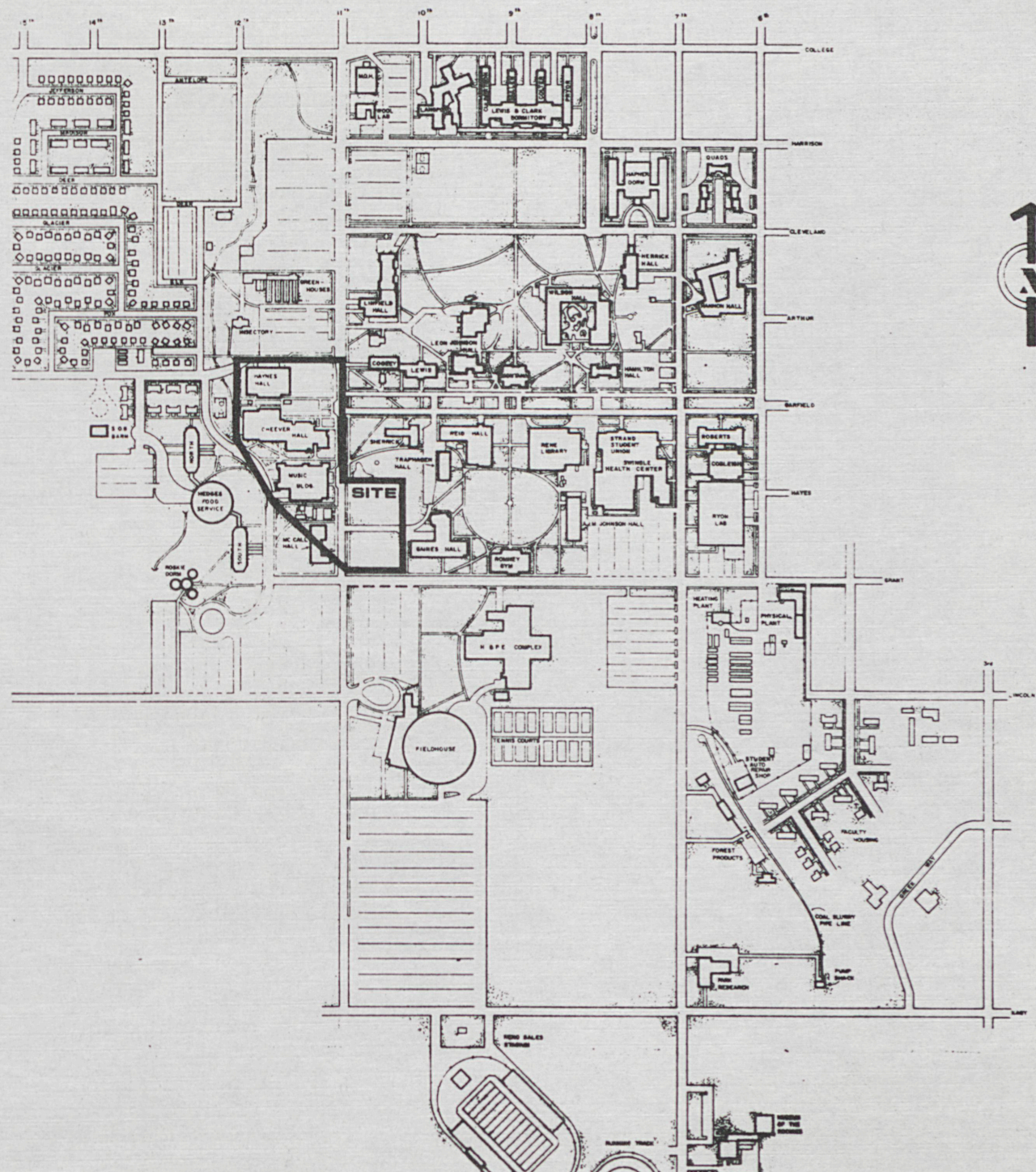
ONE PILE



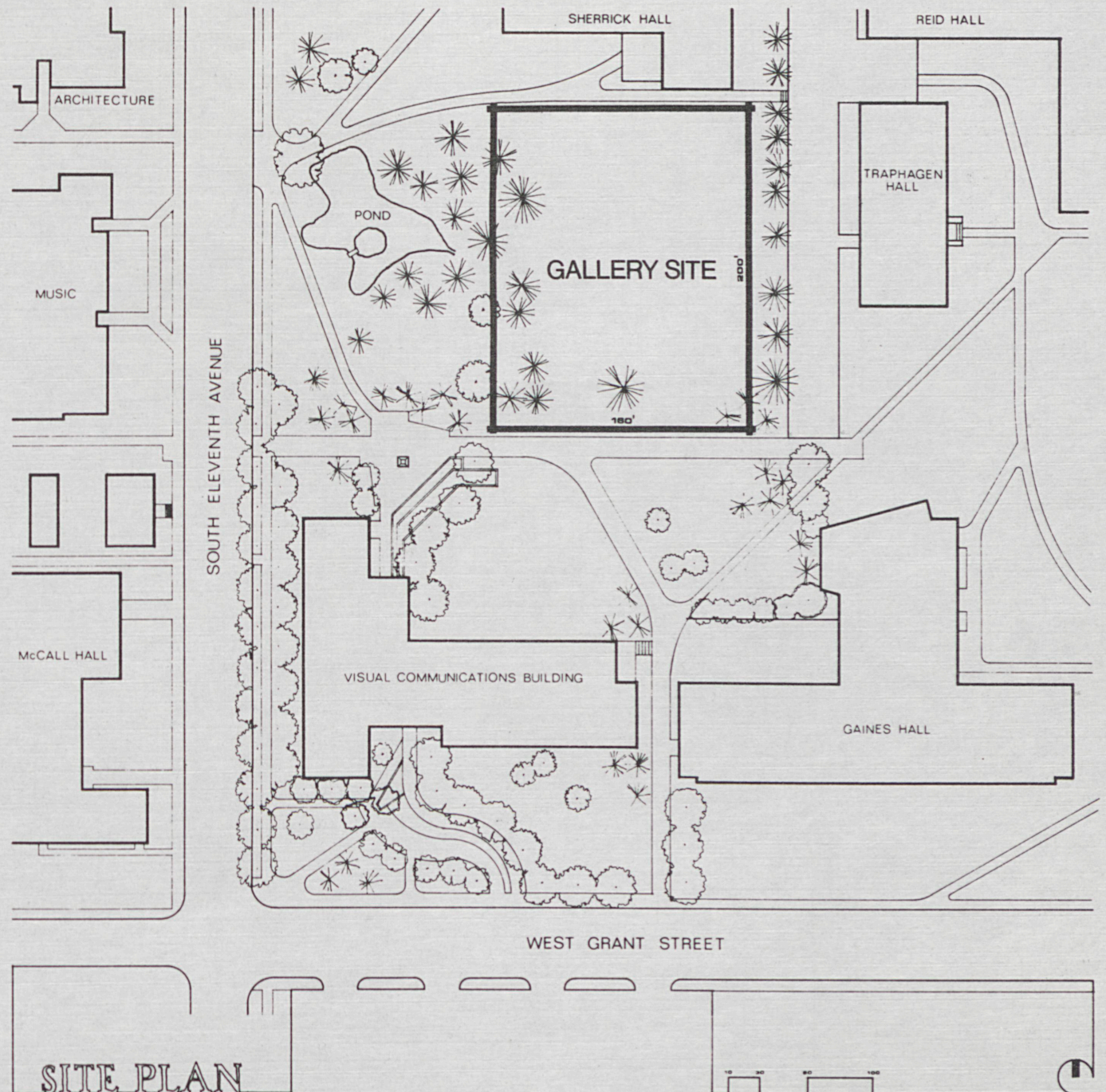
TWO PILE

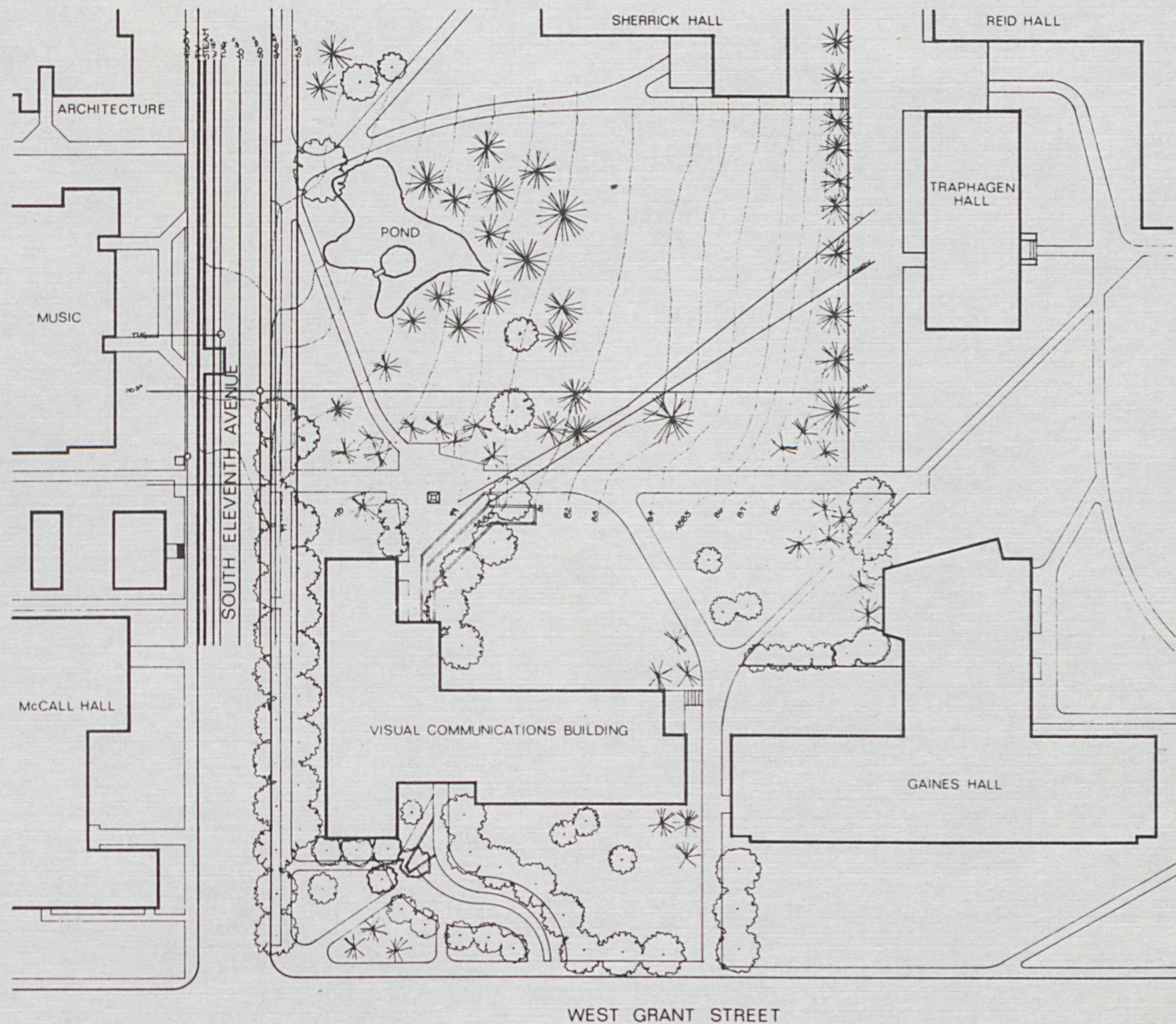


SHERRICK HALL
 DAVIDSON & KUHR ARCHITECTS
 SCALE 3/8" = 1'-0"

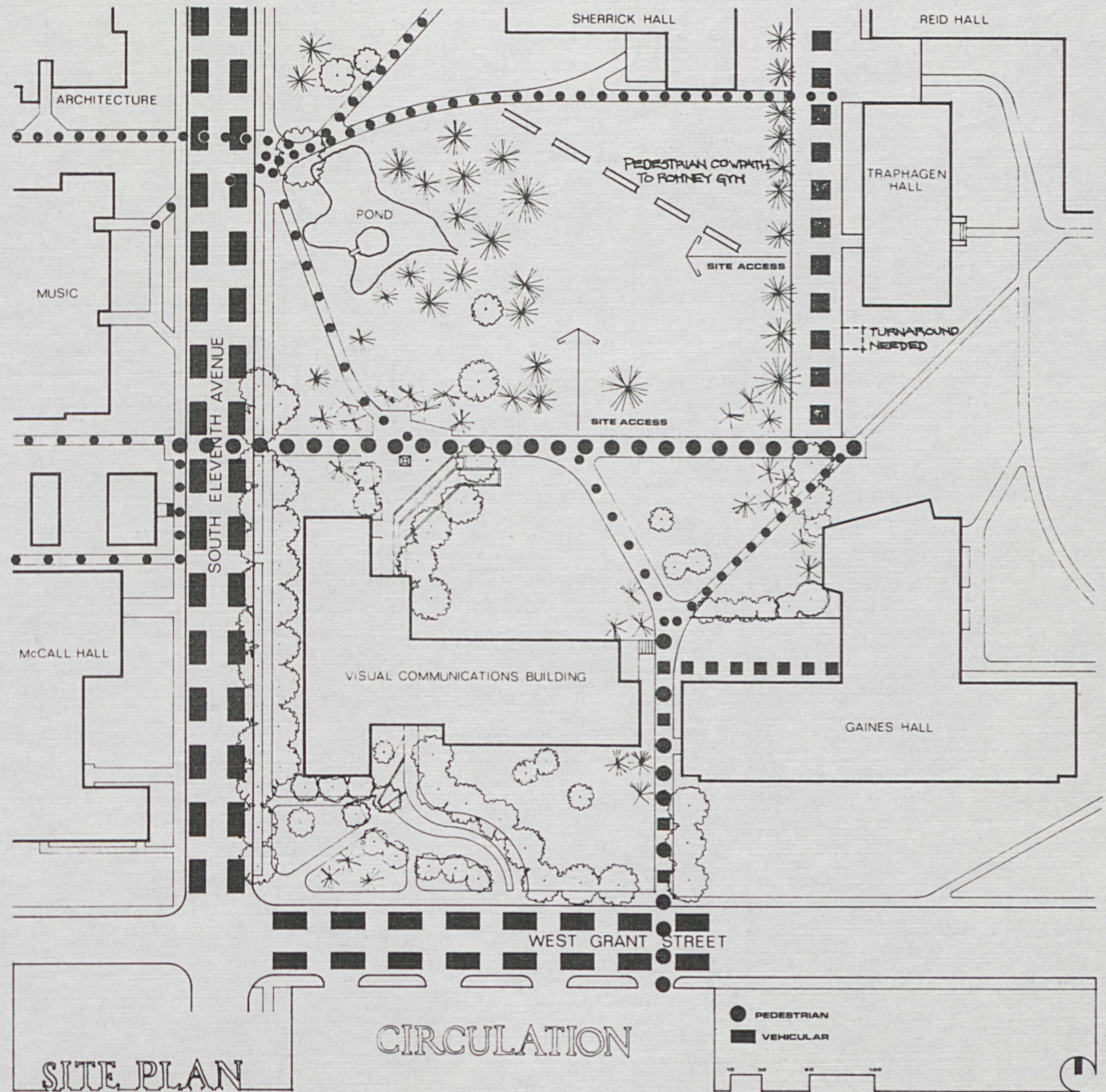


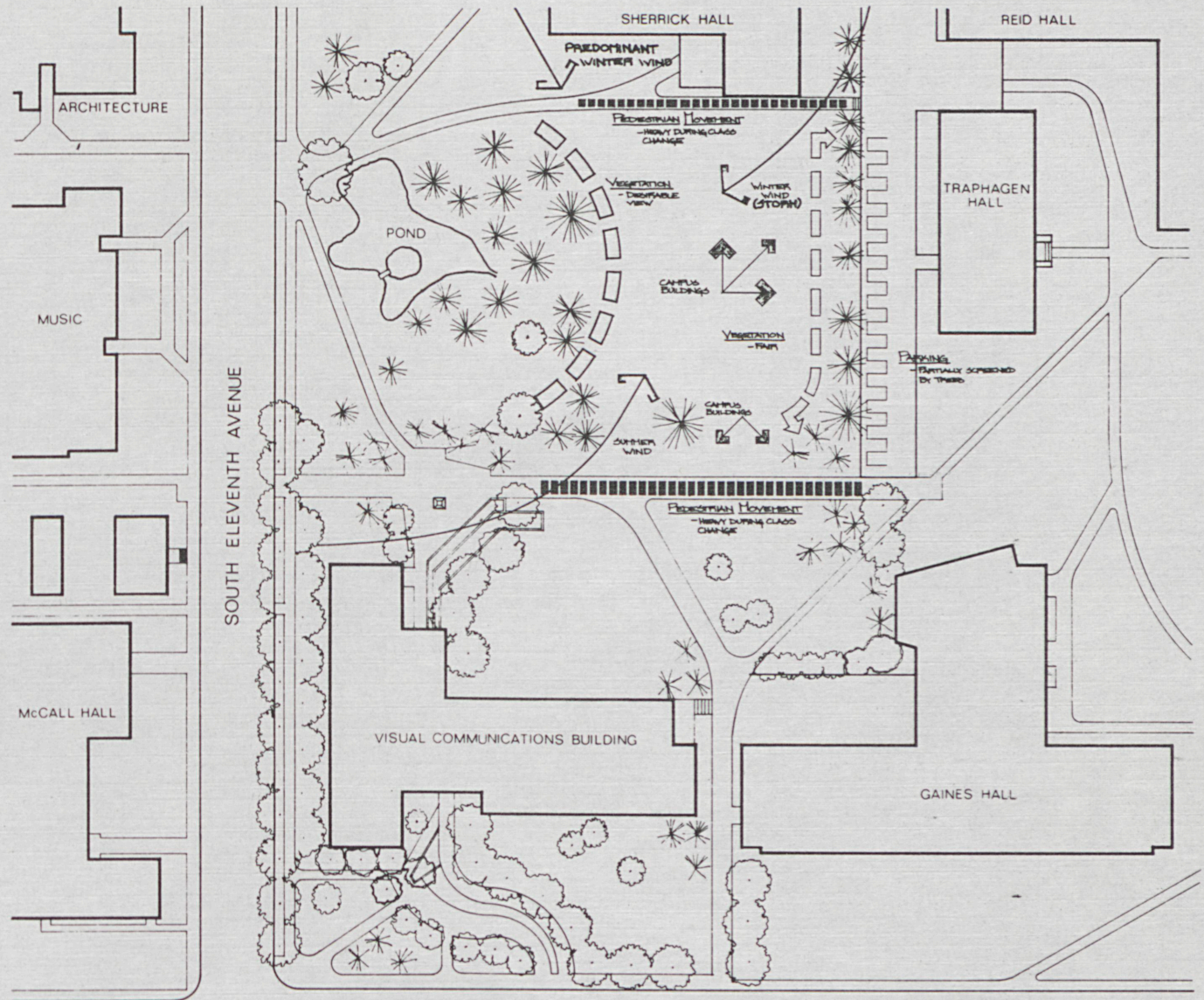
SCALE 1" = 200' 0"

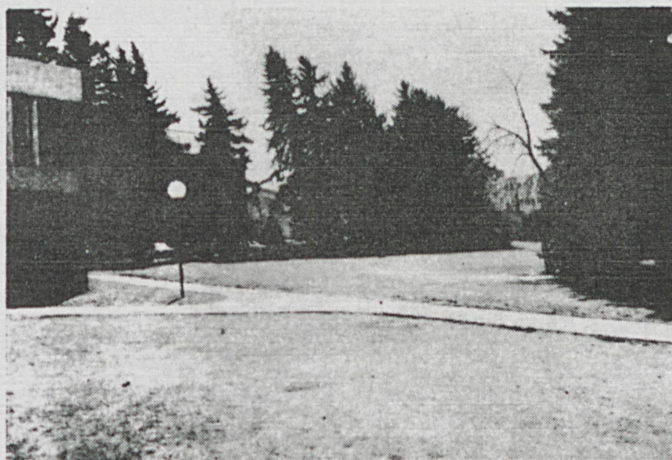




SITE PLAN UTILITIES AND TOPOGRAPHY



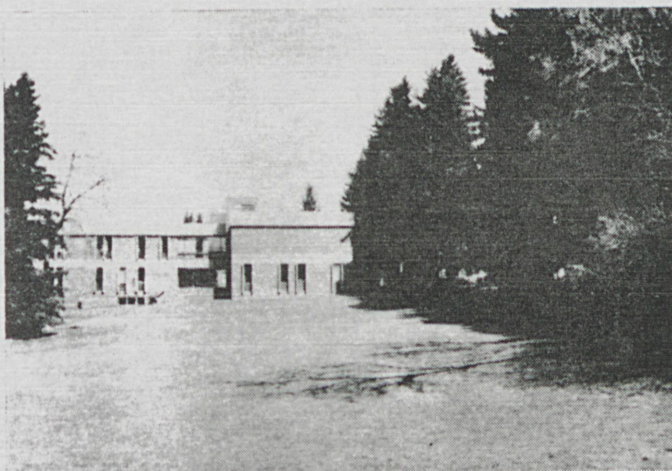




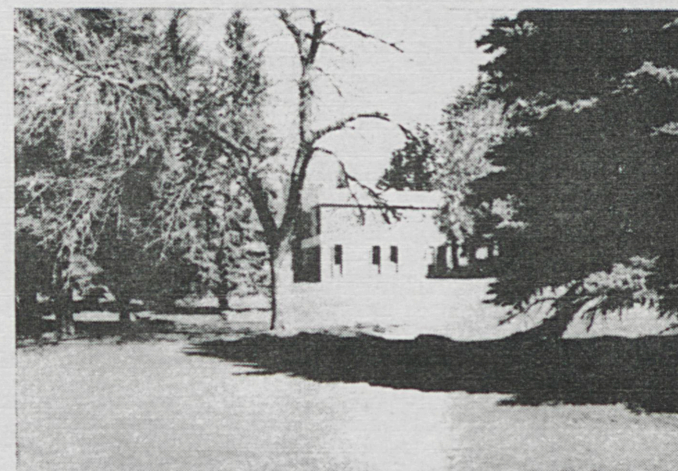
VIEW OF SITE LOOKING SOUTHEAST
WITH SHERRICK HALL TO THE LEFT
AND GAINES HALL IN THE BACKGROUND.



LOOKING NORTHWEST TOWARD THE
GROVE OF TREES & POND WITH
SHERRICK HALL ON THE RIGHT.



LOOKING DUE NORTH ACROSS THE
SITE AT SHERRICK HALL WITH THE
TREES AND PARKING BEHIND
TRAPHAGEN HALL TO THE RIGHT.



LOOKING NORTHEAST FROM THE
TREE GROVE TOWARD SHERRICK,
REID, AND TRAPHAGEN HALLS.

Climate

45°40' North Latitude

111°03' West Longitude

AVERAGE MONTHLY TEMPERATURE

	Mean Daily Max. (F)	Mean Daily Min. (F)	Mean Total Precip.
January.....	30.7	10.1	.94 inches
May.....	63.3	38.5	2.61 inches
August.....	80.3	49.4	1.36 inches
October.....	58.7	33.4	1.44 inches
Year.....	55.2	30.0	18.61 inches

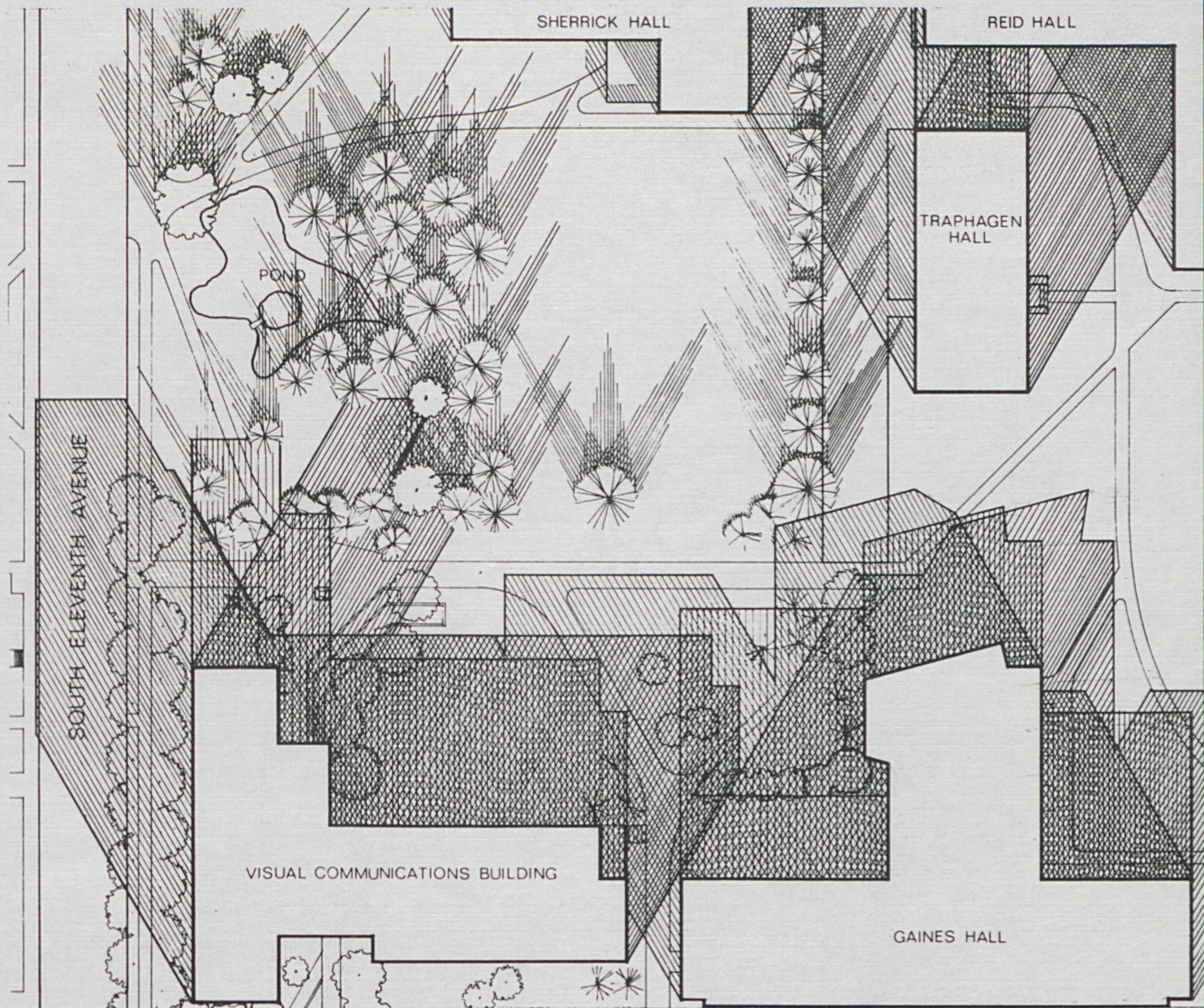
Average Annual Snowfall -- 83.5 inches

Average length of growing season -- 107 days

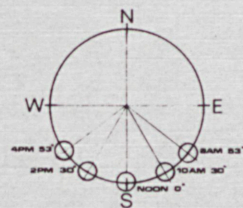
First killing frost about September 12

Last killing frost about May 28

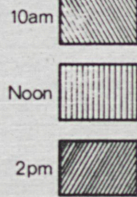
Bozeman Chamber of Commerce

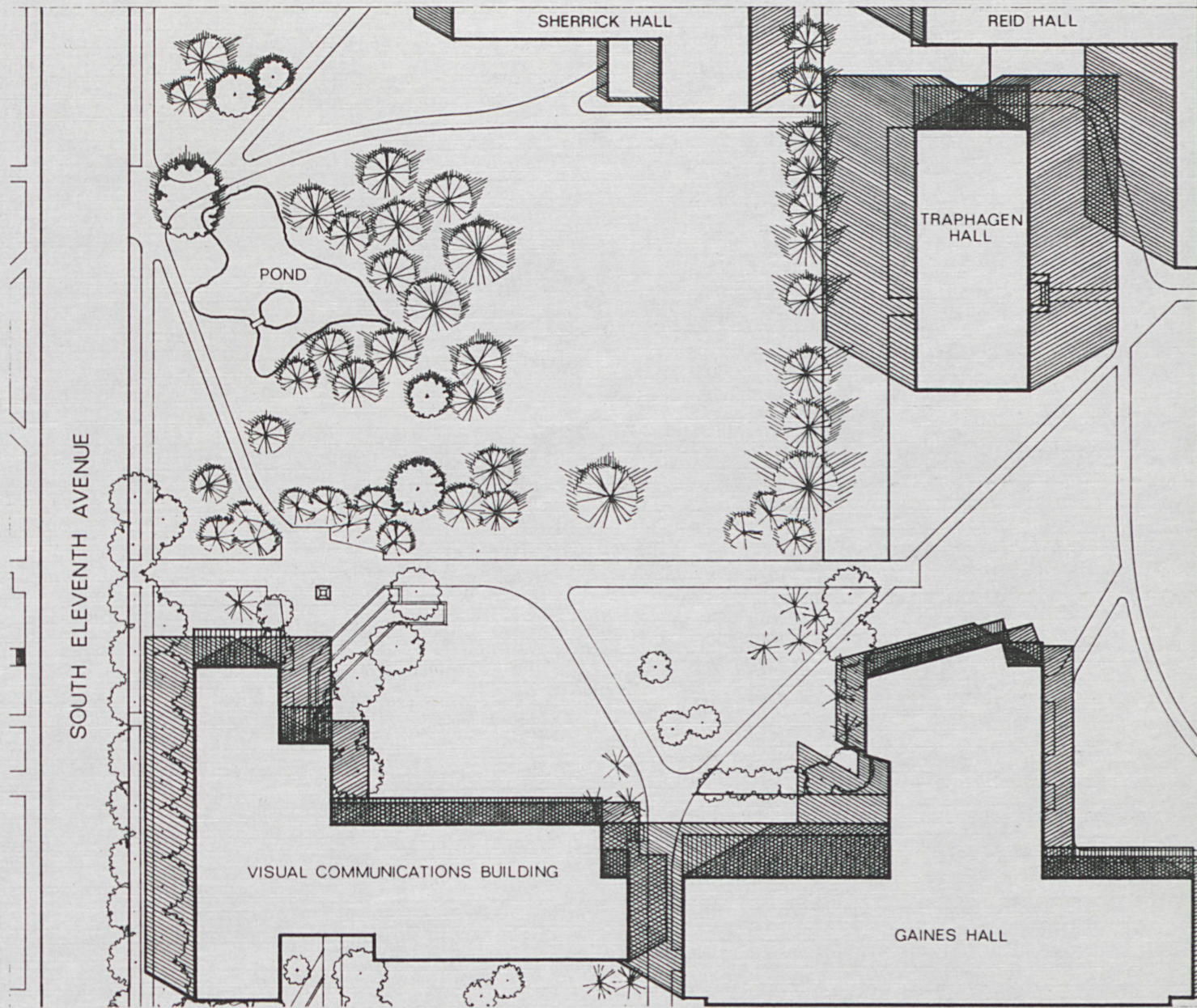


WINTER SITE SHADING

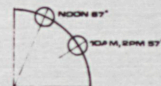
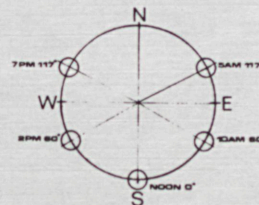


46° N Latitude
Dec. 21st.

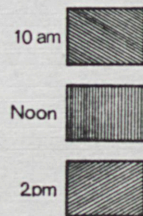




SUMMER SITE SHADING



46°N.Latitude
June 21st.



Building Codes

Occupancy Group A-3 -- Auditorium
Gallery/Lobby

Fire Resistance, exterior walls -- 2 hr. less than 5 feet
1 hr. elsewhere

Openings, exterior walls -- not permitted less than 5 feet
protected less than 10 feet

Allowable floor area and
building height --

Type of Const.	I-F.R.	II-F.R.	II-one hr.	III-one hr.	V-one hr.
Floor area (sq.ft.)	unlimited	29,900	13,500	13,500	10,500
Max. Height (stories)	unlimited	12	2	1	2

Natural light - glazing equal to 1/10th of total floor area, minimum

Natural ventilation - exterior openings not less than 1/20th of floor area

*or provide artificial lighting and mechanically operated ventilating
system supplying a minimum of 5 ft.³/minute of outside air.

Water Closet - supply a minimum of one for each sex

Occupancy Load -- Auditorium ----- 120
Gallery/Lobby -- 230

Exits - minimum of two required, maximum distance to exits 150-200 feet (with sprinklers)
doors, 3' minimum width, 6'8" minimum height
- panic hardware may be omitted as long as a sign stating "This door must remain
unlocked during business hours" is located adjacent to the doorway
- 7' total exit width required

Corridors - minimum width 44", clear height 7'
Stairways - minimum 44"
Ramps - minimum 44", maximum slope 1 in 10
 - slope of auditorium floor not to exceed 1 in 5

Sprinkler System - not required but will be used

Projection Booth - 80 sq.ft. floor area, minimum
 - clear ceiling height 7'-6", minimum
 - supply air, exhaust air, and projection equipment
 ventilation must be provided

Occupancy Group B-2 -- Seminar
 Offices
 Workshop

Fire Resistance, exterior walls -- 1 hr. less than 20 feet

Openings, exterior walls -- not permitted less than 5 feet
 protected less than 10 feet

Allowable floor area and
 building height --

Type of Const.	I-F.R.	II-F.R.	II-one hr.	III-one hr.	V-one hr.
Floor area (sq.ft.)	unlimited	39,900	18,000	18,000	14,000
Max. Height (stories)	unlimited	12	4	4	3

Natural Light - glazing equal to 1/10th total floor area, minimum

Natural Ventilation - exterior openings not less than 1/20th of floor area

*or provide artificial lighting and mechanically operated ventilating
 system supplying a minimum of 5 ft.³/minute of outside air

Water Closet - supply a minimum of one for each sex

Occupancy Load -- Seminar --- 20
 Offices --- 3
 Conference 10
 Workshop -- 8

Exits - minimum of two required, maximum distance to exits 150-200 feet (with sprinklers)
 doors, 3' minimum width, 6'8" minimum height
 - .8' total exit width required

Corridors - minimum width 44", clear height 7'

Stairways - minimum 44"

Ramps - minimum 44", maximum slope 1 in 10

Sprinkler System - not required but will be used

*NOTE - Allowable increases in building height and floor area for both
 occupancies are applicable but are not required.

Program

The program exists in response to the need for recognition of the artistic potential and ability of MSU's students and faculty. It is the responsibility of architecture to provide an architecture of completeness in lieu of need. Insufficient solutions in many of our own campus buildings, as a result of program cuts, etc., create and determine need. Examples include the Creative Arts Complex and the lack of gallery space planned for the Visual Communications Building.

Programming of spaces within the gallery building was based on the percentage areas of several other gallery programs, some of which were approximately equal in size to mine. Flexibility in plan was often listed as an important criteria in gallery planning and design. "The size of galleries should be scaled to the material exhibited."⁴⁸ Programs must provide

adequate space for circulation and observation.

In addition, "the exhibition area should occupy about 30 and not more than 40 percent of the total space available." Assuming a peak attendance of 100 persons during a special exhibition, 1000 sq. ft. of gallery space would be considered sufficient.⁴⁹

The point most stressed, however, was the separation of public and private functions. Recognition of separate operating and public functions, of the gallery, is most important. "Failure often occurs if not planned accordingly."⁵⁰

PROGRAM PARAMETERS

- Minimum Gallery Width 18'
- Public Doorways Minimum 6'
- Viewing Angle Within 30°-45°

Additional Requirements Include the Following:

- Receptionist, sales, and gallery observation area to be well defined and located near the public entrance.
- Storage and service areas which have easy access to both the gallery and a truck loading dock. The service areas should also include water and sink facilities.
- Professional security, fire sprinkler, and humidity and temperature systems should be included.

THE NATURE OF EXHIBITS

The primary purpose of this gallery project is to provide needed exhibition space for the fine arts and the campus as a whole. Student and faculty work will make up a good portion of the exhibits presented. These exhibits will consist of photographs, drawings and paintings, fiber and fabric, ceramics, small sculpture, and architectural work. However, a detached gallery of this size would be unrealistic, as well as unsuccessful, if its only purpose was to exhibit student work. Therefore, art work of a similar

scope as mentioned above would be procured for exhibition from foundations, museums, and other sources. A list of sources for obtaining traveling exhibits may be found in the appendix. All exhibits would be rotated (approx.) on a 2-4 week basis. A selection of university work, as well as work indigenous to the Bozeman area, would be retained as part of a permanent collection. This work will be displayed during the interim period while new exhibits are being acquired. It is important to note that there should be no redundancy in exhibits of artifacts which the Museum of the Rockies might already have.

Display

Display systems, like gallery spaces, also require a high degree of flexibility. Exhibits will be displayed using three methods; 1) hung display, 2) cantilevered display, and 3) floor display.

- Hung display will consist of perimeter gal-

lery walls, movable floor to ceiling partitions capable of enclosing rooms, and the use of a Struc-Tube (pogo-stick) system of poles and panels that remain open above and below the panel. Walls and panels will be fabric covered, rather than painted, eliminating the patching and repainting necessary after each exhibition greatly increasing the longevity of these vertical surfaces.

- A cantilevered bracket system will be employed to support display cases that are not free standing. It is important that the supporting track be concealed within the walls and partitions as much as possible so as to maintain visual continuity.
- Floor display will almost exclusively consist of pedestals of varying height and would be used to display sculpture, ceramics, and work of a similar size and nature.

The above mentioned systems have the desired

flexibility needed in arranging gallery spaces and are stackable for ease of storage in a minimum amount of space. It should be recognized that many of todays exhibits are being designed to incite viewer participation. Art objects are becoming more tactile, with emphasized textures and walk-through sculpture, etc. With this increase in viewer participation flexibility remains as the key to a successful exhibition.

Program

I. PUBLIC FUNCTIONS

Reception/Assembly

Entrance Lobby	1000 Sq.Ft.
Information/Security	60 Sq.Ft.
Restrooms 2 @ 150	300 Sq.Ft.
Kitchen	50 Sq.Ft.
Cloakroom	

Exhibition

Temporary Exhibit (2)	2000 Sq.Ft.
Permanent Exhibit (2)	2000 Sq.Ft.
Outdoor Sculpture Court	

Educational

Auditorium	2000 Sq.Ft.
Lobby/Interior Street	1400 Sq.Ft.
Seminar Rooms 2 @ 400	800 Sq.Ft.
Restrooms 2 @ 150	300 Sq.Ft.

II. OPERATIONAL FUNCTIONS

Administration

Directors Office	200 Sq.Ft.
Secretary/Receptionist	250 Sq.Ft.
Conference Room	160 Sq.Ft.
Archival Storage Vault	200 Sq.Ft.
Storage/Future Office	150 Sq.Ft.
Kitchen	50 Sq.Ft.

Work Spaces

Shipping and Receiving	400 Sq.Ft.
Workshop/Preparation	500 Sq.Ft.
Permanent Storage	500 Sq.Ft.
Restrooms 2 @ 150	300 Sq.Ft.

Other Services

Mechanical	750 Sq.Ft.
Janitorial 3 @ 50	150 Sq.Ft.
General Storage	

ACTIVITY: RECEPTION/ASSEMBLY

SPACE: ENTRANCE LOBBY,
INFORMATION & SECURITY

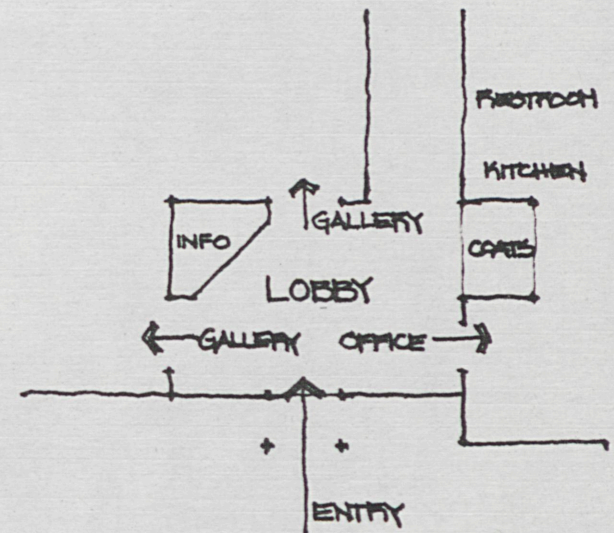
area 1000 SQ.ft.
60 SQ.ft. WITHIN LOBBY SPACE

ZONE: PUBLIC

ACOUSTICS: MODERATE

ILLUMINATION: DAYLIGHTING,
GENERAL INCANDESCENT

MECH./ELEC.: GENERAL ELECTRICAL
CONTROL FOR SECURITY SYSTEM



DESCRIPTION: LOBBY SERVES AS
ORIENTATION TO BUILDING & ESTABLISHES
PUBLIC/PRIVATE ZONES. IT IS USED FOR
ARTISTS RECEPTIONS & AS A LOUNGE.
THE DESK SERVES AS GALLERY CONTROL.

ADJACENCY: LOCATED WITHIN
SIGHT LINES OF BOTH GALLERIES.
ALSO IN PROXIMITY OF KITCHEN.

ACTIVITY: RECEPTION/ASSEMBLY

SPACE: PUBLIC RESTROOMS
CLOAKROOM

area 300 sq.ft.

ZONE: PUBLIC (PRIVATE NATURE)

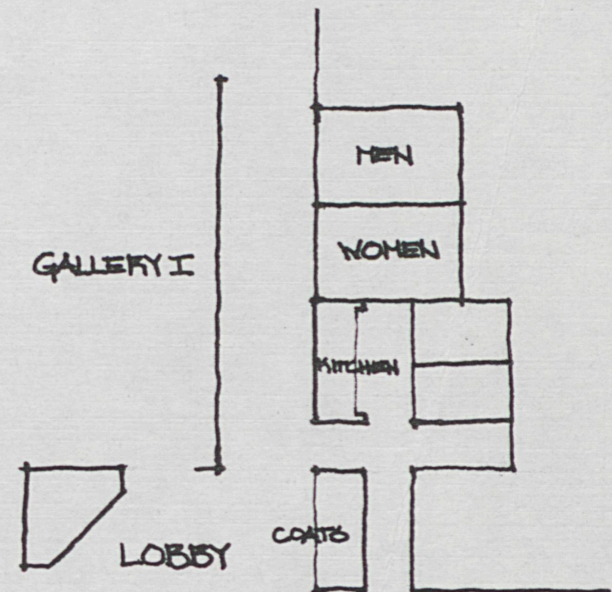
ACOUSTICS: QUIET

ILLUMINATION: GENERAL INCANDESCENT

MECH./ELEC.: GENERAL ELECTRICAL
LOCAL VENTING

DESCRIPTION:

ADJACENCY: RESTROOMS LOCATED
IN CLOSE PROXIMITY TO ALL PUBLIC
FUNCTIONS



ACTIVITY: EXHIBITION

SPACE: TEMPORARY EXHIBIT (2)
PERMANENT EXHIBIT (2)

area 2000 sq.ft.
2000 sq.ft.

ZONE: PUBLIC

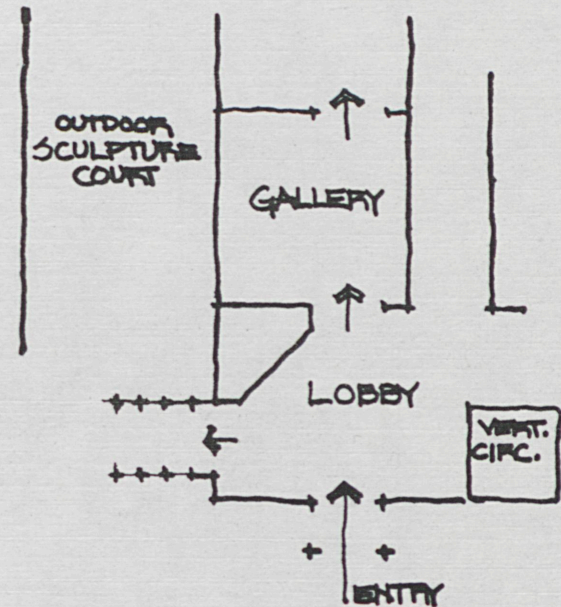
ACOUSTICS: QUIET

ILLUMINATION: CONTROLLED DAYLIGHTING
IF USED, INCANDESCENT TRACK LIGHTING,
FLUORESCENT WORK LIGHTING IN CEILING

MECH./ELEC.: ELECTRICAL SERVICE TO
FLOORS, WALLS, & CEILING. SPECIAL
CONSIDERATIONS FOR HUMIDITY &
TEMPERATURE CONTROL. PROFESSIONAL
SECURITY & FIRE SPRINKLING SYSTEMS.

DESCRIPTION: GROUND LEVEL
GALLERY FOR ROTATING EXHIBITS,
BASEMENT GALLERY TO HOUSE
MUSEUMS PERMANENT COLLECTION

ADJACENCY: BOTH GALLERIES
LOCATED NEAR ENTRY, LOBBY,
& OUTDOOR SCULPTURE COURT



ACTIVITY: EDUCATION

SPACE: AUDITORIUM
LOBBY/INTERIOR STREET

area 2000 SQ. FT.
1400 SQ. FT.

ZONE: PUBLIC

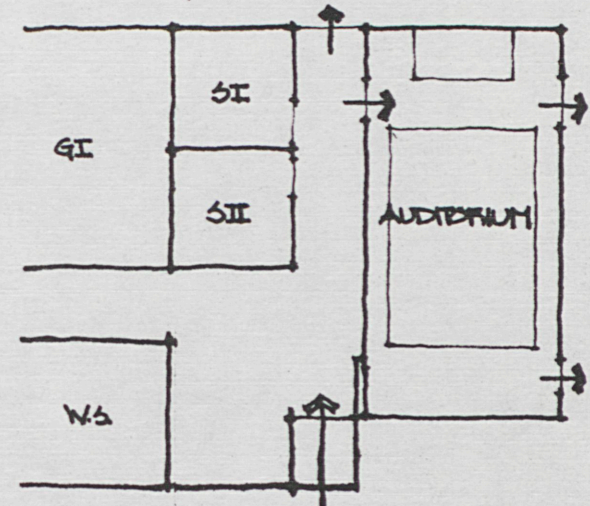
ACOUSTICS: MODERATE
1.0 SEC. REVERBERATION
TIME DESIRED IN AUDITORIUM

ILLUMINATION: GENERAL
INCANDESCENT WITH DIMMER,
SOME DIRECT SPOTLIGHTING

MECH./ELEC.: GENERAL ELECTRICAL,
SOUND SYSTEM,
LOCAL VENTING OF
PROJECTION BOOTH

DESCRIPTION: USED FOR
LECTURES &
SCREENING OF FILMS

ADJACENCY: GROUPED WITH
SEMINAR ROOMS



ACTIVITY: EDUCATION

SPACE: SEMINAR ROOMS (2)

area 800sq.ft.

ZONE: PUBLIC

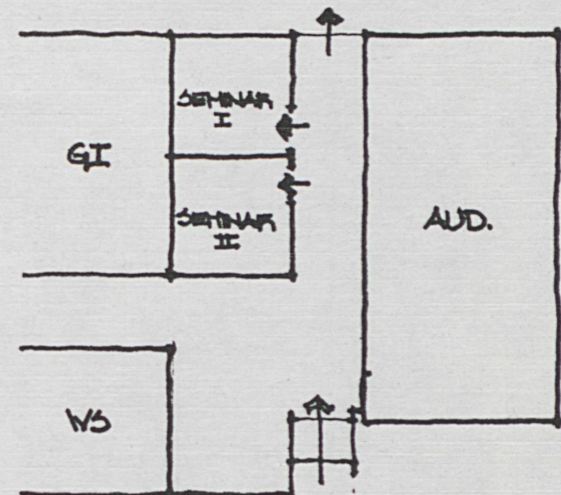
ACOUSTICS: MODERATE

ILLUMINATION: DAYLIGHTING,
GENERAL INCANDESCENT,
& TRACK LIGHTING

MECH./ELEC.: GENERAL ELECTRICAL

DESCRIPTION: USED FOR
PRESENTATIONS &
DISCUSSION. SHOULD HAVE
OWN ENTRANCE & FOYER

ADJACENCY: GROUPED WITH
AUDITORIUM



ACTIVITY: ADMINISTRATION

SPACE: DIRECTOR'S OFFICE
SECRETARY/RECEPTIONIST
CONFERENCE ROOM

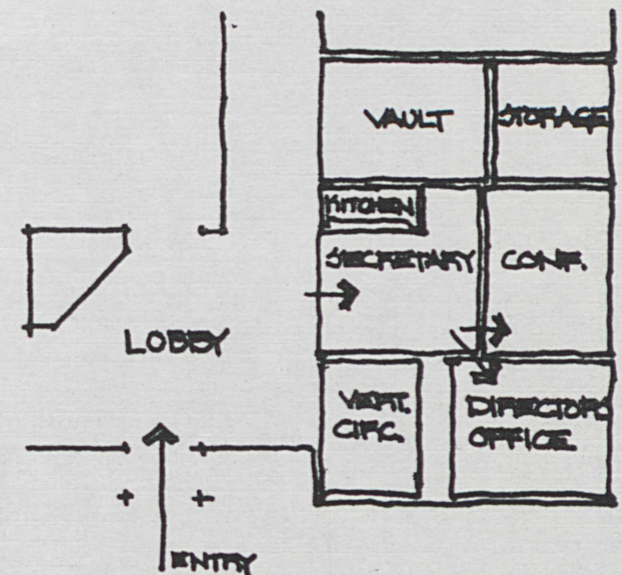
area 200 sq.-ft.
250 sq.-ft.
160 sq.-ft.

ZONE: PRIVATE

ACOUSTICS: MODERATE

ILLUMINATION: DAYLIGHTING,
GENERAL INCANDESCENT,
TASK LIGHTING

MECH./ELEC.: GENERAL ELECTRICAL



DESCRIPTION:

ADJACENCY: OFFICES ADJACENT
TO LOBBY & RESTROOMS

ACTIVITY: ADMINISTRATION

SPACE: ARCHIVAL STORAGE VAULT
STORAGE/FUTURE OFFICE
KITCHENETTE

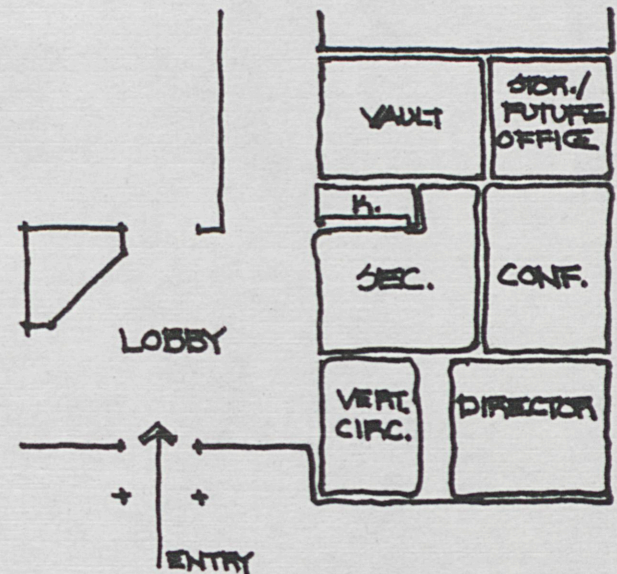
area 200 SQ.ft.
150 SQ.ft.
50 SQ.ft.

ZONE: PRIVATE

ACOUSTICS: MODERATE

ILLUMINATION: DAYLIGHTING
FOR FUTURE OFFICE,
GENERAL INCANDESCENT,
TASK LIGHTING

MECH./ELEC.: GENERAL ELECTRICAL



DESCRIPTION: FIREPROOF
VAULT FOR PAINTINGS &
PRINTS, FUTURE OFFICE
WHEN GALLERY BECOMES
ESTABLISHED

ADJACENCY: PART OF OFFICE
CLUSTER

ACTIVITY: WORK SPACES

SPACE: SHIPPING & RECEIVING
STORAGE/INVENTORY
FREIGHT ELEVATOR

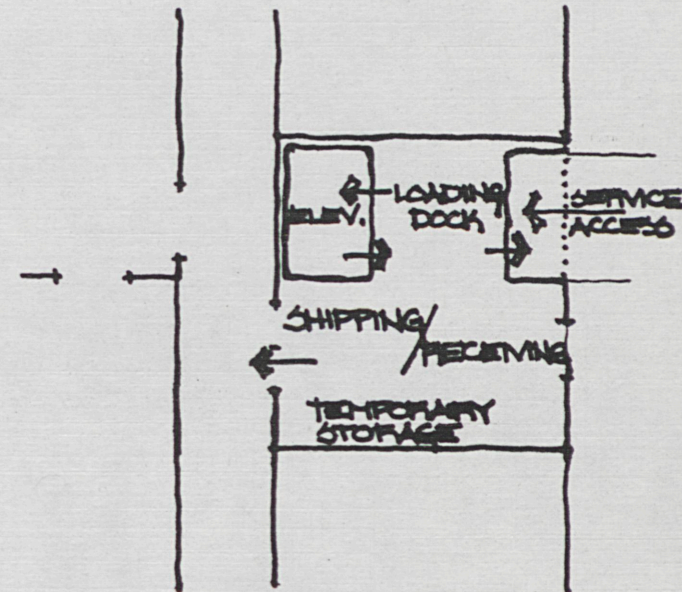
area 100 sq.ft.
100 sq.ft.
100 sq.ft.

ZONE: PRIVATE

ACOUSTICS: NOISY

ILLUMINATION: GENERAL
FLUORESCENT & TASK
LIGHTING.

MECH./ELEC.: GENERAL ELECTRICAL



DESCRIPTION: RECEIVING & UNCRATING,
WRAPPING, PACKING, TEMPORARY
CRATE STORAGE
INSPECTION & INVENTORY

ADJACENCY: LOCATED AT POINT OF
SERVICE ACCESS. LOADING DOCK & PRIVATE
ENTRANCE SHOULD BE PROVIDED AS WELL
AS WATER & SINK FACILITIES.

ACTIVITY: WORK SPACES

SPACE: WORKSHOP/PREPARATION
PERMANENT STORAGE

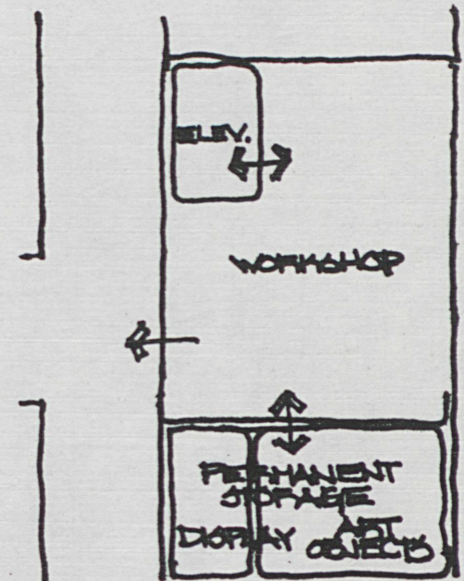
area 500 sq. ft.
500 sq. ft.

ZONE: PRIVATE

ACOUSTICS: Noisy

ILLUMINATION: GENERAL
FLUORESCENT & TASK
LIGHTING

MECH./ELEC.: GENERAL ELECTRICAL



DESCRIPTION: CONSTRUCTION OF
SPECIAL EXHIBITIONS & DISPLAYS
ASSEMBLY OF SHOWS & DISPLAY
COMPONENTS. STORAGE OF MUSEUM'S
PERMANENT COLLECTION (BULK OBJECTS)

ADJACENCY: LOCATED NEXT TO
SHIPPING/RECEIVING
& RESTROOMS

ACTIVITY: OTHER SERVICES

SPACE: MECHANICAL
JANITORIAL (3)
GENERAL STORAGE

area 150 sq. ft.
50 sq. ft.
WITHIN MECHANICAL ROOM

ZONE: PRIVATE

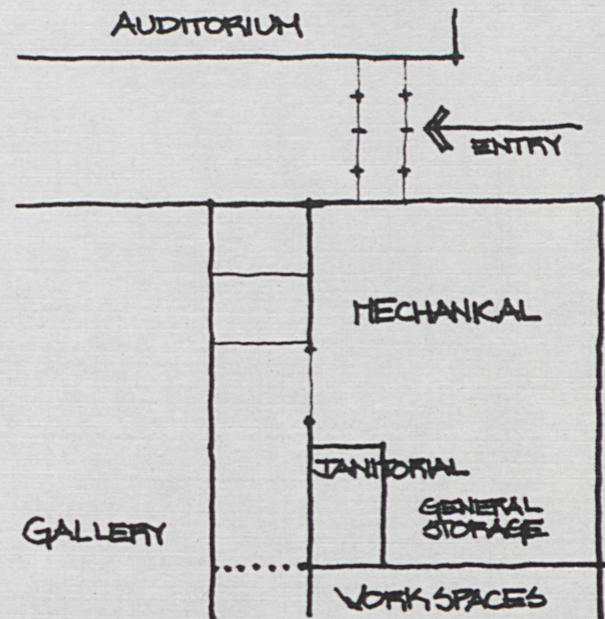
ACOUSTICS: NOISY, BUFFERED

ILLUMINATION: GENERAL
FLUORESCENT

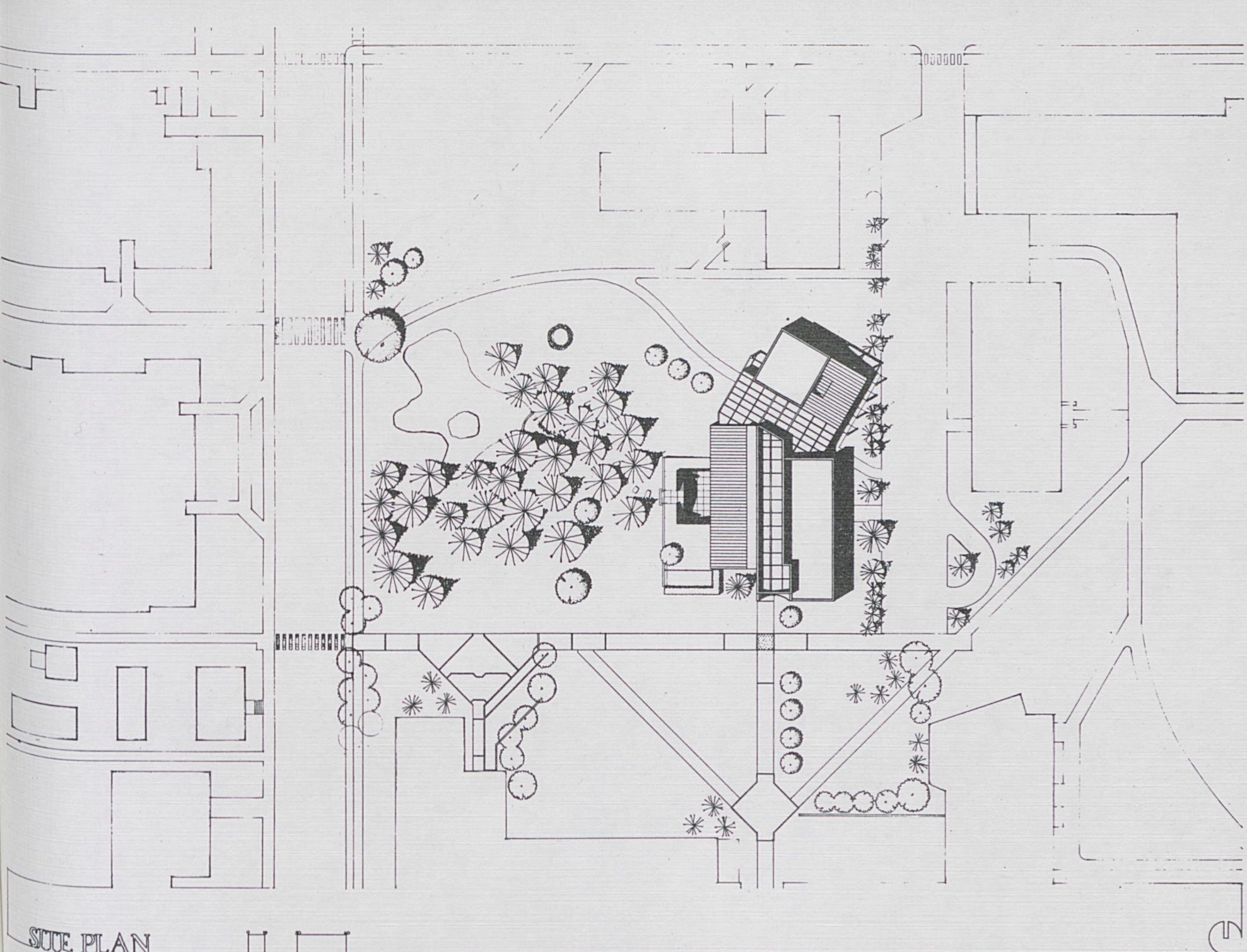
MECH./ELEC.: HEATING & AIR
CONDITIONING, FAN &
PUMP ROOMS, MACHINE
ROOMS FOR ELEVATORS
TELEPHONE RELAY PANEL, ETC.

DESCRIPTION: SUPPORT SPACE

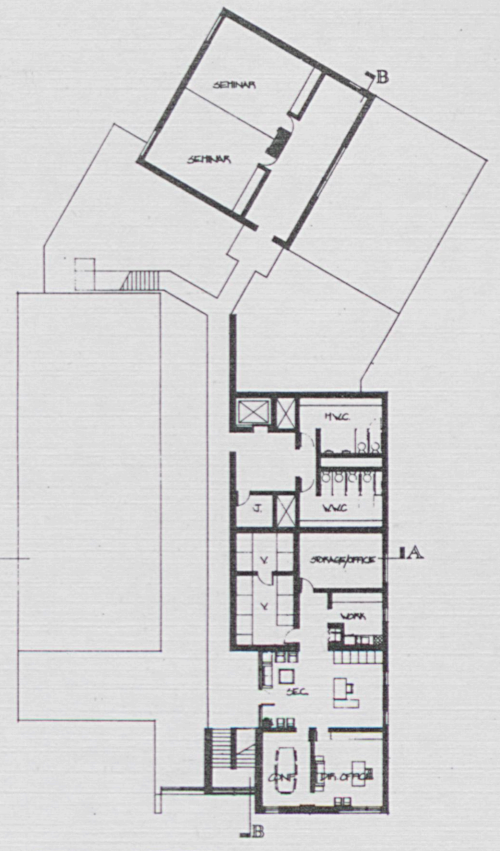
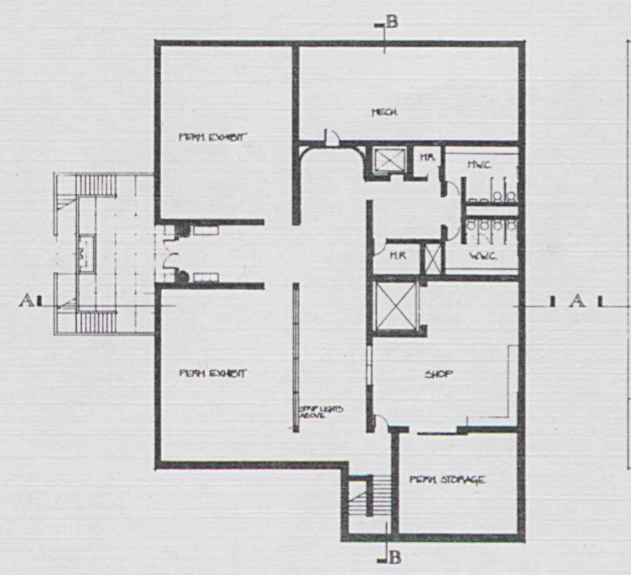
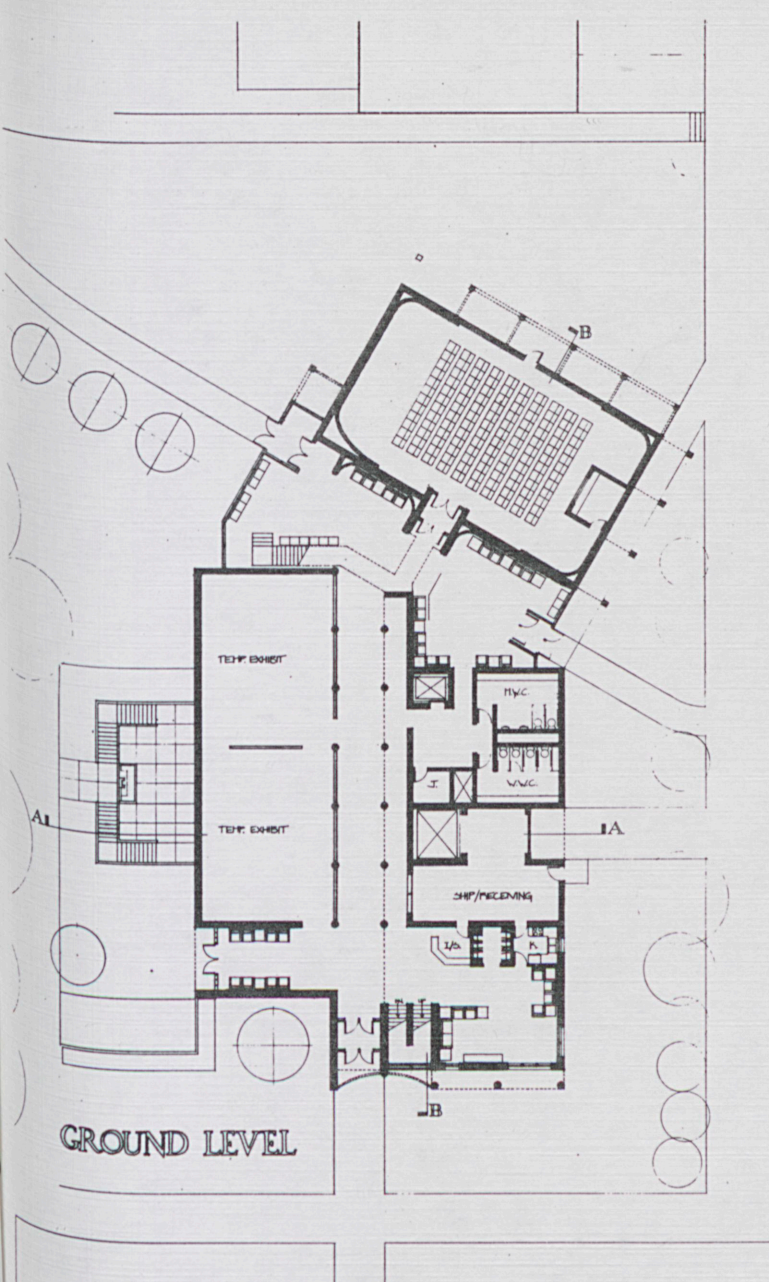
ADJACENCY: GROUPED WITH
WORK SPACES

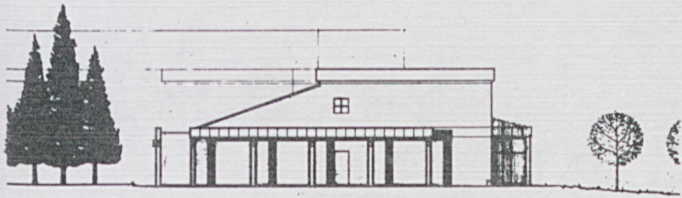


Project

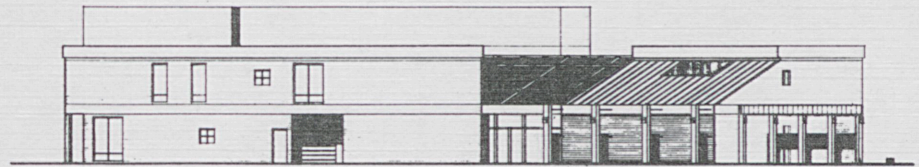


SITE PLAN

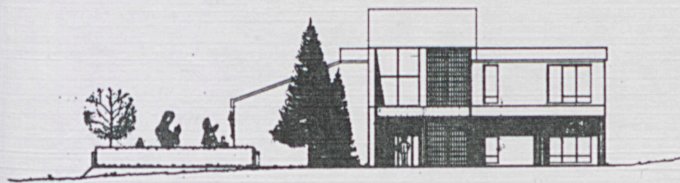




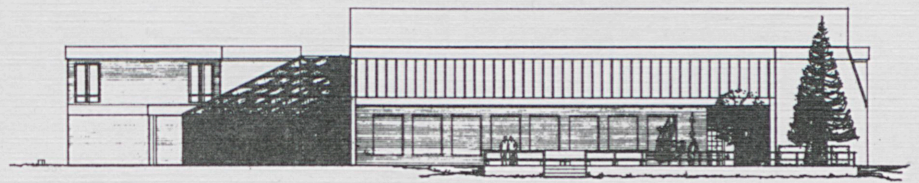
NORTHEAST ELEVATION



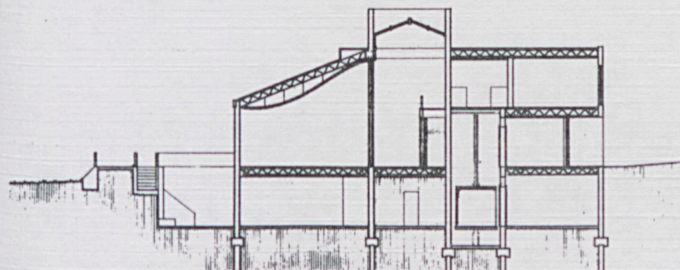
EAST ELEVATION



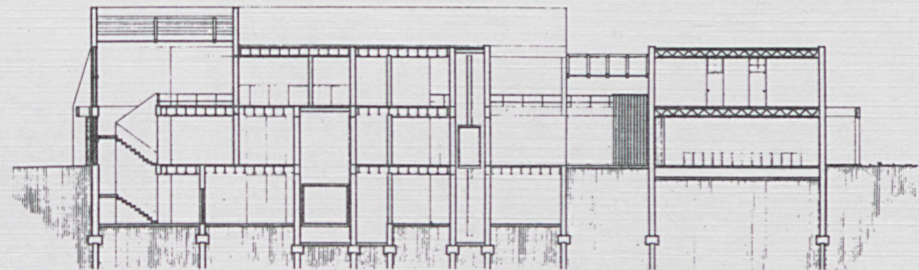
SOUTH ELEVATION



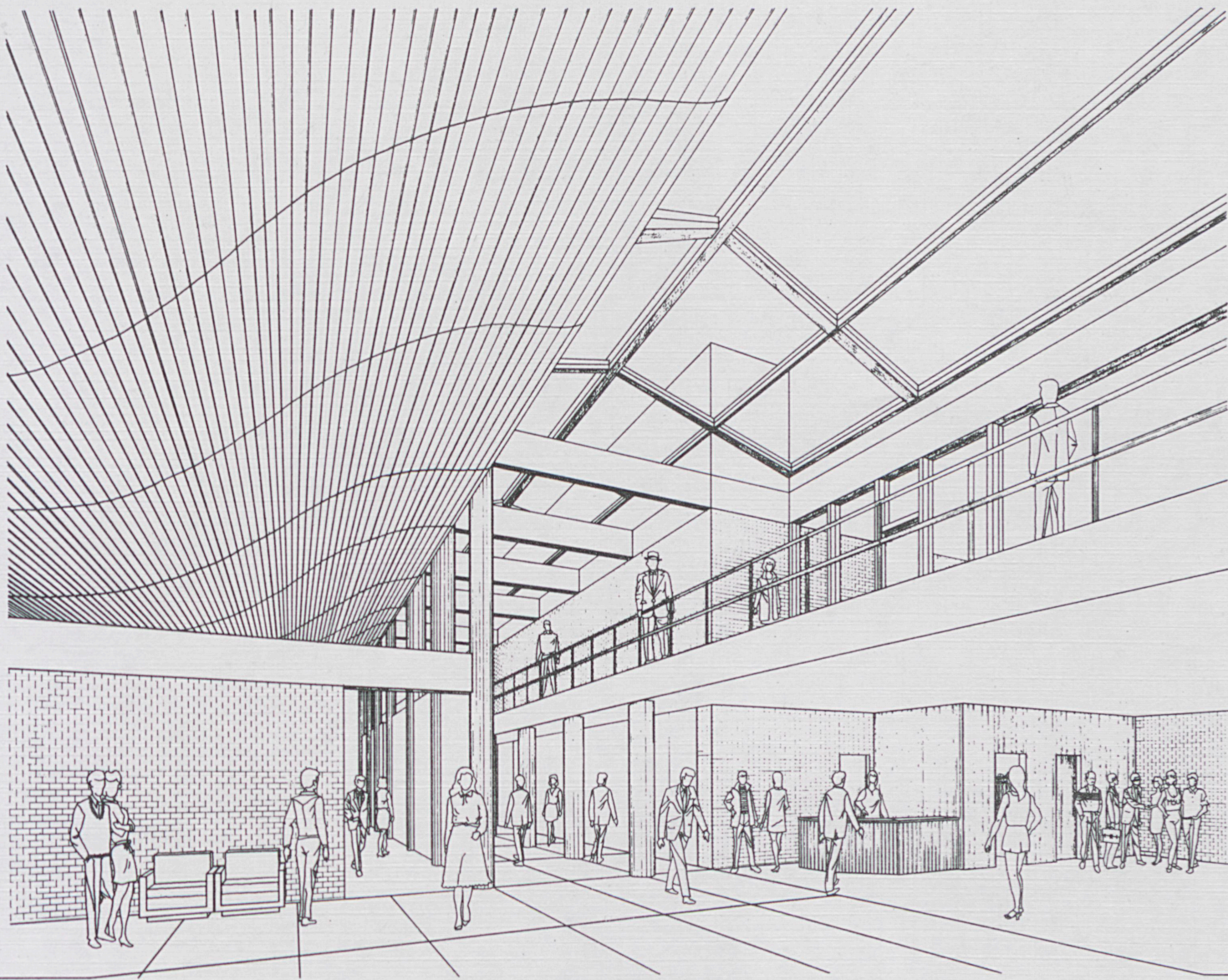
WEST ELEVATION

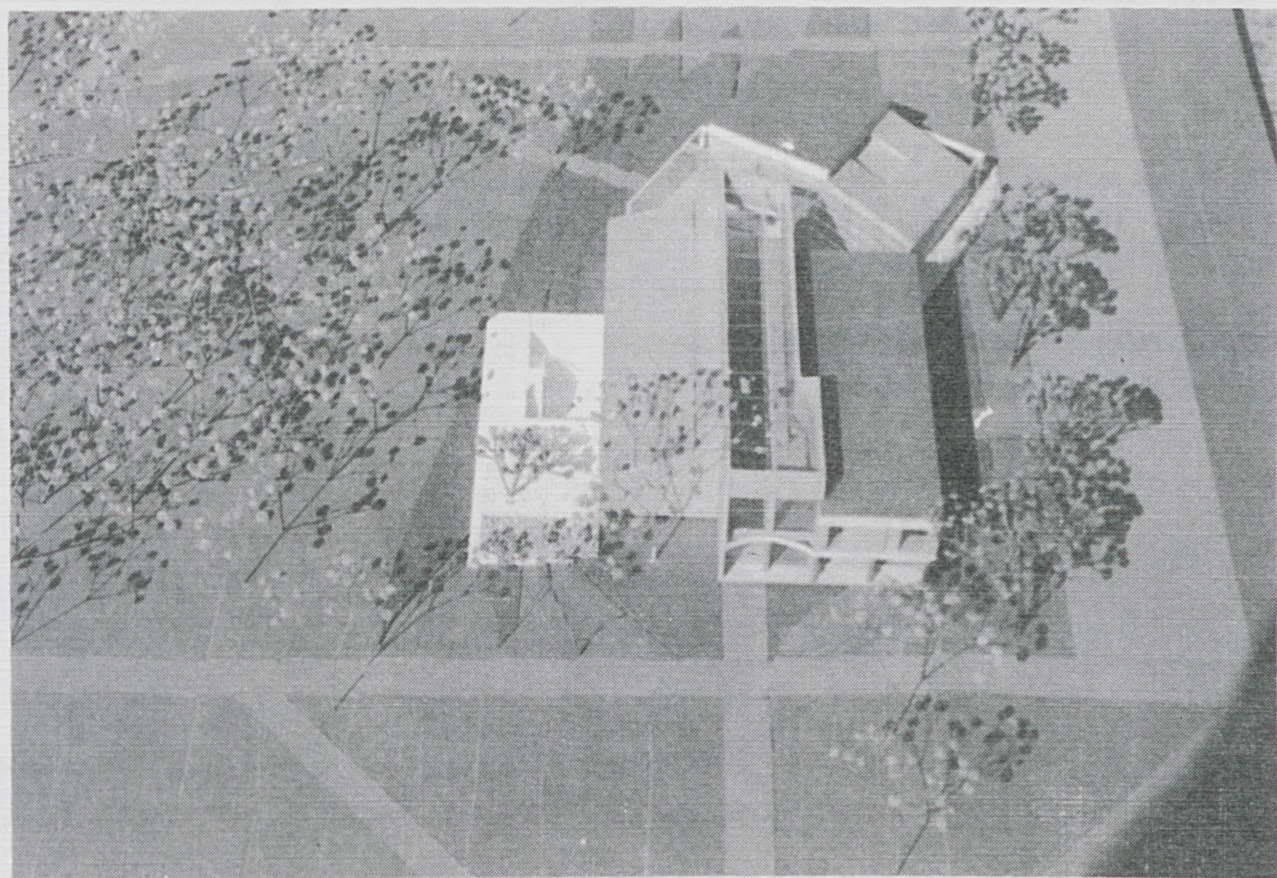


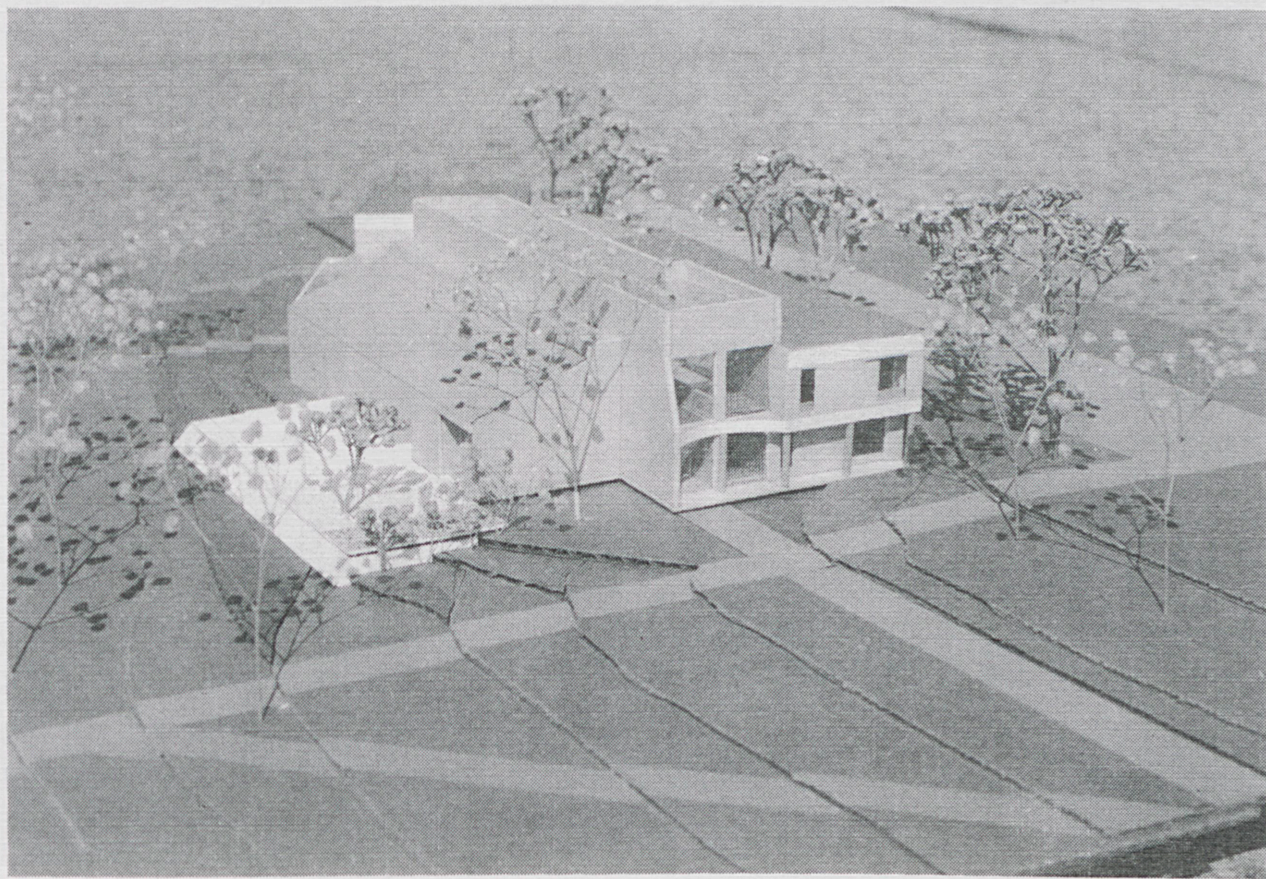
SECTION AA

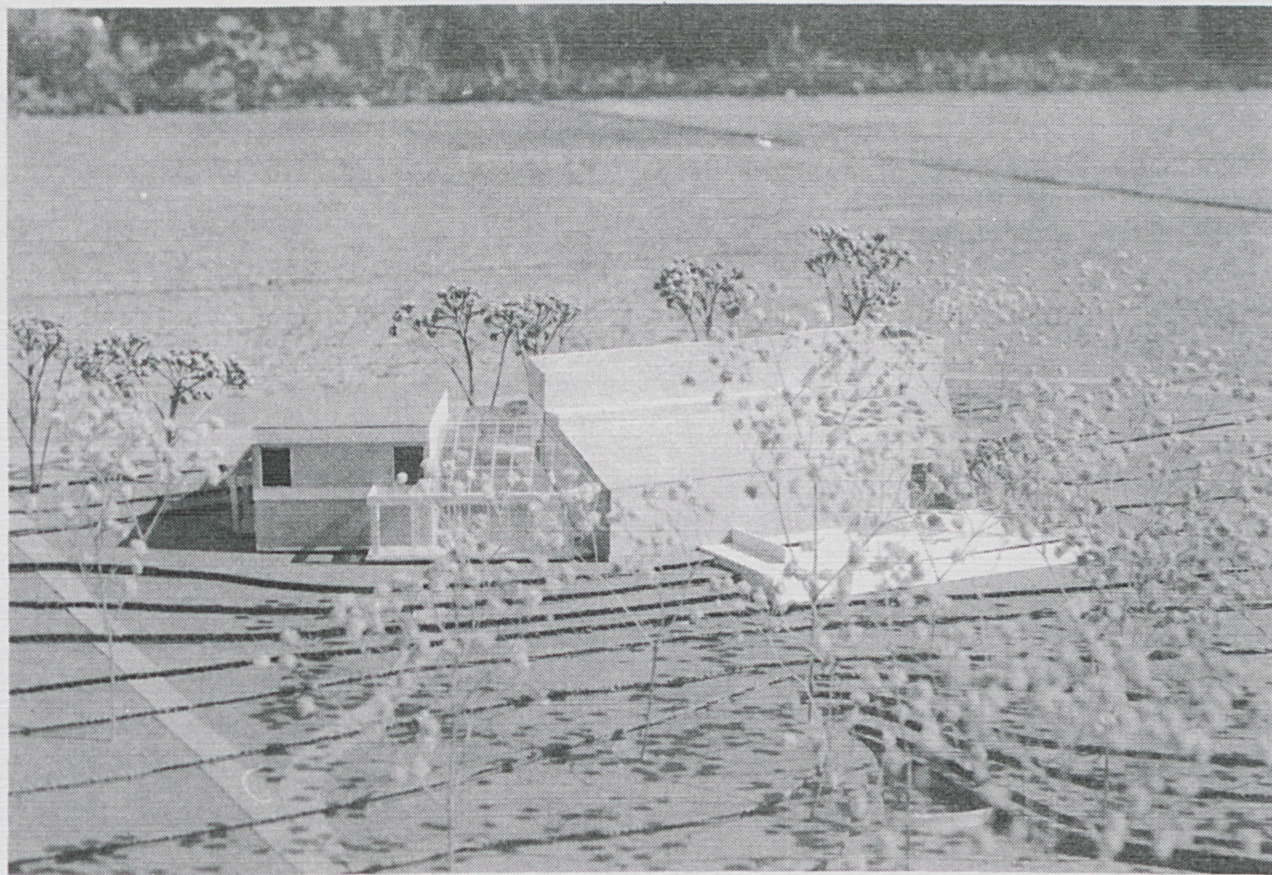


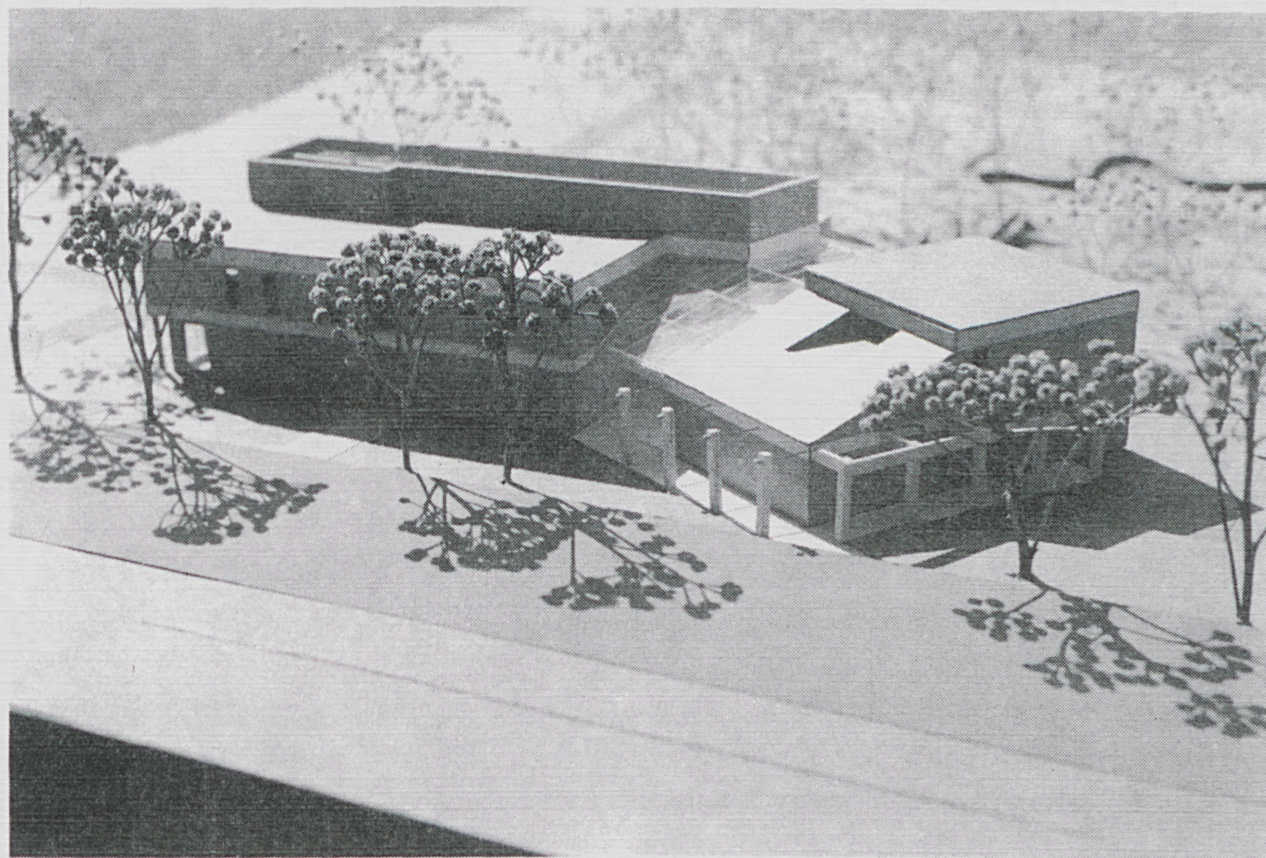
SECTION BB

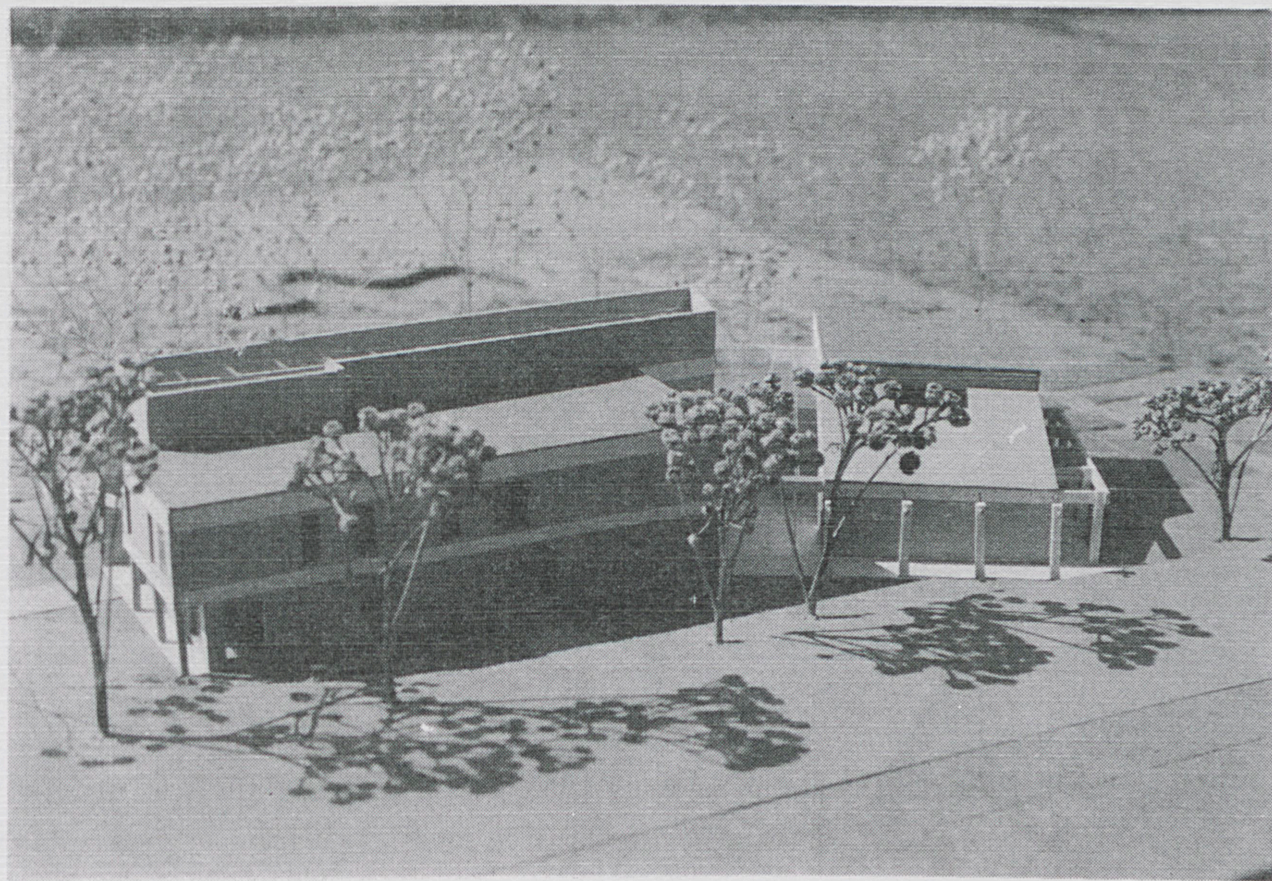












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Appendix

Sight-Lines, Ceiling Heights, and Viewing Zones. A sight-line height of 5 feet 6 inches from the floor has been found most responsive to adult seeing habits. Sight-lines in rooms set up for school classes may be lowered, but not more than one foot, because of wide age differences between grades. High schools invariably use the regular galleries.

For purposes of lighting design, the determination of the 60 degree incident angle for concentrated, vertical illumination, is of the first order of procedure. At gallery height H in inches, specified by the museum, the distance in inches, x , from the walls to the line of light sources is:

$$x = (H - 66) (.577)$$

This provides a frame of reference around the gallery ceiling for the respective designs for lighting the perimeter (viewing) zone and central area. However, such calculation neither defines the viewing zone itself, nor its basic relation to *objects being viewed*. The control of ceiling heights should be based on the anticipated maximum height of wall-hung displays. In a small museum, the higher ceilings may be needed in only one or two rooms.

Unless ceiling heights are arbitrarily established, the dimensions of perimeter (viewing) zones should be related, for the purpose of electric illumination, to three pertinent factors (see Fig. 12-23):

1. The height of paintings or tapestries, etc.
2. Ideal utilization of concentrated light-beam cones.
3. Minimum effective viewing distances for the maximum permissible height of exhibits.

At the specified 60-degree incident angle of presentation, a projected light-beam cone becomes oval. Because the maximum candlepower at the beam axis is the one critical point governing (a) relative brightness as a function of good seeing, and (b) any over-exposure to photochemical damage hazards (see below), measurement of vertical illumination at the sight-line becomes one of the most trustworthy, yet simplest, of criteria for the management

of lighting in a fine arts museum. It will also provide a guide for the number of horizontal spacing of emphasis lighting units needed for any single display setup.

A study of Fig. 12-23 with performance data on projector and reflector lamps will show that for good visual performance and maximum safety of fine arts collections, the following approximate, sight-line values of *concentrated* illumination (in "maintained" footcandles) should *not* be exceeded:

1. 60 footcandles for short-term, or temporary exhibits.

2. 20 footcandles for fixed or permanent exhibits. Combined with the described diffuse component, the total, vertical footcandles will, according to the best available information, conform to both seeing performance and museum conservation limits.

The above specified values may be selected according to standard, concentrating lamp ratings of maximum candlepower within 10-degree beam cones, as follows:

$$E = \frac{.214 I}{h^2}$$

where:

- E = maintained illumination in footcandles,
 I = the (manufacturer's) listed, initial candlepower, and
 h = ceiling height *above* sight-line.

Since such lamps are handled much more frequently, they are cleaned more often. The above equation is, therefore, based on an 80 per cent light loss factor, or 95 per cent median candlepower, with a 10-degree cone, over the life of the lamp, the length of beam throw squared, and the cosine of the specified incident angle.

It will be seen at once that any real balance between horizontal and vertical illumination contradicts the idea of flexibility. However, it is equally plain that the cost of vertical lighting in terms of

good seeing favors diffuse light. The over-employment of concentrated light may be shown to *decrease* visual efficiency and *increase* photochemical damage hazards. The over-employment of concentrated light has become a commonly demonstrated tendency in the absence or lack of sufficient diffuse light. It is a potentially harmful trend. To the extent that the two are made complementary, and kept under control, unnecessarily high electric current costs, and the impaired visual performance of visitors are avoided.

There are, of course, a large number of ways to meet these needs. They depend upon the architectural and structural character of the building, whether or not lighting auxiliary to daylight is involved, availability of ceiling cavity space, the incidence of arches and doors, dimensions of rooms, the physical features of the material for exhibition, and available operating funds. Ceilings may be fully luminous, or with luminaires distributed in the central area.

For the best seeing a viewer should be unaware of where the light is coming from, but in many museums the ceiling and the lighting appear in the view of approaching visitors. Viewers then quickly become aware of any over-busy, or cluttered ceiling appearance. It is recommended that luminance ratios between adjacent luminaires or surfaces be reduced to a ratio of 3 to 1. If fully luminous ceilings are preferred, they should extend to within one foot of walls for galleries having ceiling heights of 15 feet or less, and within two feet of walls for those over 16 feet in height, in order to insure that at least 40 per cent of the calculated diffuse horizontal illumination is available as vertical footcandles at the wall, measured along the sight-line height. Such a ceiling should have its control divided between the perimeter and the central areas; the latter may be subject to dimming—no closer than a 50 to 1 range being necessary.

Floor luminance is important in all rooms devoted to wall hung displays. It is very distracting at or near the base of walls in the normal position of viewing. This can be clearly seen by reference to Fig. 3-6, page 3-4, showing that the angle of visual sensitivity for both eyes, increases to 70 degrees below the horizontal, at the bottom of the field of view (see Fig. 12-23). Floor reflectance in galleries should be held below 10 per cent (see Fig. 12-21), being totally unlike the ideal conditions for task lighting where the higher floor reflectances often aid the available working flux. Floors of this reflectance appear lighter under diffuse light when waxed, as is frequently the case, but this effect disappears when directly viewed at the walls.

Color of Light Source

For two or three-dimensional lighting requirements (wall-hanging and freestanding), aspects of both color and texture must be specifically visualized. In interior spaces, a lower color temperature or (warmer) source than daylight is usually preferred. The color temperature of daylight can range from 5000 K to 50,000 K. Electric sources available today generally range from 2500 K to 7500 K.

The three major categories of electric light sources, incandescent, fluorescent, and high-intensity discharge, all now have lamp varieties that can offer good to excellent color rendering. Incandescent light sources, including the many tungsten-halogen types, are high in color rendering ability although they tend toward the warmer tones, *e.g.*, yellow-orange. Standard white fluorescent lamps such as warm white, cool white and daylight, are limited in their color rendering capabilities. However, the deluxe cool white lamp and the higher color temperature daylight-matching fluorescent sources do an excellent color rendering job. High-intensity discharge sources are compact, efficient, and produce a great deal of light but present sources have limited color rendering capability. As these sources are developed they will become more suitable for museum and art gallery lighting.

Tinting of standard incandescent projector lamp output may often produce outstanding results by the use of pale, blue-white, "daylight" color roundels. Paintings which have the delicate blues or other colors of unsaturated quality, such as French impressionist, particularly respond to "daylight" tonality in accent lighting. Tinting, other than with "daylight" tones should be done only under curatorial judgment in the lighting of fine arts.

RESOURCES OF TRAVELING ART EXHIBITS

American Federation of Arts. 41 E. 65th St.,
N.Y. 10021 (212-988-770).

American Institute of Graphic Arts. 1059 Third
Ave., N.Y. 10021 (212-753-0813).

Art Index, Inc. 3111 Los Feliz Blvd., Suite
107, Los Angeles, CA 90039 (213-666-4422).

Delaware Art Museum. 2301 Kentmere Pkwy.,
Wilmington, DE 19806. (302-655-6289).

Dorothy T. Van Arsdale Associates. 803
Montrose St., Clermont, FL 32711 (904-394-
2094 or 394-2619).

Extension in Visual Arts. Division of
University Extension, in cooperation with
the College of Fine and Applied Arts and the
Krannert Art Museum, 127 Fine Arts Bldg.,
University of Illinois, Champaign, IL 61820
(217-333-0418).

International Exchange Print Exhibits. College
of Liberal Arts, Oregon State University,
Corvallis, OR 97331 (503-754-2511).

International Exhibitions Foundation. 1729 H
St. NW, Suite 310, Washington, DC 20006
(202-298-7010).

International Museum of Photography. George
Eastman House, 900 East Ave., Rochester, NY
14607 (716-271-3361).

RESOURCES OF TRAVELING ART EXHIBITS (cont.)

Old Bergson Art Guild. 43 W. 33rd St.,
Bayonne, NJ 07002 (201-437-3599).

Pratt Graphics Center. 831 Broadway. NY
10003 (212-674-0603).

Smithsonian Institution. Washington, DC
20560 (202-381-5035).

Western Association of Art Museums. Mills
College, Box 9989, Oakland, CA 94613
(415-568-2775).

Statewide Services, University of Oregon.
Eugene, OR 97403 (503-686-3027).

Independent Curators, Inc. 3415 McKinley
St. NW, Washington, DC 20015

New Mexico Museum Touring. Museum of
New Mexico, 113 Lincoln Ave., Santa Fe, NM
87501, Attn: Michael Weber. (505-827-2534).

Minnesota Museum of Art. 305 10th St., St.
Paul, MN 55101 (612-227-7613).

The New Bertha Schaefer Gallery, Inc. 41 E.
57th St., NY 10022 (212-755-3330).

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