A SCHOOL FOR ENVIRONMENTAL DESIGN

by BRADLEY SCOTT WILLIAMSON

S.B.A.D., Massachusetts Institute of Technology (1970)

SUBMITTED IN PARTIAL FULFILLMENT

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DEGREE OF MASTER OF ARCHITECTURE

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Author, Department of Architecture, May 12, 1972

Certified by

Thesis Supervisor

Accepted by

Chairman, Departmental Committee on Graduate Students

ABSTRACT: A SCHOOL FOR ENVIRONMENTAL DESIGN
Submitted to the Department of Architecture on May 12, 1972, in partial fulfillment of the requirements for the degree of Master of Architecture

Bradley Scott Williamson

The intent of the (following) investigation is an experiment in the integration of an individual / human scale flexibility with an overall specificity to be dictated by a set of space and use requirements--a program-satisfying building / structure generated from changeability. The subject is an urban SCHOOL FOR ENVIRONMENTAL DESIGN, based on studies of a hypothetical problem the previous term under visiting design critics Ram Karmi and Prof. Avraham Wachman, and considered as a thetical problem justified by (specifically M I T's) current needs within the Cambridge / Boston area for more space for design study. The program, based on a reappraisal of the researches of the APSS 1969 (M I T (School of) Architecture and Planning Space Study, summer, 1969), is conceived to enhance rather than to multiply the resources of the Cambridge / Boston area by providing a setting for interaction among students, the community, and their environment--a laboratory for environmental studies.

The goal of the investigation is a general scheme for site organization, a description of an applicable building method / language, and a design for built site modifications, described as a system / possible, functioning building.

Thesis Supervisor: Maurice K Smith
Professor of Architecture

has become...an academic institution, and suffers all the infirmities of the professional mentality...In order to find immediate joy in the soul, a search must be made for rarefied and distinctive types of architectural polemic...Architects have destroyed both the imagination and surroundings of the people of the world by forming an academic profession (LINEAR THINKING) rather than an amateur service (SCATTER THINKING)."

Peter Hodgkinson

CONTENTS

THE CURRICULUM

is devised in an effort to provide maximum opportunity for full time research in(to) the field of environmental science for 150 students. Time spent would be comparable to that of standard college format--four to six years, but (dis)organized into the following:

first year core (crash) survey course:

design sketch problems
architectural theory
sociology
architectural history
building process
architectural communications
mathematics
structures
electives
philosophy
ecology
--at Harvard, M I T, B A C, B U, etc.

second and subsequent years:

courses at the school (to be combined with others in the Cambridge Boston area)

architectural design (with resident and visiting faculty)

photography
visual design
art history
participatory art courses
film
architectural history
posters
architectural theory
environmental psychology
program analysis
urban design survey
computer applications

THE PROGRAM

was designed to satisfy the SCHOOL's proposed PURPOSE

AS A SCHOOL

to PROVIDE an environment in which an environmental / architectural design experience happens: the school as a laboratory for study —— (flexible environment) (re)moving / adding structure, changing spaces / elements, using space, modifying with various degrees of permanence, making / placing / disassembling furniture

AS A PART OF THE CITY

to EXTEND to the city the results of its research

"SELL" (express) to the community its products

STIMULATE an interchange between the public and the students: contribute various amenities (food, display, entertainment, light, shade, etc.) to MASS AVE and the community, temporary ——→ permanent architectural modifications, public activities as an extension of private activities, participatory "theater" (plaza), circumjacencies throughout for the opportunity of continuous interchange among those who will use the school

AS A BUILDING

to HOUSE 120 students and a few faculty, minimum 130 sleeping places, facilities to accommodate residences

SHELTER from the elements those activities which require it

Activity
Use
Place

Space
Accommodations

The GREEN STREET edge of the site will be a reflection of the existent residential nature of the street at present.

Living areas are clusters formed from a few continuous spaces by modifiable / movable barriers.

assumed distribution

1 "core cluster" of 30
8 clusters of 2
8 3
5 5
4 8
30 located elsewhere in the community

view towards either GREEN STREET or MASS AVE

daylight in all spaces

double entry: one from the residential edge; one from the school side--the studio area on the upper level

area per cluster: (200 sf/person, private) + (50 sf + 50 sf/person, communal) + kitchen(s) + bath(s)

1 core cluster of 30 private areas, 8 baths, 8 potential cooking spaces, and 1 divisible (double level) communal area (1500 sf)

1 bathroom per four persons, centrally located

service spaces (power, water, heat, storage, garbage)

ability to accommodate standard student residential furniture (beds, desks, chairs, dressers, clothes storage)

outdoor or convertible platforms

adequate fire exits

acoustic privacy between clusters

The studio is an interface between the residential clusters and the academic / public areas of the school

individual studio areas for 80 people, 1000 cu ft per person

circulation area

games

relaxation

mostly north light
can accommodate faculty offices
blueline machines
access to residential, outdoor, and academic activities
ceiling heights to accommodate mezzanine type constructions

Shop

modelmaking--part of studio activity
worktables in studio
small scale power tools

woodworking
ground level shop
freight elevator to studio area
acoustically isolated
ventilated
storage area
large doors at ground level
delivery access on BAY STREET

Academic

2 class / seminar interchange areas
1000 sf per class area
natural lighting
does not face outside activity
audio-visual facilities for one of these areas
variable acoustic privacy
one area adjacent to studio area

lecture / theater area
divisible into two smaller "theaters"
200 person capacity (interior)
audio-visual facilities
can be separated from plaza activity
can be opened to become part of community
near seminar areas
storage space

Photography
- enlarger room, 400 sf, 5 enlargers, 1 sink
- film and mounting room, 500 sf
- adjacent to studio space; distant from model shop area

Library
- access from exterior
- access from studios
- lots of natural light
- worktables
- stacks, 2000 linear feet
- card catalog to Harvard, M I T, B A C, B U
- portfolios ($\begin{matrix}\text{art}\\\text{arch}\end{matrix}$ history)
- Xerox machine
- duplicating facilities for maps
- singular spatial quality (with many one-person places)
- slide library
- trade catalogs
- reference
- reading spaces, 2000 sf total
- periodicals (incl 200 ft linear display)
- acoustic isolation
- library office
- 50 person capacity

Exhibit
- visually open to $\begin{matrix}\text{exterior}\\\text{public}\end{matrix}$
- glass walls exterior
- double height
- second level circulation, way to get out on upper level

Eating
- seat 100
- cooking area--visible (limited access) from plaza area
- food storage, dish storage
- washing, cleaning up

delivery, dispatch
garbage
cashier
2 rest rooms
"private" residential access
public access / exchange from plaza area

Vehicles
parking for 60 cars
service space for 2 cars
delivery accommodations for restaurant, woodshop, freight elevator

Plaza
node of academic interchange
part of sidewalk, exhibit, theatrics, architectural experiments, main entrance, elevator, midblock circulation, eating places, movement office, student enterprise
visual part of library, some residential, studios, architecture office
exterior movie / projection screen
upper level circulation around
summer shade
winter sun
protection from rain

The "storefront" architecture office could be a(n) architecture advocacy / small job school-run firm.
extension of the studio
public access visible from but not part of the plaza
display space
relationship to the Cambridge Seven building
model storage

The "movement" office could be a rentable / loanable home for movements and campaigns wanting or inspiring interchange.

The student enterprise area is a place where students can participate in MASS AVE as a commercial street.

SITE SELECTION

was considered to be part of the solution rather than a program specification. The conditions were to be met

that the site be presently available

that it have immediate access to the community through the pedestrian public in order to provide / stimulate the community↔school interchange considered vital to the function of the school

that it be close to (proximally or by public transportation) those other institutions of which it is considered an extension (M I T, Harvard, B A C, B U, etc.)

that it be large enough to site the school and to allow for a minimum of 50% expansion

The sites considered were

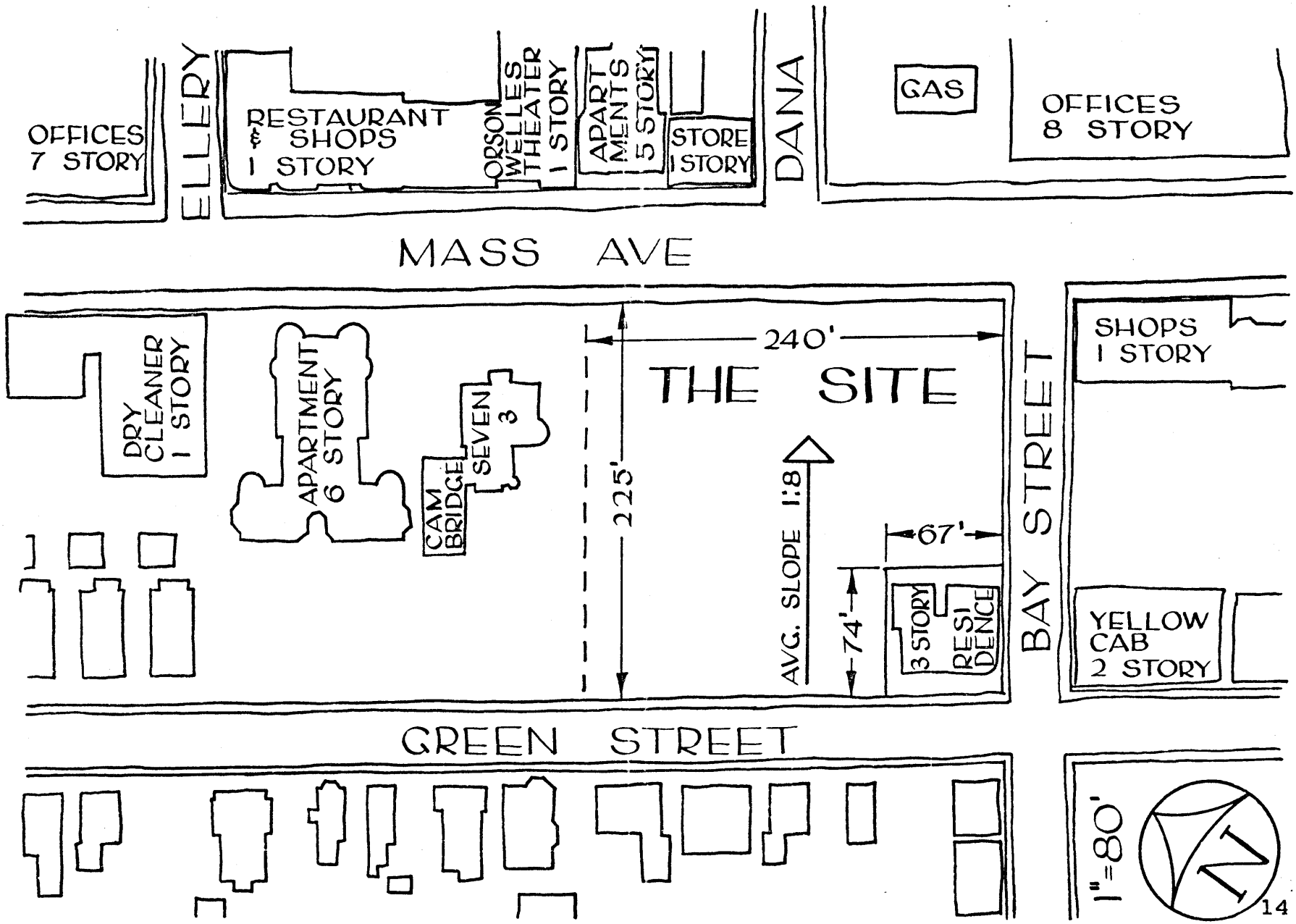
the Webster building (in the East Campus of M I T), rejected because of its "backyard" community location and limited opportunities for modification to the existing structure

the Metropolitan Storage Warehouse (adjacent to the M I T Armory on Mass Ave), rejected because of limits on its expansion and structural modification opportunities

the old Dexter School campus, sited in a residential/dormitory neighborhood south of

Commonwealth Avenue in Boston, discarded because of its poor accessibility to the pedestrian community

the old site of the McCartney Garage, now demolished, and the building presently housing Ed Axelrod's hardware store and an A&P (slated for demolition), located on MASS AVE between Harvard and Central Squares, and owned by M I T. THE SITE is the block bounded by MASS AVE and GREEN STREET, and by BAY STREET on the south, extended to the property line of The Cambridge Seven Associates (architects), to be extended into that lot and into that of the apartment building to the north, as it grows.


OFFICES
7 STORY
ELLERY
RESTAURANT
& SHOPS
1 STORY
ORSON
WELLES
THEATER
1 STORY
APART
MENTS
5 STORY
STORE
1 STORY
DANA
GAS
OFFICES
8 STORY
MASS AVE
DRY
CLEANER
1 STORY
APARTMENT
6 STORY
CAM
BRIDGE
SEVEN
3
240'
THE SITE
225'
AVG. SLOPE 1:8
67'
74'
3 STORY
RESI
DENCE
BAY STREET
SHOPS
1 STORY
YELLOW
CAB
2 STORY
GREEN STREET
1"=80'
N

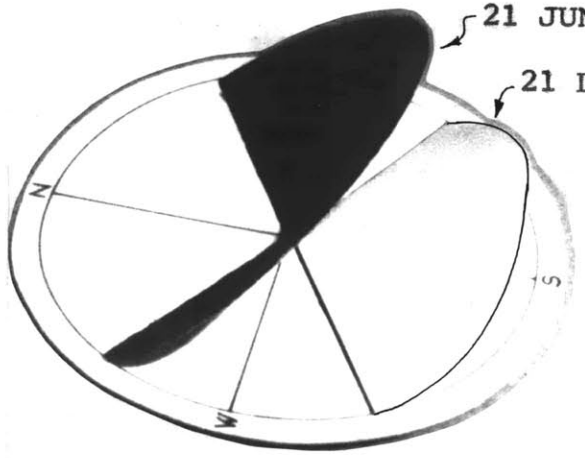
THE SUN
THE INTENT

defines a building envelope which allows its light to reach the sidewalk and suggests a building form that will permit a variable community/pedestrian↔school

existing structures on the east edge of MASS AVE, and provides summer shade and winter interchange/interaction along the MASS AVE edge, and stimulates/accommodates more intense

warmth to the unenclosed/interior (plaza) areas.
interaction in an interior ("piazzarena") area.

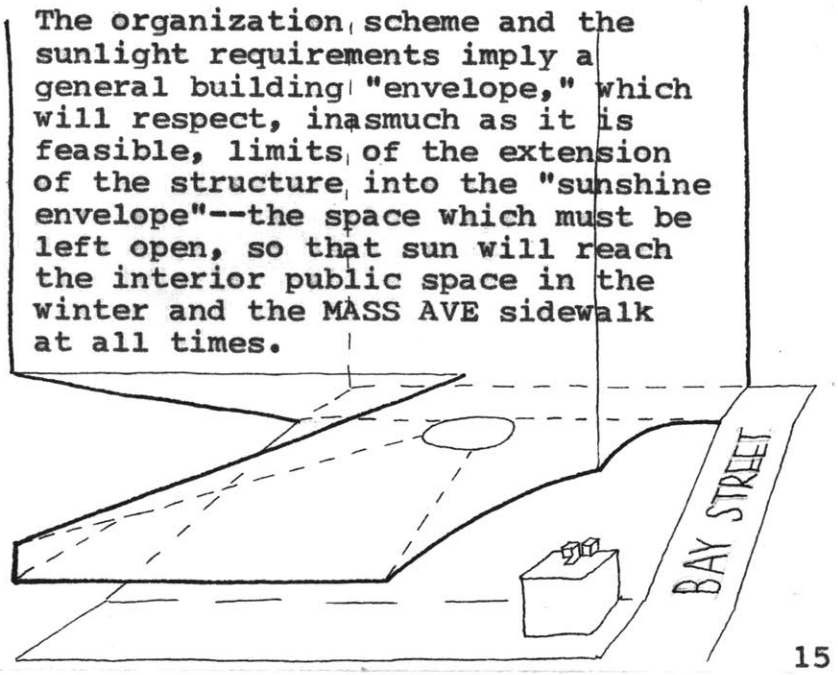
SUNLIGHT TRAJECTORY

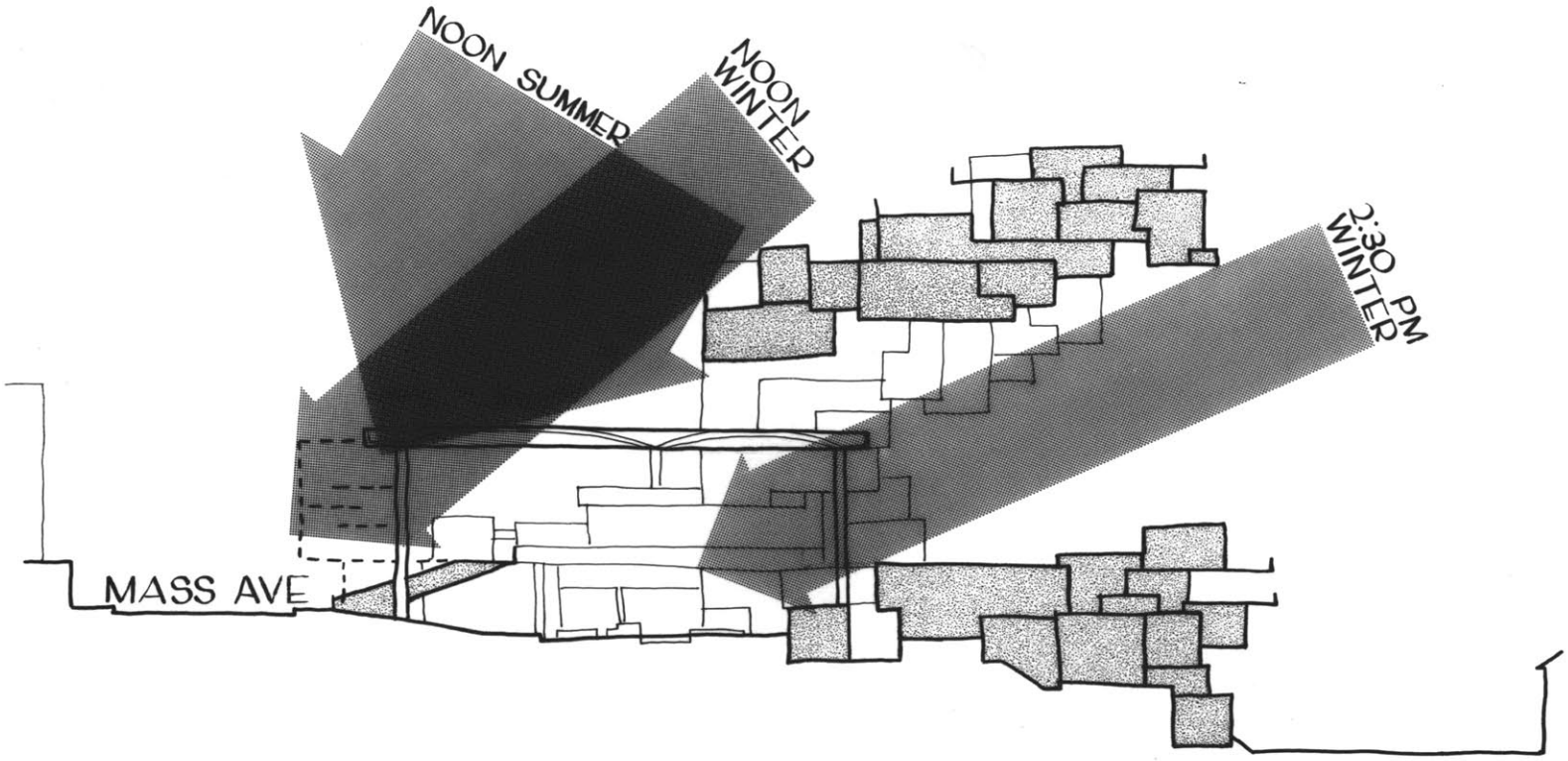


	21 JUN	21 DEC
DAY LENGTH	15.6 hr	8.4 hr
MAX ELEVATION	71°	24°
AZIMUTH	58°	122°

SUNSHINE ENVELOPE

The organization scheme and the sunlight requirements imply a general building "envelope," which will respect, inasmuch as it is feasible, limits of the extension of the structure into the "sunshine envelope"--the space which must be left open, so that sun will reach the interior public space in the winter and the MASS AVE sidewalk at all times.

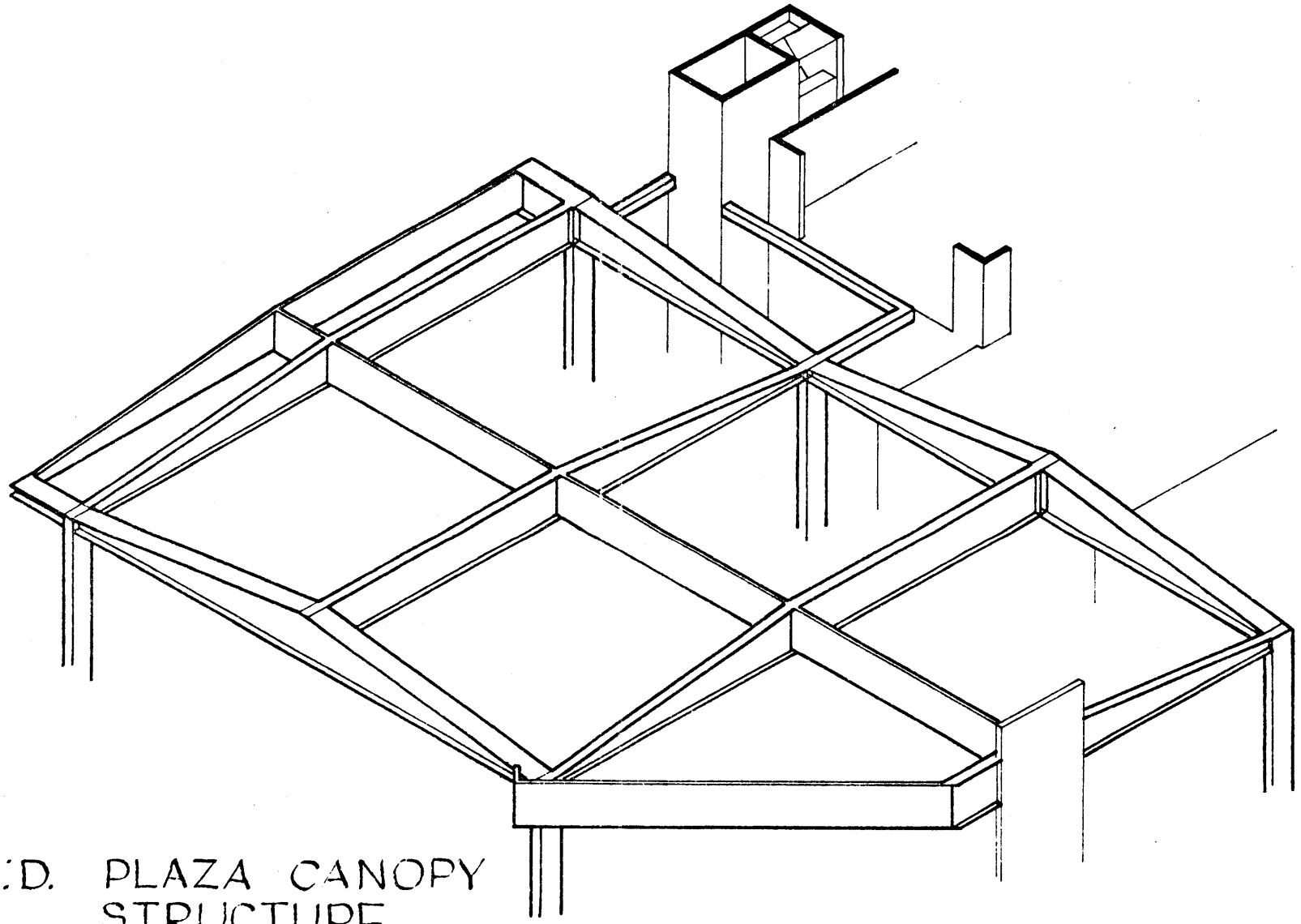




S.E.D. SUNLIGHT ADMITTANCE

THE CANOPY

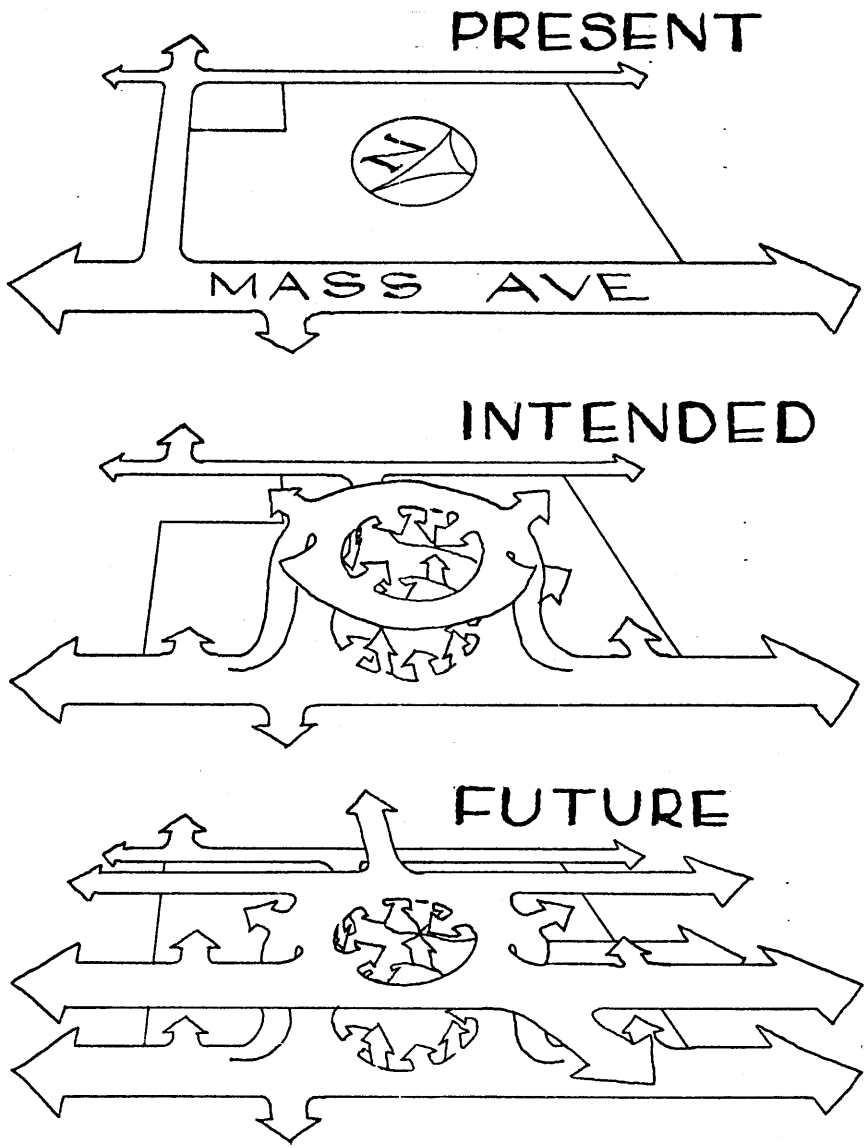
As a shelter from rain, a transparent canopy is proposed as a cover for the plaza area. The suggested canopy support system, trusses on columns, in general, suggests truss shapes which can be modified slightly to allow the use of five hyperbolic paraboloids, hung from a substructure attached to the trusses. This would yield a structural stability, as well as providing drainage through or along each of the supporting columns.



S.E.D. PLAZA CANOPY
STRUCTURE
GENERALIZATION

PEDESTRIAN PUBLIC CIRCULATION

Pedestrian circulation at PRESENT is basically confined to the edges of the site and is little affected by the qualities of the site, itself (now used as a parking lot). The apparent openness resultant from sunlight reaching the sidewalk and from the view over the part of Cambridge between the site and the Charles River occasionally attracts vendors to sell food, and to change the site to a stopping place for those who are hungry; a slowing-down place for those who are not. The place becomes a relief, not by providing a rest for tired feet, but by interrupting the linearity of the pedestrian way and by providing an outdoor participatory

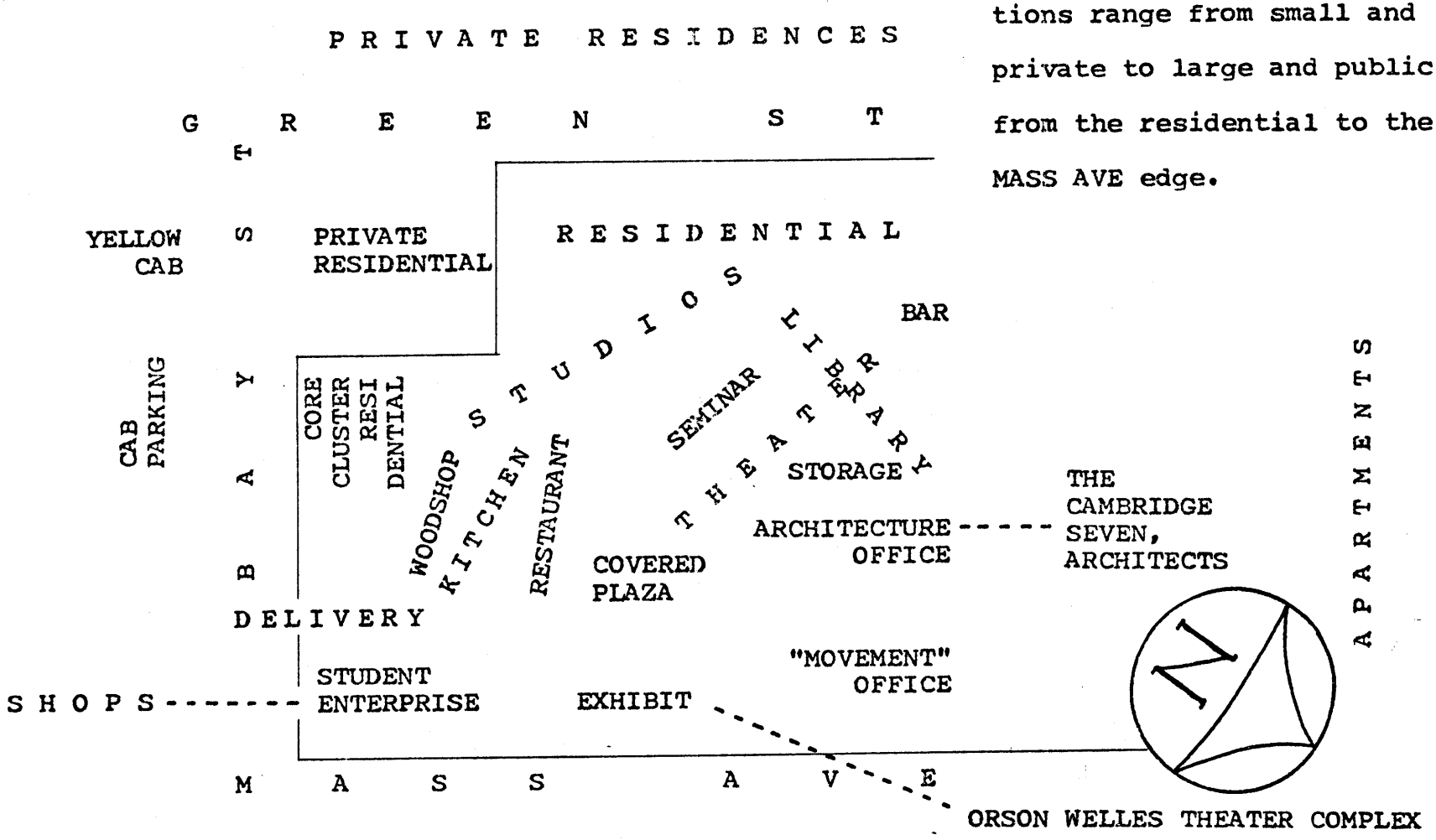


(pedestrian-associated) activity, while allowing the MASS AVE experience orientation to remain very present.

The INTENDED built site is regarded as a potential relief from linear travel by its provision for people in a central area which provides possibilities for varied use around the area, recognizing, but dissociated from, the directionality of MASS AVE. It should not crowd the sidewalk with "frontage." In addition, pedestrian traffic can be moved from BAY STREET, the service street, to a walkway extending through this area to GREEN STREET, and serving as access to the residential area.

Intentions Projections for the FUTURE are magnifications of the immediate INTENDED circulation modifications. In this case, MASS AVE would have double level circulation, corresponding access to the central space, a second level access to GREEN STREET, a midblock pedestrian public walkway, and bridges across MASS AVE to the Orson Welles Complex and across BAY STREET to another circulation use area.

The school, as a place to live, is a part of the residential community, extended to MASS AVE to provide public open space highly accessible to the pedestrian. Activity accommodations range from small and private to large and public from the residential to the MASS AVE edge.



was specified to coincide with a method for design, spacemaking, and construction. The intent was to form the building from an arrangement of small and large spaces, and to form these spaces from variations on a single structural member. The specifications thus placed on the piece and its variations were

that it be -

highly flexible as a design element

moderately flexible in use, both in the accommodation of changes to the structure / modifications of the spaces / holes for glass, people, sunlight

and in the combination with a smaller scale, highly flexible partition / furniture system

large enough to possess significant spatial / space forming qualities of its own, in order that the number of pieces can be held to a reasonable minimum

small enough to allow the dimensions and shape of the smaller spaces to remain basically unrestricted and flexible

usable as a long span structural member

also a column

a provider of shade, modifiable or movable to cause minimum disturbance to sunlight

In keeping with the general organizational scheme, the structural member was considered as the principle structural component of the residential spaces, the smallest scale enclosures required of the school. The structure should then consist of the specified definitions structural system along the GREEN STREET edge, extended and multiplied to form the larger spaces as the structure approaches MASS AVE. The method was conceived as an activity-accommodation size intensity gradient from GREEN STREET to MASS AVE. privacy

private ——————→ public

sleep	photograph	exhibit
eat	eat	eat
read	read	posters
draft	draft	bicycle
print	print	watch
play	play	play(s)
music	music	music
bathe	drive	listen to
study	shop	concert
	craft	see
	research	movies
		lecture

It became more reasonable in specific cases, where large span continuous spaces, sloped floors, ramps, and special openness criteria were to be met, to combine the system in various degrees with a larger scale method. The specific individual requirements of the large spaces suggested the use of poured concrete (columns, structural walls).

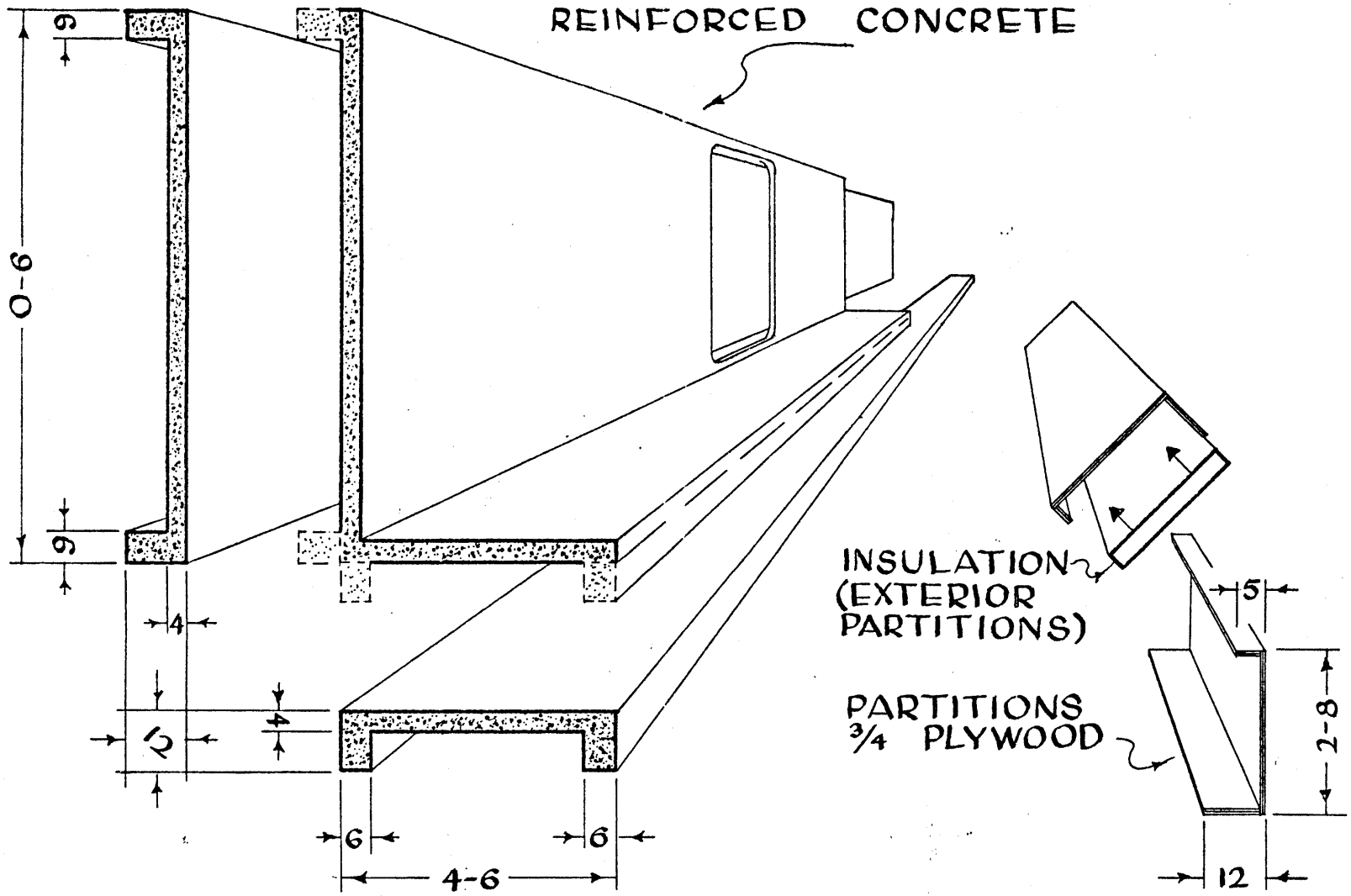
The size of the member was dictated by an approximation of the smallest conveniently usable spaces. Experiments with preliminary structural methods deemed a piece based on a four foot system too small. A module of 4'-6" was chosen because it better accommodates furniture, use possibilities, and the dimensions (thickness) of the piece, itself. The modular quality of the $\frac{\text{piece}}{\text{method}}$ was assumed to be a prerequisite for design and use flexibility.

architectural experimentation
modification of

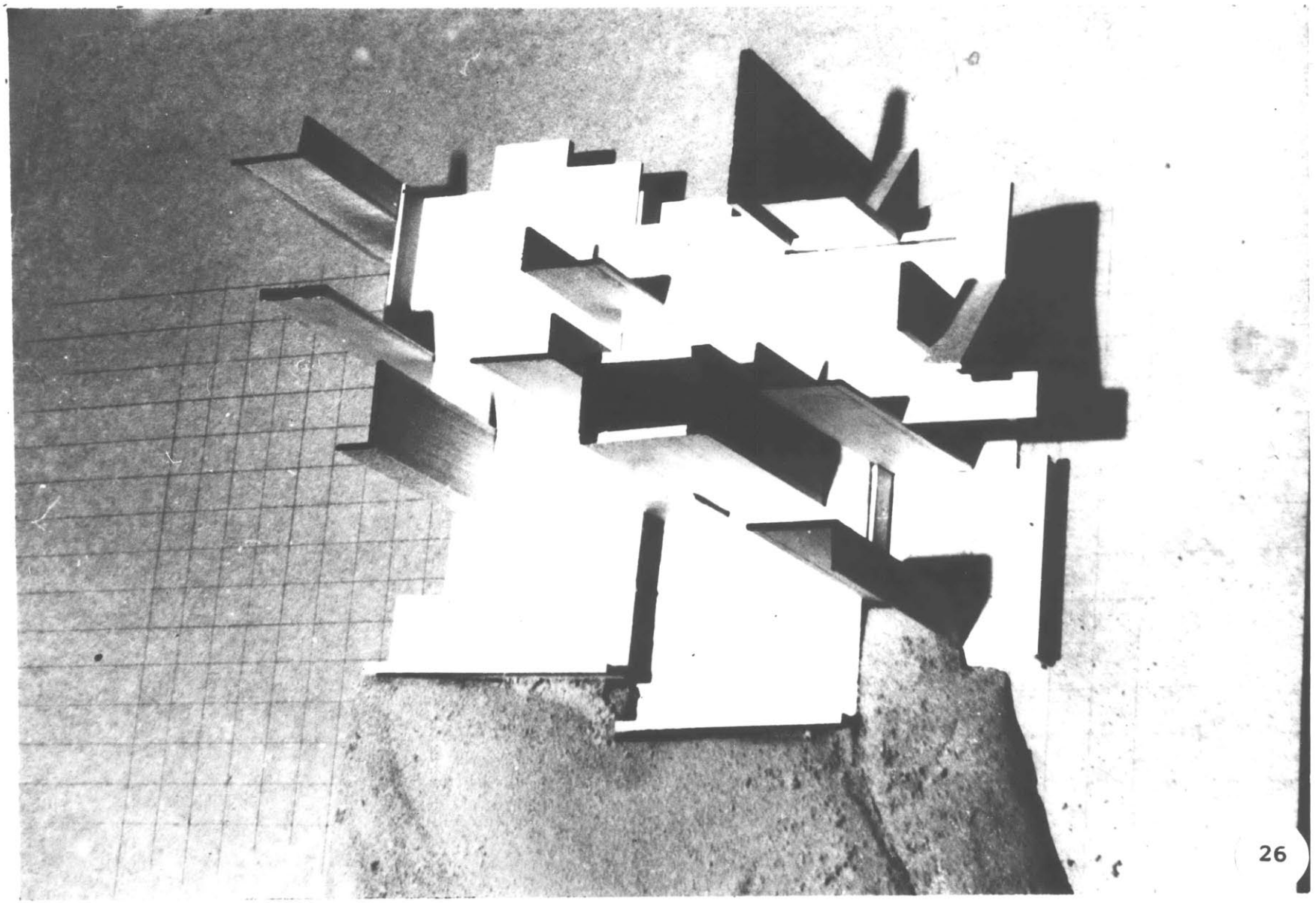
private space ⟶	public space
expansion	movable ground
filling in	sitting
dividing	standing
tilting	touching
substitution of elements	climbing
making stuff	building
	assembling / disassembling
	office / design

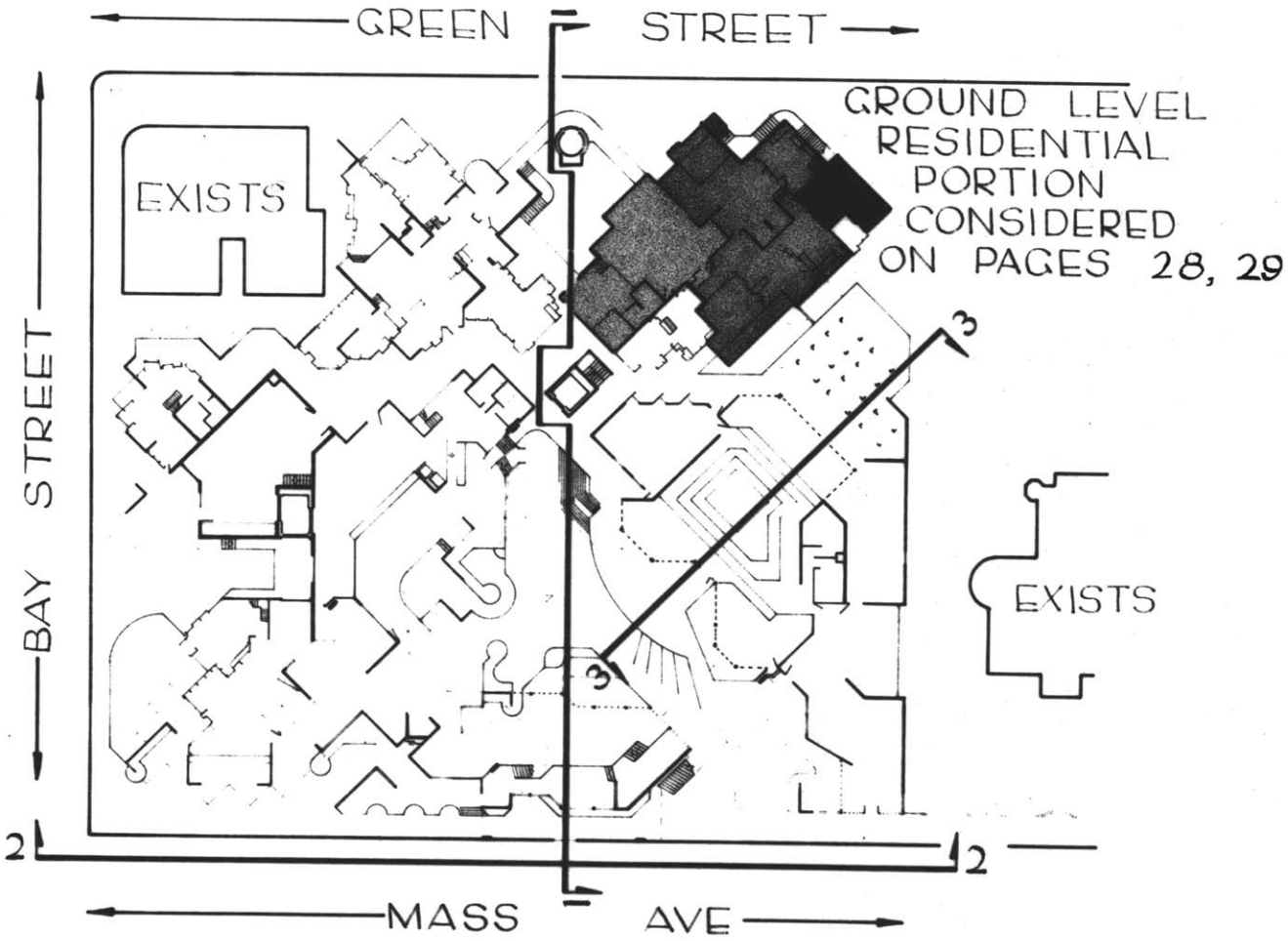
The piece is a simple concrete L, poured in a mold which can be plugged to adjust the addition of structural flanges, or modifications to a floor panel, the width of either the short or the long leg of the L.

When used as a beam or as a column, holes can be cut to allow sun or people to pass through. To allow maximum sunlight penetration, the columns are oriented roughly with the noon sun, at 45° to the site edges.

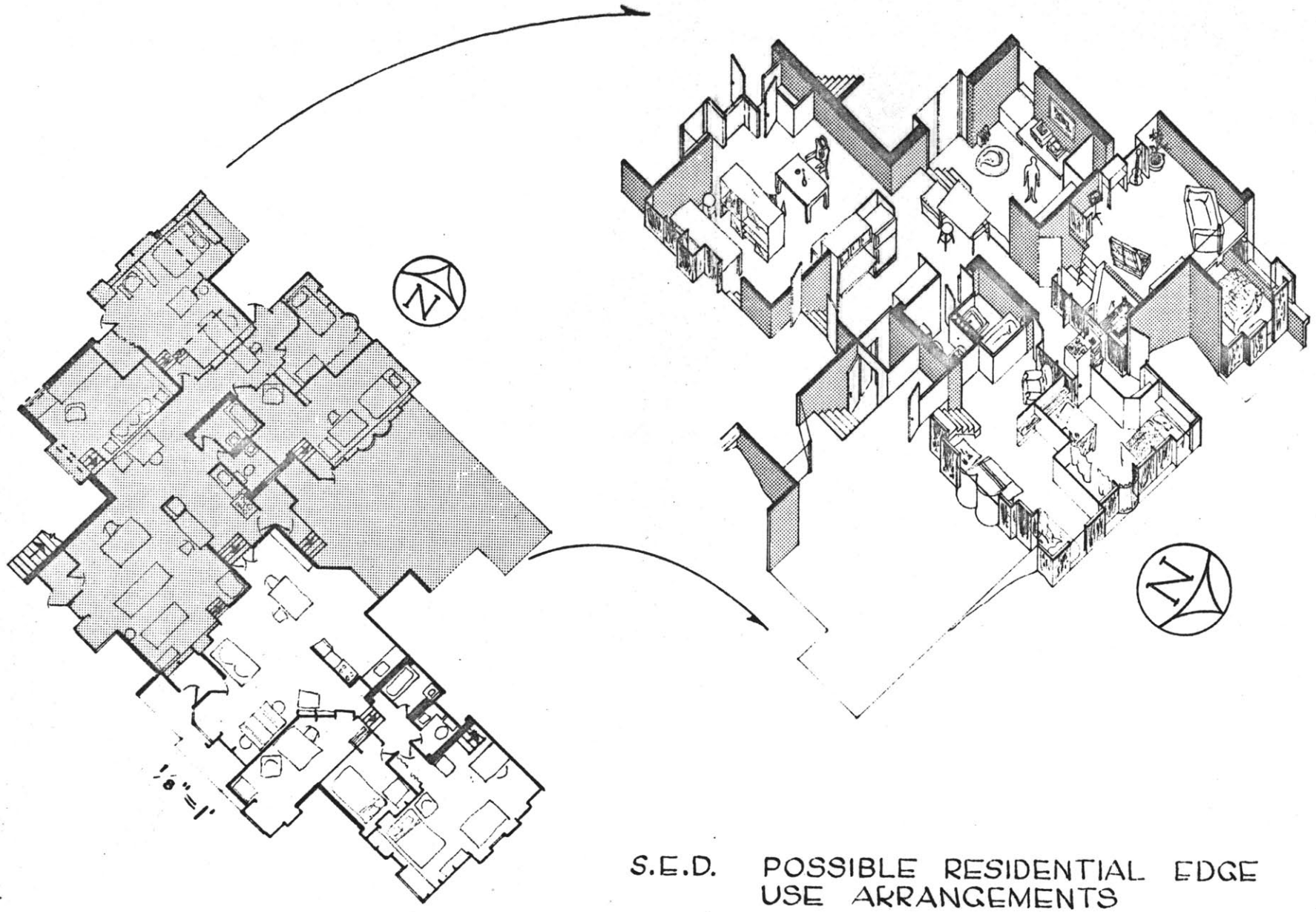


REPEATING STRUCTURAL PIECES
PARTITION ELEMENTS

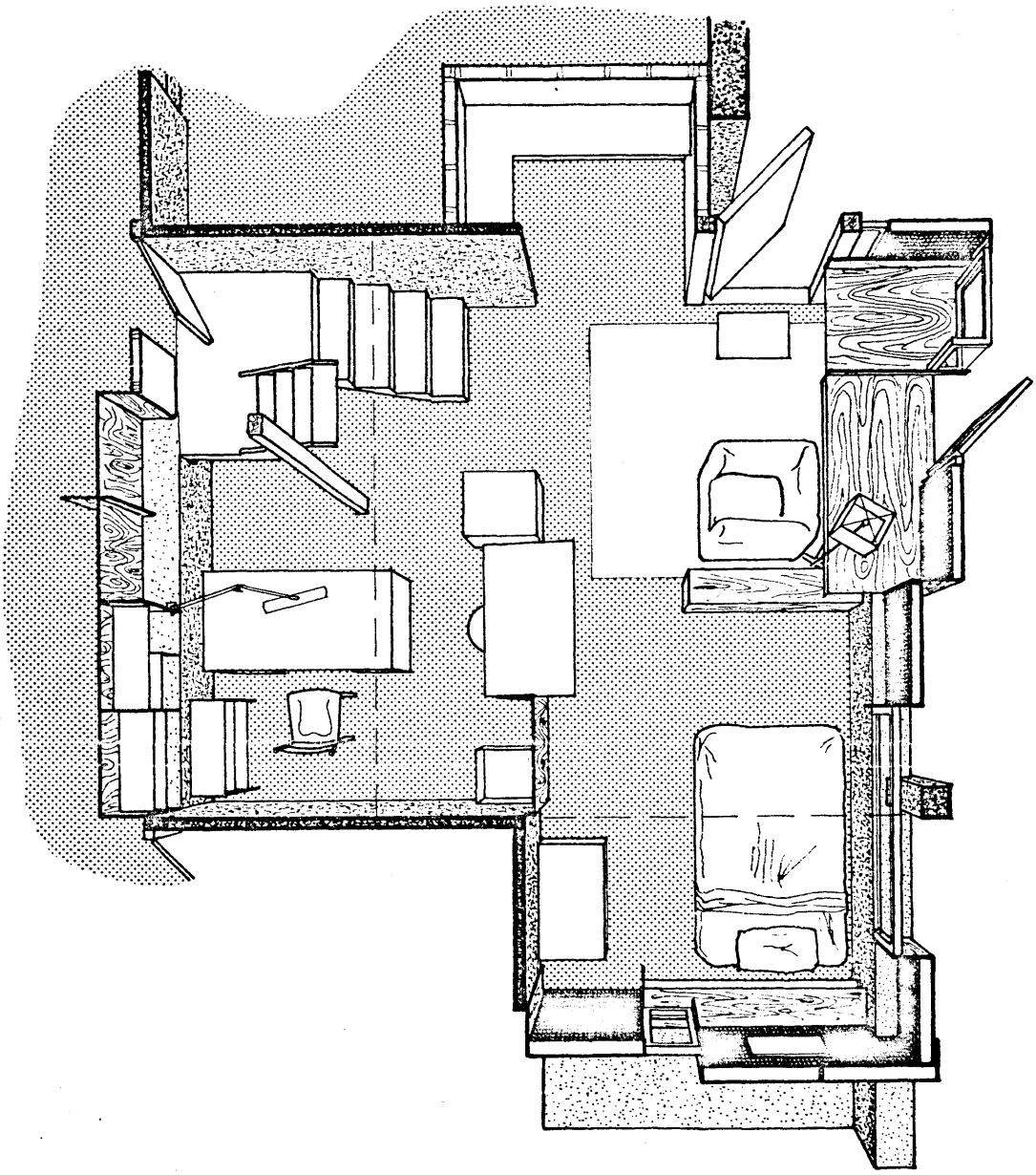




S. E. D. SECTION INDEX

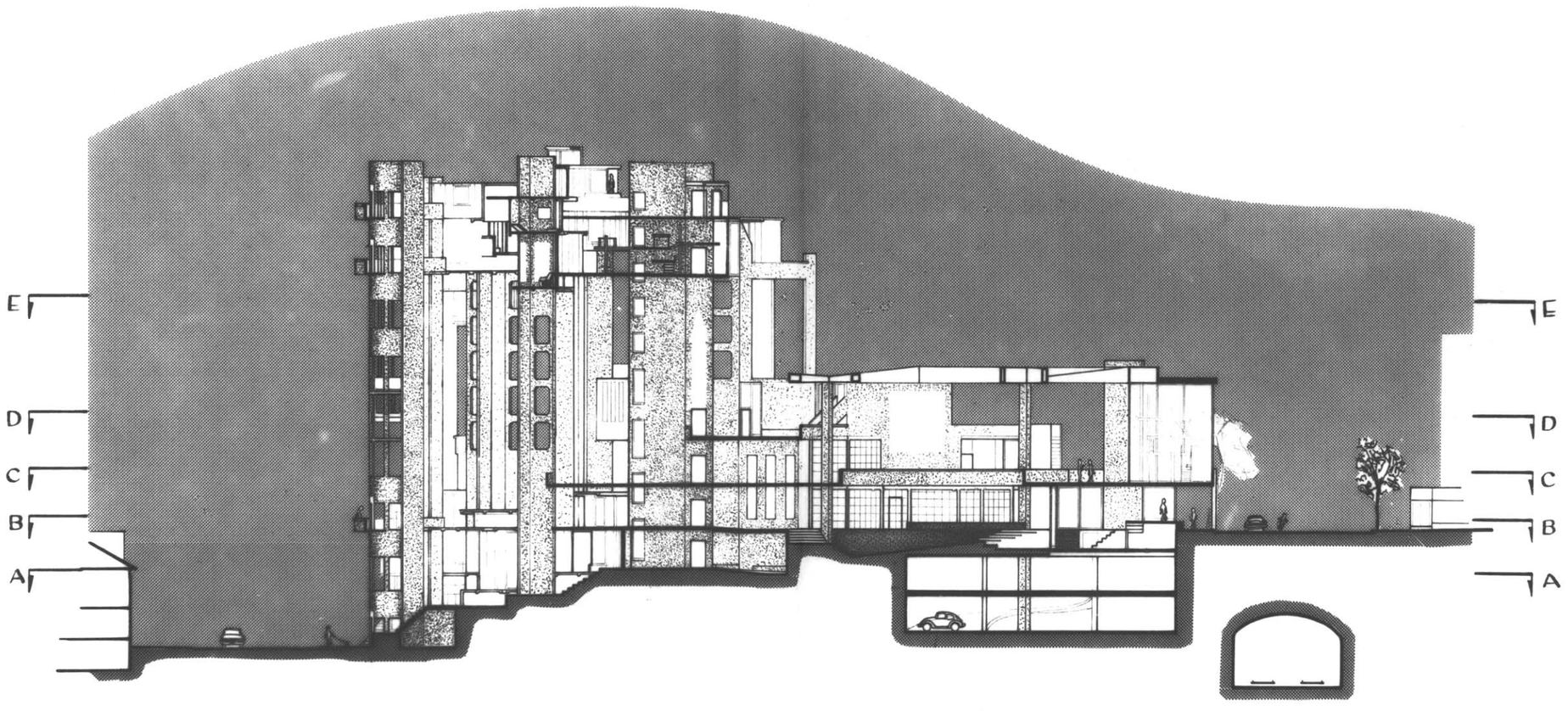


S.E.D. POSSIBLE RESIDENTIAL EDGE USE ARRANGEMENTS

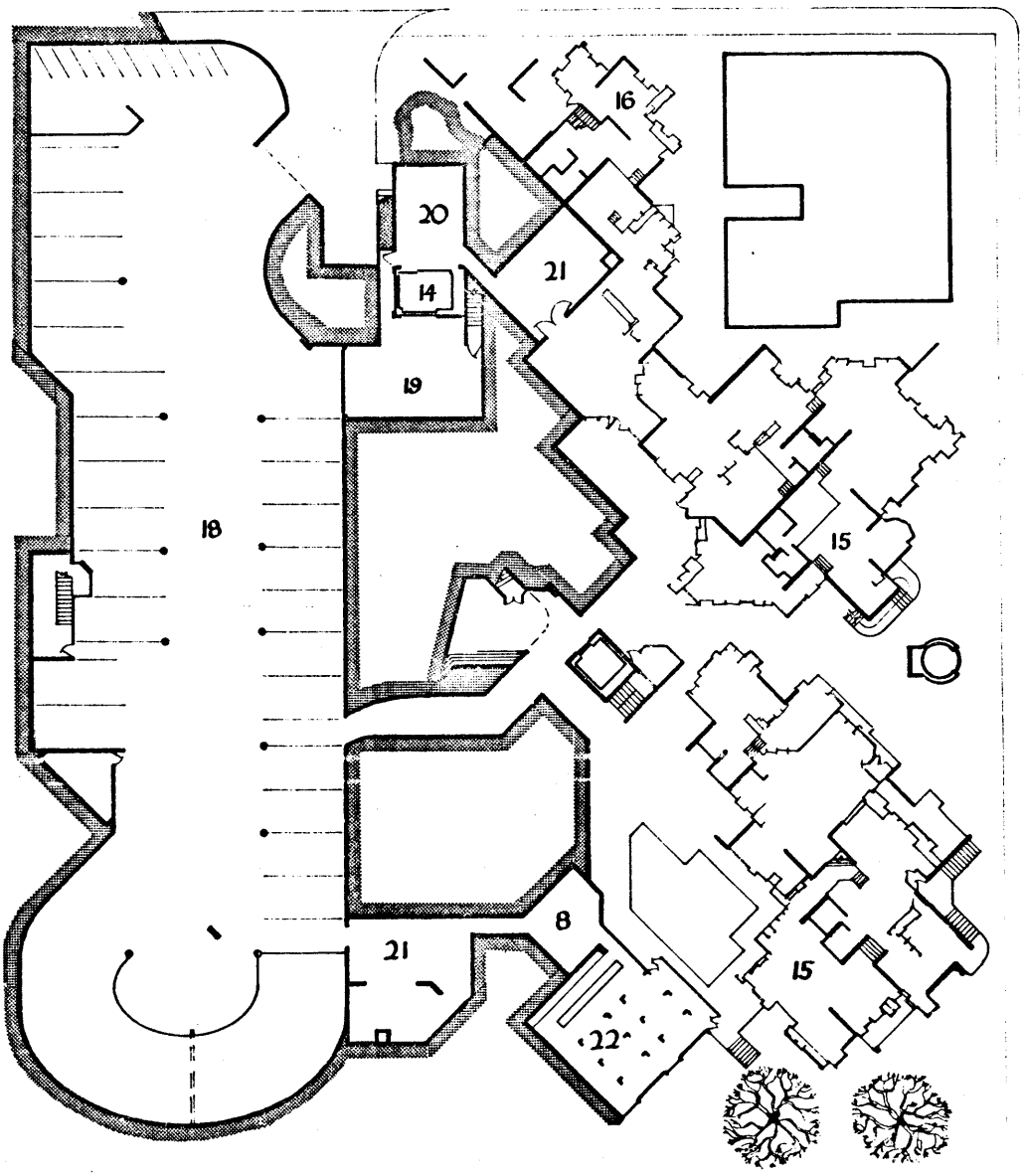


S.E.D. POSSIBLE PRIVATE
FURNITURE LAYOUT
STRUCTURE

29



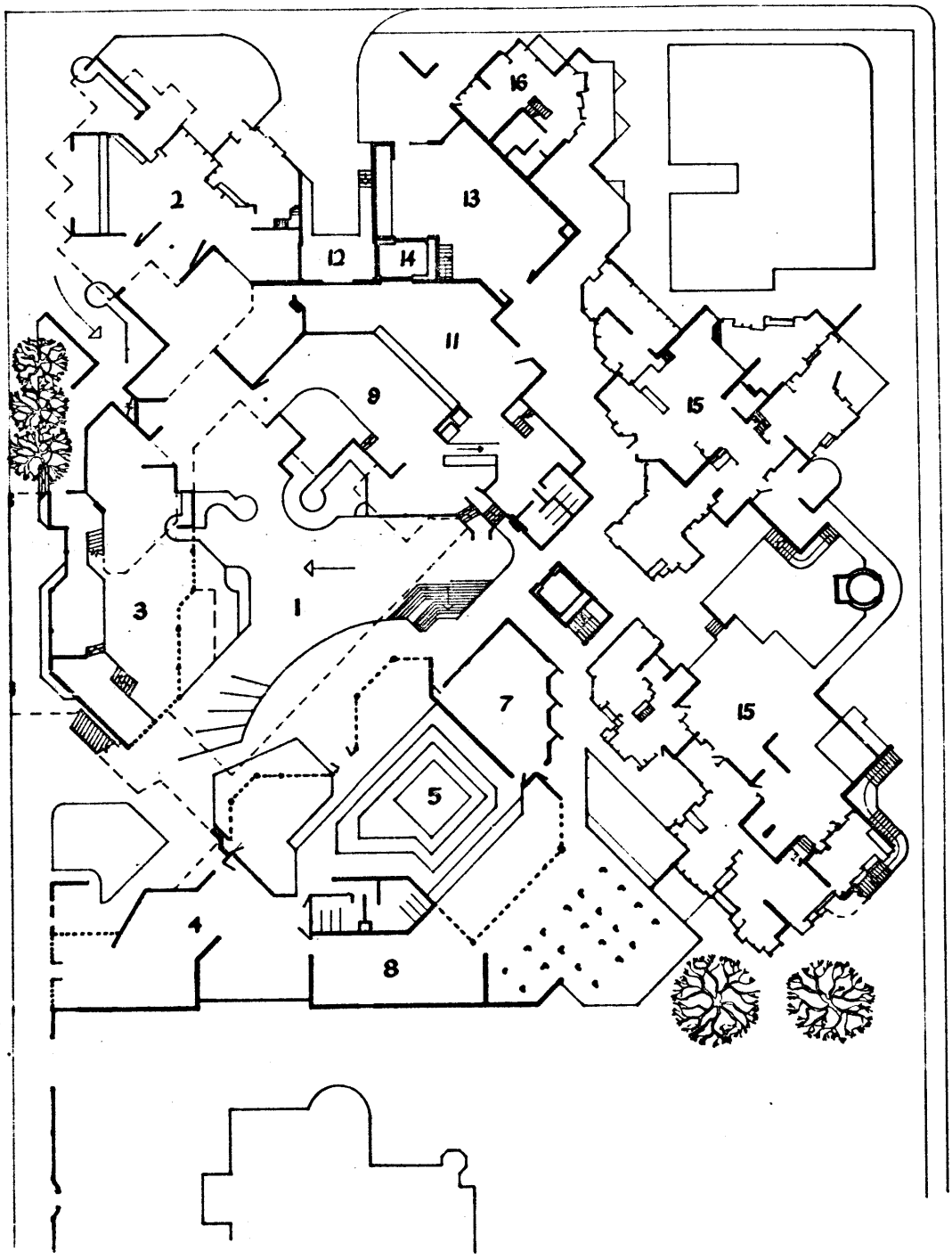
S.E.D. SECTION 1 1/32"=1'



(KEY ATTACHED TO PLAN E, PAGE 37)

S.E.D. PLAN A 1/32" = 1'

31



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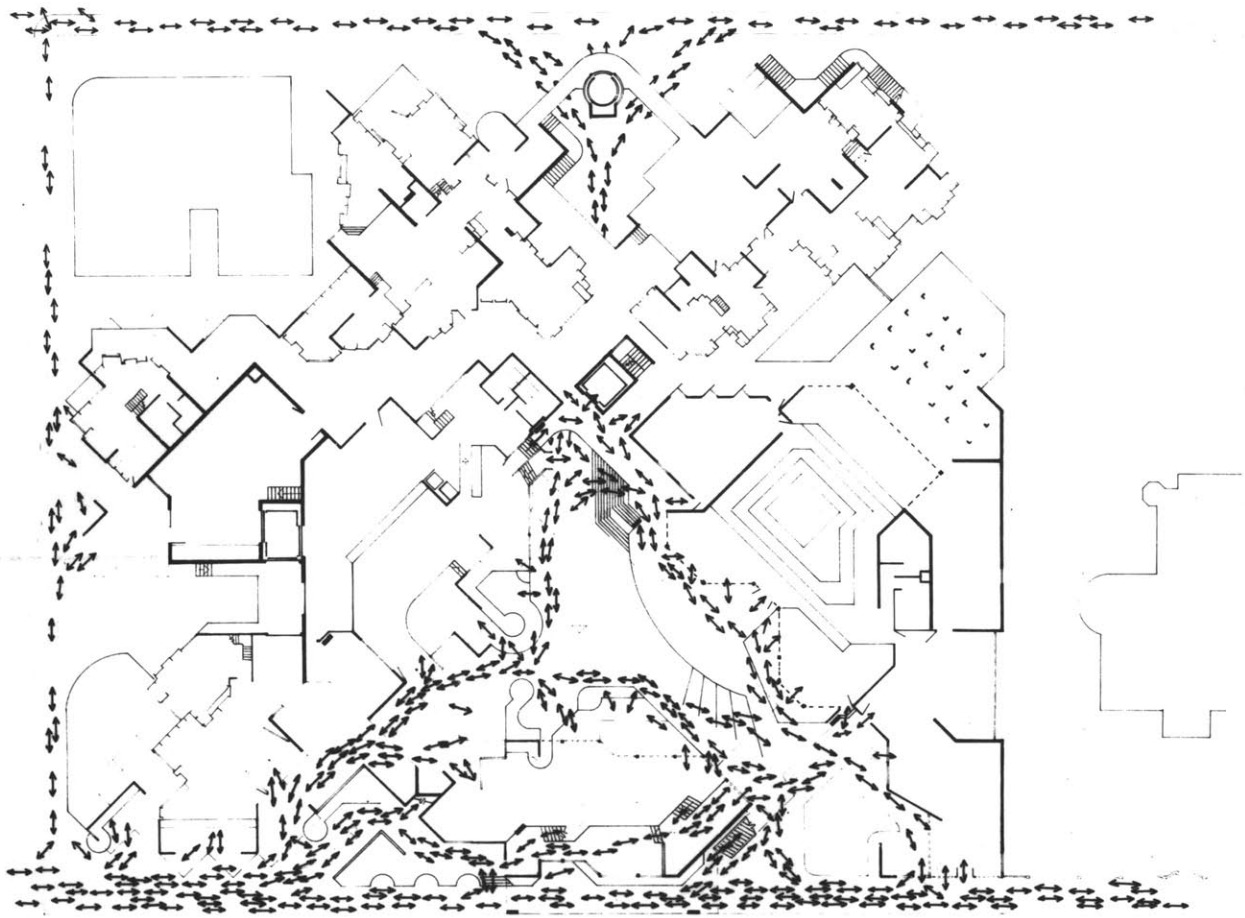
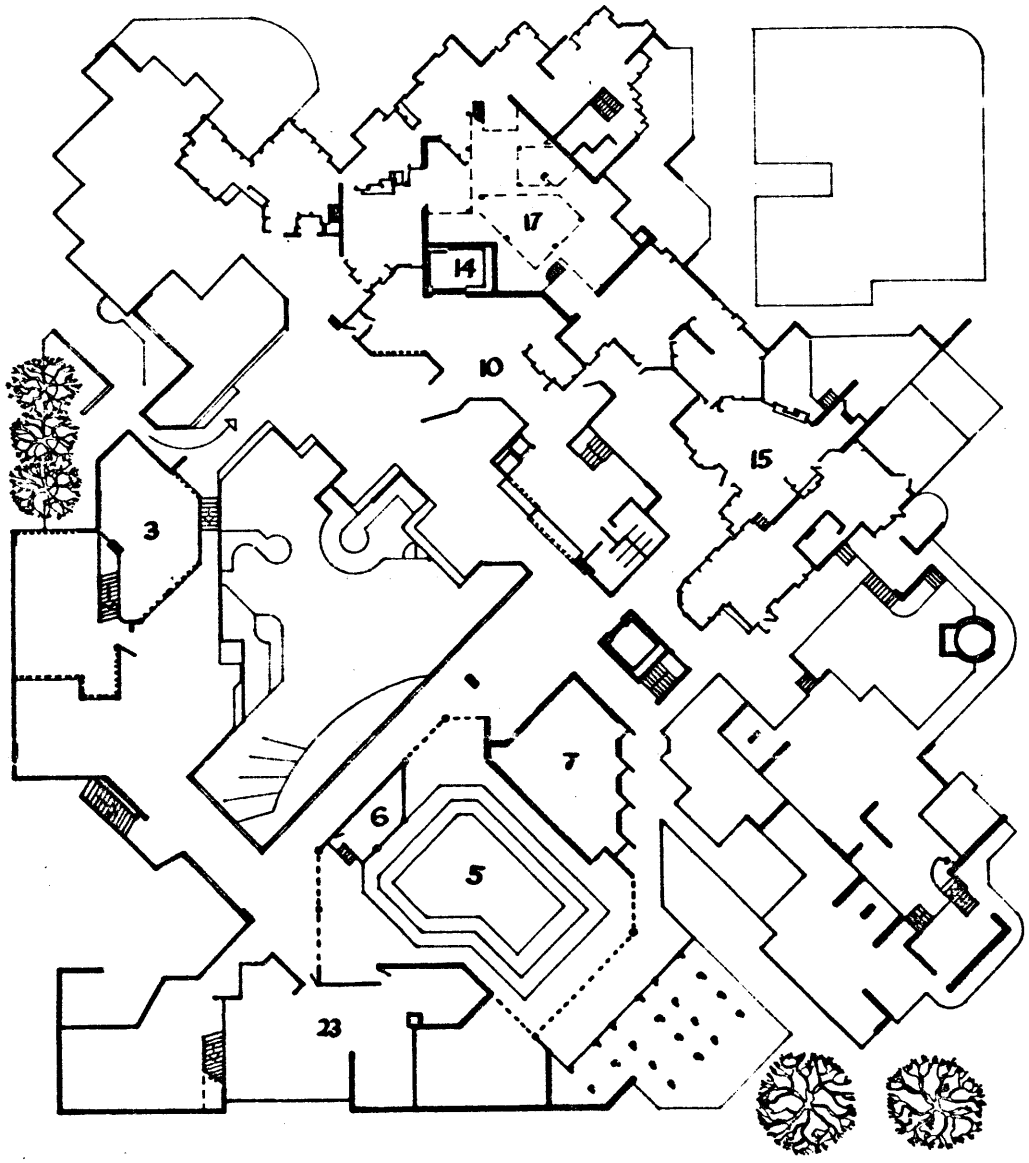
S.E.D. PLAN B 1/32" = 1'

32

S. E. D. GENERAL USE (LEVEL B)



S. E. D. PUBLIC ACCESS MOVEMENT



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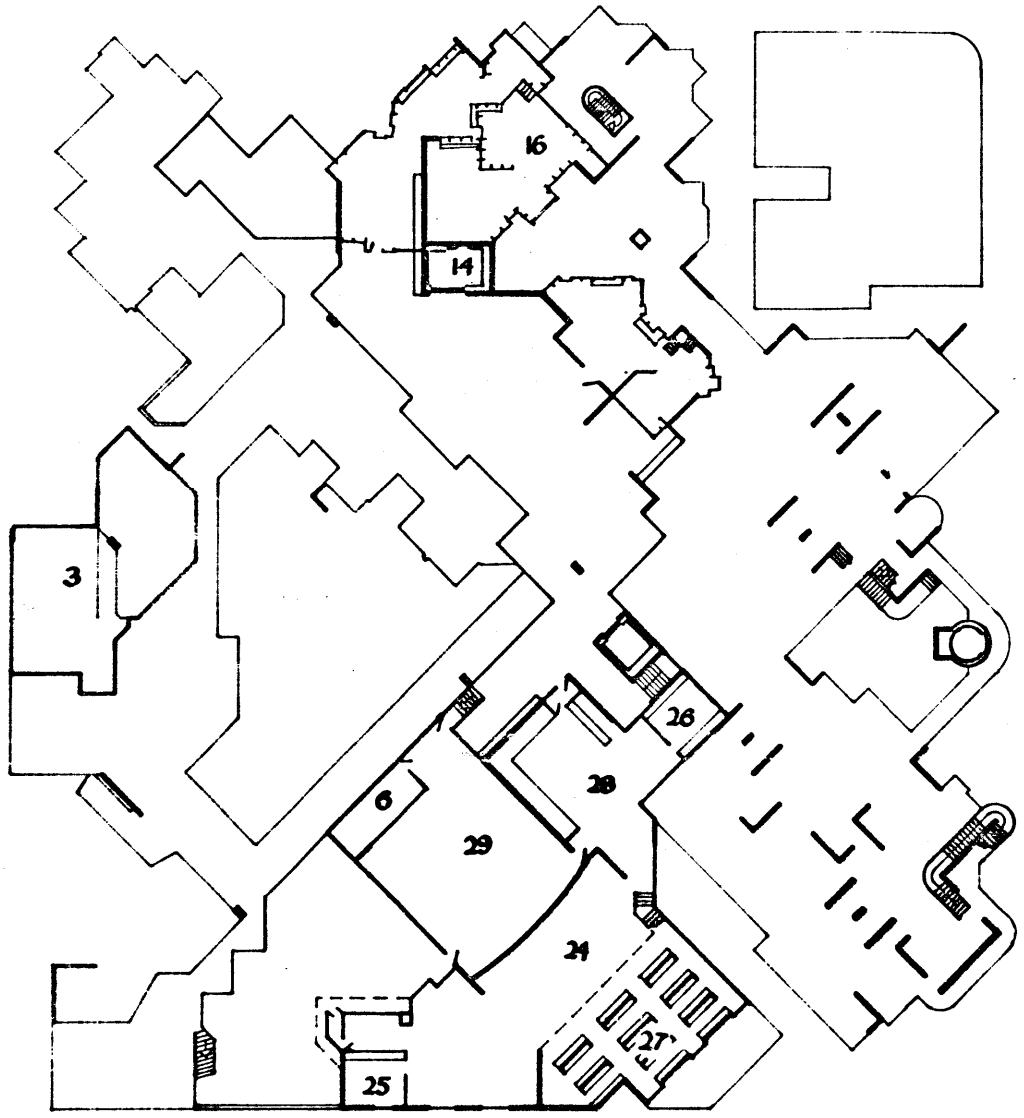
S.E.D. PLAN C 1/32" = 1'

35



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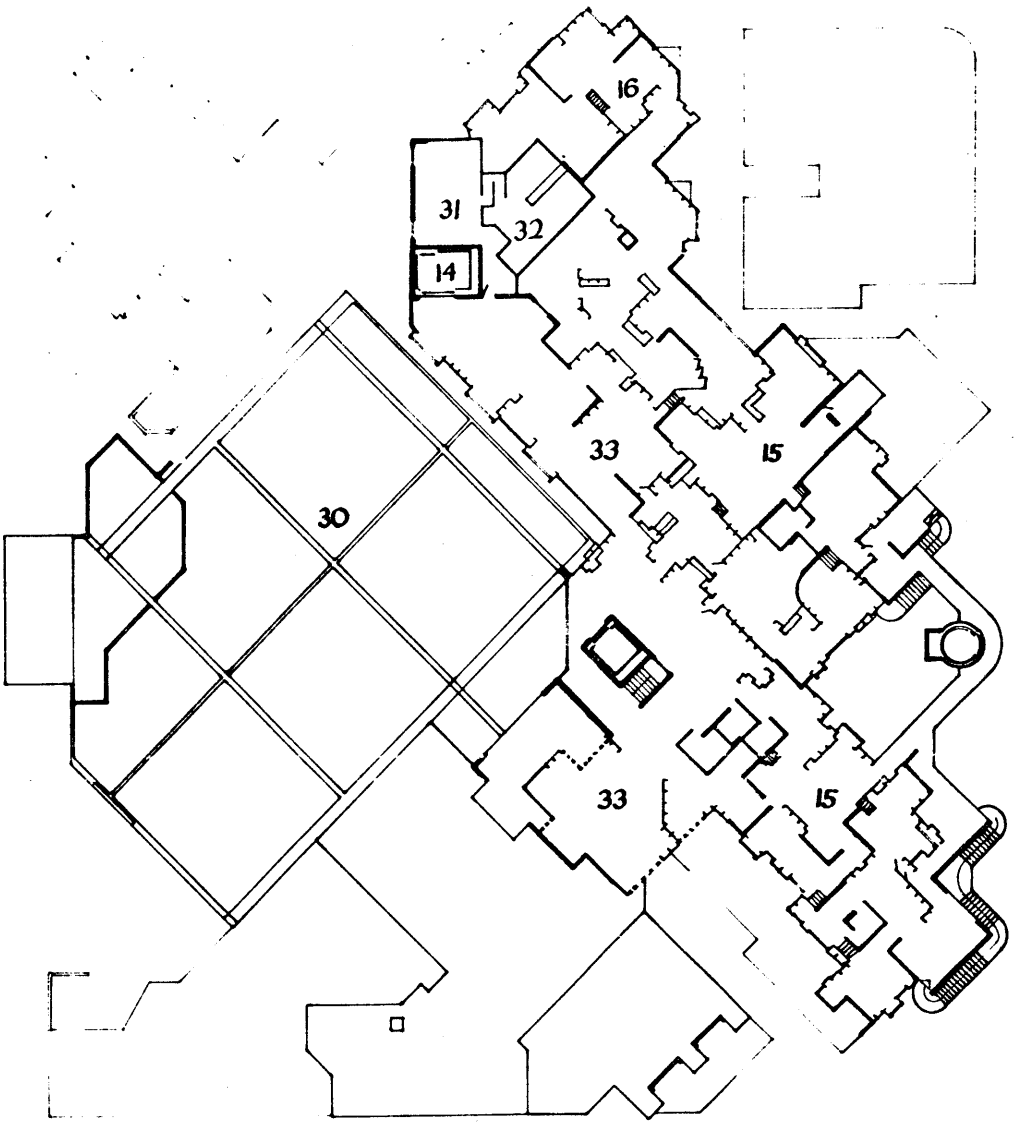
S.E.D. PLAN D 1/32" = 1'

36



S.E.D. PLAN E 1/32" = 1'

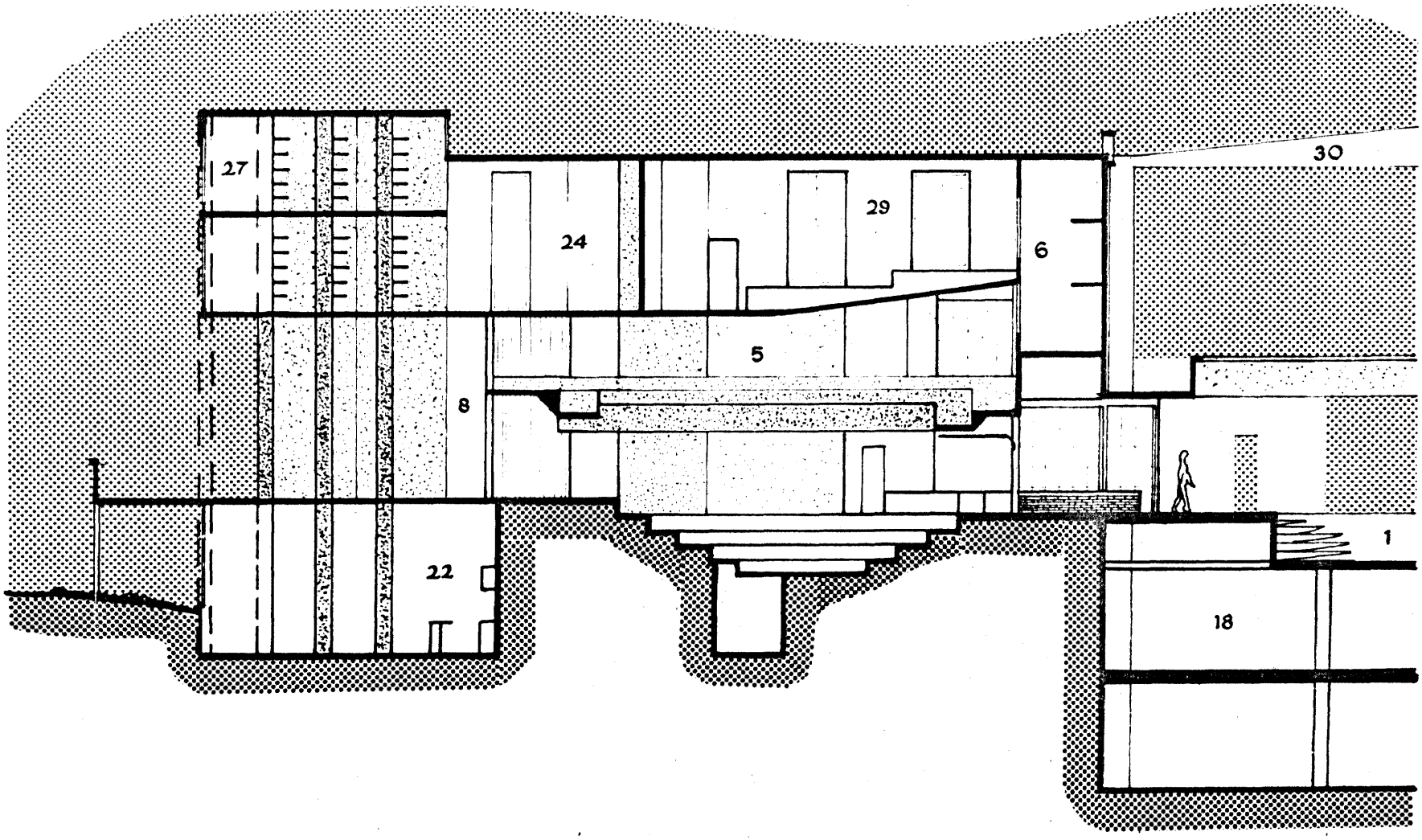
KEY

- - - - - - - - - REMOVABLE PARTITIONS OR GARAGE DOORS

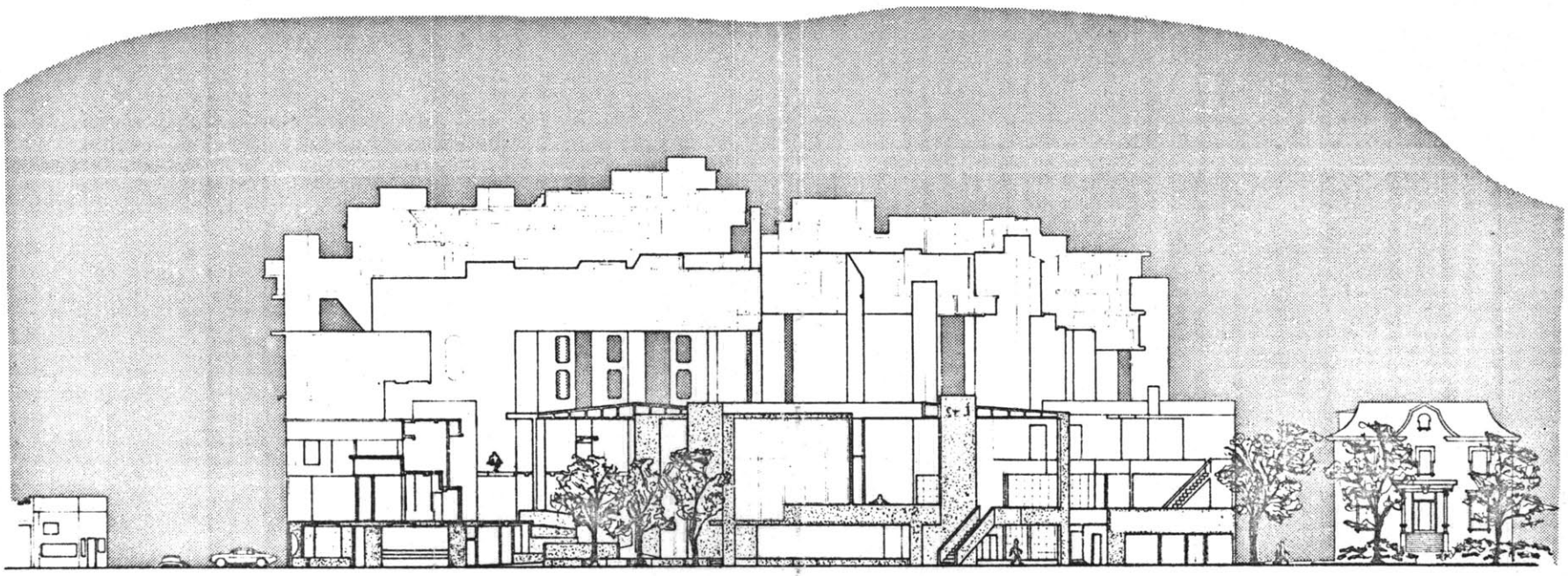
..... REMOVABLE GLASS

——▷ SLOPE UP

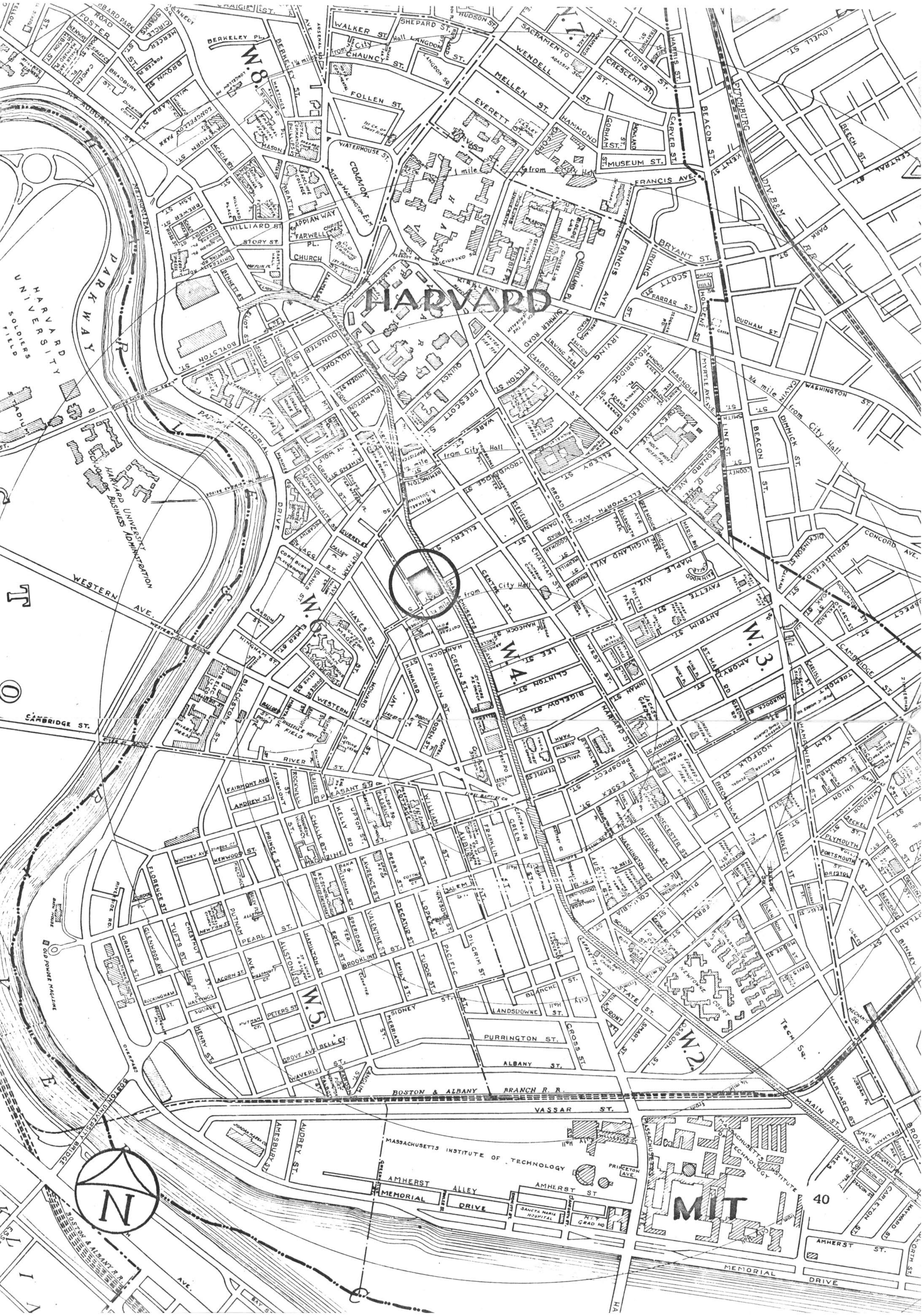
1 PLAZA
2 STUDENT ENTERPRISE
3 EXHIBIT
4 MOVEMENT OFFICE
5 THEATER / LECTURE
6 PROJECTION
7 CLASSROOM
8 STORAGE
9 RESTAURANT
10 RESTAURANT UPPER LEVEL
11 COOKING / FOOD PREPARATION
12 SERVICE DOCK
13 WOODSHOP
14 FREIGHT ELEVATOR
15 RESIDENTIAL
16 CORE CLUSTER RESIDENTIAL
17 CORE CLUSTER COMMUNAL AREA
18 PARKING
19 AUTOMOBILE WORK AREA
20 ELEVATOR SERVICE
21 ENVIRONMENTAL CONTROL
22 BAR / COFFEE HOUSE
23 STOREFRONT ARCHITECTURE OFFICE
24 LIBRARY
25 OFFICE
26 SLIDES
27 STACKS
28 PORTFOLIOS
29 SEMINAR
30 TRANSPARENT CANOPY
31 DARKROOM MAKEUP
32 DARKROOM PRINTING
33 STUDIOS



S.E.D. SECTION 3 1/16" = 1'



S.E.D. MASS AVE ELEVATION 2 1/32"=1'


HARVARD
MIT
W.2
W.3
W.4
W.5
W.6
W.7
W.8
HARVARD UNIVERSITY SOLDIERS FIELD
HARVARD UNIVERSITY SCHOOL OF BUSINESS ADMINISTRATION
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PARKWAY
METROPOLITAN
MEMORIAL DRIVE
WESTERN AVE.
CAMBRIDGE ST.
RIVER ST.
BOSTON & ALBANY BRANCH R. R.
BOSTON & ALBANY R.R.
BOSTON UNIVERSITY BRIDGE
VASSAR ST.
FITCHBURG DIV. B&M. R.R.
MASSACHUSETTS AVE.
BROADWAY
HAMPSHIRE
PROSPECT
CONCORD AVE.
BEACON ST.
KIRKLAND
BRATTLE
MT. AUBURN ST.
BOYLSTON ST.
COMMON
SITE OF WASHINGTON ELM
NEWTOWNE COURT
TECH. SQ.
OLD POWDER MAGAZINE
1 mile from City Hall
3/4 mile from City Hall
1/2 mile
1/4 mile
N
40