AIR RIGHTS DEVELOPMENT OF URBAN TRANSIT CORRIDORS

by

Steven C. Hayes

B.S. BOSTON UNIVERSITY

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Submitted in partial fulfillment of

the requirements for the

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Thesis Supervisor

Accepted by.....
Chairman, Departmental Committee on Graduate Students

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ABSTRACT

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The primary purpose of this thesis is to examine the air rights over urban transit corridors, their current effect on the urban context, and, through the design process, their potential for development.

Thesis Supervisor: Imre Halasz

ACKNOWLEDGEMENTS

I would like to thank the following people for their help and encouragement in the preparation of this thesis:

Imre Halasz, Thesis Advisor
Professor, Department of Architecture

Waclaw Zalewski
Professor, Department of Architecture

Jan Wampler
Assistant Professor, Department of Architecture

DEDICATION

I wish to thank Kit and Jeff Hayes, whose love, understanding, and hard work have made this thesis and my time at M.I.T. possible.

TABLE OF CONTENTS

TITLE PAGE. 1

ABSTRACT. 2

ACKNOWLEDGEMENTS. 3

DEDICATION. 4

TABLE OF CONTENTS 5

INTRODUCTION. 6

SITE 11

PROGRAM. 16

BUILDING SYSTEM. 20

PROCESS. 23

ILLUSTRATIONS. 24

Table of photographs and drawings. 25

BIBLIOGRAPHY 50

INTRODUCTION

My interest in the air rights development of urban transit corridors began with an assessment of the present condition of most major urban transit paths and their effect on the cities they service. These corridors can be found in one form or another in every major city in the world and, while their particular use and vehicular type may vary, their role in the urban scheme and their effect on urban life are generally the same.

The primary function of these corridors is to service the business, industrial, and commericial institutions of the city with people, goods, and services in the most efficient manner possible. In order to attain this maximum efficiency, they all but cut themselves off from any direct association with the dense urban areas they pass through on their way to/through the city. Their use connections to the city are at intervals separated by a distance that reflects the character of the vehicles which utilize the corridor and the major terminal points of the city. The individual connections (stations) are not associated with each other except as sequential elements of the transit system itself.

The types of transit/vehicles utilizing the corridors under discussion are limited to automobile/truck/bus expressway systems and rail systems, which include conventional rail, high speed rail, and rapid transit systems. For the purpose of my design projection, I further restricted the vehicle types to the rail and rapid transit systems. This

is due primarily to the greater tendency toward the use of these systems in the solution of urban transportation problems, and the greater, often prohibitive, technological problems encountered when attempting to deal with air rights development over highways.

The problems presented by all transit corridors are similar whether the vehicular right-of-way is on grade, elevated, or depressed. A major obstruction confronts the residents/users of the area through which the corridor passes.

The basic characteristics of the three systems are the degree of present efficiency, visibility, and their degree of obstruction. Early transit systems primarily complemented the established vehicular and pedestrian traffic of the city with an alternative vehicle. The proximity of the transit system to the other means of transportation of both parallel and perpendicular routes meant that the system had to be totally integrated with the existing systems at a great sacrifice to the efficiency of the new system.

This type of corridor is rarely constructed new today as mass transit but can frequently be found in suburban areas as a highway system. When properly cordoned off, this system can be very efficient. It is very visable and noisy, however, and presents a formidable obstruction requiring tunnels or bridges to cross. These are expensive enough that they are generally not provided at frequent enough intervals to allow free pedestrian or vehicular access from one side to the other of the corridor.

The elevated type of transit corridor, itself a form of air rights development, is

frequently used for highways. It was used regularly in the past and, if monorails become popular, may possibly be used frequently in the future for rapid transit rights-of-way.

The justification for this type of right-of-way is to accommodate a radical change in grade, as in Charlestown and the Mystic-Tobin Bridge situation, or to avoid the expense and/or dislocation/disruption involved in a tunneled or depressed system. The effort to save money, while real in expended costs, is not effective when the welfare of the entire area is taken into consideration. The elevated right-of-way is such a negatively dominant feature that the area immediately becomes undesirable as a place to live or shop and usually the area within a block or two on either side of the transit path deteriorates rapidly. The only businesses that manage to survive are those marginal enterprises that rely primarily on the traffic generated by the subway stations for off-street casual shopping. It is ironic that these systems accommodate the existing vehicular and pedestrian traffic best, as they only occasionally interfere with that traffic plain with their support structure. These systems are not only visual obstructions but they also distribute their noise and dirt over a wider area.

The depressed transit corridor is the type currently most frequently used for surface routes and is the form of transit corridor that offers the most potential for development and successful integration into the pedestrian scale urban context. While the problems presented by construction and obstruction are present in the depressed corridor the

fact that it is depressed gives us the opportunity to present associative facilities at an accessible level to the surrounding community.

Putting the transit path below grade has several advantages. It removes the transit system from direct access, thus allowing efficient operation. The depression also contains the dirt and some of the noise of the system. It is absolutely necessary, however, to utilize bridges for crossing the corridor; having to accommodate both automobiles and pedestrians, this is quite expensive and, therefore, only provided at points of maximum exchange, usually a mile or more apart. The result is that those who find themselves adjacent to these canyons often find themselves cut off from 180° of their environment. These edges usually deteriorate rapidly.

What we are confronted with is the desperate need for more miles of efficient (less neighborhood associative) rapid transit systems in virtually all of our urban areas. I whole-heartedly endorse the need for these facilities, but at the same time I am concerned about their effect on the areas they pass through. My thesis, within the context of a site in the South End of Boston, will attempt to deal with this intrusion in a positive way and to break down the barrier set up by the present railroad excavation while preventing the enforcement of that barrier by the expansion of rail road and/or rapid transit facilities. I also intend to re-establish a more continuous and consistent urban network for both automobiles and pedestrians on a local level and to enforce the presently weak

links (bridges) between the two sides. Furthermore, I am interested in this project as a way to rebuild/renew/refurbish an old historic area without tearing it down and displacing the residents, while at the same time making more efficient use of urban land, allowing transit facilities to be contributive assets to a community as opposed to detractive barriers.

SITE

The site I have chosen is the intersection and air rights area to the southwest of the new MBTA Orange Line and Massachusetts Avenue in the South End of Boston, Massachusetts.

This site presents the residents of the area with the obstacles of both the depressed and on-grade types of transit corridor, as both conditions are present at the site. The railroad preceded the development of this residential part of the South End. At the time of development, Massachusetts Avenue was seen as a strong vehicular pedestrian link between the then new and desirable South End and Back Bay.

The planners of this street, in an attempt to strengthen this link, did not want to have to deal continuously with the railroad obstruction. Therefore, buildings facing Massachusetts Avenue adjacent to the railroad are entered from the front on the third floor, rather than the second floor as in the traditional Back Bay-South End manner. The difference in entry elevation was then compensated for by a gradual berming up of Massachusetts Avenue from Columbus Avenue to the elevation needed to give proper clearance to the railroad and then gradually back down to grade at St. Botolph Street. This allowed for continuous unobstructed passage over the railroad at Massachusetts Avenue, while maintaining the traditional pedestrian entry relationship to the buildings on each side of the

right-of-way.

As one follows the right-of-way to the northeast or southwest away from Massachusetts Avenue, the grade change is abrupt. The grade at the rear of the buildings facing Massachusetts Avenue is the mean Back Bay grade and approximately sixteen feet below that of the sidewalk grade at the bridge over the tracks. The grade adjacent to the right-of-way varies but the right-of-way is slightly depressed, the difference ranging between two and six feet.

This right-of-way was originally used as a major rail link from the city to all points to the south and west. It is still used as a rail link to the city although the intensity of use has decreased as have trains as a means of transportation.

In the 1950's and 1960's, this right-of-way was chosen for the route of the southwest corridor. As originally proposed, this was to have been part of the highway system and roads varying from six to eight lanes, with and without continued rail traffic and/or supplemental truck roads, were proposed at various times. These proposals were scrapped by Governor Sargent's moratorium on further urban highway construction in the late 1960's, but not before considerable land had been taken and demolition begun on many properties adjacent to the corridor.

As an alternative to the highway, various mass transit proposals have been advanced for the corridor over the last few years. The latest, which is in preliminary planning

stages, now calls for the demolition and relocation to this corridor of the present elevated Orange Line which runs out of Boston along Washington Street. This would involve the use of two of the present four tracks. The other tracks would be maintained for rail service. There are a number of other proposals which call for various combinations: two to six tracks to remain at their present level, two to six tracks to be depressed below the present South End grade, and all of these combinations possibly supplemented by a two lane limited access truck road. For the purpose of my projection, I have assumed there will be four tracks maintained at their present elevation and that the truck road will not be developed.

The site is surrounded by facilities of varying use. On Massachusetts Avenue on either side of the right-of-way are former residential buildings. These are of traditional South End type and are presently gutted for either renovation or demolition, depending on the eventual width required for the corridor. To the north is the Boston Arena. This is a moderate size sporting facility used primarily for hockey, but is occasionally used for basketball and boxing as well as closed circuit television broadcasts. Physically, the facility is in poor condition, but its contribution to the area as a resource has tremendous potential. I have assumed that the Arena will remain in its present location and continue to be used as it is currently. My scheme does not preclude the replacement of the building with another similar facility. To the west of the Arena on

the other side of Camden Street is a large parking garage. I have again assumed this building will remain in its present use and condition.

The south side of the right-of-way, with the exception of the rear of the buildings which face Massachusetts Avenue, is all recreation area. The existing Carter fields, tennis courts, and basketball courts are soon to be supplemented by the new athletic fields for the Carter Grammar School which is to be built close by on the other side of Columbus Avenue. I have used as existing conditions the site plan prepared for this playing field by Imre and Anthony Halasz, Inc.

The area to the south of the right-of-way is primarily residential, the majority of the population being black. There are a few churches, schools, and commercial facilities, but the area would be described as residential and in generally poor condition. Recently, there has been quite a bit of work done in many of the buildings in this area. I believe with the addition of the new school and cooperation of the city and financial institutions, this area can be renewed.

The area to the north of the right-of-way is also residential; however, there are quite a number of institutional and commercial facilities, also. These institutions will be described in the section on the program. The population of these residential areas is more mixed and the condition of the buildings is generally better than those found on the south side of the corridor.

The only access provided from one side of the corridor to the other from Copley Square to Ruggles Street, a distance of almost three miles, are at Massachusetts Avenue and the pedestrian bridge at Camden Street, one hundred yards west of Massachusetts Avenue. With the general deterioration of those buildings immediately adjacent to the right-of-way, a very effective barrier has been established with only two means of crossing provided over the three miles of this section of the right-of-way.

The community to the south of the right-of-way is oriented away from the right-of-way towards the east and south. Many cultural, educational, and recreational facilities are very close to much of this community, but not directly accessible. Likewise, the community to the north is oriented toward the core city to the east and the residential, commercial, and institutional facilities to the north.

I believe that the development of the site I have selected would serve as an attractive link/node between these two communities, enabling each to benefit from the presence and accessibility of the other.

PROGRAM

When I developed the program for this project, I took advantage of the fact that I was dealing with an explorative concept of urban development and adopted a flexible attitude toward the various institutions and agencies which would affect this complex and the way they might function/respond to it.

My goal is to further develop the existing urban fabric, in this case dealing with the weakness and negative qualities of the transit corridor, and not to intensify the density or existing pattern of streets and sidewalks. An air rights development done in the traditional manner, over an existing street would have a similar effect as the elevated railway system on Washington Street. It would completely change the character of the place to its detriment. This type of development is also very difficult to implement, as one is dealing with the air rights over public streets and sidewalks. The legal problems for this type of private development are highly complex. Furthermore, I do not believe that our enlightened public of today would put up with it. The public protest over Harvard's Kennedy Library is an example of their concern regarding the effect of urban development on existing areas.

By confining the project to the air rights over private property and utilizing a site which is undeveloped in an area that needs renewal, new facilities can be constructed which

complement rather than detract from the existing situation.

The program itself will be responsive to the needs of the site and will draw on the existing institutions surrounding the site to provide for some of those needs. The primary problem presented by the excavation is the isolation of the two communities on either side of it from each other. This facility will provide a means for the expansion of facilities in both communities and thereby provide the means and place for expansion.

The facility is organized around a central pedestrian street which runs west from Massachusetts Avenue parallel to the railroad at the same level as Massachusetts Avenue, to the point of the present Camden Street pedestrian bridge. Here a major node is established, and direction of the pedestrian is turned either left or right to Camden Street to the north or south. Most of the commercial, institutional, and service activity accommodated by the facility will take place on this, Massachusetts Avenue level or on a level adjacent to it. The lower levels accommodate the railroads and what is presently programmed as parking facilities and service access for the present time. However, they would be constructed in such a way as to accommodate changes in use if the current demand for parking facilities were later relieved. The remainder of the facility, the upper levels, would be used primarily for housing and small service/professional offices. The details of organization and use are found in the section "Illustrations".

The major institutions affecting the site are the following and possibly one or all

could have permanent or seasonal branches or support facilities in the project:

Berkley College of Music

Boston Arena

Carter Athletic Field

Carter Grammar School

Horticultural Hall

MBTA Station

Museum of Fine Arts

Museum School

New England Conservatory of Music

Northeastern University

Symphony Hall

YMCA

The commercial and service facilities considered are the following:

movie theatre/performance center

restaurants

service and professional offices

community center--a year-round, multi-use facility designed to accommodate a variety of uses on short notice

commercial retail shops in a wide range of sizes and types

bazaar or flea market facility that would accommodate businesses

like those which currently subsist on transit-generated activity,

such as those currently along the present Orange Line.

In the absence of a specific program, in this projection, I have made assumptions as to what activities are to be included and what their space requirements should be.

BUILDING SYSTEM

The building system used in this project is developed in two inter-dependent parts, both physically and in time. The basic megastructure of the facility is designed to serve as new land for later users/developers to work with. It is a reinforced concrete, totally fireproof structure built in response to the physical criteria of the site and its abutters. It provides the required egress stairs, elevators, and service cores for the distribution of mechanical services and circulation to the different levels.

There are at least twenty six feet of clearance between the upper megalevels. This allows for three distinct levels of residential construction within each megalevel, a constraint imposed by the building codes. Temporary lateral support is provided for the upper levels by diagonal steel cross bracing. These braces can either remain in the structure as the levels are developed or be removed as fire walls and/or infill structure contribute to the lateral stability of the megastructure.

Each megastructural module is either 24' x 24' on center, or 24' x 32' on center, 32' required to span two train or transit tracks. This large module is sub-divided into 12' x 12' or 12' x 16' quadrants, each of which is further sub-divided into 4' x 4' modules. This gives the flexibility of easily modifying the megastructure later by the removal of a portion of the slab. A portion up to 10' x 10' or 10' x 14' can be removed

from any part of the network without altering the structural integrity of the system. The 4' x 4' two-way beam system provides a flexible point loading capability module for the infill structure.

The 16' structural bays accommodate slab expansion joints and the vertical cores; elevators, mechanical cores and stairs. To increase the design flexibility I have located some of the stairs outside of, but adjacent to, the 16' bays.

The slab design could be refined to greatly increase the flexibility and accessibility to mechanical services if the space utilized by the structure were opened to allow for the distribution of services horizontally through the megastructure. Then service from an individual space could be achieved by tapping directly down to the slab, avoiding long horizontal runs of drain lines, ducting, and conduit in the usable space.

Details of the Building System are on page 35.

The design of the megastructure on the lower levels considered the pedestrian and vehicular circulation requirements of the site and the form of the megastructure dictates specifically that circulation.

In the upper levels more consideration was given to climatic forces. These factors combined with the location of the vertical core elements dictates generally a double loaded corridor/street situation parallel to the railroad track. However, there is considerable room for flexibility and the designers of that housing have the opportunity for a

wide variety of spaces/uses/site/circulation patterns.

While I have not conducted a detailed study into the legal and financial implications of this type of development, it is my assumption that a project of this type could be undertaken by either public or private groups with the resulting new land either rented, leased, or sold; some cooperation between these two groups in the form of zoning incentives or subsidy might encourage this type of development.

The completed megastructure is then available to individual users, much as land is available, subdivided, and used today over an extended period of time. They are free to use a wide range of building and closure systems. The costs of construction, time, degree of difficulty, and special equipment required for implementation are significantly reduced as the problems presented by foundations and mechanical services are solved.

I have programmed a theater/performance center into the facility. Since this is not the type of structure that can be easily accommodated by a framework designed for domestic and commercial uses, I have provided it as part of the megastructure. It has its own concrete plank and beam structure with column locations generated by the grid network of the rest of the facility.

PROCESS

This is basically a design thesis and the process has been what I have come to think of as the design process. This process has many facets but, as I presently see it, it is one with two basic elements: problem definition and implementation.

As I began this project, I started on a very fundamental level gathering information, establishing needs and goals, forming an attitude towards the problem, the site, and those affected by it. This material was then documented again on a very elementary level in the form of a projection, and evaluated. This process was repeated again and again, continually searching for more information, restating criteria, applying it to the projection, refining it, and re-evaluating the result.

The illustrations in their present form reflect the progress of this process over the course of this thesis. I do not intend for them to be considered as a finished proposal for a specific facility but as a product of this design process. A project of this magnitude cannot be refined to the form of a final projection in the amount of time allotted to thesis. The process is brought to a halt by outside forces, here, a deadline. The design process is ongoing.....

ILLUSTRATION

TABLE OF PHOTOGRAPHS AND DRAWINGS

View to the Southwest from Massachusetts Avenue. 27

View to the Northeast from the Railroad right-of-way 28

View of Model from East North East 29

View of Model from the East. 30

View of Model from the West South West 31

Location Plan. 32

Site Circulation 33

Site Plan. 34

Mechanical/Structural/Vertical distribution diagrams 35

Plan @ elev. 0'-0" 37

Plan @ elev. 16'-0" 39

Plan @ elev. 22'-0" 40

Plan @ elev. 45'-0" 42

Plan @ elev. 65'-0" 44

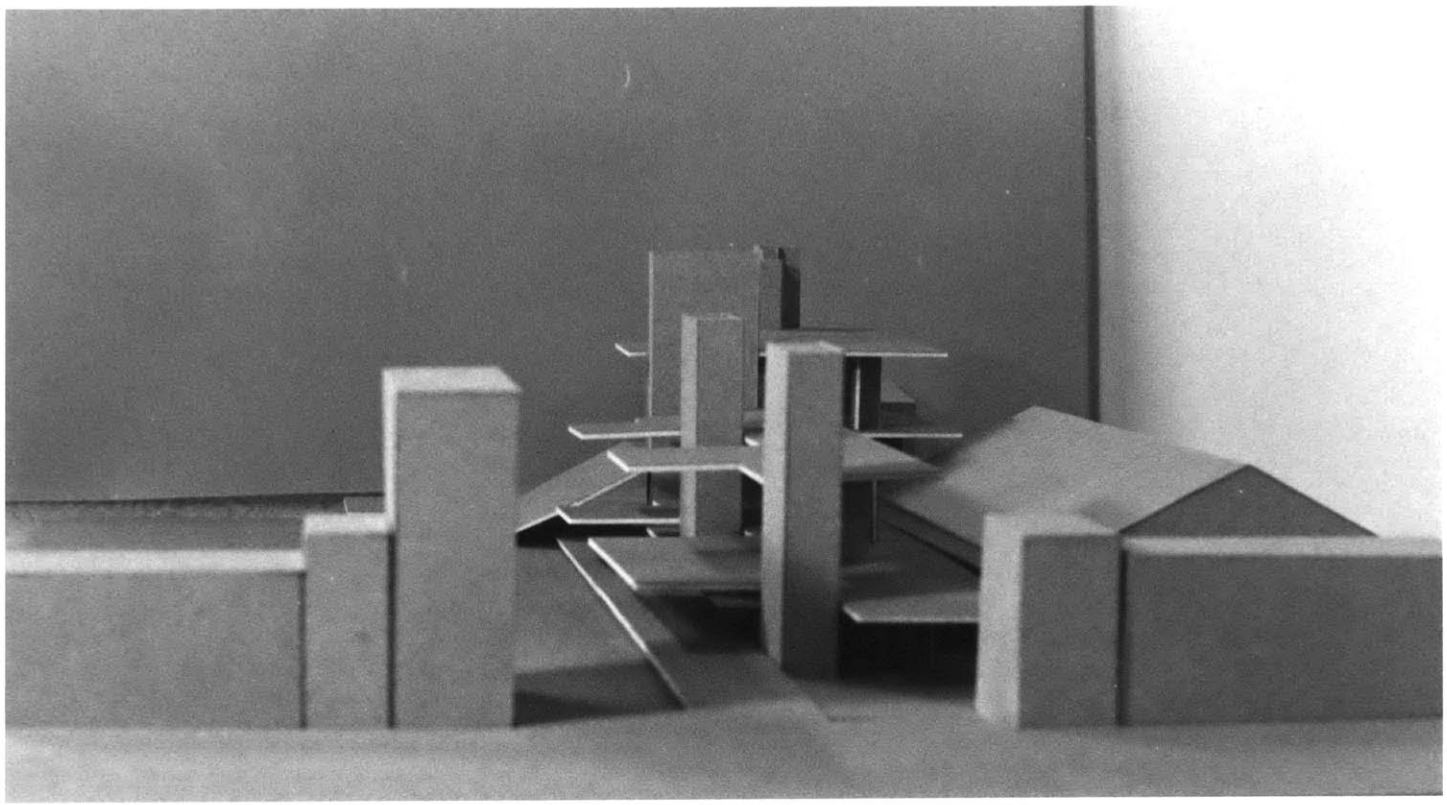
Plan @ elev. 85'-0" 45

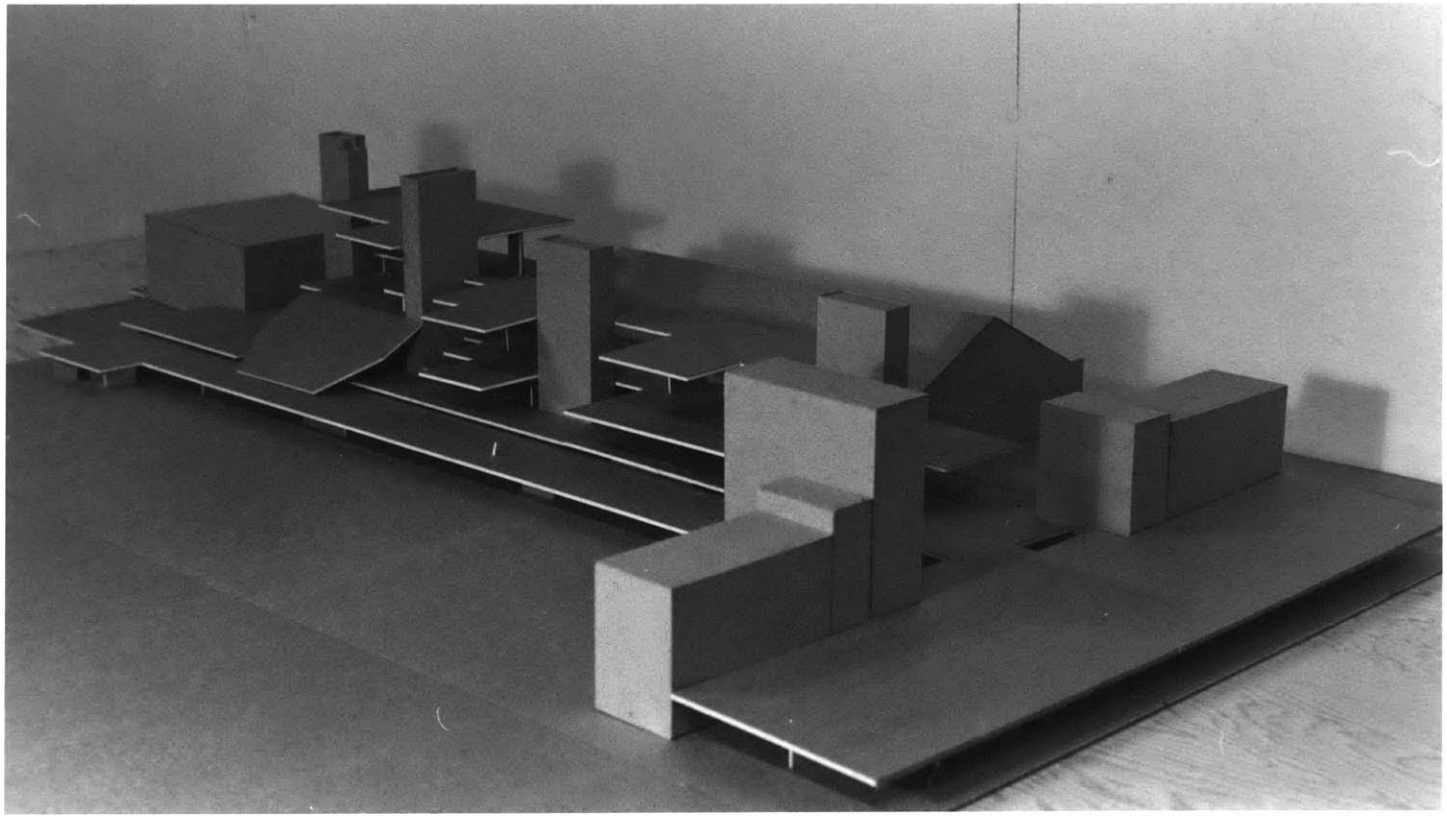
Section "A". 46

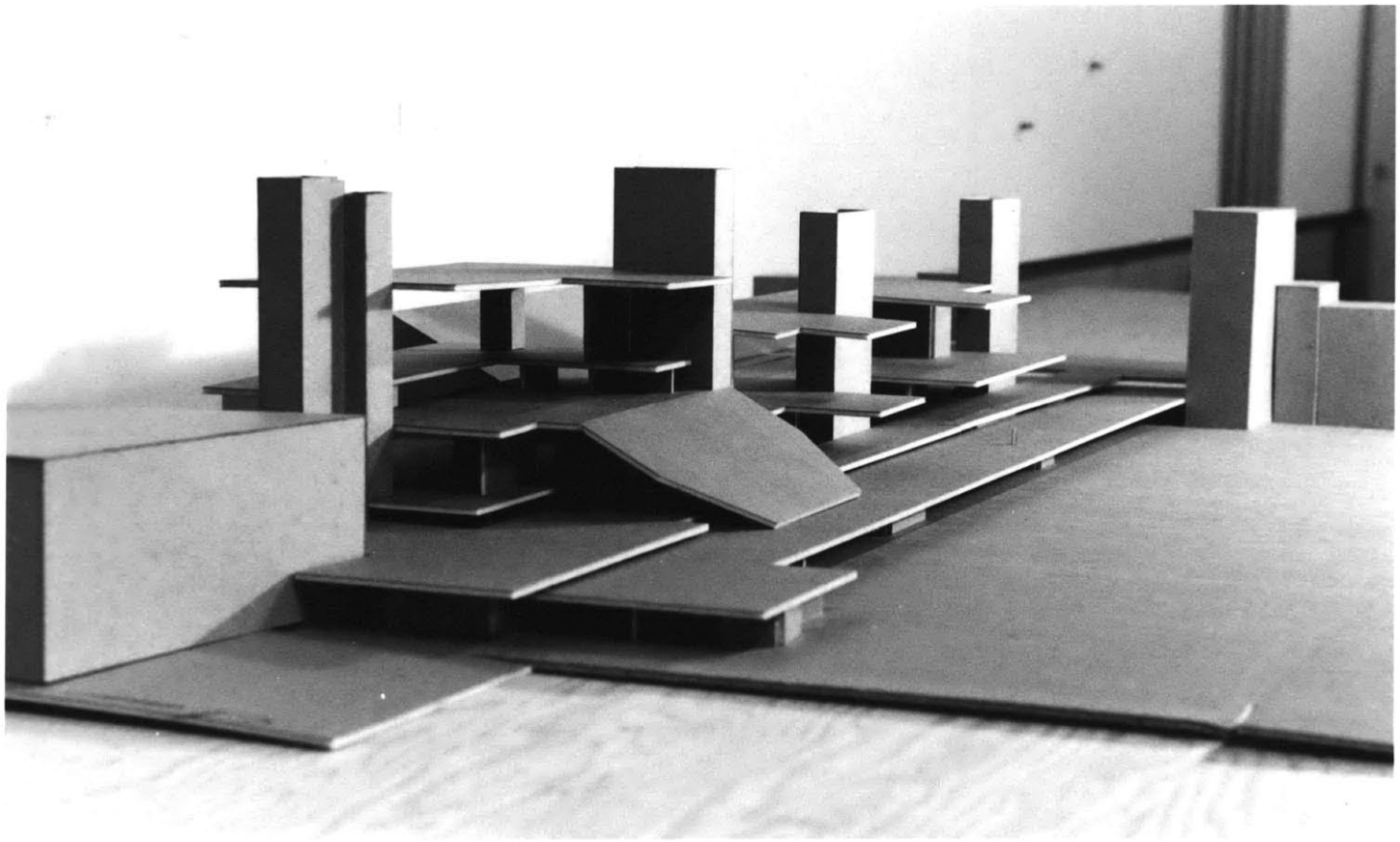
Section "B". 47

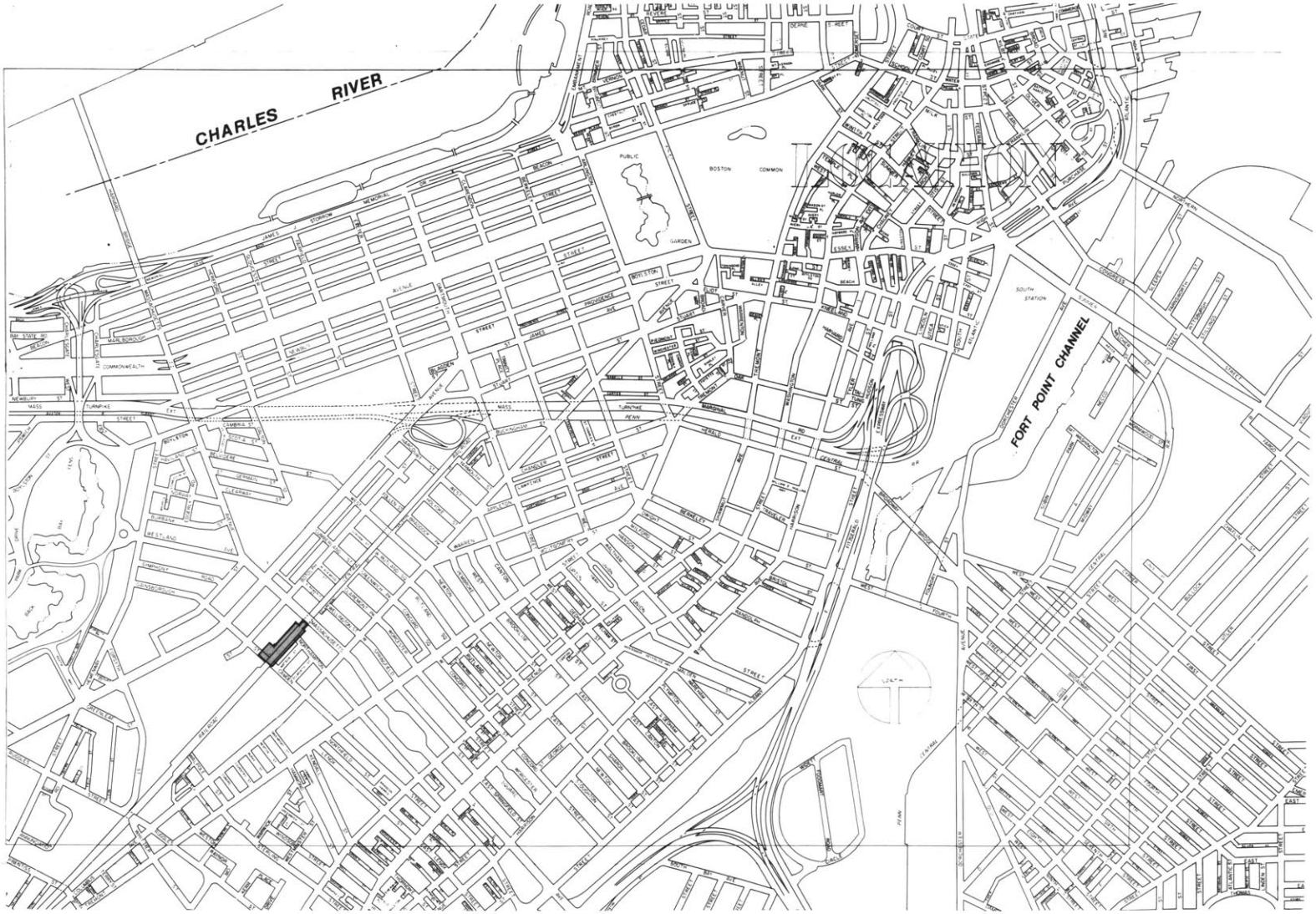
Section "C". 48

Elevation from Carter Field. 49

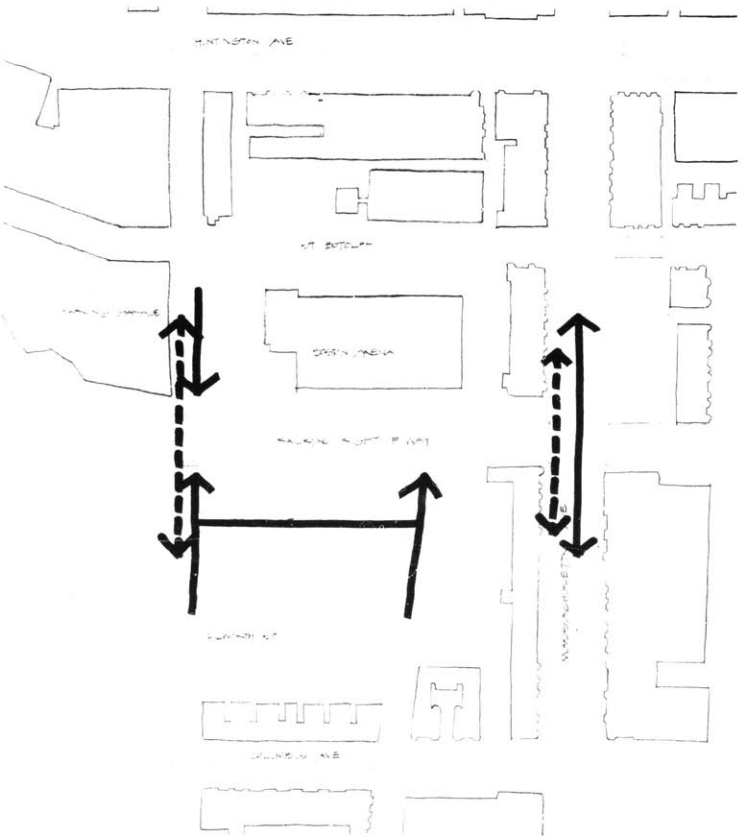






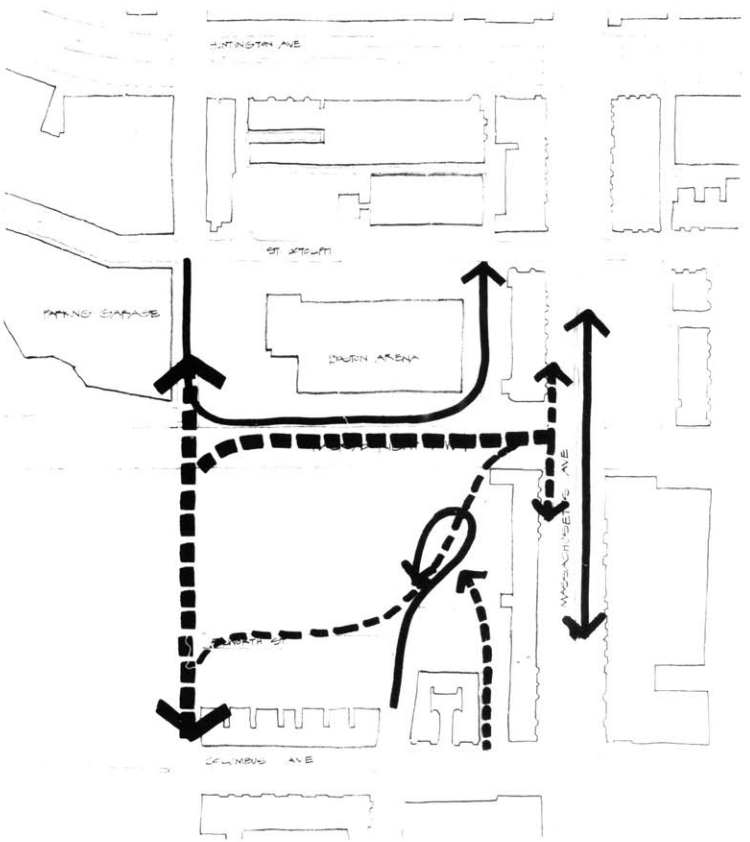

CHARLES RIVER
BOSTON COMMON
PUBLIC GARDEN
FORT POINT CHANNEL
SOUTH STATION

CIRCULATION



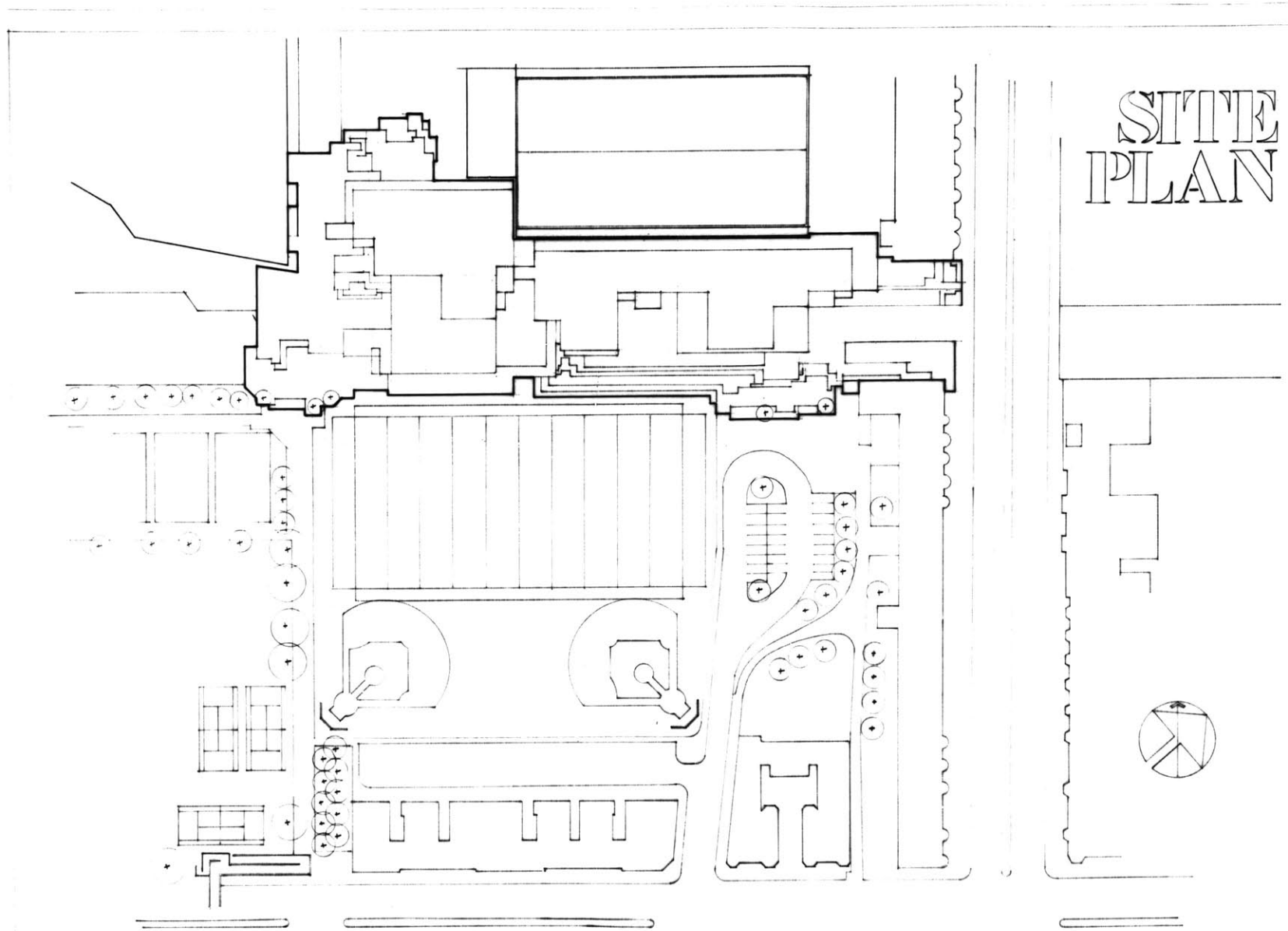
ACTIVE USE
PEDESTRIAN

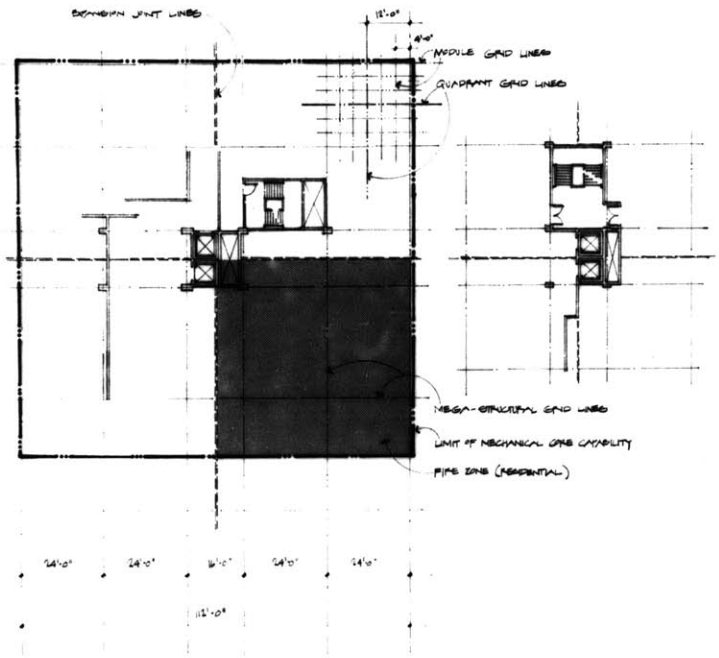
EXISTING CIRCULATION



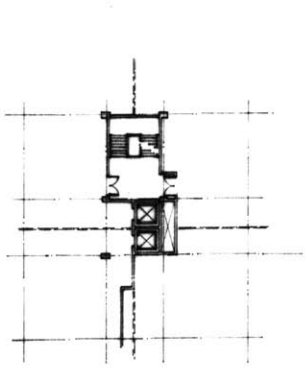
ACTIVE USE
PEDESTRIAN

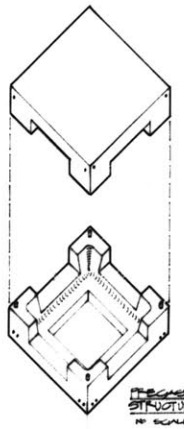
PROPOSED CIRCULATION


SITE
PLAN

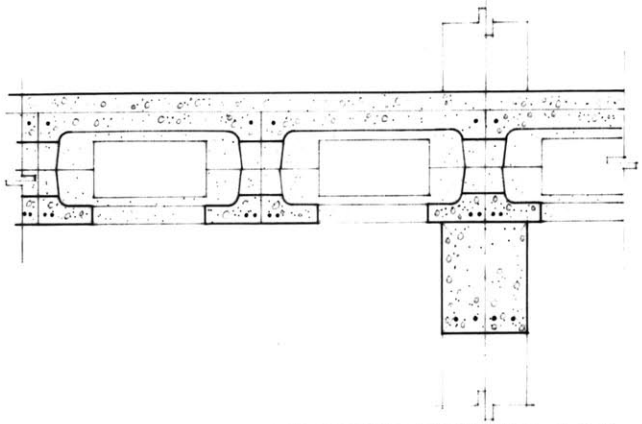


STRUCTURAL GRID
MECHANICAL ZONE
FIRE ZONE RELATIONSHIP
SCALE 1/0 = 1'-0"

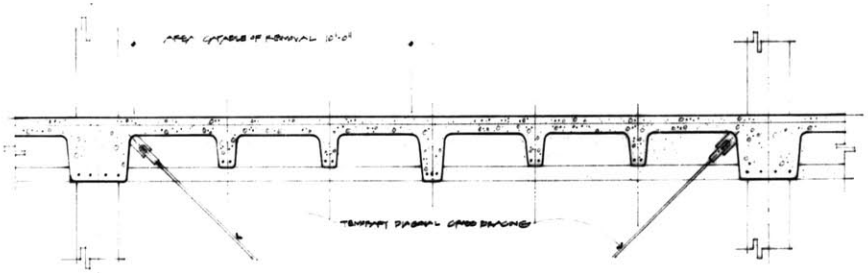




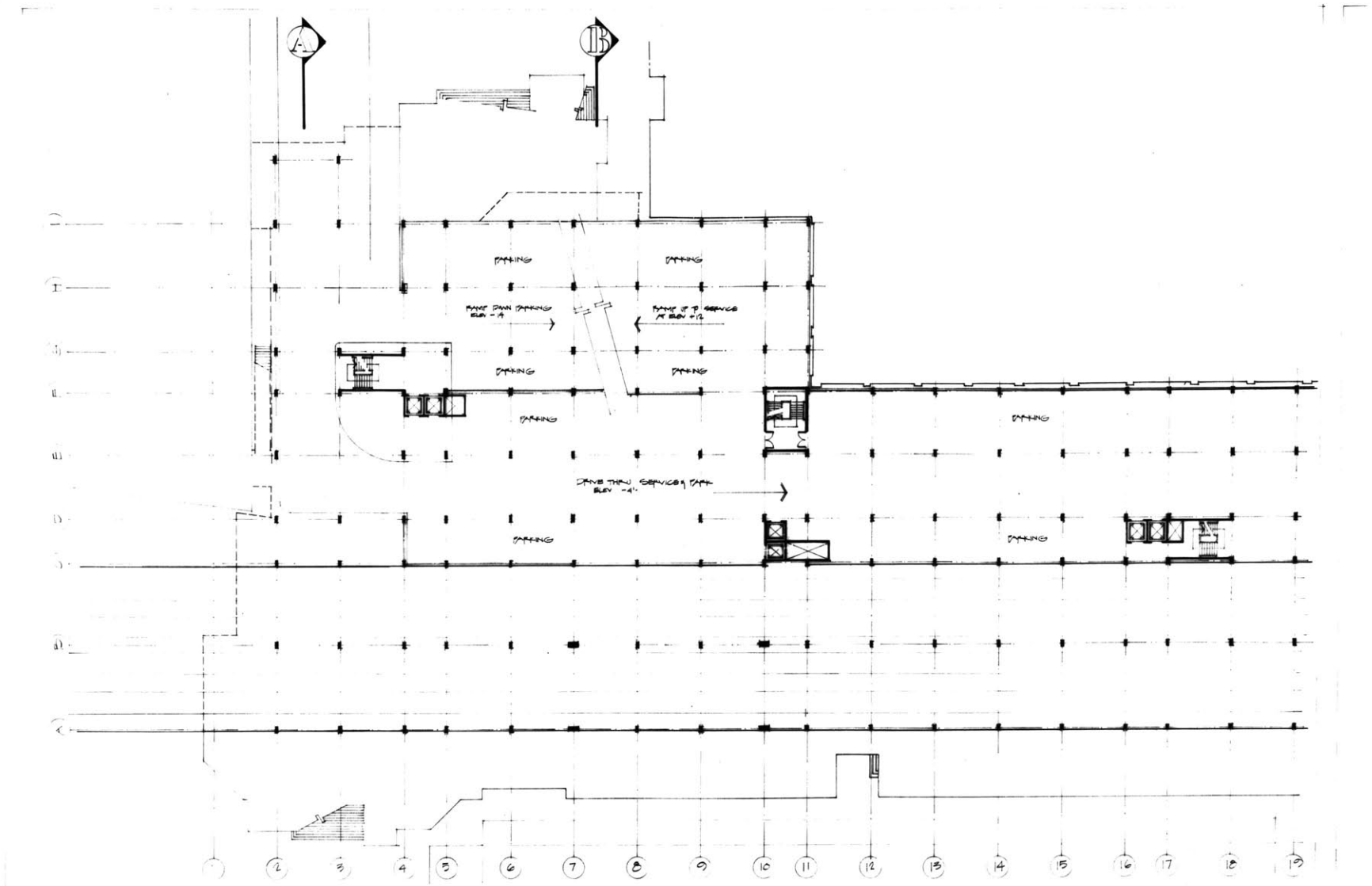
PRECAST MEGA-STRUCTURE COMPONENT
NO SCALE



SECTION THRU PRECAST-POST TENSIONED MEGA-STRUCTURE
SCALE 1" = 1'-0"



SECTION THRU SLAB
SCALE 1/2" = 1'-0"


A
B
PARKING
PARKING
RAMP DOWN PARKING
ELEV. -9'
RAMP UP TO SERVICE
AT ELEV. +12'
PARKING
PARKING
PARKING
PARKING
DRIVE THRU SERVICE & PARK
ELEV. -4'
PARKING
PARKING
1
2
3
4
5
6
7
8
9
10
11
12
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14
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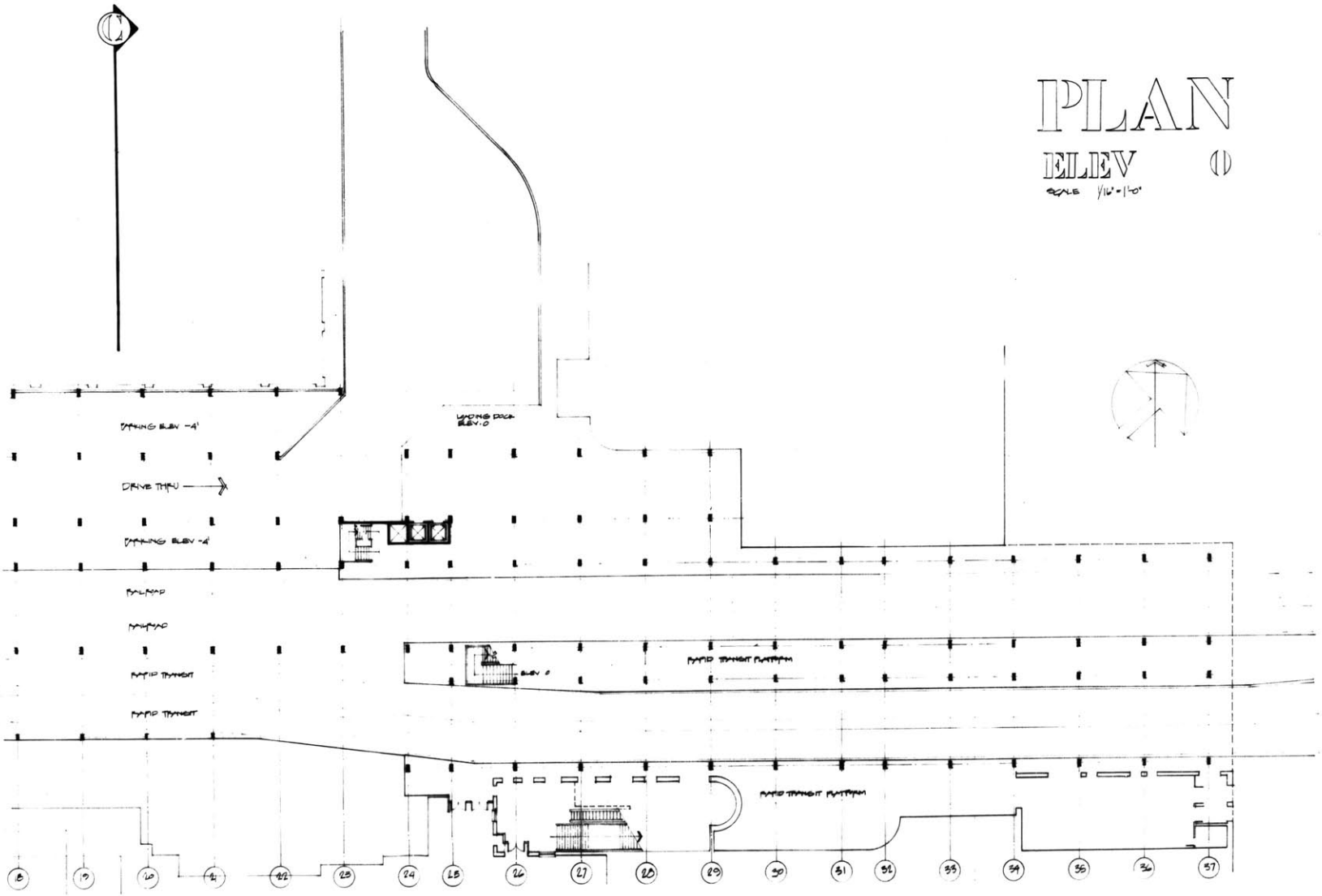
16
17
18
19

PLAN

ELEV (1)

SCALE 1/16" = 1'-0"



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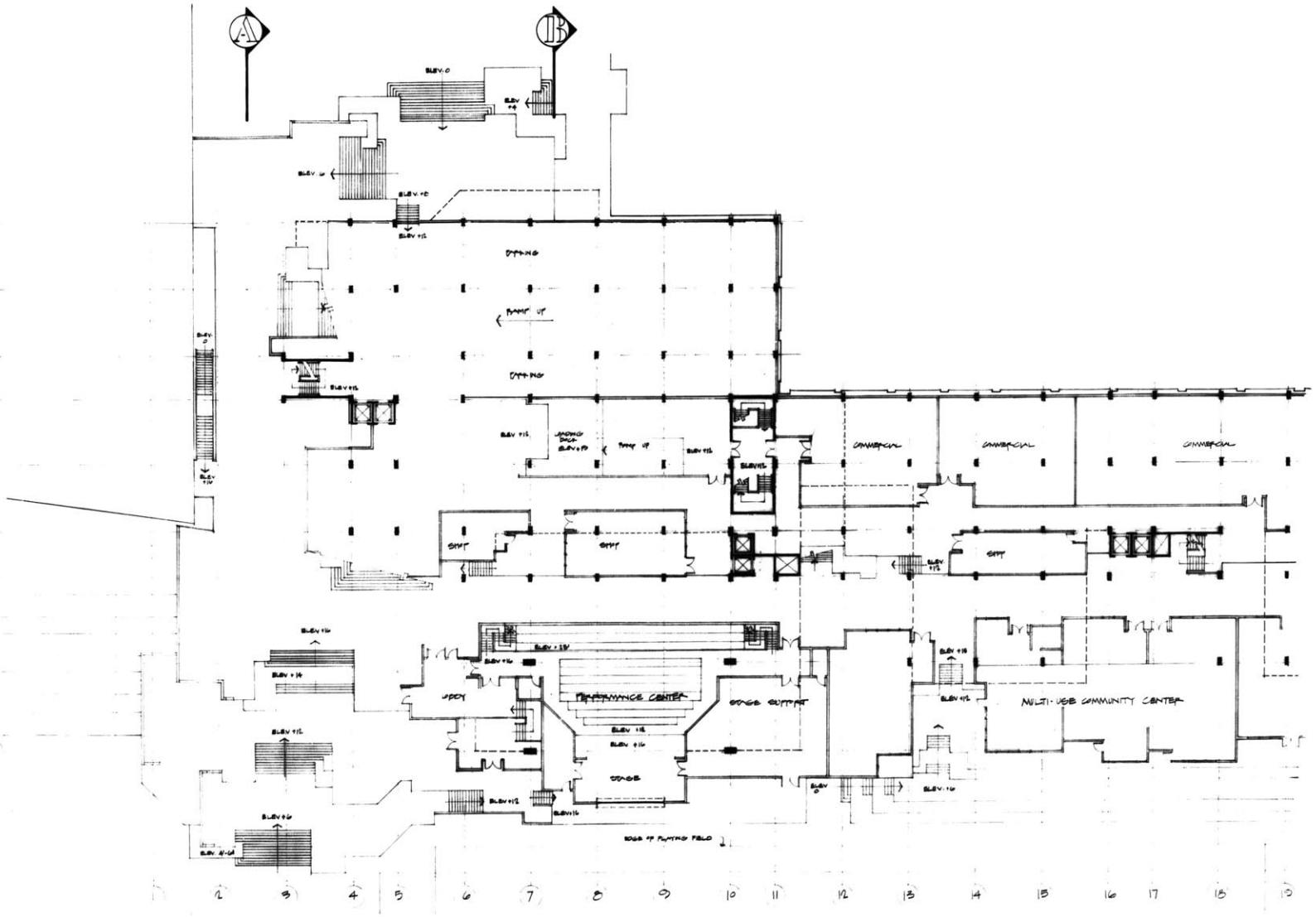

A
B
PARKING
PARKING
COMMERCIAL
COMMERCIAL
COMMERCIAL
SHOP
SHOP
SHOP
LOBBY
PERFORMANCE CENTER
STAGE SUPPORT
STAGE
MULTI-USE COMMUNITY CENTER
EDGE OF PLAYING FIELD
2
3
4
5
6
7
8
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11
12
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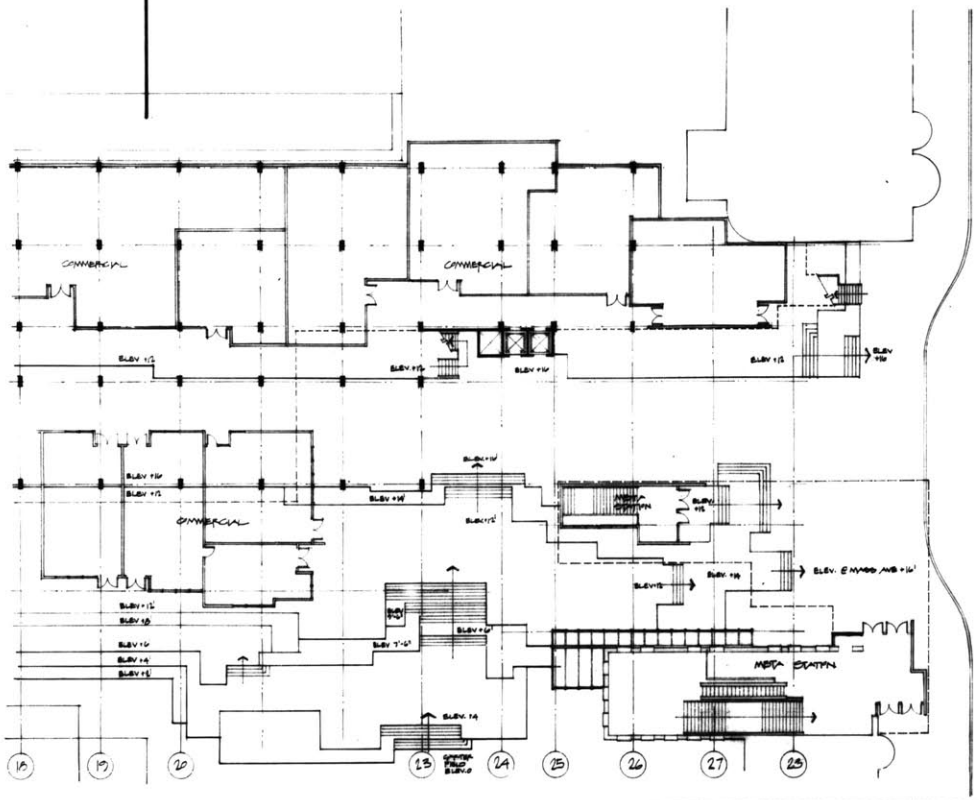
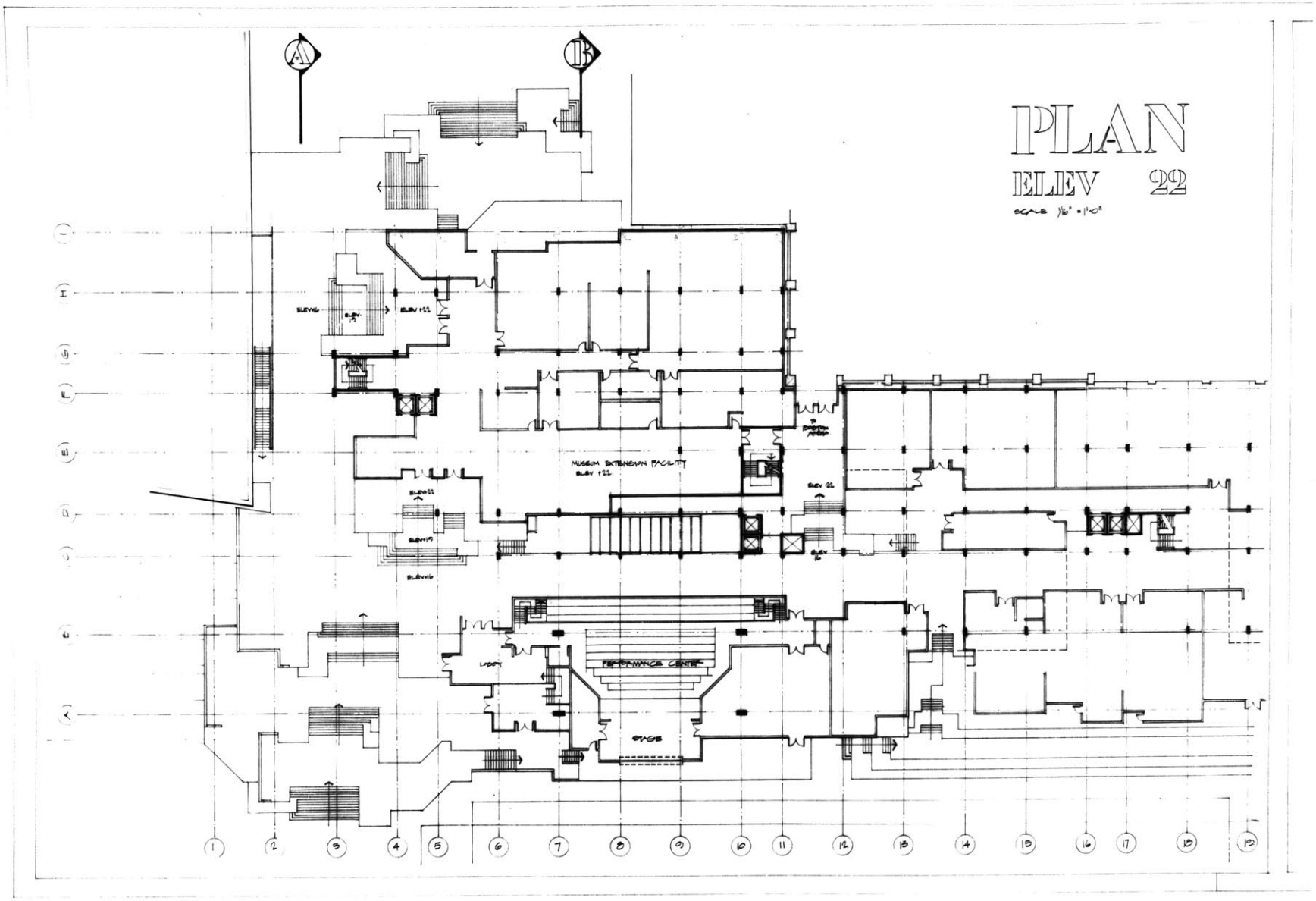
14
15
16
17
18
19

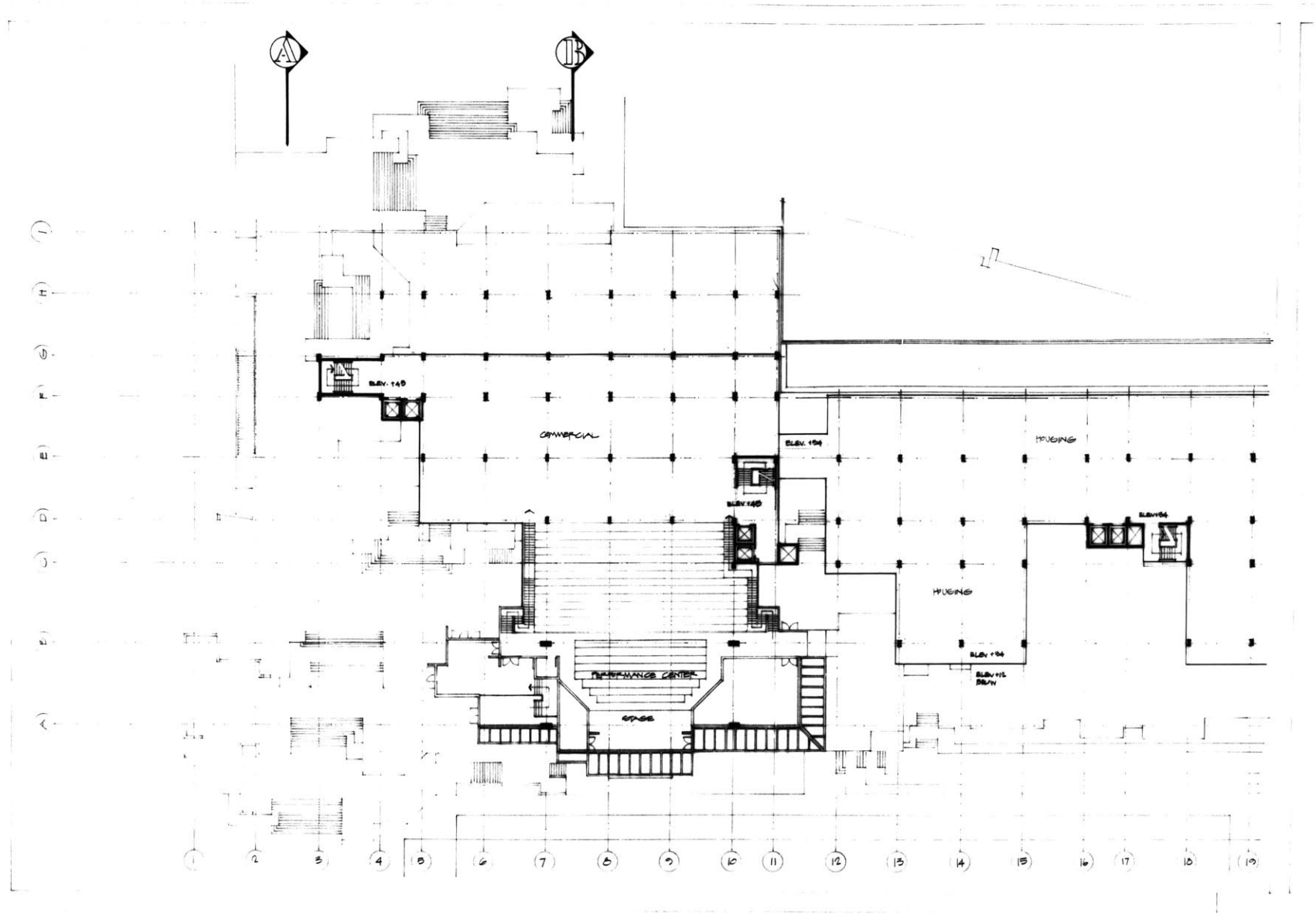
PLAN

ELEV 16

scale 1/16" = 1'-0"



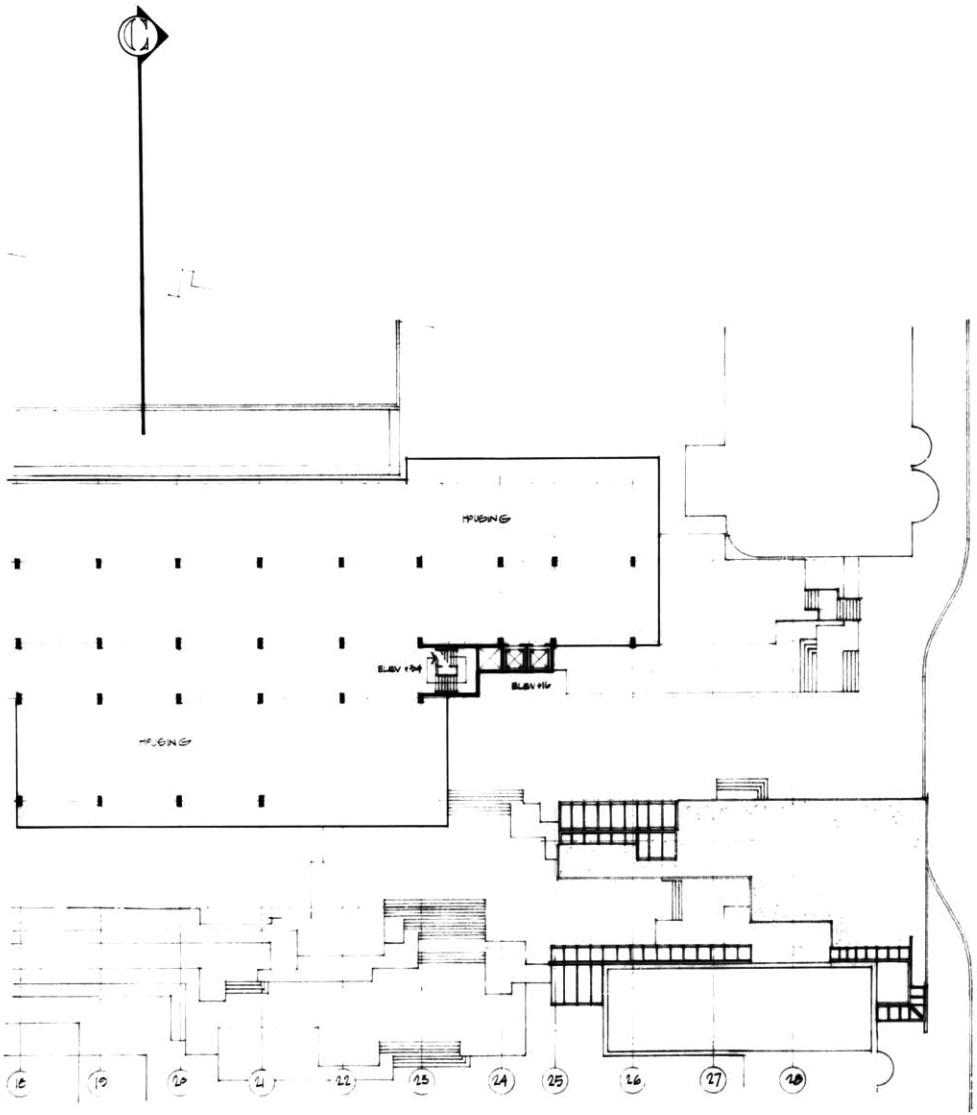

A
B
PLAN
ELEV 22
scale 1/16" = 1'-0"
MUSEUM EXTENSION FACILITY
ELEV +22
PERFORMANCE CENTER
LOBBY
STAGE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19


A
B
COMMERCIAL
HOUSING
HOUSING
PERFORMANCE CENTER
STAGE
ELEV. +45
ELEV. +34
ELEV. +45
ELEV. +34
ELEV. +34
ELEV. +12 BELOW
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

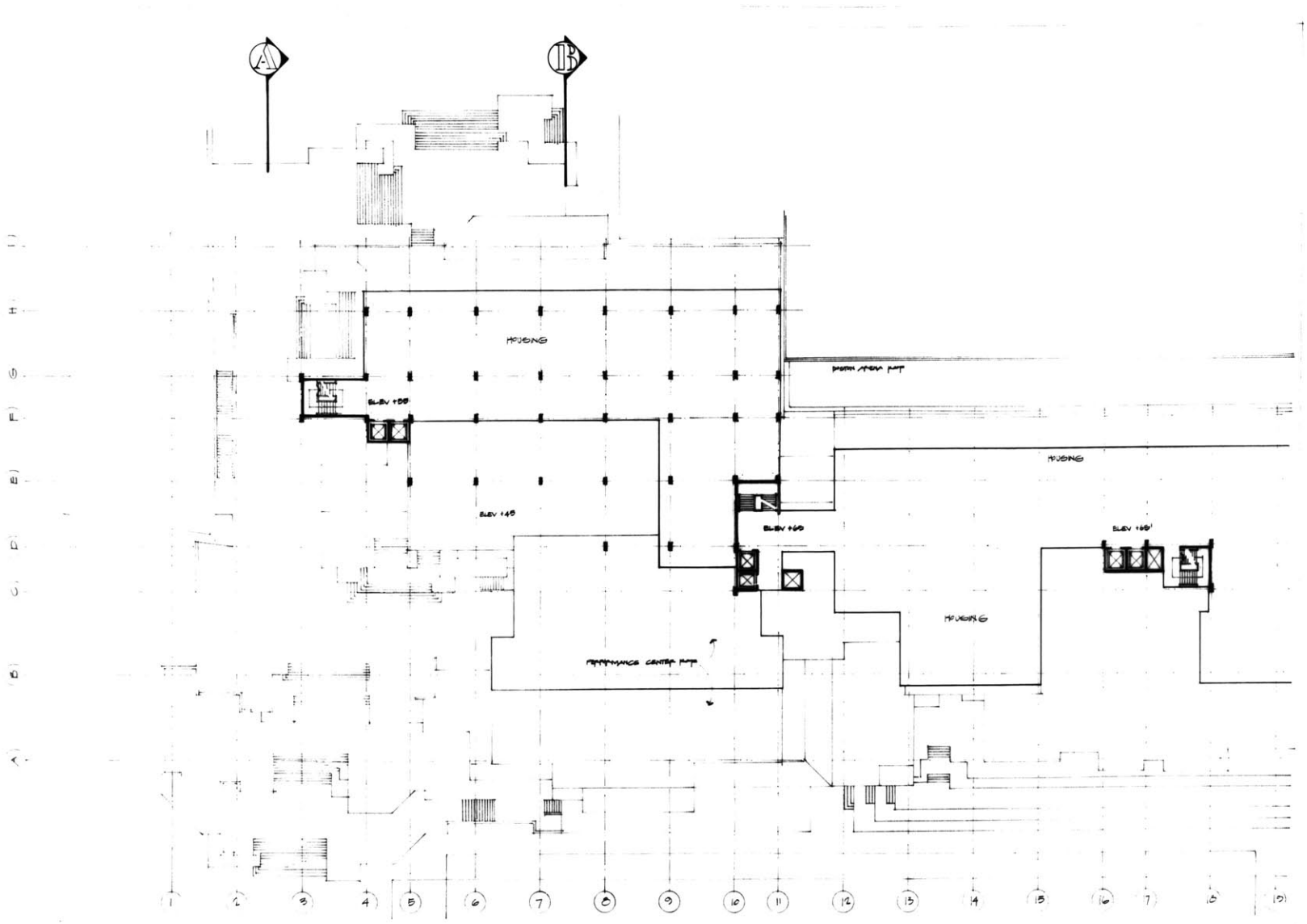
PLAN

ELEV 34

SCALE 1/16" = 1'-0"



43

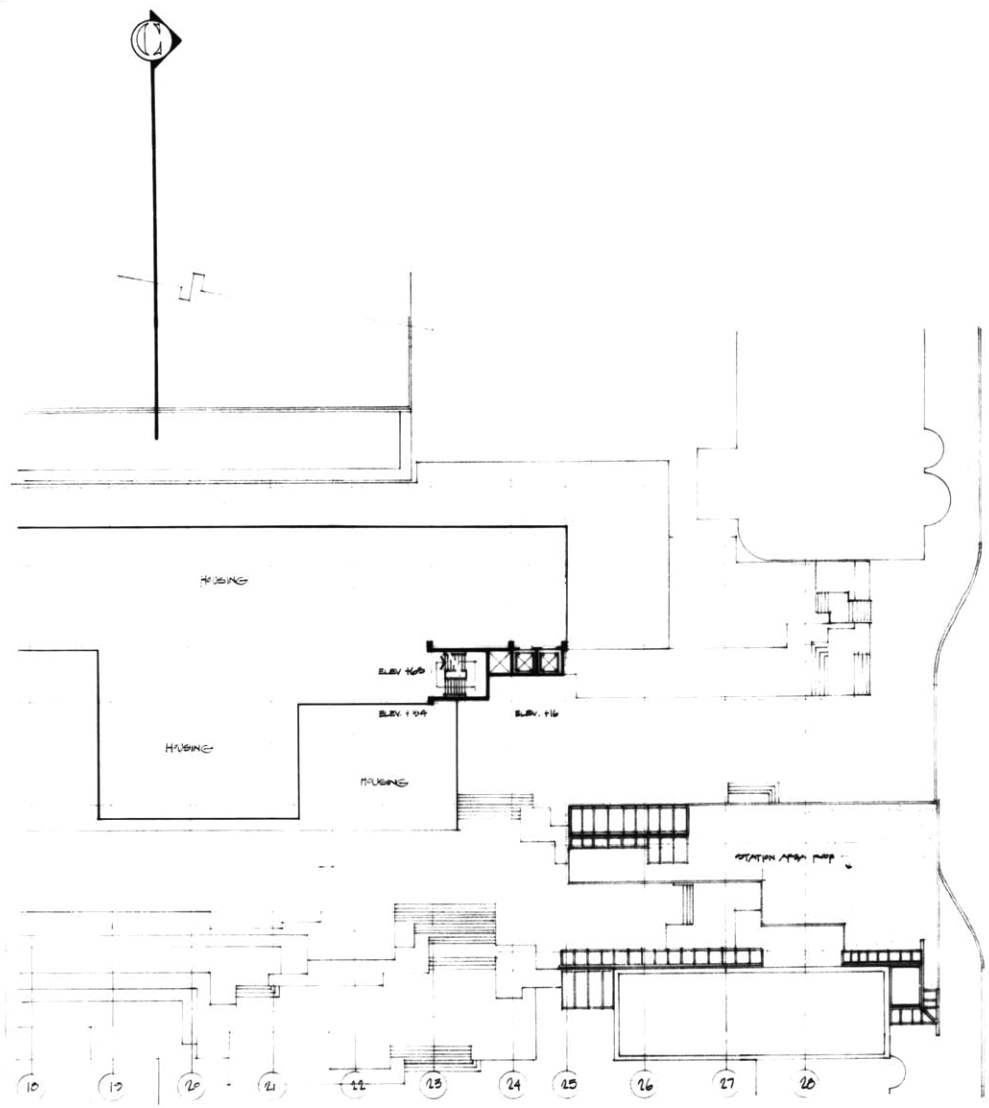


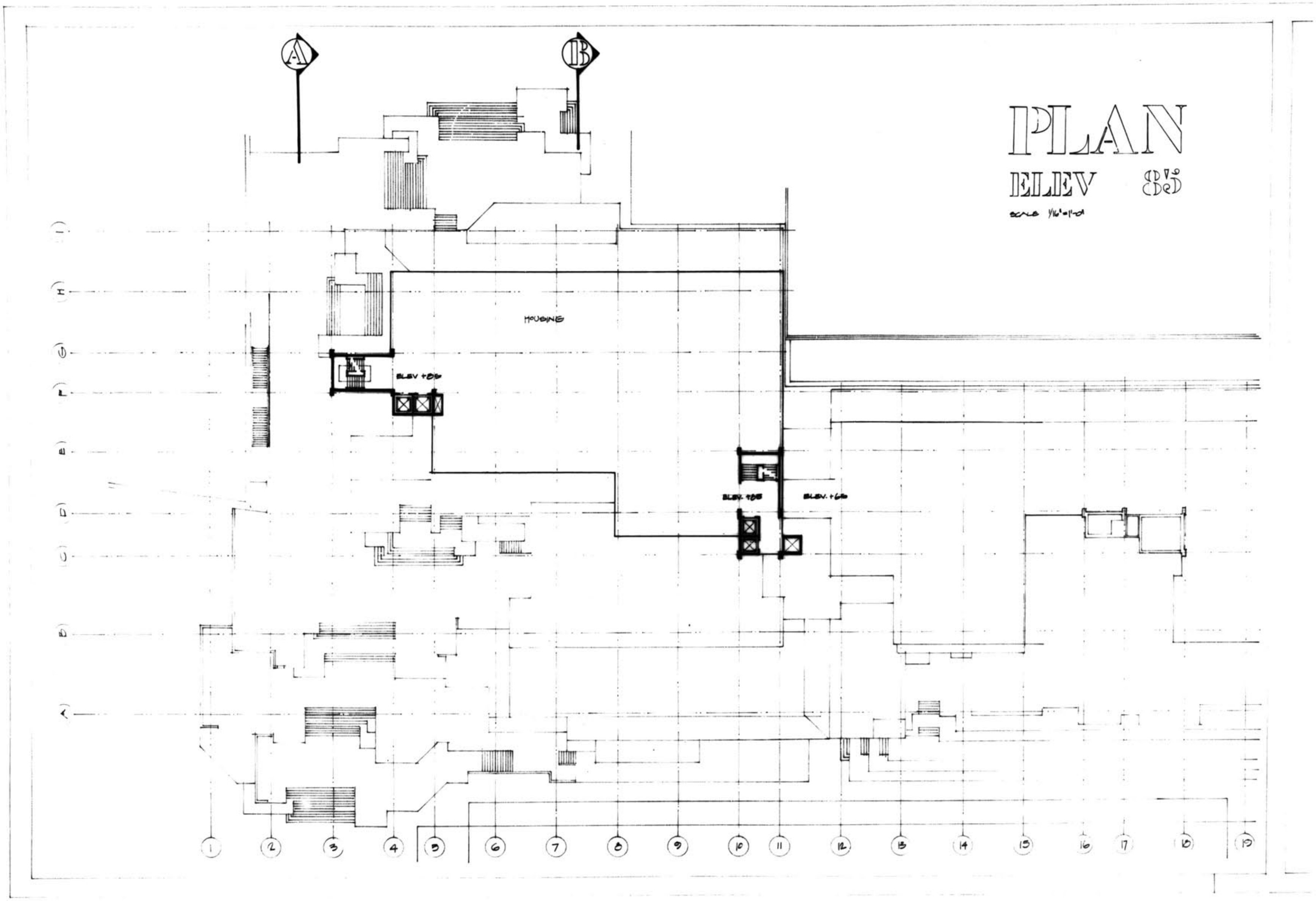
A
B
HOUSING
ELEV +55
ELEV +45
ELEV +65
ELEV +65'
HOUSING
HOUSING
PERFORMANCE CENTER PLOT
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

PLAN

ELEV G5

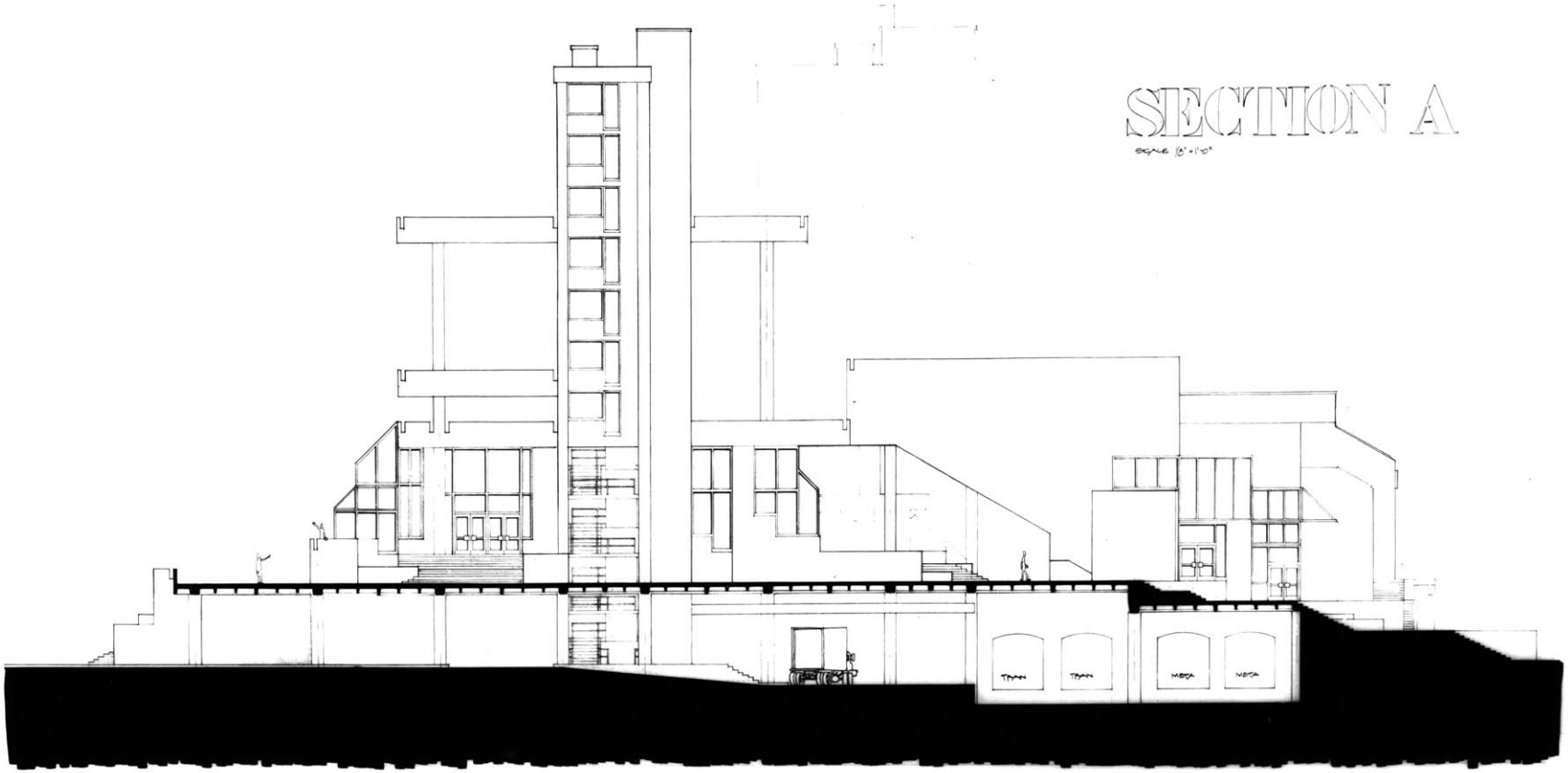
SCALE 1/16" = 1'-0"



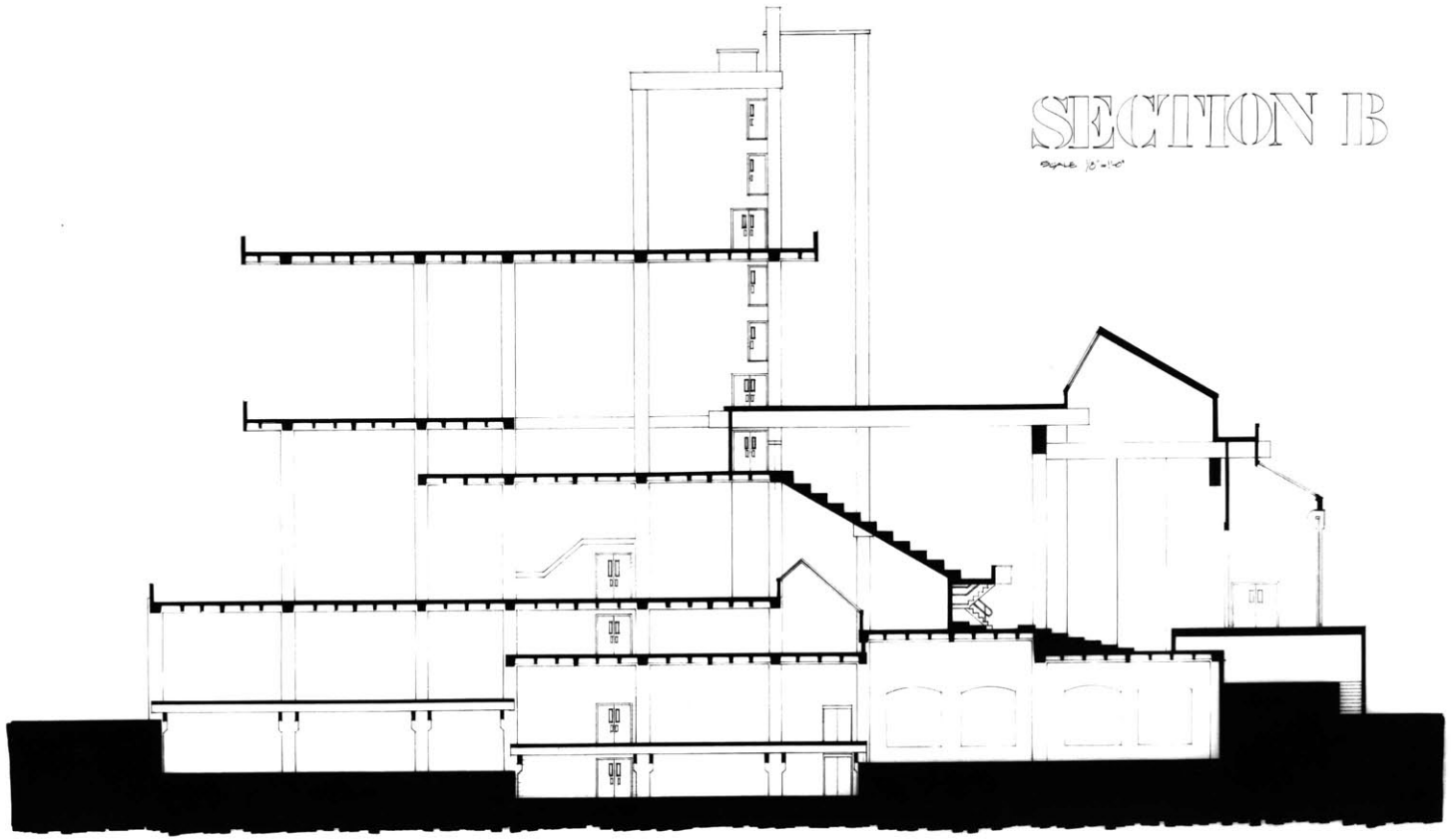

PLAN
ELEV 85
SCALE 1/16" = 1'-0"
HOUSING
ELEV +85
ELEV. +85
ELEV. +65
A
B

SECTION A

SCALE 1/8" = 1'-0"

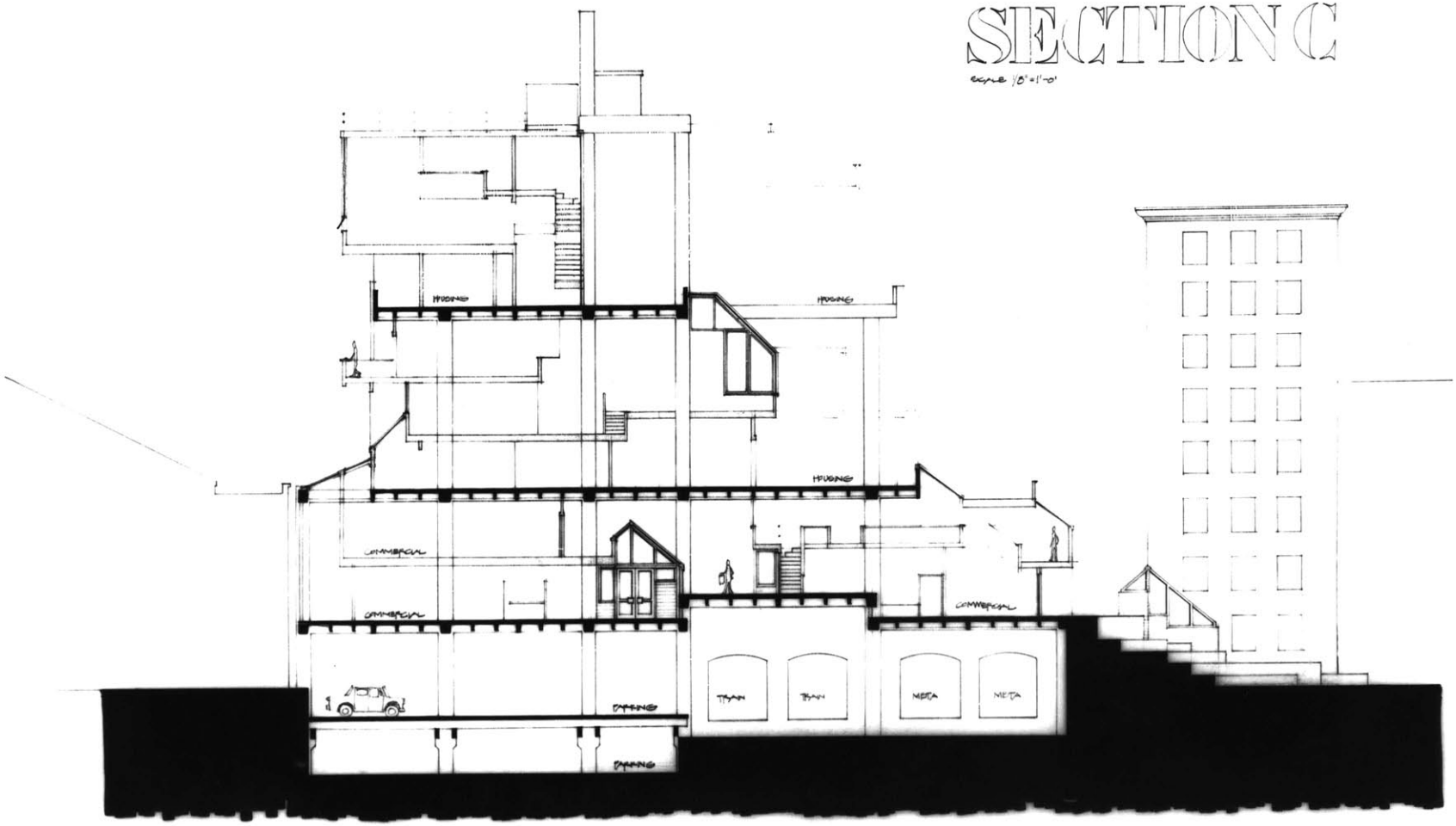


SECTION B



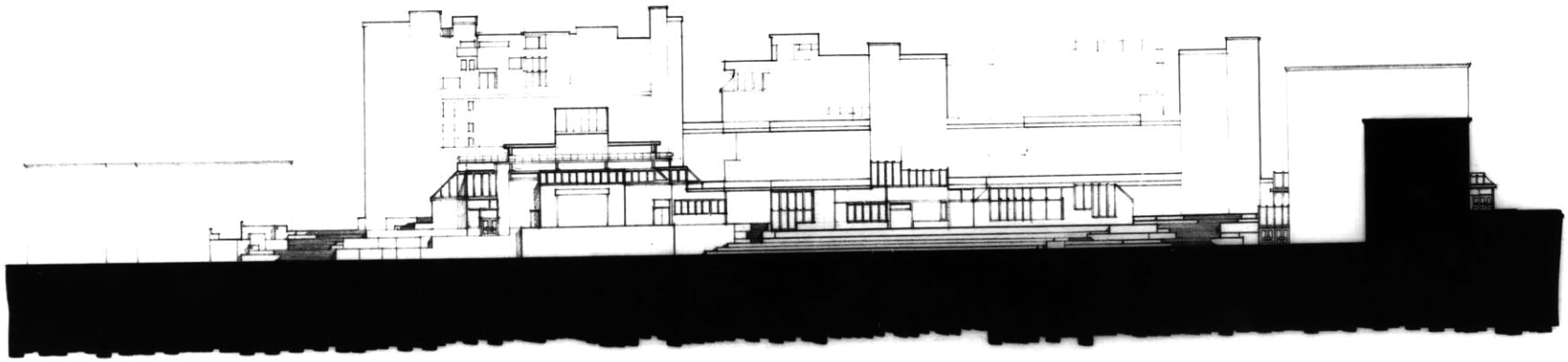
SECTION C

SCALE 1/8"=1'-0"



ELEVATION

FROM CARTER FIELD
SCALE 1/32" = 1'-0"



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