HIGH-DENSITY HOUSING
ON AN URBAN ARTERY
by
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S.B.A.D., MASSACHUSETTS INSTITUTE OF TECHNOLOGY
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Signature of Author

Department of Architecture
May 10, 1974

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ABSTRACT

High-Density Housing on an Urban Artery
Leslie Matthew Klein

Submitted to the Department of Architecture on May 10, 1974 in partial fulfillment of the requirements for the degree of Master of Architecture.

The thesis is an exploration of the formal conditions required by a high-density development which includes a combination of residential and commercial space and occurs on an intensively active major urban street. The project proposes an organization for a site at 1000 Massachusetts Avenue in Cambridge, Massachusetts, to accommodate 301 units of housing (made up of 247 new units and 54 existing units), approximately 77,000 net square feet of commercial and office space, and 379 parking spaces in an underground garage. This organization is intended to add to and improve the current fabric of intensive mixed use development occurring in the area of Massachusetts Avenue between Harvard Square and Central Square. This goal is accomplished primarily by including features which enhance the pedestrian character of the area.

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Title: Associate Professor of Architecture
The section of Massachusetts Avenue between Harvard Square and Central Square is at present experiencing more convulsive and haphazard development than any other area in Cambridge. More particularly, in that portion which is zoned for Business B development, no less than eight major new buildings have been erected since 1965, ranging in height from six to nineteen stories, providing housing or commercial and office space, and in some cases, both. Several other parcels of land in this area are being assembled for future development. The parcel at 1000 Massachusetts Avenue, which is the focus of this thesis, is one such package. It is presently owned by M.I.T., and is slated for use as housing, commercial and office space, and parking.

It is not certain whether the uses to which land has been put (or economic and social pressures for such uses) leads to the institution of appropriate zoning ordinances to enhance those uses; or whether the zoning ordinance itself creates and encourages appropriate activities. In the case of the Massachusetts Avenue area, the situation is probably a combination of the two possibilities. And even though zoning has probably been the primary influence behind the current surge of building taking place in the area, other factors may also be partially
responsible for determining the nature of the development boom, including:

(a) a dramatic increase in demand for commercial and office space in the vicinity of Harvard Square;

(b) the proximity of the heavily residential neighborhoods of Riverside and Mid-Cambridge, with their large populations of youth and elderly providing a nearby (and largely pedestrian) market for housing and appropriate commercial services;

(c) the fact that the area is at the point between Central and Harvard Squares closest to Harvard Square where Massachusetts Avenue becomes a two-way street for vehicular traffic, increasing its accessibility by automobile and bus.
INTENTIONS AND ASSUMPTIONS

The goal of the thesis was to design an organization for housing, commercial and office space, and parking at the maximum allowable density which would create an extendable urban fabric favorable to the varied activities and lifestyles which occur in that part of Cambridge. The site, at 1000 Massachusetts Avenue, forms an abrupt transition between the intensive commercial development along Massachusetts Avenue and the much less dense residential neighborhood of Riverside to the south. To accomplish this, concern was focused on improving conditions for the pedestrian. Pedestrians are separated from the automobile, without banishing the latter, since the automobile may be a major factor in making Massachusetts Avenue the important street that it is today. To enhance the pedestrian character of the development, three major physical criteria are set down, and fulfilled in the proposal.

First, a pedestrian path connecting Massachusetts Avenue and Green Street is provided at an interior location in the site. This allows movement perpendicular to the direction of the main street at points between cross streets. This is necessary because the blocks which form the south side of Massachusetts Avenue are very long and do not allow pedestrian movement towards Green Street independently of automobile routes.

Second, the living units are organized into small zones or
regions of fifteen to thirty units, each with its own distribution system connected with the more public ways of moving vertically or horizontally through the site. The zones are walk-up in nature, with the units located at most two flights of stairs above a reference level, which itself is accessible either by stairs from the ground or by elevator.

Third, the major sidewalk at ground level shifts away from the street and leads the pedestrian through the center of the site. It is an assumption of this proposal that a bonus system can be devised which would allow developers to build to the street edge of the sidewalk in exchange for providing an interior sidewalk which would conform to certain physical standards. Developers could reasonably be expected to support the establishment of such a system, since they could utilize it to provide twice as much profitable commercial frontage on the ground level as could be available now along a public sidewalk. In addition, the lot on which they were building would be increased in size by the area of the adjacent sidewalk. This would add to the total allowable square footage of their buildings, under the existing maximum allowable floor area ratio regulations. In exchange for such benefits, the municipal government will be able to dictate to developers minimum requirements for the physical character of the interior sidewalks, including height, width, protection from the elements, amounts of sunlight and artificial lighting for safety at night, etc. This system
could provide a comfortable pedestrian atmosphere for year-round use within the larger framework of mixed use development along Massachusetts Avenue. It would avoid the situation which occurs when a building built within traditional lot lines offers an arcade or other pedestrian way at its edge. Generally these arcades remain unused as sidewalks since they are redundant with the existing sidewalk, and are utilized only to enter the building or occasionally to avoid a summer rain. Furthermore when covered ways are provided, they do not continue from one lot to the next. By contrast, with the large number of potential development sites which are expected to be available along this sector of Massachusetts Avenue, the potential exists for the fabric of such interior covered sidewalks to extend along the entire length of the street as new construction occurs. Indeed, the development of the site across Bay Street from 1000 Massachusetts Avenue appears to be imminent, and the possibility for such an extension across Bay Street is indicated in the illustrations.
The thesis proposes to retain on the site the existing six
story apartment building at 1010 Massachusetts Avenue known as 'The Cantabrigia'. By doing this, the proposed new construction can be accomplished with no necessity for tenant relocation. The building is in satisfactory condition, and contains a total of 54 apartments -- 26 one bedroom, 27 two bedroom, and one four bedroom. The proposed new development contains 247 residential units -- 28 efficiency, 85 one bedroom, 84 two bedroom, 34 three bedroom, and 16 four bedroom apartments. Most of the units are on a single level, with some duplex arrangements available. However, the organization of the units into zones allows many other arrangements to occur, such as communal living spaces, and units of three levels, for example. The ranges of sizes for the units in this project are:

- **efficiency**: 400-500 square feet
- **one bedroom**: 600-800 square feet
- **two bedroom**: 750-950 square feet
- **three bedroom**: 900-1100 square feet
- **four bedroom**: 1200+ square feet

Furthermore, approximately 77,000 rentable square feet of commercial and office space are included in the proposal.

The gross square footage of the above (areas of parking garages are not included in the calculation of floor area ratios) brings the floor area ratio for the entire site to approximately 4.0,
which is the maximum allowable under the Cambridge Zoning Ordinance in a Business B zone. In addition, 379 parking spaces are provided in an underground garage, which is one space per residential unit and one space per 1000 square feet of net commercial and office space, as required by the Cambridge Zoning Ordinance. Also provided is a loading dock sufficient to accommodate two 55 foot trucks, which are the maximum length permitted in Massachusetts.

The structural system for the development is a framework of cast-in-place reinforced concrete columns at regular bays which measure either 20'x20' or 20'x40'. The columns in the five rows closest to Massachusetts Avenue are 2'x1' in plan, while the rest measure 1'x1'. Beams spanning in all four directions from the columns complete the framework. Precast concrete planks 8" deep are employed to span between beams and form the floors at each level. The garage has spans of 40' and 60' which are carried by beams 30" deep. The proposed projection of the built form in the thesis does not have planks spanning between all available beams. The exposed framework does allow significant addition to the present form by either the developer or the user without the need for additional structural strength. The infill which is proposed consists on the whole of unit masonry (concrete block, bricks) and glass, though other materials and even prefabricated curtain walls could be used as well. Interior partitions can be constructed with steel studs and sheetrock, or
any other suitable method. Partitions between units and between different use spaces (e.g. an apartment sharing a wall with an office) ought to be of sufficiently heavy construction to avoid transmission of significant amounts of noise between units. A 40 dB noise reduction ought to be the minimum standard.

To conform to the requirements for maximum allowable length of travel to fire exits listed below, all spaces, residential, commercial, and the garage, are assumed to be supplied with automatic sprinkler systems.

<table>
<thead>
<tr>
<th>type of unit</th>
<th>maximum allowable length of travel</th>
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<tbody>
<tr>
<td>residential</td>
<td>200 feet</td>
</tr>
<tr>
<td>business</td>
<td>300 feet</td>
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<tr>
<td>parking garage</td>
<td>150 feet</td>
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Generally at least two means of egress are provided to the ground. In the towers, scissor stairs may provide the required means of exit, while the low-rise conditions which occur along the Green Street edge may require access to only one stairwell.

Most mechanical systems (HVAC) are assumed to be provided by units within each of the residential and commercial spaces, and plumbing and electrical conduits are assumed to be conveyed via central mechanical shafts, which are not shown in the plans.
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<tr>
<td>Bay Street Elevation</td>
<td>17</td>
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<td>Massachusetts Avenue Elevation</td>
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<td>Section B-B</td>
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<tr>
<td>Plan at 165'</td>
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SITE OF 1000 MASSACHUSETTS AVENUE

PROPOSED FOR FUTURE DEVELOPMENT

- 1033 - 6 STORIES
- 929 - 19 STORIES
- 872 - 11 STORIES
- 955 - 8 STORIES
- 1050 - 6 STORIES
- PUTNAM AVENUE - 11 STORIES

12 INMAN STREET - 7 STORIES

MASSACHUSETTS AVENUE
FROM CENTRAL SQUARE TO HARVARD SQUARE

- NEW DEVELOPMENT SINCE 1965
- BUSINESS B ZONE

SCALE: 0 200 400 800

NORTH
PLAN at 65'