How Color and Light Change Our Perception of Space, Time and Movement in Architecture

by

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How Color and Light Change Our Perception of Space, Time and Movement in Architecture

Abstract

by Deirdre A. Terzian

This thesis explores the way in which color and light change the way we understand our built environment.

The site for this thesis is at the west end of the Esplanade. The Esplanade is a recreational park along the Boston side of the Charles River in Massachusetts. The park has built facilities for sailing, concerts, and eating that detour off to one side or the other of the park's system of paths. The topography of the site is quite flat. Movement through the park is seemingly timeless as one walks parallel to the water, past unremarkable landmarks.

The west end of the Esplanade is a long, narrow strip of land between the Charles River and a small lagoon. Through the exploration of color and light, this thesis tries to recover a sense of time at both a large and small scale as one moves through the site. The sense of time is revealed through the constantly changing interaction between light and materials as the sun moves from east to west. It also tries to introduce a new spacial understanding of the site by breaking away from the existing parallel movement both physically and visually.

The vehicle for this exploration is a proposal for a recreational building that includes a swimming pool with changing facilities, cafe and community art gallery.

Thesis Supervisor: Imre Halasz, Professor of Architecture, Emeritus

Thesis Supervisor: Julie Dorsey, Assistant Professor of Architecture

Submitted to the Department of Architecture on January 17, 1997 in partial fulfillment of the requirements for the degree of Master of Architecture.

Acknowledgments

To my mother and father.
To Terry.
To Alexi.
Thank you for all your help and support throughout the program.

To Imre, Julie and Dimitris.
Thank you for your insightful critiques and encouragement.

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Introduction

Light

As natural light passes through a space highlighting different materials, our understanding of that space is transformed. The light changes the way we perceive the quality of a material. For example, when light hits a sheet of glass it appears to be opaque but when the light comes from behind its transparency is revealed. The affects of light on one material also change the perception of the other materials around it. The other materials will receive more or less light depending on the reflectiveness of the first material. As a result of the fact that the sun is always moving and that the interaction between light and material is constantly changing, a lifeless surrounding can become animated. In both nature and in built environments, these precious moments are more often accidental events: they are seldom the result of an intentional design scheme.

An interest in photography inspired the investigation of this thesis. Through photography, it is possible to record these instances of light hitting a material. Though the event is frozen in a photograph, the process becomes an exercise in observing the phenomenon. This thesis translates the interest in light observed through photography into an architectural project.

Light is always a part of the discussion of architecture. Yet, architects that consider light as equally important as all other decisions in the design process stand out as precedents to this thesis.

For example, at the Chapel on Mount Rokko in Japan, Tadao Ando cuts narrow slits into the walls and the roof of the structure to allow the light to bathe the surfaces of concrete. The light changes the apparent materiality of the concrete and transforms the church from a simple concrete box with one large window into an experience of meditation and a measuring device for time.

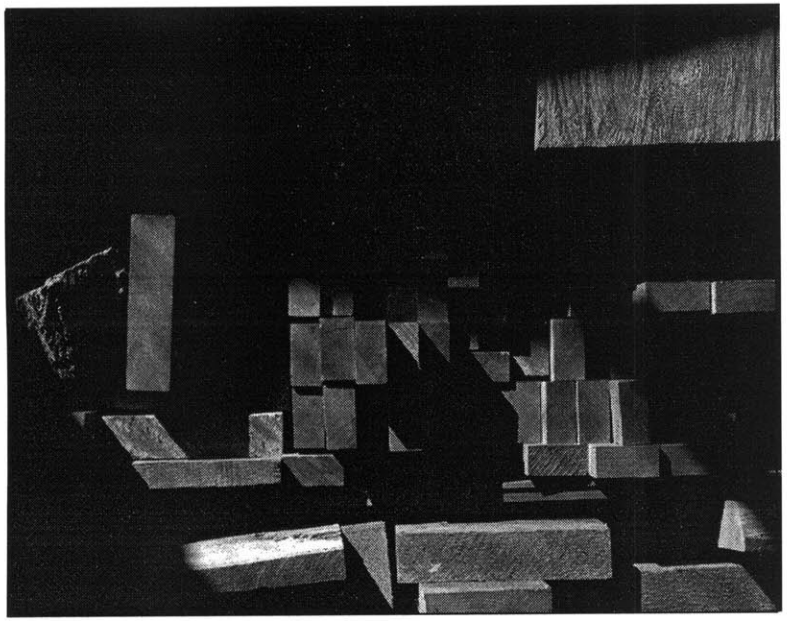


fig. 1. Natural light falling on a wall of wood

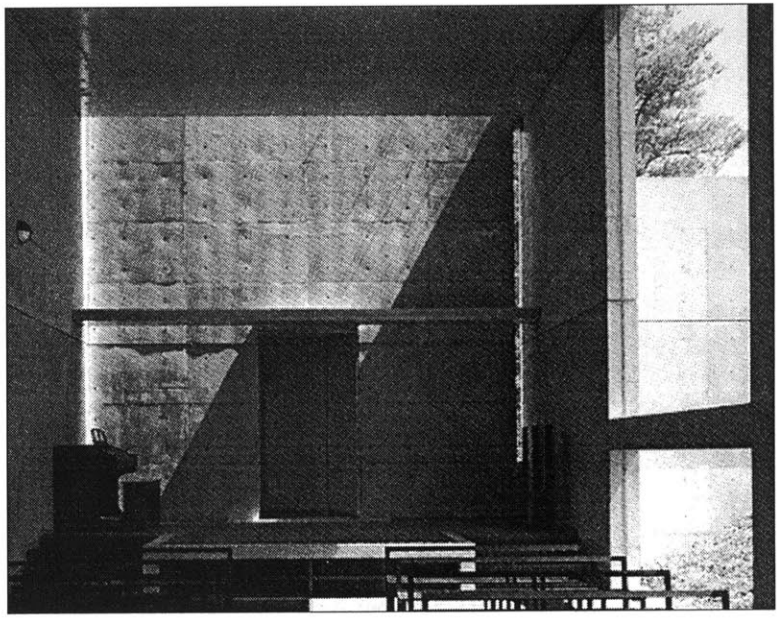


fig. 2. Chapel at Mount Rokko by Tadao Ando.

Color

The proposition of incorporating color into the investigation of this thesis has its roots in the same observations of light. The moment light hits a wall of color and that color reflects onto another surface, here again, the quality of that space is transformed. Though the choice of materials and applied color are mindfully chosen by an architect, as argued earlier, the results are probably more often accidental and not the original intention of the architect.

Yet, there are examples of architectural work that incorporate the use of color in ways that move beyond a formally decorative intention. Such examples can be found in work by Dimitris and Suzana Antonakakis in Greece, and Luis Barragan in Mexico.

At the Hotel Lyttos in Crete, Dimitris and Suzana Antonakakis use applied color on the exterior of a large hotel complex. By introducing color into the project, the mass of the structure appears to break down and transform the hotel into a series of small connected structures: the project no longer presents itself as a vast compound but as something at the scale of a small village. The use of color also helps orient a new visitor to the hotel.

Another architect that ties his instinct for the qualities of color and light into the whole of his architecture is Luis Barragan. At the Gilardi House, in Mexico, an interior pool becomes an exaggerated three dimensional spacial experience by a selective use of color and an understanding of light. By painting the column red and the back walls blue, the back wall recedes while the column pops out. The distance between the walls and the column seems greater than it actually is. As light hits the water, the rectangular column and the blue walls behind it not only soar through the opening in the ceiling but also plummet through the floor of the pool.

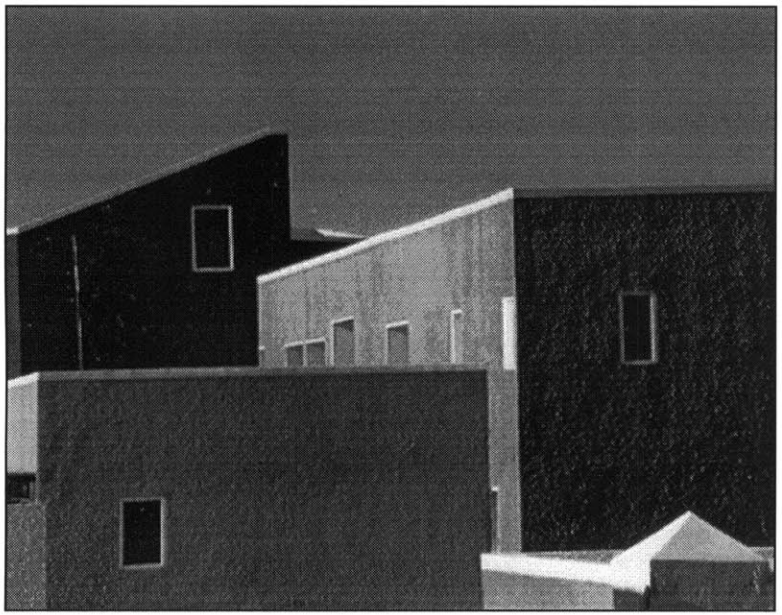


fig. 3. Hotel Lyttos by Suzana and Dimitris Antonakakis.

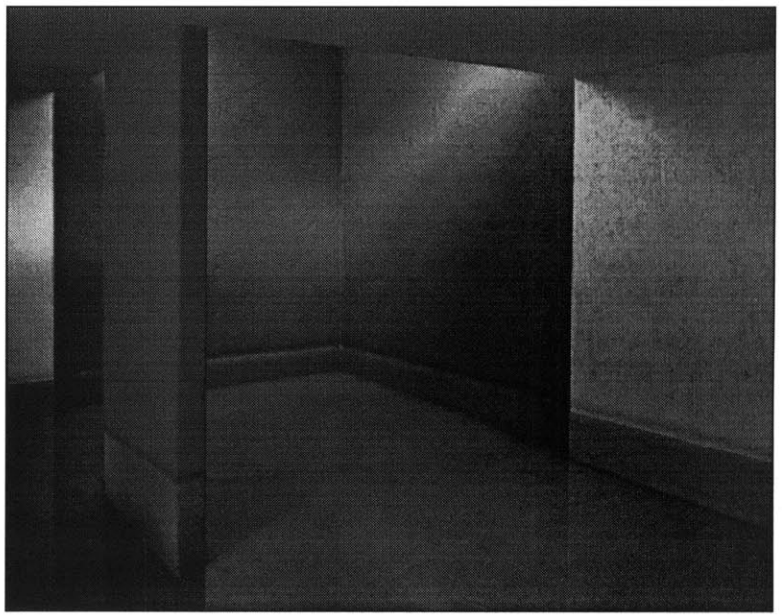


fig. 4. Gilardi House by Luis Barragan.

Site

The site for the investigation of this thesis is on the Esplanade in Boston, Massachusetts. The Esplanade is a recreational park that runs along the Boston side of the Charles River, between the Harvard and Longfellow Bridges. It is a man-made park that did not come into existence until the turn of the century.

Up until the end of the 19th century the Charles River was still tidal. When the tide went out it revealed an ugly muddy river floor. It carried with it dangerous currents, bad odors and pollution as the result of a growth in population and an increase in industry. It was soon apparent that changes would have to be made in order to improve the situation. In 1881, Charles Davenport proposed a river front development that included the construction of an esplanade.[1]

It was also argued at this time, that damming the Charles River would add to the health and the recreational use of the river. After much debate, the decision to dam the Charles River was reached in 1903. It was effectively dammed by 1908.[2]

The first version of the Esplanade was built at the same time the first dam was constructed. The design of the Esplanade was fairly straightforward. In front of the back lots of the row houses that face Beacon Street, ran Embankment Road (which later became Storrow Memorial Drive). In front of Embankment Road a wide strip of green was built between the Harvard and Longfellow Bridges. In front of the green a path ran along the edge of the water.[3]

The design of the Esplanade as it exists today was developed by Arthur A. Shurcliff. It was built between the early 1930's and the early 1950's. Shurcliff's design style was very likely influenced by Frederick Law Olmsted. Shurcliff's career included working for the office of Olmsted, Olmsted and Eliot;[4] the same firm that designed the system of parks in Boston called the Emerald Necklace.

fig. 5. View of the site before the Esplanade is constructed, when the Charles River is still tidal. The view is facing east.

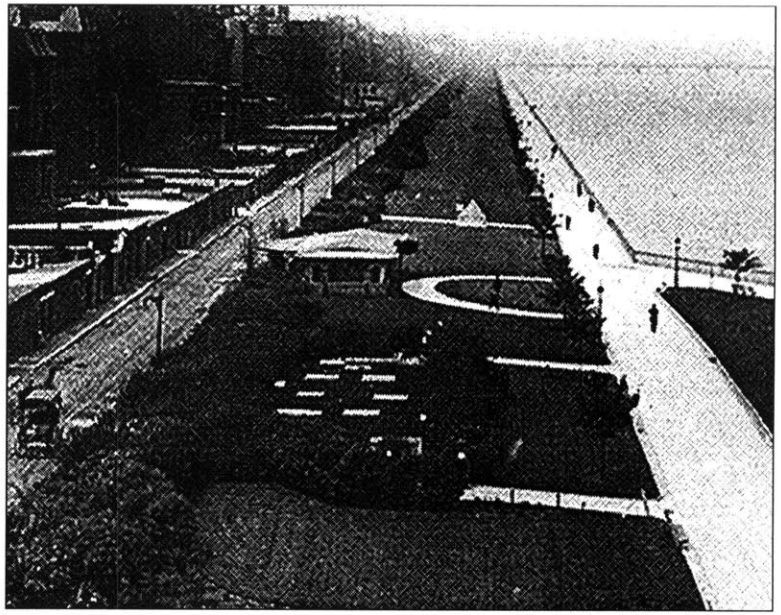
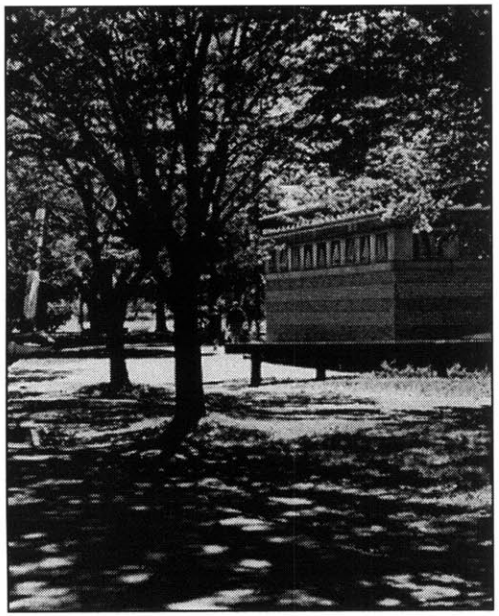
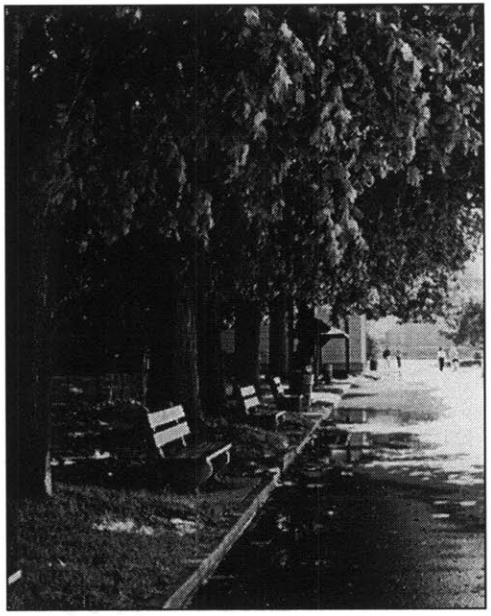
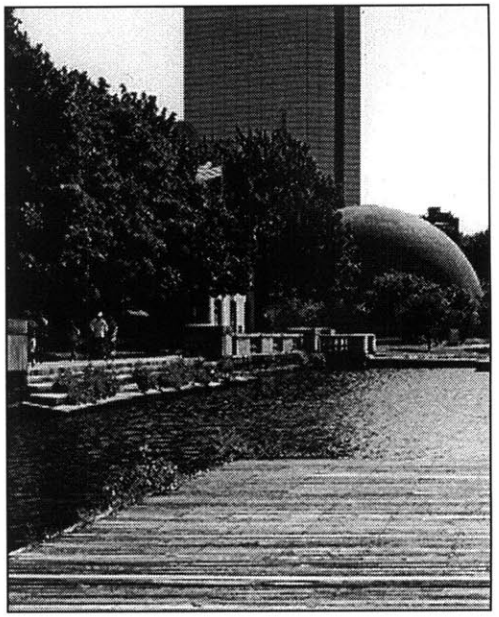


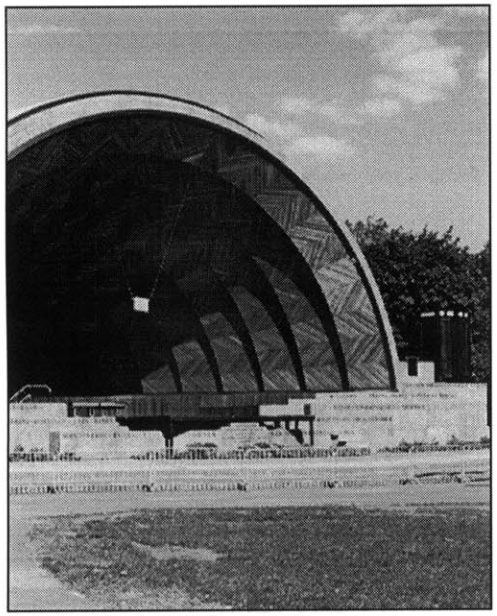
fig. 6. View of the first version of the Esplanade, facing west toward the Harvard bridge.

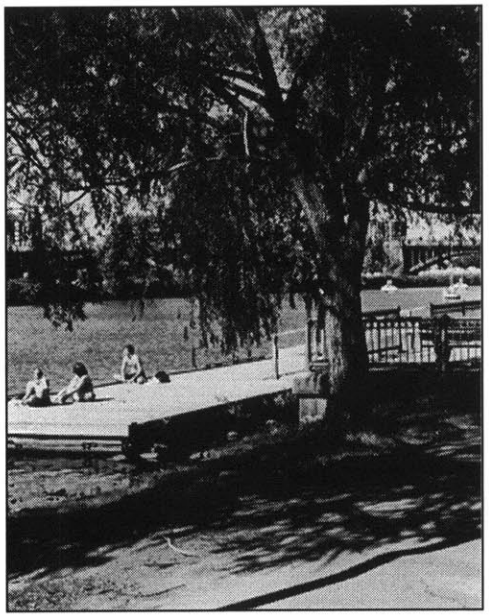


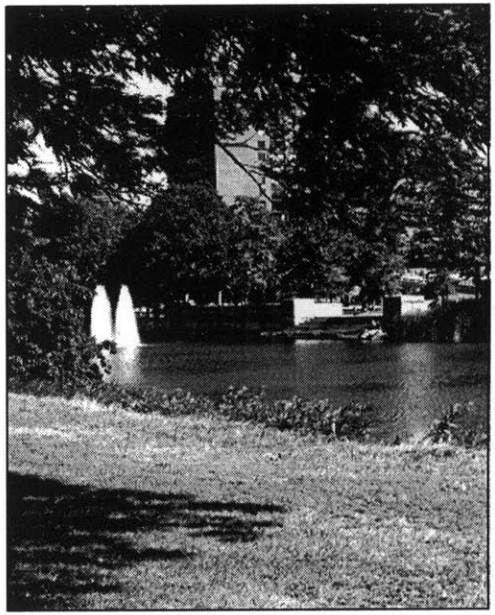




figs. 7-12 Various views of the Esplanade as it is today.







Today the Esplanade is actively used throughout the year by residents of Boston and Cambridge as well as visitors to the city. It offers relief from city life and an opportunity to enjoy activities on the Charles River. It is used by strollers, joggers, bicyclists, and sunbathers. It has built facilities for sailing, concerts and eating that detour off one side or the other of the park's systems of paths.

The topography of the Esplanade is uniformly flat. Movement through the park is seemingly timeless as one moves parallel to the water past unremarkable landmarks.

This thesis looks at a section of the west end of the Esplanade. It is the end of a long narrow strip of land, essentially an island, that encloses one of the park's lagoons. The limits of the site for this study are between the last two pedestrian bridges that connect the island back to the embankment before the park continues west and meets the base of the Harvard Bridge.

Mature trees are grouped at the ends of the site near the pedestrian bridges. Between these ends, the land is treeless. An asphalt path about twelve feet wide runs down the middle of the this stretch of land. The flatness of the land, the treeless landscape and the centralization of the path contribute very little to the pleasure or use of the site. Yet, the desolate nature of this strip of land intensifies the understanding that one is standing on a piece of land between two very different bodies of water: the Charles River to the north, active with boaters and alive with a directional current, and the Storrow Lagoon to the south, a calm body of water, without any recreational activity, that falls short of a reflecting pool.

The site is primarily used by sunbathers on either side of the path. The path is a pedestrian thoroughfare. The only clearly defined territories are the treed ends of the landscape. They are more private and offer an a place to get relief from the sun.

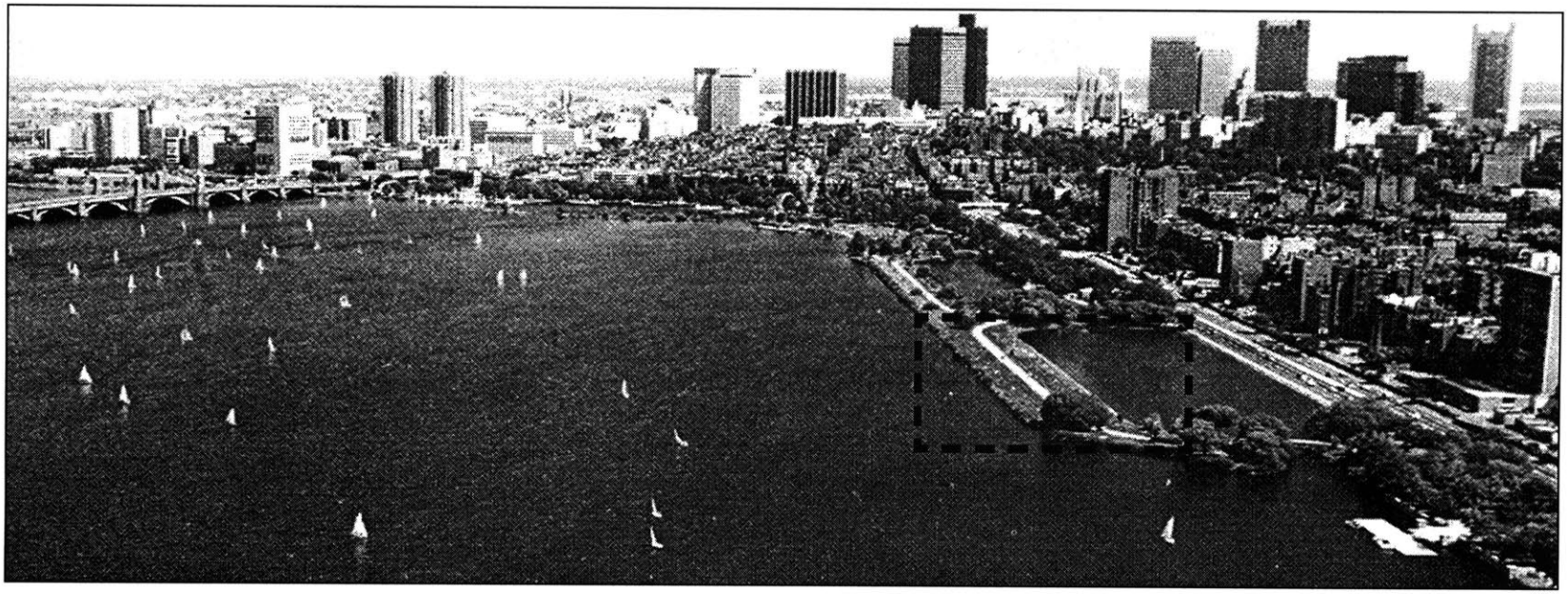


fig. 13. Aerial view of the Esplanade with the site for the thesis highlighted.

fig. 14. View of the site facing east.

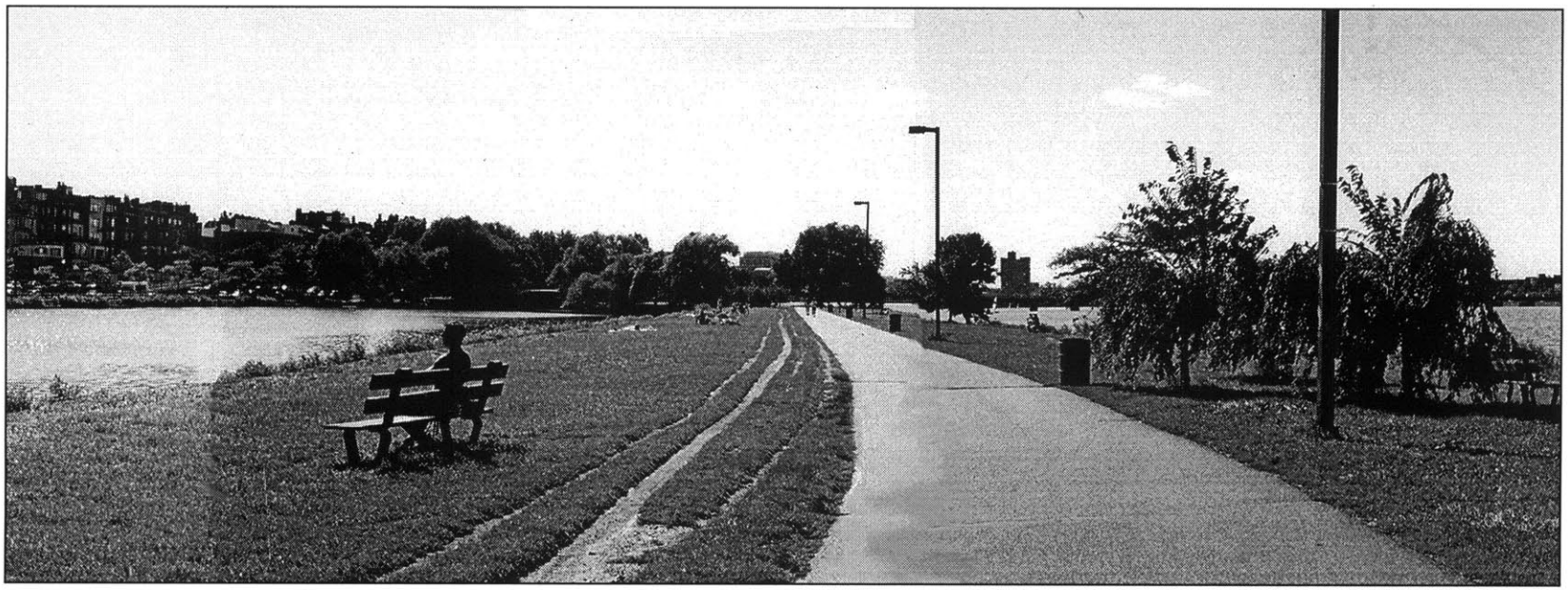


fig. 15. View of site facing west.

Site Analysis

The Esplanade Park is a man-made, formal design. It is unlike the nearby Boston Common Gardens designed by Shurcliff's mentor, Frederick Law Olmsted, which was designed to look like natural pastureland or the Fens, which were designed to look like natural marshland. The Esplanade is most definitely read as purposefully designed by man and not by nature.

Looking at the overall site plan of the park, there appears to be a pattern of a long dimension of about 1,000 feet. In the first two bays running west to east, the dimension is marked at the points that the linear island connects to the embankment by way of pedestrian bridges. The third bay takes the curve of the site leading to the fourth bay which is defined by the land jetties. It was through this analysis that the territory for the site of this thesis was decided.

Applying this dimension to the west end of the island between the Storrow Lagoon and the Charles River it is possible to create a rectangle. The short sides of the rectangle are above the existing pedestrian bridges and the long sides are defined by the edges of the land.

By subdividing the larger rectangle from the left at the point at which the two diagonals drawn from the corners of the rectangle intersect, a smaller rectangle is created and repeated at the other end. The width of this rectangle is about the same width as the pedestrian bridges.

Running this new dimension along the diameters of the circumference that define the ends of the lagoon and extending them to the River, a pattern begins to reveal itself. This second set of parallel lines also extends back through the streets that enclose the west and east ends of the row house block on the other side of Storrow Drive. By repeating this pattern, a comb-like movement is suggested. It connects the two bodies of water, offering an alternative to the existing resolute movement parallel to the water.

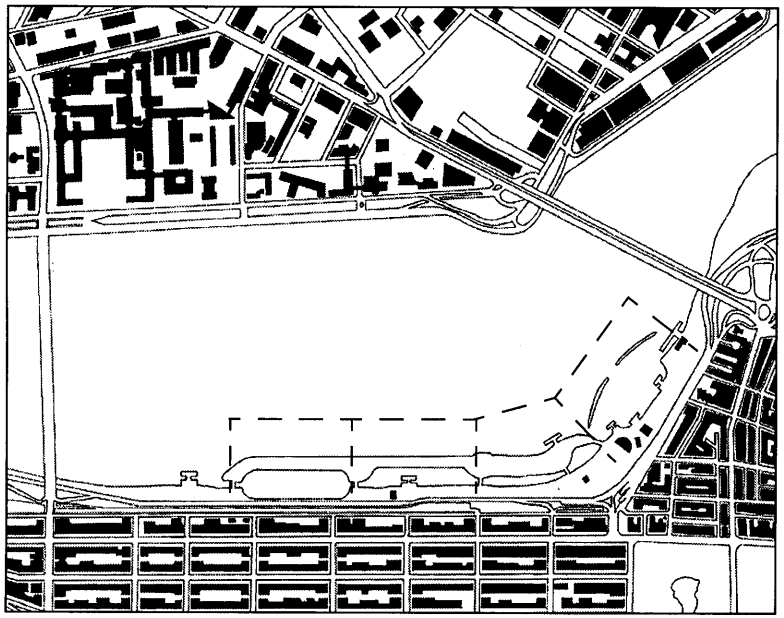


fig. 16. Diagram of the Esplanade.

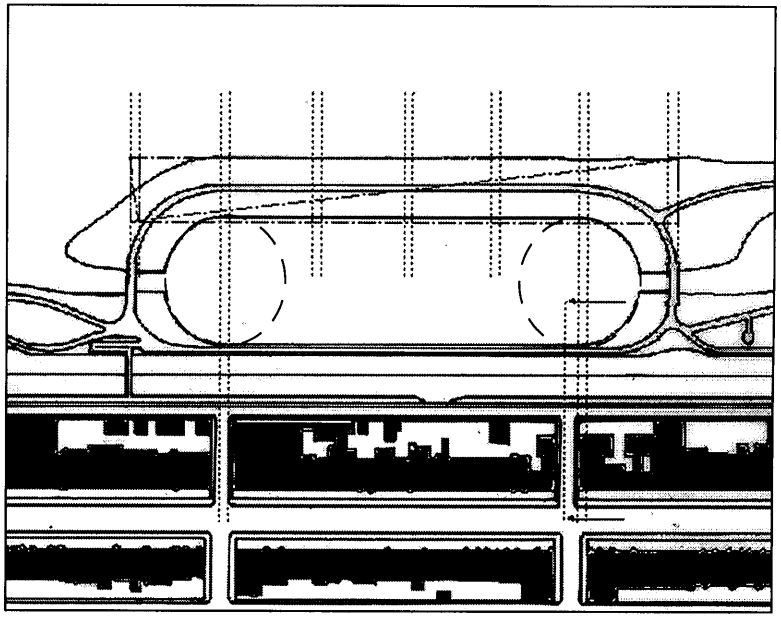


fig. 17. Diagram of the site.

Conceptual Idea

Personal observations and the analysis of the site created the basis for the development of the design concept.

The Rhythm of Movement: The existing path runs longitudinally through the center of the site creating two long indistinguishable stretches of land on either side. They do not present any sense of territory or use. All they appear to be are adjuncts to the circulation path. Moving the path to one side of the site frees the land for some use other than circulation.

Still, the primary movement through the park is parallel to the water. The analysis of the site maintains movement parallel to the water but creates a way to move off of the path in a way that bridges the Charles River and the lagoon.

By overlaying two different directions of movement, two different paces of movement are generated. One for the person who moves expeditiously through the site and the other for the person who meanders and explores the site at a more leisurely pace. The diagram also indicates a rhythm of movement as one moves parallel to the water, crossing over the perpendicular markers at regular intervals.

Between the Paths: The rhythm of perpendicular markers subdivides the land into smaller and more manageable territories. It is within these territories that the program is developed. Just as the existing recreational buildings are set off of the main path, limiting the interaction of the pedestrian to that activity, the new circulation pattern opens up the opportunity for a more integrated relationship between the pedestrian and the activities on the site.

Visual Bridges: One of the unique qualities of the site as it exists now is the visual connection to two very distinct bodies of water. Through a change in section, the visual bridge is preserved. It is through the structure that new views are uncovered.

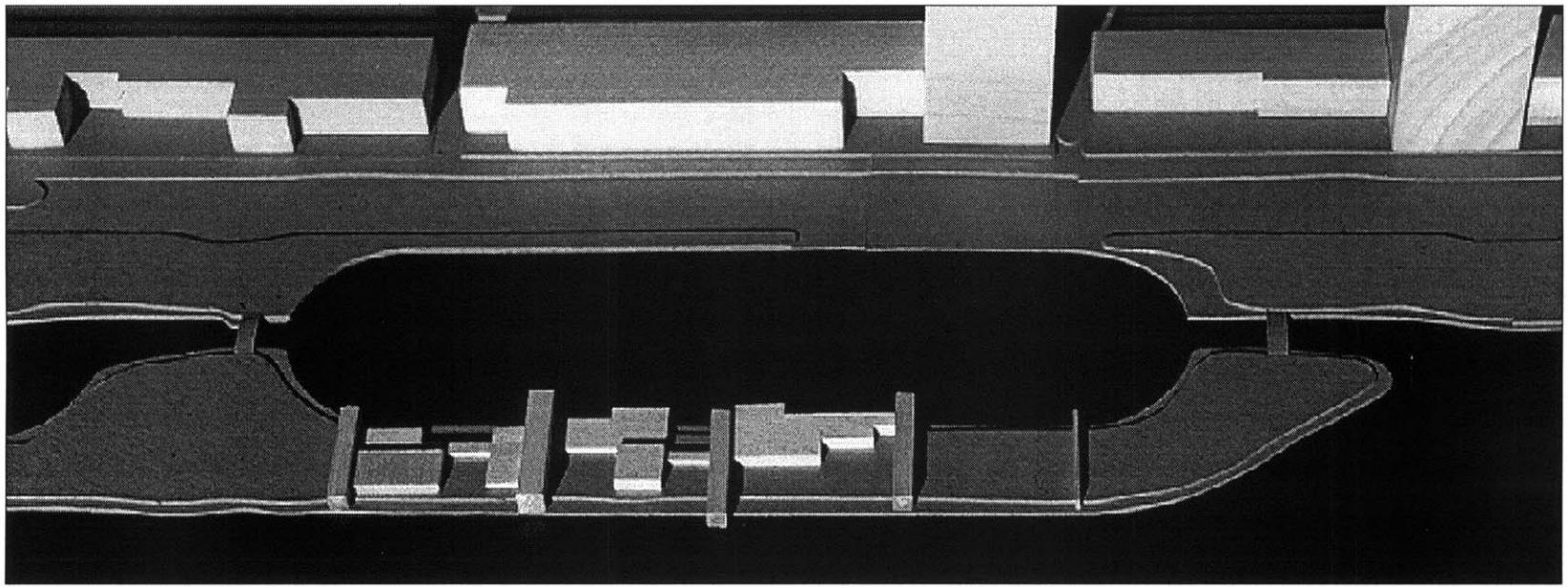


fig. 18. Detail of model of the site on the Esplanade.

The Rhythm of Movement

The circulation through the site includes one longitudinal path and a series of lateral paths. The longitudinal path is moved from the center of the site to the side along the Charles River. The new path is reconnected to the existing network of paths in two ways. At the east end of the new path, the curves of the existing paths are reconfigured to allow for a smooth flow of movement. From the east end of the new path, the path moves between the water's edge and a discontinuous wall that cuts through the site at an angle. The wall directs the path to meet up with the existing path on the west end of the site as it shifts away from the water's edge.

The decision to move the path to the River's edge and not to the lagoon's edge is based on the way the longitudinal path is currently used. The longitudinal path is essentially a thoroughfare for pedestrian movement. The pace is at a higher intensity than the movement off of this path. Similarly, the movement of the water of the Charles is at a higher intensity than the lagoon. With this move, the site now has a highly active zone on the north side and a quieter zone on the south side. As the south side receives more sun it is sensible that the more leisurely activities occur on this side.

The secondary exterior circulation runs perpendicular to the longitudinal path. In the diagrammatic model they appear to be conspicuous cores of yellow. They are now translated into a series of parallel walls that cut into the land and move people below the water level of the Charles River. The interior surface of parallel walls are painted yellow. When the sunlight hits these walls, the highly reflective quality of the yellow creates a strong glow.

The glowing corridors become markers in the landscape that set up a rhythm as one moves along the longitudinal path. They also bridge the Charles River and the lagoon allowing pedestrians to move off the active longitudinal path to the more tranquil side of the site.

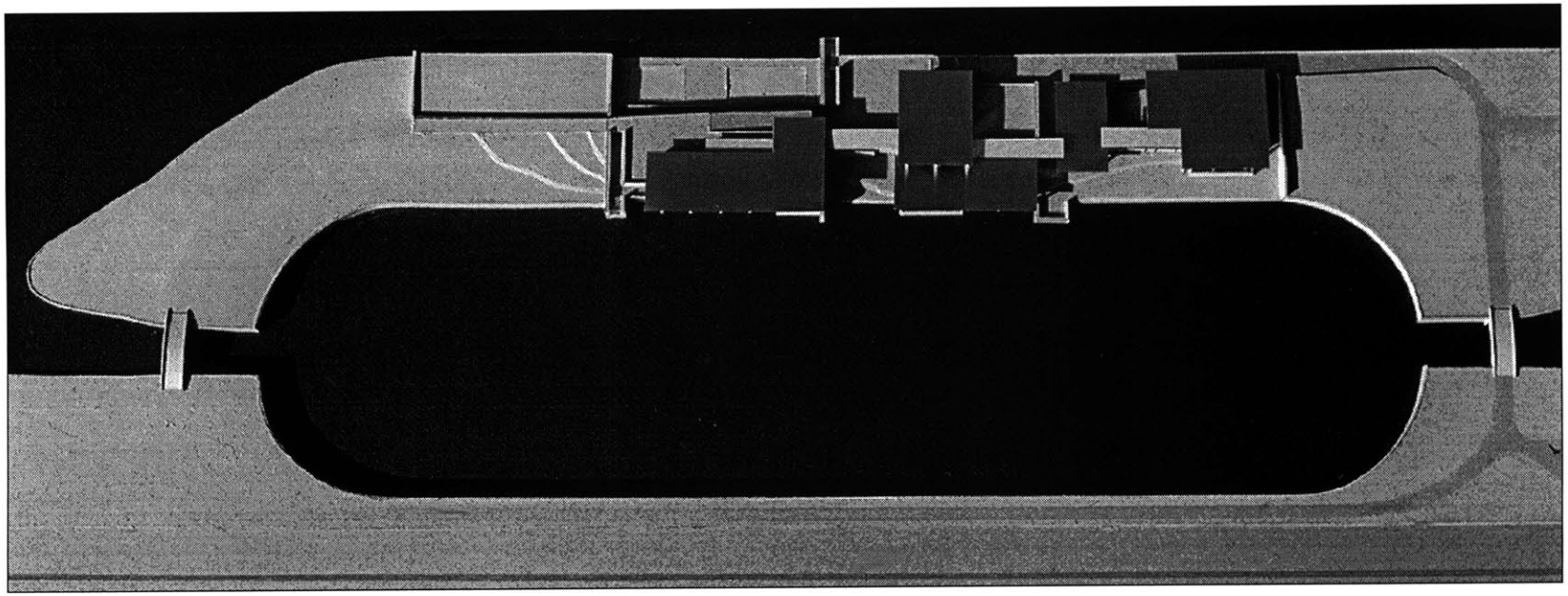


fig. 19. Top view of model.

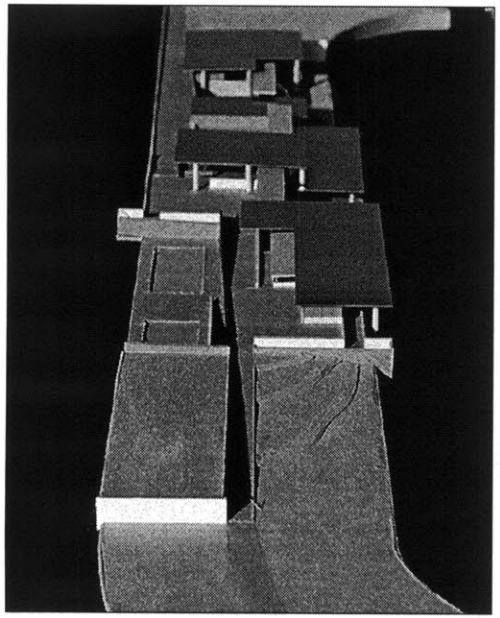


fig. 20. View facing east.

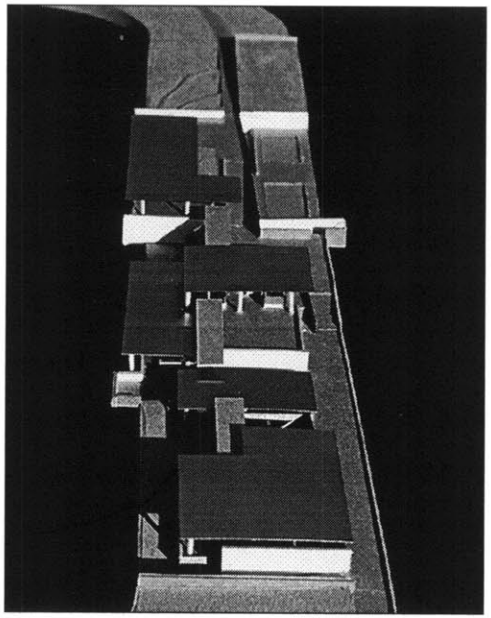


fig. 21. View facing west.

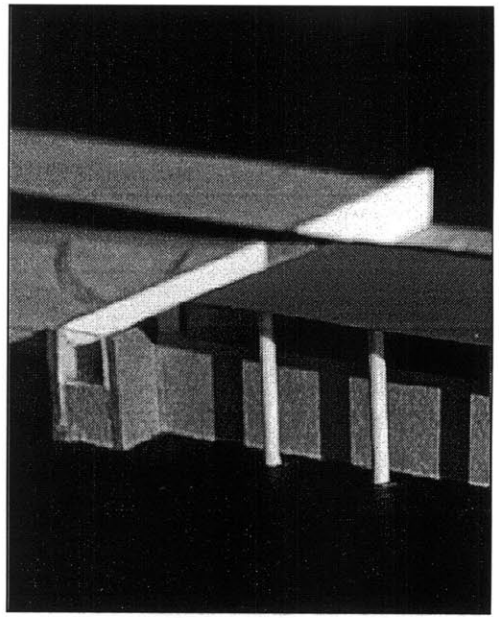
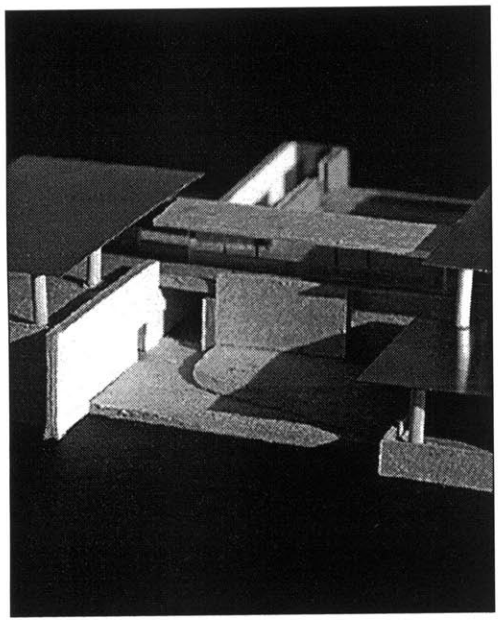
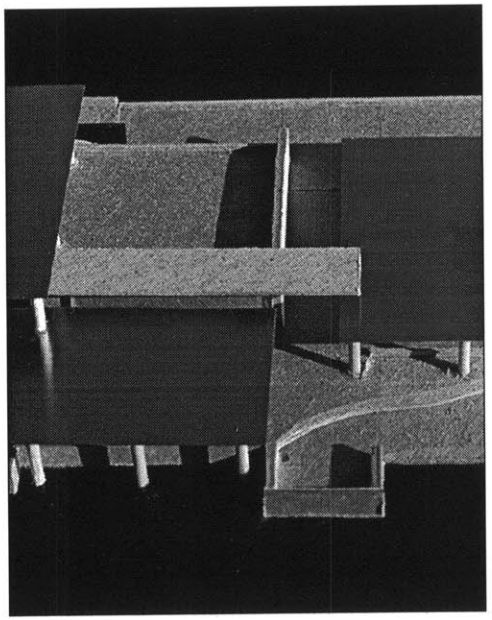
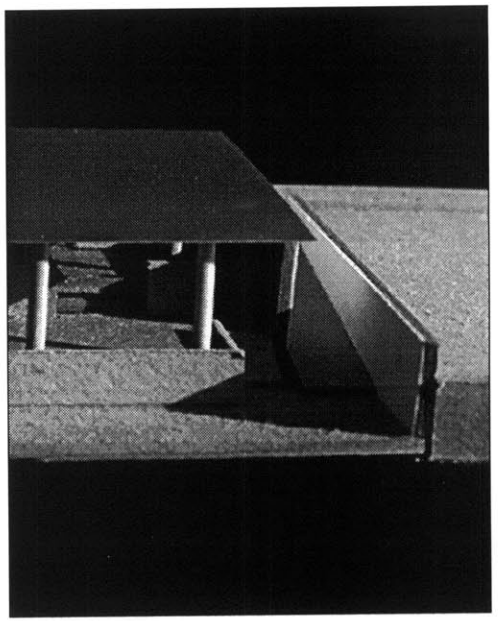


fig. 22. Detail of parallel wall.







figs. 23-25. Details of parallel walls.

Between the Paths

As stated earlier, the system of circulation creates new territories on which to develop the program of this thesis. The program is a recreational building that includes a swimming pool with changing rooms, a cafe and a community art gallery.

Each function is located within one of the bays defined by the parallel walls that corridor the perpendicular movement. The cafe is located in a bay between the community gallery on the east side and the pool with changing rooms on the west side. Arranging the program in this order allows the cafe to be used by all the visitors to the building without overlapping swimming and gallery activities.

The three functions are linked together by an interior longitudinal path. Although separate from the exterior circulation, the interior path adds a third layer of circulation through the site. There is parallel movement between interior and exterior longitudinal paths and an overlapping of movement with the paths perpendicular to the site.

The parallel walls not only define circulation, mark territories and provide structure but they also help make the transition from interior to exterior space. For example, at the east end of the gallery and the east end of the changing rooms one of the parallel walls is not as long as the other. It is at that point that the longer wall continues to lead the pedestrian to the lagoon while the spacial experience opens up to an outdoor green area. As a result of this variation in the parallel walls, the walls become more integrated into the fabric of the interior and exterior experience while maintaining a subtle rhythm of perpendicular movement.

Moving east to west of the plan, the structure is less dependent on the parallel walls for either territorial definition or structure. Yet, while the density of the structure is reduced, exterior movement from the River's edge to the lagoon is still dependent on the parallel walls.

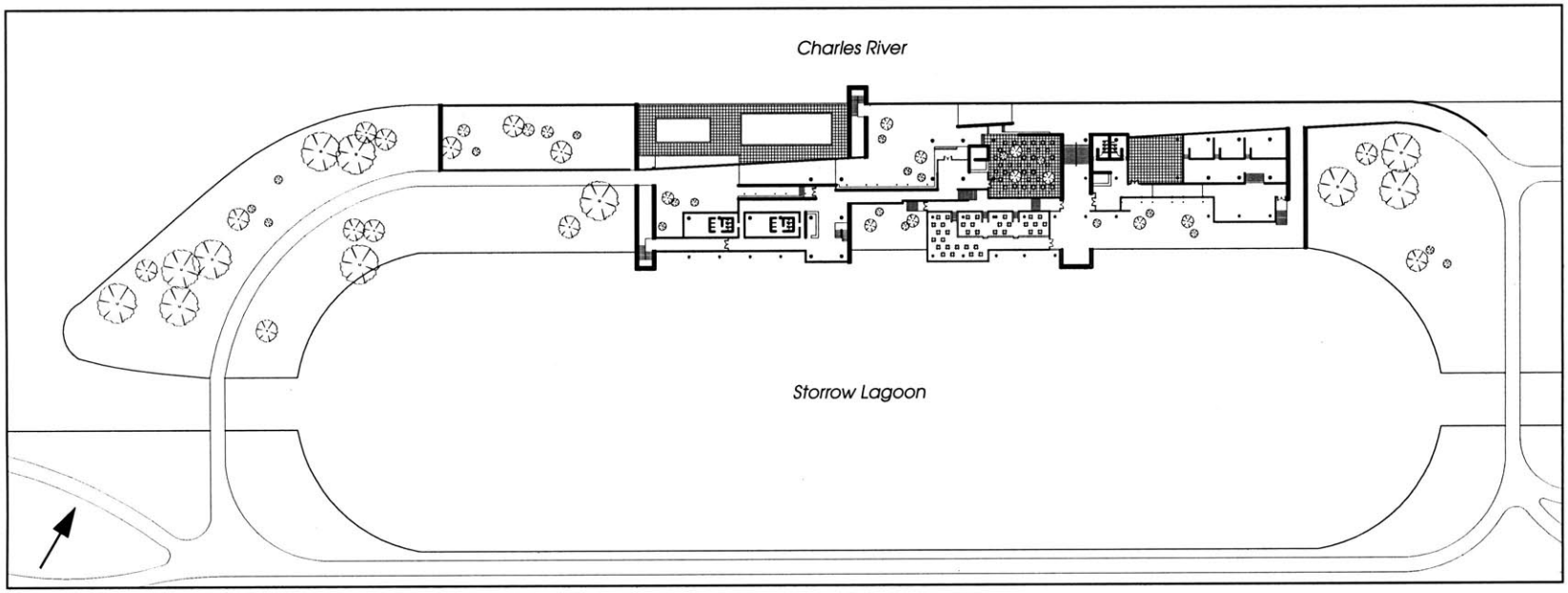


fig. 26. Site Plan.

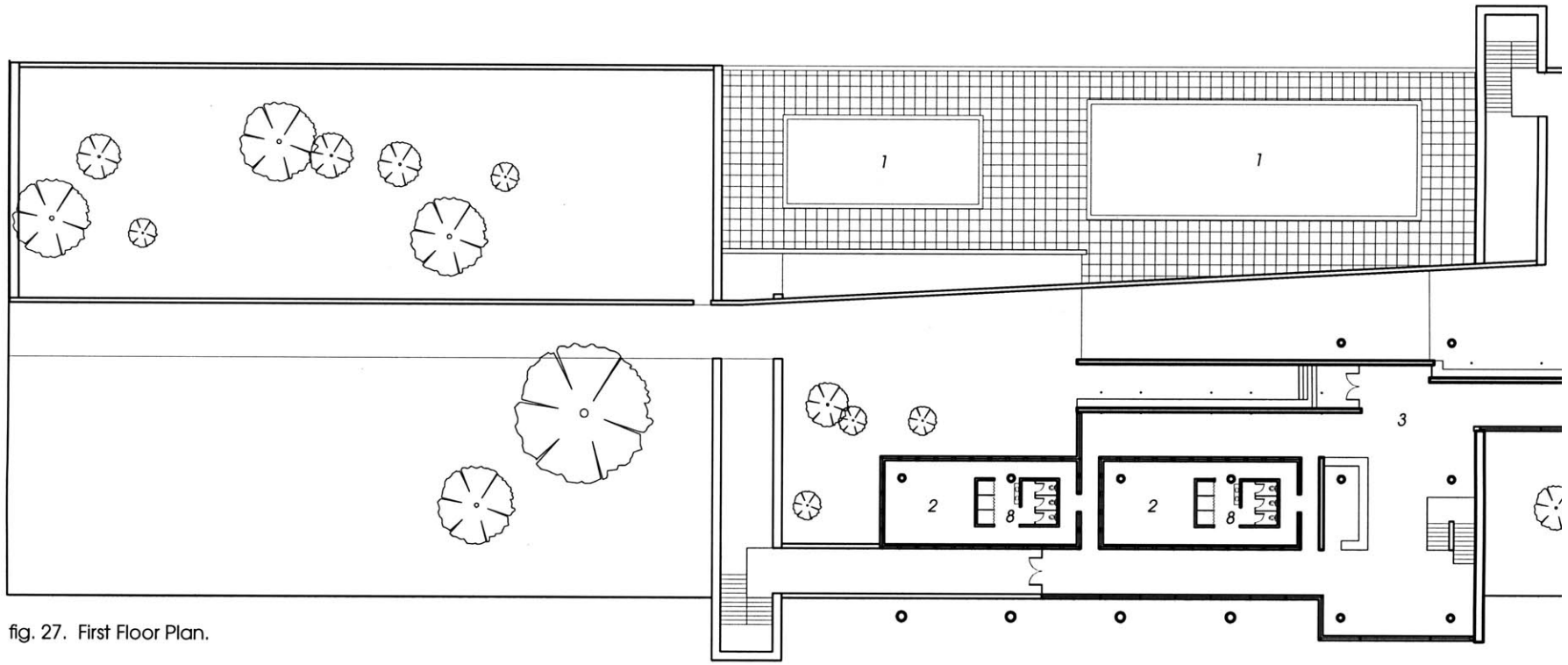
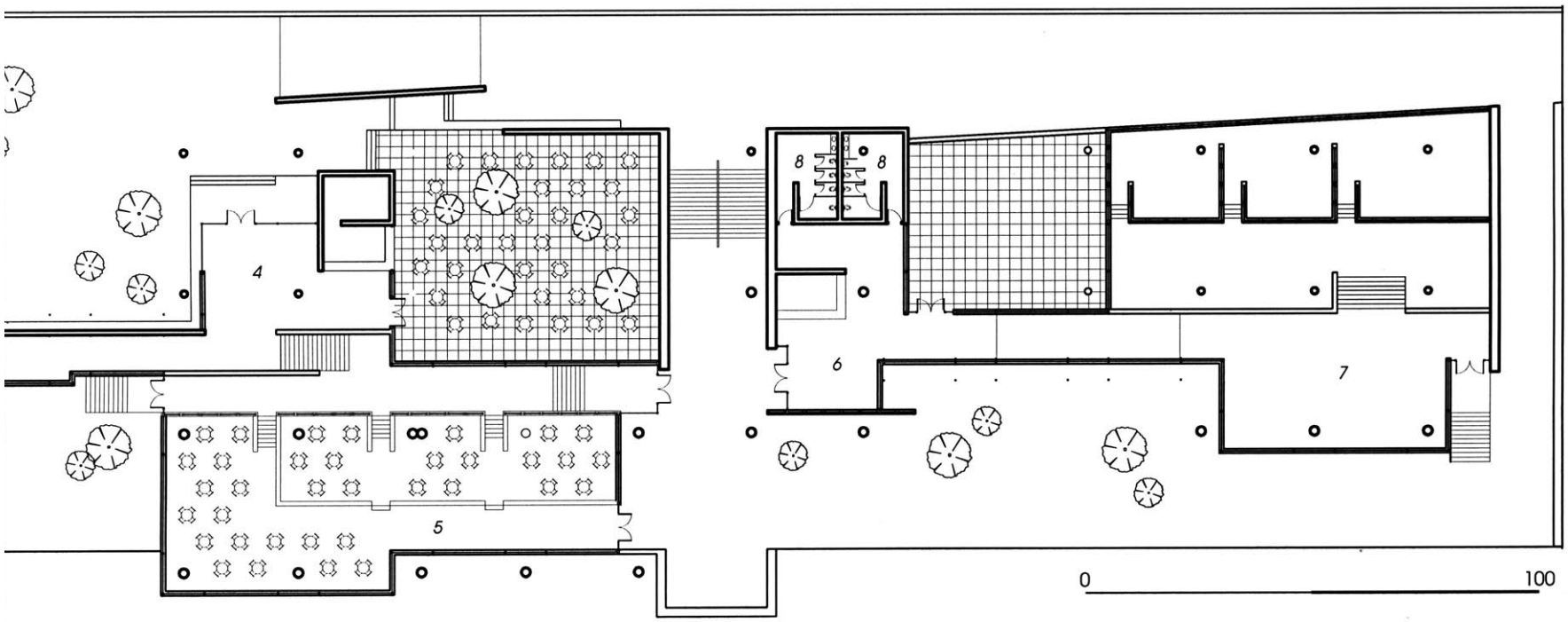


fig. 27. First Floor Plan.

1. pool
2. changing room
3. room entrance
4. cafe entrance
5. cafe
6. gallery entrance
7. gallery
8. bathroom


4
5
6
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0
100

Visual Bridges

The parallel walls provide a physical bridge to the Charles River and the lagoon. At the same time, a visual bridge is preserved through the change of section and the use of materials.

In order to maintain a visual connection it is necessary to build down into, and not up on, the site. Yet, the Esplanade is a place where people go to be outside and not underground. By damming the lagoon it is possible to lower the level of its water. By lowering the level of water, the section drops below the level of the Charles River. With the land now at a lower elevation it is possible to build up without blocking the view from the upper level. As people move through the higher levels of the site the building becomes the instrument through which they can view the lagoon.

On the other hand, on the lagoon side of the site, the view is denied by the drop in section. As a result, the lagoon side becomes an enclave, protected from the activities on the Charles River side of the site.

Another visual connection to the lagoon is through the construction system of the structure. The structure is made up of a column grid. The territories are defined by one and a half foot high walls. The walls are used as a base for a moveable paneling system. The panels are transparent, translucent or opaque depending on the privacy needed.

In the model, a section of the cafe shows a system of panels that are a translucent white, transparent blue and, in contrast to the blue, transparent orange. The white panels move to provide privacy and block out the sun. The blue panels hang horizontally above to create a new horizon line and relate to the blue water. The orange panels along the corridor set up another rhythm of movement and along the water's edge appear as markers for the water. Looking through these transparent layers a new spacial experience is created without closing down the space with solid walls.

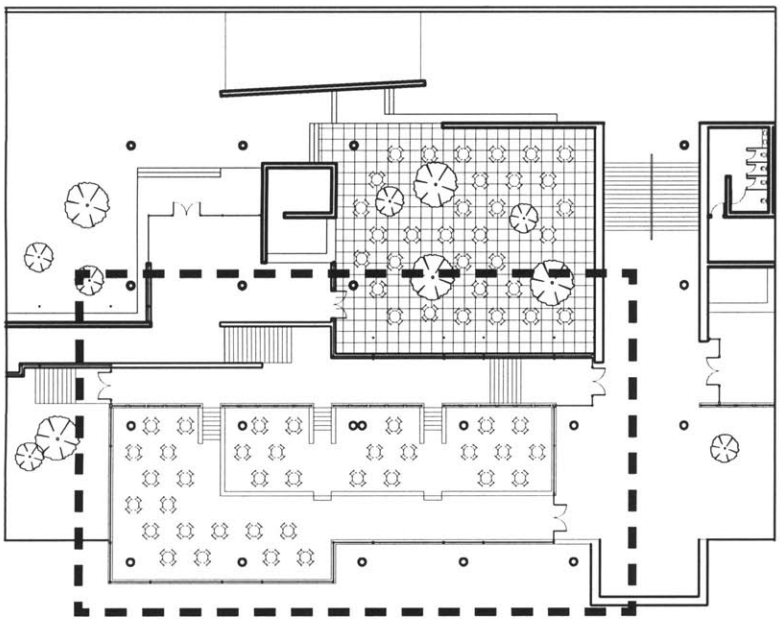

fig. 28. Plan of cafe with section represented in model highlighted.

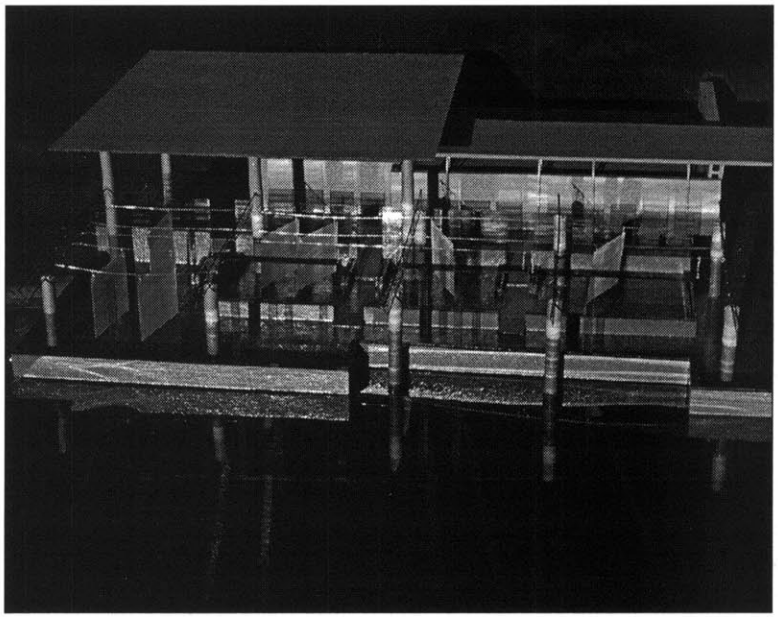

fig. 29. Model of cafe without lower roof.

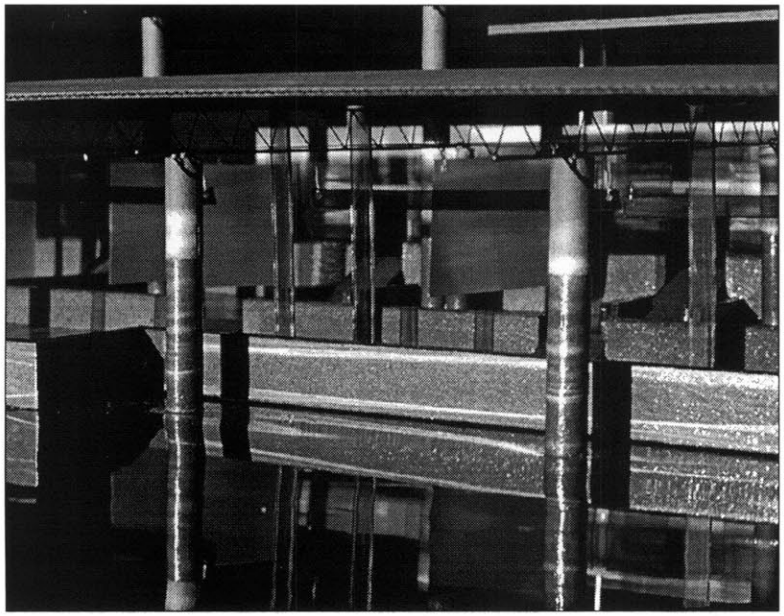

fig. 30. View from lagoon looking into cafe.

fig. 31. View from cafe courtyard looking through structure towards the lagoon.

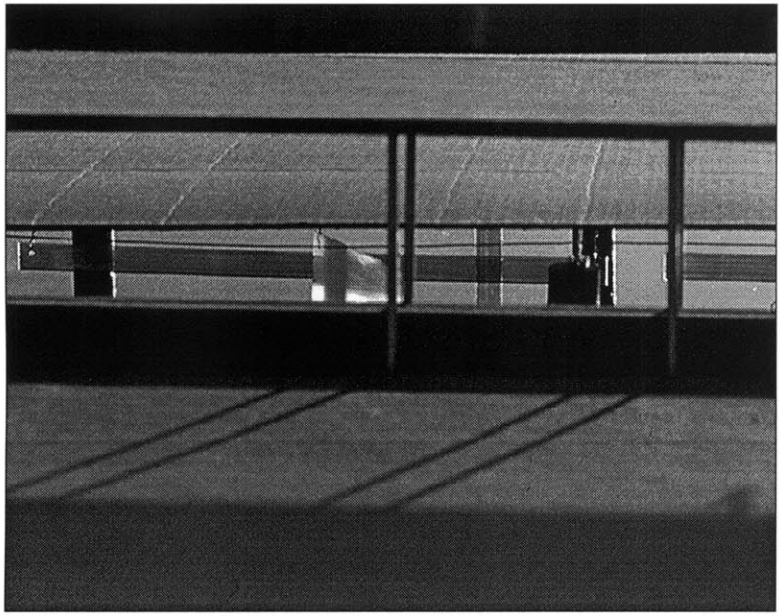

fig. 32. View from cafe courtyard looking through structure towards the lagoon.

fig. 33. View from lower ground level through cafe towards lagoon.

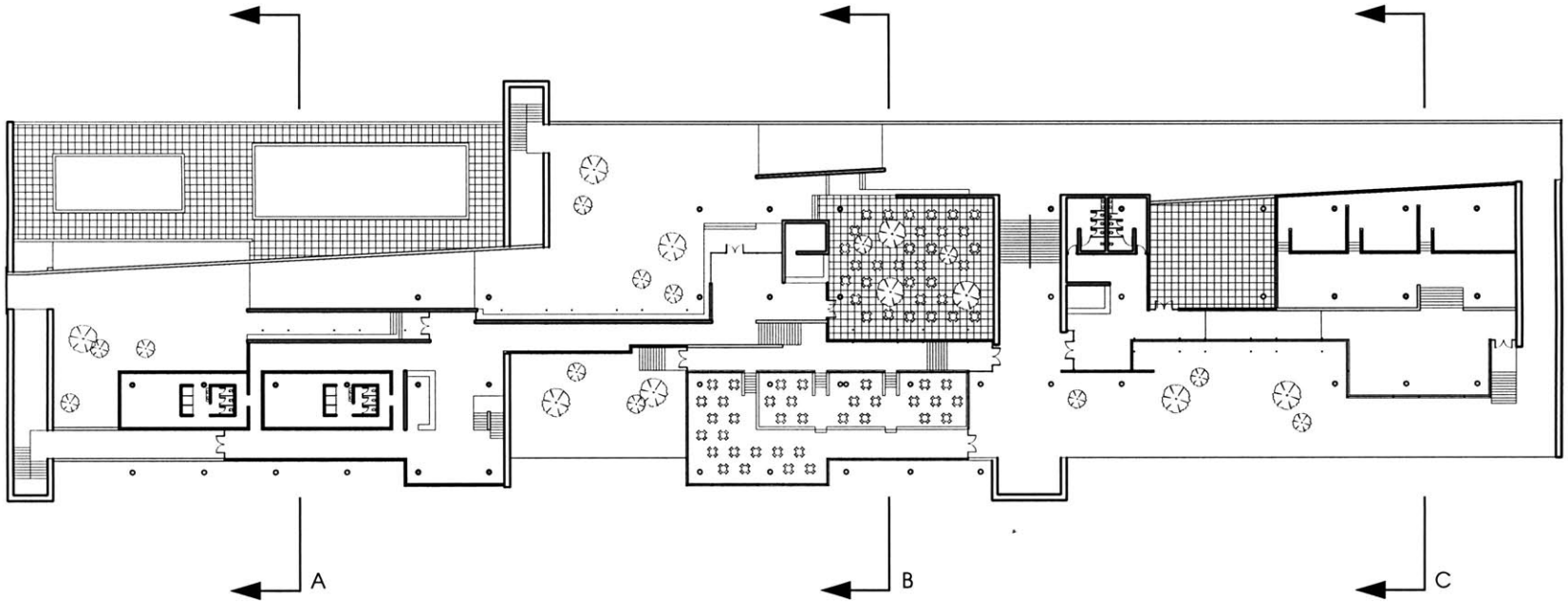

fig. 34. Section Cuts.

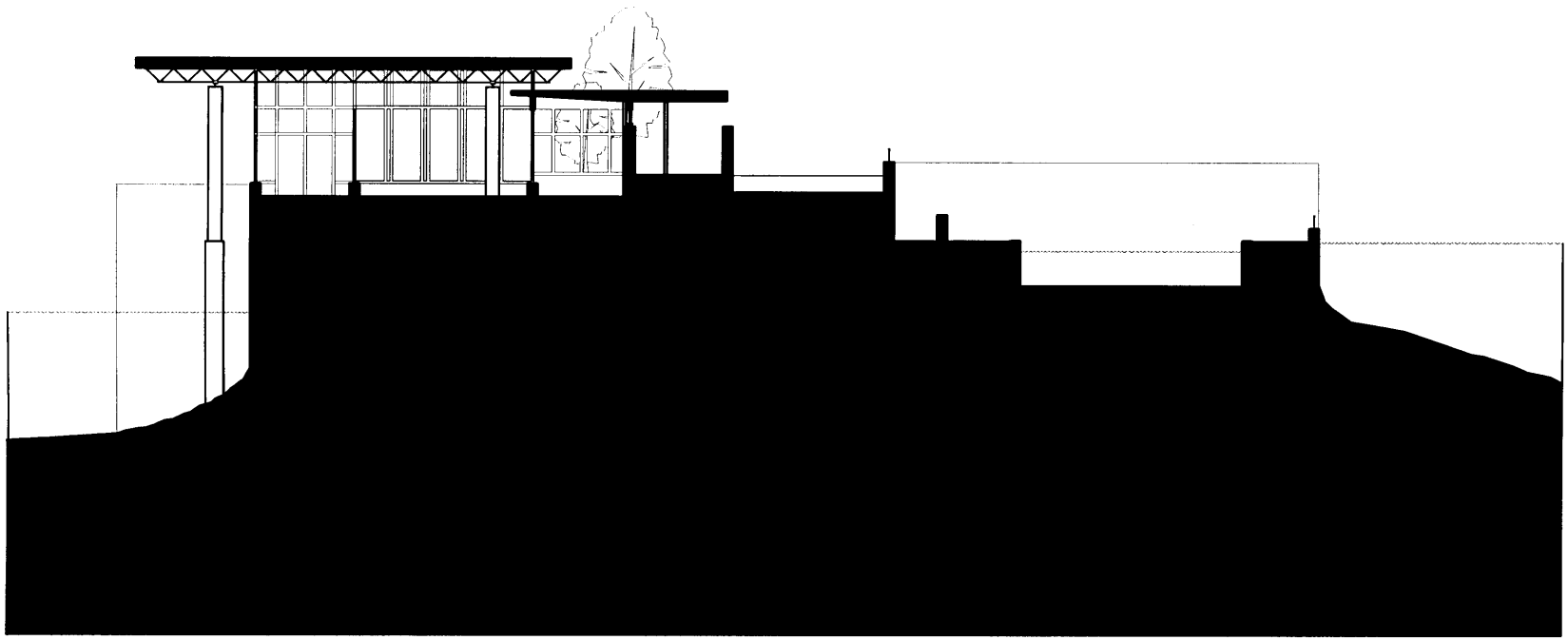

fig. 35. Section A.

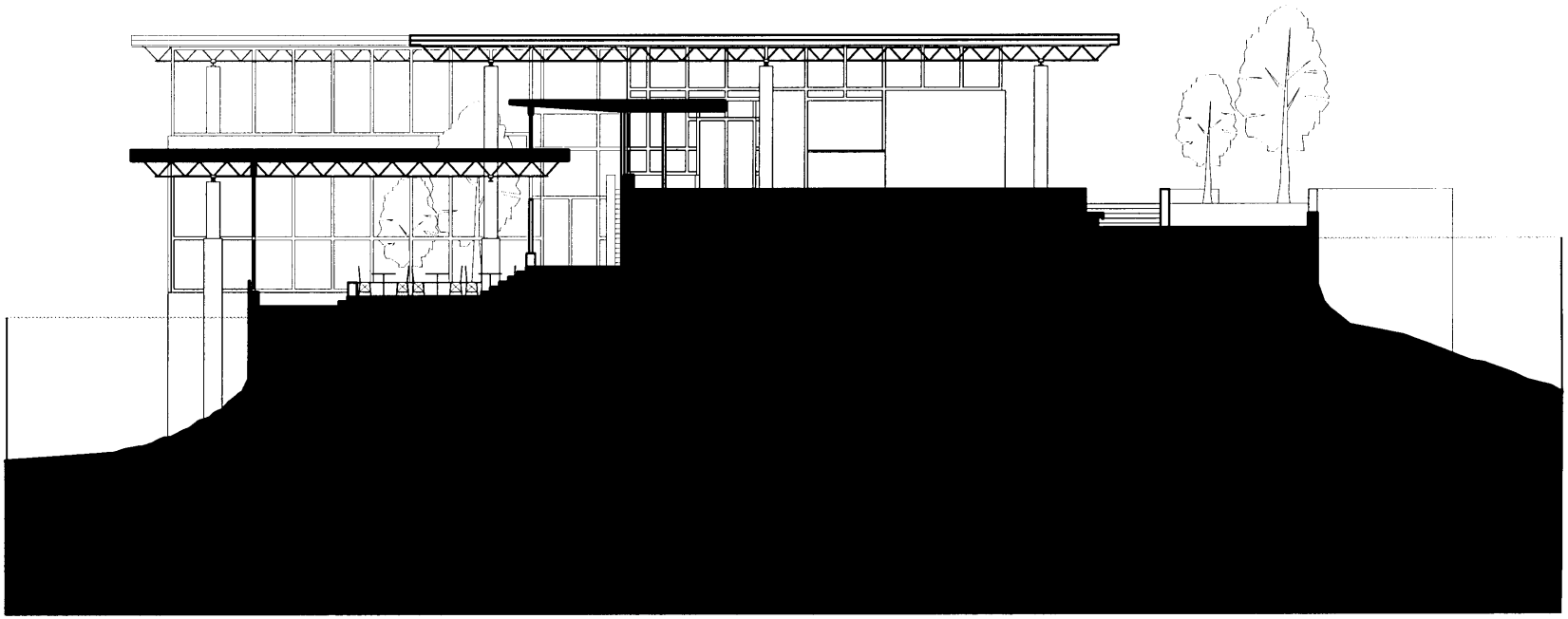

fig. 36. Section B.

fig. 37. Section C.

Conclusion

The primary goal throughout this thesis was to use the investigation of color and light as a tool with which to develop an architectural design. The original question being, could the design process be influenced as equally by decisions concerning color and light as by the decisions about how to deal with the site, program, materials and structure.

It proved to be more difficult than anticipated. Although the issues of color and light were always at hand, it was difficult to keep them at the forefront of discussion throughout all phases of the design process. Generally, thoughts about color and light were secondary to the development of the site and program. It was easier to incorporate them when thinking about, for example, materials.

In the end, color and light were dealt with at two distinct points of the process. At the larger scale, the decision to incorporate a system of parallel walls that reflected colored light not only created the phenomenon desired but also provided a structure within which the entire project could be developed. At the smaller scale, once inside the building, the interaction of color, light and material became a more intimate experience. It was at the scale of my personal experiences in photography.

Perhaps, part of the difficulty of pursuing a thorough investigation of color and light was due to a geographical understanding of the phenomenon. Both the Antonakakises and Barragan come from regions, Greece and Mexico, that have a history of using materials and colors that recreate this phenomenon regularly. It is very unlike the tradition in New England where color is often limited to decorative uses. Granted color and light exist regardless, but the ability to manipulate an entire project with these issues constantly in mind is not a part of the tradition. The challenge becomes bridging one's own regional understanding of light and color with an exploration that is not necessarily within the realm of one's cultural experience.

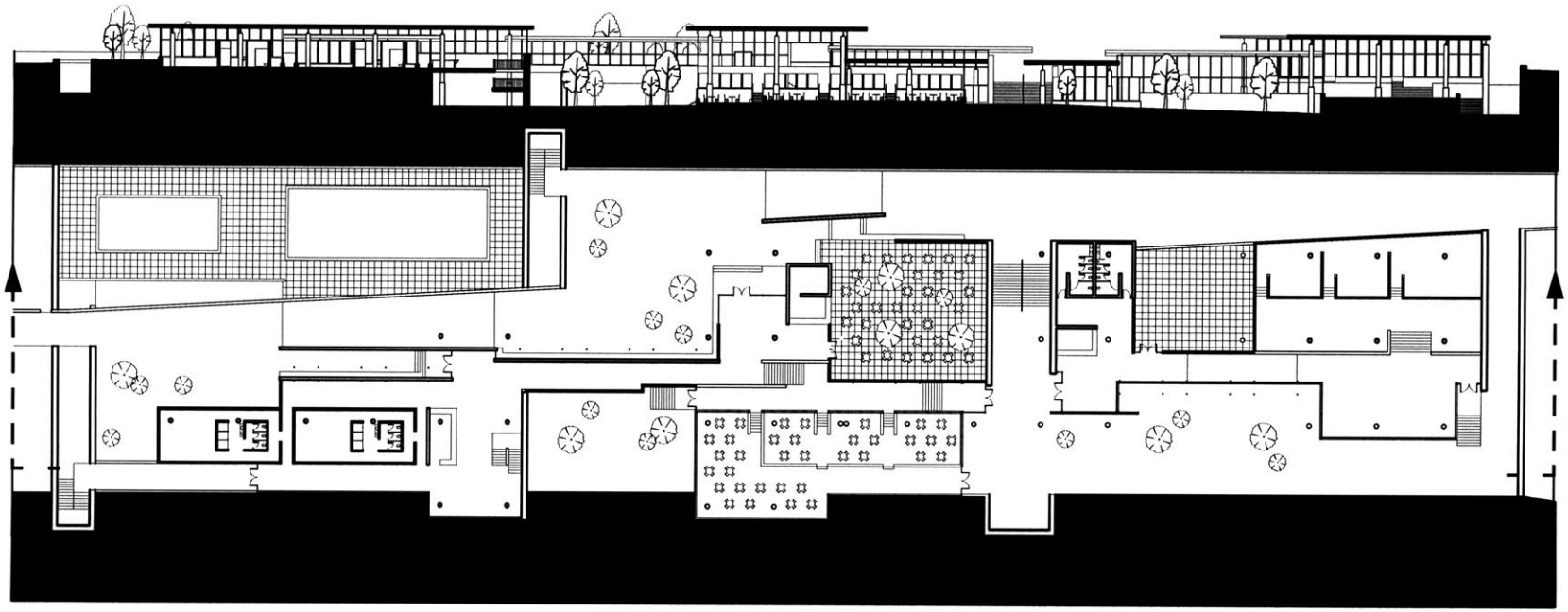

fig. 38. Longitudinal section with plan.

Endnotes & Illustration Notes

Endnotes

1. Maxx Hall, The Charles River: The People's River, (Boston: David R. Godine, Publisher, Inc., 1986) pp. 35-38.

2. Hall, pp. 46-47.

3. Hall, p. 50.

4. Hall, p. 51.

Illustration Notes

All illustrations and photographs are by the author unless noted below:

fig. 2. GA Document, Vol. 15, December 1986, p. 128.

fig. 3. Atelier 66, ed. Kennith Frampton, (New York: Rizzoli, 1985) p. 101.

fig. 4. Armando Salas Portugal, Fotografias de la arquitectura de Luis Barragan, (Barcelona: Editorial Gustavo Gili, S.A., 1992) p. 136.

fig. 5. Maxx Hall, The Charles River: The People's River, (Boston: David R. Godine, Publisher, Inc., 1986) p. 45.

fig. 6. Hall, p. 50.

fig. 13. Hall, p. 53.

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Futagawa, Yokio, Editor, GA Document, Vol. 15, December 1986.

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