The Edge of The Bridge: Redefine the Space Adjacent to Urban Infrastructure

by

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B.A. in Architecture, University of Minnesota, Minneapolis, June 1990

Submitted to the Department of Architecture in partial fulfillment of the requirements for the degree of

Master of Architecture

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 1996

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Abstract

In large urban community, infrastructures play a vital role in the daily life of the city. The contemporary development of these systems can be seen as an overlay of several networks which form the infrastructure of the city. Such developments often enhance the discontinuity and fragmentation of the urban fabric, and create isolated areas between themselves.

This thesis explores a design process that integrates the linear configuration of infrastructure as it manifests itself in a single-purposed function into a series of architectural events. An Art and Media Technology Center for Boston University will be designed at an intersection of a highway, a railroad and a bridge. The project will provide an opportunity to re-exam the nature and limits of the site, first, as an integrated part of the city and second, as a setting for human activities. Therefore, the center is not understood as an isolated building but as an architectural expression that would reinforce the notion of movement and necessity as the highway, the railroad and the bridge that form the place itself.

Thesis Supervisor: Wellington Reiter
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To my parents
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Introduction

Unlike city streets that are usually defined by the buildings they host, transportation facilities are designed according to an internal logic through the means of economy. The structures are usually single purposed and each only taking the forms of its kind. They have increasingly become contentious neighborhood intrusions. To synthesize such linear forms with the surrounding building becomes important in this design. If indeed, formal strategies and the connection of structure, access and the site are all part of architectural design, we perhaps could view infrastructure as the form which generates the buildings around it and eventually becomes part of the building.

This project aims to develop a design process in which architectural design serves as a means of discovering qualities that preexist on the site and provide suggestions for viewing the entire context in a new way. The exploration of this work will be accomplished in three steps. First, to interpret the site using infrastructures as references. Here, the references are found using the level of each structure to generate site plans. Each site plan could almost read as a building floor plan which illustrates the relationship between the structure and its surrounding landscape. An architectural reading instead of an engineering drawing would thus be created which would resemble the existing plan we often use in an architecture office.

The second step is to use an analog as a design. I have always believed that in an architecture design, a theoretical concept may be either applied to a project or derived from it. If such a process exists, a certain aspect of a building may support an architectural intuition, and later, through the development of another project, be transformed into a concept for architecture in general. When we look at Le Corbusier’s Carpenter Center for the Arts at Harvard University, with its ramp that violates the building, a genuine movement of bodies is made into an architecture solid. Or, in reverse, it is a solid that forcibly channels the movement of bodies. The form of the ramp made into a building, and developed into a driven force in the building design could become the beginning of the analogical research. As we look into the form of the ramp, we can't help link it to the form of highways or bridges.
The third, and the last step is to bring the study of the previous two cases together, in order words, it is the juxtaposition of resemblance through the process of transformations. The process seeks not the obvious but the ambiguous, not the singular unifying order, but balance through proximity of discontinuous extremes. Through the observational and reflective process, I hope that an architecture design can then emerge that allows simultaneous interpretations since it can be understood as derived from a decision that has been transformed from an ideal condition into reality.
Infrastructure vs. Architecture

Infrastructure is one of those words that suddenly appeared in everyday conversation after it was raised during the 1992 Clinton/Gore presidential campaign as an issue of great importance on the national agenda. In Boston, this word has been frequently mentioned due to the ongoing Central Artery/Third Harbor Tunnel project. In this thesis, infrastructure refers mainly to the traffic circulation structures, more specifically, highways, railroads and bridges.

In a city like Boston, the increasing demands for traffic circulation facilities such as highways and bridges have taken up more and more of the urban space. Currently, 40 percent of the city's surface is covered by highways, railroads and parking lots. If the need for infrastructure keeps growing at the current rate, not too long from now, the buildings will eventually become urban infidels between highways. On the following page, figure ground drawings are used to look at part of Boston on a citywide scale. The roadways are almost act like a network linking the city together and organizing its streets in a linear directions. The junction of major roads and on and off ramps of highways have taken up large amounts of land and also have created blocks of land where building continuity is interrupted. At the site of this project, the building figure ground appears to be blank because of the extreme condition of the Massachusetts Turnpike, the railroad tracks and the Boston University bridge intersection.
From the figure ground drawings, one can not help raise the question of whether the ground figures of roadways should be so easily separated from the building. Should infrastructures also be part of the architecture?

Architectural historian Robert Brueggman writes about infrastructure: "Thousands of stone viaducts, reservoirs, and lighthouses dating from the 19th and early 20th centuries stand as handsome reminders of America's pride in its infrastructure." But today, it's rare to find a prominent bridge or utility structure that departs even slightly from the standardized civil engineering "kit-of-parts."

The notion of infrastructures as monuments to cities seems to be lost as well as their spatial qualities which created many great buildings throughout history. Looking back in time, the Ponte Vecchio bridge, which spans the Arno River at its narrowest point, was probably built by the Romans who extended the road from Paris to Rome. It was the only bridge across the river in Florence until 1218. It was rebuilt in 1345 after the disastrous floods of 1333. There have always been shops on the Ponte Vecchio since the early 12th century. All sorts of craftsmen and tradesmen displayed their wares there until 1593, when Ferdinando I complained about the squalor and decreed that only goldsmiths and jewelers could conduct business there. The shops still line the bridge today, and people and vehicles still pass through the bridge day and night. Besides the practical use of the bridge, it stands as a synthesis of architecture, infrastructure and the city at large.
The site is framed by the Charles River on the north and Commonwealth Avenue on the south, and is located on open land where the Massachusetts Turnpike runs diagonally through it near where Storrow Drive passes through it and along the Charles River. The landing of the Boston University Bridge intersects with Commonwealth Avenue above the Massachusetts Turnpike. The site is situated in the middle of Boston University's Charles River Campus, and is located in a densely populated urban setting which represents an extreme situation where infrastructures intersect with the city.
Interpretation

Without their long, linear configuration, transportation facilities will not serve their purposes. Each infrastructure of the site not only remain its own dimensions, such as turning radius, width, height..., but also tries to avoid interruption when they have to intersect with each other. An unique balance finally achieved to form the context of the place. Here, the carefully defined plans and the angles of intersection become the key to the balance.

A series of drawings are created to detail the site as described in the introduction. The site plan is examined at each level of the infrastructure rather than as one large plan, so the site can be read as different "floors" of a "building."
Level 15+

Massachusetts Turnpike under Commonwealth Avenue.

Storrow Drive
Level 25+

Railroad crossing at the Charles River
Two railroad tracks were built as the original Boston and Albany Railroad. One of the tracks is abandoned, the other one is used once or twice a day.
Level 45+

Mid-point of Boston
University Bridge
Elevated Massachusetts Turnpike
The Carpenter Center for the Visual Arts at Harvard University, one of the last of Le Corbusier's buildings to be brought to completion in his lifetime, fits between "neo-Georgian" buildings along Quincy Street. A concrete building at the heart is a cubic volume from which curved studios shear away from one another on the diagonal. A hole is cut through by an s-shaped ramp which rises from one street and descends toward another. The Carpenter Center breaks boldly from the "neo-Georgian" setting. The layers and levels swing out and back from the grid of concrete pilotis within, making the most of the cantilevering to create interpretations of exterior and interior, as well as a sequence of spatial events linked by the ramp. The curved elements explode outwards from grids or boxes to become elusive landscapes or traffic circulation sculptures. They illustrate Le Corbusier's contention that "the quality of
... circulation is the biological discipline of the work.*

Circulation was truly the penetrating force of the design of Carpenter Center. Early sketches show the build as a curved, free-form sculpture on pilotis with the ramp passing though the third level, ending at the other side of Quincy Street. The sketches of Carpenter Center reflect Le Corbusier's urbanistic intentions rather than his early "five points of architecture."

---

Looking into a miniature museum of architecture. among the collections of Quincy Street, the s-shaped ramp, the lung-shaped 3-D curves supporting greenery, are surely a metaphor for an old urban dream in which man, machine and nature were to live in harmony.  

2. Le Corbusier Ideas and Forms, William Cortis, Phaidon Press. pp221
Analogical Study

A spatial and tectonic analysis of the Carpenter Center with the intent of exposing and further transforming those principles of order is observed in the original object based upon a structural research of its parts. The purpose of such an investigation is to further intensify the system of order found in the architectural original. Three steps are taken in this process:

First, one must study the plan documents for their implied system of order. A "system" may be thought of as a set of relationships among architectonic elements, spacing, rhythm, sequence of tectonic parts, their spatial adjacencies, their dependence or isolation from one another, serial repetition or unique occurrence, etc.

Second, select or isolate one or more of

context | form
---|---
C1 | F1
C2 | F2
C3 | F3

actual world
mental picture
formal picture of mental picture

fig. 4
these systems and begin to transform them into other possible configurations with the origin of their "parts" being recognizable.

Third, make a series of studies exposing, exaggerating these configurations, suggesting redistribution and reinvention of familiar orders.

Though design is by nature imaginative and intuitive, we can easily be mislead by the unselfconscious process. What I have done above is to improve such a situation by making an abstract picture of the design problem as described in the diagram of Christopher Alexander's book, "Notes on the Synthesis of Form." The third level in the diagram is an approximation of the study in this chapter.
Having defined the system of order, the investigation turns to context. The site is the 800 feet "void" of building along Commonwealth Avenue. Different levels of infrastructure intersect within this 800 feet and create a chaotic situation. Here, each level is separated from the other and each serves as a single-purposed traffic structure. Fundamental to this site is its identity as a multi-levels junction with plains intersecting each other. The infrastructures are the "sculpture" here which is often too large to compare with buildings. Very little "leftover" space is between these structures.
Plains

1" = 40' Model is used in the interpretation of the site.

The level of highway (15+),

railroad tracks (25+),

B.U. Bridge landing (35+)

are modeled in different color so the differences and complexity can be recognized.
A "block building" 800 feet long, almost resembles the idea of "slabs on pilotis" is superimposed on the site along Commonwealth Ave. The three levels indicate the three plains of the major infrastructures on the site.

Next the "block building" pulls away on the diagonal as if it is sheared by the highway and bridge passing though it. Plains of the building thus are shifted and rotated.

The process starts to bring the notion of use and the tectonic elements into the site.
1"=16' study model
Art.Media.Technology.Center

After defining both systems of order and notion of use in the analog and programmatic phase of my investigation of space between infrastructure line, we finally turn to the building -- A Center for Art and Media Technology at Boston University (The Bauhaus for the 21st Century).
The building is understood not as an isolated form but as an open architecture that synthesizes the infrastructure passing through it and implies a series of relationships with the city. The building is formed in three parts.

1) The lecture hall and meeting area.
Located next to the current College of Art building. The form of the auditorium creates an open space under it that almost resembles the profile of the space inside of the auditorium. Along the Commonwealth Avenue side of the lecture hall is a granite staircase that leads to the bridge level.

2) The "bridge" is the link between the lecture hall and the exhibition area at the other side of the turnpike. The bridge is formed by a trestle 14' deep with computer terminals set up along its length, a symbolic "Gateway" to
the people driving into Boston from the Massachusetts Turnpike and a backdrop for people walking along Commonwealth Avenue.

3) At the other end of the bridge is the exhibition hall ramped down into its main level from the bridge. The "hall" has two layers. The inside is a semicircular space used as a 180 degree screen theatre. When the screen opens up, it turns into a gallery with northern light coming into the space. The second layer now can be seen from the hall as a ramp leading up to the street level. The hall then opens up to the entrance under the B.U. bridge toward the other side of the campus. The experience of the place becomes a short animation, as one moves through it, and the building unfolds.
1"=16' plan and sections
1"=16' plan and sections
1"=16' plan and sections
1"=16' model
1"=16' model
1"=16' model
1"=16' model
Starts and Stops

Signs of change along state highways

By Thomas C. Palmer Jr. GLOBE STAFF

A

n any newcomer to the Bos-
ton area soon learns, there
is a reason why so many lo-
cal streets are not marked with
their monikers for blocks (or
more) at a time: If you don't know
where you are, you simply
shouldn't be there.

It's anybody's guess whether a
change in that practice says some-
thing about our evolving local
character, but some major thor-
oughfares — previously anony-
mous to passersby — are now be-
ing marked.

Both the Massachusetts High-
way Department and the Mass-
achusetts Turnpike Authority are
placing signs on bridges and over-
passes above their roadways.

"It helps drivers and the
Highway Department with inci-
dent response," said state high-
way spokeswoman Julie Vitek.

That last little bureaucratic
phrase means it helps ambulances
and fire trucks get there faster.

The turnpike will be putting
signs on 99 of the 260 bridges
over its highway. "We started last
fall on the extension," the stretch
between Route 128 and Boston,
said turnpike spokeswoman Linda
Barbo.

The 99 will be "signed" by the
end of the year, Barbo said. About
a quarter of them already are
tagged, and the whole process will
cost the authority $20,000, with
the signs being made in-house
by the maintenance department.

State workers began install-
ing signs on state highways in the
spring of 1993 and now have put
them up at 53 locations — in both
directions of course.

The Turnpike Authority is placing signs on bridges and overpasses such as this one in Brighton.

Note you citizens of South
Shore

This week.

And for at least another
week, the Central Artery south-
grope to 249 caring for stretches
of road statewide in this, its
fourth year.
Transplant, Transform, Translate

The intention behind this project is to study the current infrastructure and its relationship to the city and raise an urban proposition through the development of an architectural project. Therefore, the transformation of infrastructure into architectonic elements. The redefined "edge" thus will introduce the activities that have been missing at the junction of infrastructures, and on the other hand, to design the "architecture" of infrastructure. So that a series of architectural "events" could occur when moving along the line of highways.

To conclude the project, I would like to briefly describe the process of design in the notion of 'transplant, transform, and translate'.

Transplant is a process or result of relocation. One would assume that the elements of the transplantable would remain the same through the process.

In many cases, infrastructures are the "transplantables" of the city. The design principles are derived from their internal logic, such as the turning radius of a vehicle, the strength of materials,... Although the tectonic, spatial qualities of the adjacent structures are seldom considered during the design process, the structure will establish a relationship with its surroundings once being placed on the site. The synthesis of such elements become the key to the design of such places.

*At the core of architectural creation is the transformation of the concreteness of the real
through transparent logic into spatial order. This is not an eliminative abstraction but, rather, an attempt at the organization of the real around an intrinsic viewpoint to give it order through abstract. The starting point of an architectural problem - whether place, nature, life-style, or history - is expressed within this development into abstract.  

The starting point of this project is the transformation of infrastructure into abstract order, at the same to transform an architectural example at the same level. The superposition of the two become the ordering principle of the project. If such abstractions support our design intuition, they could become the spatial order for the place.

But what I start to realize is that the ambiguous abstract study will become valuable only when it is transformed in the test of reality, or to be translated in the language of tectonic expression.

Like language, a concept could be interpreted using different words. The concept of a spatial order could also be translated into different readings depends on the context, natural or cultural.

In this project, I like to see how far the "translation" can pursue design, and after the design has been made, to see how far it could be transformed.

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1. Tadao Ando, MOMA, New York, 1991, pp75
IMAGE CREDITS

fig.1 Boston Redevelopment Authority

fig.2 Boston University, Campus Map


Craig, Lois, *The Image of Boston*

All other illustrations by author unless otherwise noted
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Acknowledgements

I would like to thank my advisor Duke, readers Andrew and Bill for their advice and criticism.

I would like thank B.K. for reminding me “the sense of crisis” and the great help during the time.

I would also like to thank Winstone Lim for sharing the thoughts on design with me and Irene Wu, Minhao Lim for helping me with the productions.

...and the friends at N52.