Reactive architecture: Urban Recreational center

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

REACTIVE ARCHITECTURE: URBAN RECREATIONAL CENTER

A thesis submitted in partial fulfillment of the requirements for the degree of
MASTER OF ARCHITECTURE
by
Michael Figueredo

2005
To: Dean Juan Antonio Bueno  
School of Architecture  

This thesis, written by Michael Figueredo, and entitled Reactive Architecture: Urban Recreational Center, having been approved in respect to style and intellectual content, is referred to you for judgment.  

We have read this thesis and recommend that it be approved.  

Gray Read  
Henry Lares  
Monica Tiulescu, Major Professor  

Date of Defense: April 01, 2005  
The thesis of Michael Figueredo is approved.  

Dean Juan Antonio Bueno  
School of Architecture  

Dean Douglas Wartzok  
University Graduate School  

Florida International University, 2005
DEDICATION

This book is dedicated to my father Francisco a Cuban exile who was unable to complete his architectural studies. I hope he can live his dreams through my eye’s.

I also dedicate this book to my mother Myriam, and my brothers Gus, Frankie and Henry for their love and support which allowed me to achieve dreams.

Most importantly I dedicate this book to my wife Eva and sons Giancarlo and Alessandro, whom are the driving force and inspiration for my life.
ACKNOWLEDGMENTS

I wish to thank my chair Monica Tuilescu for her support and friendship throughout this process. Without her patients and understanding I would not have completed this Thesis.

I would also like to thank Henry Lares for his invaluable guidance throughout my studies at Florida International University.
ABSTRACT OF THE THESIS

REACTIVE ARCHITECTURE: URBAN RECREATIONAL CENTER

by

Michael Figueredo

Florida International University, 2005

Miami, Florida

Professor Monica Tiulescu, Major Professor

This thesis explores how architecture can be designed to react to changing conditions. In the design I address how the occupants of a building may change the exterior façade based on a change of events or on group size. This creates an architectural language on the façade for pedestrians and motorists to read those activities that are occurring.

The design project is a hybrid recreational center and plaza that is designed for the use of small groups and can be adapted for larger groups. By manipulating the ground plane I create spaces where the spectator becomes the display and the display becomes the spectator. The public spaces at the center are a casual stage for movement, while private spaces at the edge offer places for spectators to overlook events. The movements at the center and edge are displayed on the façade creating a system of information.
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INTRODUCTION

This thesis explores how architecture can be designed to react to changing conditions. In design I address how the occupants of a building may change the exterior façade based on a change of events or on group size. This creates an architectural language on the facade for spectators to read what activities are occurring.

Research is centered on analysis of buildings that change physically or visually in response to changing conditions, in particular The School of Architecture at Florida International University by Bernard Tschumi, The Milwaukee Art Museum by Santiago Calatrava, and The Centre Pompidou in Paris France, by architects Renzo Piano and Richard Rogers.

1. Calatrava’s Art Museum presents a dramatic entrance to a temporary exhibition space. The building’s structure which acts as a mobile rib system. The rib system visually extends the interior of the gallery space for events. When the roof structure is open it presents a beacon to the city announcing that an event is taking place.

2. Tschumi’s School of Architecture includes buildings that generate events and interactions. These social events redefine the courtyard simply by filling it with people. In this project the courtyard and walkways set a stage for social networking. It is in these spaces where people mingle, see each other and can be seen.

3. Piano and Rogers Centre Pompidou was designed to allow maximum interior flexibility for changing events. The long span structure allows for a column free floor plan for moveable partitions.
The School of Architecture, at Florida International University by architect Bernard Tschumi.

Figure 1 - F.I.U. School of Architecture

"Key for a new school of architecture is an ability to set a stage, a scene, a culture and to be identified with it. Its new building must contribute to making that scene and that identity."1

Tschumi's school of architecture is a young school in which a majority of its students commute from work to school. Removing the circulation from the interior of the buildings allows students that spend little time on campus to become a part of the social network.

This precise control of the circulation spaces creates a place where conversations can begin and projects can be discussed or reviewed. Whether coming from the parking lot or as an extension of the Florida International University campus the courtyard which is 60 feet by 90 feet can be accessed from any side of the building.

Upon entering the courtyard, two generators shown in red and yellow, on either side where pedestrian activity activate the courtyard. The red generator contains the lecture hall and a roof top plaza while the yellow generator contains the art gallery and reading room. The generators are not orthogonal but designed to reflect pedestrian movement. The courtyard is flanked on the north and south by the design studio and the offices, respectively, which are linear.
in form. The design studio is a loft space to allow for flexibility of events and group sizes. A curtain wall system faces 8th street to allow pedestrian and vehicular traffic to see activities within, serving as a billboard for the school.

“Our project starts from the following thesis: There are buildings that are generators of events and interactions. As much through their programs as through their special organization, they can intensify a social or cultural interface.”

Performance when analyzing architecture can be defined as activities by which movement and non-movement take place. For example a street vendor selling his good can also be described as an actor. His display can be considered his stage. The school of architecture can also be divided into degrees of performances. The landscape generators where relaxation and gatherings take place, is the major connection point to the campus. This is the pastoral or park component. The yellow generator where student and faculty meetings are held and where student work is shown and reviewed is the display or gallery component. The courtyard where social interaction and pedestrian movement are concentrated is the urban plaza component. The red generator where presentations, speeches and school assemblies are held is the performances component.

“The red, yellow, and green generators of activities are places of exuberant invention. In contrast to the linear rigors of the wing, these three volumes challenge the poetry of the right angle. Here, movement has informed form.”

---


Tschumi’s design of the pin-up rooms was to create a space where pedestrians in motion could observe the events. The pin-up rooms facing the courtyard allow for visual contact between pedestrians in the courtyard and students presenting their work.

I analyzed the pin-up room to determine if Tschumi’s design ideas were implemented upon the completion of the building. As a student I have observed that the pin-up rooms, which were designed to display and critique student work, lack a connection both with the pedestrian traffic and the courtyard. The pin-up room are rectangular with mounting wall space where students show their work. The frosted glass separating the pin-up room from the corridor is semi-transparent. It does not allow pedestrians to see what or if an event is taking place. The only way in which a pedestrian can see an event is by opening the door. The mechanical room which divides the pin-up room from the studios is also an obstacle rather than a visual activator or producer of an event. The mechanical work space serve as a clear separation of work space form presentation space.

Furthermore, I found that there was even less connection between the activities of the studios and the courtyard and circulation spaces. The pin-up rooms are undersized, in some cases too bright and inflexible. The design was to create intimate spaces while allowing visual accessibility from the corridor and...
courtyard. Clear glass would have allowed pedestrians in the
courtyard and in the corridors greater visibility to the design
reviews. Changing the frosted glass system to an operable panel
system, would allow pedestrians in the courtyard to see into
the pin-up rooms while at the same time extending the pin-up
rooms spatially into the corridor. The operable panels would
have allowed for the pedestrian to engage or take part in the
event there by creating a social activity. The observer now
becomes the participant and the participant becomes the
observer.
The gallery which according to Tschumi, was designed as a focal point for the whole university, is a space where student and faculty work can be displayed and viewed.

As illustrated by the blue lines in the image above, the gallery is mostly an enclosed space. There are openings located at the entrance and lower corner; however they offer limited views of the landscape and from outside limited view of the gallery. These store front systems are the only direct visual of information a pedestrian can see an event is taking place. The views are at an angle from the main space. This type of view impacts perception of performances and marginalizes viewers while hindering observation.

As illustrated in the image above, by extending the store front system and adding a series of operable panels, the gallery could become more accessible to pedestrians and create a new social interaction. The interior gallery concrete wall could be used as the display surface. The operable panels can be used for displaying projects and, when open, can signal that an event is taking place. The panels would also expand the gallery space to the adjacent landscape area, creating a dynamic and flexible ephemeral boundary.
Tschumi created an event-oriented central courtyard where users and visitor enter before progressing to other rooms. The courtyard is the focal point of the design. The courtyard can be accessed on all sides. Here students can interact and communicate ideas, projects can be viewed and discussed. Moving vertically or horizontally through the building, the courtyard performs as a stage where students can see one another. In my research I found that the courtyard does activate by the activities in which students engage the space.
Santiago Calatrava in 1994 designed a 143,000 square foot addition to the Milwaukee Art Museum (MAM).

Designed as an entry and temporary exhibition space, the main entrance leads into the glass enclosed 90’ high reception hall. Temperature and light also trigger the structure to change. The movable sun screen is a wing-like structure comprised of 72 steel fins, located above the reception hall rises and lowers to modify both temperature and light within the reception hall. The wing structure has fins ranging from 26 feet to 105 feet, with a span of 217 feet at the widest point. It weighs 90 tons and is wider than a Boeing 747 jetliner. The mobile rib system rises 60 meters to generate shade and extend the interior space, combining structure and sculpture. The mobile rib system also creates a visual beacon which invites the visitor to come inside. As the entrance is altered and changed, the building’s appearance signals that an event is taking place.
In the winter the wing-like structure is open to allow heat to penetrate the gallery space. In the summer the structure can be placed at several different heights for shade and cooling the gallery space. Calatrava’s design is responsive of how an environment is in a constant state of change and reconfiguration.

"Rather than just add something to the existing buildings, I also wanted to add something to the lakefront. I have therefore worked to infuse the building with a certain sensitivity to the culture of the lake - the boats, the sails and the always changing landscape". Santiago Calatrava.4

4 Alexander Tzonis, ed. The Poetics of Movement New York: Universe Pub., Inc. pg 202
The Centre Pompidou in Paris France, by architects Renzo Piano and Richard Rogers is designed to allow maximum flexibility of interior space.

The project known for its high technology was completed in 1977. The architects have designed a space that is flexible, by creating an open plaza and a long building façade that gives spectators information on interior events. The plaza side displays current events, banners and advertising for pedestrian traffic. The interior spaces are free of columns. The circulation and mechanical systems for services are located on the exterior of the building. By locating the services on the exterior the floor plan is free of structure. Creating a dynamic interior which can adapt to events and group sizes.

"It would estrange itself from the historic character of its urban context in every way imaginable: scale, height, form, and expression. Reintegration with the cityscape would rely on attractive differences rather than soft-edged harmony."\(^5\)

The project is a million square foot cultural centre consisting of four major areas: museum of modern art, a reference library, centre for industrial design, and a centre for music and acoustic research.

In my research I found the interior space to be flexible and allow for changes of events and group sizes. My project will implement interior changes based on events or group sizes; however the changes will not be limited to the interior. The exterior reacts to the change of the interior, therefore creating a relationship between interior and exterior.

\(^5\) http://www.architectureweek.com/2003/1203/building_1-2.html
Project Introduction

The site for the design project is 68 Varick Street in Manhattan, New York. A triangular parcel flanked by SOHO, Tribeca and Greenwich Village. The site was originally an industrial area that has become retail and residential and serves a large artist community. The retail which occupies the ground level has a high level of activity throughout the day. The housing is found on the upper levels above the retail spaces. I found a large separation between the ground level activities and the residents which live there. My thesis proposes a new social space where residents can become a part of the ground level activities and allow for an interaction between retail activities and residential activities.

The design project is a hybrid recreational center and plaza. It can be adapted for the use of both small and large groups. By manipulating the ground plane I create spaces where the spectator becomes the display and the display becomes the spectator. The public spaces at the center are a casual stage for movement, while private spaces at the edge offer places for spectators to observe events. The movements at the center and edge are displayed on the façade creating a system of information. The new system of information will create a new public space where social interaction become the central focus. In designing a mix of a plaza and recreational center, I will incorporate a mechanical system which will add a mobile element which will respond to interior events and climate. This change will be visual creating and altering the façade, informing the spectators of the plaza that an event or change is taking place. By incorporating operable wall the plaza will adapt to group sizes and changes of events.

Design Principles

- Design for small groups and adapt for larger groups
- Degrees of performance (Actor/Audience, Display/Gallery, Conversation/Plaza and Pastoral/Park
- Architectural language for demonstrating how the building reacts
- Edge conditions (non movement)
- Center condition (movement)

Figure 18 - 3D Site plan
For my site I have chosen 68 Varick Street in New York City. It is a dynamic site which seems to be in constant movement and change. It is located where SOHO, Tribeca and Greenwich Village diverge. A triangular parcel flanked by three major streets, 6th Avenue, Canal Street and West Broadway. Once an industrial area comprised of abandon warehouses, it has been transformed into communities where professional and families call home. I have chosen a pavilion and Community Center which will serve as an extension of these new residences.

**Major Programmatic Elements**

- **Entrance/Childcare - (4,100 sq. ft.)**
  This will be the primary threshold space for public entrance. In this area the public will access the registration desk which will access to members only. Parents will then have access to the supervised childcare facilities.

  - entrance vestibule: 1 @ 100 sq. ft.
  - front desk: 1 @ 200 sq. ft.
  - play station: 1 @ 500 sq. ft.
  - game room: 1 @ 600 sq. ft.
  - infant room: 1 @ 400 sq. ft.
  - toddler room: 1 @ 600 sq. ft.
  - teen room: 1 @ 800 sq. ft.
  - restrooms: 4 @ 400 sq. ft.
  - offices: 3 @ 500 sq. ft.

- **Fitness Center - (10,910 sq. ft.)**
  This space is for members only. Members will have access to exercise equipment, a swimming pool, aerobics and lockers.

  - aerobics/dance room: 1 @ 800 sq. ft.
  - gymnasium: 1 @ 2800 sq. ft.
  - locker rooms: 2 @ 860 sq. ft.
  - storage: 2 @ 750 sq. ft.
  - swimming pool: 1 @ 4000 sq. ft.
  - weight room: 1 @ 1700 sq. ft.

- **Wellness Center - (5,800 sq. ft.)**
  This space will serve as the primary educational facilities where classes and lectures will take place. This area will also have the dining area where healthy food alternatives will be served and eaten in the dining room or exterior terraces.

  - Lounge: 1 @ 750 sq. ft.
  - Restrooms: 2 @ 400 sq. ft.
  - Kitchen: 1 @ 200 sq. ft.
  - Concession: 1 @ 250 sq. ft.
  - senior room: 1 @ 600 sq. ft.
  - multi-purpose room: 1 @ 1500 sq. ft.
  - craft room: 1 @ 750 sq. ft.
  - computer room: 1 @ 350 sq. ft.
  - terrace: 2 @ 1000 sq. ft.
Area

**SoHo:** is the area south of Houston and north of Canal Street on the west side of Manhattan. It is famous for the galleries and shops lining its narrow streets.

**Greenwich Village:** is an area from 14th Street to Houston Street in Manhattan. In the early decades of the 20th century the word got around that The Village was the place to live "the free life" as it was then called. It is now home to Washington Square Park and NYU

**Tribeca:** short for "triangle below Canal", the area south of SoHo in Manhattan bounded by Canal on the north, Broadway on the east, Barclay on the south and the Hudson River on the west. Originally farmland, Tribeca became a central transfer point for textiles and dry goods in the mid 1800s

Location

Borough: Manhattan  
Block: 220  
Lot: 8  
Address, ZIP Code: 68 VARICK STREET, 10013  
Lot Area: 15750 sq. feet  
Lot Frontage: 149 feet  
Lot Depth: 105 feet  
Number of buildings: 0  
Year built: 0 (estimated by Dept. of Finance)  
Number of floors: 0  
Building Gross Area: 0 sq. feet  
Landuse: Vacant Land  
Zoning: Ml-5: Manufacturing  
Owner: PORT OF NY AUTH

Zoning

Ml= districts typically generate light industrial uses and often serve as a buffer zone between commercial or residential and heavier manufacturing zones. Strict performance standards apply in Ml districts. Retail and office uses are permitted.
Figure 20 - Pedestrian filtration pattern

Figure 21 - 3d Site Perspective

Figure 22 - 3D Site perspective
DESIGN DEVELOPMENT

Flexible

Figure 31 - Flexible Site Diagram

Inflexible

Figure 32 - Inflexible Site Diagram
Figure 33 - Massing Study Performance Diagram
Figure 34 - Massing study performance diagram
Figure 35 - Site Plan
Figure 36 - Birdseye Site Perspective
Figure 37 - Cross Section Thru Site
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