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Reactive architecture : Urban Recreational center

Michael Figueredo

Florida International University

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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

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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.

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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 buildings structure which acts as a mobile rib system. The rib system visually extends the interior of the galley 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.

SCHOOL OF ARCHITECTURE FLORIDA INTERNATIONAL UNIVERSITY

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.

¹ Bernard Tschumi, ed. *Event-Cities 2* London, England: The MIT Press, Inc. pg 591

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.

Figure 2 - Site plan diagram

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"*²

Performance when analyzing architecture can be defined as activities by which movement and non-movement take place. For example a street vender 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."*³

² Bernard Tschumi, ed. *Event-Cities 2* London, England: The MIT Press, Inc. pg 591

³ Bernard Tschumi, ed. *Event-Cities 2* London, England: The MIT Press, Inc. pg 593

Degrees of Performance (Diagram)

Figure 3 - Degrees of performance diagram

SCHOOL OF ARCHITECTURE PIN-UP ROOMS

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.

Figure 4 - Pin-up room frosted glass wall Figure 5 - Courtyard view of pin-up RM.

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 rooms 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 serves as a clear separation of work space from presentation space.

Figure 6 - Sketch of existing pin-up room

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.

SCHOOL OF ARCHITECTURE GALLERY

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.

Figure 7 - Sketch of existing

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

Figure 8 - Sketch of gallery with operable panels exhibits and 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.

Figure 9 - View of courtyard from yellow generator

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. I my research I found that the courtyard does activate by the activities in which students engage the space.

Figure 10 - Composite views of courtyard

MILWAUKEE ART MUSEUM

Santiago Calatrava in 1994 designed a 143,000 square foot addition to the Milwaukee Art Museum (MAM).

Figure 11 - Aerial photography of Milwaukee Art Museum

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.

Figure 12 - Diagram of light penetrating the rib system

Figure 13 - Diagram of retractable rib system

Figure 14 - Diagram of visual extension

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

Figure 15 - Diagram of accessibility and circulation

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.

Figure 16 - Elevation image of the Centre Pompidou

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

Figure 17 - Diagram of circulation
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 through out 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 were 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 were 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 facade, informing the spectators of the plaza that an event or change s 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

Program

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 were 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 were 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.

▪ Plaza - (4,500 sq. ft.)

This area will serve the private and public. It will have green and paved areas where pedestrians can experience the events taking place inside the center.

PROJECT SITE

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: M1-5: Manufacturing

Owner: PORT OF NY AUTH

Zoning

M1= 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 M1 districts. Retail and office uses are permitted.

Figure 19 - Site location map

Figure 20 - Pedestrian filtration pattern

Figure 21 - 3d Site Perspective

Figure 22 - 3D Site perspective

Figure 23 - Site transportation accessibility

Figure 25 - Site activity in 24 hours analysis

Figure 24 - Site forces diagram

Figure 26 - 3D Site activity in 24 hours analysis

Figure 27 - Site Image

Figure 28 - Site Image

Figure 29 - Site Image

Figure 30 - Additional Site Images

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

Figure 38 - Cross section thru site

Figure 39 - Street Level Perspective

Figure 40 - Street Level Perspective

Figure 41 - Street Level Perspective

Figure 42 - Street Level Perspective

Figure 43 - Camera Match Perspective

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