Sponge Logics | Rethinking Thresholds Through a Porous Mass

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Sponge Logics

RETHINKING THRESHOLDS THROUGH A POROUS MASS

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SYRAUCSE UNIVERSITY SCHOOL OF ARCHITECTURE
"But architecture is as much a **physical** construct as it is a **social** or **political** one and to understand architecture as a mere representation of the political is as problematic as to declare architecture entirely ruled by natural laws."

- Alejandro Zaera Polo in *The Politics of the Envelope*¹

"In the end, there is no useful form of exchange between the **constative** and **performative** (of the critical or projective), it's simply a choice one makes which world does one want to occupy, what game does one want to play?"

- Robert Somol in *Green Dots 101*²

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This thesis contends that the separation and distinction between the envelope and the mass in contemporary architecture is to be resisted. Architect and theorist, Greg Lynn, argues that mass “is not only the outward shape of a building; it’s also the projection of shape, plan organization, spatial and sectional type, and façade”1. This critical reevaluation of the mass, and its relationship to the interior spaces and the building’s face, is particularly pertinent to the modern construction in Jaipur, Rajasthan, India. The character of the historicist and post-modern buildings that make up Jaipur is made solely based on the applied façade. This capstone argues that this strategy does not work at the building scale because it simply becomes an act of surface creation that does not impact the space beyond. Additionally, at the urban scale, the applied façade is an even weaker strategy with rigid boundaries that does not capitalize on the inherent richness of the urban grain.

Rajput architecture, typical of Jaipur, used extravagance to project power and elevated the façade, an element of exclusion and inclusion, to reflect the social distinctions of the Kachwaha dynasty of Jaipur. Hawa Mahal, or the Palace of the Wind, is a prime example in that it serves as a screen for the court women to visually engage in the urban activities through its 953 jharokhas or windows but restricts physical interaction. This proposal learns from and updates Hawa Mahal’s contextual, literal and socio-political thickness by challenging the role of the observer and the observed. Using the ideas of massing put forth by Lynn, this capstone reimagines the potential of a new type of architecture based on ‘sponge logics’ that transcends the established Rajput thresholds, enabling a more inclusive experience, indicative of the current society of Jaipur. The Hawa Mahal, acting as a screen, privileged the observer but sponge logics challenges the relationship between the observer and observed, mirroring the changing social dynamics of contemporary Jaipur.

While a sponge can be identified autonomously, the lack of distinction between the mass, the structure and the façade make it part of an endless field condition that absorbs and transforms what is around it. The overall mass of a sponge is “an elaboration of conditions established locally” that can filtrate through the dense urban fabric of Jaipur.1 Doing so allows the street life of the city to in and the building life to filter out by sponge logics that identify the potential of a porous building to contribute to the enrichment of an already packed urban environment.

Located outside the old city walls, a newly constructed building, 72 Screens, attempts to evoke the traditional architectural techniques of Rajput architecture in a nuanced way. It leverages the concept of “jaalis” or screens to reduce heat gain in the arid climate of Jaipur. These contemporary “jaalis” are made of concrete and rest on a steel frame and allow for plants to grow within.  

However, the facade does not do enough other than re-skin the building with a complex geometry. While the intention of a performative facade is innovative, the facade’s performance does not match its predicted performance. Though this thesis does not contend a critical regionalist architecture, 72 Screens does not react to or benefit the urban context it is embedded in. As a product of extreme post-modernism, 72 Screens, fails to perform in the same way Rajput and Mughal buildings did politically, socially and environmentally. Rajput and Mughal buildings used their facade and courtyard organization to alter the interior and exterior spaces while 72 Screens only alters the exterior experience.

The World Trade Park, located outside the old city walls of Jaipur, provides services such as shopping, hotel accommodations, movie theaters, restaurants as well as offices. In short, it is a ‘city with in a city’. While the urban density of Jaipur actively uses the World Trade Park as it offers an alternative to the small retail stores synonymous to the old city, architecturally, it uses the western model of a free plan with a curtain wall. Though the curtain wall is seductive, it fails to perform environmentally. Again, it becomes an exercise in re-skinning new construction.  

Unlike 72 Screens, World Trade Park does not claim to refer to the architectural legacy of Rajput or Mughal empires which is why the political significance can be neglected. However, the environmental performance of the building cannot be ignored. Furthermore, the social impact of one of the largest mostly public buildings in the city of Jaipur cannot be overlooked either. The World Trade Park does not foster the urban context. The World Trade Park simply does not do enough to be considered as an example of a contemporary Indian architecture.
Historically, architecture has been politically charged whether it was the temple front on a villa, the neoclassical government buildings of Washington DC or the aedicular facades of havelis (mansions) across India. In The Politics of the Envelope, Alejandro Zaera Polo theorizes architecture’s physical, social and political potentials in the twenty-first century.

Besides the primary environmental function of reducing heat loss from buildings in colder climates, the envelope differentiates the inside from the outside, natural from the artificial and private from the public. Alejandro discusses four essential envelope types for hermetically sealed boxes where each type is associated with typical corresponding programs. Flat-horizontal “boxes” are used for retail, conventions and complexes while flat-vertical envelopes enclose residential and offices buildings. Spherical envelopes wrap libraries and museums and vertical envelopes cover mixed use programs.

However, the socio-economic realities of India limit the use of these hermetically sealed box buildings due to the inability of sustaining costs of mechanical systems.

2 Ibid.

BIRLA AUDITORIUM OR AMBER FORT?

Before the master plan of the city of Jaipur, the Kachawaha dynasty held residence at the capital city of Amber which was about twelve kilometers north of Jaipur. The royal residence at Amber today is recognized for its Diwan-i-Am, Diwan-i-Khaas and the Ganesh Gate. Besides the gate’s political significance, it is known for its original dyes that ornately cover the surface and have made the fort a critical symbol of the Rajput legacy.

Considering that the city of Jaipur is still deeply rooted in its history, it comes as no surprise that a ‘contemporary’ construction of Birla Auditorium replicates the Ganesh Gate. The Birla Auditorium hosts local as well as international exhibits, conferences and conventions. The extreme historicism evident in this example is actually just one of many instances found in the new city of Jaipur. Public buildings replicate royal façades while new hotels and apartment buildings apply symbols associated with havelis or mansions on their façades. Similar to the post-modernist objects in the city of Jaipur, these historicist constructions simply re-skin the building without altering what is behind it. Their impact is only surface deep, essentially masquerading an otherwise non-functional box in the climate of Rajasthan.


ENVELOPE TYPES FOR RAJASTHAN

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2 Ibid.
Facade

noun /ˈfaːsəd/.
1. the front of a building; also: any face of a building given special architectural treatment
2. a false, superficial, or artificial appearance or effect

ORIGIN
French façade, from Italian *facciata, from *faccia face, from Vulgar Latin *facia

Hawa Mahal, or the Palace of the Wind, is one of the last additions to the City Palace of Jaipur. Constructed in 1799 by Maharaja Sawai Pratap Singh who was an ardent devotee of Hinduism, the pyramidal elevation resembles the crown of Lord Krishna.¹ Lord Krishna was one of the ten reincarnations of Lord Vishnu, part of the Trimurti or ‘Three Deities’ including Lord Brahma and Lord Shiva.²

While the Hawa Mahal stands tall at fifty feet from ground, the other courtyard buildings are only two stories as seen in section. The circulation tower of ramps is separated from the Palace itself and is required to travel to higher floors. The height of the structure allows exquisite views of the city palace complex and also the entire city of Jaipur.

Though the street façade is exuberantly ornate, the interior surfaces are strikingly plain. The street façade has 953 windows or “jharokhas” to allow the court women to visually participate in the urban daily and ceremonial activities.³ Similar “jharokhas” are seen throughout the city palace.

Hotel Hawa Mahal imitates the pyramidal form but fails to adapt the performative aspect inherent to the architecture of Hawa Mahal.¹

Built 65 years after the Hawa Mahal in Jaipur, the Kota City Palace incorporated a similar feature in the women’s court without the splendor of the original.²

THE VENTURI EFFECT

Organizationally, bays on the street facade can be identified but they seem compressed and squeezed together with the iconic 953 “jharokhas” reflecting some aspects of Rajputana architecture. Though visually appealing, these windows serve an environmental function of passively cooling the Palace. As the name ‘Palace of the Wind’ suggests, the venturi effect is used to increase ventilation and cooling in the specifically arid climate of Jaipur. By constricting the size of fenestration, the air passing through experiences a decreased pressure and an increased flow. As a result, when the air passes through the opening and mixes with the higher pressured atmospheric air, the interior spaces are passively cooled.

Higher thermal mass is also used as another passive cooling strategy. While most palace and fort walls in Jaipur and surrounding region of Amber have a thickness ranging from eighteen to thirty-six inches, the walls of Hawal Mahal are barely a foot thick. Pink and red sandstone is used to construct the Hawa Mahal. The thermal mass combined with the windows forms a system that can passively cool rooms and adjoining courtyards.

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TYPES OF THICKNESS

1. MASSIVE-NESS
Dominus Winery | Napa Valley, USA | Herzog de Meuron | 1995-98

2. SYSTEMIC
Centre Pompidou | Paris, France | Rogers + Piano | 1971-77

3. ARCHITECTONIC
Arab World Institute | Paris, France | Jean Nouvel | 1987

4. PROGRAMMATIC
Bordeaux Stadium | Bordeaux, France | Herzog de Meuron | 2015

5. SUBTRACTIVE
261 Jinhua Structures | Jinhua, China | Herzog de Meuron | 2004-06

6. DE-LAMINATION
Formosa 1140 | West Hollywood, USA | Lorcan O’Herlihy Architects | 2008
MASSIVE-NESS

Situated in Napa Valley, the Dominus Winery, contrary to expectations, blends in with the environment rather than standing singularly as a monument in the vineyards.\(^1\)

The large diurnal temperature shifts of Napa Valley required specific systems to react to the unique environmental condition. The ‘rock-wall’ made of stainless steel baskets and basalt from nearby area provides just that as a large thermal mass.\(^2\) The literal thickness of the thermal mass absorbs heat during the day and releases it at night which works efficiently enough to not necessitate mechanical systems at the winery. While the environmental functions of the ‘rock-wall’ are apparent, the stacking of stones allows light to filter through the gaps, creating varying levels of transparency through a ‘masonry’ wall.\(^3\)

Herzog de Meuron take a box that works programmatically and add layers that perform environmentally and aesthetically.


\(^{3}\) Ibid.

SYSTEMIC

The chosen competition entry for Centre Pompidou radically changed the perception of museums and cultural centers from being ‘elitist’ to ‘popular’.\(^1\)

The ‘radical’ façade seemingly is not very radical at all considering it exposes the systems that allow the building to operate smoothly. The systemic components of structure, heating, cooling and ventilation of the building are exhibited though the façade with colors that identify different types of elements.\(^2\)

Also, probably the most iconic aspect of the façade is the escalator that can be used even by non-museum goers and provides a view of the entire city. The escalator allows visitors to inhabit the façade and experience the complex differently than the plaza in front of the museum. Not only does the façade give an insight to the building, it also makes the interior space more flexible. The result is a monumental icon of ‘anti-monumentalism’.\(^3\)


\(^{2}\) Ibid.

\(^{3}\) Ibid.
ARCHITECTONIC

Built collaboratively by France and nineteen Arab countries, the Arab World Institute in Paris serves as a cultural institution rather than a political one and its architecture is reflective of that. Two primary façade systems are employed on the north and the south façades. While the north curved façade speaks to the western culture, the south façade evokes older eastern architectural conditions. The architectonics of the southern façade modulate the mechanical lenses depending on the natural light. The resulting geometry of these “camera-like diaphragms” imitates traditional mashabriyas/moucharabiehs/latticework. Though the material, technology and context of this screen surface vary immensely, similar effects of light and shadow visually thicken the façade and its effects.

These automatically governed apertures of the façade do not serve the same function they did traditionally of maintaining privacy and allowing a cool breeze. However, they effectively evoke eastern traditions in western context without completely being a nostalgic representation of the traditional architecture.


PROGRAMMATIC

The form of the Bordeaux stadium can be divided into a plinth, bowl and ribbon. However, the spatial experience blurs the distinction between these three elements as the white temple-like columns are the residue of the traditionally massive form of stadiums. The bowl serves the primary function for hosting sporting and musical events while the ribbon inhabits retail and service spaces. The plinth encloses more private functions of the stadium. The element that ties these three disparate forms are the stairs. Specifically in section, the stairs allow one to inhabit all three elements at once and thus diminish the distinction between inside and outside. The question then remains what is the façade and what is the “space”? Programmatic and formal integration create a building that is either ‘all façade’ or ‘all space’. It can be argued that the skin of the building is removed. However, what about the columns that line the edge? Does a façade have to be continuous or can it be permeable? The fact that the question of the façade can be debated effectively shows that the interior and exterior are not distinguishable.

SUBTRACTIVE

An architectural-landscape park in Jinhua, China includes pavilions from various local and global participants. One of these pavilions is designed by Herzog de Meuron.

Initially conceived as a geometric pattern extruded three dimensionally, the piece of sculptural architecture dissolves from a cube. Using modern computer programming, a habitable space is carved from a visually monolithic concrete cube. Though habitable, the sculpture does not have an interior or exterior. It simply disintegrates.

Again, the question of the façade calls attention. Firstly, the singular material and uniform thickness of surfaces makes it difficult to differentiate between the internal and external conditions. Secondly, the not completely distinguishable geometric pattern makes the sculpture look organic. Considering the context of a park and its public function, does this pavilion require a façade? If so, does it have a façade? Because the interior of the pavilion appears to be interwoven, it can be said that the disintegrative subtractive surface is a façade.

DE-LAMINATION

Consisting of eleven housing units, the Formosa building modifies the courtyard housing typology to prioritize common public space. Located in the West Hollywood region of Los Angeles, the building attempts to cater to the city wide problem of insufficient public space. By moving the courtyard space to all sides of the exterior, the public space becomes a continuous thread throughout the complex. This public space is created from layers of screens, thermal separation and circulation space.

These layers of the façade facilitate cross ventilation through the units and extend public space to not only the residents but also to the other residents of West Hollywood. Extrusions from the façades caused by stacking residential units allow pockets of space within the façade. Essentially, building then has a street front, a circulation corridor and the thermal barrier which simultaneously can be argued result in one thick façade of environmental function, activity and aesthetic appeal. The thickness results from multiple thin layers that begin the conversation of what is in the poche.

Recreated and Modified from *Collage City* by Colin Rowe

Principles of Vastu Shastra used for the Planning of Jaipur

- Block Printing
- Blue Pottery
- Stone Carving
- Handmade Paper
- Textile Weaving
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## BIBLIOGRAPHY
noun | \(\text{span}\)

SPONGE

1. a piece of light natural or artificial material that becomes soft when it is wet, is able to take in and hold liquid, and is used for washing or cleaning

2. an elastic porous mass of interlacing horny fibers that forms the internal skeleton of various marine animals (phylum Porifera) and is able when wetted to absorb water

3. any of a phylum (Porifera) of aquatic chiefly marine simple invertebrate animals that have a double-walled body of loosely aggregated cells with a skeleton supported by spicules or spongian and are filter feeders that are sessile as adults

ORIGIN
Middle English, from Old English, from Latin spongia, from Greek ¹

FIRST KNOWN USE OF SPONGE

SWISS CHEESE
Top: Process Photograph #1
Below: Process Photograph #2
Photos by Jason Foggie

HYPER GRID
Laser-Cut Chipboard

SCRAP PILE
Scraps + Spray Paint

FOUND OBJECT
Blue Foam

HONEYCOMB
Chipboard + Spray Paint

SWISS CHEESE
MDF Mold, Balloons + Plaster

EXTRUDED VOID
Blue Foam, Dowels + Spray Paint
Photos by Jason Foggie
THE SPONGE CRITERIA

1. DENSITY
   Programmatic Density

2. VARIATION
   Spatial Complexity

3. INTERCONNECTIVITY
   Result of Programmatic Density + Spatial Complexity
Step 1: Glue balloons to bowl. Allow the glue to dry completely.

Step 2: Pour plaster on the balloons. Place a plastic bowl over the balloon and attach it with rubber bands. Allow the plaster to dry completely.

Step 3: Pop the balloons. The plaster will remain intact and be attached to the bowl.

Step 4: Detach the casting from the bowl. You will have a mold of the balloons.

**Note:** This process can be repeated to create various shapes and sizes of molds.

**Images:**
- Natural Sponge #1
- Natural Sponge #2
- Artificial Sponge #1
- Pore Size + Density
- Depth Analysis
- Schematic Plan #1
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COMBINATION ITERATION #1

Inverse Combination Iteration #1

Iteration #1 Moves

Elevational + Sectional Studies
Combination Iteration #2

Inverse Combination Iteration #2

Iteration #2 Moves

Elevational + Sectional Studies
COMBINATION ITERATION #4
Below: 3D Powder Print

Inverse Combination Iteration #4
Iteration #4 Moves

Elevational + Sectional Studies
PROGRAM DISTRIBUTION

PRIMARY CIRCULATION

DRY

PERMANENT DISPLAY 6000 SQFT

WORKSHOPS 8000 SQFT

INDOOR AUDITORIUMS 5000 SQFT

ENTRANCE 1500 SQFT

ARCHIVES 3500 SQFT

COFFEE SHOP 1500 SQFT

AMPHITHEATER 6000 SQFT

RETAIL

SOAKED 34,500 SQFT
SITE MODEL: Museum Board + 3D Powder Print

Photo by Matthew Trulli
SITE MODEL: Museum Board + 3D Powder Print


Photos by Matthew Trulli
ARCH EXTRUSION
3D MakerBot Print

SWISS CHEESE
Plaster+Balloons

ARCH EXTRUSION
3D MakerBot Print

EGG-SHELLED
MDF, Plaster+Balloons

Photos by Mook Waralee Kaekwoon + Anuradha Desai
WORKS CITED


IMAGES


Engravings of microscopic diatoms (detail) by Ernst Haeckel. Kunstformen der Natur (1904), plate 84: Diatomeae.


ACKNOWLEDGMENTS

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While in Mumbai, I had the opportunity to speak with architect and professor, Pinkish Shah, who guided me in the initial research phase. During my stay in Jaipur, I had the pleasure of meeting with another professor and architect, Gaurav Mathur, who aided my on site research and analysis. I even had the chance to visit three institutions: Poornima University, Aayojan School of Architecture and Arch Academy of Design where I received guidance from Mr. Bhawani Shankar and Mr. and Mrs. Rathore. I would like to specifically thank Pooja Madam for giving me permission to use base digital drawings of the city.

Also, during my time in Jaipur, I was able to go to artisan workshops to see how the art and crafts was produced. I am extremely grateful that the local artisans permitted me into their workshops and let me see how they functioned. My trip to Rajasthan has inherently enriched my educational experience.

WORKS CITED


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Rajput architecture, typical of Jaipur, used extravagance to project power to the people and the other dominant political entity, the Mughal Empire. It elevated the façade, an element of exclusion and inclusion, to reflect the social distinctions of the Kachwaha dynasty of Jaipur. Hawa Mahal, or the Palace of the Wind, is a prime example in that it serves as a screen for the court women to visually engage in the urban activities through its 953 jharokhas or windows but restricts physical interaction. This thesis learns from and updates Hawa Mahal’s conceptual, literal and socio-political thickness by challenging the role of the observer and the observed. Using the ideas of massing put forth by Lynn, this thesis reimagines the potential of a new type of architecture based on ‘sponge logics’ that transcends the established Rajput thresholds, enabling a more inclusive experience, indicative of the current society of Jaipur. The Hawa Mahal, acting as a screen, privileged the observer but sponge logics challenges the relationship between the observer and observed, mirroring the changing social dynamics of contemporary Jaipur.

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