Barrier and Threshold in Architecture

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ABSTRACT

This thesis explores the role of barrier and threshold as a form of differentiation between objects and situations. Building elements such as façade, structure, and space become the means by which to distinguish between separate parts, functions, and experiences. Sited in downtown Washington D.C. the proposed office building becomes the permeable barrier between street and lawn. Within the building there is contrasting differentiation between service space and occupiable office space through the role of different building parts that make up an office building.
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Things We Notice
As occupants of a diverse world, we tend to categorize the things we see in order to understand them. We use associations to distinguish similarities and differences and are able to recognize when something is out of place or missing. Our eye is naturally drawn to the objects that seem not to belong to the group they occupy, resulting in emphasis of the objects. This provokes curiosity as to the object’s character, placement, and role in the given environment.
One of the main visual and spatial indicators that allow us to determine where an object should be is a boundary. It defines the edge of a region and allows a set of similar objects to be contained into an individual unit; giving them a place to belong. These boundaries also provide a barrier between other groups of objects or situations; creating a clear distinction of where one ends and another begins. For instance, think of a sea wall in a harbor. On one side is the land that is solid, walkable, and has a defined shape, while on the other side of the wall is an environment that is fluid, and dynamic. This barrier defines a clear boundary between the two conditions and allows us to understand that land belongs to this side, and water to that side.

(Fig. 1.3)
Differentiation also plays an important role in the world of architecture. For example, what defines the inside from the outside of a building is its enclosure that acts as a barrier between the two conditions. The inside of the building is associated with characteristics such as refined surfaces or temperate environments, while the outside condition tends to be more governed by its direct exposure and resistance to weather and climate. The physical response gives specific form to objects in each situation, which in turn become indicators of place. The building envelope becomes the barrier between these two places telling us whether we are inside or outside.

The general recognition of typified environments offers opportunities to place an object generally belonging to one environment in the other. The result is a kind of contrast between the object and its surroundings that contributes to an emphasis and greater consideration of the object.
It is necessary to understand both sides of a barrier in order to draw a comparison. Thresholds within a barrier allow us to bridge the gap between two distinct conditions while informing us where one exists and the other exists. The threshold also allows access to both conditions from a neutral standpoint between the two environments. In this case the threshold is envisioned as an interstitial place that is in both conditions and neither condition at the same time. It allows the person to exist on the edge of both situations and experience them as two individual, complete objects.

Occupation of a Threshold
Boundary and Threshold in an Urban Environment
The L’Enfant plan of Washington D.C. differentiates between radial movement and orthogonal movement in the street grid. Nodes within the city are emphasized and rise in hierarchy over the existing traffic grid with their radial connections. This clear differentiation calls attention to the radial connections and provokes a consideration of their overall role within the city.
What defines the nodes within the urban landscape is the presence of significant buildings and their facades. Their presence creates vertical boundaries along the sides of the corridor; giving a directionality and a spatial edge to the street.
Along the New York Avenue portion of the site, the street corridor lacks a vertical boundary. An argument to reinforce the existing street pattern with a building façade can be made.
Shadow Projection of City Blocks

Reinforcement of Vertical Boundary Along New York Ave.
The wide open space of the site offers a unique contrast to the densely packed network of offices and civic buildings that occupy the area. It has the opportunity to be different from the area around it and can potentially become a place where people gather for recreation and relaxation during the day. The proposal responds directly to the L’Enfant plan by establishing a strong façade along New York Avenue, bounding a kind of urban public lawn. This park-like space responds to the hardscaped orthogonal conditions of the surrounding city with verdant grounds and curvilinear geometry, articulating the southern sloping contours. The existence of these two environments in such close proximity to one another facilitates the need for a barrier to separate the two conditions and define where one ends and the other begins.
The lawn is a raised plinth bounded by a wall along the edges of the site. The wall becomes the articulated threshold and strong barrier that allows the street and lawn to exist next to one another. On the south side of the site, the transition between city and lawn is more gradual based on the absence of the wall, blurring the distinction between where city ends and lawn begins.
Just as the L’Enfant plan promotes the radial street corridors over the orthogonal grid, so too is a differentiation made between parts of the barrier that bound the site. The orthogonal, cardinally oriented city grid to the east, south, and west of the site suggest a different response than New York Avenue’s grand presence. This portion of the boundary is emphasized through an increase in scale, allowing it to become an inhabitable zone between city and lawn.
Approaching the Boundary
The threshold between the lawn and street has two distinct faces. One face is associated with the street and the other face is associated with the lawn. This allows the two facades to belong to either street or lawn and informs the pedestrian from which side of the building he is entering. Openings are placed in the façade to indicate areas of permeability. The street façade with its heavy concrete face cast in shadow is framing openings filled with light, emphasizing their locations.
The opposite occurs on the façade belonging to the lawn where dark openings are located in a predominantly light surface. In each case the openings become emphasized.
When entering from New York Avenue, the pedestrian is confronted with a thick concrete load bearing wall. This portion of the office building houses vertical movement of mechanical systems and vertical transportation. The openings on this face appear as punched out subtractions from the larger mass. Opacity and heaviness of the face are dominant with occasional glimpses of the lawn and its face on the other side of the threshold.
The smaller ground floor openings in the concrete face are entrances to shops and store fronts along the street. These openings respond more to the pedestrian scale of the street, indicating areas of permeation of the concrete wall, not necessarily the entire building.
The face given to the lawn is characterized by lightness, and transparency. Constructed of steel and glass, it seems to hover over the ground beneath it. This portion of the building houses the occupiable work space of the office; a structure assembled from individual pieces. Glimpses of the condition on the other side of the threshold are also present. The ability to see the other condition is important to support a contrast between the two different faces.
The end condition highlights the two distinct parts of the building. One part belonging to the street and the other part belonging to the lawn show themselves clearly in their overlap. The heavy part and the light part suggest principal habitation and use.
The northeast corner condition plays an important role in establishing the relationship between building parts. Differences in construction, form, and character are emphasized at this highly active pedestrian zone.
Differentiation with Structure
Two structural systems support the office building. The first, facing New York Avenue, is a concrete load bearing building. This part of the project relies mostly on compression with smaller spans. The mechanical systems and vertical transportation belong to this mass, becoming the servant space for the building.

The second structural system is made of steel. This system houses the offices. The spanning ability of steel allows this part of the building to be open with the opportunity for light and views to penetrate the spaces.
What allows these uninhibited open spaces within the office to exist is the use of tension members supporting the floors. The ability of steel in tension to carry large loads with a relatively small cross sectional area of material minimizes the presence of vertical members in the space.

The tension members are hung from trusses in the roof that span between the thick concrete wall and a 16’ deep steel Vierendeel truss that runs the length of the building. The Vierendeel truss is located outside of the thermal envelope and is supported by 36” thick concrete columns spaced 75’ apart. A clear differentiation is formed between compression members and tension members within the building.
The height of the Vierendeel truss is enough that occupants can walk through the openings. Located on the accessible roof of the building, the truss becomes a dominant part of the structure that can be seen, touched, and to an extent, occupied. These experiences are also present in the load bearing concrete wall where characteristics like compression, heaviness, and opacity can be perceived. The two structures offer a dynamic contrast between two building systems that while being very different in nature, interact together to support the building.
The supports for the Vierendeel truss are the bold, thick concrete columns found inside the steel and glass portion of the building. A sharp contrast arises between the delicately thin tension members and the heavy concrete columns that run vertically through the offices.
The open office spaces defined by the tension structure offer natural lighting and unrestricted movement. This spatial quality contrasts with the space within the concrete wall. Defined by narrow, dimly lit, directional corridors, the concrete wall emphasizes its role as a servant space devoted to movement. The interior spaces begin to inform the overall organization of the building through their contrasting spatial qualities.
About 70% of the office space is devoted to public work area, while approximately 30% is devoted to private work space. Circulation through the offices occurs along the side adjacent to the large concrete wall, just as circulation within the concrete wall happens along the side adjacent to the steel and glass box. The spatial separation between the two structures provides a threshold that lets each part become a distinct architectural object. Another threshold defines the area of circulation from the work areas. Rooms for storage and utility without access to natural light or views are located towards the center of the space. In this organization, these rooms become the permeable barrier between areas of work and the areas of movement.
The public work space has access to natural light and views to the outside. The more private work areas have restricted views but ample light is still available. The suspended multi-layer curtain wall on the lawn side of the building becomes the mediator for the interior light quality of the spaces. The organization of the interior office environment informs the placement of panels in the façade by having a greater number of translucent panels adjacent to private work areas than public work areas.
A layer of curtain wall glass thermally encloses the offices while the outer face of the building is constructed of an 8’ by 8’ grid of suspended cables hung from the trusses on the roof. Translucent panels and aluminum louvers are attached at the corners to the cable system. The variation between translucent panels, aluminum louvers, and open spaces create a diverse surface that can manipulate the light and views that are available in the interior spaces of the office. The façade also carries a sense of delicacy due to thin tensioned members. These characteristics are different from the heavy, opaque concrete face along New York Avenue. This contrast between the facades acknowledges the separate boundary conditions for the street and lawn.
Although the tension façade is made of separated pieces, at a larger scale the assortment of panels and louvers gives the building an appearance of one large object floating beside the concrete wall. This in turn gives a sense of wholeness to the served portion of the building and allows it to be seen as an individual piece that helps define the threshold between street and lawn.
The four foot area between the tension façade and the curtain wall becomes another occupiable space. It is a place where workers can go outside to take a break or relax. More importantly, it acts as a threshold between the outside lawn and the inside of the building; a transition space allowing physical and visual movement from one condition to the other.
Threshold within a Building: The Space Between
A threshold facilitates the change from one environment to another. When the threshold can be occupied, it allows the simultaneous observation of the two environments it separates. The differences in the two conditions become clear and attention is drawn towards characteristics present in one but not the other.
The atrium space between the concrete wall and the steel and glass box creates a separation between the two pieces of the building. In a way the air space becomes the barrier that allows the two structures to exist as individual, distinct objects. Their proximity and spatial relationship generate a comparison between the two structures with very different characteristics. Places where the atrium is bridged become important moments by creating the occupiable thresholds that connect the two pieces from which their differences can be observed.
The two storey sky lobbies that are visible on the facades of the building are the main platforms that bridge the atrium space. These areas are given dominance over both the concrete wall and the glass box by creating an uninterrupted space that visually and spatially connects lawn and street. The spaces primarily act as openings that have been “punched” through both structures, designating an area that belongs to neither.
Originally conceived as open air sky lobbies, wind tunnel testing indicated that high wind velocities would make these “punch-throughs” uninhabitable. In order to allow occupation of these spaces, it is necessary to enclose them within the thermal envelope of the building.
The openings at the ends of the “punch-throughs” are made of transparent glass with little mullion presence while the floor is made of wood, a material independent of concrete, steel or glass. These voids allow sunlight to penetrate deep into the building while visually and spatially connecting the two different environments.
As additional cross-overs between the two building parts, bridges located on both ends of the building provide egress and movement of people and mechanical systems from one part to the other. Unlike the sky lobbies, these thresholds between the concrete piece and the glass piece are not allowed to penetrate the entire building. However, emphasis is still given to these areas by reversing the structural patterns of the building. Instead of the ends of the crosswalks being supported by compression members in the concrete mass, they are supported by steel spanning members. Accordingly, the ends of the crosswalks housed in the steel structure are supported by a concrete wall. The structural reversal highlights the mechanical cross-overs and establishes an organization to the building.
In these mechanical “cross-over” sections, the inner workings of the building become exposed. Belonging to neither concrete wall nor glass box, these skeletal structures expose the mechanical systems and necessary egress for the building. Serving as vertical boundaries for the thermal envelope of the atrium, these pieces are meant not to divert attention away from the concrete structure or steel and glass structure. Unlike the sky lobbies, these pieces are designed to dissolve into the background and blur the distinction between the inside and outside of the atrium, making it seem like open, unbound space separating the two main pieces of the building.
Conclusions

Thresholds are an important moment in the transition from one environment to another. They provide permeation through barriers that distinguish two separate things as individual conditions. From within these transition spaces, a comparison can be made between the characteristics of either side. The differences provoke an emphasis that contributes to the understanding of each environment.

In architecture differentiation is a way to provide clarity and identity. Differentiation within a building informs movement, habitation, and interaction. Façades, structures, and spaces when carefully and responsively articulated, give organization to a place and define the framework in which things belong.
Works Cited

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Fig 1.1

Fig 1.2

Fig 1.3

Fig 2.1