A Study of Boundaries and Transitions: A Nature Center in West Virginia

by

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This thesis explores the boundaries and transitions within architecture. What makes a solid boundary? And what blurs the lines of transition in between? Possibilities were explored and limits pushed through the studying of elements such as thickness, transparency, material, texture, and light. The result is an architectural space in which a person can experience nature, while being separate from it. The building becomes a transition into nature while also a part of the landscape. The intent of this thesis is to bring the site together with the thesis idea and program in a cohesive way.
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This thesis is a proposition for a nature center through the studies of boundaries and transitions. The idea of a nature center is a place for people to learn about their surroundings. It acts as a bridge between two worlds; the human-developed world, and the unbuilt world. Because of the already existing boundary between these two extremes, maintaining a solid boundary was important to the architectural proposition. Boundaries can be a part of architecture by limiting access or sight, or drawing definite lines separating two things. In contrast, a blurred transition also became part of the proposition. Transitions can be a part of architecture by merging two or more different things. This intention, combined with the program, created a compromise between man and nature; a place where one can appreciate and be educated on nature.
THESIS

Boundaries:
indications of fixed limits or extents

As the slope is a boundary limiting the river’s width... such is the building a boundary limiting one’s access to the forest environment.

Transitions:
movements, or evolutions from one extreme to another

As the slope is a transition from the mountain to the river... such is the building a transition from the built to the unbuilt.
Understanding and appreciating nature is absolutely crucial to our future. Society must learn to exist peacefully and respectfully with nature without destroying it. The program of this thesis is a Nature Center in north-central West Virginia. Because West Virginia is a state vastly covered in forest, it is also an optimal place in which to experience the natural surroundings. This nature center would hopefully serve as a transitional building into the unbuilt environment.
The site is located in West Virginia, in the Cheat River Canyon area. West Virginia is the only state located entirely within Appalachia. It is densely forested, much of it untouched, making it an excellent location to experience nature. The site is also easily accessible from two major highways.
SITE

The Cheat River Canyon is located in North-central West Virginia and extends between the towns of Albright and Morgantown. Just outside of Morgantown, it forms Cheat Lake. The canyon runs for the full ten miles between the two towns.

The Cheat River attracts many because of its whitewater. It is a destination for many rafters and kayakers, with its class IV and V rapids. It is said that the Cheat River’s name originated from the white water where it has cheated many people out of their lives.

The difference in elevation from the river to the canyon’s rim is as much as 1,200 feet in some areas. This gives a spectacular view from the top, and a prime location for the building site.

After flowing out of Cheat Lake, the river then joins with the Monongahela River north of Morgantown. The Monongahela River eventually joins with the Ohio River in Pittsburgh, which is a part of the Mississippi River watershed.
The building site is located along the rim of the canyon, south of Big Sandy Creek and Conner Run. While the existing contours are quite steep, they were pushed back further and ever more steeply to make space for the building and provide a dramatic slope.
WALLS IN PLAN

The most obvious boundary condition in this project is the presence of the thick and heavy limestone walls. One of the ways they act as a boundary is in plan. They extend beyond the enclosure of the building, and even into the mountain side. Their massive presence draws a person through the building in the direction of the walls. They exist only in the north-south direction. Their directional and extending properties are what distinguish it as a solid boundary.
WALL SECTIONS

The second way the walls act as a boundary are in their enclosing properties. As a solid and unyielding boundary, they protect the interior of the building. They define the inside from the outside.

The walls are constructed to form a cavity wall. The total thickness of the wall is 2 feet. The walls forming a thermal barrier condition are constructed using two 8 inch thick blocks, with four inches of insulation and four inches of airspace. The other walls are constructed with two 10 inch blocks with a four inch cavity.

On the interior of the building there are several doorways and openings through the wall. In these instances, a lintel is used to span over the opening. There are two lintel sizes, a six-foot and an eight-foot.

The end condition of the walls is made using one or two 12-inch thick blocks, depending on the alternating run. The diagram to the left shows the layout of the stones, each situation for both wall sections, and all the sizes of stone necessary to complete the walls.
TERRAIN

Along the gradually rising mountain side, an area where the countours become . The steep slope creates a “wall”. Its presence is especially known in the courtyard area, where the steep terrain creates a courtyard between the two walls.
ROOF

The roof acts as a boundary between the inside and the outside of the building, horizontally. The walls extend vertically beyond their boundary. The roof of the building is at two heights. In the main part of the building, the roof is a height of 26 feet. This allows for the mezzanine level, and also a dramatic ceiling height. The ceiling under the mezzanine is 12 feet, and the roof in the wing of the building is 16 feet high. The changing ceiling heights defines the different areas of the building. The roof is also secondary to the walls, as they extend beyond the limit of the roof.
STRUCTURE

The primary structure of the building runs in the same direction as the walls. This allows for spaces for the reveals along the walls, as well as the parallel presence of the joists. It was important to be consistent with the thesis idea of boundaries, even though the structure is hidden within the drop ceiling. The structure becomes a boundary because it separates the floor from the roof. It also supports the building laterally.

I-beams are located at either end of the walls. They are hefty in size to support the long span of the joists.

The joists in the main part of the building are 44LH09, using ASD tables for span length. (page 67, Vulcraft steel joist & joist girder manual) The depth is 44 inches.

On the main part of the building, the I-beams chosen are W30x90. The depth is 29.5 inches and weighs 90 lbs per linear foot. While this beam is well over the minimum requirements for moment capacity and moment of inertia, it was chosen for the depth. As the depth of the girder approaches the depth of the joist, it becomes an optimal design. The difference between the joist depth and beam depth is 6 inches.

The joists in the wing of the building are 20LH02, using ASD tables for span length. (page 65, Vulcraft steel joist & joist girder manual) The depth is 20 inches.

In the wing part of the building, the I-beams chosen are W14x34. The depth is 14 inches and weighs 34 lbs per linear foot. The difference between the joist depth and beam depth is 2 inches.
The remaining portion of the building's structure uses 20LH02 joists for consistency, since it is at the same roof height of the wing section. The joists span between the walls, since these walls are not lit by the reveals of the roof. Two W14x34 beams span in the longest area in the office space.

The steel girders are connected to the load bearing limestone cavity walls by using steel angles and anchor bolts. The area where the girders are bolted are also filled with concrete within the cavity space. This causes the wall to act as a column at these locations.

The structures supports the boundary condition simply by its nature of protecting and holding up the building.
VEGETATION

The existing flora of the site is a mixed hardwood forest also consisting of dense rhododendron and mountain laurel. After the construction of the site, the native trees and plants will be replanted, with a few planned landscaping schemes;

First, five flowering dogwood trees will be planted at the front entrance of the parking lot; each in line with one of the stone walls. This marks a boundary into the site, and also a hint of what is ahead.

Along the rim of the steep slope, rhododendron and mountain laurel will be planted to prevent people from attempting to walk to the edge, and also to hide a direct view of the overlook from the top. These densely planted bushes are also excellent for holding to the earth on steep slopes.

Rhododendron and mountain laurel will also be planted in front of the building, past the terrace. Again, this prevents people from walking off the edge, while providing greenery.

The rest of the replanting will not be “planned” per se, but planted to fill in the open spaces around the building from construction, and eventually the growth will join in with the surrounding forest.
MEZZANINE

The building site not only has boundaries in the horizontal direction, but also in the vertical. Within the building, the mezzanine acts as a boundary within the larger space. The columns supporting it provide a boundary and signify what is above.
TRANSITIONS
WALLS

The walls of the building are also a part of the transition. Because their origin is within the side of the mountain, they are a part of the landscape as they emerge from the steep terrain. The walls become an extension of the landscape.
The conditions of light were studied in the building. Because the depth of the roof is almost four feet, the width of the reveal needed to be studied for the ultimate effect. Of the various widths tested, the six inch reveal provided a light wash while also bringing out the texture of the wall. The light spilling from the reveal draws the eye upward. It not only gives the walls more presence, but it also gives a transition between the outside and the inside. The light helps to blend the transition vertically - blurring the height of the wall with the sky.
WALLS - JOINTS

The joints in the walls between the stones are of two different depths. The vertical depth is 1/8 of an inch, and the horizontal is 1/2 inch. When the light spills over the wall from the reveals in the roof, it creates dramatic shadows along the horizontal joints. Upon entering the building from the elevator, this would be very obvious. The joint shadows would draw your eye toward the opening on the opposite side of the building, toward the outside. The wall acts to carry you in transition from the inside to the outside.
The first planned element of the site is the parking lot. The first thing one would approach are the five trees, marking the five massive walls on the other side of the hill. The next element is the pavement of the parking lot. Between each paver is earth, allowing grass to grow between. This is an even more slight transition into the built world. On the side of the parking lot, is a sidewalk and ramp, which directs one toward the entrance of the building.
At the end of the sidewalk ramp, one arrives at the roof of the building. The long and massive walls are extended from the earth towards a spectacular view. Because of the length of the building, one must get closer to the edge to see the view fully. The end of the ramp is also the location of a hydraulic elevator. Stepping onto the platform, the elevator moves down to the main floor of the building. Because of the unique way of entering the building, the approach and experience remain in one’s mind as a peaceful transition into the built environment.
The windows in the building are constructed using glass mullions. This makes the transition from inside to outside as smooth as possible, as the presence of the glass almost disappears. The only thing one sees when looking out is the breathtaking scenery. This is opposed to framed traditional window mullions.
In the conference/event room of the building, there exists a unique condition. This is the only place in the building that has glass windows, a transition zone, on two opposite sides. In the front of the room, exists the large window to the view overlooking the river. In the back of the room is a glass wall with pivoting panels that act as doors. When in this space, it is possible to open all of the panels, further blurring the transition to the outside. The courtyard on the other side, formed between the two stone walls and the terrain of the hillside, and the conference room join to become one space.
The effect of the building at night is quite different from during the day, with a lack of light. The reveals do not light up the walls, and the light from outside does not provide a picture frame for the eye to follow. The internal parts of the building must play its part in transitions.

The ceiling is a drop system made of thin frosted glass. It is lit from inside the ceiling and creates a transluscent glow. The effect is a floating and glowing ceiling. The mezzanine floor is also lit this way. This contrasts greatly with the building’s massive walls, which appear especially heavy and dark at night.
A PLACE FOR SITTING

The final transition from the built to the unbuilt lies in the outdoor area on the terrace. The walls are extended after a small break of seven feet. The extensions are a height of 30 inches; perfect for climbing to sit on and enjoying the view. The extensions are a transition of the wall’s disappearance into the wild. They are also a transition of the presence of the walls from being a massive presence to becoming something at the human scale. One can sit on, climb over and look across the lower walls and see what the nature center is all about; the breathtaking landscape and scenery of West Virginia.
CONCLUSION: THE FINAL DRAWINGS
SITE PLAN AND ELEVATIONS
DIMENSIONS

100'-0"

134'-0"

96'-0"

139'-0"

100'-0"
SITE SECTION
DIMENSIONS

134'-0"

14'-0"
GROUND FLOOR PLAN
NORTH-SOUTH SECTIONS
NORTH-SOUTH SECTIONS
DIMENSIONS

Section D-D

Section C-C
EAST-WEST SECTIONS
EAST-WEST SECTIONS
DIMENSIONS

Section B-B

Section A-A

Dimensions:
- 33' 0"
- 19' 0"
- 40' 0"
- 16' 0"
- 11' 0"
- 26' 0"
- 22'
- 54' 0"
- 2'
- 40' 0"
- 2'
- 9' 0"
- 8' 8"
- 28' 0"
BIBLIOGRAPHY

All photos, images, drawings, renderings, and scans by author.