complexity form
order structure

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abstract

This thesis project is complex because of its crystalline form. It is ordered through structural hierarchy and modularity. The presence of both complexity and order gives articulation to all scales of the project, allows for variety without chaos, and repetition without monotony. All of these characteristics are essential for the program of a high-rise residential building that accommodates 1,500 people.
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introduction

This thesis project is the beginning of the development of a position in architecture. This position is grounded in four themes: complexity, form, order, and structure. These themes are related in many ways. Complexity and form are interrelated. Order and structure are achieved simultaneously. Complexity needs order to avoid chaos. Form needs structure to become manifest. When these themes are united and applied at all scales of the project, the result is the manifestation of a coherent architectural idea. In the following pages, I present these themes as they exist in this project, demonstrating the confluence of complexity, form, order, and structure.

The project actually began with a model from a second-year studio assignment (right and following page). This model describes space through cutting and folding a plane. But, what began as a simple idea became a complex composition through the creation of multiple characters and multiple centers. The complexity of these multiple characters is ordered by vertical, horizontal and proportional relationships which bring harmony to the whole. Lastly, the model made of white paper “shines.” All of these aspects of the model are characteristics of crystalline form. Thus, this model also became the benchmark for the thesis.

The program of human habitation was brought to the model and it informed the origins of the thesis. The model suggested a large scale project, a scale that would allow all of the model’s complexity to be retained. In addition, the challenge of designing a large residential structure seemed worthy for our time, considering our current situation of sprawl, population growth, and strained resources.

Along with the early model and the aspects of crystalline form, there were several other principles that informed the design of. The first was the desire to articulate all scales of the project on the exterior. There was no desire to hide the individual, the smallest unit of the whole, or to drown it in a sea of monotony. Each individual has its place in the making of the whole composition. This articulation raises the importance of the individual within the whole.
However, there was also the desire for order. It is proper that a place of human habitation be ordered rather than disordered. The ordering of the composition allows all the parts to come together to the benefit of each one and the whole. The project is ordered through structural hierarchy. The primary structural elements are the towers which rise from the ground to support the blocks. The blocks consist of primary walls, floors and ceilings which contain the residential units. The units are also made from secondary walls, floors and ceilings which form the rooms for living.

This structural hierarchy is not only the means of resisting gravity but also orders the spaces inside the building. The towers are the place for movement throughout the building, basically becoming the public “streets” of the complex. The blocks house numerous units of residences and become the neighborhood or small community. The units are three stories in height and each unit contains two residences.

Each chapter of this book is devoted to one level of this hierarchy. From the whole building to the individual residence, the chapters develop each in further detail.
the city

The building is composed of towers and blocks, a complex of many parts that make a whole, and as such, is rightly labeled a “city”. Each tower and block is similar in structure but slightly varying in height and orientation. True to the notion of crystalline form, the building hints at growth. The towers open as they rise and the blocks decrease in size with the height of their location. Additionally, the many parts that make the whole are visible from the exterior. All scales are articulated, from that of a room, to an apartment unit, to apartment block. Finally, as in crystalline form, the building wants to “shine.” Therefore, the main material is lightweight, light-in-color, reinforced, cast-in-place concrete. On the exterior of the towers and blocks, the formwork for the concrete will be finely treated so that the building surface is smooth and polished, thus it will shine.

The towers are translated radially (8 degrees) which introduces a slight curve in plan. Each tower creates (or it could be viewed as absorbing) a portion of the curve with two of its opposite corners skewed to 82 and 98 degrees (see diagram below). The interstitial blocks and their hanging connection to the towers are allowed to remain at 90 degrees. The curve has two major consequences. One, is that any view of the exterior of the building is more dynamic;
many of the various faces of the building can be seen at once, and though the faces are similar in structure, there is variety introduced by this changing angle. The second consequence is a recognizable differentiation of a front/back or inside/outside relationship which further orders the complex.

The site for the project never became a priority or focus, but there is an ideal setting that the project seems to suggest. Due to its large size the project needs a setting where its surroundings are similar in scale. It would not be beneficial to the idea of the project to place the building in a location where it dwarfs everything nearby and is visible from such a distance that its appearance is monolithic and static. But, the appropriate scale should not necessarily come from an urban context because the project was developed free from urban constraints. It is possible that the project could be modified to be appropriately inserted in an urban site, but that would not be true to the current project.

Rather, it seems appropriate that the setting of the project be rural, with mountains and a river as the surrounding large-scale elements. This would be beneficial in other areas as well. The approach to the building would be on winding roads which would offer a quick glimpse of the building, then take it away, then offer it again from a new angle, allowing one’s curiosity and imagination to flourish. Also, the sloping land would be better than a flat plinth for enhancing the “growth” or movement of the towers and residential blocks. Lastly, the high-density development that this project proposes can be beneficial to a growing, rural area because land for natural wildlife habitat, recreation and agriculture can be conserved. Land for these uses could exist near the project, giving the residents immediate access to the benefits of the land.

This ideal setting is similar to areas found along the New River in southwest Virginia, or areas closer to urban centers like Pittsburgh, Pennsylvania, Charleston, West Virginia or Chattanooga, Tennessee.
Photo-montage showing all scales: city, tower, block, unit, room
Study model of the tower and block masses (front)
Study model of the tower and block masses (back)
This is a plan of the whole building. The slight curve of the plan as discussed above is recognizable. Also, the order of the alternating towers and residential blocks (charaters in the composition) is present. Note the varying wall thicknesses which relate to the structural hierarchy.
This drawing shows initial ideas about the ground condition surrounding the project; terraced levels following the slope of the land.
As the ground floors step up with the slope of the land, the land is made level with the floors at several places.
the towers

The towers are the primary element in the structural hierarchy of the complex. Their main role is that of pilotis, the piers on which the blocks hang. The outer walls are thick for increased mass to contain the reinforcing necessary to support the residential blocks. Two columns rise through the interior to support the floors. The interior floors vary throughout the tower and correspond to the entrances into the blocks.

The tower “opens” as it rises and a glass curtain wall completes the enclosure. This “opening” or cutting away of the front corner of the tower is a formal compliment to the blocks, allows light into the tower, and brings the edge of the tower closer to the residential blocks. The roofs of the towers are not accessible to the public and would be used for appropriate mechanical systems.

The programmatic role of the towers is to be the place of vertical movement through the complex and to contain community spaces; basically the vertical streets of the city. Each tower contains four general use elevators (except for the end towers which only have two), a large service elevator and a fire stair. The community spaces inside the towers include areas for recreation, leisure, education, and commercial purposes. A diagram of more specific uses and their location can be found on page 14. These programs are important for modern life and promote social interaction.

It is also important that the experience of moving through the building be pleasant. If a resident needed to wait for an elevator, they would typically be in a large open space with natural light and a view to the outside. Since these spaces are the main public streets, it is likely that the resident would meet a friend here as well.
At this level of the third tower, only the block to the left has access to the space. There is, then, space opposite of the entrances to the block for various community uses such as a fitness room or garden. The individual elevators are local; only designated to serve the residential blocks.
Both neighboring residential blocks have access to this level of the fourth tower. The center of the floor is open to the level below and the columns continue up to the next floor. The opening in the floor creates a strong vertical, spatial connection within the tower. The next page is an interior perspective showing the view from near the elevators towards the front corner.
Interior perspective in a tower looking toward the front
the blocks

The blocks hang from the towers and contain the residential units. The size of each block is a function of the size of the residential units it contains. The exterior shows the complexity of the spaces inside; even the scale of a small room is articulated. However, the composition is ordered by the hierarchy of the walls (thickness) and by repeating residential units. Here, the unity of complexity, form, order, and structure is most evident, giving the building its character and texture.

There is an atrium in the center of each block which serves as the circulation space for the block. The atrium receives light mainly from above, in the case of the lower blocks which have a glass roof at the top, or from the side, in the case of the upper blocks through open floors (see page 22). These open floors could also be used as indoor or outdoor gathering spaces for residents of the block. Each block has a laundry area, guest rooms, and a children’s play area on the first floor. Thus, the first floor eases the transition from the public towers to the private apartments.

The blocks contain a total of 416 residences. The total occupancy of the “city” could be as high as 1,500 people. It would take 25 of these “cities” to house a town the size of Blacksburg.
This block consists of four, 32 feet wide units and two corner units. The hallway, which borders the block’s central atrium can be seen at this level. This hallway serves 12 residences.
This plan cut is through an “open floor” of the residential block and would be used for multiple activities. The corners provide outdoor space. The sides provide indoor space and are open to the atrium at the center of the block.

The lower blocks have large glass roofs to let light into the atrium. This drawing shows the mullion arrangement for one of these roofs. The roofs of the upper blocks are accessible and are not this type.
Location Diagram for Unit 24 Block (Far Left)

Location Diagram for Unit 32 Block (Left)
Location Diagram for Unit 56 Block
the residential units

Each unit contains two residences and is three levels in height. Both residences are entered from the hallway on the middle level, which is split between the two residences. Then, one residence has the entire top level, while the other has the entire bottom level. There are six types of units. One is the corner unit which remains the same throughout the building. The other five units vary in size. These units are 56, 48, 40, 32, and 24 feet in width. The unit that is 56 feet wide is a combination of the 32 and 24 feet wide units and as such contains four residences.

There were several principles that guided the project at the level of the individual residence. There was a conscious effort to enhance the life of the family by creating recognizable entry spaces, delightful dining spaces, and outdoor patio spaces. Additionally, the thickness of the wall is utilized to define rooms, or create niches for display or storage.

The main construction is cast-in-place, light-weight, foam concrete. Doors and cabinetry are treated as furniture, things separate from the walls. Windows are the result of an absence of wall. Their frames are hidden as much as possible to pronounce the sense of void.

There are plans, sections, and elevation diagrams for each unit type on the following pages.
conclusion

This thesis project is the beginning of the development of an architectural position that I believe in; an architecture that has a harmonious relationship between complexity, form, order and structure. One of the primary strengths of this position is that it creates a method of working that addresses tolerance at one level and precision at another. The complexity and form needed the guidelines and boundaries of the structure to be understood. Thus, by setting certain guidelines I was able to bring the project together and make a whole.

I also see a reflection of these ideas in the world around me. We, as humans, are complex beings yet we are not without form, order and structure. Our circulatory system is a good example of this. Another is a tree where the complexity, form, order and structure move up through the trunk to the branches, twigs and leaves. I will continue to develop this position but it is clear to me that people will respond to such an architecture because of these correlations.

There were several sources of study for this project. The most important ones are Moshe Safdie’s Habitat ’67 and Le Corbusier’s Unite d’habitation at Marseille. Those familiar with these projects will see many contrasts with my thesis but some similarities as well.

All of the images and text belong to the author.
appendix a

study models