

# **A Design for Portland Municipal Courthouse**

An Honors Thesis

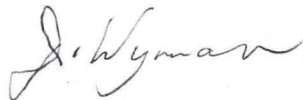
By

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(ARCH 401)

Thesis Advisor:

Jack Wyman

A handwritten signature in black ink, appearing to read "J. Wyman". The signature is fluid and cursive, with a large initial "J" and a long, sweeping underline.

Ball State University

Muncie, Indiana

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Lauren Comes  
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## ABSTRACT

The CAPstone project in the Ball State University College of Architecture and Planning is meant to integrate all aspects of design that students have learned in their undergraduate studies. This year's CAPstone project challenged students to design a municipal courthouse for one of five major U.S. cities. My particular project's site is in Portland, Oregon. The main goal of the project was to create a building that would be a symbol of Portland's culture and ideals, a fresh interpretation of courthouse architecture, a model of sustainable design, and a revitalization of a central intersection in the city. In order to fulfill these objectives, I worked with a partner to develop a strong concept, and then to advance the design over the course of eight weeks using a variety of design methods and media. The final product consisted of four 20" x 20" presentation boards, a PowerPoint presentation, and a physical model (to scale). These presentation materials are included in the enclosed compact disc. The following paper is a documentation of the design process and an explanation of our design decisions.

## ACKNOWLEDGEMENTS

- First of all, I want to thank my partner, Jim Moehring, for the time and effort he contributed to this project. The design would not have been the same without him.
- I want to thank my studio professor and thesis advisor, Jack Wyman, for all of his input and critiques throughout the design process.
- I want to thank all of the professors whose input Jim and I sought during this project, particularly Rob Underwood for his structures expertise and Walter Grondzik for his knowledge of environmental systems.
- I want to thank Bob Fisher, who organized the trip to Portland, Oregon and helped us to choose a site for our project.
- Finally, I want to thank the graduate architecture students that gave of their time and talent to help Jim and I with our design: Sam Vonderau, David Schaffer, and Adam Miller.

The final design studio project for students in the College of Architecture and Planning at Ball State University is called the CAPstone Project. It is meant to be a culmination of everything that students have learned over the past three or four years in the College. This year, the CAPstone project for architecture students was done in conjunction with the national AIAS/Kawneer Student Design Competition. The project challenged students to design a 25,000 square-foot (minimum) municipal courthouse for one of five major U.S. cities. Students were able to choose their sites within the city, and site choice would be evaluated as part of the design as well. The design guidelines issued by the national competition stressed that designs should be environmentally responsible, representative of the city's values, and should use Kawneer curtain wall products in an innovative way.

These objectives, combined with the complex programming requirements of courthouse design, truly challenged me to utilize everything I have learned about architecture up to this point in my education. In addition to synthesizing my knowledge of site analysis, design, building systems, structure, environmental sustainability, and other aspects of building design on this courthouse project, I also worked with a partner. This part of the project challenged me to develop my communication and collaboration skills within the context of design, which will prepare me for my possible future in an architectural design firm. My partner, Jim Moehring, is a fellow 4<sup>th</sup>-year architecture student. This paper documents our design process, explains the intentions and reasoning behind our proposal for the courthouse design, and finally analyzes our final product as well as the design experience overall.

## RESEARCH

The project began with a visit to our chosen site: Portland, Oregon. During the annual CAP Field Trip Week in October, Jim and I traveled to Seattle and Portland for a week with Bob Fisher, one of the 4<sup>th</sup>-year studio professors. Professor Fisher had already discussed a potential site for the courthouse with a local architecture firm, ZGF Architects. It comprises of half of a city block (approximately 20,000 s.f.) and is located in essentially the center of the city, very close to a number of public transit stops. By

actually visiting the site, Jim and I were able to more fully understand the context in which we would be working. In addition to getting measurements and photographs of the site, we were able to get the feel of Portland as a city.

On our trip, we also took a tour the Mark O. Hatfield United States Courthouse, during which we were able to learn about the various requirements of the building type, such as circulation patterns and security concerns. Even though that courthouse was a federal courthouse, while we were designing a municipal courthouse, much of the information was still very helpful. This first-hand look at the workings of a courthouse proved indispensable to our understanding of its design requirements. Furthermore, other studio sections also visited various courthouses on their field trips; when we returned to Muncie, we shared our information with each other in a sort of “forum” on courthouse design. Following these accounts, Jim and I were able to pool information and experiences in order to come up with our intentions and goals for the design project.

Our research also included the study of some precedents. After discussing some of our initial ideas for the design, Jim and I looked at a few existing buildings from which to draw inspiration. Two of these buildings were the Seattle Public Library, which we also visited on our trip, and the Limerick County Council building in Ireland. The Seattle Public Library, designed by Rem Koolhaas, used the idea of an organic skin wrapped around a more rigid, simple building core; it was somewhat of a “building within a building”. We thought this could be an interesting new way of approaching security. The library also had a very clear and bold circulation system, which we thought helped people stay oriented within the building. The Limerick County Council building was designed by Bucholz McEvoy Architects, and we found it instantly appealing from photographs in a magazine. Its materiality, approach to sustainability, and fresh take on civic architecture were all things we wanted to emulate in our design. By looking at these precedents, we were able to get our creative juices flowing and start thinking outside the box of existing courthouse architecture.

## CONCEPT & GOALS

Looking at examples of existing courthouses, Jim and I detected a clear message being conveyed through their design. It was a message of stability, monumentality, and security. These characteristics seemed to be nearly as important to courthouse design as the programmatic functions themselves. We noticed that impressions of stability, monumentality, and security were traditionally achieved by means of mass: heavy materials, high amounts of enclosure, and a grand scale. For the design of the new Portland Municipal Courthouse, we wanted to explore ways of achieving similar effects—monumentality and security—through the layering of lighter materials. This approach has several advantages. First, it creates a potentially *more* secure environment by allowing greater visibility to and from the courthouse. This way, the building feels safe, but not intimidating. A lighter, more open building design is also more in line with the values and aesthetics of Portland, a leading city in the movement toward environmental sustainability. Finally, we felt that a more open design would express the current shift from past notions of an overbearing, authoritative government toward one of transparency and public involvement.

Though our main design goal was to create monumentality and security in a less oppressive way, we also had a couple secondary objectives. First, we wanted to create a clear system of circulation throughout the building. We felt that many of the courthouses we had visited and researched seemed confusing because they had no point of orientation; thus, the building became less secure because visitors were often wandering around looking for their destinations. By designing clear, open, and understandable paths through the building, visitors would feel safer because they would know where they were and where they were going.

Our second auxiliary goal for this project was to integrate green design strategies into the overall design of the building rather than simply tack them on at the end, as is often done in many so-called “sustainable” designs today. From the beginning of the design process, we intended to make decisions—about orientation, glazing, materials, etc.—with environmental responsibility in mind. We

felt that this was an essential part of designing a building that would last and a building that would be expressive of Portland's values.

## THE DESIGN

### *Methods & Process*

Throughout the eight-week design process, Jim and I employed a variety of different media to express and revise our design. Of course, we started in the verbal realm, simply discussing our ideas with one another. An important product of these discussions was the first draft of our 500-word design statement, which was a requirement for the AIAS/Kawneer competition submission. By putting our ideas in writing early on in the process, we had created a set of guidelines on which to base our future design decisions.

Sketching is a design method that we used alongside our discussions in the early design phases. Both Jim and I are very comfortable with hand drawing, and this proved to be very beneficial to our relationship as a team.

Many times, our ideas were much easier to express in a simple sketch than in

words. For example, one sketch (Fig. 1) that we worked on together became the visual equivalent of our design statement; it simply and clearly expressed our basic ideas of a programmatic core, water collection, a sun-shading skin, and a full-height atrium with stack ventilation.

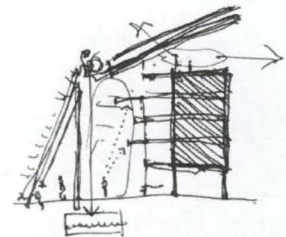


Fig. 1: Concept Sketch

Once we had some of our basic ideas about the form of our building decided, we moved into modeling the design, both physically and in the computer. My forte is building physical study models, so I typically worked in that media, while Jim worked in the computer modeling programs, such as Rhino. Study models proved to be a very effective design method throughout our process; they allowed us to test different design solutions quickly and in three dimensions. The progression of the design from study models (Fig. 2-3) to the final model (Fig. 4) can be seen below.

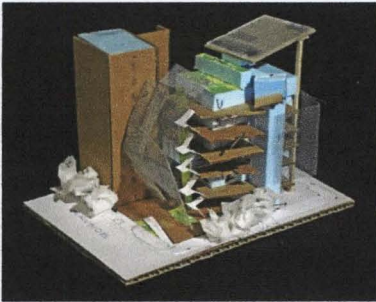


Fig. 2: Study Model

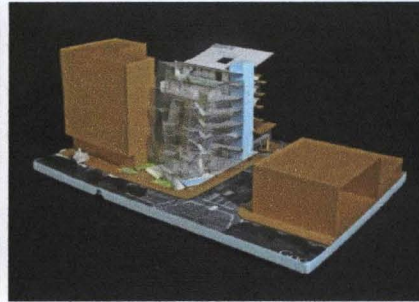


Fig. 3: Study Model

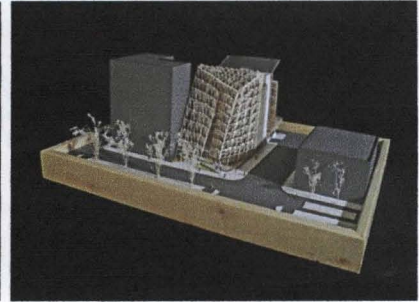


Fig. 4: Final Model

At various stages in the design process, Jim and I sought the opinion of others to help refine and improve our design. In addition to critique sessions with our studio professor, Jack Wyman, we also set up reviews with other professors, graduate architecture students, and our own classmates. These reviews pushed us to constantly improve our design. We often received input and suggestions that we would not have considered on our own, and consulting experts in certain focus areas helped us to develop the design in more detail. For example, we scheduled a review with our structures professor, Rod Underwood, to discuss strategies for seismic design because Portland is in an earthquake zone. As a result of this consultation, we were able to refine our design to include a rigid-frame core that would stabilize the building in the event of seismic activity.

For the final presentation drawings, Jim and I utilized a number of different computer programs and graphic media. Once Jim had built a digital model of our courthouse design in Rhino, a 3D modeling software, we were able to apply materials and lighting conditions to create realistic renderings of the most important views of our design. This model was also used to make 3D diagrams to explain systems of daylighting, water collection, ventilation, and structure. All of these renderings were finished in Adobe Photoshop, where I added entourage: people, furniture, cars, etc. For the floor plans, I used AutoCAD to generate the basic linework, and then I exported them to Adobe Illustrator to add lineweights, text, hatches, and color. Finally, the physical model was constructed with the help of the laser cutter, which allowed us to very precisely cut out the pieces of our building from various materials. These pieces were then assembled as a team effort, using glue as adhesive.

The methods we employed throughout this project were truly an amalgamation of all the different media that we had learned in our studies for the past three years. From sketching to physical modeling to computer rendering, we utilized all of the resources that were available to us and that we would be expected to use in the professional world.

### *Site*

One of the first issues we discussed in the design process was the site. We had to decide how we wanted our building to sit on the site, particularly how we wanted it to react with existing massing and circulation patterns. Because the site was surrounded by buildings that were at least five stories tall (with many being taller), we decided to design our courthouse to be seven stories so that it would fit in with its neighbors, at least in terms of scale. We also decided that the main public entrance would be from the southern side facing Burnside Road, one of the most prominent streets in Portland. A small raised plaza on this side of the building would act as a “front porch”, creating a buffer between the street/sidewalk and the front door of the courthouse. Not only does this enhance the entry sequence to the building, but it also adds an extra level of security, preventing cars from driving up into the building.

Across the street from our site to the southeast was a parking lot that took up an entire block. Jim and I saw this as an opportunity to design a public plaza that would complement the civic function of the courthouse. In this space, we designed an area for bicycle parking, various places for seating, and a large open lawn for picnicking or hosting events such as speakers or concerts. This lawn also collects water, reducing the amount of runoff from the site. Combined with multiple green spaces in the courthouse plaza, the water collection system in the building, and permeable pavement materials throughout, our goal was that the project site would have no runoff into surrounding sewers.

### *Programming*

After we had developed our basic ideas about siting and massing, we started to tackle the programming of the building (deciding how the various functions of the courthouse should be arranged).

In our discussions of concept and massing, we had already decided that the required spaces of the building would be housed in what we were calling a “programmable core”. We would wrap various layers—balconies, the atrium, glazing, shading devices—around this core to increase security by means of many lighter materials rather than one solid, heavy mass. This idea of a “programmable core” surrounded by various layers on enclosure can be seen in Figure 5.

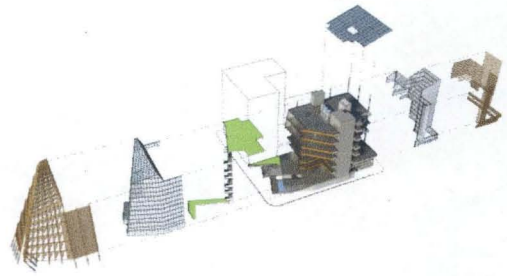


Fig. 5: “Programmable Core” wrapped in layers

The specific arrangement of spaces within the “programmable core” was a challenging task. Courthouses, in particular, have very rigid requirements when it comes to the layout of rooms. Considerations must be made in order to keep the public spaces completely separate from private spaces, such as judge’s chambers, jury deliberation rooms, and secure holding facilities. Because of this, we chose to design the circulation paths first, making sure to separate public and private means of circulation. We did this by placing a double-sided bank of elevators near the center of the building. One side has two elevators for public use, while the other side has one elevator for judges and administration, as well as one elevator for defendants that only stops on the first floor and the two floors that house the courtrooms. There is also a separate “back” entrance to the north that includes parking for judges and a drop-off area for defendants that may be coming from prison. Based on this circulation system, we tried to keep all of the public spaces on the south side of the building, which is served by the public elevators; the more private spaces are on the north side, served by the private elevator. This scheme is explained by the diagram in Figure 6. The only exception to this organization is the third floor, which consists of the large public meeting hall. Here, we

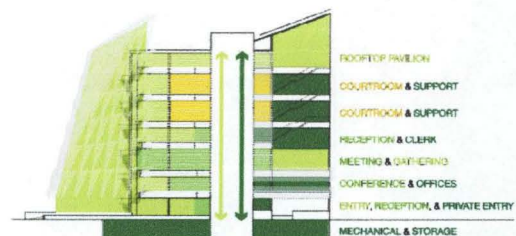


Fig. 6: Public/Private Distribution  
Public (Light Green) to Private (Dark Green)

placed a public space on the north side of the building. This move adds variety to the building section and creates a separate “lobby” or gathering space for users of the meeting room.

In dealing with the support spaces—restrooms and mechanical spaces—we chose to stack them along the western edge of the building, making plumbing and ventilation ducts easy to coordinate. Most of the major mechanical equipment would be housed in the basement, but there is also a supplementary mechanical room on the fourth floor. These rooms are connected by a mechanical chase that runs through all seven floors on the western edge of the building.

### *Environmental Systems*

As I stated before, many of our design decisions were based on optimizing energy efficiency and resource conservation. There are three main areas on which we focused our efforts: water management, ventilation/air quality, and solar management.

I have already explained our water management strategies to some extent. By using permeable paving materials and vegetation in outdoor areas, runoff into the sewers is minimized. The building itself is also designed to collect and reuse the rainwater that falls on it (see Fig. 7). A large sloping roof

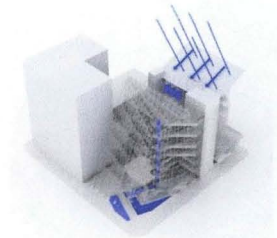


Fig. 7: Water Management

that covers most of the building directs rainwater to one point, where it is collected and stored in three large cisterns on the top floor of the building. From these cisterns, the water—powered by the force of gravity—is used to irrigate the green wall that climbs the entire atrium. It is also used as graywater in the toilets throughout the building. In addition, there is also a pool of water in the front plaza that can be used to collect any extra rainwater.

Ventilation was a complicated system to manage for this project. Usually, the most energy-efficient way to handle heating and cooling in a building is to use passive ventilation. For a courthouse, however, there are security measures that must be considered in order to prevent an attack using something like poisonous gas. Much of our solution to these problems is wrapped up in the design of

the seven-story atrium. The height of the atrium creates a stack ventilation effect (see Fig. 8); as hotter air naturally rises to the top of the atrium, it creates a natural airflow that aids in cooling the building. An outlet at the top of the atrium vents the hot air out of the building, and inlets on lower floors

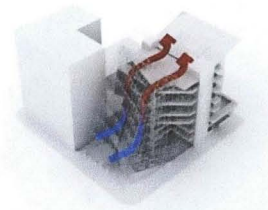


Fig. 8: Stack Ventilation

let in cooler air to take its place. We were sure to place these inlets high enough off the ground floor to prevent contamination by possible security threats. We also envisioned that the “programmable core” could be closed off to use an active ventilation system in case of an emergency. The curtain wall on the north façade of the building is a Kawneer product that consists of operable windows. This allows employees on each floor to adjust the amount of fresh air flowing through their spaces. Finally, the green wall in the atrium is more than just a focal point; it also contributes to a higher indoor air quality. The plants growing on it are constantly filtering the air and releasing fresh oxygen into the atrium.

In dealing with the sun, we wanted to use it as a lighting and energy source, but we also had to make sure that the building was protected from it. We used several methods to achieve this. First, we used a product called Kawneer PowerWall as the primary roofing material. This product consists of photovoltaic cells laminated between pieces of glass. The roof is sloped at an optimum angle catching the sun in Portland, so it is able to generate a good amount of electricity for the building. We also arranged the spaces within the building to ensure that all habitable spaces had access to as much daylight as possible. This was achieved through large amounts of glazing on all sides of the building, as well as a light well that penetrates several stories into the core of the building. With all this glazing, however, systems had to be designed to protect the building from overheating like a greenhouse. Figure 9 explains the various solar management strategies we employed.

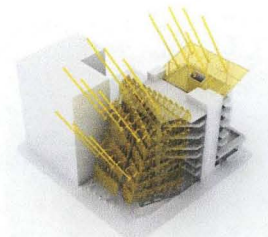


Fig. 9: Solar Management

The way we chose to control the amount of solar radiation that entered the building was to design a sun-shading skin to wrap the entire building. This skin is the most visible “layer” that wraps the

core of the building, and it became the most prominent aspect of the building's architecture. It was designed parametrically using the computer program Grasshopper, a plug-in for the Rhino software. This program enabled us to design a custom component and array it across a surface, in this case the façade of the building. The program would also alter each component to specifically respond to variables (like sun altitude and azimuth angles) in order to provide customized shading for our location and certain times of day. Jim and I worked together to design a component (see Fig. 10) that would block the sun from the south and the east, while remaining open to the west, since a tall neighboring

building already shaded our building from that direction. The component would also bounce diffused light into the atrium of the courthouse, enhancing the daylight in that space. While we experimented with many



Fig. 10: Skin Design Process

organic shapes for the surface on which to array our component, Jim and I finally agreed that a simpler design would be the most practical solution. We chose to use wood as the material for the skin because we thought it best represented the design aesthetic of the Pacific Northwest. The skin also created the sense of



Fig. 11: Monumental Skin

monumentality (see Fig. 11) while still allowing the building to feel light and open, thus contributing to our overall design goals.

## THE OUTCOME

After eight weeks and many late nights of working on this project, Jim and I were very proud of what we had accomplished. Though the final product was unlike anything either of us had ever

designed before, we knew that we had good reasons for our design choices and that we represented them well with our presentation materials. We felt that the overall result was a design that fulfilled our original goals of being secure without being oppressive, being easy to navigate, and being truly sustainable at its core. It fits well with its context and even extends across the street to incite further community development. Our design is uniquely monumental, uniquely secure, and uniquely Portland.

Apparently, the jury of the AIAS/Kawneer Student Design Competition agreed with us on our design's success. We were awarded an Honorable Mention, which included a \$500 cash prize, as well as a donation to Ball State's chapter of AIAS. Our design will be published in this spring's *Crit 69*, a publication of the American Institute of Architecture Students (AIAS).

Looking back on my project, I am amazed at the amount of work that Jim and I were able to accomplish in just eight weeks. The design is truly the culmination of everything I have learned in my undergraduate architecture studies at Ball State. I dealt with a new, complex building type: a courthouse. I worked with a partner, testing my teamwork skills. The final building design showed a high amount development, from the environmental systems to the material assembly details. I integrated a specific sponsor's product—Kawneer curtain wall—into the design. All of these challenges are ones that I will face in my professional career, and the completion of this project has proved that I am ready to move forward into the next phase of my education.

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