



# THESIS TECHNICAL REPORT 4 | PART B

UNIVERSITY OF MARYLAND – BALTIMORE  
HEALTH SCIENCES FACILITY III

666 W. BALTIMORE ST. BALTIMORE, MD

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LIGHTING / ELECTRICAL  
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## EXECUTIVE SUMMARY

The following proposal details the topics to be researched and developed throughout the spring semester. In it, a re-evaluation of the lighting systems, and electrical systems will be completed for the University of Maryland – Baltimore Health Sciences Facility III. The re-evaluated spaces include:

- CIRCULATION SPACE – MAIN ATRIUM AND ELEVATOR LOBBY
- LARGE WORK SPACE – NANOMEDICINE WORKSTATION
- SPECIAL PURPOSE SPACE – MEETING ROOM
- OUTDOOR SPACE – EXTERIOR PLAZA

In addition to the lighting and electrical depths of study, two breadth proposals are listed, including: a daylighting study of one or more of the four spaces, and a structural analysis of the meeting room space. The advantages and disadvantages of a daylighting control scheme, as well as a new structural design will be addressed as well.

## BUILDING OVERVIEW | HEALTH SCIENCE FACILITY III

**Building:** Health Sciences Facility 3

**Location and Site:** University of Maryland – Baltimore

666 W. Baltimore Street, Baltimore, MD 21201

**Building Occupant:** University Students and Staff

**Occupancy Type:** Business use Group B, Assembly use Group A-3, Storage use Group S

**Size:** Approximately 430,000 square feet

**Number of Stories above Grade:** 10

**Total Number of Stories:** 13 (Includes the upper and lower basement levels. The Mechanical Penthouse and Mechanical Mezzanine are considered an additional level because it encompasses the entire rooftop structure)

**Dates of Construction:** July 2013 - September 2017 (including Demo)

**Cost Information:** \$216 million total building construction cost

**Project Delivery Method:** CM at Risk

**Architect:** Hellmuth, Obata, Kassabaum (HOK)

**Construction Manager:** Barton Malow Company

**Associate Architect:** Design Collective

**Mechanical Engineer:** AEI Engineers

**Plumbing/FA/FP Engineer:** WFT Engineers

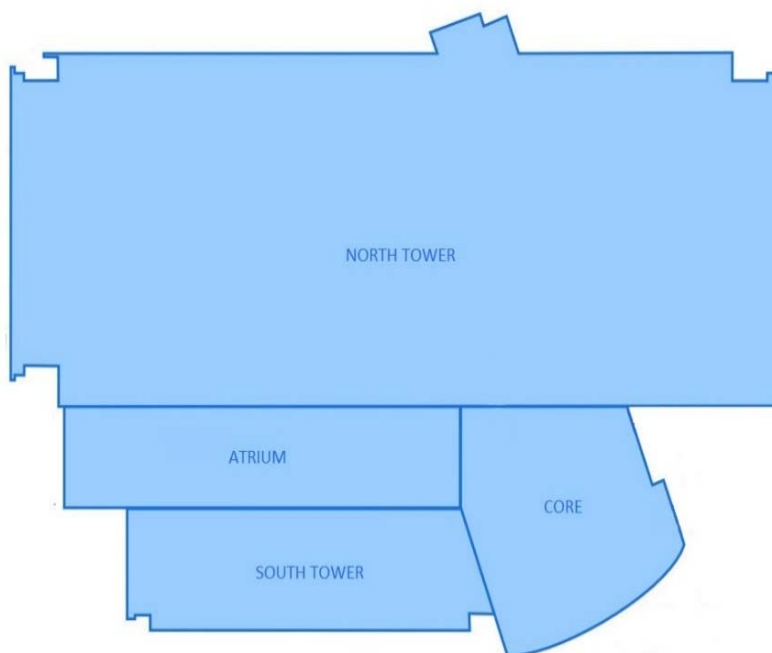
**Structural Engineer:** Cagley & Associates

**Civil Engineer/Landscape Architect:** Site Resources

**Lab Planning:** Jacobs Consultancy

**Interior Architects:** Melville Thomas Architects, Inc.

**Geotechnical Engineer:** Kim Engineering, Inc.



The Health Science Facility III building will be the University of Baltimore-Maryland's newest research facility. It will house work groups from the schools of Medicine, Pharmacy, and Dentistry. Each school shares the interior lab space, including the nanomedicine laboratory on the first level. The building can be categorized into 4 separate sections: a north tower consisting of wet lab space, a south tower consisting of dry lab space, an elevator lobby core, and a central atrium space which connects the towers.

## LIGHTING DEPTH | PROPOSAL

### CONCEPT

This research facility is a brand new addition to university and, as such, must reflect a new and innovative design. I was intrigued by the simplicity and scale of the interior architecture, particularly in the atrium and lobby space. The building had its form, but needed a creative lighting design that would extenuate its existing structure. In brainstorming the concept of creating form through light, I decided to apply the concept of bioluminescence. In nature, bioluminescent plants and animals produce their own light in order to function or deter prey. Their bodies form the skeletal structure, and the light emitting chemicals take the form of the structure. Therefore, the concept is that the building is the skeletal structure, and the light is emitting from within forming the body. When applied, the lighting scheme should be simple, unseen (recessed), and should create texture throughout the spaces.

### MAIN ATRIUM AND ELEVATOR LOBBY

I plan to implement John Flynn's psychological counterpart system of Spaciousness within the atrium space. Because of its size, the students and staff members will experience a sense of an open/ public space, where you can see every person within the atrium at any point in time. It is important to note from the lighting criteria that each of the entry ways to the lobby and atrium must be well lit to provide adequate illumination for safe passenger travel. The existing lighting maintains an acceptable target illuminance while also providing enough light in the atrium space to transition from one side to the other. The goal of a new lighting design is to incorporate new fixtures or layouts to potentially decrease the LPD for the main atrium.

This atrium is the connection between all the building towers and bridges the wet lab and dry lab together. This central space also features a 7 story curtain wall shown in the North West corner of figure 1. This curtain wall provides the majority of daylighting, however at nighttime hours the interior lighting must compensate. The atrium space can be entered via the overhang entrance connecting to the stairwell (south), or the canopied entrance closest to the vehicle drop-off/pickup circle (west).

The atrium is also the literal bridge between the wet and dry laboratories. The bridge connections are at the 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> floors of the building. These bridges will have integrated lighting fixtures in the railings so that the entire walkway is illuminated.

The atrium continues into the central elevator lobby. A central information and check-in desk is situated below the 2<sup>nd</sup> floor overhang which separates the lobby's ceiling height and the atrium's ceiling height. A total of 4 pedestrian elevators are available to the public, while a 5<sup>th</sup> staff elevator is located at the north wall of the elevator lobby. This lobby also connects to the meeting room space located on the first floor.

## NANOMEDICINE WORKSTATION

The nanomedicine workstation room is one of a number of research and development labs within the building. It is expected to be a laboratory where a myriad of chemicals and compounds are synthesized, while also serving as presentation and educational space. The lab is predominantly filled with casework, sinks, benches, and shelving units. The shelving units are attached to the partition of the benches, above the table workspace and can reduce the amount of light hitting the surface of the desk, depending on the placement of the overhead fixture. There are also ten fume hoods within the lab, small ventilation devices that limits human exposure to hazardous materials or fumes. The hoods will be avoided when considering placement of the lighting fixtures.

## MEETING ROOM

The meeting room is a moderately sized conference room space. Here office staff and building patrons can meet for video conferencing, audiovisual presentations, and lectures. The majority of seating is assumed to be temporary, and can be moved as needed to fit the conferencing event. The north wall of the meeting room features two presentation boards mounted between the structural columns. The surrounding exterior is large pane glass windows showing wonderful views of the exterior space and landscaping. This is also the space that the three schematic design concepts will be applied to. Each one consists of a different layout that thematically applies to bioluminescence.

## EXTERIOR PLAZA

The Health Sciences Facility site is within one block of the Schools of Pharmacy and Medicine, and adjacent to the School of Dentistry building. The exterior space is mostly paved walkways. There is a large courtyard space near the south entrance which connects to a pathway that functions as a pedestrian channel through the HSF3 site and the School of Dentistry building. This pathway's slope declines walking from north to south, thus there are a series of stairs and ramps between the paved paths. There are also many raised planters for landscaping where lighting fixtures can be hidden from view but still provide a pathway of light. This heavily trafficked space will need to provide an adequate amount of illumination for pedestrians to travel safely through the campus either during the day, or at night. Up lighting and pathway grazing will be a key element of the exterior space, applying the concept of unseen but powerful light throughout the plaza.

## ELECTRICAL DEPTH | PROPOSAL

Alterations to the existing lighting design will require a re-evaluation of the electrical systems. Due to new fixture positions, the circuitry and control diagram will need to be updated. The electrical depth will also reflect the addition of the daylighting study. The electrical system could include sensor based equipment to adhere to the daylighting study's results, creating an optimal lighting environment. In addition, there is the potential for a photovoltaic array on the atrium ceiling. This could enhance energy savings for the building as well.

## DAYLIGHTING STUDY | BREADTH

A daylighting analysis will be performed on the atrium or meeting room space to confirm if any energy savings can be achieved. The atrium receives the majority of the natural light and is located at the center of the tower space. The performance of the lighting systems located in the central atrium, in addition to the bridge connections of the upper levels, can be adjusted to accommodate the light levels received from daylight. The meeting room also presents a daylighting opportunity. The majority of the windows face south and are open to the plaza space and thus receive an optimal amount of sunlight throughout the day. Shading systems and sensor controls will also be evaluated in one of these spaces.

A computer evaluation using programs such as Revit, AGI, and Daysim, will be required for this study. I will research the extended cost for providing power to these locations in the hopes that a comparison can be made of a building cost with daylighting controls, and without.

## STRUCTURAL STUDY | BREADTH

I plan to change the existing ceiling system in the meeting room space. The existing ceiling is based on a grid pattern, similar to the majority of spaces in the facility. By adjusting the ceiling, with either a new layout, or dropped ceiling panels, the lighting scheme can better reflect the design concepts listed in the lighting depth. Naturally, the structural integrity of the new ceiling design will need to be researched and calculated.

## PROFFESIONAL EVALUATION | LEE WALDRON

- Design is not exciting. Your straightforward solutions did not meet my dreams.
- Concept of living light is great, but I don't see the connection between the concept and the lighting design. Find solutions that are organic and innovative.
- Find another way to create the glowing ceiling in your third concept for the meeting room space. Eliminate the grid. Maybe stretch fabric and back light it?
- Consider choosing a single form of bioluminescence throughout.
- Think about projection and dynamic lighting.
- Make your qualitative criteria more readable.
- Really interesting motivations, but push the concept further.

## PROFFESIONAL EVALUATION | SHAWN GOOD

- Re-evaluate the brightness of some of your layers. Lighting in the exterior seems off, address hierarchies and balance.
- Good presentation presence.
- Better inspiration images were used for each space and tied in the overall theme.

## SELF - EVALUATION | KENNETH MOORE

After reviewing the professional evaluations above, it is clear that I will need to apply a more thoughtful design that thematically enhances my lighting concept. The bioluminescent theme is a solid idea, but perhaps I can create a lighting scheme that makes the spaces appear more inviting, interesting, and alive. The use of various colors and fixtures may be an important element to the design.



UNIVERSITY OF MARYLAND - BALTIMORE: HEALTH SCIENCE FACILITY III

Milestone #1 January 23		Milestone #2 February 13			Milestone #3 March 6			Milestone #4 April 3								
12-Jan	19-Jan	26-Jan	2-Feb	9-Feb	16-Feb	23-Feb	2-Mar	9-Mar	16-Mar	23-Mar	30-Mar	6-Apr	13-Apr	20-Apr	27-Apr	1-May
Schematic Design		Revit Model Construction			Electrical Report			Daylighting Calculation				Presentation				
Gather IES Files and Cutsheets		Electrical Evaluation			Structural Evaluation			Evaluate Daylighting Areas				Finish Report				
								S P R I N G				F I N A L				
								B R E A K				R E P O R T				
												P R E S E N T A T I O N				
												A B E T A s s i g n m e n t				
												U p d a t e C P E P				
												S E N I O R				
												B A N Q U E T				

Legend:

	Lighting
	Electrical
	Structural
	Daylighting
	General

Milestone Activity Summary

- 1 Schematic design re-evaluated and completed.
- 2 Revit model completed. (One space complete prior to Feb. 3rd) Finished fixture selection.
- 3 Structural evaluation complete. Finish daylighting evaluation.
- 4 Report completed and ready to present