

HYATTSVILLE BRANCH LIBRARY

Spring Final Thesis Proposal

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AE 481



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Executive Summary

The Hyattsville Branch Library is planned to be built right in the middle of the Hyattsville, MD commercial complex. The library's main purpose is to provide a welcoming place for the community to come together as well as provide the atmosphere for learning. This proposal explains the building systems and spaces of the library that will be redesigned. The lighting design for four major spaces, the Children's Area/ Preschool Play Area, Collection/ Seating Area, Young Adult Area/ Circulation Desk, and Entrance to the building. In addition, the electrical and mechanical building systems will have substantial changes in the new design. There will be the addition of an optional standby electrical system as well as energy efficiency studies of both the electrical and mechanical equipment and devices. Also, the acoustics of the large open space with book stacks will be studied for excess noise that could interrupt the privacy of readers. At the end of the report, there is a tentative schedule for the following spring semester with the separation of different tasks.

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Building Statistics

- Stories: 1 Story Library with 1 Level Parking Garage
- Size: 40,258 sqft. Library & 46,314 sqft. Parking Garage
- Cost: \$27,970,244 estimate
- Construction Timeline: Not started yet, Goal to start in Spring 2018

Design & Construction Team

- Owner: Prince George's County Memorial Library System
- Architect: Grimm & Parker
- MEP: Weigand Associates
- Civil: Adtek Engineers, Inc.
- Structural: Restl Designers
- Landscape: Bradley Site Design, Inc.

Background

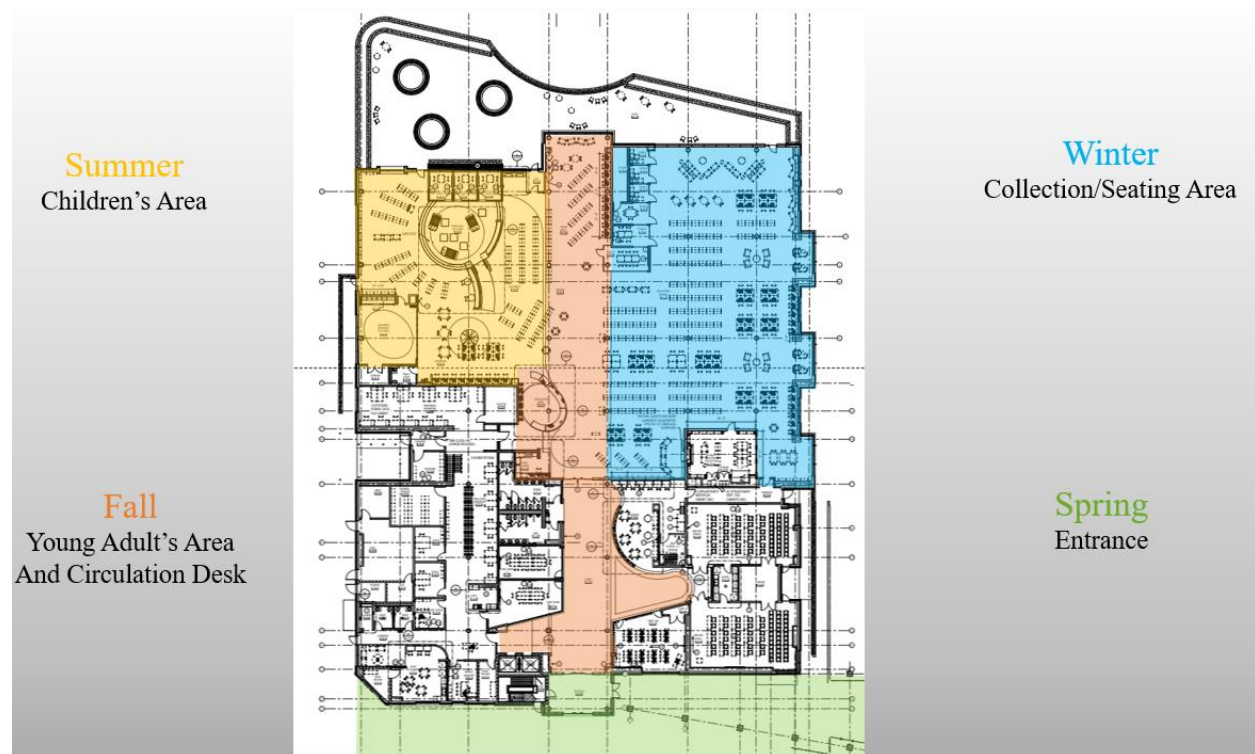
The Hyattsville Branch Library has been designed as a single-story library with a partially underground, one floor parking garage below the library footprint. The architecture of the library includes a multi-leveled metal deck roof, terra-cotta bricks, metal panel walls, glass curtain walls, and a patio that is above ground over the parking lot entrance to the north. The main entrance for pedestrians is on the south façade, whereas the parking garage entrance is on the north side and has southern elevators and stairs to bring people up to the library. In addition, on the roof there is a solar photovoltaic array on the west side and a green roof and skylights on the eastern roof. The library was designed to provide spaces to support the community, such as, Community meeting rooms, children's area, café/vending, teen area, group study rooms, quiet study rooms, public computers, plaza deck. The overall design concept was to create a welcoming facility with flexible spaces and modern technology that is accessible to all people.

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Lighting Depth

The existing lighting design for Hyattsville Branch Library is based on functionality and efficiency. The lighting designer from the MEP consultant, Weigand Associates, is a Penn State architectural engineering alumnus and used the IES handbook, codes, and AGi 32 to model the illuminance in the building. The lighting design therefore is very good at reaching illuminance criteria and uses entirely LED luminaires.

To improve upon the existing designs, I chose to redesign three interior spaces of the library that contain most of the book stacks and the exterior lighting for the south entrance into the building. Without the budget constraints of a MEP firm, the new lighting design will add much more visual interest to the spaces and architecture as well as more closely match the specific illuminance needs for certain tasks in the library. Large glass curtain walls can be found on each side of the library and provide useful illuminance to some of the spaces, but have the chance of creating glare in other sections with east or west facing glazing. The overall theme for the new lighting design of these four spaces is the seasons, with each assigned a different season based on room function.



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Children's Area / Preschool Play Area

The overall lighting concept for this space is the summer. The design will include different types of luminaires to support the various tasks, such as, children playing in play houses, children and parents looking at book stacks, using computers, and reading in seats at tables. The main goals for the lighting design are to relax the occupant while providing a good condition for playing and learning.

Main Collection / Seating Area

The overall lighting concept for this space is the winter. Most of the book stacks are found in this large area, as well as, many groupings of seats for both reading and computers. In addition to the north and east facing curtain walls, there are skylights that allow a lot of daylight into the space. Additional electric lighting will be added to provide proper illuminances for the tasks during times when natural light is insufficient. Some of the seating areas have been designated by non-uniform lighting, created by multiple sources, creating a more private feeling. The option between public and private seating represents the owner's original desire to make every visitor welcome, by providing a variety of amenities.

Young Adult Area / Circulation Desk

The overall lighting concept for this space is the fall. This space acts as a transitional area that stretches from the entrance in the south all the way to the north side of the library, where the young adult section can be found. The ceiling is raised in this section with clearstory windows with provide light into the space. The reading spaces in the young adult section and the circulation desk need the most illuminance, whereas the transition areas need much less, which could be provided by natural light most of the time.

Entrance

The overall lighting concept for this space is the spring. The entry into the building is symbolic to the beginning of new life in the spring time. It is important that the lighting for the entrance is both welcoming and aesthetically pleasing to a passerby. The lighting must be sufficient for a person to walk up on the sidewalk or a car to pull in the circle safely during the evenings and nights, so that the library can stay open late to host community events.

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Electrical Depths

1. Photovoltaic Array Powered Panel

In the existing electrical design for Hyattsville Branch Library, there is a specified branch panel that is being fed power from two sources. The ATS switches power between the utility through the MSB and from the PV array on the roof. This panel however, is specified to have 42/42 spare circuits, meaning the panel is currently not supposed to have a use. It is likely the panel was kept open for the occupant to later decide the best loads to connect, but it is best to decide on loads for the panel during the design phase to take advantage of the solar energy to help with the building function from day one of occupancy. A use for the unused panel could be to power some of the HVAC devices during the event of lost power from the utility as an optional standby system. This panel is already connected to an ATS that can switch the power source between the utility and the solar panels, but the addition of DC batteries will likely be needed in order to store energy from the PV array for later use. The practicality of this plan will need to be analyzed, including, but not limited to, if the HVAC devices can be reasonably connected to the panel, how many HVAC devices will be connected, the existing sizes of breakers and the PV array, the need for DC batteries. If batteries are needed, then they will need to be sized appropriately based on the demand of the new devices added to the branch panel.

2. Electric Vehicle Charging Station

The addition of electrical vehicle charging stations will encourage visitor sustainability through providing a convenient spot to charge their car in the parking garage. The additional load will require a new panel also located in the garage level electrical room and will be sized based on the power required by the charging stations and based on how many charging stations will be included.

3. Voltage Drop and Protective Device Coordination Study

In order to test the worst case potential voltage drop, two paths will be studied. The first circuit path has the most devices on it and begins in the utility main switch board, next to an automatic transfer switch (ATS-PE), then PE-1, then LG-EM, then TGP-EM, and finally PEM. It is very important that this circuit runs at the correct voltage because it is connected to the emergency power for the elevator lights and ventilation. The second circuit path is the longest by distance beginning at the main switch board in the main electrical room and then to LP2, Transformer 2, and finally P2, which are all in Electrical Room 118 on the north end of the building.

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In addition, a short circuit analysis and overcurrent protective device will be completed on a circuit that is part of the emergency power distribution system. This circuit begins with a 400 amp breaker at the utility main switch board and goes to ATS-PE and then through another 400 amp breaker to the branch panel, PE-1. This emergency panel is important because it powers the HVAC systems, and two transformers that provide the only 120V power for emergency devices, including elevator controls, receptacles, and lighting relays.

Acoustical Breadth

A large open space of the library that supports most of the public services. This open space also includes three out of four areas I am redesigning the lighting for. Beginning with the circulation desk, the room with irregular leveled ceilings, extends to the young adult section, the children's area is on the west side and the main collection/seating area is to the east. I am very concerned with the noise levels in this wide-open space, primarily because the children may create a lot of noise that may interrupt an adult reading in the opposite side of the room. The sound from equipment both in the electrical room or on the roof could also contribute to unwanted sound levels. A decision matrix will be created from different solutions, including the current design and a few new designs with different equipment locations. Results of the acoustical study will be compared to see which solution creates the least amount of noise in the collection/seating area. If moving the locations of the mechanical equipment alone is not sufficient, possible changes to the architecture will be considered for the large open space.

Mechanical Breadth

Specific mechanical equipment and plans have been created for the large open space within the north side of the library. Using a matrix, I will be able to compare each mechanical device with similar replacements and compare the benefits each offers as well as the energy consumption of each device. The best devices will be chosen based on the devices with the lowest unit energy consumption, that still fulfil every purpose of the original system. Also, after settling on the best devices and completing the acoustical study it may become necessary to move some of the mechanical devices to different areas of the building to reduce excess sound or excess redundancies. Finally, the electrical emergency power system will be updated and additionally support some mechanical systems on standby for important spaces within Hyattsville Library. Both of these other studies will affect the best design for the mechanical system and where each device should be located.