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Marie Ostrowski

Lighting/Electrical

Dr. Mistrick

Science Building-Phase 1

Buffalo State College-Buffalo, NY

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Breadth Proposal

Breadth One: Daylighting (MAE)

The design for the New Science Building incorporates daylighting by means of toplighting in the atrium and sidelighting. An analysis will further study the existing skylighting systems and their efficiency by comparing calculated illuminance levels. Different layouts, shapes, and sizes of skylights will be analyzed for optimal performance. Particular attention will be directed towards the effects of shading produced by the mechanical penthouse on the skylights throughout different times of the day over the course of a year. Simulations and studies will be conducted by calculating illuminance levels (by the inverse square law and Daysim software) at specified heights within the atrium space and creating solar path diagrams.

A study of the sidelighting in the western, curtain wall of the New Science Building will also be integrated into the daylighting analysis with complementary studies incorporated into the mechanical breadth. Illuminance calculations and solar path diagrams would again be used to compare the daylight penetration and light levels with the existing design and a curtain wall that incorporates more glazing.

Breadth Two: Mechanical

The mechanical breadth will include a study of adjustments to the façade and their impacts on the mechanical loads. To dovetail with Breadth One, an analysis of the materials used in the building envelope will be conducted with simulations/calculations developed in the Heating Air and Moisture (HAM) Building Science Toolbox software program. The software conducts summations of R-values for a designated wall assembly and generates a graph to pinpoint condensation issues based on the environment and dewpoint temperatures. Specifically, research will be conducted on the utilization of an alternative glazing material, such as spectrally selective low-e glass, in order to analyze heating loads and obtain optimum insulating performance. Additionally, there is the coordination that will be conducted with the electrical system for the motor controller center design.

Breadth Three: Acoustical

The atrium designed for the building serves as a link between the existing building and the new addition and functions as a major circulation space and a casual meeting place for students. As a major open space within the academic core of the Buffalo State College campus, it could also serve as an event space for workshops or information sessions. Therefore, intelligible speech is relatively important at the ground level. The atrium is finished primarily with brick and ceramic tile. Therefore, a sound-absorbing treatment will be designed to reduce reverberant sound levels and create an appropriate Noise Reduction Coefficient (NR) for the large volume space. The Sabine formula will be utilized to evaluate noise reduction of the proposed redesigns in comparison to the existing space.

Breadth Four: LED Luminaire Options (Honors)

This additional breadth will analyze the options for LED luminaire utilization within the building. Aside from emergency and sign lighting, there is one LED step light specified in the existing design. This study would propose a luminaire for ambient lighting within a classroom or lab space and analyze the benefits and disadvantages to specifying such a luminaire. Items for study and analysis include:

- Durability
- Lamp Life
- Maintenance
- Cost
- Performance (distribution, optics)
- Color rendering properties
- Matching CCTs with other luminaires in the building