

Executive summary

This report provides a detailed outline and discussion of all work and analysis performed during the AE 897G senior thesis. In short, included are lighting and electrical designs for four spaces, two electrical depth topics, two breadth topics, and one MAE breath topic. The redesigns and this report in general, is not indentured to suggest that there are any problems with the existing designs of the lighting and electrical system; and all other disciplines for that matter. This senior thesis project was, however, intended to research and investigate alternative design solutions, budget-free.

The redesign of the electrical and lighting systems was performed for the following four spaces; The façade, auditorium, high school art room, and intermediate school café. See the appropriate sections for specific details on the goals and strategies of the lighting designs. The lighting redesign in general aimed to achieve a sense of connection with the building, and with the people in the surrounding neighborhood. See specific sections for elaborations.

Electrical depth 1 conducted an analysis of the distribution method with which the rooftop mechanical equipment is fed. The current method, which is to feed each piece of equipment individually from the first floor, is inefficient and cost-ineffective. In an attempt to save money, a rooftop switchboard is added to that a single feed may be routed to the roof, as opposed to the 6 previously. The redesign of the distribution system amounts to a savings of **\$205,540.83**.

The MAE breadth conducted an analysis of the available daylight in the space using the software DAYSIM 3.0. The results from DAYSIM were used to design a skylight system that supplements the shading system that was designed to block direct sun throughout the year. The addition of the skylight increased the daylight and spatial daylight autonomy of the space so that most of the points in the room met the target illuminance of 250 lux during 90 percent of the occupancy schedule.

The addition of the skylights into the high school art room introduce addition load onto the heating and cooling systems. As such, a mechanical analysis of had to be done to determine the cost implications, if any, of increasing the mechanical systems due to the increase in load. It was found that the heating system was adequate to combat the addition load, but the cooling system was not. An additional diffuser had to be added and selective ductwork upsized. The total cost increase due to the skylighting loads is **\$246.50**

Removing the drop ceiling to implement the skylights into the system required coordination of the MEP systems located in the ceiling space. The systems were modeled and coordinated in REVIT MEP 2012. It was shown that reorganizing the layout of the systems in the space decreased the obstruction of the skylights by approximately **37%**. In addition, the increase of open area of skylight amounted to an approximately 40% increase in illuminance into the space.