Section Three: Electrical Depth

1. Following the redesign of the four spaces (Student Gathering, Tiered classroom, Roof Garden, and Library), a redesign will be done for the associated Electrical branch circuit distribution.

2. A protective device coordination study will be completed. This study will address a single path through the distribution system. This path will be from the service entrance to panel HLP2S1. This path is from the service entrance in the North tower, to panel MSB-BS, to panel HLPS1.

3. A study of existing photovoltaic array will analyze the cost effectiveness of utilizing the array for the given location of New Haven, CT will be completed.

   Problem

   Currently it is designed to incorporate 448 photovoltaic panels, two combiner boxes rated with 10A fuses (600VDC), two 50kW inverters (480/277VAC), and two 200A (480VAC) AC disconnect switches. The panels themselves have been mounted on steel structure so they hover above the Student Gathering (or atrium) roof. This type of mounting and structure make the panels themselves segregated from the building (or considered *not* to be "building integrated"). Additionally there is doubt for such a moderate climate as New Haven to prosper and produce considerable energy from the array.

   Solution & Methodology

   My study will investigate the initial cost of the PV panels in respect to their cost-savings over time. The payback period for installing and operating the panels will be found and analyzed in respect to the given geographical area. An annual study will also follow that will summarize the energy collected over a one year period. In addition to the first analysis, a second investigation will address the feasibility of making the panels "building integrated," or making the panels serve more than one purpose for the building. One common way to do this include making the panels part of the roof membrane. In the end the panels would serve to collect energy as well as provide a moisture barrier to the building. This use could also apply for a LEED Building Innovation credit. Also, this utilization of the panels will have potential cost savings for actual roofing material and structural framing (for PVs) that would be used in the current design. A final comparison will be made between the as-designed and redesigned PV layouts.

   Tasks & Tools

   By using AGI 32, the amount of daylight hitting the panels will be found and used to estimate the amount of power that could be collected. Then it will be compared to the cost of power from the utility. Also, a cost analysis will be done based on RS Means and cost of material, and a rough estimate of installation costs.

4. *Problem*

   In conjunction with my daylight studies an HVAC breadth will be completed for both the Library and Student Gathering. Because the daylighting properties of the windows will change, so will the windows properties (specifically related to heat transfer). This will necessitate an HVAC redesign for the spaces.

   Solution and Methodology

   The HVAC equipment and design will be analyzed and any substitutions or changes will be adequately made. Since the two spaces account for a large amount of space, it is very likely that daylight changes will reflect on the HVAC system.

   Tasks and Tools

   A computation of modified designed loads will follow. Selection of distribution equipment and protective devices (including the building's main distribution equipment; the transformer and switchgear) will also be completed. It will be a goal of this portion of the project to decrease the cooling load used by HVAC equipment and by doing so, reduce the electrical load needed to power the given HVAC equipment.