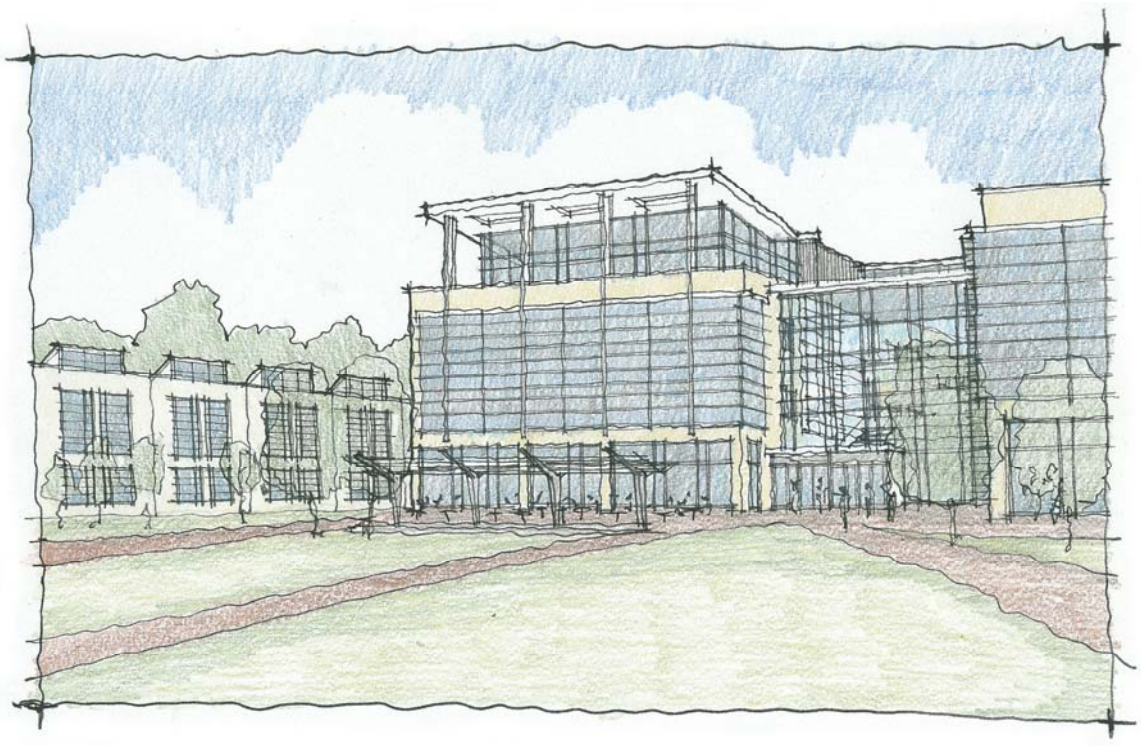
STUDENT SERVICES BUILDING
HOWARD COMMUNITY COLLEGE
COLUMBIA, MD

THESIS PROPOSAL



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Mechanical Option
January 16, 2006

EXECUTIVE SUMMARY:

The Student Services Building at Howard Community College is an approximately 101,000 sqft mixed use building. The building is separated into two main wings connected with a central three story atrium space. Many functions are housed in this building. There are a variety of office spaces, conference rooms, testing rooms, a full commercial kitchen, dining rooms, and retail space for a book store. This mix of uses makes for an overall challenging design where typical office type designs will not be suitable. The mechanical systems are also varied to meet these various demands. In my proposed redesign I will explore various mechanical systems and supplemental systems to meet the demands of this building.

EXISTING CONDITIONS:

The chilled and condenser water is provided by a stand-alone chilled water plant since campus chilled water service is not available. This plant is located in the basement level mechanical room and linked to the chilled water plant in the basement mechanical room of the adjacent Arts Building. This allows for select loads in each building to remain uninterrupted in the event of a failure of one plant. Since campus steam is not available, there is a heating water system located in the basement mechanical room and will be operating year round to meet the required heating loads. Two 3100MBH hot water boilers are used to meet these demands. Each boiler will be able to operate on natural gas and No.2 oil. The heated water is supplied at 200°F and returned at 160°F. Both the chilled water system and the heating water system are in a primary-secondary loop type set-up. Six air handling units are utilized to meet the required building loads and ventilation requirements. The air handling units are ducted to air terminal units which service each zone. Supplemental fin tube radiant heaters are also used around the perimeter walls to maintain thermal comfort near the windows.

PROPOSED DEPTH TOPIC:

The mechanical systems at the Student Services Building are designed to meet several different types of loads and occupancies. The building houses many administrative offices,

admissions and testing facilities, kitchen and dining spaces, and retail space for a book store. Due to these diversified load types, the growing cost of fossil fuels, and the push for more green buildings, I have decided to investigate a more environmentally friendly systems to meet the required heating and cooling loads and water consumption. The system I will investigate is a geothermal heat pump. This system will be modeled in the TRACE program and will be used to assist in the generation of hot water and help with the cooling loads during the summer. The capacities and demand on this system is yet to be determined. The third system I plan to investigate is heat recovery and grey water recovery from the kitchen. Large amounts of conditioned air are exhausted from the kitchen which increases the heating and cooling loads. The use of heat recovery in these exhausts will assist in the promotion of a green building. There are many restrooms within the building, so the use of grey water from the dishwashers and other kitchen drains in the toilets will reduce the overall water consumption of the building.

PROPOSED BREDTH TOPICS:

The use of a geothermal heat pump system will affect cost and construction time of the Student Services Building. As part of my breadth analysis I plan to analyze the constructability of this option. The use of a geothermal system will require extensive drilling and/or site excavation in order to install the required ground source water loop. The additional site work required will be compared to the existing time table to see if any major milestones are delayed in the critical path of the schedule. The required time, additional labor, and materials will be estimated to provide a first cost versus lifecycle cost financial analysis.

The use of large amounts of glazing in the Student Services Building causes additional heating and cooling loads; however, these loads are offset by the reduction of artificial lighting. The extensive use of indirect daylighting and occupancy sensors will decrease the loads generated by artificial lighting. The redesign of the lighting scheme in the bookstore and dining rooms will also be investigated. I believe that the lighting densities of 1.4 W/ft^2 for the dining rooms and 1.1 W/ft^2 for the bookstore can be reduced without compromising the visual appearance of the spaces. The use of lower voltage and higher efficiency fixtures will allow for lower cooling loads within the spaces.