Jessica R. Baker
Mechanical Option
"Thesis Proposal"

The Montgomery County Conference Center and Hotel (MCCCH), Rockville, MD

Architectural renderings compliments of RTKL Associates

Thesis Proposal

Faculty Advisor: Dr. William P. Bahnfleth

December 10, 2004

Thesis Building Sponsors:

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1.0 Executive Summary:

The purpose of this report is to collect and summarize all the information generated by work completed throughout this semester, in an effort to propose ideas for a mechanical system redesign of the Montgomery County Conference Center and Hotel (MCCCH) in Rockville, MD. If approved, this proposal will serve as a guideline for research to be completed during the spring semester 2005.

To begin, MCCCH's existing mechanical system is revisited in order to spark redesign ideas. Redesign objectives are then evaluated. Numerous redesign options are considered but narrowed down in order to create a realistic thesis proposal. The main elements of the proposal are thoroughly explained and justified with regard to building integration and coordination. Several supporting breadth topics relating to the building's mechanical redesign are also presented. Finally, a tentative schedule of events for the spring semester is included. (Both the main proposal topic and schedule are subject to change at any time.)

Architectural renderings compliments of RTKL Associates

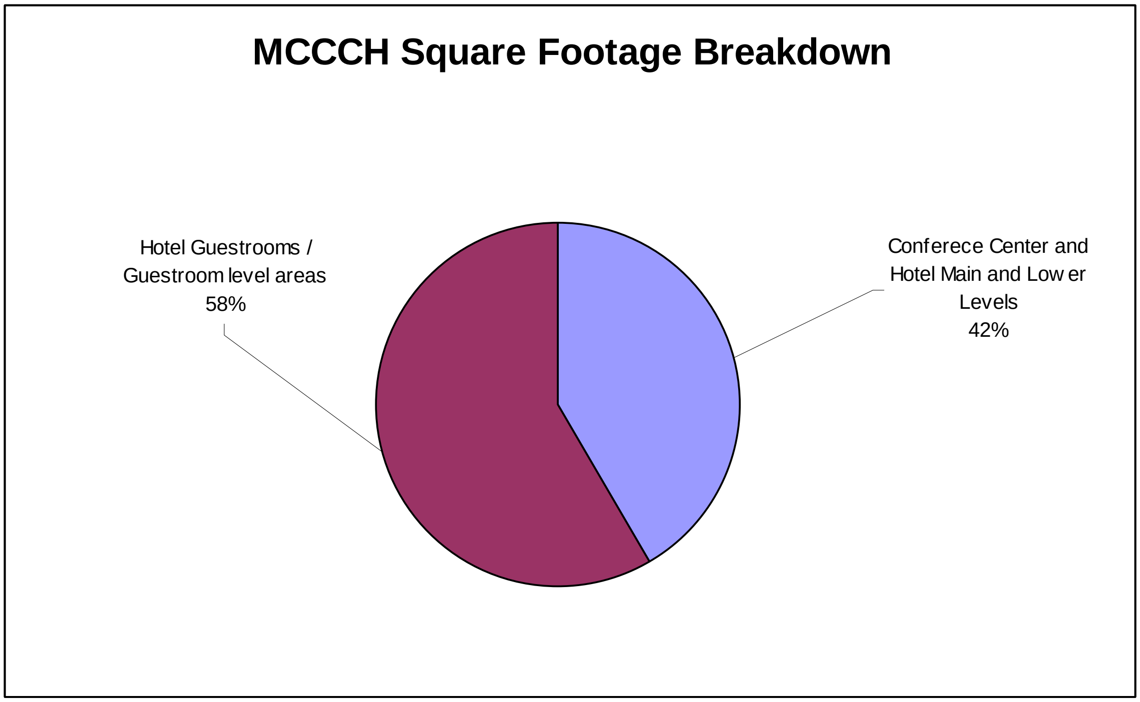
2.0 Building Background / Existing Mechanical System:

The Montgomery County Conference Center and Hotel is located on a twelve-acre plot of land neighboring the White Flint Metro Station (of the Washington D.C. Metro's Red Line) along the Rockville Pike in the North Bethesda/Rockville, MD area. By Metro-rail, downtown Washington D.C. is a fifteen minute ride from the hotel and conference center. The building's site is surrounded by several major shopping areas, like the White Flint Mall, and over two-hundred restaurants. The location is also minutes away from the Washington D.C. Beltway (I-495) and Montgomery County's Technology Corridor (I-270).

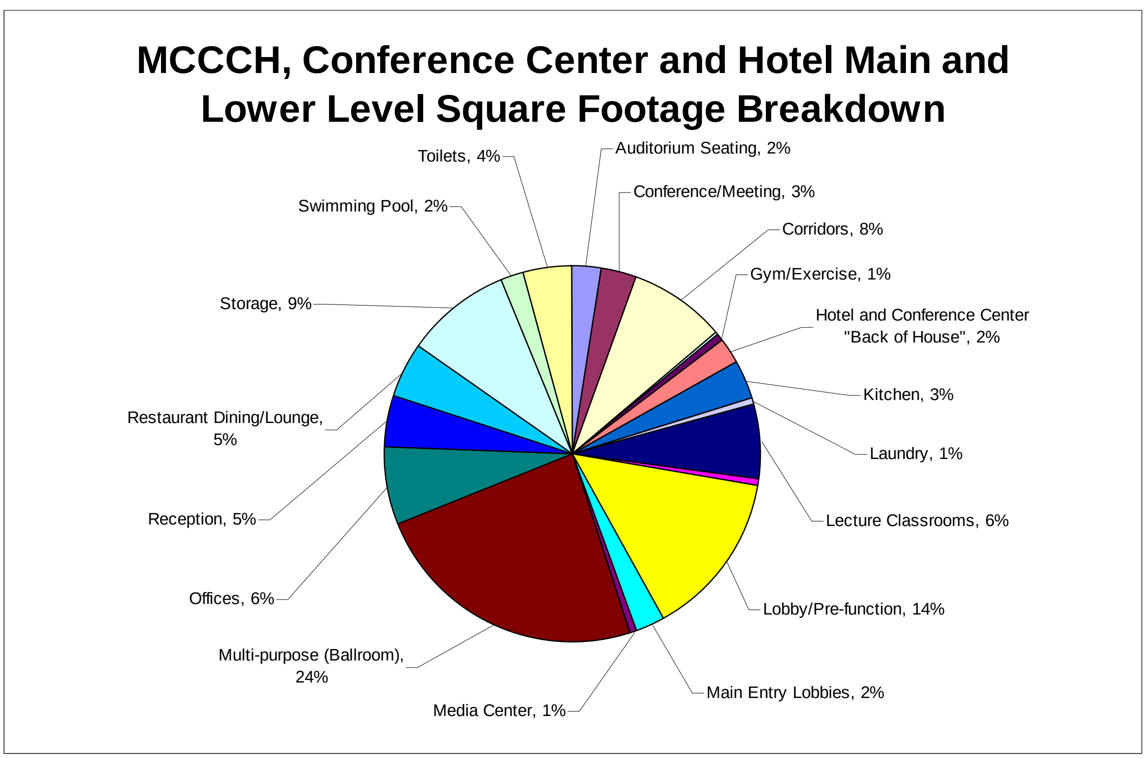
The overall size of the Montgomery County Conference Center and Hotel is approximately 240,000 square feet. The conference center portion, with its two stories extending into the hotel main and lower level, comprises about 100,000 square feet of this total. The hotel makes up the remaining square footage with its nine stories of guestrooms. The building's space breakdown is listed / displayed below in Table 1, Graph 1, and Graph 2.

SPACE NAME	AREA (sq. ft.)	# ROOMS IN EACH SPACE
Auditorium Seating	2370	1
Conference/Meeting	3295	4
Corridors	8085	9
Electric/Telephone/Data Entry	320	10
Gym/Exercise	760	1
Hotel and Conference Center "Back of House"	2176	10
Kitchen	3116	1
Laundry	650	1
Lecture Classrooms	6465	8
Lobbies	380	1
Lobby/Pre-function	14369	12
Main Entry Lobbies	2275	4
Media Center	540	2
Multi-purpose (Ballroom)	24070	1
Offices	6480	20
Reception	4615	6
Restaurant Dining/Lounge	4740	2
Storage	8988	10
Swimming Pool	1860	1
Toilets	4270	12
Hotel Guestrooms / Guestroom level areas	140000	225
Untreated	N/A	N/A
TOTALS	**239824**	**341**

Table 1: MCCCH Building Space Breakdown



Graph 1: MCCCH Building Space Breakdown



Graph 2: MCCCH Building Space Breakdown

The majority of the Montgomery County Conference Center and Hotel's redesign will involve the building's mechanical system. The following gives an overview of MCCCH's present mechanical system.

Air-Side Systems

The airside mechanical system for the Montgomery County Conference Center and Hotel consists of a combination of variable air volume and constant volume systems served by eleven different air handling units throughout the building. Eight of the air handling units are located in mechanical rooms throughout the building, two rest on the hotel roof, and one is ceiling mounted in a stairway area. Variable air volume boxes with electric reheat distribute conditioned (55 ^{o}F) air from the air handling units to all spaces in the two-story conference center, as well as, the restaurant and hotel first floor. Constant volume systems are used in the kitchen, exercise room, pool, and guest corridors/elevator areas on each hotel level. (Two of the three air handling units serving the kitchen area provide makeup air to the kitchen hoods, supplying 100% outdoor air.) Vertical fan coil units are used in each of the hotel guestrooms while other small split system and water cooled air-conditioning units are used in spaces like fire control, telephone, and security rooms. The following is a list of MCCCH's air handling units/makeup air units and the components of their design.

Air Handling Units 1 and 2: are located in a mezzanine level mechanical room and serve all spaces in the conference center (Variable Volume), see Sketch 1, Section A. The contents of each AHU include min/max OA dampers, re-circulated air with a variable frequency drive fan, economizer, mixing box, filter (30% ASHRAE efficiency), pre-heat coil, cooling coil, heating coil, and a variable frequency drive supply fan all mounted on a 4" high housekeeping pad with ¼" thick neoprene pads. Both air handling units are balanced at a supply air cfm of 50,000, a max OA cfm of 50,000, and a minimum OA cfm of 30,000.

Air Handling Unit 3: is also located in the mezzanine level mechanical room. It serves the restaurant area on the main level between the conference center and hotel (Variable Volume), see Sketch 1, Section B. The contents of the AHU include min/max OA dampers, re-circulated air with a variable frequency drive fan, economizer, mixing box, filter (30% ASHRAE efficiency), cooling coil, heating coil, and a variable frequency drive supply fan all mounted on a 4" high housekeeping pad with ¼" thick neoprene pads. Air handling unit 3 is balanced at a supply air cfm of 12,500, a max OA cfm of 12,500, and a minimum OA cfm of 5,000.

Air Handling Unit 4: is located in the mezzanine level mechanical room. It serves the kitchen area on the main level between the conference center and hotel (Constant Volume), see Sketch 1, Section C. The contents of the AHU include min/max OA dampers, re-circulated air, economizer, mixing box, filter (30% ASHRAE efficiency), cooling coil, heating coil, and supply fan all mounted on a 4" high housekeeping pad with ¼" thick neoprene pads. Air handling unit 4 is balanced at a supply air cfm of 9,000, a max OA cfm of 9,000, and a minimum OA cfm of 2,250.

Air Handling Unit 5: is located in a mechanical room on the main hotel level, farthest from the conference center. It serves the hotel's first floor areas (Variable Volume), see Sketch 1, Section D. The contents of the AHU include min/max OA dampers, re-circulated air with a variable frequency drive fan, economizer, mixing box, filter (30% ASHRAE efficiency), cooling coil, heating coil, and a variable frequency drive supply fan all mounted on a 4" high housekeeping pad with ¼" thick neoprene pads. Air handling unit 5 is balanced at a supply air cfm of 9,000, a max OA cfm of 9,000, and a minimum OA cfm of 2,250.

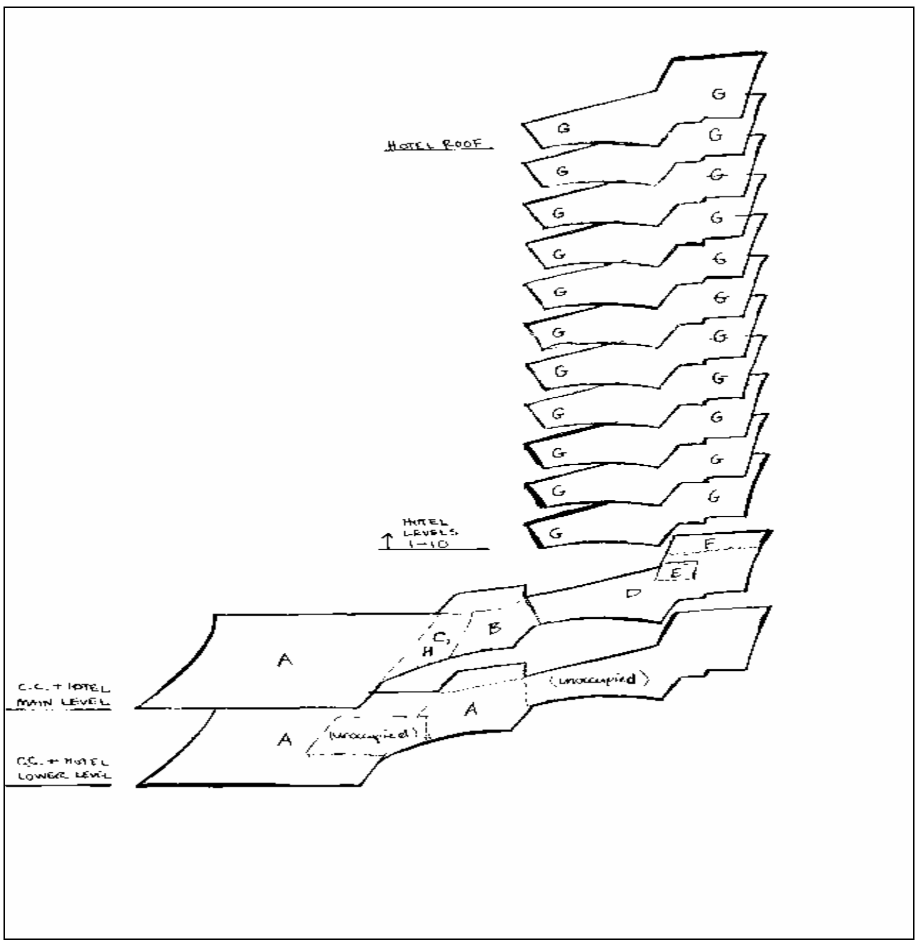
Air Handling Unit 6: is also located in the mechanical room on the main hotel level, farthest from the conference center. It serves the exercise area on the hotel's main level (Constant Volume), see Sketch 1, Section E. The contents of the AHU include min/max OA dampers, re-circulated air, economizer, mixing box, filter (30% ASHRAE efficiency), cooling coil, heating coil, and supply fan all mounted on a 4" high housekeeping pad with ¼" thick neoprene pads. Air handling unit 6 is balanced at a supply air cfm of 1,400, a max OA cfm of 1,400, and a minimum OA cfm of 350.

Air Handling Unit 7: is ceiling mounted above a stairway near the pool area on the hotel's main level. It exists solely to provide air to the pool area (Constant Volume), see Sketch 1, Section F. The contents of the AHU include min/max OA dampers, re-circulated air, economizer, mixing box, filter (30% ASHRAE efficiency), preheat coil, cooling coil, heating coil, and supply fan. Additionally, the coils inside AHU 7 are coated with heresite to prevent corrosion. Air handling unit 7 is balanced at a supply air cfm of 3,200, a max OA cfm of 3,200, and a minimum OA cfm of 1,000.

Air Handling Units 8 and 9: are both located on the roof of the hotel tower. Each provide ventilation (100% OA) to the guest corridors and elevator lobbies on hotel levels 2 through 10 (Constant Volume), see Sketch 1, Section G. The contents of each AHU include an economizer, filter (30% ASHRAE efficiency), preheat coil, cooling coil, heating coil, and supply fan all mounted on a factory finished 18" high roof curb. Air handling unit 8 is balanced at a supply air cfm of

4,000, a max OA cfm of 4,000, and a minimum OA cfm of 4,000. Air handling unit 9 is balanced at a supply air cfm of 5,000, a max OA cfm of 5,000, and a minimum OA cfm of 5,000. (There are no AHUs that serve the individual hotel guestrooms. Each of these areas is provided for by an individual vertical fan coil unit.)

Makeup Air Units 10 and 11: are located in the mezzanine level mechanical room. They provide 100% outdoor air to the kitchen area in order to offset the kitchen exhaust hoods (Constant Volume), see Sketch 1, Section H. The contents of each AHU include an economizer, filter (30% ASHRAE efficiency), cooling coil, heating coil with face and bypass dampers, and supply fan all mounted on a 4" high housekeeping pad with ¼" thick neoprene pads. Makeup air unit 10 is balanced at a supply air cfm of 5,600, a max OA cfm of 5,600, and a minimum OA cfm of 5,600. Makeup air unit 11 is balanced at a supply air cfm of 6,025, a max OA cfm of 6,025, and a minimum OA cfm of 6,025.



Sketch 1: 3-D Sketch of Areas Served by AHUs (Not to Scale)

Water-Side Systems

Two 300 ton/5,000 MBH direct fired absorption chillers with dual fuel natural gas/No. 2 oil burners provide chilled and hot water to the conference center and hotel. Each possesses a COP of 1.25 (at IPLV) and a heating efficiency of 85%. The absorption cycle in these machines, which takes the place of the compressor in vapor compression chiller equipment, is based on a water and lithium bromide solution. The two chillers/heaters are located along with the building's end suction pumps in a mechanical room on the lower level of the conference center. Two primary (one is stand-by), constant flow and two secondary, variable flow end-suction pumps distribute the building’s chilled water supply. Hot water is delivered via two (one is stand-by), constant flow end suction pumps. Two 1300 gpm cooling towers assist the absorption chillers and are located on the roof of the hotel. This condenser water loop is driven by two constant volume end suction pumps. In the winter months, a 1300/720 gpm plate and frame heat exchanger operates within the condenser water loop to provide “free cooling.” Schematics of this overall system are available in technical assignment #3.

3.0 Proposal Objectives:

The idea behind the mechanical system redesign of MCCCH is to improve the system’s overall performance while also lowering its life-cycle cost. The redesign process will follow a general outline put forth by the Pennsylvania State University’s Architectural Engineering Department. “All modifications and changes related to the original building design and construction methodology will be solely for the purpose of academic development. Changes and discrepancies will in no way imply that the original design contained errors or was flawed. Different assumptions, code references, requirements, and methodologies will be incorporated into the redesign; therefore, investigation results will vary from the original design” (Thesis E-studio Disclaimer).

One major goal of the proposed redesign involves improving matters that directly affect the building’s owner and surrounding environment. As stated before, the proposal will justify issues of redesign that will hopefully decrease the building mechanical and related systems' life-cycle costs. (Lower building system first costs could also be an objective of the redesign, however, it is not a driving factor for success. If system first costs can be lowered while still making improvements, it will be accepted as an added bonus.) One way in which all of this will be attempted entails decreasing the building's annual energy consumption. By doing this, the monthly/annual bills for the facility/building owner will be decreased. This will also result in a more environmentally friendly building. Less energy usage converts directly into less fossil fuel use, and less fossil fuel usage means less emissions by both the building's electricity supplier and the building itself. In an area like Washington D.C. and Baltimore, such savings are usually very appealing to building owners as utility rates can be extremely lofty. The fact that the design is good for the environment creates even further encouragement.

Another goal for the successful redesign of MCCCH's mechanical system involves providing an improved, clear, and concise control/operation strategy for any altered or new building systems. This will act as a check for successful system implementation while also furthering benefits to the owner. The clearer the control and operation of building systems, the easier it is for building operators to maintain an optimized level of system performance.

Finally, several assumed objectives for the redesign of MCCCH include providing a clear design while not losing any of the beneficial aspects of the building's current systems. For example, in technical assignment #1, it was shown that the building meets the ASHRAE Standard 62 ventilation requirements. If changes affecting this issue are made in the building's redesign, it must be checked. And, the process of review must compare "apples to apples."

4.0 Preliminary Design Considerations:

Initially, thought was given to providing the Montgomery County Conference Center and Hotel with some sort of cogeneration (building combined heat and power, BCHP) system. It was assumed that the hotel portion of the building would have steady, coinciding thermal and electric loads. Micro-turbines were considered for providing the building with electric power while also driving the absorption chiller equipment. However, because of the unpredictable occupancy schedule / operation of the conference center portion of the building, this idea was discouraged. The CHP system would most likely end up providing electricity for the hotel only, and the conference center would have to be connected to the grid. Thermal energy would be in abundance throughout the entire building and the absorption equipment would have to be altered or replaced with special absorption machines designed to run off of micro-turbine exhaust.

A second alternative for the redesign of MCCCH's mechanical system was providing the entire building with a dedicated outdoor air system (DOAS) supplemented by ceiling radiant panels. With the original design, the building's large ductwork and air handling units barely fit within certain allocated spaces. By redesigning with a DOAS-radiant system, the ductwork and equipment sizes could be reduced, allowing for easier construction and lower energy usage. However, shafts needed for the DOAS system's ductwork did not exist in the hotel portion of the building. Major structural changes would have to be made throughout the building in order to provide the space needed. Also, the entire conference center and hotel public areas (approximately 70% of the building interior) contained custom, finished ceilings well exceeding ten feet (technical assignment #3). In order for the radiant panels to be successfully integrated, major architectural changes would have to be made. The architect would have to agree on both ceiling height and finish changes, altering the entire look of the building interior. Therefore, this option was considered too radical a redesign.

Another option involved redesigning the building's mechanical system according to the Leadership in Energy and Environmental Design (LEED) in an effort to obtain a LEED certified status. This seemed to be a good idea for energy conservation and building efficiency purposes as well. However, when the building was compared to the LEED point system in technical assignment #2, it only acquired 6 points overall. Much more than just a redesigned mechanical system would have to be incorporated in order to develop a LEED certified building. Consequently, LEED design was not selected as a thesis topic.

Finally, two smaller thesis topics were pondered. These consisted of adding air-side heat recovery to the building's eleven air handling units and redesigning the mechanical system for optimum acoustics. But, each of these topics seemed to be too small for a main thesis objective. As a result, it was decided that the two ideas could be utilized as additional breadth options if time permits throughout the spring semester.

5.0 Proposed Redesign:

After eliminating each of the preliminary design considerations, it was decided that the entire spring 2005 semester will be dedicated to conducting the research proposed below. The study's results will be presented in April 2005.

Scope:

The main mechanical system alteration will consist of designing an optimized chiller plant for the building. The application of both sensible and latent thermal storage will be implemented throughout all design processes / chiller plant configurations.

Currently, the building contains two direct-fired absorption chillers that were essentially thrown into the building's mechanical system and never optimized. These current machines will be studied along with several other manufacturers' absorption equipment in order to find the most favorable absorption chilling plant configuration with thermal storage. This select absorption arrangement will then be compared to several different central plant combinations, one of which involves vapor compression, air-cooled and/or water-cooled chillers coupled with hot water boilers and thermal storage. Another comparison will consist of a hybrid plant designed for chilled/hot water and ice-making/thermal storage.

The final optimum chiller plant design will be selected based upon each working arrangement's first cost, energy consumption (life-cycle cost), and simplicity of control.

A water conservation study and redesign will also be conducted for the building. The possibility of recovering the hotel's laundry wastewater for use as cooling tower makeup will be examined. Ozone water treatment versus chemical water treatment will be utilized throughout for further water/pumping cost conservation purposes.

If time allows, an additional redesign will take place. On the building's air-side mechanical system, energy recovery in the form of both sensible and enthalpy wheels will be added to the eleven air handling units throughout the building. The slight change could result in a great amount of energy conservation.

Proposal Justification:

Improved economics and lessened environmental impact are two of the expected results of the proposed redesign for the Montgomery County Conference Center and Hotel. As a result of optimizing the building's chiller plant and incorporating the use of thermal storage, the building's life-cycle costs will be decreased and less energy should be used. This decrease in energy usage, along with the use of wastewater recovery and ozone water treatment, will also make the building more environmentally friendly. Energy and pumping savings will be converted into "effective emissions" prevented, while water savings can be compared directly. If time permits, even more effective energy management will be achieved through the use of the air-side heat recovery systems. This energy savings will be calculated and compared in the same fashion.

Coordination and Integration:

The greatest coordination issue of the redesign will involve the rearranging and addition of major equipment for the building's central chilling/heating plant. In certain situations, several pieces of new equipment will have to be added to the building. Other existing equipment will be kept and relocated, or simply replaced. Either way, space will be an issue. Therefore, throughout the redesign, each area allocated as a mechanical room must be precisely laid out in order to fit all equipment properly.

Another large integration issue entails maintaining the building's superficial appearance throughout the redesign of the mechanical system. Several large pieces of equipment could end up being placed on or around the exterior of the building. However, these changes will in no way detract from the building itself. Much special care will be taken as to keep this from happening.

Lastly, any addition of equipment to the building's air handling units must be very carefully considered. The current mechanical rooms containing air handling units are extremely overcrowded. If any air-side heat recovery is implemented, optimum arrangement will have to be sought.

6.0 Breadth Areas:

The proposed changes in the redesign of the Montgomery County Conference Center and Hotel's mechanical system will directly effect several of the building's other systems. These impacts made upon the other systems can not be ignored as they will highly influence the building's overall operation. However, this concept works in reverse as well. Intentional changes and implementations to the other building systems can be made in an effort to increase the mechanical system redesign's level of success. Several breadth areas that will be included in this proposal for redesign involve the building's electrical system, lighting system, structural system, and construction management process.

MCCCH's original electrical design will have to be changed. The electrical loads generated by the building's mechanical equipment will be different. This will result in the need for feeder, panel board, and over current protection resizing. The new electrical equipment will alter the building's first cost and utility bills, ultimately helping with the economics of the mechanical system redesign.

Another area that will be looked into entails the building's lighting system. Most of MCCCH's custom lighting fixtures involve the use of incandescent bulbs. It is known that incandescent bulbs tend to use more energy, produce more heat, and fail more often than something like fluorescent bulbs. Therefore, throughout the building's redesign, replacing these bulbs will be researched. If anything, the building's cooling load on the chiller plant may be slightly reduced and all energy savings could further justify the mechanical system's redesign.

The building's structural system will also be studied at locations where new mechanical equipment might need to be placed. It is not guaranteed that this will be necessary. However, all new loads and structural framing members/concrete slabs will be studied if required. Any changes made to enhance the building's structural system will increase the building first cost but, should be offset by the mechanical system redesign.

Finally, MCCCH's construction management process will be studied for the hotel portion of the building. A short interval production schedule (SIPS) will be created for the hotel guestroom floors' construction. This analysis/redesign has no immediate affect on the mechanical system's redesign but, any cost savings encountered can be put toward the new mechanical system.

(If the need for an acoustical analysis arises at any point throughout the redesign, it will also be conducted. For now, though, all areas in which redesign/equipment replacement is taking place are very well isolated from the rest of the building.)

7.0 Project Methods:

Many different project methods / sequences will be utilized throughout the proposed redesign of the Montgomery County Conference Center and Hotel. Work for the mechanical depth areas will be focused on first, if not throughout the entire semester. The breadth areas will follow second while also serving as "fill in" work.

The optimized chiller plant design will begin with the selection of different central chilling/heating plant configurations using thermal storage. The economics of all systems will be tabulated. Then, these combinations will be modeled throughout several building simulations with Carrier's Hourly Analysis Program (HAP). References for all data needed include the ASHRAE Handbooks of Fundamentals, HVAC Systems and Equipment, and HVAC Applications. Many manufacturer catalogs and websites will also be utilized. From all of this, the most fitting chilling/heating plant design will be chosen.

The breadth sections of this proposal will then be implemented. The electrical breadth will bat first as it will be most affected by the building's mechanical system changes. All alterations made to the electrical system will follow the 2002 National Electrical Code. Calculations will be done using Microsoft's Excel.

The building lighting analysis will then be conducted. Lighting manufacturers' data will be consulted for all of this work. Calculations will be done using Microsoft's Excel.

If a structural analysis is needed due to the addition of mechanical equipment on roofs or elevated slabs, STAAD will be used to determine the structural impacts. Member sizes and slab strengths will be checked accordingly. Additional calculations will be done using Microsoft's Excel.

Lastly, the construction management breadth will be covered. The architectural engineering, construction management professors will give much guidance on how to go about creating the short interval production schedule (SIPS) for the hotel portion of MCCCH. Student peers will also help throughout the process. Calculations will be done using Microsoft's Excel.

8.0 Preliminary Research:

The following is a list of reference materials that have already been consulted and will definitely be used throughout the future design process. Many more will be added to this list as the redesign unfolds.

ASHRAE Handbook, Fundamentals. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., Atlanta, GA 2001.

ASHRAE Handbook, HVAC Applications. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., Atlanta, GA 2003.

ASHRAE Handbook, HVAC Systems and Equipment. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., Atlanta, GA 2004.

Butkus, Alexander S. 2003. Using Wastewater for Cooling Tower Makeup – Laundry Water Recovery for Tower. *American Society of Heating, Refrigerating, and Air Conditioning Engineers Journal*.

CoolTools Chilled Water Plant Design and Specification Guide. Pacific Gas and Electric Company, San Francisco, CA 2000.

Zentox Industrial and Commercial Water Treatment. www.zentox.com.

9.0 References:

The Pennsylvania State University's Architectural Engineering E-thesis Archives-Mechanical. www.arche.psu.edu/thesis. (Particularly, http://www.arche.psu.edu/thesis/2004/sms422 and http://www.arche.psu.edu/thesis/2004/aps150)

Disclaimer: Past architectural engineering thesis proposals from the Penn State AE E-thesis Archives were used as guidelines for this thesis proposal document. Formatting and several general thesis ideas were taken from example thesis proposal documents and used throughout parts of this proposal. Most redesign issues are different as they apply directly to this proposal's main focus; the Montgomery County Conference Center and Hotel. However, because of the great amount of structure incorporated into the AE Senior Thesis program, many overall objectives of this proposal match those done over the past years.

10.0 Tentative Schedule:

The following pages contain a preliminary schedule for the spring semester 2005 redesign of the Montgomery County Conference Center and Hotel. Everything scheduled is subject to change.

January 2005

January 2005

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February 2005

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3 File Intent to Graduate	4	5	6	7	8 9
10 Chiller Plant Optimization Thermal Storage Research Detailed Consultations with Mechanical Faculty Faculty Consultation Spring 2005 Semester Begins	11	12	13	14	15 16 Chiller Plant Optimization Thermal Storage Research
17 Chiller Plant Optimization Thermal Storage Research Faculty Consultation	18	19 Last Day for Drop/Add	20	21	22 23 Chiller Plant Optimization
24 Chiller Plant Optimization HAP / Energy Analyses Faculty Consultation Last Day to File Intent to Graduat	25	26	27	28	29 30 Chiller Plant Optimization HAP / Energy Analyses
31 Chiller Plant Optimization HAP / Energy Analyses Faculty Consultation					

February 2005

February 2005

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7 Chiller Plant Optimization HAP / Energy Analyses National ASHRAE Conference Orlando, FL Faculty Consultation Final Exam Conflict Filing Begins	8	9 Electrical / Lighting Breadths	10	11	12 13 Chiller Plant Optimization HAP / Energy Analyses Electrical / Lighting Breadths
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March 2005

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April 2005

April 2005

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May 2005

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29	30	31				

Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
				April 1: Chiller Plant Optimization; HAP / Energy Analyses; Structural and CM Breadths	2: Chiller Plant Optimization; HAP / Energy Analyses 3: Chiller Plant Optimization; HAP / Energy Analyses
4: Chiller Plant Optimization; HAP / Energy Analyses; Faculty Consultation; Written Submission of Thesis?	5: Chiller Plant Optimization; HAP / Energy Analyses	6: Chiller Plant Optimization; HAP / Energy Analyses; Faculty Consultation	7: Chiller Plant Optimization; HAP / Energy Analyses	8: Chiller Plant Optimization; HAP / Energy Analyses; Faculty Consultation	9 10
11: Thesis Presentations?	12: Thesis Presentations?	13: Thesis Presentations?	14	15	16 17
18: Faculty Consultation?	19	20: Faculty Consultation?	21	22: Faculty Consultation?	23 24
25: Faculty Consultation?	26	27: Faculty Consultation?	28	29: Faculty Consultation?; Last Day of Classes!!!	30

May 2005

May 2005

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

June 2005

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
					May 1
2 FINAL EXAMS	3 FINAL EXAMS	4 FINAL EXAMS	5 FINAL EXAMS	6 FINAL EXAMS	7 8
9	10	11	12	13 Commencement	14 Commencement 15 Commencement
16	17	18	19	20	21 22
23	24	25	26	27	28 29
30	31				