

Montgomery County Equipment Maintenance and Operations Center

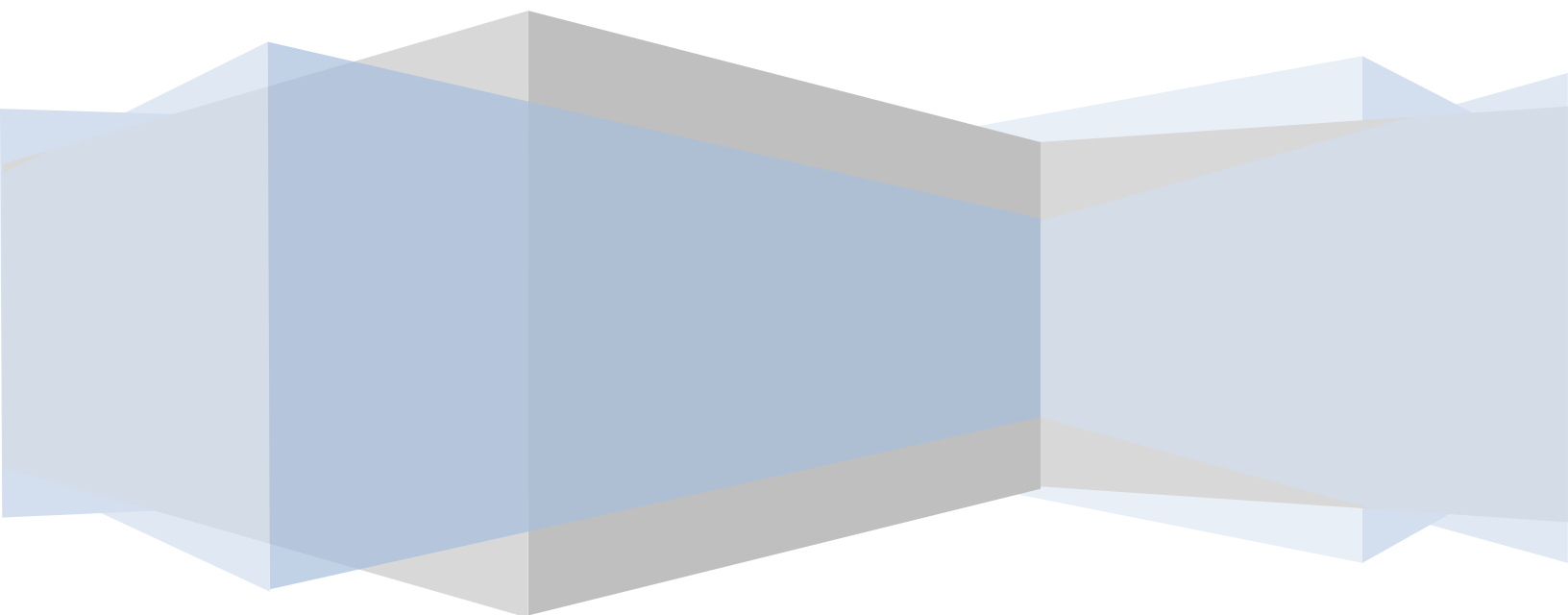
Final Report

Architectural Engineering Capstone Thesis

Michael A. Tellep

Mechanical Option

Advisor: Moses D. F. Ling, PE, RA



This thesis is dedicated to the life and memory of

Frances J. Palko

My Grandmother, Frances Palko, has always been very influential in my education. Her motivation and support through tough and trying times made me push even harder to be the person and scholar I am today.

In May of 2010, I was preparing to travel to Rome, Italy for the Architectural Engineering study abroad program. Frances had been fighting Leukemia for some time. A few weeks before returning from Rome, I received a phone call from her. After talking for a few minutes, she told me one last time to do my best, followed by, "I have lots of things to be worried about today, but I know I don't have to worry about you. I know you're going to do great things." One week before I was able to return home, she passed away.

These words have continued to push me through those tough and trying times, as they will for many days to come.

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Abstract:

The Montgomery County Equipment Maintenance and Operations Center

Project Information:

- **Location:** Rockville, MD
- **Size:** 75,000sf
- **Cost:** \$15 million
- **Estimated Completion:** Feb 2013
- **Occupancy:** Mixed Use



Project Team:

- **Owner:** Montgomery County
- **General Contractor:** Coakley Williams Construction
- **Architect:** Baker and Associates
- **Engineering Firm:** EPCM, Inc.



Architecture:

- Designed for function rather than appearance
- Fits into the urban fabric of its surroundings
- Mixed Use: lower level is garage and storage space, upper level is offices and operations
- Design Strives for LEED Gold

Mechanical System:

- Two main rooftop air handling units
- Strict focus on ventilation systems due to fuel and vehicle fumes
- 4.3 acres (75% of roof) of green roof provides thermal barrier from solar heat gain

Lighting/Electrical System:

- Automated lighting reduces energy consumption by 50%
- Daylighting into vehicle maintenance bays through glazed panels and transoms
- Exterior lighting complies with LEED requirements for light pollution

Structural System:

- Steel frame building with multiple façade materials
- Large spans and high ceilings in maintenance bays
- Minimal columns in maintenance bays for easy maneuvering of buses and other vehicles

Michael A. Tellep

Mechanical Option,
Penn State Architectural Engineering

AE 481W, Senior Thesis
Advisor: Moses Ling

Acknowledgments:

Thank you to all of those who assisted and supported me throughout this thesis.

Penn State Faculty and Staff:

Moses D. F. Ling, PE, RA..... Advisor

M. Kevin Parfitt, PE..... Thesis Course Coordinator

Robert J. Holland..... Thesis Course Coordinator

Montgomery County Personnel:

Rassa Davoodpour..... Office of Special Projects
Manager, Smart Growth Initiative

EMOC Project Team Members:

William Gregory Shipley, Jr., AIA, LEED AP BD+C..... Architect, Michal Baker, Jr., Inc.

Susan Garcia, OAQ..... Project Manager, Michael Baker, Jr., Inc.

Jeff Engel, PE..... S3E Klingemann, Inc.

Michael Deer..... Project Manager, Truland Walker Seal
Transportation, Inc.



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Executive Summary:

This thesis is presented as a requirement for graduation from the Architectural Engineering department at the Pennsylvania State University. In the summer of 2011, the Montgomery County Equipment Maintenance and Operations Center, Building 1 (EMOC1) was chosen for analysis. Montgomery County will be using this building, upon completion in February of 2013, for the maintenance of their transportation and road repair equipment. It is a 2 story building comprised of 3 major sections. Those sections are the garage and maintenance bays, the lower offices and workspaces, and the upper offices and workspaces. The organization of these spaces can be seen in the following sections of this report.

The existing design of the mechanical system consists of 2 Energy Recovery Units (ERUs) servicing the garage spaces, 3 Rooftop VAV Units (RTUs) servicing the upper and lower office spaces, and various smaller air conditioning units for specific spaces. Heating and cooling for this building are provided by central plants that service the entire complex of which this building is a part of.

The hypothesis of this thesis is to explore the possibilities of using more passive and natural ventilation in the office spaces as well as combining the rooftop units to simplify the system. The possibility of using chilled beams in the upper office spaces will also be analyzed.

The results of the study show that the natural ventilation system and combination of the RTUs works well in reducing energy at a slightly higher initial cost. Natural ventilation is driven by a large courtyard enclosure added to the building. The option of using chilled beams for this building turned out to be impractical due to cost, increased cooling load, and condensation issues.

Along with the changes to the mechanical system, the effect of these changes in terms of Architecture and Acoustics are analyzed. The architecture of the building is changed by adding a much more elaborate break space for the occupants as well as architecturally designating this building to be the "head" building in the complex. Acoustically, this new space adds a buffer zone to the outside noise. It is well placed between a busy street outside and the windows of the office spaces inside.

The goal of this project is to continue the trend of natural ventilation throughout the building. The garage spaces are already 100% cooled by natural ventilation and only require heating in the winter. At the completion on this project, the office spaces also conserve a decent amount of energy due to naturally driven ventilation.

Existing Conditions

Building Overview:

The Montgomery County Equipment Maintenance and Operations center is a 2 story building located in Rockville, MD. It is currently under construction and will be completed in February of 2013. It is a part of a large complex that serves as Montgomery County's industrial site as well as a hub for the County's transportation services. Bus parking and service, road maintenance equipment parking and service, salt and cinder storage, transportation operations, and dispatch are all parts of this complex. EMOC 1 is to be the operations head as well as the main, state of the art maintenance facility for the transportation system.

Project Team:

The project team for EMOC 1 is as follows:

Owner.....	Montgomery County, MD
Architect.....	Michael Baker, Jr., Inc.
Interior Design.....	Michael Baker, Jr., Inc.
Landscape Architecture.....	Michael Baker, Jr., Inc.
Environmental.....	Michael Baker, Jr., Inc.
Cost Estimating.....	Michael Baker, Jr., Inc.
General Contractor.....	Coakley Williams Construction
Civil Engineering.....	Adtek Engineers, Inc.
Structural Engineering.....	Adtek Engineers, Inc.
Equipment.....	Maintenance Design Group
Mechanical, Plumbing, Fire Protection.....	S3E Klingemann, Inc.
Electrical Engineering.....	EPCM, Inc. Consulting Engineers
Vehicle Fueling.....	Fuel Solutions, Inc.
Foodservice.....	Tricon Foodservice Consulting, Inc.
Life Safety.....	Hughes Associates, Inc.
Wetland Mitigation.....	Ecotone, Inc.
Commissioning.....	Gretchen Coleman Commissioning Group. LLC



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Site:

EMOC 1 is located on an empty lot, at 16624 Crabbs Branch Way, Rockville, MD, in the pre-existing Montgomery County Industrial Complex. The site was chosen for easy access from the main streets so buses can quickly drive in, be refueled or maintained, and drive out. It can be seen here that the site is quite industrial in its surroundings, and the architecture of EMOC 1 supports that. The following aerial photographs show that site in more detail.

Google Maps Aerial of the site (Future location of EMOC 1 in red):



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Michael Baker Image of EMOC 1 Site (Building 1 is the larger building in blue). Note the wetland mitigation required in the upper right corner of the site:



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Architecture:

EMOC 1 is mainly an industrial facility. The urban fabric of its surroundings does not require specific exterior modifications to hide what the building actually is. The envelope is designed specifically for the site and its surroundings to help in the LEED qualifications of this building.

Landscape was deeply considered by the architects because of both the LEED requirement for wetland mitigation and the local zoning requirements for noise. Noise barriers along with strategically placed vegetation comply with this requirement of the site.

A specific item to note about this building is the circulation of buses and equipment. Buses enter from the North side of the building, are maintained and serviced, and exit through the South side of the building. This circulation allows for maximum flow within the building as well as around the building.

The parking deck, located North of the building, is accessed by a small ramp, seen in the image to the right in white. This ramp allows the circulation of personal vehicles to be separate from the circulation of buses and equipment.



Statistics:

The following are basic statistics on the building:

Physical Address	16624 Crabbs Branch Way, Rockville, MD
Size	75 000 SF
Total Cost Estimation	\$15 Million
Stories Above Grade	2
Stories Below Grade	Maintenance Pits Only
Date of Construction	June 2011 to February 2013
LEED Objective	Gold Certification

Sustainability Features:

Modern buildings strive to have as little impact on the environment as possible along with using as little energy as possible. EMOC 1 employs some very unique sustainability features that are listed below. Some of these are related to the existing County service depot at a different site for proof that the County is moving forward in green buildings.

- New facilities take less land than the existing facility
- New program and needs are larger than the existing program, but the new facilities design on less footprint than existing facilities by providing the first multi-story depot for the county
- Project has been coordinated with the community for sound, view, traffic, and other community-related concerns
- Bus circulation allows on-site bus queuing to minimize impact on Crabbs Branch Way
- Active and passive noise reduction measures have already been proactively designed into the proposed project, including equipment location, operation, enclosures, and building heights/orientation
- 23 spaces reserved for carpool
- 100% of the average annual rainfall is treated by storm filters
- 4.3 acres of green roof, 75% of roof surface
- Exterior lighting complies to LEED light pollution requirements
- Interior lighting in direct line of sight are automated to reduce 50% of their power from 11pm to 5am
- Automated treatment system will save 80% of water used in the wash process and discharge.
- Rainwater will be collected at the roof and will be used for the following functions: bus wash, chassis wash, toilets and urinals, and hose bibbs.
- The equipment and refrigerants for the EMOC facility have been selected to minimize or eliminate the emission of compounds that contribute to ozone depletion and global warming.
- The elevator's EcoDisc uses 60-70% less energy with no oil and no hole drilling
- Daylighting into vehicle maintenance bays through glazed panels and transoms.
- Solar lighting is provided on the parking roof
- 75 percent of the construction waste will be recycled .
- Air quality during construction will be maintained under a Construction IAQ Management Plan
- Wood products to contain no added chemical and pollutant source.
- MCG is dedicated to implementing and maintaining a green cleaning policy as it relates to purchasing cleaning products, janitorial paper products, and hand soaps as well as the use of cleaning equipment, storing hazardous materials, training of the Cleaning Contractor, and being aware of sensitive building occupants



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Existing Mechanical System Overview:

The main components of the existing mechanical system and the spaces that they serve are shown in the table below:

System	Service Description
RTU - 1	Southeast 2nd Floor Offices, Elec. Room 1215 Air
RTU - 2	Central 2nd Floor Offices, 1st Floor Offices
RTU - 3	Western 2nd Floor Offices
AC - 1	Electrical Switchgear (1st Floor)
AC - 2	Telecom (1st floor)
AC - 3	Computer Room (2nd Floor)
AC - 4	Comm Room (2nd Floor, West)
AC - 5	Comm Room (2nd Floor East)
AC - 6	Electrical Room Load (2nd Floor East)

The following 2 pages are floor plans with blocks that show where each unit serves according to the following color code. The page 11 is the 1st floor and the page 12 is the 2nd floor.

RTU - 1

RTU - 2

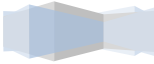
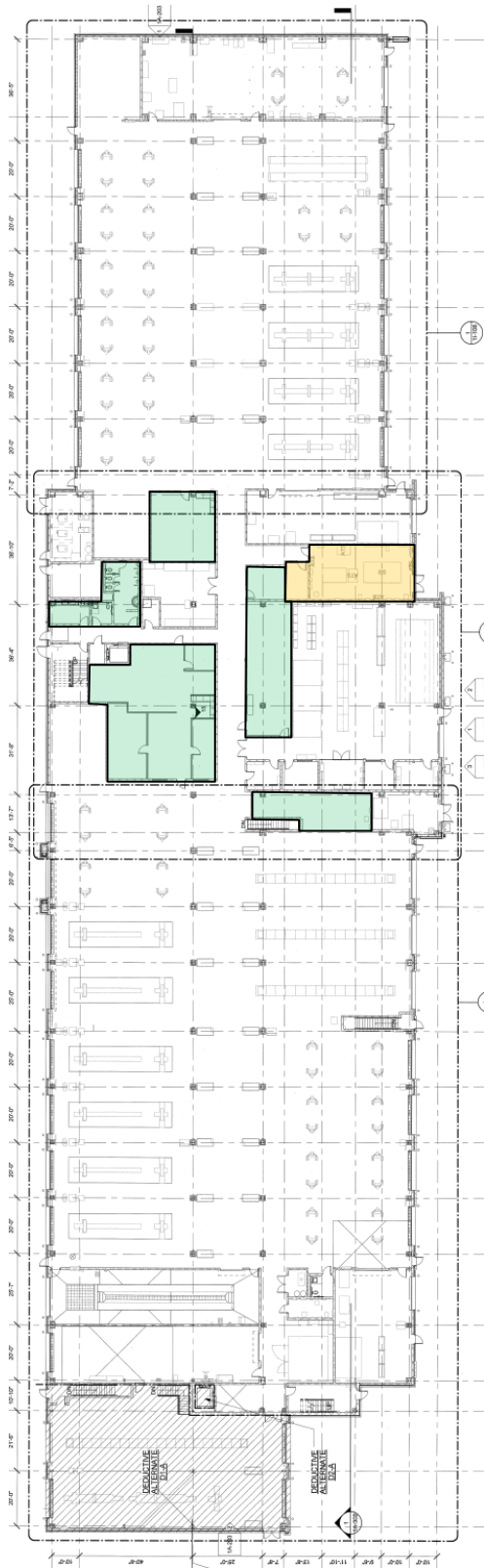
RTU - 3

AC - 1,2,3,4,5,6

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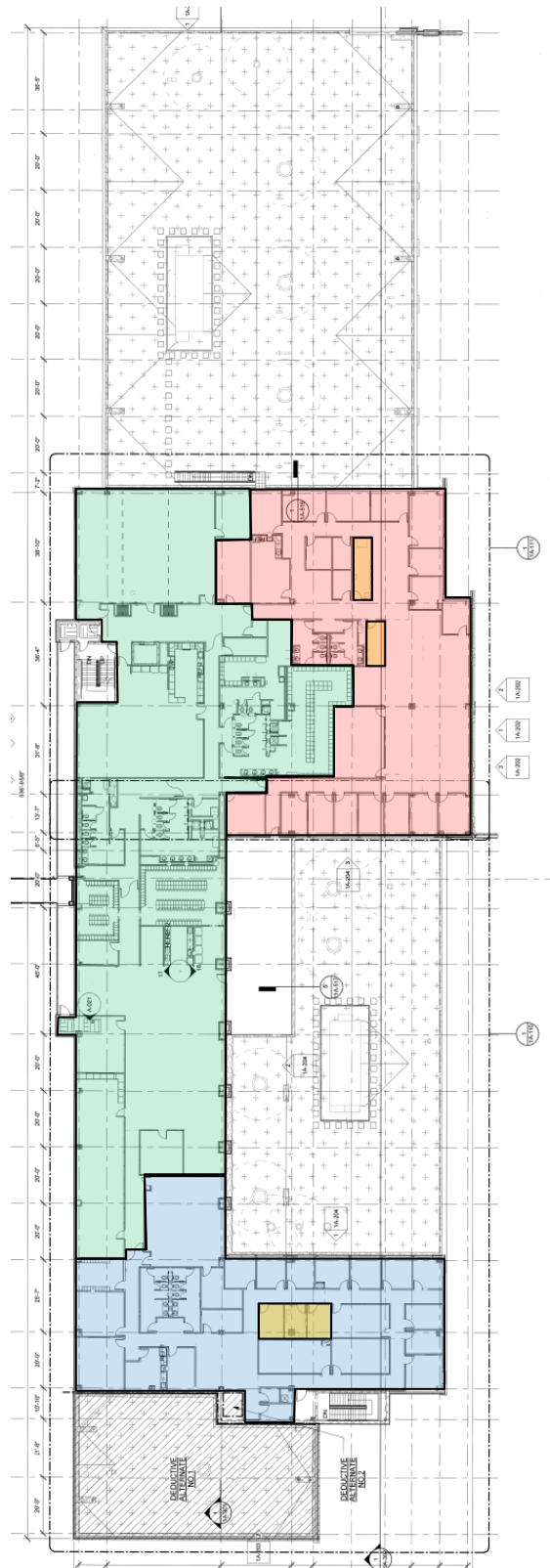
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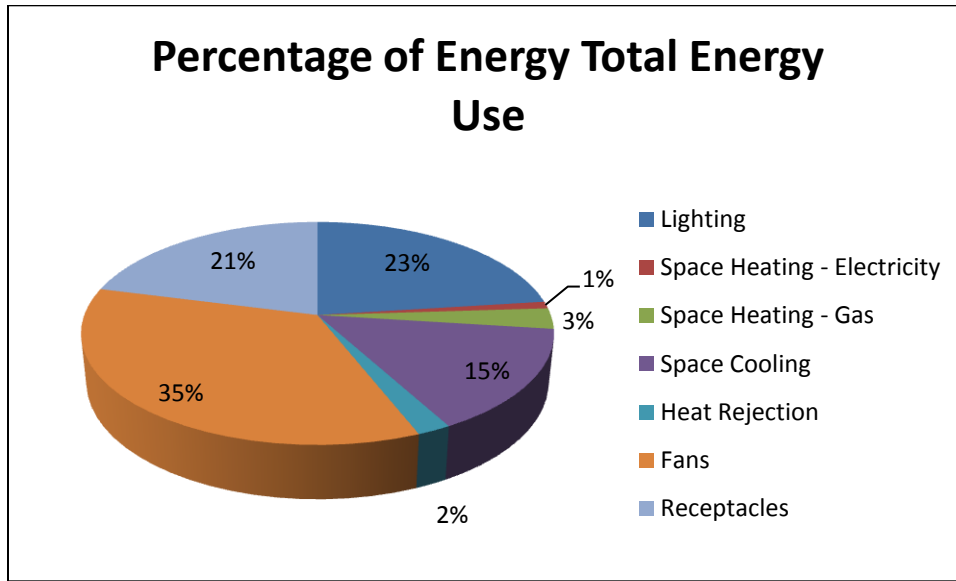
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Cost and Energy:

The systems in question, those mentioned in the previous section, cost \$29,737.00 per year to run and use a total of $4,133 \times 10^6$ BTU/yr according to the analysis by Trane TRACE 700. The following is a breakdown of the loads in the building as a percentage of the total energy use:



As one can see from the chart, fans are the largest percentage of energy use. This is why the natural ventilation method was chosen as the proposed thesis. Natural ventilation will provide a driving force as well as a cooling source for the building's air supply and therefore reduce both of those values relative to the rest.



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Proposal Overview

The existing mechanical system employs natural ventilation throughout the entire garage space as the primary source of cooling. Heating is the only consumer of energy other than the required ventilators for a 100% outdoor air space. As a topic for this thesis, I wanted to incorporate natural ventilation and passive cooling into the rest of the building. Two alternatives were to be considered for this.

The first was to add a large glass enclosure to the top of the building over the existing courtyard for the purpose of adding height and solar gain to drive natural ventilation. Louvers would be placed throughout the second story of the building and at the top of the enclosure to serve as the inlet and outlet points. Also as part of this alternative, and to make up for the initial cost of building the enclosure, the RTUs would be combined from 3 to 2 units. This is possible with slight modifications to the operating schedule of each, but still holding true to the required overall operating schedule by code and by the owner.

The second alternative was to incorporate passive chilled beams into the second floor office spaces as well as combining the RTUs as mentioned in alternative 1. Chilled beams are effective at reducing duct work and fan energy, however, the cooling load picks up the slack. There are also issues with condensation forming on the pipes of the chilled beam if not installed and controlled carefully.

The garage spaces are serviced only by the ERUs and the necessary ventilation fans. Energy is already being conserved here as much as possible because of the lack of a cooling load. Also, the engineers on the project were able to come to an agreement with the code officers and LEED officers that only 0.75 CFM/SqFt was required due to the installed air quality sensors. This allows the fans to only use half of the normal electrical energy as most buildings. The sensors are linked to the fan control system and increase ventilation if air quality decreases below acceptable levels.

Architecturally, the building already fits within its urban fabric, however, it is difficult to determine that this building is the head building in the complex. As part of integrating my architectural breadth with my mechanical depth in this thesis, the enclosure mentioned above was also to make the building stand out slightly architecturally as well as provide a more substantial break space for the occupants. An HVAC shed was also moved to a new location on the roof to accommodate the building of the enclosure.

Acoustically, the enclosure described above provides a buffer zone between Shady Grove Road, a busy street, and the offices surrounding the courtyard. Buses also travel just outside this courtyard and the noise from them will be reduced as well.

Mechanical Depth

Design Objectives:

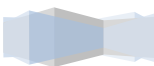
As with any design, objectives are required at the beginning to guide the design process. The following were my objectives leading into this thesis:

- Reduce the total energy used by the building and by the central plant
- Keep to the code
- Provide a better break and relaxation space for off duty drivers and office workers
- Architecturally designate EMOC 1 as the head building in the complex
- Keep to the urban fabric of the area
- Acoustically isolate the offices better from the garage, street, and bus staging

The analysis of success or failure to complete these objectives will be explained in detail in the following sections.

Proposed Passive Ventilation System

As stated in the Proposal Overview, passive ventilation is already used in part of the garage spaces. Natural Ventilation is the only means of cooling. The office spaces, however, are currently all serviced by active systems. The proposed natural ventilation system for the offices comprises of an enclosed courtyard to provide the height and drive for the passive system, and operable windows throughout the upper floor of offices as the inlets. The operable window locations will be shown later in this section. On the following page is a view of the building without the enclosure and a view of the building with the enclosure added.

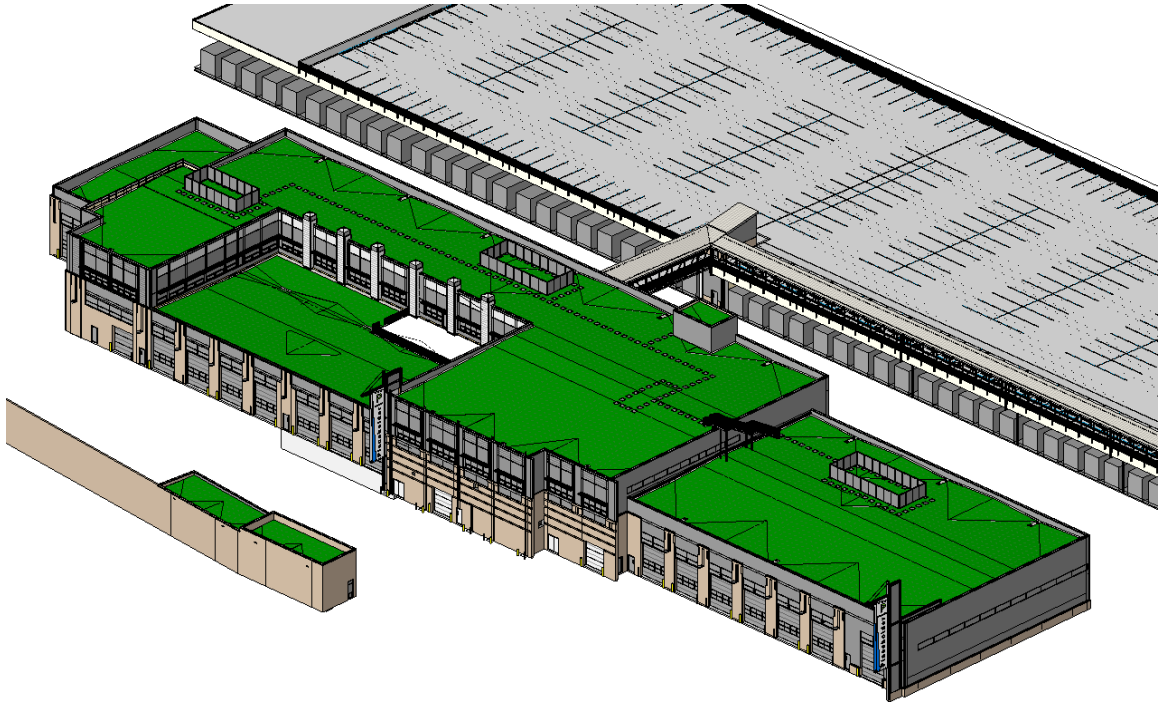


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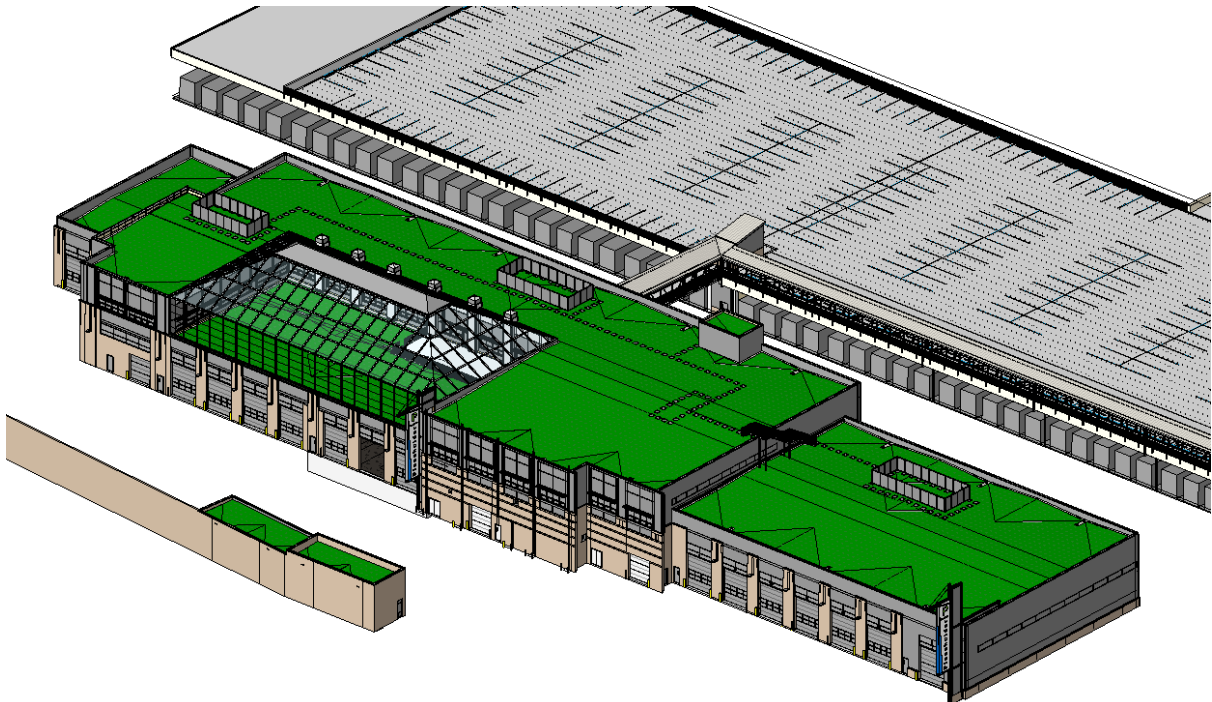
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Building Aerial without enclosure:



Building Aerial with enclosure:



The small cap on the top of the enclosure is the outlet point for the natural ventilation, giving a height difference of 35ft for natural ventilation. This is the distance from the center of the operable windows to the center of the outlets on the cap. According to the ASHRAE Fundamentals Handbook, cubic feet per minute of ventilation can be determined by the following equation:

$$Q_{cfm} = 60 \times C_d \times A \times \sqrt{2 \times g \times (H_n - H_b) \times \frac{T_i - T_o}{T_i}}$$

Where,

$C_d = 0.60$, for slightly obstructed openings

$A = 30$, smallest opening area in ft^2

$T_i = 70$, Indoor temperature

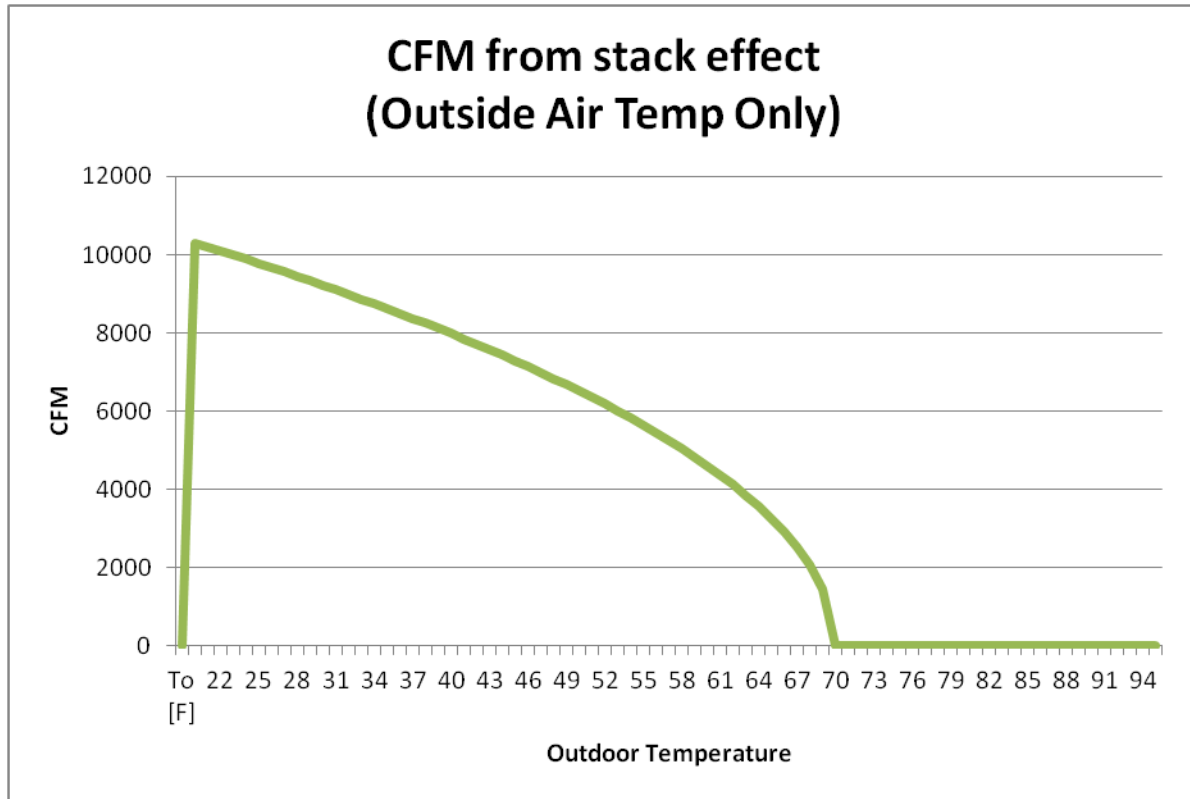
$T_o =$ Outdoor temperature

$H_n = 17.5ft$, height of neutral pressure point

$H_b = 0ft$, height of bottom opening (assumed to be 0 as a baseline for the equation)

$g = 32.17$, gravity in IP units

Using these values in the formula directly yields a CFM distribution based on outside air temperature alone as follows:



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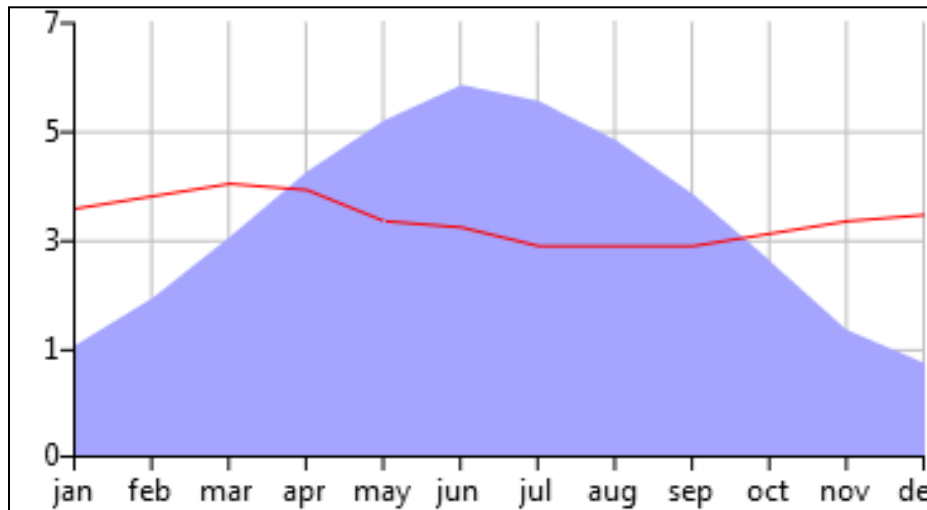
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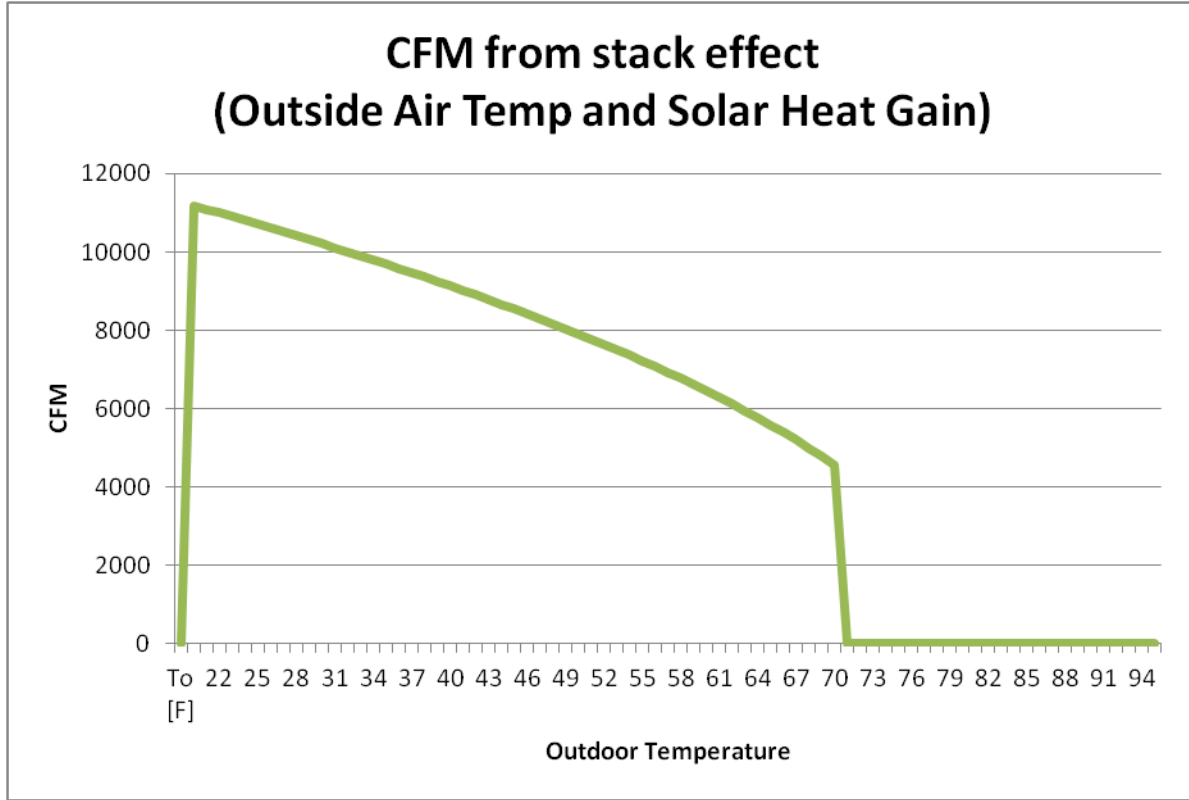
Solar Attributes of the Passive Ventilation System:

The graph in the previous section shows a very basic computation of CFM for stack effect not taking into account any other factors except for the geometry of the building and the design indoor air temperature. One of the major factors that will make the natural ventilation system more useful on more days of the year is solar heat gain. Stack effect is limited by the concept that the indoor air must be higher than the outdoor air to function. When solar heat gain is added into the equation, the weighted average of the indoor air temperature goes up slightly. However, the higher temperature will only be in the glass enclosure. The active system will still hold the air in the occupied spaces at 70 degrees. The fan power will be decreased under these conditions as the natural ventilation system will still be working when the outdoor temperature is close to 70 degrees to meet minimum ventilation requirements as per ASHRAE Standard 62.1. After the outdoor temperature rises above 70 degrees, the passive system becomes rather useless as it will be only adding to the cooling load, but, the added solar heat gain allows for more CFM through the space when the outdoor temperature is close to, yet still below 70 degrees.

The following is data on the sun's energy over the period of one year. The blue graph is the solar irradiation data in kW/m²/day for Washington D. C. The red line is weather data that is irrelevant to this thesis, but was provided by the source:



After using this data in the solar heat gain calculations set forth in the ASHRAE Fundamentals Handbook, and applying those calculations to the specifics of the new enclosure, the new distribution of CFM based on outdoor air temperature is as follows:



It can clearly be noted that the ventilation is now more useful at temperatures close to 70 degrees. The graph drops off at 70 degrees due to the before mentioned concept that the natural ventilation would only be adding to the cooling load. Under these conditions, the operable windows to the outside and the windows from the offices to the enclosure would be closed off, and the active system will run as normal. More on this can be found in the Controls section later in this report.

The solar heat gain aspect of this enclosure also provides a thermal buffer zone between the outside air and the office spaces. In the winter and summer, less load due to exterior exposure will be seen by the office spaces and therefore the active system. This is accounted for in the revised Trane TRACE 700 model which will be analyzed later in this report.



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Combination of VAV systems and New Operating Schedules:

As part of an effort to recover the construction cost of building the glass enclosure for natural ventilation, the RTUs that serve as the active system for the office spaces were combined from 3 to 2 units. The RTUs that were selected by the project engineers cost, on average, very close to \$10,130.00. This makes a total cost for the RTUs of just over \$30,000. A construction cost breakdown for the enclosure is as follows:

Item	Cost per Square Foot (\$)
Framing	0.79
Glazing	0.42
Mechanical Louvers	1.26
Labor and Construction	0.64
TOTAL	3.11

This value was calculated from various sources and manufacturers who provided quotes, and RS Means data for construction costs.

At this rate in cost per square foot, the construction of the enclosure would be approximately \$34,981. This value will be compared to the new cost of RTUs later in this section, after the new system is introduced.

On the following pages can be found the same diagrams and floor plans as on pages 11 and 12, however, the new color coding is as follows based on the reorganization of RTUs:

RTU - 1

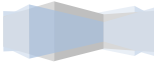
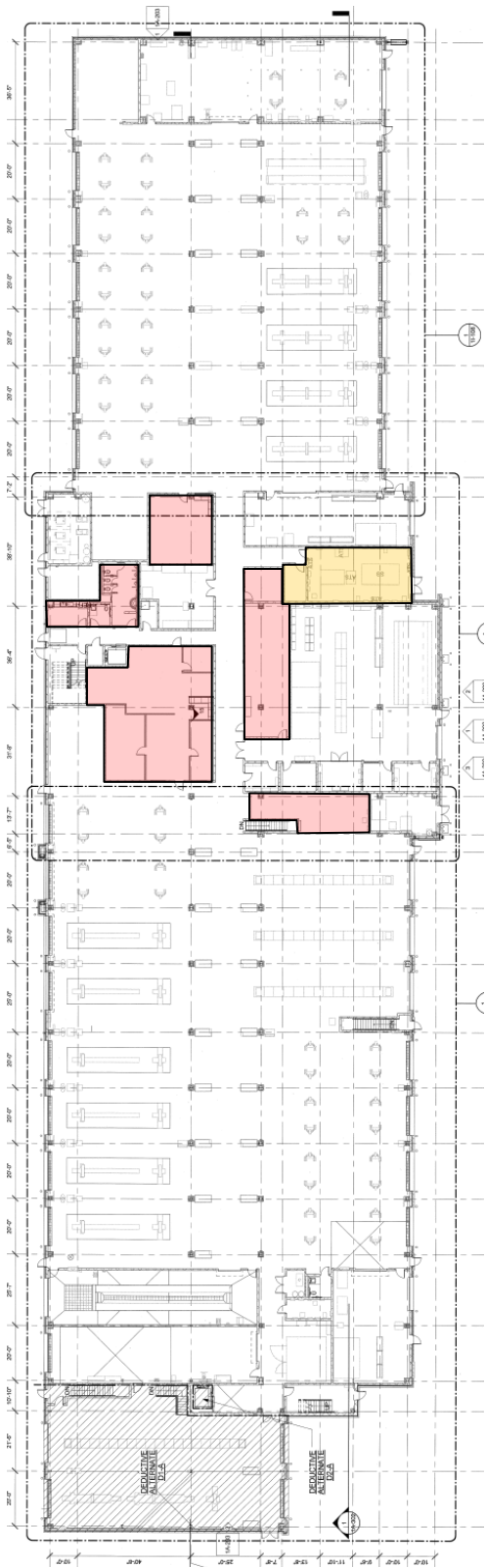
RTU - 2

AC - 1,2,3,4,5,6

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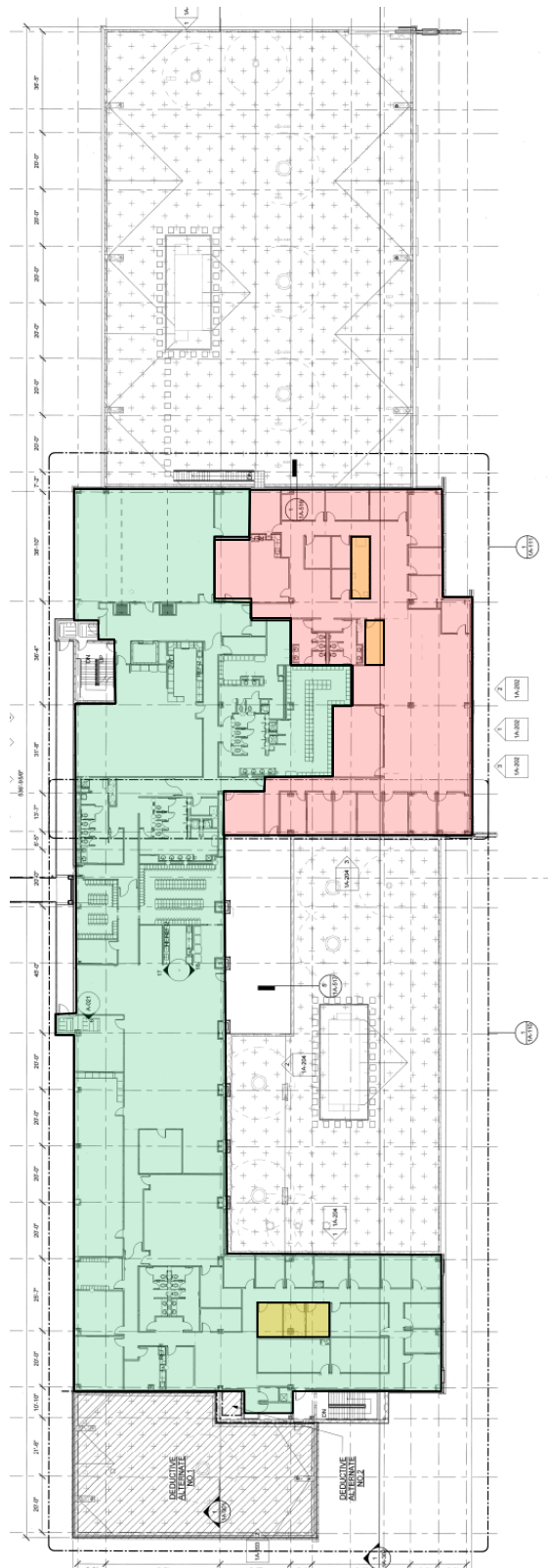
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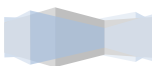
After making the above changes in Trane TRACE 700, the combination of the RTUs reduced the total energy use and cost very slightly. This also includes the effect of the enclosure acting as a thermal buffer between the outside and the offices. The operating costs before the addition of the natural ventilation system are as follows in comparison to the original system:

	Original (Existing) System	Revised System	Percent Decrease
Annual Operating Cost	\$29,737	\$29,547	0.6%
Energy Consumption	4,133 x10 ⁶ BTU/yr	4,079 x10 ⁶ BTU/yr	1.3%

It should be noted that the variables that were changed for the above table are only the reorganization of RTUs and the addition of a thermal buffer on the offices facing the new enclosure.

The new operating schedules as compared to the existing schedules are as follows:

System	Original (Existing) Operating Schedule	Revised Operating Schedule
RTU - 1	5am - 10pm (extended office)	24 hours
RTU - 2	24 hours	5am - 10pm (extended office)
RTU - 3	5am - 10pm (extended office)	N/A
AC - 1,2,3,4,5,6	24 hours	24 hours



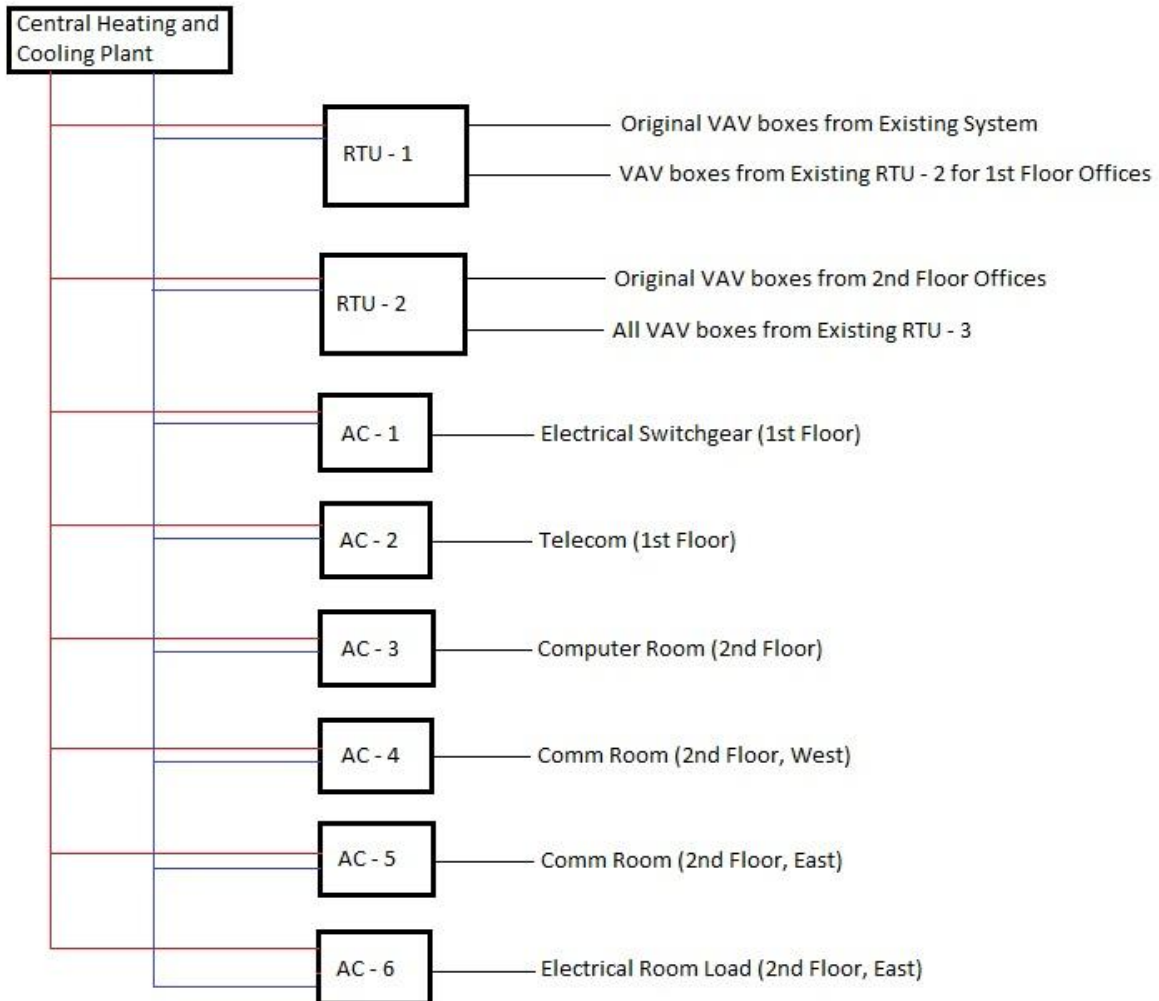
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VAV System Schematic Diagram:

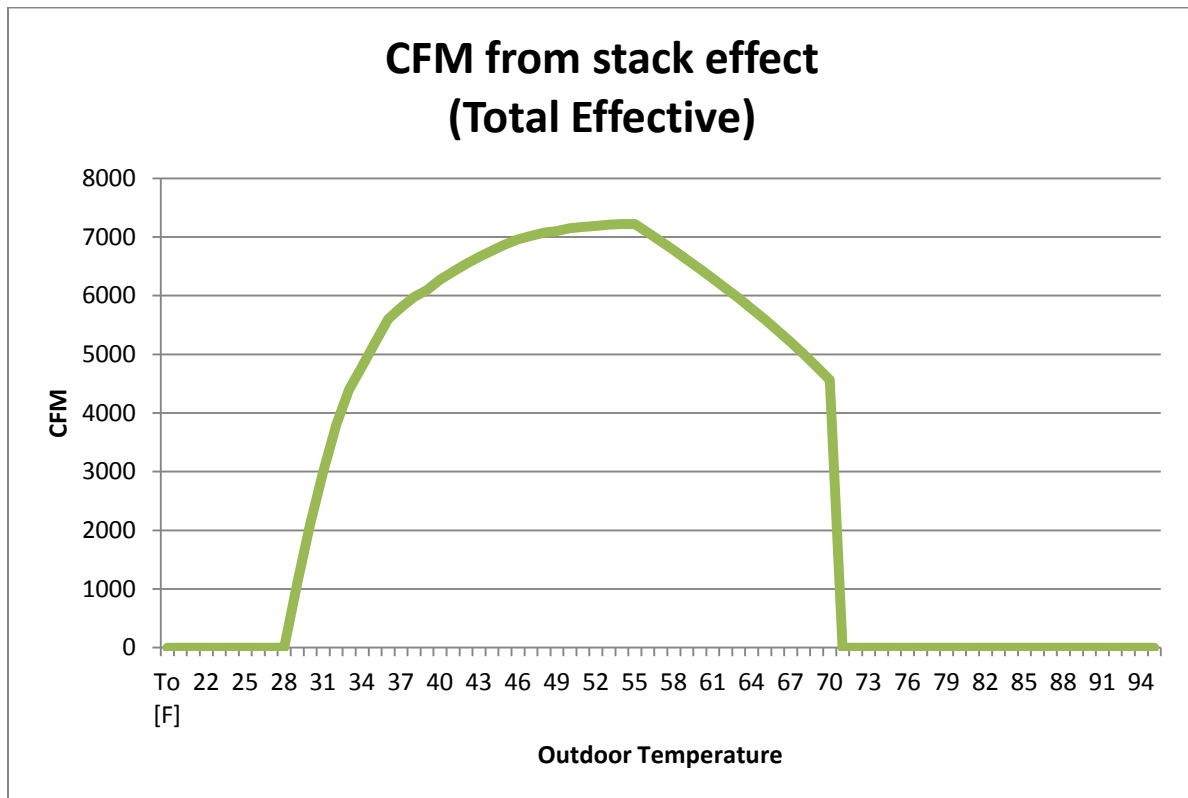
The following is a schematic diagram for the revised systems. Revisions from the existing system (i.e. the combinations from the previous section) are noted.



Relationship and Coordination between Active and Passive Systems:

As with any building that contains multiple HVAC systems, coordination and careful control between them is critical to creating an efficient and effective system. The relationship between the active and passive systems here are simple. When the natural ventilation can help the active system with either cooling load or ventilation, the louvers will be opened. If the conditions are such that the natural system will be hurting the active system by adding more cooling load, the louvers will be closed.

On favorable days, however, the system must be able to decide how favorable the conditions are to be effective. Having only two positions for the louvers - open and closed - will not provide the maximum efficiency for either system. The louvers must have a control structure that allows them to be open certain amounts relative to the degree of favorability of the outdoor conditions. For example, if the outdoor temperature is 30 degrees, the louvers should just barely be open, providing some cooling load, but not overtaking the occupants of the building with drafts of cold air. After following the procedures in the ASHRAE Handbooks to balance systems, the following is the final iteration of the graph that shows CFM from the natural ventilation system based on outdoor air temperature. It can be seen here that the range at which the louvers are fully open is from 55 degrees (supply air temperature) to 70 degrees (highest desirable ventilation temperature).



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Cost and Energy:

The combination of CFM for ventilation and the cooling load provided by the natural ventilation system, and the active heating and cooling system is difficult to accurately predict due to fluctuations in weather on any given day. However, after formulating an ideal scenario for weather, and combining that with the data from the graph in the previous section, load calculations were done to find the effect the natural ventilation system would have in saving energy used by the active system. My findings for annual cost and energy use are as follows:

	Original Design	Revised Design (Before Natural Ventilation)	Revised Design (After Natural Ventilation)	Total Percent Saved
Cost (\$)	29,737	29,547	26,962	9.3%
Energy (10⁶BTU/yr)	4,133	4,079	3,769	8.8%

As this data shows, there is significant energy savings from making the revisions presented in this thesis. Below is a breakdown to determine payback period for the revised system in comparison to the original system. Cost data was retrieved from Trane for active systems and from the above estimate for the passive system.

Effective Systems	Original Cost (\$)	Revised Cost (\$)
RTU - 1	10,130	11,825
RTU - 2	10,225	13,330
RTU - 3	10,060	0
Passive System	0	34,981
TOTALS:	30,415	60,136

Difference in Operating Cost	Difference in Equipment Cost	Payback Period
2,775	29,721	10.71 Years

Architectural Breadth

Design Objectives:

The following are my objectives for the revised architectural design that guided my design process:

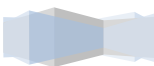
- Integrate with mechanical depth
- Provide better break and relaxation space for off duty drivers and office workers
- Remain within the urban fabric of the site and surrounding community
- Designate this building as the head building in the complex
- Promote green building technology

Changes to Existing Conditions:

As described in the Mechanical Depth portion of this report, a large, glass atrium was added to enclose the current courtyard space. Architecturally, this change provides a very large space for off duty drivers and office workers to relax. Being right next to the kitchenette and the indoor drivers' room, the spacial organization allows for easy transfer from space to space.

In order to enclose this courtyard, however, a mechanical shed needed to be moved. The shed was previously located in the middle of the courtyard and directly in the line of sight of 50% of the offices. To me, this seemed like an unpleasant view. The shed is now located close to one of the other mechanical sheds, but still outside of the clearance requirements for the equipment.

On the following page, a before and after model can be found where these changes are clearly visible.

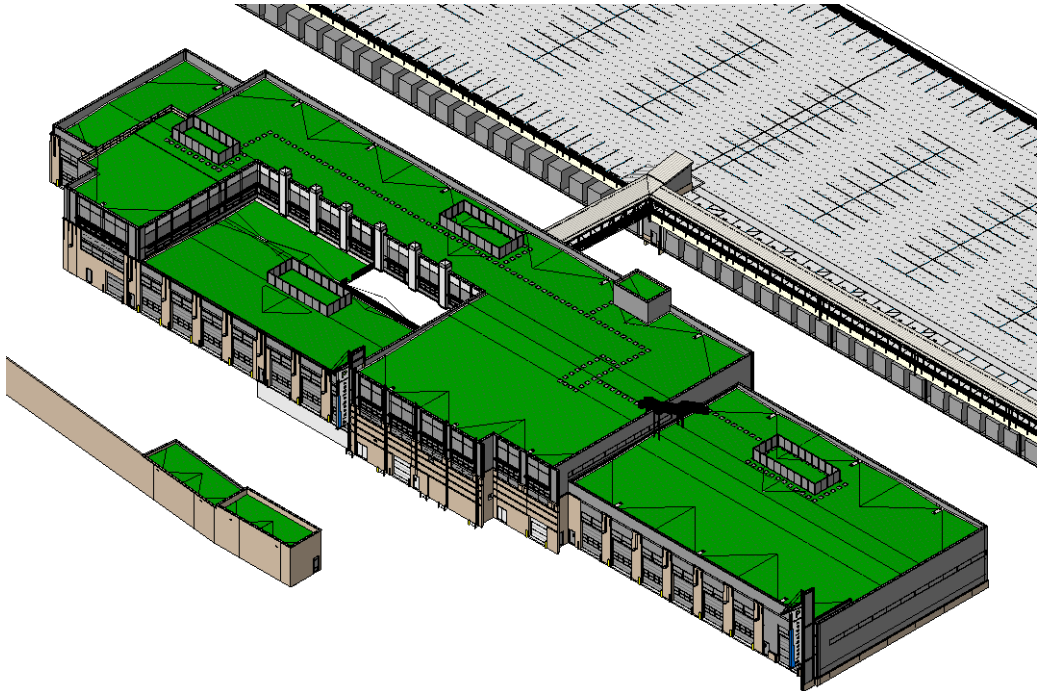


Montgomery County Equipment Maintenance and Operations Center

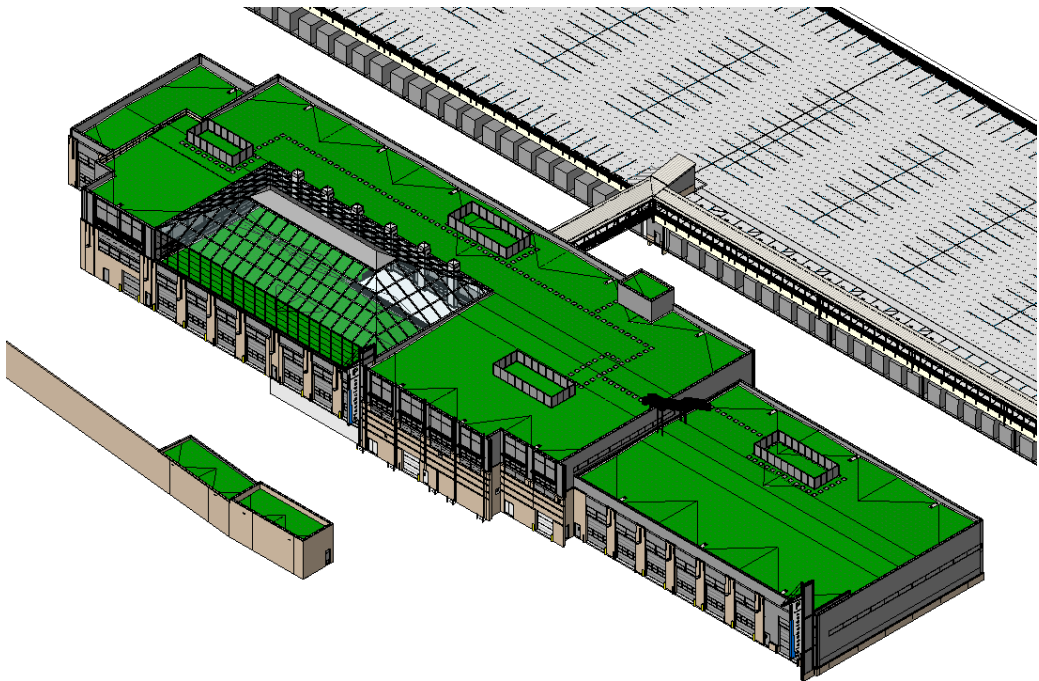
Final Report - Architectural Engineering Capstone Thesis

Michael Tellep

EMOC 1 before changes:



EMOC 1 after changes:



Integration to Mechanical Depth:

The mechanical depth uses the enclosure as a way to drive the passive ventilation system. It is a large addition to the building and had to be considered architecturally as well. Providing the enclosure promotes green building construction and design while also offering an aesthetically pleasing part of the building for its occupants to enjoy. In overall appearance, the enclosure provides smooth continuity across the front of the building which give it a slightly more modern look. This makes the building have a sense of progress as opposed to just conformity.



Montgomery County Equipment Maintenance and Operations Center

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Acoustical Breadth

Design Objectives:

The acoustics of this site provide some challenges when it comes to isolating office work spaces from garage and outdoor noise. The following were my design objectives which guided the design process:

- Provide acoustical buffer from outdoor noise
- Analyze the NC values in the office spaces before and after the addition of courtyard enclosure

Acoustical Study of the Effect of the Buffer Enclosure:

The rating system I used to determine the effectiveness of the buffer enclosure was the Noise Criteria, or NC value of the office spaces which directly interact with the courtyard. Outside of these office spaces and below the courtyard is a main thoroughfare in the circulation pattern for the buses receiving maintenance. The following shows the effective NC value change from the addition of the enclosure:

Before Enclosure		After Enclosure	
NC Value	Octave Band	NC Value	Octave Band
36	250Hz	31	250Hz

The addition of the enclosure effectively reduced the NC value to the low end of the acceptable range for private offices (30-35). Without the enclosure, the private office spaces are somewhat on the loud end of the range when a bus drives out of the garage.

Conclusions and Recommendations

After completing this project, my conclusion is that the addition of the passive ventilation system effectively reduced energy consumption and annual operating cost with a relatively decent payback period for the extra initial cost. The system was also compatible with the architectural and acoustical goals set forth for the breadth topics.

Recommendations for further research could certainly include a deeper study of the controls system for such a mechanical design. Controls were briefly considered for this project to make sure the system was viable and would work, however, more fine-tuning of the controls could work even more energy out of this combination of systems.



Montgomery County Equipment Maintenance and Operations Center

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References

ASHRAE. 2005, 2005 ASHRAE Handbook-Fundamentals. American Society of Heating Refrigeration and Air Conditioning Engineers, Inc., Atlanta, GA.

ASHRAE. 2005, 2005 ASHRAE Handbook-HVAC Applications. American Society of Heating Refrigeration and Air Conditioning Engineers, Inc., Atlanta, GA.

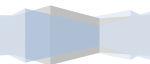
ASHRAE. 2007, ANSI/ASHRAE, Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality. American Society of Heating Refrigeration and Air-Conditioning Engineers, Inc., Atlanta, GA.

ASHRAE. 2007, ANSI/ASHRAE, Standard 90.1-2007, Energy Standard for Building Except Low-Rise Residential Buildings. American Society of Heating Refrigeration and Air-Conditioning Engineers, Inc., Atlanta, GA.

Design Documents of the Montgomery County Equipment Maintenance and Operations Center
Michael Baker, Jr., Inc.

Online catalog of Trane HVAC products, Trane Commercial, <http://www.trane.com/comercial>

Appendix A - Trane TRACE 700 Data for Existing Conditions



SYSTEM SUMMARY

DESIGN COOLING CAPACITIES

By ACADEMIC

Alternative 1

Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton			Of Peak mo/hr					Desic Cond ton	Desic Cond ton		
Cooling plant - 005		82.7	0.0	0.0	0.0	0.0	0.0	0.0	82.7	7/15	82.7	0.0	0.0	0.0	0.0	0.0	0.0	82.7
	RTU-1	19.9	0.0	0.0	0.0	0.0	0.0	0.0	19.9	7/15	19.9	0.0	0.0	0.0	0.0	0.0	0.0	19.9
	EF-31	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6	7/15	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6
	RTU-2	43.3	0.0	0.0	0.0	0.0	0.0	0.0	43.3	7/15	43.3	0.0	0.0	0.0	0.0	0.0	0.0	43.3
	RTU-3	13.4	0.0	0.0	0.0	0.0	0.0	0.0	13.4	7/15	13.4	0.0	0.0	0.0	0.0	0.0	0.0	13.4
	AC-3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2	7/15	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2
	AC-5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-1	2.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9	7/15	2.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Building totals		82.7	0.0	0.0	0.0	0.0	0.0	0.0	82.7		82.7	0.0	0.0	0.0	0.0	0.0	0.0	82.7

Building peak load is 82.7 tons.

Building maximum block load of 82.7 tons occurs in July at hour 15 based on system simulation.

MONTHLY UTILITY COSTS

By ACADEMIC

Utility	----- Monthly Utility Costs -----												Total
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
Alternative 1													
Electric													
On-Pk Cons. (\$)	1,445	1,308	1,551	1,638	2,179	4,479	4,848	4,638	4,049	3,199	0	0	29,334
On-Pk Demand (\$)	0	0	0	0	0	0	0	0	0	0	9	9	19
Total (\$):	1,445	1,308	1,551	1,638	2,179	4,479	4,848	4,638	4,049	3,199	9	9	29,353
Gas													
On-Pk Cons. (\$)	72	57	34	19	18	18	18	18	18	24	32	56	384
Monthly Total (\$):	1,517	1,364	1,585	1,657	2,197	4,497	4,867	4,656	4,067	3,223	41	66	29,737

Building Area = 33,417 ft²

Utility Cost Per Area = 0.89 \$/ft²

ACADEMIC

USE

ONLY

Economic Summary

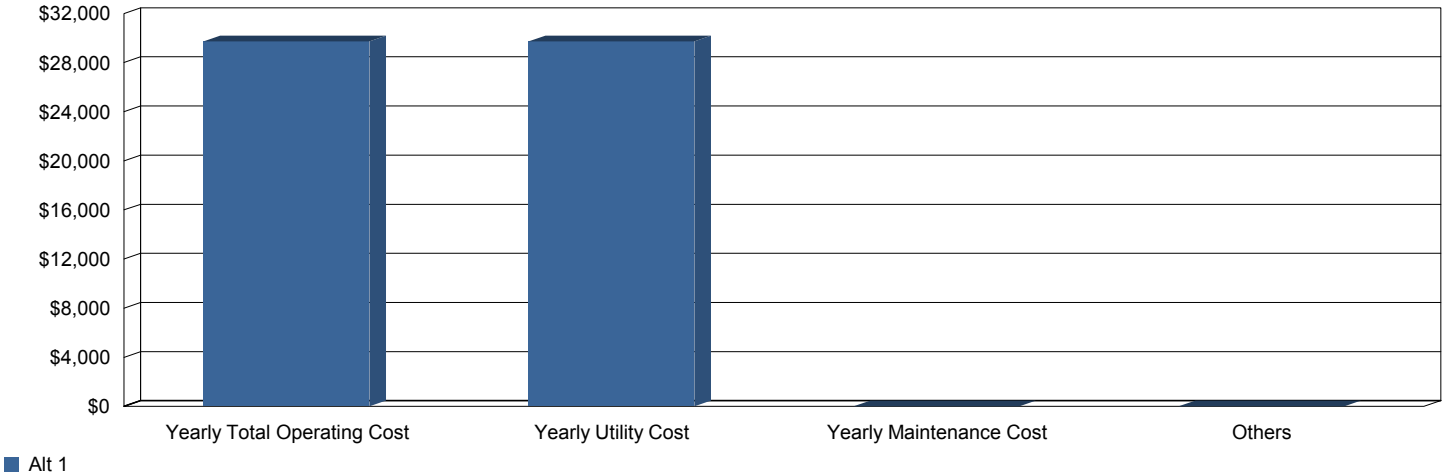
Project Information

Location	Montgomery County, Maryland	Study Life:	20 years
Project Name	08197_01 EMOC	Cost of Capital:	10 %
User	Brenner	Alternative 1:	
Company	S3E Klingemann, Inc		
Comments			

Economic Comparison of Alternatives

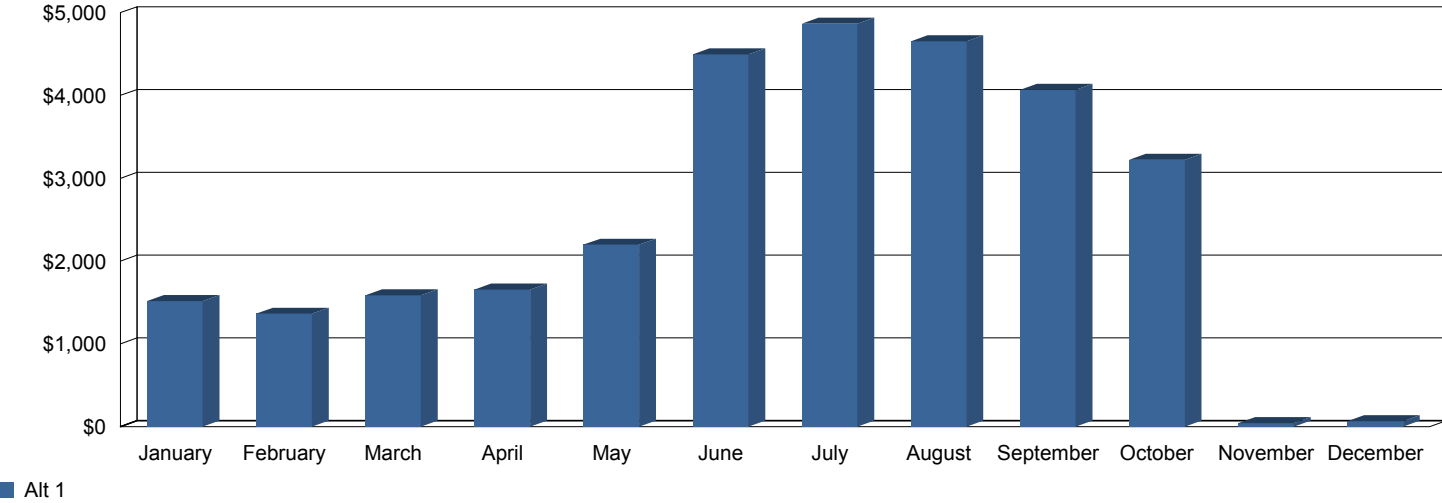
Yearly Savings (\$)	First Cost Difference (\$)	Cumulative Cash Flow Difference (\$)	Simple Payback (yrs.)	Net Present Value (\$)	Life Cycle Payback (yrs.)	Internal Rate of Return (%)	Life Cycle Cost
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Annual Operating Costs



Yearly Total Operating Cost (\$)	Yearly Utility Cost (\$)	Yearly Maintenance Cost (\$)
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Monthly Utility Costs



Energy Cost Budget / PRM Summary

By ACADEMIC

Project Name: 08197_01 EMOG	Date: April 04, 2012
City: Montgomery County, Maryland	Weather Data: Washington, D.C.

Note: The percentage displayed for the "Proposed/ Base %" column of the base case is actually the percentage of the total energy consumption.

* Denotes the base alternative for the E-3 study.

		* Alt-1		
		Proposed Base Consumption (kWh/yr)	Proposed Base % of Total	Peak Load (kW)
Lighting - Conditioned	Electricity	956.6	23	109
Space Heating	Electricity	35.4	1	4
	Gas	141.7	3	138
Space Cooling	Electricity	637.7	15	306
Heat Rejection	Electricity	80.0	2	27
Fans - Conditioned	Electricity	1,419.3	34	259
Receptacles - Conditioned	Electricity	862.8	21	98
Total Building Consumption		4,133.4		

		* Alt-1
Total	Number of hours heating load not met	0
	Number of hours cooling load not met	0

		* Alt-1	
		Energy 10 ⁶ Btu/yr	Cost/yr \$/yr
Electricity		3,991.7	29,353
Gas		141.7	384
Total		4,133	29,737

ENGINEERING CHECKS

By ACADEMIC

System	Zone	Room	Type	Floor Area ft ²	COOLING					HEATING		
					% OA	cfm/ft ²	cfm/ton	ft ² /ton	Btu/hr-ft ²	% OA	cfm/ft ²	Btu/hr-ft ²
Alternative 1												
		1132 - Electric Switchgear	Zone	728	2.98	2.03	506.5	249.5	48.09	2.98	2.03	-8.79
AC-1			System - Single Zone	728	2.98	2.03	506.5	249.5	48.09	2.98	2.03	-8.79
		1131 - Telecom	Zone	81	0.00	2.31	543.6	234.9	51.08	0.00	2.31	-11.73
AC-2			System - Single Zone	81	0.00	2.31	543.6	234.9	51.08	0.00	2.31	-11.73
		1270 - Computer Room	Zone	107	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
AC-3			System - Single Zone	107	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
		1292 - Comm Room	Zone	100	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
AC-4			System - Single Zone	100	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
		1229 - Comm Room	Zone	98	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
AC-5			System - Single Zone	98	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
		1215 - Elec Room - Load	Zone	147	1.37	4.46	530.7	119.0	100.82	1.37	4.46	-6.28
AC-6			System - Single Zone	147	1.37	4.46	530.7	119.0	100.82	1.37	4.46	-6.28
		1291 - Elec Room	Zone	93	1.82	3.54	521.5	147.3	81.48	1.82	3.54	-6.50
EF-31			System - Single Zone	93	1.82	3.54	521.5	147.3	81.48	1.82	3.54	-6.50
		1206 - Conference Room	Room	273	25.00	0.95	272.9	286.5	41.89	83.33	0.29	-18.82
VAV-101			Zone	273	25.00	0.95	272.9	286.5	41.89	83.33	0.29	-18.82
		1207 - Break Room	Room	304	25.00	1.42	269.0	188.8	63.56	83.33	0.43	-27.48
VAV-102			Zone	304	25.00	1.42	269.0	188.8	63.56	83.33	0.43	-27.48
		1209 - Fleet Serv Manager III	Room	165	25.00	1.27	408.0	320.7	37.42	83.33	0.38	-30.91
		1211 - Coord Manager III	Room	162	25.00	1.60	414.4	258.5	46.43	83.33	0.48	-39.98
VAV-103			Zone	327	25.00	1.39	417.7	301.2	39.84	80.45	0.43	-34.78
		1204-2 - Corridor	Room	470	25.00	0.13	249.3	1,866.8	6.43	83.33	0.04	-3.80
		1204A - Sign-out Desk	Room	101	25.00	0.62	305.0	494.9	24.25	83.33	0.18	-12.65
		1210 - Visiting Staff Office	Room	102	25.00	0.62	305.0	494.9	24.25	83.33	0.18	-12.65
		1212 - Supply Storage	Room	68	25.00	0.13	249.3	1,866.7	6.43	83.29	0.04	-3.80
		1213 - File Room	Room	74	25.00	0.13	249.3	1,866.7	6.43	83.29	0.04	-3.80
		1215 - Elec Room - Air	Room	147	25.00	0.34	466.8	1,372.4	8.74	83.33	0.10	-7.59
VAV-104			Zone	962	25.00	0.22	279.7	1,263.7	9.50	69.08	0.08	-5.67
		1231 - Men	Room	141	25.00	0.13	249.3	1,866.8	6.43	83.31	0.04	-3.80
		1232 - Women	Room	141	25.00	0.13	249.3	1,866.8	6.43	83.31	0.04	-3.80
VAV-105			Zone	282	25.00	0.13	249.3	1,866.8	6.43	83.31	0.04	-3.80
		1214 - Coord Manager III	Room	162	25.00	1.60	414.4	258.5	46.43	83.33	0.48	-39.98
		1216 - Admin Spec III	Room	141	25.00	1.61	414.5	257.7	46.57	83.33	0.48	-40.13
VAV-106			Zone	303	25.00	1.56	420.2	270.0	44.45	80.76	0.48	-39.42
		1204-5 - Corridor	Room	393	25.00	0.13	249.3	1,866.8	6.43	83.33	0.04	-3.80
		1204B - Office Serv Coord	Room	90	25.00	0.62	305.0	494.9	24.25	83.33	0.18	-12.65
		1204C - Exec Admin Aide	Room	90	25.00	0.62	305.0	494.9	24.25	83.33	0.18	-12.65
VAV-107			Zone	573	25.00	0.27	286.6	1,063.0	11.29	78.77	0.09	-6.38
		1217 - Division Chief	Room	237	25.00	2.03	434.6	214.1	56.05	83.33	0.61	-52.16

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft²/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
VAV-108			Zone	237	25.00	2.03	434.6	214.1	56.05	83.33	0.61	-52.16
		1218 - Program Manager	Room	113	25.00	2.59	404.0	155.7	77.06	83.33	0.78	-62.96
		1219 - Manage & Budget Spec III	Room	119	25.00	1.57	375.3	238.4	50.35	83.33	0.47	-37.90
VAV-109			Zone	232	25.00	2.02	399.5	197.6	60.72	81.34	0.62	-49.48
		1220 - Senior Spec Fin II	Room	109	25.00	2.32	364.9	157.5	76.17	83.33	0.69	-60.71
VAV-110			Zone	109	25.00	2.32	364.9	157.5	76.17	83.33	0.69	-60.71
		1204-3DEFGH Open Offices - Interior	Room	870	25.00	0.62	305.0	494.9	24.25	83.33	0.18	-12.65
VAV-111			Zone	870	25.00	0.62	305.0	494.9	24.25	83.33	0.18	-12.65
		1204-6JKLM - Open Offices - Exterior	Room	936	25.00	1.76	392.0	222.8	53.86	83.33	0.53	-42.09
VAV-112			Zone	936	25.00	1.76	392.0	222.8	53.86	83.33	0.53	-42.09
		1228 - Conference Room	Room	446	25.00	1.17	285.9	244.4	49.09	83.33	0.35	-22.80
VAV-113			Zone	446	25.00	1.17	285.9	244.4	49.09	83.33	0.35	-22.80
		1221 - Admin Serv Coord Manager III	Room	160	25.00	1.77	354.8	200.2	59.93	83.33	0.53	-46.66
VAV-114			Zone	160	25.00	1.77	354.8	200.2	59.93	83.33	0.53	-46.66
		1204-4 - Corridor	Room	180	25.00	0.13	249.3	1,866.8	6.43	83.32	0.04	-3.80
		1222 - Program Manager II	Room	138	25.00	2.34	359.6	153.5	78.20	83.33	0.70	-55.82
		1223 - Program Manager II - Parts	Room	128	25.00	2.29	359.2	156.7	76.56	83.33	0.69	-54.53
		1224 - Program Manager II - Fuel	Room	124	25.00	2.35	359.6	153.3	78.29	83.33	0.70	-55.89
VAV-115			Zone	570	25.00	1.60	358.1	224.2	53.54	81.46	0.49	-38.65
		1204-1 Corridor	Room	197	25.00	0.18	253.3	1,393.3	8.61	83.32	0.05	-6.22
		1225 - IT Spec III	Room	131	25.00	2.25	358.9	159.3	75.34	83.33	0.68	-53.57
		1226 - IT Spec II	Room	127	25.00	2.30	359.3	155.9	76.98	83.33	0.69	-54.86
		1227 - IT Spec II	Room	133	25.00	2.23	358.7	161.0	74.55	83.33	0.67	-52.95
VAV-116			Zone	588	25.00	1.53	355.3	232.5	51.62	81.41	0.47	-37.39
		1244 - Shop Mtg Room	Room	207	25.00	3.09	342.8	111.0	108.14	83.33	0.93	-69.12
VAV-117			Zone	207	25.00	3.09	342.8	111.0	108.14	83.33	0.93	-69.12
RTU-1			System - Variable Volume Reheat (30% Min Flow Default)	7,379	25.00	0.89	329.1	371.7	32.29	61.86	0.36	-23.97
		1249 - Lockers	Room	631	25.00	0.75	392.4	523.8	22.91	83.33	0.22	-19.61
VAV-201			Zone	631	25.00	0.75	392.4	523.8	22.91	83.33	0.22	-19.61
		1245-2 - Corridor	Room	298	25.00	0.12	236.4	1,919.5	6.25	83.32	0.04	-3.38
		1245-3 - Corridor	Room	189	25.00	0.12	236.4	1,919.4	6.25	83.32	0.04	-3.38
		1251 - Drivers Mailboxes	Room	116	25.00	0.22	267.3	1,236.8	9.70	83.32	0.06	-5.08
		1255 - Drivers Room	Room	1,971	25.00	1.73	311.5	180.1	66.63	83.33	0.52	-38.05
		1256 - Kitchenette	Room	144	25.00	1.62	346.8	213.7	56.15	83.33	0.49	-30.88
		1257 - Vending Area	Room	148	25.00	4.72	404.0	85.6	140.19	83.33	1.42	-100.28
VAV-202/203/204/229			Zone	2,866	25.00	1.27	345.5	272.6	44.02	68.39	0.46	-30.17
		1258 - Quiet Room	Room	244	25.00	0.91	289.5	317.7	37.77	83.33	0.27	-17.83
VAV-205			Zone	244	25.00	0.91	289.5	317.7	37.77	83.33	0.27	-17.83
		1245-1 - Corridor	Room	283	25.00	0.12	236.4	1,919.5	6.25	83.32	0.04	-3.38
		1252/1260 - Dispatch Coord/Window	Room	1,110	25.00	1.05	341.4	324.5	36.98	83.33	0.32	-28.26
VAV-206			Zone	1,393	25.00	0.82	341.8	415.8	28.86	79.35	0.26	-22.68
		1259 - Vestibule	Room	379	25.00	0.88	288.7	326.8	36.72	83.33	0.27	-24.07
VAV-207			Zone	379	25.00	0.88	288.7	326.8	36.72	83.33	0.27	-24.07

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft²/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
		1254 - Reception/Lobby	Room	308	25.00	1.50	302.2	201.8	59.47	83.33	0.45	-36.47
VAV-208			Zone	308	25.00	1.50	302.2	201.8	59.47	83.33	0.45	-36.47
		1293 - Recycling	Room	123	25.00	0.92	382.9	414.4	28.96	83.33	0.28	-31.40
		1295 - Lockers	Room	307	25.00	0.61	360.7	587.9	20.41	83.33	0.18	-21.08
VAV-209			Zone	430	25.00	0.70	368.8	525.0	22.86	83.33	0.21	-24.03
		1247 - Womens Shower & Restroom	Room	347	25.00	0.24	266.1	1,094.1	10.97	83.33	0.07	-9.16
		1284 - Corridor	Room	496	25.00	0.13	238.9	1,772.5	6.77	83.33	0.04	-4.15
VAV-210			Zone	843	25.00	0.18	249.3	1,419.2	8.46	81.57	0.05	-6.17
		1248 - Mens Restroom/Shower	Room	430	25.00	0.16	245.6	1,543.5	7.77	83.33	0.05	-4.76
VAV-211			Zone	430	25.00	0.16	245.6	1,543.5	7.77	83.33	0.05	-4.76
		1106 - Quality Assurance Technician	Room	654	25.00	0.84	348.6	416.9	28.78	83.33	0.25	-21.19
VAV-212			Zone	654	25.00	0.84	348.6	416.9	28.78	83.33	0.25	-21.19
		1107 - Conference Room	Room	352	25.00	1.35	310.8	229.9	52.20	83.33	0.41	-32.07
VAV-213			Zone	352	25.00	1.35	310.8	229.9	52.20	83.33	0.41	-32.07
		1105 - Crew Chief Transit	Room	538	25.00	0.76	346.8	459.3	26.13	83.33	0.23	-18.04
		1109 - Crew Chief (Transit)	Room	181	25.00	1.04	351.7	339.6	35.34	83.33	0.31	-28.95
VAV-214			Zone	719	25.00	0.78	356.6	459.5	26.12	78.33	0.25	-20.16
		1108 - Equip Service Coord	Room	105	25.00	1.11	352.6	318.3	37.70	83.33	0.33	-31.76
VAV-215			Zone	105	25.00	1.11	352.6	318.3	37.70	83.33	0.33	-31.76
		1126 - Supply Clerk II & III	Room	748	25.00	0.99	351.1	354.1	33.89	83.33	0.30	-27.24
VAV-216			Zone	748	25.00	0.99	351.1	354.1	33.89	83.33	0.30	-27.24
		1127 - Shipping/Receiving Office	Room	104	25.00	1.67	356.9	214.0	56.09	83.33	0.50	-53.54
		1128 - Senior Supply Clerk	Room	127	25.00	1.55	356.2	229.1	52.37	83.33	0.47	-49.14
VAV-217			Zone	231	25.00	1.56	361.1	232.0	51.72	80.76	0.48	-50.49
		1116 - Equip Service Coord Heavy Equip	Room	157	25.00	1.01	351.3	349.4	34.35	83.33	0.30	-27.78
VAV-218			Zone	157	25.00	1.01	351.3	349.4	34.35	83.33	0.30	-27.78
		1113/1114/1115 - Crew Chief Heavy Eqp	Room	555	25.00	1.04	351.8	338.2	35.48	83.33	0.31	-29.12
VAV-219			Zone	555	25.00	1.04	351.8	338.2	35.48	83.33	0.31	-29.12
		1110 - Break Room	Room	131	25.00	2.21	261.3	118.3	101.43	83.33	0.66	-50.99
		1111 - Men	Room	230	25.00	0.21	391.7	1,834.6	6.54	83.33	0.06	-6.89
		1112 - Women	Room	52	25.00	0.39	379.5	973.9	12.32	83.31	0.12	-13.74
VAV-220			Zone	413	25.00	0.62	298.4	483.0	24.84	59.27	0.26	-18.57
		1234 - Mens Locker Room	Room	702	25.00	0.12	236.4	1,919.5	6.25	83.33	0.04	-3.38
		1235 - Mens Restroom / Shower	Room	417	25.00	0.12	236.4	1,919.5	6.25	83.33	0.04	-3.38
VAV-221			Zone	1,119	25.00	0.12	236.4	1,919.5	6.25	83.33	0.04	-3.38
		1239 - Break Room	Room	1,352	25.00	1.10	250.8	227.0	52.87	83.33	0.33	-22.80
VAV-222/223			Zone	1,352	25.00	1.10	250.8	227.0	52.87	83.33	0.33	-22.80
		1240 - Kitchen	Room	202	25.00	1.22	341.6	279.7	42.90	83.33	0.37	-23.52
		1242 - Vending Area	Room	124	25.00	3.54	357.0	100.8	119.08	83.33	1.06	-66.08
VAV-224			Zone	326	25.00	2.10	351.3	167.0	71.88	83.33	0.63	-39.70
		1203A - Training Room (north)	Room	700	25.00	1.58	292.9	185.7	64.63	83.33	0.47	-39.83
VAV-225			Zone	700	25.00	1.58	292.9	185.7	64.63	83.33	0.47	-39.83
		1203B - Training Room (mid)	Room	670	25.00	1.35	296.3	219.1	54.77	83.33	0.41	-28.28
VAV-226			Zone	670	25.00	1.35	296.3	219.1	54.77	83.33	0.41	-28.28

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft²/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
		1203C - Training Room (south)	Room	643	25.00	1.37	297.6	217.4	55.20	83.33	0.41	-28.70
		1205 - Bunks/Bulk Storage	Room	202	25.00	0.76	424.3	557.4	21.53	83.33	0.23	-21.09
	VAV-227		Zone	845	25.00	0.95	335.0	351.2	34.17	64.96	0.37	-23.46
		1236 - Womens Restroom/Shower/Lounge	Room	411	25.00	0.12	236.4	1,919.5	6.25	83.33	0.04	-3.38
		1237 - Womens Locker Room	Room	124	25.00	0.12	236.4	1,919.4	6.25	83.31	0.04	-3.38
	VAV-228		Zone	535	25.00	0.12	236.4	1,919.5	6.25	83.32	0.04	-3.38
		1200 - Lobby Waiting Area	Room	617	25.00	0.80	273.2	341.1	35.18	83.33	0.24	-15.81
		1238 - Corridor	Room	493	25.00	0.12	236.4	1,919.5	6.25	83.33	0.04	-3.38
		1241 - Storage	Room	96	25.00	0.12	236.4	1,919.4	6.25	83.30	0.04	-3.38
	VAV-230		Zone	1,206	25.00	0.36	271.9	753.2	15.93	64.01	0.14	-8.36
RTU-2		System - Variable Volume Reheat (30% Min Flow Default)		18,211	25.00	0.74	309.8	420.3	28.55	63.64	0.29	-20.14
		1267 - Conference Room	Room	314	25.00	1.85	318.4	172.5	69.55	83.33	0.55	-45.46
	VAV-301		Zone	314	25.00	1.85	318.4	172.5	69.55	83.33	0.55	-45.46
		1250 - Dispatch Coord Locker Alcove	Room	186	25.00	0.32	310.5	958.8	12.52	83.33	0.10	-11.55
		1265 - Uniform Storage	Room	262	25.00	0.56	362.9	653.8	18.35	83.33	0.17	-19.14
	VAV-302		Zone	448	25.00	0.46	350.2	763.0	15.73	83.33	0.14	-15.99
		1261 - Training Room	Room	866	25.00	1.61	319.5	198.7	60.40	83.33	0.48	-35.45
	VAV-303/304		Zone	866	25.00	1.61	319.5	198.7	60.40	83.33	0.48	-35.45
		1266 - Personnel Records Storage	Room	146	25.00	0.33	286.3	877.6	13.67	83.33	0.10	-10.32
		1268 - Break Room	Room	195	25.00	1.31	285.6	218.9	54.83	83.33	0.39	-28.60
	VAV-305		Zone	341	25.00	0.65	289.8	447.3	26.83	60.94	0.27	-17.76
		1262 - Men	Room	204	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
		1263 - Women	Room	206	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
		1282-1 Corridor	Room	360	25.00	0.15	266.7	1,823.7	6.58	83.33	0.04	-4.27
	VAV-306		Zone	770	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
		1245 ABC - Open Offices	Room	244	25.00	0.70	314.7	447.9	26.79	83.33	0.21	-15.63
		1264 - Training Storage	Room	115	25.00	0.15	266.7	1,823.6	6.58	83.31	0.04	-4.27
		1271 - Chair/Table Storage	Room	160	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
		1282-2 Corridor	Room	257	25.00	0.18	268.4	1,495.8	8.02	83.33	0.05	-5.96
	VAV-307		Zone	776	25.00	0.32	298.8	946.5	12.68	79.17	0.10	-8.19
		1272 - Transit Service Supervisor	Room	120	25.00	2.40	450.7	187.5	63.99	83.33	0.72	-59.54
		1273 - Transit Operations Supervisor	Room	109	25.00	2.59	451.5	174.5	68.76	83.33	0.78	-64.31
		1274 - Transit Operations Supervisor	Room	109	25.00	2.06	433.7	210.2	57.09	83.33	0.62	-51.44
		1282-4 - Corridor	Room	195	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
	VAV-308		Zone	533	25.00	1.50	443.9	296.4	40.49	80.75	0.46	-38.04
		1275 - Transit Operations Supervisor	Room	120	25.00	2.71	452.0	167.0	71.86	83.33	0.81	-67.42
		1276 - Transit Operations Supervisor	Room	120	25.00	2.58	451.5	175.2	68.49	83.33	0.77	-64.04
		1277 - Transit Operations Supervisor	Room	115	25.00	2.57	451.5	175.5	68.39	83.33	0.77	-63.95
		1282-5 Corridor	Room	270	25.00	0.53	362.6	690.2	17.39	83.33	0.16	-14.16
	VAV-309		Zone	625	25.00	1.54	442.9	287.1	41.80	74.96	0.51	-40.95
		1278 - Transit Operations Supervisor	Room	111	25.00	2.89	398.1	137.8	87.06	83.33	0.87	-79.23
		1279 - Transit Operations Supervisor	Room	110	25.00	2.44	402.5	165.0	72.74	83.33	0.73	-59.31
		1280 - Transit Operations Supervisor	Room	109	25.00	2.46	402.7	163.9	73.22	83.33	0.74	-59.75
	VAV-310		Zone	330	25.00	2.35	393.8	167.6	71.60	75.42	0.78	-63.03

System	Zone	Room	Type	Floor Area ft ²	COOLING				HEATING			
					% OA	cfm/ft ²	cfm/ton	ft ² /ton	Btu/hr-ft ²	% OA	cfm/ft ²	Btu/hr-ft ²
		1281 - Section Chief	Room	167	25.00	1.40	343.6	245.6	48.87	83.33	0.42	-37.40
	VAV-311		Zone	167	25.00	1.40	343.6	245.6	48.87	83.33	0.42	-37.40
		1269 - Lost and Found	Room	166	25.00	0.47	289.3	615.2	19.51	83.33	0.14	-15.28
		1282-3 - Corridor	Room	354	25.00	0.18	275.3	1,518.4	7.90	83.33	0.05	-5.48
		1296 - Vehicle Condition Report Storage	Room	296	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
		1297 - Copy/Work Room	Room	236	25.00	0.63	309.8	492.7	24.36	83.33	0.19	-13.12
		1298 - Schedule/Transfer Storage	Room	251	25.00	0.15	266.7	1,823.7	6.58	83.32	0.04	-4.27
	VAV-312		Zone	1,303	25.00	0.27	295.1	1,079.9	11.11	80.05	0.09	-7.46
RTU-3			System - Variable Volume Reheat (30% Min Flow Default)	6,473	25.00	0.67	324.7	481.5	24.92	58.60	0.29	-20.28

USE

ONLY

MONTHLY ENERGY CONSUMPTION

By ACADEMIC

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1													
Electric													
On-Pk Cons. (kWh)	75,638	68,433	81,144	85,693	114,036	123,901	134,121	128,292	112,000	88,502	81,204	76,584	1,169,547
On-Pk Demand (kW)	124	123	148	165	198	213	219	217	214	170	160	127	219
Gas													
On-Pk Cons. (therms)	333	263	158	89	21	5	3	6	18	111	148	262	1,417
On-Pk Demand (therms/hr)	1	1	0	0	0	0	0	0	0	0	0	1	1

Energy Consumption	
Building	123,691 Btu/(ft2-year)
Source	362,850 Btu/(ft2-year)
Floor Area	33,417 ft2

Environmental Impact Analysis	
CO2	4,377,136 lbm/year
SO2	11,505 gm/year
NOX	6,111 gm/year

ONLY

System Checksums

By ACADEMIC

AC-1

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK				TEMPERATURES		
Peaked at Time:		Mo/Hr: 8 / 15		Mo/Hr: Sum of		Mo/Hr: Heating Design		Mo/Hr: Heating Design						
Outside Air:		OADB/WB/HR: 92 / 74 / 100		OADB: Peaks		OADB: 10		OADB: 10						
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Space Sens	Tot Sens	Percent Of Total	Cooling	Heating	
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h	(%)			
Envelope Loads				Envelope Loads				Envelope Loads						
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	0	0	0.00	SADB	55.0	73.4
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	0	0	0.00	Ra Plenum	74.9	71.3
Roof Cond	0	0	0	0	0	Roof Cond	0	0.00	0	0	0.00	Return	74.9	71.3
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	0	0	0.00	Ret/OA	75.4	69.5
Glass/Door Cond	95	0	95	0	84	Glass/Door Cond	-353	5.52	-353	-353	5.52	Fn MtrTD	0.0	0.0
Wall Cond	511	1,174	1,684	5	592	Wall Cond	-561	29.04	-1,859	-1,859	29.04	Fn BldTD	0.0	0.0
Partition/Door	896		896	3	896	Partition/Door	-1,045	16.32	-1,045	-1,045	16.32	Fn Frict	0.0	0.0
Floor	0		0	0	0	Floor	-119	1.85	-119	-119	1.85			
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	0	0	0			
Infiltration	0		0	0	0	Infiltration	0	0.00	0	0	0.00			
Sub Total ==>	1,501	1,174	2,675	8	1,572	Sub Total ==>	-2,078	52.72	-3,376	-3,376	52.72			
Internal Loads				Internal Loads				Internal Loads						
Lights	2,187	547	2,733	8	2,187	Lights	0	0.00	0	0	0.00			
People	0	0	0	0	0	People	0	0.00	0	0	0.00			
Misc	27,304	0	27,304	78	27,304	Misc	0	0.00	0	0	0.00			
Sub Total ==>	29,491	547	30,037	86	29,491	Sub Total ==>	0	0.00	0	0	0.00			
Ceiling Load	211	-211	0	0	235	Ceiling Load	-159	0.00	0	0	0.00			
Ventilation Load	0	0	2,342	7	0	Ventilation Load	0	47.81	-3,061	-3,061	47.81			
Adj Air Trans Heat	0		0	0	0	Adj Air Trans Heat	0	0	0	0	0			
Dehumid. Ov Sizing			0	0		Ov/Undr Sizing	0	0.00	0	0	0.00			
Ov/Undr Sizing	0		0	0	0	Exhaust Heat		34	-0.53		-0.53			
Exhaust Heat		-45	-45	0		OA Preheat Diff.		0	0.00		0.00			
Sup. Fan Heat			0	0		RA Preheat Diff.		0	0.00		0.00			
Ret. Fan Heat			0	0		Additional Reheat		0	0.00		0.00			
Duct Heat Pkup			0	0										
Underflr Sup Ht Pkup			0	0		Underflr Sup Ht Pkup		0	0.00		0.00			
Supply Air Leakage			0	0		Supply Air Leakage		0	0.00		0.00			
Grand Total ==>	31,203	1,464	35,009	100.00	31,297	Grand Total ==>	-2,237	100.00	-6,402	-6,402	100.00			

AIRFLOWS		
	Cooling	Heating
Diffuser	1,478	1,478
Terminal	1,478	1,478
Main Fan	1,478	1,478
Sec Fan	0	0
Nom Vent	44	44
AHU Vent	44	44
Infil	0	0
MinStop/Rh	0	0
Return	1,478	1,478
Exhaust	44	44
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS		
	Cooling	Heating
% OA	3.0	3.0
cfm/ft²	2.03	2.03
cfm/ton	506.49	
ft²/ton	249.53	
Btu/hr-ft²	48.09	-8.79
No. People	0	

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	2.9	35.0	33.5	1,478	75.4	60.2	53.5	55.0	51.7	52.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2.9	35.0								

AREAS			
	Gross Total	Glass ft²	(%)
Floor	728		
Part	506		
Int Door	0		
ExFlr	19		
Roof	0	0	0
Wall	466	0	0
Ext Door	45	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-6.4	1,478	69.5	73.4
Aux Htg	0.0	0	0.0	0.0
Preheat	0.0	0	0.0	0.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-6.4			

System Checksums

By ACADEMIC

AC-2

Single Zone

COOLING COIL PEAK					CLG SPACE PEAK					HEATING COIL PEAK					TEMPERATURES				
Peaked at Time:		Mo/Hr: 7 / 15			Mo/Hr: Sum of		Mo/Hr: Heating Design							Cooling	Heating				
Outside Air:		OADB/WB/HR: 93 / 75 / 102			OADB: Peaks		OADB: 10							SADB	55.0	76.6			
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total	Space Sensible	Percent Of Total	Space Peak	Coil Peak	Percent	Space Sens	Tot Sens	Of Total								
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h	(%)								
Envelope Loads					Envelope Loads										AIRFLOWS				
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00									Cooling	Heating	
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00									187	187	
Roof Cond	0	0	0	0	0	Roof Cond	0	0.00									187	187	
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00									0	0	
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00									0	0	
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00									0	0	
Partition/Door	814		814	20	21	Partition/Door	-950	100.00									0	0	
Floor	0		0	0	0	Floor	0	0.00									0	0	
Adjacent Floor	0		0	0	0	Adjacent Floor	0	0.00									0	0	
Infiltration	0		0	0	0	Infiltration	0	0.00									0	0	
Sub Total ==>	814	0	814	20	21	Sub Total ==>	-950	100.00									0	0	
Internal Loads					Internal Loads										ENGINEERING CKS				
Lights	243	61	304	7	6	Lights	0	0.00									% OA	0.0	0.0
People	255	0	255	6	4	People	0	0.00									cfm/ft²	2.31	2.31
Misc	2,765	0	2,765	67	70	Misc	0	0.00									cfm/ton	543.65	
Sub Total ==>	3,263	61	3,324	80	79	Sub Total ==>	0	0.00									ft²/ton	234.92	
Ceiling Load	7	-7	0	0	0	Ceiling Load	0	0.00									Btu/hr-ft²	51.08	-11.73
Ventilation Load	0	0	0	0	0	Ventilation Load	0	0.00									No. People	1	
Adj Air Trans Heat	0		0	0	0	Adj Air Trans Heat	0	0.00											
Dehumid. Ov Sizing			0	0	0	Ov/Undr Sizing	0	0.00											
Ov/Undr Sizing	0		0	0	0	Exhaust Heat	0	0.00											
Exhaust Heat		0	0	0	0	OA Preheat Diff.	0	0.00											
Sup. Fan Heat			0	0	0	RA Preheat Diff.	0	0.00											
Ret. Fan Heat			0	0	0	Additional Reheat	0	0.00											
Duct Heat Pkup			0	0	0	Underflr Sup Ht Pkup	0	0.00											
Underflr Sup Ht Pkup			0	0	0	Supply Air Leakage	0	0.00											
Supply Air Leakage		0	0	0	0	Grand Total ==>	-950	100.00											
Grand Total ==>	4,083	54	4,138	100.00	3,970	100.00	Grand Total ==>	100.00											

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION								
	Total Capacity		Sens Cap.	Coil Airflow	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass	Lvg	Capacity	Coil Airflow	Ent	Lvg				
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb								ft²	(%)	MBh	cfm
Main Clg	0.3	4.1	4.0	187	74.3	59.4	51.9	55.0	51.4	50.9	Floor	81					Main Htg	-1.0	187	72.0	76.6
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	460					Aux Htg	0.0	0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0					Preheat	0.0	0	0.0	0.0
											ExFlr	0					Humidif	0.0	0	0.0	0.0
Total	0.3	4.1									Roof	0	0	0			Opt Vent	0.0	0	0.0	0.0
											Wall	0	0	0			Total	-1.0			
											Ext Door	0	0	0							

System Checksums

By ACADEMIC

AC-3

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK				TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: Sum of		Mo/Hr: Heating Design		Mo/Hr: Heating Design				Cooling	Heating	
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: Peaks		OADB: 10		OADB: 10				SADB	55.0	72.2
Space Sens. + Lat.	Plenum Sens. + Lat.	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Space Sens	Tot Sens	Percent Of Total	Ra Plenum	75.4	71.1
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h	(%)	Return	75.4	71.1
Envelope Loads				Envelope Loads				Envelope Loads				Fn MtrTD	0.0	0.0
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Skylite Solar	0	0.00	Fn BldTD	0.0	0.0
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Skylite Cond	0	0.00	Fn Frict	0.0	0.0
Roof Cond	0	297	7	0	0	Roof Cond	0	100.00	Roof Cond	0	-217			
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Glass Solar	0	0.00			
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Glass/Door Cond	0	0.00			
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	Wall Cond	0	0.00			
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Partition/Door	0	0.00			
Floor	0	0	0	0	0	Floor	0	0.00	Floor	0	0.00			
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	Adjacent Floor	0	0			
Infiltration	0	0	0	0	0	Infiltration	0	0.00	Infiltration	0	0.00			
Sub Total ==>	0	297	297	7	0	Sub Total ==>	0	100.00	Sub Total ==>	-217	100.00			
Internal Loads				Internal Loads				Internal Loads				AIRFLOWS		
Lights	146	37	183	4	4	Lights	0	0.00	Lights	0	0.00	Cooling	Heating	
People	0	0	0	0	0	People	0	0.00	People	0	0.00	Diffuser	182	182
Misc	3,652	0	3,652	88	95	Misc	0	0.00	Misc	0	0.00	Terminal	182	182
Sub Total ==>	3,798	37	3,835	93	99	Sub Total ==>	0	0.00	Sub Total ==>	0	0.00	Main Fan	182	182
Ceiling Load	48	-48	0	0	48	1	Ceiling Load	-31	Ceiling Load	0	0.00	Sec Fan	0	0
Ventilation Load	0	0	0	0	0	0	Ventilation Load	0	Ventilation Load	0	0.00	Nom Vent	0	0
Adj Air Trans Heat	0	0	0	0	0	0	Adj Air Trans Heat	0	Adj Air Trans Heat	0	0	AHU Vent	0	0
Dehumid. Ov Sizing	0	0	0	0	0	0	Ov/Undr Sizing	0	Ov/Undr Sizing	0	0.00	Infil	0	0
Ov/Undr Sizing	0	0	0	0	0	0	Exhaust Heat	0	Exhaust Heat	0	0.00	MinStop/Rh	0	0
Exhaust Heat	0	0	0	0	0	0	OA Preheat Diff.	0	OA Preheat Diff.	0	0.00	Return	182	182
Sup. Fan Heat	0	0	0	0	0	0	RA Preheat Diff.	0	RA Preheat Diff.	0	0.00	Exhaust	0	0
Ret. Fan Heat	0	0	0	0	0	0	Additional Reheat	0	Additional Reheat	0	0.00	Rm Exh	0	0
Duct Heat Pkup	0	0	0	0	0	0	Underflr Sup Ht Pkup	0	Underflr Sup Ht Pkup	0	0.00	Auxiliary	0	0
Underflr Sup Ht Pkup	0	0	0	0	0	0	Supply Air Leakage	0	Supply Air Leakage	0	0.00	Leakage Dwn	0	0
Supply Air Leakage	0	0	0	0	0	0	Grand Total ==>	-31	Grand Total ==>	-217	100.00	Leakage Ups	0	0
Grand Total ==>	3,846	286	4,132	100.00	3,846	100.00	Grand Total ==>	-31	Grand Total ==>	-217	100.00	ENGINEERING CKS		

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION							
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft² (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F				
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb										
Main Clg	0.3	4.1	4.1	182	75.4	57.2	41.0	55.0	48.6	40.7	Floor	107				Main Htg	-0.2	182	71.1	72.2
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0				Aux Htg	0.0	0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0				Preheat	0.0	0	0.0	0.0
											ExFlr	0				Humidif	0.0	0	0.0	0.0
Total	0.3	4.1									Roof	107	0	0		Opt Vent	0.0	0	0.0	0.0
											Wall	0	0	0		Total	-0.2			
											Ext Door	0	0	0						

System Checksums

By ACADEMIC

AC-4

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling		Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: Peaks		OADB: 10			SADB	55.0	72.2		
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total	Space Sensible	Percent Of Total	Space Peak Space Sens	Coil Peak Tot Sens	Percent Of Total	Return	75.4	71.1		
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Ret/OA	75.4	71.1		
Envelope Loads				Envelope Loads							Fn MtrTD	0.0	0.0
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Fn BldTD	0.0	0.0		
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Fn Frict	0.0	0.0		
Roof Cond	0	278	7	0	0	Roof Cond	0	100.00					
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00					
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00					
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00					
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00					
Floor	0	0	0	0	0	Floor	0	0.00					
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0					
Infiltration	0	0	0	0	0	Infiltration	0	0.00					
Sub Total ==>	0	278	7	0	0	Sub Total ==>	0	-203	100.00				
Internal Loads				Internal Loads							AIRFLOWS		
Lights	137	34	171	4	137	Lights	0	0.00	Diffuser	Cooling	Heating		
People	0	0	0	0	0	People	0	0.00	Terminal	170	170		
Misc	3,413	0	3,413	88	3,413	Misc	0	0.00	Main Fan	170	170		
Sub Total ==>	3,550	34	3,584	93	3,550	Sub Total ==>	0	0.00	Sec Fan	0	0		
Ceiling Load	45	-45	0	0	45	Ceiling Load	-29	0.00	Nom Vent	0	0		
Ventilation Load	0	0	0	0	0	Ventilation Load	0	0.00	AHU Vent	0	0		
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0	Infil	0	0		
Dehumid. Ov Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00	MinStop/Rh	0	0		
Ov/Undr Sizing	0	0	0	0	0	Exhaust Heat	0	0.00	Return	170	170		
Exhaust Heat	0	0	0	0	0	OA Preheat Diff.	0	0.00	Exhaust	0	0		
Sup. Fan Heat	0	0	0	0	0	RA Preheat Diff.	0	0.00	Rm Exh	0	0		
Ret. Fan Heat	0	0	0	0	0	Additional Reheat	0	0.00	Auxiliary	0	0		
Duct Heat Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00	Leakage Dwn	0	0		
Underflr Sup Ht Pkup	0	0	0	0	0	Supply Air Leakage	0	0.00	Leakage Ups	0	0		
Supply Air Leakage	0	0	0	0	0	Grand Total ==>	-29	-203	100.00				
Grand Total ==>	3,594	267	3,861	100.00	3,594	100.00	Grand Total ==>	-29	-203	100.00			

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity		Sens Cap.	Coil Airflow	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft²	Glass (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb							
Main Clg	0.3	3.9	3.9	170	75.4	57.2	41.0	55.0	48.6	40.7	Floor	100	-0.2	170	71.1	72.2	
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0	0.0	0	0.0	0.0	
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	0.0	0	0.0	0.0	
											ExFlr	0	0.0	0	0.0	0.0	
Total	0.3	3.9									Roof	100	0.0	0	0.0	0.0	
											Wall	0	0.0	0	0.0	0.0	
											Ext Door	0	0.0	0	0.0	0.0	
											Total	-0.2	-0.2	0	0.0	0.0	

System Checksums

By ACADEMIC

AC-5

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling		Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: Peaks		OADB: 10			SADB	55.0	72.2		
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak Space Sens	Coil Peak Tot Sens	Percent Of Total (%)	Return	75.4	71.1		
Btu/h	Btu/h	Btu/h		Btu/h		Btu/h	Btu/h		Ret/OA	75.4	71.1		
Envelope Loads				Envelope Loads							Fn MtrTD	0.0	0.0
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Fn BldTD	0.0	0.0		
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Fn Frict	0.0	0.0		
Roof Cond	0	272	7	0	0	Roof Cond	0	100.00					
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00					
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00					
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00					
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00					
Floor	0	0	0	0	0	Floor	0	0.00					
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0					
Infiltration	0	0	0	0	0	Infiltration	0	0.00					
Sub Total ==>	0	272	7	0	0	Sub Total ==>	0	-199					
Internal Loads				Internal Loads							AIRFLOWS		
Lights	134	33	167	4	134	Lights	0	0.00	Diffuser	166	166		
People	0	0	0	0	0	People	0	0.00	Terminal	166	166		
Misc	3,345	0	3,345	88	3,345	Misc	0	0.00	Main Fan	166	166		
Sub Total ==>	3,479	33	3,512	93	3,479	Sub Total ==>	0	0.00	Sec Fan	0	0		
Ceiling Load	44	-44	0	0	44	Ceiling Load	-29	0.00	Nom Vent	0	0		
Ventilation Load	0	0	0	0	0	Ventilation Load	0	0.00	AHU Vent	0	0		
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0	Infil	0	0		
Dehumid. Ov Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00	MinStop/Rh	0	0		
Ov/Undr Sizing	0	0	0	0	0	Exhaust Heat	0	0.00	Return	166	166		
Exhaust Heat	0	0	0	0	0	OA Preheat Diff.	0	0.00	Exhaust	0	0		
Sup. Fan Heat	0	0	0	0	0	RA Preheat Diff.	0	0.00	Rm Exh	0	0		
Ret. Fan Heat	0	0	0	0	0	Additional Reheat	0	0.00	Auxiliary	0	0		
Duct Heat Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00	Leakage Dwn	0	0		
Underflr Sup Ht Pkup	0	0	0	0	0	Supply Air Leakage	0	0.00	Leakage Ups	0	0		
Supply Air Leakage	0	0	0	0	0	Grand Total ==>	-29	-199					
Grand Total ==>	3,522	262	3,784	100.00	3,522	Grand Total ==>	-29	-199					

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft² (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F	
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb							
Main Clg	0.3	3.8	3.8	166	75.4	57.2	41.0	55.0	48.6	40.7	Floor	98	-0.2	166	71.1	72.2	
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0	0.0	0	0.0	0.0	
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	0.0	0	0.0	0.0	
											ExFlr	0	0.0	0	0.0	0.0	
Total	0.3	3.8									Roof	98	0.0	0	0.0	0.0	
											Wall	0	0.0	0	0.0	0.0	
											Ext Door	0	0.0	0	0.0	0.0	
											Total	-0.2					

System Checksums

By ACADEMIC

AC-6

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES			
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling			Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: Peaks		OADB: 10			SADB	55.0	72.0	Ra Plenum	74.6	71.6
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Return	74.6	71.6	Ret/OA	74.8	70.8
Btu/h	Btu/h	Btu/h		Btu/h		Space Sens	Tot Sens		Fn MtrTD	0.0	0.0	Fn BldTD	0.0	0.0
						Btu/h	Btu/h		Fn Frict	0.0	0.0			
Envelope Loads				Envelope Loads							AIRFLOWS			
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Diffuser	655	655	Terminal	655	655
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Main Fan	655	655	Sec Fan	0	0
Roof Cond	0	401	3	0	0	Roof Cond	0	32.59	Nom Vent	9	9	AHU Vent	9	9
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Infil	0	0	MinStop/Rh	0	0
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Return	655	655	Exhaust	9	9
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	Rm Exh	0	0	Auxiliary	0	0
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Leakage Dwn	0	0	Leakage Ups	0	0
Floor	0	0	0	0	0	Floor	0	0.00						
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0						
Infiltration	0	0	0	0	0	Infiltration	0	0.00						
Sub Total ==>	0	401	3	0	0	Sub Total ==>	0	-301						
Internal Loads				Internal Loads							ENGINEERING CKS			
Lights	201	50	251	2	1	Lights	0	0.00	% OA	1.4	1.4	cfm/ft²	4.46	4.46
People	0	0	0	0	0	People	0	0.00	cfm/ton	530.68		ft²/ton	119.03	
Misc	13,652	0	13,652	92	98	Misc	0	0.00	Btu/hr-ft²	100.82	-6.28	No. People	0	
Sub Total ==>	13,853	50	13,903	94	100	Sub Total ==>	0	0.00						
Ceiling Load	27	-27	0	0	28	Ceiling Load	-18	0.00						
Ventilation Load	0	0	521	4	0	Ventilation Load	0	67.83						
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0						
Dehumid. Ov Sizing			0	0		Ov/Undr Sizing	0	0.00						
Ov/Undr Sizing	1		1	0	1	Exhaust Heat	4	-0.42						
Exhaust Heat		-6	-6	0	0	OA Preheat Diff.	0	0.00						
Sup. Fan Heat			0	0		RA Preheat Diff.	0	0.00						
Ret. Fan Heat		0	0	0		Additional Reheat	0	0.00						
Duct Heat Pkup		0	0	0		Underflr Sup Ht Pkup	0	0.00						
Underflr Sup Ht Pkup		0	0	0		Supply Air Leakage	0	0.00						
Supply Air Leakage		0	0	0										
Grand Total ==>	13,881	419	14,820	100.00	13,881	Grand Total ==>	-18	-923	100.00					

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION			
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft² (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb						
Main Clg	1.2	14.8	14.5	655	74.8	59.4	51.0	55.0	51.2	50.2	Floor	147	-0.9	655	70.8	72.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0	0.0	0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	0.0	0	0.0	0.0
											ExFlr	0	0.0	0	0.0	0.0
Total	1.2	14.8									Roof	147	0.0	0	0.0	0.0
											Wall	0	0.0	0	0.0	0.0
											Ext Door	0	0.0	0	0.0	0.0
											Total	-0.9				

System Checksums

By ACADEMIC

EF-31

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES				
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling			Heating			
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: Peaks		OADB: 10			SADB	55.0	72.0	Ra Plenum	74.7	71.5	
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Return	74.7	71.5	Ret/OA	75.1	70.4	
Btu/h	Btu/h	Btu/h		Btu/h		Space Sens	Tot Sens		Fn MtrTD	0.0	0.0	Fn BldTD	0.0	0.0	
						Btu/h	Btu/h		Fn Frict	0.0	0.0				
Envelope Loads				Envelope Loads							AIRFLOWS				
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Diffuser	329	329	Terminal	329	329	
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Main Fan	329	329	Sec Fan	0	0	
Roof Cond	0	253	3	0	0	Roof Cond	0	31.45	Nom Vent	6	6	AHU Vent	6	6	
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Infil	0	0	MinStop/Rh	0	0	
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Return	329	329	Exhaust	6	6	
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	Rm Exh	0	0	Auxiliary	0	0	
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Leakage Dwn	0	0	Leakage Ups	0	0	
Floor	0	0	0	0	0	Floor	0	0.00	ENGINEERING CKS						
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	% OA	1.8	1.8	cfm/ft²	3.54	3.54	
Infiltration	0	0	0	0	0	Infiltration	0	0.00	cfm/ton	521.52		ft²/ton	147.28		
Sub Total ==>	0	253	3	0	0	Sub Total ==>	0	31.45	Btu/hr-ft²	81.48	-6.50	No. People	0		
Internal Loads				Internal Loads											
Lights	127	32	159	2	2	Lights	0	0.00							
People	0	0	0	0	0	People	0	0.00							
Misc	6,826	0	6,826	90	98	Misc	0	0.00							
Sub Total ==>	6,953	32	6,985	92	100	Sub Total ==>	0	0.00							
Ceiling Load				Ceiling Load											
Ventilation Load	0	0	344	5	0	Ventilation Load	0	69.08							
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0							
Dehumid. Ov Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00							
Ov/Undr Sizing	0	0	0	0	0	Exhaust Heat	3	-0.53							
Exhaust Heat	0	-5	-5	0	0	OA Preheat Diff.	0	0.00							
Sup. Fan Heat	0	0	0	0	0	RA Preheat Diff.	0	0.00							
Ret. Fan Heat	0	0	0	0	0	Additional Reheat	0	0.00							
Duct Heat Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00							
Underflr Sup Ht Pkup	0	0	0	0	0	Supply Air Leakage	0	0.00							
Supply Air Leakage	0	0	0	0	0	Grand Total ==>	-14	100.00							
Grand Total ==>	6,974	259	7,577	100.00	6,975	100.00	Grand Total ==>	-14	-604						

COOLING COIL SELECTION											AREAS				HEATING COIL SELECTION				
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft² (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F			
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb									
Main Clg	0.6	7.6	7.4	329	75.1	59.7	52.1	55.0	51.5	51.0	Floor	93							
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0							
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0							
											ExFlr	0							
Total	0.6	7.6									Roof	93	0	0					
											Wall	0	0	0					
											Ext Door	0	0	0					

System Checksums

By ACADEMIC

RTU-1

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES			
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: 9 / 16		Mo/Hr: Heating Design			Cooling			Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: 89		OADB: 10			SADB			Ra Plenum		
Return		77.1		77.1		77.1			Ret/OA			81.2		
Fn MtrTD		0.3		0.3		0.3			Fn BldTD			0.7		
Fn Frict		2.2		2.2		2.2			Fn Frict			2.2		
Envelope Loads	Space Sens. + Lat.	Plenum Sens. + Lat.	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Envelope Loads	Space Peak	Coil Peak	Percent Of Total	AIRFLOWS			
	Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)		Btu/h	Btu/h	(%)		Cooling	Heating	
Skylite Solar	0	0	0	0	0	0	Skylite Solar	0	0	0.00	Diffuser	6,533	2,640	
Skylite Cond	0	0	0	0	0	0	Skylite Cond	0	0	0.00	Terminal	6,533	2,640	
Roof Cond	0	20,064	20,064	8	0	0	Roof Cond	0	-14,155	8.00	Main Fan	6,533	2,640	
Glass Solar	30,278	0	30,278	13	38,771	34	Glass Solar	0	0	0.00	Sec Fan	0	0	
Glass/Door Cond	8,297	0	8,297	3	6,658	6	Glass/Door Cond	-28,378	-28,378	16.04	Nom Vent	1,633	1,633	
Wall Cond	4,073	6,001	10,074	4	4,408	4	Wall Cond	-5,821	-14,210	8.03	AHU Vent	1,633	1,633	
Partition/Door	0	0	0	0	0	0	Partition/Door	0	0	0.00	Infil	0	0	
Floor	0	0	0	0	0	0	Floor	0	0	0.00	MinStop/Rh	2,640	2,640	
Adjacent Floor	0	0	0	0	0	0	Adjacent Floor	0	0	0	Return	6,533	2,640	
Infiltration	0	0	0	0	0	0	Infiltration	0	0	0.00	Exhaust	1,633	1,633	
Sub Total ==>	42,648	26,065	68,713	29	49,837	43	Sub Total ==>	-34,199	-56,744	32.08	Rm Exh	0	0	
Internal Loads				Internal Loads				Internal Loads			ENGINEERING CKS			
Lights	19,667	4,917	24,583	10	19,667	17	Lights	0	0	0.00	% OA	25.0	61.9	
People	20,266	0	20,266	9	11,554	10	People	0	0	0.00	cfm/ft²	0.89	0.36	
Misc	27,696	0	27,696	12	27,696	24	Misc	0	0	0.00	cfm/ton	329.07		
Sub Total ==>	67,629	4,917	72,545	30	58,917	51	Sub Total ==>	0	0	0.00	ft²/ton	371.68		
Ceiling Load	7,294	-7,294	0	0	6,246	5	Ceiling Load	-9,981	0	0.00	Btu/hr-ft²	32.29	-23.97	
Ventilation Load	0	0	80,551	34	0	0	Ventilation Load	0	-113,607	64.23	No. People	92		
Adj Air Trans Heat	0	0	0	0	0	0	Adj Air Trans Heat	0	0	0				
Dehumid. Ov Sizing	0	0	0	0	0	0	Ov/Undr Sizing	0	0	0.00				
Ov/Undr Sizing	119	119	119	0	140	0	Exhaust Heat	0	7,772	-4.39				
Exhaust Heat	0	-5,680	-5,680	-2	0	0	OA Preheat Diff.	0	0	0.00				
Sup. Fan Heat	0	0	21,985	9	0	0	RA Preheat Diff.	0	-14,290	8.08				
Ret. Fan Heat	0	0	0	0	0	0	Additional Reheat	0	0	0.00				
Duct Heat Pkup	0	0	0	0	0	0	Underflr Sup Ht Pkup	0	0	0.00				
Underflr Sup Ht Pkup	0	0	0	0	0	0	Supply Air Leakage	0	0	0.00				
Supply Air Leakage	0	0	0	0	0	0	Grand Total ==>	-44,180	-176,869	100.00				
Grand Total ==>	117,690	18,008	238,234	100.00	115,139	100.00	Grand Total ==>	-44,180	-176,869	100.00				

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity		Sens Cap.	Coil Airflow	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass	ft² (%)	Capacity	Coil Airflow	Ent °F	Lvg °F
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb							
Main Clg	19.9	238.2	182.8	6,183	81.2	65.8	70.3	55.0	53.1	57.2	Floor	7,379	Main Htg	-94.2	2,640	55.0	87.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0	Aux Htg	0.0	0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	Preheat	-82.7	1,633	9.6	55.0
											ExFlr	0	Humidif	0.0	0	0.0	0.0
Total	19.9	238.2									Roof	7,379	Opt Vent	0.0	0	0.0	0.0
											Wall	4,620	Total	-176.9			
											Ext Door	24					

System Checksums

By ACADEMIC

RTU-2

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK					CLG SPACE PEAK					HEATING COIL PEAK					TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 15			Mo/Hr: 9 / 13		Mo/Hr: Heating Design							Cooling	Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 102			OADB: 87		OADB: 10							SADB	58.2	88.5	
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Space Sens	Coil Peak	Percent Of Total	Return	76.5	68.5			
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Tot Sens	(%)	Btu/h	Btu/h	(%)	Ret/OA	80.8	31.0			
Envelope Loads																	
Skylite Solar	0	0	0	0	0	0	0	0.00	Skylite Solar	0	0	0.00	Fn MtrTD	0.3	0.0		
Skylite Cond	0	0	0	0	0	0	0	0.00	Skylite Cond	0	0	0.00	Fn BldTD	0.7	0.0		
Roof Cond	0	38,073	38,073	7	0	0	0	7.56	Roof Cond	0	-27,733	7.56	Fn Frict	2.2	0.0		
Glass Solar	23,263	0	23,263	4	40,150	17	0	0.00	Glass Solar	0	0	0.00					
Glass/Door Cond	11,233	0	11,233	2	6,915	3	-38,547	10.51	Glass/Door Cond	-38,547	-38,547	10.51					
Wall Cond	5,552	7,481	13,033	3	4,485	2	-9,988	6.39	Wall Cond	-9,988	-23,437	6.39					
Partition/Door	24,061	0	24,061	5	24,061	10	-28,071	7.65	Partition/Door	-28,071	-28,071	7.65					
Floor	0	0	0	0	0	0	0	0.00	Floor	0	0	0.00					
Adjacent Floor	0	0	0	0	0	0	0	0	Adjacent Floor	0	0	0					
Infiltration	0	0	0	0	0	0	0	0.00	Infiltration	0	0	0.00					
Sub Total ==>	64,108	45,553	109,662	21	75,610	32	-76,605	32.12	Sub Total ==>	-76,605	-117,788	32.12					
Internal Loads																	
Lights	50,417	12,604	63,021	12	50,417	21	0	0.00	Lights	0	0	0.00					
People	94,746	0	94,746	18	50,617	21	0	0.00	People	0	0	0.00					
Misc	49,922	0	49,922	10	49,922	21	0	0.00	Misc	0	0	0.00					
Sub Total ==>	195,085	12,604	207,689	40	150,956	64	0	0.00	Sub Total ==>	0	0	0.00					
Ceiling Load																	
Ceiling Load	14,309	-14,309	0	0	9,983	4	-20,401	0.00	Ceiling Load	-20,401	0	0.00					
Ventilation Load	0	0	165,557	32	0	0	-233,402	63.64	Ventilation Load	0	-233,402	63.64					
Adj Air Trans Heat	0	0	0	0	0	0	0	0	Adj Air Trans Heat	0	0	0					
Dehumid. Ov Sizing	0	0	0	0	0	0	0	0.00	Ov/Undr Sizing	0	0	0.00					
Ov/Undr Sizing	0	0	0	0	0	0	0	0.00	Exhaust Heat	13,225	-3.61						
Exhaust Heat	0	-9,276	-9,276	-2	0	0	0	0.00	OA Preheat Diff.	0	0.00						
Sup. Fan Heat	0	0	46,274	9	0	0	-28,778	7.85	RA Preheat Diff.	-28,778	7.85						
Ret. Fan Heat	0	0	0	0	0	0	0	0.00	Additional Reheat	0	0.00						
Duct Heat Pkup	0	0	0	0	0	0	0	0.00	Underflr Sup Ht Pkup	0	0.00						
Underflr Sup Ht Pkup	0	0	0	0	0	0	0	0.00	Supply Air Leakage	0	0.00						
Supply Air Leakage	0	0	0	0	0	0	0	0.00	Grand Total ==>	-97,007	-366,743	100.00					
Grand Total ==>	273,502	34,573	519,906	100.00	236,549	100.00	-97,007	100.00	Grand Total ==>	-97,007	-366,743	100.00					

AIRFLOWS		
	Cooling	Heating
Diffuser	13,422	5,273
Terminal	13,422	5,273
Main Fan	13,422	5,273
Sec Fan	0	0
Nom Vent	3,355	3,355
AHU Vent	3,355	3,355
Infil	0	0
MinStop/Rh	5,273	5,273
Return	13,422	5,273
Exhaust	3,355	3,355
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS		
	Cooling	Heating
% OA	25.0	63.6
cfm/ft²	0.74	0.29
cfm/ton	309.79	
ft²/ton	420.33	
Btu/hr-ft²	28.55	-20.14
No. People	389	

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	43.3	519.9	382.0	13,015	80.8	66.1	72.8	55.0	53.0	57.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	43.3	519.9								

AREAS			
	Gross Total	Glass ft²	(%)
Floor	18,211		
Part	13,595		
Int Door	0		
ExFlr	0		
Roof	14,277	0	0
Wall	7,205	1,718	24
Ext Door	45	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-196.9	5,273	55.0	88.5
Aux Htg	0.0	0	0.0	0.0
Preheat	-169.8	3,355	9.6	55.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-366.7			

System Checksums

By ACADEMIC

RTU-3

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES																																													
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: 8 / 11		Mo/Hr: Heating Design			Cooling		Heating																																													
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: 83		OADB: 10			SADB	58.2	91.6																																													
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Return	77.7	67.0																																													
Btu/h	Btu/h	Btu/h		Btu/h		Space Sens	Tot Sens		Ret/OA	82.0	33.4																																													
Envelope Loads				Envelope Loads				Fn MtrTD		0.3	0.0																																													
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Fn BldTD	0.7	0.0																																													
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Fn Frict	2.2	0.0																																													
Roof Cond	0	16,968	11	0	0	Roof Cond	0	9.34	AIRFLOWS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Cooling</th> <th>Heating</th> </tr> </thead> <tbody> <tr> <td>Diffuser</td> <td>4,365</td> <td>1,862</td> </tr> <tr> <td>Terminal</td> <td>4,365</td> <td>1,862</td> </tr> <tr> <td>Main Fan</td> <td>4,365</td> <td>1,862</td> </tr> <tr> <td>Sec Fan</td> <td>0</td> <td>0</td> </tr> <tr> <td>Nom Vent</td> <td>1,091</td> <td>1,091</td> </tr> <tr> <td>AHU Vent</td> <td>1,091</td> <td>1,091</td> </tr> <tr> <td>Infil</td> <td>0</td> <td>0</td> </tr> <tr> <td>MinStop/Rh</td> <td>1,862</td> <td>1,862</td> </tr> <tr> <td>Return</td> <td>4,365</td> <td>1,862</td> </tr> <tr> <td>Exhaust</td> <td>1,091</td> <td>1,091</td> </tr> <tr> <td>Rm Exh</td> <td>0</td> <td>0</td> </tr> <tr> <td>Auxiliary</td> <td>0</td> <td>0</td> </tr> <tr> <td>Leakage Dwn</td> <td>0</td> <td>0</td> </tr> <tr> <td>Leakage Ups</td> <td>0</td> <td>0</td> </tr> </tbody> </table>				Cooling	Heating	Diffuser	4,365	1,862	Terminal	4,365	1,862	Main Fan	4,365	1,862	Sec Fan	0	0	Nom Vent	1,091	1,091	AHU Vent	1,091	1,091	Infil	0	0	MinStop/Rh	1,862	1,862	Return	4,365	1,862	Exhaust	1,091	1,091	Rm Exh	0	0	Auxiliary	0	0	Leakage Dwn	0	0	Leakage Ups	0	0
	Cooling	Heating																																																						
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Leakage Dwn	0	0																																																						
Leakage Ups	0	0																																																						
Glass Solar	14,427	0	9	32,481	42	Glass Solar	0	0.00																																																
Glass/Door Cond	6,793	0	4	2,636	3	Glass/Door Cond	-23,407	17.83																																																
Wall Cond	4,442	5,321	6	2,093	3	Wall Cond	-7,052	11.81																																																
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00																																																
Floor	0	0	0	0	0	Floor	0	0.00																																																
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0																																																
Infiltration	0	0	0	0	0	Infiltration	0	0.00																																																
Sub Total ==>	25,663	22,288	47,951	37,210	48	Sub Total ==>	-30,459	-51,163	38.98																																															
Internal Loads				Internal Loads				Nom Vent		1,091	1,091																																													
Lights	14,103	3,526	11	14,103	18	Lights	0	0.00	AHU Vent	1,091	1,091																																													
People	17,845	0	11	10,226	13	People	0	0.00	Infil	0	0																																													
Misc	11,963	0	7	11,963	16	Misc	0	0.00	MinStop/Rh	1,862	1,862																																													
Sub Total ==>	43,911	3,526	47,437	36,292	47	Sub Total ==>	0	0.00	Return	4,365	1,862																																													
Ceiling Load				Ceiling Load				Exhaust		1,091	1,091																																													
Ventilation Load	7,482	-7,482	0	3,424	4	Ventilation Load	-10,290	0.00	Rm Exh	0	0																																													
Adj Air Trans Heat	0	0	35	0	0	Adj Air Trans Heat	0	57.83	Auxiliary	0	0																																													
Dehumid. Ov Sizing	0	0	0	0	0	Dehumid. Ov Sizing	0	0.00	Leakage Dwn	0	0																																													
Ov/Undr Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00	Leakage Ups	0	0																																													
Exhaust Heat	0	-4,437	-3	0	0	Exhaust Heat	0	6,103	ENGINEERING CKS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Cooling</th> <th>Heating</th> </tr> </thead> <tbody> <tr> <td>% OA</td> <td>25.0</td> <td>58.6</td> </tr> <tr> <td>cfm/ft²</td> <td>0.67</td> <td>0.29</td> </tr> <tr> <td>cfm/ton</td> <td>324.66</td> <td></td> </tr> <tr> <td>ft²/ton</td> <td>481.48</td> <td></td> </tr> <tr> <td>Btu/hr-ft²</td> <td>24.92</td> <td>-20.28</td> </tr> <tr> <td>No. People</td> <td>82</td> <td></td> </tr> </tbody> </table>				Cooling	Heating	% OA	25.0	58.6	cfm/ft²	0.67	0.29	cfm/ton	324.66		ft²/ton	481.48		Btu/hr-ft²	24.92	-20.28	No. People	82																									
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Btu/hr-ft²	24.92	-20.28																																																						
No. People	82																																																							
Sup. Fan Heat	0	14,008	9	0	0	Sup. Fan Heat	0	10,298																																																
Ret. Fan Heat	0	0	0	0	0	Ret. Fan Heat	0	0.00																																																
Duct Heat Pkup	0	0	0	0	0	Duct Heat Pkup	0	7.85																																																
Underflr Sup Ht Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00																																																
Supply Air Leakage	0	0	0	0	0	Supply Air Leakage	0	0.00																																																
Grand Total ==>	77,057	13,894	161,329	76,925	100.00	Grand Total ==>	-40,749	-131,260	100.00																																															

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	13.4	161.3	120.7	3,940	82.0	66.2	71.2	55.0	52.7	55.8
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	13.4	161.3								

AREAS			
	Gross Total	Glass ft²	(%)
Floor	6,473		
Part	0		
Int Door	0		
ExFlr	0		
Roof	6,473	0	0
Wall	4,712	1,045	22
Ext Door	23	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-76.0	1,862	55.0	91.6
Aux Htg	0.0	0	0.0	0.0
Preheat	-55.2	1,091	9.6	55.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-131.3			

Appendix B - Trane TRACE 700 Data for Revised System, Excluding Passive Integration



SYSTEM SUMMARY

DESIGN COOLING CAPACITIES

By ACADEMIC

Alternative 1

Building Airside Systems and Plant Capacities

Plant	System	Peak Plant Loads							Block Plant Loads									
		Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Peak Total ton	Time	Main Coil ton	Aux Coil ton	Opt Vent Coil ton	Misc Load ton	Stg 1	Stg 2	Base Utility ton	Block Total ton
						Desic Cond ton	Desic Cond ton			Of Peak mo/hr					Desic Cond ton	Desic Cond ton		
Cooling plant - 005		74.1	0.0	0.0	0.0	0.0	0.0	0.0	74.1	7/15	74.1	0.0	0.0	0.0	0.0	0.0	0.0	74.1
	RTU-1	27.4	0.0	0.0	0.0	0.0	0.0	0.0	27.4	7/15	27.4	0.0	0.0	0.0	0.0	0.0	0.0	27.4
	EF-31	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6	7/15	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6
	RTU-2	40.6	0.0	0.0	0.0	0.0	0.0	0.0	40.6	7/15	40.6	0.0	0.0	0.0	0.0	0.0	0.0	40.6
	AC-3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2	7/15	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2
	AC-5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7/15	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3
	AC-1	2.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9	7/15	2.9	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Building totals		74.1	0.0	0.0	0.0	0.0	0.0	0.0	74.1		74.1	0.0	0.0	0.0	0.0	0.0	0.0	74.1

Building peak load is 74.1 tons.

Building maximum block load of 74.1 tons occurs in July at hour 15 based on system simulation.

MONTHLY UTILITY COSTS

By ACADEMIC

Utility	Jan	Feb	Mar	Apr	----- Monthly Utility Costs -----				Sept	Oct	Nov	Dec	Total
					May	June	July	Aug					
Alternative 1													
Electric													
On-Pk Cons. (\$)	1,476	1,336	1,586	1,671	2,172	4,423	4,725	4,571	4,051	3,262	0	0	29,272
On-Pk Demand (\$)	0	0	0	0	0	0	0	0	0	0	9	9	19
Total (\$):	1,476	1,336	1,586	1,671	2,172	4,423	4,725	4,571	4,051	3,262	9	9	29,291
Gas													
On-Pk Cons. (\$)	34	29	18	18	18	18	18	18	18	18	18	30	256
Monthly Total (\$):	1,510	1,364	1,604	1,689	2,191	4,442	4,743	4,589	4,070	3,280	27	40	29,547

Building Area = 33,417 ft²

Utility Cost Per Area = 0.88 \$/ft²

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USE

ONLY

Economic Summary

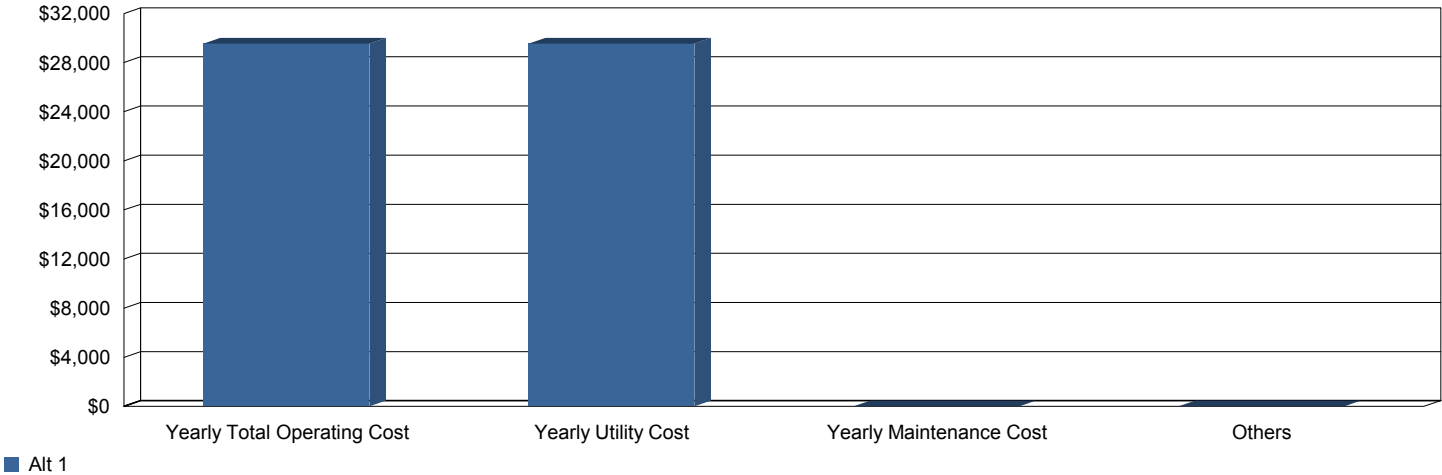
Project Information

Location	Montgomery County, Maryland	Study Life:	20 years
Project Name	08197_01 EMOC	Cost of Capital:	10 %
User	Brenner	Alternative 1:	
Company	S3E Klingemann, Inc		
Comments			

Economic Comparison of Alternatives

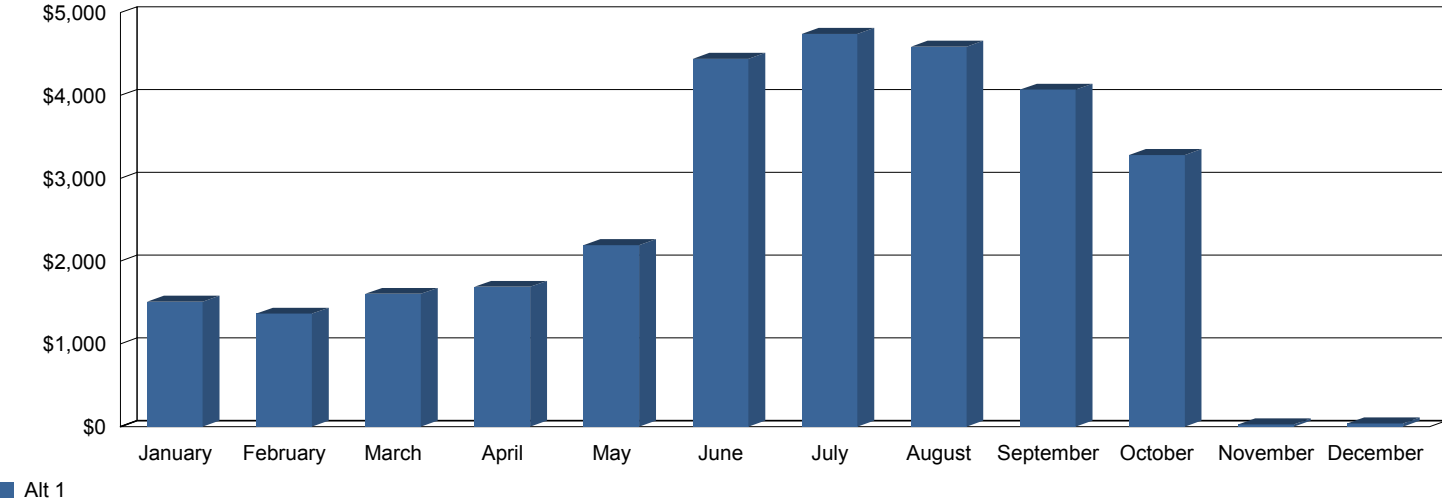
Yearly Savings (\$)	First Cost Difference (\$)	Cumulative Cash Flow Difference (\$)	Simple Payback (yrs.)	Net Present Value (\$)	Life Cycle Payback (yrs.)	Internal Rate of Return (%)	Life Cycle Cost
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Annual Operating Costs



Yearly Total Operating Cost (\$)	Yearly Utility Cost (\$)	Yearly Maintenance Cost (\$)
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Monthly Utility Costs



ENERGY CONSUMPTION SUMMARY

By ACADEMIC

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1					
Primary heating					
Primary heating		71,238	1.8 %	71,238	74,987
Other Htg Accessories	9,279		0.8 %	31,668	95,014
Heating Subtotal	9,279	71,238	2.5 %	102,906	170,001
Primary cooling					
Cooling Compressor	179,313		15.0 %	611,995	1,836,170
Tower/Cond Fans	22,470		1.9 %	76,691	230,097
Condenser Pump			0.0 %	0	0
Other Clg Accessories	876		0.1 %	2,990	8,970
Cooling Subtotal....	202,659		17.0 %	691,676	2,075,237
Auxiliary					
Supply Fans	429,122		35.9 %	1,464,594	4,394,221
Pumps			0.0 %	0	0
Stand-alone Base Utilities			0.0 %	0	0
Aux Subtotal....	429,122		35.9 %	1,464,594	4,394,221
Lighting					
Lighting	280,280		23.5 %	956,595	2,870,071
Receptacle					
Receptacles	252,787		21.2 %	862,763	2,588,547
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	1,174,127	71,238	100.0 %	4,078,533	12,098,076

* Note: Resource Utilization factors are included in the Total Source Energy value .

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

Energy Cost Budget / PRM Summary

By ACADEMIC

Project Name: 08197_01 EMOG	Date: April 04, 2012
City: Montgomery County, Maryland	Weather Data: Washington, D.C.

Note: The percentage displayed for the "Proposed/ Base %" column of the base case is actually the percentage of the total energy consumption.

* Denotes the base alternative for the E-3 study.

		* Alt-1		
		Proposed Base Consumption (kWh/yr)	Proposed Base % of Total	Peak Load (kW)
Lighting - Conditioned	Electricity	956.6	23	109
Space Heating	Electricity	31.7	1	4
	Gas	71.2	2	94
Space Cooling	Electricity	615.0	15	274
Heat Rejection	Electricity	76.7	2	24
Fans - Conditioned	Electricity	1,464.6	36	226
Receptacles - Conditioned	Electricity	862.8	21	98
Total Building Consumption		4,078.5		

		* Alt-1	
Total	Number of hours heating load not met	0	
	Number of hours cooling load not met	0	

		* Alt-1	
		Energy 10 ⁶ Btu/yr	Cost/yr \$/yr
Electricity		4,007.3	29,291
Gas		71.2	256
Total		4,079	29,547

ENGINEERING CHECKS

By ACADEMIC

System	Zone	Room	Type	Floor Area ft ²	COOLING					HEATING		
					% OA	cfm/ft ²	cfm/ton	ft ² /ton	Btu/hr-ft ²	% OA	cfm/ft ²	Btu/hr-ft ²
Alternative 1												
		1132 - Electric Switchgear	Zone	728	2.98	2.03	506.5	249.5	48.09	2.98	2.03	-8.79
AC-1			System - Single Zone	728	2.98	2.03	506.5	249.5	48.09	2.98	2.03	-8.79
		1131 - Telecom	Zone	81	0.00	2.31	543.6	234.9	51.08	0.00	2.31	-11.73
AC-2			System - Single Zone	81	0.00	2.31	543.6	234.9	51.08	0.00	2.31	-11.73
		1270 - Computer Room	Zone	107	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
AC-3			System - Single Zone	107	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
		1292 - Comm Room	Zone	100	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
AC-4			System - Single Zone	100	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
		1229 - Comm Room	Zone	98	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
AC-5			System - Single Zone	98	0.00	1.70	527.4	310.8	38.61	0.00	1.70	-2.03
		1215 - Elec Room - Load	Zone	147	1.37	4.46	530.7	119.0	100.82	1.37	4.46	-6.28
AC-6			System - Single Zone	147	1.37	4.46	530.7	119.0	100.82	1.37	4.46	-6.28
		1291 - Elec Room	Zone	93	1.82	3.54	521.5	147.3	81.48	1.82	3.54	-6.50
EF-31			System - Single Zone	93	1.82	3.54	521.5	147.3	81.48	1.82	3.54	-6.50
		1206 - Conference Room	Room	273	25.00	0.94	268.2	285.7	42.00	83.33	0.28	-18.16
VAV-101			Zone	273	25.00	0.94	268.2	285.7	42.00	83.33	0.28	-18.16
		1207 - Break Room	Room	304	25.00	1.41	265.3	188.0	63.82	83.33	0.42	-26.82
VAV-102			Zone	304	25.00	1.41	265.3	188.0	63.82	83.33	0.42	-26.82
		1209 - Fleet Serv Manager III	Room	165	25.00	1.27	403.7	318.6	37.66	83.33	0.38	-30.40
		1211 - Coord Manager III	Room	162	25.00	1.60	410.2	256.7	46.75	83.33	0.48	-39.48
VAV-103			Zone	327	25.00	1.38	413.3	299.2	40.11	80.44	0.43	-34.27
		1204-2 - Corridor	Room	470	25.00	0.12	228.4	1,908.8	6.29	83.33	0.04	-3.14
		1204A - Sign-out Desk	Room	101	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1210 - Visiting Staff Office	Room	102	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1212 - Supply Storage	Room	68	25.00	0.12	228.4	1,908.7	6.29	83.29	0.04	-3.14
		1213 - File Room	Room	74	25.00	0.12	228.4	1,908.7	6.29	83.29	0.04	-3.14
		1215 - Elec Room - Air	Room	147	25.00	0.34	452.1	1,329.1	9.03	83.33	0.10	-7.18
VAV-104			Zone	962	25.00	0.21	267.6	1,268.3	9.46	68.89	0.08	-5.06
		1231 - Men	Room	141	25.00	0.12	228.4	1,908.7	6.29	83.31	0.04	-3.14
		1232 - Women	Room	141	25.00	0.12	228.4	1,908.7	6.29	83.31	0.04	-3.14
VAV-105			Zone	282	25.00	0.12	228.4	1,908.8	6.29	83.31	0.04	-3.14
		1214 - Coord Manager III	Room	162	25.00	1.60	410.2	256.7	46.75	83.33	0.48	-39.48
		1216 - Admin Spec III	Room	141	25.00	1.60	410.3	255.9	46.90	83.33	0.48	-39.63
VAV-106			Zone	303	25.00	1.55	415.8	268.1	44.76	80.75	0.48	-38.92
		1204-5 - Corridor	Room	393	25.00	0.12	228.4	1,908.8	6.29	83.33	0.04	-3.14
		1204B - Office Serv Coord	Room	90	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1204C - Exec Admin Aide	Room	90	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
VAV-107			Zone	573	25.00	0.26	274.5	1,073.6	11.18	78.54	0.08	-5.72
		1217 - Division Chief	Room	237	25.00	2.02	430.2	212.5	56.47	83.33	0.61	-51.66

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft²/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
VAV-108			Zone	237	25.00	2.02	430.2	212.5	56.47	83.33	0.61	-51.66
		1218 - Program Manager	Room	113	25.00	2.59	400.4	154.5	77.68	83.33	0.78	-62.52
		1219 - Manage & Budget Spec III	Room	119	25.00	1.57	372.0	236.5	50.74	83.33	0.47	-37.46
VAV-109			Zone	232	25.00	2.02	396.0	196.1	61.20	81.34	0.62	-49.04
		1220 - Senior Spec Fin II	Room	109	25.00	2.31	360.7	156.4	76.72	83.33	0.69	-60.12
VAV-110			Zone	109	25.00	2.31	360.7	156.4	76.72	83.33	0.69	-60.12
		1204-3DEFGH Open Offices - Interior	Room	870	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
VAV-111			Zone	870	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1204-6JKLM - Open Offices - Exterior	Room	936	25.00	1.76	382.9	217.9	55.07	83.33	0.53	-41.65
VAV-112			Zone	936	25.00	1.76	382.9	217.9	55.07	83.33	0.53	-41.65
		1228 - Conference Room	Room	446	25.00	1.16	281.5	243.6	49.27	83.33	0.35	-22.14
VAV-113			Zone	446	25.00	1.16	281.5	243.6	49.27	83.33	0.35	-22.14
		1221 - Admin Serv Coord Manager III	Room	160	25.00	1.76	351.0	199.6	60.11	83.33	0.53	-45.75
VAV-114			Zone	160	25.00	1.76	351.0	199.6	60.11	83.33	0.53	-45.75
		1204-4 - Corridor	Room	180	25.00	0.12	228.4	1,908.8	6.29	83.32	0.04	-3.14
		1222 - Program Manager II	Room	138	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1223 - Program Manager II - Parts	Room	128	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1224 - Program Manager II - Fuel	Room	124	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
VAV-115			Zone	570	25.00	0.42	294.4	707.8	16.95	77.04	0.13	-8.76
		1204-1 Corridor	Room	197	25.00	0.17	238.5	1,412.1	8.50	83.32	0.05	-5.57
		1225 - IT Spec III	Room	131	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1226 - IT Spec II	Room	127	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
		1227 - IT Spec II	Room	133	25.00	0.60	298.1	495.0	24.24	83.33	0.18	-11.99
VAV-116			Zone	588	25.00	0.42	294.7	695.8	17.25	77.21	0.14	-9.41
		1244 - Shop Mtg Room	Room	207	25.00	1.41	292.7	208.1	57.66	83.33	0.42	-26.73
VAV-117			Zone	207	25.00	1.41	292.7	208.1	57.66	83.33	0.42	-26.73
		1106 - Quality Assurance Technician	Room	654	25.00	0.83	341.2	409.8	29.28	83.33	0.25	-20.95
VAV-212			Zone	654	25.00	0.83	341.2	409.8	29.28	83.33	0.25	-20.95
		1107 - Conference Room	Room	352	25.00	1.35	305.0	226.3	53.04	83.33	0.40	-31.83
VAV-213			Zone	352	25.00	1.35	305.0	226.3	53.04	83.33	0.40	-31.83
		1105 - Crew Chief Transit	Room	538	25.00	0.75	339.4	451.6	26.57	83.33	0.23	-17.80
		1109 - Crew Chief (Transit)	Room	181	25.00	1.03	344.4	333.6	35.97	83.33	0.31	-28.71
VAV-214			Zone	719	25.00	0.77	348.9	451.5	26.58	78.31	0.25	-19.92
		1108 - Equip Service Coord	Room	105	25.00	1.10	345.3	312.6	38.38	83.33	0.33	-31.52
VAV-215			Zone	105	25.00	1.10	345.3	312.6	38.38	83.33	0.33	-31.52
		1126 - Supply Clerk II & III	Room	748	25.00	0.99	343.8	347.9	34.50	83.33	0.30	-27.00
VAV-216			Zone	748	25.00	0.99	343.8	347.9	34.50	83.33	0.30	-27.00
		1127 - Shipping/Receiving Office	Room	104	25.00	1.66	349.6	210.0	57.14	83.33	0.50	-53.30
		1128 - Senior Supply Clerk	Room	127	25.00	1.55	348.9	225.0	53.34	83.33	0.47	-48.90
VAV-217			Zone	231	25.00	1.55	353.6	227.7	52.69	80.75	0.48	-50.25
		1116 - Equip Service Coord Heavy Equip	Room	157	25.00	1.00	344.0	343.3	34.96	83.33	0.30	-27.54
VAV-218			Zone	157	25.00	1.00	344.0	343.3	34.96	83.33	0.30	-27.54
		1113/1114/1115 - Crew Chief Heavy Eqp	Room	555	25.00	1.04	344.4	332.3	36.11	83.33	0.31	-28.88

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft²/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
	VAV-219		Zone	555	25.00	1.04	344.4	332.3	36.11	83.33	0.31	-28.88
		1110 - Break Room	Room	131	25.00	2.21	257.4	116.7	102.86	83.33	0.66	-50.76
		1111 - Men	Room	230	25.00	0.21	380.3	1,810.6	6.63	83.33	0.06	-6.65
		1112 - Women	Room	52	25.00	0.39	370.0	958.1	12.53	83.31	0.12	-13.50
	VAV-220		Zone	413	25.00	0.61	292.7	476.0	25.21	59.21	0.26	-18.34
RTU-1		System - Variable Volume Reheat (30% Min Flow Default)		11,313	25.00	0.81	333.3	412.8	29.07	69.25	0.29	-21.24
		1249 - Lockers	Room	631	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
	VAV-201		Zone	631	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
		1245-2 - Corridor	Room	298	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1245-3 - Corridor	Room	189	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1251 - Drivers Mailboxes	Room	116	25.00	0.23	282.6	1,224.7	9.80	83.32	0.07	-5.67
		1255 - Drivers Room	Room	1,971	25.00	1.06	251.1	237.5	50.53	83.33	0.32	-20.83
		1256 - Kitchenette	Room	144	25.00	1.64	353.1	215.6	55.65	83.33	0.49	-31.47
		1257 - Vending Area	Room	148	25.00	3.04	360.9	118.7	101.10	83.33	0.91	-57.19
	VAV-202/203/204/229		Zone	2,866	25.00	0.73	284.5	389.2	30.83	60.96	0.30	-16.37
		1258 - Quiet Room	Room	244	25.00	0.93	295.7	319.4	37.57	83.33	0.28	-18.42
	VAV-205		Zone	244	25.00	0.93	295.7	319.4	37.57	83.33	0.28	-18.42
		1245-1 - Corridor	Room	283	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1252/1260 - Dispatch Coord/Window	Room	1,110	25.00	1.06	348.1	327.3	36.66	83.33	0.32	-28.79
	VAV-206		Zone	1,393	25.00	0.83	349.2	418.9	28.65	79.34	0.26	-23.22
		1259 - Vestibule	Room	379	25.00	0.90	294.6	329.2	36.45	83.33	0.27	-24.60
	VAV-207		Zone	379	25.00	0.90	294.6	329.2	36.45	83.33	0.27	-24.60
		1254 - Reception/Lobby	Room	308	25.00	1.51	307.2	203.5	58.96	83.33	0.45	-37.00
	VAV-208		Zone	308	25.00	1.51	307.2	203.5	58.96	83.33	0.45	-37.00
		1293 - Recycling	Room	123	25.00	0.94	391.8	418.8	28.65	83.33	0.28	-31.93
		1295 - Lockers	Room	307	25.00	0.63	370.7	592.9	20.24	83.33	0.19	-21.62
	VAV-209		Zone	430	25.00	0.71	378.3	529.9	22.65	83.33	0.21	-24.57
		1247 - Womens Shower & Restroom	Room	347	25.00	0.26	279.0	1,093.0	10.98	83.33	0.08	-9.70
		1284 - Corridor	Room	496	25.00	0.15	260.6	1,741.5	6.89	83.33	0.04	-4.74
	VAV-210		Zone	843	25.00	0.19	266.2	1,406.4	8.53	81.67	0.06	-6.73
		1248 - Mens Restroom/Shower	Room	430	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
	VAV-211		Zone	430	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
		1234 - Mens Locker Room	Room	702	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
		1235 - Mens Restroom / Shower	Room	417	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
	VAV-221		Zone	1,119	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
		1239 - Break Room	Room	1,352	25.00	1.12	255.3	228.3	52.56	83.33	0.34	-23.36
	VAV-222/223		Zone	1,352	25.00	1.12	255.3	228.3	52.56	83.33	0.34	-23.36
		1240 - Kitchen	Room	202	25.00	1.24	348.4	281.9	42.57	83.33	0.37	-24.10
		1242 - Vending Area	Room	124	25.00	3.56	362.5	101.9	117.76	83.33	1.07	-66.66
	VAV-224		Zone	326	25.00	2.12	357.3	168.6	71.17	83.33	0.64	-40.29
		1203A - Training Room (north)	Room	700	25.00	1.59	297.9	187.2	64.10	83.33	0.48	-40.39
	VAV-225		Zone	700	25.00	1.59	297.9	187.2	64.10	83.33	0.48	-40.39
		1203B - Training Room (mid)	Room	670	25.00	1.36	300.0	221.2	54.25	83.33	0.41	-28.68
	VAV-226		Zone	670	25.00	1.36	300.0	221.2	54.25	83.33	0.41	-28.68
		1203C - Training Room (south)	Room	643	25.00	1.37	301.4	219.5	54.67	83.33	0.41	-29.09

System	Zone	Room	Type	Floor Area ft²	COOLING					HEATING		
					% OA	cfm/ft²	cfm/ton	ft²/ton	Btu/hr-ft²	% OA	cfm/ft²	Btu/hr-ft²
		1205- Bunks/Bulk Storage	Room	202	25.00	0.77	430.8	563.1	21.31	83.33	0.23	-21.48
	VAV-227		Zone	845	25.00	0.96	339.9	354.9	33.81	65.02	0.37	-23.86
		1236 - Womens Restroom/Shower/Lounge	Room	411	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
		1237 - Womens Locker Room	Room	124	25.00	0.14	259.2	1,881.0	6.38	83.31	0.04	-3.97
	VAV-228		Zone	535	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1200 - Lobby Waiting Area	Room	617	25.00	0.82	279.4	342.6	35.02	83.33	0.24	-16.39
		1238 - Corridor	Room	493	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
		1241 - Storage	Room	96	25.00	0.14	259.2	1,881.0	6.38	83.30	0.04	-3.97
	VAV-230		Zone	1,206	25.00	0.38	282.3	751.6	15.97	64.59	0.15	-8.95
		1267 - Conference Room	Room	314	25.00	1.84	322.8	175.9	68.22	83.33	0.55	-45.12
	VAV-301		Zone	314	25.00	1.84	322.8	175.9	68.22	83.33	0.55	-45.12
		1250 - Dispatch Coord Locker Alcove	Room	186	25.00	0.31	308.5	984.4	12.19	83.33	0.09	-11.21
		1265 - Uniform Storage	Room	262	25.00	0.54	364.6	669.5	17.93	83.33	0.16	-18.80
	VAV-302		Zone	448	25.00	0.45	350.5	781.3	15.36	83.33	0.13	-15.65
		1261 - Training Room	Room	866	25.00	1.05	272.0	258.6	46.40	83.33	0.32	-20.73
	VAV-303/304		Zone	866	25.00	1.05	272.0	258.6	46.40	83.33	0.32	-20.73
		1266 - Personnel Records Storage	Room	146	25.00	0.32	286.0	905.2	13.26	83.33	0.09	-9.98
		1268 - Break Room	Room	195	25.00	1.29	288.5	222.8	53.86	83.33	0.39	-28.27
	VAV-305		Zone	341	25.00	0.64	290.8	456.0	26.31	60.68	0.26	-17.42
		1262 - Men	Room	204	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1263 - Women	Room	206	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1282-1 Corridor	Room	360	25.00	0.14	259.2	1,881.1	6.38	83.33	0.04	-3.97
	VAV-306		Zone	770	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1245 ABC - Open Offices	Room	244	25.00	0.69	317.0	457.8	26.21	83.33	0.21	-15.29
		1264 - Training Storage	Room	115	25.00	0.14	259.2	1,881.0	6.38	83.31	0.04	-3.97
		1271 - Chair/Table Storage	Room	160	25.00	0.14	259.2	1,881.0	6.38	83.32	0.04	-3.97
		1282-2 Corridor	Room	257	25.00	0.17	264.6	1,534.7	7.82	83.32	0.05	-5.68
	VAV-307		Zone	776	25.00	0.31	296.8	971.7	12.35	78.64	0.10	-7.86
		1272 - Transit Service Supervisor	Room	120	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1273 - Transit Operations Supervisor	Room	109	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1274 - Transit Operations Supervisor	Room	109	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1282-4 - Corridor	Room	195	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
	VAV-308		Zone	533	25.00	0.41	309.8	751.1	15.98	77.42	0.13	-9.18
		1275 - Transit Operations Supervisor	Room	120	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1276 - Transit Operations Supervisor	Room	120	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1277 - Transit Operations Supervisor	Room	115	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1282-5 Corridor	Room	270	25.00	0.52	369.5	706.5	16.98	83.33	0.16	-13.97
	VAV-309		Zone	625	25.00	0.54	343.5	641.4	18.71	77.16	0.17	-12.77
		1278 - Transit Operations Supervisor	Room	111	25.00	1.60	370.2	231.6	51.82	83.33	0.48	-39.71
		1279 - Transit Operations Supervisor	Room	110	25.00	2.44	412.6	169.2	70.94	83.33	0.73	-59.14
		1280 - Transit Operations Supervisor	Room	109	25.00	2.46	412.7	168.1	71.41	83.33	0.74	-59.57
	VAV-310		Zone	330	25.00	2.11	408.0	193.1	62.13	81.42	0.65	-52.12
		1281 - Section Chief	Room	167	25.00	1.39	349.6	250.7	47.87	83.33	0.42	-37.17
	VAV-311		Zone	167	25.00	1.39	349.6	250.7	47.87	83.33	0.42	-37.17
		1269 - Lost and Found	Room	166	25.00	0.46	288.0	626.7	19.15	83.33	0.14	-14.94

System	Zone	Room	Type	Floor Area ft ²	COOLING				HEATING			
					% OA	cfm/ft ²	cfm/ton	ft ² /ton	Btu/hr-ft ²	% OA	cfm/ft ²	Btu/hr-ft ²
		1282-3 - Corridor	Room	354	25.00	0.17	267.9	1,566.1	7.66	83.33	0.05	-5.14
		1296 - Vehicle Condition Report Storage	Room	296	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
		1297 - Copy/Work Room	Room	236	25.00	0.62	312.5	503.8	23.82	83.33	0.19	-12.82
		1298 - Schedule/Transfer Storage	Room	251	25.00	0.14	259.2	1,881.1	6.38	83.32	0.04	-3.97
	VAV-312		Zone	1,303	25.00	0.26	291.9	1,109.9	10.81	79.62	0.08	-7.13
RTU-2			System - Variable Volume Reheat (30% Min Flow Default)	20,750	25.00	0.58	296.2	511.0	23.48	62.44	0.23	-15.46

USE

ONLY

MONTHLY ENERGY CONSUMPTION

By ACADEMIC

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1													
Electric													
On-Pk Cons. (kWh)	77,232	69,885	82,972	87,418	113,681	122,365	130,695	126,434	112,072	90,241	82,961	78,172	1,174,127
On-Pk Demand (kW)	122	123	145	159	186	196	201	199	197	159	150	125	201
Gas													
On-Pk Cons. (therms)	158	133	84	44	9	2	1	3	8	55	76	141	712
On-Pk Demand (therms/hr)	1	0	0	0	0	0	0	0	0	0	0	0	1

Energy Consumption	
Building	122,050 Btu/(ft2-year)
Source	362,034 Btu/(ft2-year)
Floor Area	33,417 ft2

Environmental Impact Analysis	
CO2	4,319,066 lbm/year
SO2	11,353 gm/year
NOX	6,030 gm/year

ONLY

System Checksums

By ACADEMIC

AC-1

Single Zone

COOLING COIL PEAK					CLG SPACE PEAK					HEATING COIL PEAK					TEMPERATURES		
Peaked at Time:		Mo/Hr: 8 / 15			Mo/Hr: Sum of		Mo/Hr: Heating Design							Cooling	Heating		
Outside Air:		OADB/WB/HR: 92 / 74 / 100			OADB: Peaks		OADB: 10							SADB	55.0	73.4	
Space Sens. + Lat.	Plenum Sens. + Lat.	Net Total	Percent Of Total	Space Sensible	Percent Of Total	Space Peak	Coil Peak	Percent	Space Sens	Tot Sens	Of Total	Return	74.9	71.3			
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h	(%)	Ret/OA	75.4	69.5			
Envelope Loads					Envelope Loads												
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00				Fn MtrTD	0.0	0.0			
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00				Fn BldTD	0.0	0.0			
Roof Cond	0	0	0	0	0	Roof Cond	0	0.00				Fn Frict	0.0	0.0			
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00									
Glass/Door Cond	95	0	95	0	84	Glass/Door Cond	-353	5.52									
Wall Cond	511	1,174	1,684	5	592	Wall Cond	-561	29.04									
Partition/Door	896		896	3	896	Partition/Door	-1,045	16.32									
Floor	0		0	0	0	Floor	-119	1.85									
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0									
Infiltration	0		0	0	0	Infiltration	0	0.00									
Sub Total ==>	1,501	1,174	2,675	8	1,572	5	-2,078	52.72									
Internal Loads					Internal Loads												
Lights	2,187	547	2,733	8	2,187	7	0	0.00									
People	0	0	0	0	0	0	0	0.00									
Misc	27,304	0	27,304	78	27,304	87	0	0.00									
Sub Total ==>	29,491	547	30,037	86	29,491	94	0	0.00									
Ceiling Load	211	-211	0	0	235	1	-159	0.00									
Ventilation Load	0	0	2,342	7	0	0	-3,061	47.81									
Adj Air Trans Heat	0		0	0	0	0	0	0									
Dehumid. Ov Sizing			0	0			0	0.00									
Ov/Undr Sizing	0		0	0	0	0	34	-0.53									
Exhaust Heat		-45	-45	0			0	0.00									
Sup. Fan Heat			0	0			0	0.00									
Ret. Fan Heat			0	0			0	0.00									
Duct Heat Pkup			0	0			0	0.00									
Underflr Sup Ht Pkup			0	0			0	0.00									
Supply Air Leakage			0	0			0	0.00									
Grand Total ==>	31,203	1,464	35,009	100.00	31,297	100.00	-2,237	-6,402	100.00								

AIRFLOWS		
	Cooling	Heating
Diffuser	1,478	1,478
Terminal	1,478	1,478
Main Fan	1,478	1,478
Sec Fan	0	0
Nom Vent	44	44
AHU Vent	44	44
Infil	0	0
MinStop/Rh	0	0
Return	1,478	1,478
Exhaust	44	44
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS		
	Cooling	Heating
% OA	3.0	3.0
cfm/ft²	2.03	2.03
cfm/ton	506.49	
ft²/ton	249.53	
Btu/hr-ft²	48.09	-8.79
No. People	0	

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	2.9	35.0	33.5	1,478	75.4	60.2	53.5	55.0	51.7	52.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2.9	35.0								

AREAS			
	Gross Total	Glass ft²	(%)
Floor	728		
Part	506		
Int Door	0		
ExFlr	19		
Roof	0	0	0
Wall	466	0	0
Ext Door	45	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Aux Htg	0.0	0	0.0	0.0
Preheat	0.0	0	0.0	0.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-6.4			

System Checksums

By ACADEMIC

AC-2

Single Zone

COOLING COIL PEAK					CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES			
Peaked at Time:		Mo/Hr: 7 / 15			Mo/Hr: Sum of		Mo/Hr: Heating Design						Cooling	Heating	
Outside Air:		OADB/WB/HR: 93 / 75 / 102			OADB: Peaks		OADB: 10						SADB	55.0	76.6
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Space Sens	Tot Sens		Return	74.3	72.0	
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h		Ret/OA	74.3	72.0	
Envelope Loads					Envelope Loads								Fn MtrTD	0.0	0.0
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00				Fn BldTD	0.0	0.0	
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00				Fn Frict	0.0	0.0	
Roof Cond	0	0	0	0	0	Roof Cond	0	0.00							
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00							
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00							
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00							
Partition/Door	814		814	20	21	Partition/Door	-950	100.00							
Floor	0		0	0	0	Floor	0	0.00							
Adjacent Floor	0		0	0	0	Adjacent Floor	0	0							
Infiltration	0		0	0	0	Infiltration	0	0.00							
Sub Total ==>	814	0	814	20	21	Sub Total ==>	-950	100.00							
Internal Loads					Internal Loads								AIRFLOWS		
Lights	243	61	304	7	6	Lights	0	0.00				Diffuser	187	187	
People	255	0	255	6	4	People	0	0.00				Terminal	187	187	
Misc	2,765	0	2,765	67	70	Misc	0	0.00				Main Fan	187	187	
Sub Total ==>	3,263	61	3,324	80	79	Sub Total ==>	0	0.00				Sec Fan	0	0	
Ceiling Load	7	-7	0	0	0	Ceiling Load	0	0.00				Nom Vent	0	0	
Ventilation Load	0	0	0	0	0	Ventilation Load	0	0.00				AHU Vent	0	0	
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0				Infil	0	0	
Dehumid. Ov Sizing			0	0	0	Ov/Undr Sizing	0	0.00				MinStop/Rh	0	0	
Ov/Undr Sizing	0		0	0	0	Exhaust Heat	0	0.00				Return	187	187	
Exhaust Heat		0	0	0	0	OA Preheat Diff.	0	0.00				Exhaust	0	0	
Sup. Fan Heat			0	0	0	RA Preheat Diff.	0	0.00				Rm Exh	0	0	
Ret. Fan Heat			0	0	0	Additional Reheat	0	0.00				Auxiliary	0	0	
Duct Heat Pkup			0	0	0	Underflr Sup Ht Pkup	0	0.00				Leakage Dwn	0	0	
Underflr Sup Ht Pkup			0	0	0	Supply Air Leakage	0	0.00				Leakage Ups	0	0	
Supply Air Leakage			0	0	0	Grand Total ==>	-950	100.00				ENGINEERING CKS			
Grand Total ==>	4,083	54	4,138	100.00	3,970	100.00	Grand Total ==>	100.00				% OA	0.0	0.0	

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity	Sens Cap.	Coil Airflow	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass		Capacity	Coil Airflow	Ent	Lvg	
	ton	MBh	MBh	cfm	°F	°F	gr/lb	°F	°F	gr/lb		ft² (%)	MBh	cfm	°F	°F	
Main Clg	0.3	4.1	4.0	187	74.3	59.4	51.9	55.0	51.4	50.9	Floor	81	-1.0	187	72.0	76.6	
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	460	0.0	0	0.0	0.0	
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	0.0	0	0.0	0.0	
											ExFlr	0	0.0	0	0.0	0.0	
Total	0.3	4.1									Roof	0	0.0	0	0.0	0.0	
											Wall	0	0.0	0	0.0	0.0	
											Ext Door	0	0.0	0	0.0	0.0	
											Total	-1.0					

System Checksums

By ACADEMIC

AC-3

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES			
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling			Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: Peaks		OADB: 10			SADB	55.0	72.2	Ra Plenum	75.4	71.1
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Return	75.4	71.1	Ret/OA	75.4	71.1
Btu/h	Btu/h	Btu/h		Btu/h		Space Sens	Tot Sens		Fn MtrTD	0.0	0.0	Fn BldTD	0.0	0.0
						Btu/h	Btu/h		Fn Frict	0.0	0.0			
Envelope Loads				Envelope Loads							AIRFLOWS			
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Diffuser	182	182	Terminal	182	182
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Main Fan	182	182	Sec Fan	0	0
Roof Cond	0	297	297	7	0	Roof Cond	0	100.00	Nom Vent	0	0	AHU Vent	0	0
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Infil	0	0	MinStop/Rh	0	0
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Return	182	182	Exhaust	0	0
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	Rm Exh	0	0	Auxiliary	0	0
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Leakage Dwn	0	0	Leakage Ups	0	0
Floor	0	0	0	0	0	Floor	0	0.00	ENGINEERING CKS					
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	% OA	0.0	0.0	cfm/ft²	1.70	1.70
Infiltration	0	0	0	0	0	Infiltration	0	0.00	cfm/ton	527.38		ft²/ton	310.77	
Sub Total ==>	0	297	297	7	0	Sub Total ==>	0	100.00	Btu/hr-ft²	38.61	-2.03	No. People	0	
Internal Loads				Internal Loads										
Lights	146	37	183	4	146	Lights	0	0.00						
People	0	0	0	0	0	People	0	0.00						
Misc	3,652	0	3,652	88	3,652	Misc	0	0.00						
Sub Total ==>	3,798	37	3,835	93	3,798	Sub Total ==>	0	0.00						
Ceiling Load				Ceiling Load										
Ventilation Load	48	-48	0	0	48	Ventilation Load	-31	0.00						
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0.00						
Dehumid. Ov Sizing	0	0	0	0	0	Dehumid. Ov Sizing	0	0.00						
Ov/Undr Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00						
Exhaust Heat	0	0	0	0	0	Exhaust Heat	0	0.00						
Sup. Fan Heat	0	0	0	0	0	Sup. Fan Heat	0	0.00						
Ret. Fan Heat	0	0	0	0	0	Ret. Fan Heat	0	0.00						
Duct Heat Pkup	0	0	0	0	0	Duct Heat Pkup	0	0.00						
Underflr Sup Ht Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00						
Supply Air Leakage	0	0	0	0	0	Supply Air Leakage	0	0.00						
Grand Total ==>	3,846	286	4,132	100.00	3,846	Grand Total ==>	-31	100.00						

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft² (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F	
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb							
Main Clg	0.3	4.1	4.1	182	75.4	57.2	41.0	55.0	48.6	40.7	Floor	107					
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0					
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0					
											ExFlr	0					
Total	0.3	4.1									Roof	107	0	0			
											Wall	0	0	0			
											Ext Door	0	0	0			

System Checksums

By ACADEMIC

AC-4

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES					
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling			Heating				
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: Peaks		OADB: 10			SADB	55.0	72.2	Ra Plenum	75.4	71.1		
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Return	75.4	71.1	Ret/OA	75.4	71.1		
Btu/h	Btu/h	Btu/h		Btu/h		Space Sens	Tot Sens		Fn MtrTD	0.0	0.0	Fn BldTD	0.0	0.0		
						Btu/h	Btu/h		Fn Frict	0.0	0.0					
Envelope Loads				Envelope Loads							AIRFLOWS					
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Diffuser	170	170	Terminal	170	170		
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Main Fan	170	170	Sec Fan	0	0		
Roof Cond	0	278	278	7	0	Roof Cond	0	100.00	Nom Vent	0	0	AHU Vent	0	0		
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Infil	0	0	MinStop/Rh	0	0		
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Return	170	170	Exhaust	0	0		
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	Rm Exh	0	0	Auxiliary	0	0		
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Leakage Dwn	0	0	Leakage Ups	0	0		
Floor	0	0	0	0	0	Floor	0	0.00	ENGINEERING CKS							
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	% OA	0.0	0.0	cfm/ft²	1.70	1.70		
Infiltration	0	0	0	0	0	Infiltration	0	0.00	cfm/ton	527.38		ft²/ton	310.77			
Sub Total ==>	0	278	278	7	0	Sub Total ==>	0	100.00	Btu/hr-ft²	38.61	-2.03	No. People	0			
Internal Loads				Internal Loads												
Lights	137	34	171	4	137	Lights	0	0.00								
People	0	0	0	0	0	People	0	0.00								
Misc	3,413	0	3,413	88	3,413	Misc	0	0.00								
Sub Total ==>	3,550	34	3,584	93	3,550	Sub Total ==>	0	0.00								
Ceiling Load				Ceiling Load												
Ventilation Load	45	-45	0	0	45	Ventilation Load	-29	0.00								
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0.00								
Dehumid. Ov Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00								
Ov/Undr Sizing	0	0	0	0	0	Exhaust Heat	0	0.00								
Exhaust Heat	0	0	0	0	0	OA Preheat Diff.	0	0.00								
Sup. Fan Heat	0	0	0	0	0	RA Preheat Diff.	0	0.00								
Ret. Fan Heat	0	0	0	0	0	Additional Reheat	0	0.00								
Duct Heat Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00								
Underflr Sup Ht Pkup	0	0	0	0	0	Supply Air Leakage	0	0.00								
Supply Air Leakage	0	0	0	0	0	Grand Total ==>	-29	-203	100.00							
Grand Total ==>	3,594	267	3,861	100.00	3,594	Grand Total ==>	-29	-203	100.00							

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	0.3	3.9	3.9	170	75.4	57.2	41.0	55.0	48.6	40.7
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.3	3.9								

AREAS			
	Gross Total	Glass	
		ft²	(%)
Floor	100		
Part	0		
Int Door	0		
ExFlr	0		
Roof	100	0	0
Wall	0	0	0
Ext Door	0	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Aux Htg	0.0	0	0.0	0.0
Preheat	0.0	0	0.0	0.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-0.2			

System Checksums

By ACADEMIC

AC-5

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES			
Peaked at Time:		Mo/Hr: 7 / 16		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling			Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 100		OADB: Peaks		OADB: 10			SADB	55.0	72.2	Ra Plenum	75.4	71.1
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total	Space Sensible	Percent Of Total	Space Peak	Coil Peak	Percent	Return	Ret/OA	Fn MtrTD	Fn BldTD	Fn Frict	
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Space Sens	Tot Sens	Of Total	Btu/h	Btu/h	Btu/h	Btu/h	Btu/h	
Envelope Loads				Envelope Loads				Envelope Loads						
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00						
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00						
Roof Cond	0	272	7	0	0	Roof Cond	0	100.00						
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00						
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00						
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00						
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00						
Floor	0	0	0	0	0	Floor	0	0.00						
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0						
Infiltration	0	0	0	0	0	Infiltration	0	0.00						
Sub Total ==>	0	272	272	7	0	Sub Total ==>	0	100.00						
Internal Loads				Internal Loads				Internal Loads						
Lights	134	33	167	4	4	Lights	0	0.00						
People	0	0	0	0	0	People	0	0.00						
Misc	3,345	0	3,345	88	95	Misc	0	0.00						
Sub Total ==>	3,479	33	3,512	93	99	Sub Total ==>	0	0.00						
Ceiling Load	44	-44	0	0	44	1	Ceiling Load	-29	0	0.00				
Ventilation Load	0	0	0	0	0	0	Ventilation Load	0	0	0.00				
Adj Air Trans Heat	0	0	0	0	0	0	Adj Air Trans Heat	0	0	0				
Dehumid. Ov Sizing	0	0	0	0	0	0	Ov/Undr Sizing	0	0	0.00				
Ov/Undr Sizing	0	0	0	0	0	0	Exhaust Heat	0	0	0.00				
Exhaust Heat	0	0	0	0	0	0	OA Preheat Diff.	0	0	0.00				
Sup. Fan Heat	0	0	0	0	0	0	RA Preheat Diff.	0	0	0.00				
Ret. Fan Heat	0	0	0	0	0	0	Additional Reheat	0	0	0.00				
Duct Heat Pkup	0	0	0	0	0	0	Underflr Sup Ht Pkup	0	0	0.00				
Underflr Sup Ht Pkup	0	0	0	0	0	0	Supply Air Leakage	0	0	0.00				
Supply Air Leakage	0	0	0	0	0	0	Grand Total ==>	-29	-199	100.00				
Grand Total ==>	3,522	262	3,784	100.00	3,522	100.00								

AIRFLOWS		
	Cooling	Heating
Diffuser	166	166
Terminal	166	166
Main Fan	166	166
Sec Fan	0	0
Nom Vent	0	0
AHU Vent	0	0
Infil	0	0
MinStop/Rh	0	0
Return	166	166
Exhaust	0	0
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS		
	Cooling	Heating
% OA	0.0	0.0
cfm/ft²	1.70	1.70
cfm/ton	527.38	
ft²/ton	310.77	
Btu/hr-ft²	38.61	-2.03
No. People	0	

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	0.3	3.8	3.8	166	75.4	57.2	41.0	55.0	48.6	40.7
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.3	3.8								

AREAS			
	Gross Total	Glass ft²	(%)
Floor	98		
Part	0		
Int Door	0		
ExFlr	0		
Roof	98	0	0
Wall	0	0	0
Ext Door	0	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-0.2	166	71.1	72.2
Aux Htg	0.0	0	0.0	0.0
Preheat	0.0	0	0.0	0.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-0.2			

System Checksums

By ACADEMIC

AC-6

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: Sum of		Mo/Hr: Heating Design			Cooling		Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: Peaks		OADB: 10			SADB	55.0	72.0		
Space Sens. + Lat.	Plenum Sens. + Lat.	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Return	Ra Plenum	74.6	71.6	
Btu/h	Btu/h	Btu/h		Btu/h		Space Sens	Tot Sens		Ret/OA	Fn MtrTD	0.0	0.0	
						Btu/h	Btu/h		Fn BldTD	Fn Frict	0.0	0.0	
Envelope Loads				Envelope Loads							AIRFLOWS		
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Diffuser	Cooling	655	Heating	655
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Terminal	655	655		
Roof Cond	0	401	3	0	0	Roof Cond	0	32.59	Main Fan	655	655		
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Sec Fan	0	0		
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Nom Vent	9	9		
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	AHU Vent	9	9		
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Infil	0	0		
Floor	0	0	0	0	0	Floor	0	0.00	MinStop/Rh	0	0		
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	Return	655	655		
Infiltration	0	0	0	0	0	Infiltration	0	0.00	Exhaust	9	9		
Sub Total ==>	0	401	3	0	0	Sub Total ==>	0	-301	Rm Exh	0	0		
Internal Loads				Internal Loads							ENGINEERING CKS		
Lights	201	50	251	2	1	Lights	0	0.00	% OA	Cooling	1.4	Heating	1.4
People	0	0	0	0	0	People	0	0.00	cfm/ft²	4.46	4.46		
Misc	13,652	0	13,652	92	98	Misc	0	0.00	cfm/ton	530.68			
Sub Total ==>	13,853	50	13,903	94	100	Sub Total ==>	0	0.00	ft²/ton	119.03			
Ceiling Load	27	-27	0	0	28	Ceiling Load	-18	0.00	Btu/hr-ft²	100.82	-6.28		
Ventilation Load	0	0	521	4	0	Ventilation Load	0	67.83	No. People	0			
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0					
Dehumid. Ov Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00					
Ov/Undr Sizing	1	1	0	1	0	Exhaust Heat	4	-0.42					
Exhaust Heat	0	-6	-6	0	0	OA Preheat Diff.	0	0.00					
Sup. Fan Heat	0	0	0	0	0	RA Preheat Diff.	0	0.00					
Ret. Fan Heat	0	0	0	0	0	Additional Reheat	0	0.00					
Duct Heat Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00					
Underflr Sup Ht Pkup	0	0	0	0	0	Supply Air Leakage	0	0.00					
Supply Air Leakage	0	0	0	0	0	Grand Total ==>	-18	-923	100.00				
Grand Total ==>	13,881	419	14,820	100.00	13,881	100.00	Grand Total ==>	-18	-923	100.00			

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
Total Capacity		Sens Cap.	Coil Airflow	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass	Capacity		Coil Airflow	Ent	Lvg	
ton	MBh	MBh	cfm	°F	°F	gr/lb	°F	°F	gr/lb		ft² (%)	MBh	cfm	°F	°F		
Main Clg	1.2	14.8	14.5	655	74.8	59.4	51.0	55.0	51.2	50.2	Floor	147	Main Htg	-0.9	655	70.8	72.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0	Aux Htg	0.0	0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	Preheat	0.0	0	0.0	0.0
											ExFlr	0	Humidif	0.0	0	0.0	0.0
Total	1.2	14.8									Roof	147	0	0	0	0	0
											Wall	0	0	0	0	0	0
											Ext Door	0	0	0	0	0	0
													Total	-0.9			

System Checksums

By ACADEMIC

EF-31

Single Zone

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK				TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: Sum of		Mo/Hr: Heating Design		Mo/Hr: Heating Design		Mo/Hr: Heating Design		Cooling	Heating	
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: Peaks		OADB: 10		OADB: 10		OADB: 10		SADB	55.0	72.0
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Space Sens	Tot Sens	Percent Of Total	Return	74.7	71.5
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h	(%)	Ret/OA	75.1	70.4
Envelope Loads				Envelope Loads				Envelope Loads				Fn MtrTD	0.0	0.0
Skylite Solar	0	0	0	0	0	Skylite Solar	0	0.00	Skylite Solar	0	0.00	Fn BldTD	0.0	0.0
Skylite Cond	0	0	0	0	0	Skylite Cond	0	0.00	Skylite Cond	0	0.00	Fn Frict	0.0	0.0
Roof Cond	0	253	3	0	0	Roof Cond	0	31.45	Roof Cond	0	-190			
Glass Solar	0	0	0	0	0	Glass Solar	0	0.00	Glass Solar	0	0.00			
Glass/Door Cond	0	0	0	0	0	Glass/Door Cond	0	0.00	Glass/Door Cond	0	0.00			
Wall Cond	0	0	0	0	0	Wall Cond	0	0.00	Wall Cond	0	0.00			
Partition/Door	0	0	0	0	0	Partition/Door	0	0.00	Partition/Door	0	0.00			
Floor	0	0	0	0	0	Floor	0	0.00	Floor	0	0.00			
Adjacent Floor	0	0	0	0	0	Adjacent Floor	0	0	Adjacent Floor	0	0			
Infiltration	0	0	0	0	0	Infiltration	0	0.00	Infiltration	0	0.00			
Sub Total ==>	0	253	3	0	0	Sub Total ==>	0	31.45	Sub Total ==>	-190	31.45			
Internal Loads				Internal Loads				Internal Loads				AIRFLOWS		
Lights	127	32	159	2	127	Lights	0	0.00	Lights	0	0.00	Cooling	Heating	
People	0	0	0	0	0	People	0	0.00	People	0	0.00	Diffuser	329	329
Misc	6,826	0	6,826	90	6,826	Misc	0	0.00	Misc	0	0.00	Terminal	329	329
Sub Total ==>	6,953	32	6,985	92	6,953	Sub Total ==>	0	0.00	Sub Total ==>	0	0.00	Main Fan	329	329
Ceiling Load	21	-21	0	0	22	Ceiling Load	-14	0.00	Ceiling Load	-14	0.00	Sec Fan	0	0
Ventilation Load	0	0	344	5	0	Ventilation Load	0	69.08	Ventilation Load	0	-417	Nom Vent	6	6
Adj Air Trans Heat	0	0	0	0	0	Adj Air Trans Heat	0	0	Adj Air Trans Heat	0	0	AHU Vent	6	6
Dehumid. Ov Sizing	0	0	0	0	0	Ov/Undr Sizing	0	0.00	Ov/Undr Sizing	0	0.00	Infil	0	0
Ov/Undr Sizing	0	0	0	0	0	Exhaust Heat	3	-0.53	Exhaust Heat	3	-0.53	MinStop/Rh	0	0
Exhaust Heat	0	-5	-5	0	0	OA Preheat Diff.	0	0.00	OA Preheat Diff.	0	0.00	Return	329	329
Sup. Fan Heat	0	0	0	0	0	RA Preheat Diff.	0	0.00	RA Preheat Diff.	0	0.00	Exhaust	6	6
Ret. Fan Heat	0	0	0	0	0	Additional Reheat	0	0.00	Additional Reheat	0	0.00	Rm Exh	0	0
Duct Heat Pkup	0	0	0	0	0	Underflr Sup Ht Pkup	0	0.00	Underflr Sup Ht Pkup	0	0.00	Auxiliary	0	0
Underflr Sup Ht Pkup	0	0	0	0	0	Supply Air Leakage	0	0.00	Supply Air Leakage	0	0.00	Leakage Dwn	0	0
Supply Air Leakage	0	0	0	0	0	Grand Total ==>	-14	0.00	Grand Total ==>	-604	100.00	Leakage Ups	0	0
Grand Total ==>	6,974	259	7,577	100.00	6,975	Grand Total ==>	-14	0.00	Grand Total ==>	-604	100.00	ENGINEERING CKS		

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass ft² (%)	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F	
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb							
Main Clg	0.6	7.6	7.4	329	75.1	59.7	52.1	55.0	51.5	51.0	Floor	93	-0.6	329	70.4	72.0	
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	0	0.0	0	0.0	0.0	
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	0.0	0	0.0	0.0	
											ExFlr	0	0.0	0	0.0	0.0	
Total	0.6	7.6									Roof	93	0.0	0	0.0	0.0	
											Wall	0	0.0	0	0.0	0.0	
											Ext Door	0	0.0	0	0.0	0.0	
											Total	-0.6					

System Checksums

By ACADEMIC

RTU-1

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK			TEMPERATURES				
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: 9 / 12		Mo/Hr: Heating Design			Cooling		Heating	SADB	58.2	88.9	
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: 85		OADB: 10			Ra Plenum		69.0	76.3	69.0		
Envelope Loads	Space Sens. + Lat.	Plenum Sens. + Lat.	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Envelope Loads	Space Peak	Coil Peak	Percent Of Total	Ret/OA <td colspan="2">76.3</td> <td colspan="1">69.0</td>	76.3		69.0	
	Btu/h	Btu/h	Btu/h		Btu/h			Space Sens	Tot Sens		Fn MtrTD <td colspan="2">0.3</td> <td colspan="1">0.0</td>	0.3		0.0	
								Btu/h	Btu/h		Fn BldTD <td colspan="2">0.7</td> <td colspan="1">0.0</td>	0.7		0.0	
Skylite Solar	0	0	0	0	0	0	Skylite Solar	0	0	0.00	Fn Frict	2.2		0.0	
Skylite Cond	0	0	0	0	0	0	Skylite Cond	0	0	0.00					
Roof Cond	0	19,696	19,696	6	0	0	Roof Cond	0	-14,470	6.02					
Glass Solar	12,705	0	12,705	4	31,795	20	Glass Solar	0	0	0.00					
Glass/Door Cond	5,246	0	5,246	2	2,369	1	Glass/Door Cond	-18,074	-18,074	7.52					
Wall Cond	3,729	4,879	8,607	3	3,445	2	Wall Cond	-5,460	-12,600	5.24					
Partition/Door	24,061	0	24,061	7	24,061	15	Partition/Door	-28,071	-28,071	11.68					
Floor	0	0	0	0	0	0	Floor	0	0	0.00					
Adjacent Floor	0	0	0	0	0	0	Adjacent Floor	0	0	0					
Infiltration	0	0	0	0	0	0	Infiltration	0	0	0.00					
Sub Total ==>	45,740	24,574	70,315	21	61,669	38	Sub Total ==>	-51,605	-73,215	30.46					
Internal Loads				Internal Loads							AIRFLOWS				
Lights	31,284	7,821	39,105	12	31,284	19	Lights	0	0	0.00	Cooling		Heating	9,134	3,298
People	32,374	0	32,374	10	18,281	11	People	0	0	0.00	Terminal		9,134	3,298	
Misc	44,603	0	44,603	14	44,603	28	Misc	0	0	0.00	Main Fan		9,134	3,298	
Sub Total ==>	108,261	7,821	116,082	35	94,168	58	Sub Total ==>	0	0	0.00	Sec Fan		0	0	
Ceiling Load	8,228	-8,228	0	0	4,947	3	Ceiling Load	-10,669	0	0.00	Nom Vent		2,284	2,284	
Ventilation Load	0	0	118,253	36	0	0	Ventilation Load	0	-158,842	66.09	AHU Vent		2,284	2,284	
Adj Air Trans Heat	0	0	0	0	0	0	Adj Air Trans Heat	0	0	0	Infil		0	0	
Dehumid. Ov Sizing	0	0	0	0	0	0	Ov/Undr Sizing	0	0	0.00	MinStop/Rh		3,298	3,298	
Ov/Undr Sizing	157	157	0	0	200	0	Exhaust Heat	0	7,577	-3.15	Return		9,134	3,298	
Exhaust Heat	-5,843	-5,843	-2	-2	0	0	OA Preheat Diff.	0	0	0.00	Exhaust		2,284	2,284	
Sup. Fan Heat	0	29,917	9	9	0	0	RA Preheat Diff.	-15,852	6.60	6.60	Rm Exh		0	0	
Ret. Fan Heat	0	0	0	0	0	0	Additional Reheat	0	0	0.00	Auxiliary		0	0	
Duct Heat Pkup	0	0	0	0	0	0	Underflr Sup Ht Pkup	0	0	0.00	Leakage Dwn		0	0	
Underflr Sup Ht Pkup	0	0	0	0	0	0	Supply Air Leakage	0	0	0.00	Leakage Ups		0	0	
Supply Air Leakage	0	0	0	0	0	0	Grand Total ==>	-62,274	-240,333	100.00	ENGINEERING CKS				
Grand Total ==>	162,387	18,324	328,881	100.00	160,984	100.00	Grand Total ==>	-62,274	-240,333	100.00	% OA		25.0	69.2	
											cfm/ft²		0.81	0.29	
											cfm/ton		333.28		
											ft²/ton		412.78		
											Btu/hr-ft²		29.07	-21.24	
											No. People		145		

COOLING COIL SELECTION										AREAS			HEATING COIL SELECTION				
	Total Capacity	Sens Cap.	Coil Airflow	Enter DB/WB/HR			Leave DB/WB/HR			Gross Total	Glass		Capacity	Coil Airflow	Ent	Lvg	
	ton	MBh	MBh	cfm	°F	°F	gr/lb	°F	°F	gr/lb	ft²	(%)	MBh	cfm	°F	°F	
Main Clg	27.4	328.9	245.4	8,414	80.9	65.8	70.8	55.0	52.9	56.3	Floor	11,313	Main Htg	-124.8	3,298	55.0	88.9
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Part	13,595	Aux Htg	0.0	0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	Int Door	0	Preheat	-115.6	2,284	9.6	55.0
											ExFlr	0	Humidif	0.0	0	0.0	0.0
Total	27.4	328.9									Roof	7,379	0	0	0	0.0	0.0
											Wall	3,737	805	22	0	0.0	0.0
											Ext Door	24	0	0	-240.3		

System Checksums

By ACADEMIC

RTU-2

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK				CLG SPACE PEAK				HEATING COIL PEAK				TEMPERATURES			
Peaked at Time:		Mo/Hr: 7 / 15		Mo/Hr: 7 / 18		Mo/Hr: Heating Design						Cooling	Heating		
Outside Air:		OADB/WB/HR: 93 / 75 / 102		OADB: 89		OADB: 10						SADB	58.2	86.4	
Space Sens. + Lat.	Plenum Sens. + Lat	Net Total	Percent Of Total (%)	Space Sensible	Percent Of Total (%)	Space Peak	Coil Peak	Percent Of Total	Space Sens	Tot Sens	Percent Of Total	Ra Plenum	77.3	67.5	
Btu/h	Btu/h	Btu/h	(%)	Btu/h	(%)	Btu/h	Btu/h	(%)	Btu/h	Btu/h	(%)	Return	77.3	67.5	
Envelope Loads				Envelope Loads				Envelope Loads				Ret/OA	81.3	31.3	
Skylite Solar	0	0	0	0	0	0	0	0.00	Skylite Solar	0	0	0.00	Fn MtrTD	0.3	0.0
Skylite Cond	0	0	0	0	0	0	0	0.00	Skylite Cond	0	0	0.00	Fn BldTD	0.7	0.0
Roof Cond	0	54,765	11	0	0	0	-39,618	12.35	Roof Cond	0	0	0.00	Fn Frict	2.2	0.0
Glass Solar	18,691	0	4	21,293	10	0	0	0.00	Glass Solar	0	0	0.00	AIRFLOWS		
Glass/Door Cond	9,967	0	2	8,590	4	-34,222	-34,222	10.67	Glass/Door Cond	-34,222	-34,222	10.67	Diffuser	12,027	4,815
Wall Cond	7,296	7,840	3	9,635	5	-13,236	-27,868	8.69	Wall Cond	-13,236	-27,868	8.69	Terminal	12,027	4,815
Partition/Door	0	0	0	0	0	0	0	0.00	Partition/Door	0	0	0.00	Main Fan	12,027	4,815
Floor	0	0	0	0	0	0	0	0.00	Floor	0	0	0.00	Sec Fan	0	0
Adjacent Floor	0	0	0	0	0	0	0	0	Adjacent Floor	0	0	0	Nom Vent	3,007	3,007
Infiltration	0	0	0	0	0	0	0	0.00	Infiltration	0	0	0.00	AHU Vent	3,007	3,007
Sub Total ==>	35,954	62,605	20	39,518	19	-47,458	-101,708	31.71	Sub Total ==>	-47,458	-101,708	31.71	Infil	0	0
Internal Loads				Internal Loads				Internal Loads				MinStop/Rh	4,815	4,815	
Lights	52,903	13,226	14	52,903	25	0	0	0.00	Lights	0	0	0.00	Return	12,027	4,815
People	100,483	0	21	54,116	26	0	0	0.00	People	0	0	0.00	Exhaust	3,007	3,007
Misc	44,978	0	9	44,978	21	0	0	0.00	Misc	0	0	0.00	Rm Exh	0	0
Sub Total ==>	198,364	13,226	43	151,996	72	0	0	0.00	Sub Total ==>	0	0	0.00	Auxiliary	0	0
Ceiling Load	21,446	-21,446	0	20,459	10	-29,867	0	0.00	Ceiling Load	-29,867	0	0.00	Leakage Dwn	0	0
Ventilation Load	0	0	30	0	0	0	-209,153	65.21	Ventilation Load	0	-209,153	65.21	Leakage Ups	0	0
Adj Air Trans Heat	0	0	0	0	0	0	0	0	Adj Air Trans Heat	0	0	0	ENGINEERING CKS		
Dehumid. Ov Sizing	0	0	0	0	0	0	0	0.00	Ov/Undr Sizing	0	0	0.00	% OA	25.0	62.4
Ov/Undr Sizing	0	0	0	0	0	0	15,226	-4.75	Exhaust Heat	0	15,226	-4.75	cfm/ft²	0.58	0.23
Exhaust Heat	0	-10,933	-2	0	0	0	-1	0.00	OA Preheat Diff.	0	-1	0.00	cfm/ton	296.18	
Sup. Fan Heat	0	42,244	9	0	0	0	-25,113	7.83	RA Preheat Diff.	0	-25,113	7.83	ft²/ton	510.98	
Ret. Fan Heat	0	0	0	0	0	0	0	0.00	Additional Reheat	0	0	0.00	Btu/hr-ft²	23.48	-15.46
Duct Heat Pkup	0	0	0	0	0	0	0	0.00	Underflr Sup Ht Pkup	0	0	0.00	No. People	418	
Underflr Sup Ht Pkup	0	0	0	0	0	0	0	0.00	Supply Air Leakage	0	0	0.00			
Supply Air Leakage	0	0	0	0	0	0	0	0.00	Grand Total ==>	-77,324	-320,748	100.00			
Grand Total ==>	255,763	43,452	487,299	100.00	211,974	100.00	-77,324	-320,748	100.00						

COOLING COIL SELECTION										
	Total Capacity		Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
	ton	MBh			°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	40.6	487.3	359.4	11,881	81.3	66.4	73.5	55.0	53.0	57.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	40.6	487.3								

AREAS			
	Gross Total	Glass ft²	(%)
Floor	20,750		
Part	0		
Int Door	0		
ExFlr	0		
Roof	20,750	0	0
Wall	8,096	1,516	19
Ext Door	68	0	0

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-168.6	4,815	55.0	86.4
Aux Htg	0.0	0	0.0	0.0
Preheat	-152.2	3,007	9.6	55.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-320.8			