TECHNICAL REPORT II

Building and Plant Energy Analysis

TEMPLE UNIVERSITY –TYLER SCHOOL OF ART

Doug Boswell
Pennsylvania State University
Architectural Engineering
Mechanical Option

Faculty Adviser:
Dr. Jim Freihaut

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Executive Summary

The new 234,000 Temple University Tyler School of Art is a 3-story art education building located in Philadelphia, PA. The Tyler School of Art is moving from its current location of Elkins Park, PA to create a complete Arts campus at the Temple main campus. The three floors and basement consist 234,000 square feet of administration, art education, and auditorium space.

The building was evaluated for its compliance with LEED-NC Version 2.2. The LEED summary reflects the building's inadequacy in terms of green design and planning. Many of the credits were not considered in the design of the building, however, with additional cost the project could theoretically be LEED certified. The school benefits from the location in a dense urban area, but the building falls short on energy optimization.

The building was also evaluated for ASHRAE Standard 90.1-2004 compliance. The relevant sections of ASHRAE Standard 90.1-2004 are building envelope, HVAC systems, service water heating, power, and lighting. The compliance is summarized below.

ASHRAE Standard 90.1-2004 Compliance

	Building Envelope			HVAC Systems	Service Water Heating	Lighting	Power
	Roof	Walls	Fenestration				
Complies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

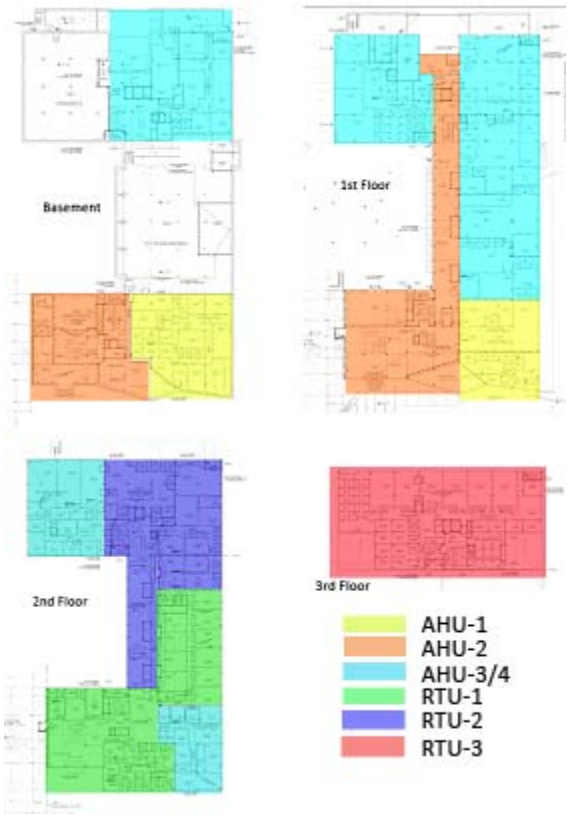
The building is designed well to limit lost rentable space for mechanical and electrical rooms. Only 6.0% of the building's useable floor area is taken up by lost "rentable" space. The majority of the lost space is consumed by the main mechanical and electrical rooms. The rest of the lost space consists of mechanical shafts and 10 electrical rooms shattered throughout the 3 stories.

Trane Trace performed all the design load calculations on the Tyler School of Art. Trace was also used to model the energy consumption and then the building operation cost. The total annual utility cost for the Tyler School of Art is $182,190 and the building consumes 1,642,774 kWh/year.

Building Systems Summary

The disciplines in the Tyler School of Art are divided over the three stories and basement. The basement floor is separated into two sections connected by a large mechanical space. The south section is connected to the main lobby by a two-story basement lobby and houses the auditorium and photo studios. The lower level shops are located on the north end of the basement. The 1st floor is broken into the zones representing the ceramics, sculpture, and glass departments as well as the school's exhibition space and a 1st floor core which features the main lobby and two-floor promenade which stretches between the two branches of the building. The 2nd floor is broken down into administration and the departments of metals, printmaking, foundations, gaid, and fibers. The painting studios are located on the top floor at north end of the building.

The building receives its heating and cooling from central boiler/chiller plants. The supply air system consists of four (4) air handling units (AHU) and one (1) makeup air unit located in the basement mechanical room. In addition, there are three (3) roof top units (RTU). AHU-1, AHU-2, RTU-1, and RTU-2 are all variable air volume (VAV) reheat systems. RTU-3, AHU-3, and AHU-4 are all constant air volume (CAV) reheat systems that run at 100% OA, because these AHUs serve most of the studio spaces. The MAU is a 5,000 cfm unit that only serves the furnace room located on the 1st floor. The air handling units range from 35,000 to 62,000 cfm. Additionally, there are (4) Heating and Ventilating (HV) units housed in the basement to handle the heating load. The graphic and table below illustrate the location of the AHU/RTU zones and the type of space being served.



	LOCATION	AREAS SERVED
AHU-1	BASEMENT	PHOTO, EXHIBIT
AHU-2	BASEMENT	LOWER LEVEL/1ST FLOOR CORE
AHU-3	BASEMENT	CERAMICS, SCULPTURE, GLASS
AHU-4	BASEMENT	PRINTMAKING, METALS, LL SHOPS
RTU-1	ROOF	2ND FLOOR ADMIN/CORE, FOUNDATIONS
RTU-2	ROOF	GAID, FIBERS, 2ND FLOOR CORE
RTU-3	ROOF	PAINTING

LEED Compliance

The *Leadership in Energy and Environmental Design* (LEED) rating system works as a standard for sustainable, green construction. The system presently evaluates buildings on six categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and LEED innovation. These points then correspond to levels of certification in which Platinum is the highest rating of a green building. The Tyler School of Art is evaluated by the LEED parameters as follows:

Sustainable Sites

As a college campus in an urban setting, Temple University has the ability to take advantage of many of the transportation alternatives and adjacencies. The Tyler School will be placed on a parking lot which satisfies site selection and development.

Water Efficiency

The Tyler School has no system in place to consider the landscaping and water use. The addition of efficient fixtures could be enough to attain the required water use reduction.

Energy and Atmosphere

The Tyler School received very few energy credits because it does nothing to reduce the energy load of the building. Temple did not want to invest in any energy recovery technology. Huge energy savings would be possible with additional spending because of the large amounts of ventilation.

Materials and Resources

Temple University did not focus on the sustainable materials when designing this building. In a built up area like the Mid-Atlantic it would be very possible for Temple to gain points by altering a few materials.

Indoor Environmental Quality

The Tyler School uses low VOC materials. With planning and monitoring, many of the missed credits could be attainable.

LEED Innovation Credits

The only credit that the Tyler School would attain would be the LEED AP.

Summary

The Tyler School only received 14 credits, however with additional spending and planning, the building could theoretically reach certification. The Tyler School is 12 credits away from mere certification, and with additional cost this certification is attainable but it does not make financial sense for the building. Refer to Appendix A for LEED-NC Version 2.2 checklist.

ASHRAE STD 90.1-2004 Compliance

ASHRAE Standard 90.1 is the energy standard for evaluating buildings by providing minimum conditions for energy efficient building design. Under this standard, the building envelope, HVAC systems, service water heating, power, lighting, and electric motor efficiency are all evaluated for compliance.

Building Envelope

ASHRAE Standard 90.1 Section 5 specifies the requirements for the building envelope. There are two methods to determine the building envelope compliance. The two methods are the Prescriptive Building Envelope Method and the Building Envelope Tradeoff option. To use the first option the vertical fenestration must not exceed 50% of the wall area and the skylight fenestration must not exceed 5% of the roof area. The total vertical fenestration is less than 30% of the wall area as specified by the design summary. The skylight fenestration area is less than 2% of the total roof area as shown in the table below. Therefore, the Prescriptive Building Envelope Method can be used.

Total Glass Area	Total Roof Area	% Glass
1320	80468	1.64

The Temple University Tyler School of Art is located in Philadelphia, PA which is classified as climate zone 4A from Table B-1 in Appendix B of Standard 90.1. The building is also categorized as now residential. For this classification, Table 5.5-4 is used to determine the minimum R-Values required.

Building Envelope Compliance

	Roof (Insulation Entirely Above Deck) Minimum R-Value		Walls (Metal Building) Minimum R-Value	
Required (90.1)	R-15 Continuous Insulation		R-13	
Actual	4" Thick	R-15 Continuous	6" Thick	R-19
Complies	Yes		Yes	

Vertical Fenestration Compliance

% Glazing (20-30%)	Assembly Max U-Value (Fixed)	Assembly Max SHGC (All Orientations)
Required (90.1)	0.57	0.39
Actual	0.5	0.39
Complies	Yes	Yes

Skylight Fenestration Compliance

With Curb, Glass	Assembly Max U-Value (Fixed)	Assembly Max SHGC (All Orientations)
Required (90.1)	1.17	0.49
Actual	1.0	0.43
Complies	Yes	Yes

HVAC Systems

Section 6 of ASHRAE Standard 90.1 focuses on the mechanical equipment and systems of the building. The Simplified Approach cannot be used for compliance because the building is more than two stories and more than 25,000 SF. Therefore, the Tyler School must be evaluated in regard to the Mandatory Provisions and Prescriptive Path.

The fans used in RTU-3 and AHU-3/4 fail the energy recovery section of 90.1. It is required that fans with capacity more than 5,000 cfm and more than 70% OA must use energy recovery with at least 50% recovery effectiveness. These systems are 100% OA but they use no energy recovery because of the additional cost.

The exhaust fume hoods were tested for compliance with 90.1. The Standard specifies additional consideration for exhaust rates greater than 15,000 cfm. This occurs in the ceramics, Metals/Smithing/Casting/, and Sculpture areas. The Standard requires heat recovery to precondition makeup air, variable air volume exhaust, or a makeup air supply equal to at least 75% of the exhaust rate. These three spaces violate this section.

The Tyler School falls into the climate zone 4a so an economizer is not required in the building. This satisfies one of the requirements under the Prescriptive Path section of section 6 ASHRAE Standard 90.1. There is also no minimum duct insulation R-Value required by section 6 of the Standard.

The gas fired, steam boilers used at the boiler plant must have an efficiency of 83% as per the project specifications. Table 6.8.1F of the ASHRAE Standard 90.1 requires an efficiency of 80%, so this boiler meets compliance.

The chillers come from the Temple University Central Chiller plants. The Tyler School of Art will only be using a small portion of the load created at this plant. The COP and NPLV of each system component are not available, because the chiller plant is being renovated as part of a separate project. The load of the chiller will be >300 Tons and the entering and leaving design temperatures are known, but the exact input and output of the chiller is still being determined.

Compliance for Table 6.8.3 Minimum Pipe Insulation Thickness from Standard 90.1 are below:

Minimum Pipe Insulation

Chiller Water Piping

	Design Operating Temp (F)	Nominal Pipe Size (in.)				
		<1	1 to <1-1/2	1-1/2 to <4	4 to <8	>8
Required	40-60	0.5	0.5	1	1	1
Actual		1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
Complies		Yes	Yes	Yes	Yes	Yes
Required	<40	0.5	1	1	1	1
Actual		1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
Complies		Yes	Yes	Yes	Yes	Yes

Hot Water Piping

	Design Operating Temp (F)	Nominal Pipe Size (in.)				
		<1	1 to <1-1/2	1-1/2 to <4	4 to <8	>8
Required	140-200	1	1	1	1-1/2	1-1/2
Actual		1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
Complies		Yes	Yes	Yes	Yes	Yes

Service Water Heating

ASHRAE Standard 90.1 Section 7 outlines the performance requirements for the service water heating systems and equipment. The performance requirements for water heating equipment are summarized in Table 7.8 of the Standard. The boiler used from the central plant has an efficiency of 83%. These calculations prove that the Tyler School complies with the service water heating section of ASHRAE Standard 90.1.

Power

Section 8 of ASHRAE Standard 90.1 refers to all the power distribution systems within the Tyler School. The standard states maximum requirements for voltage drops of feeders and branch circuits. The Tyler School of Art was designed to meet these requirements and thus complies with ASHRAE Std 90.1-2004.

- Feeder has a maximum voltage drop of 2% of the design load.
- Branch circuits have a maximum voltage drop of 3% of the design load.

Lighting

Section 9 of ASHRAE Standard 90.1 focuses on the interior and exterior lighting of the building. The two methods to test for compliance are the Building Area Method and the Space-By-Space method. The Building Area Method was used in the calculation for this report. To do so, the following procedure was followed:

- The building types were determined from Table 9.5.1 of the Standard. The Tyler School of Art falls into the categories of school/university, workshops, and office.
- The gross lighted floor area is determined for each building type.
- The interior lighting power allowance is the gross area is multiplied by the power density.
- This figure is compared to the installed interior lighting power, which is the actual wattage in the building, totaled from plans/schedules. The interior lighting power allowance must be less than the installed interior lighting power.

The lighting compliance is summarized in this table:

Space	Area	STD 90.1 W/ft2	Allowable Watts	Total Watts	Complies w/ 90.1
School/University	203,690	1.2	244428	205322	Yes

Electric Motor Efficiency

Electric Motor Efficiency was not considered because the brake horsepower information was not available.

Lost "Rentable" Space

It is important that buildings are designed efficiently, especially on college campuses and urban areas were space is limited. The total "lost space" is only about six percent of the total building area. This lost space consists of mechanical rooms, electrical rooms, and shafts. Elevator machine rooms were not considered in this calculation. Most of this lost space is in the basement, which houses the main mechanical and electrical rooms. Approximately 14% of the basement is taken up by these rooms. This number would be 17% of the basement if the 11,200 SF for planned future expansion is not included in the overall area. In addition, there are ten other electrical rooms throughout the building. The table below shows the area breakdowns:

Total Lost "Rentable" Space		
Space	Area (SF)	% of Building
Entire Building	234,000	100
Mechanical	10,130	4.3
Electrical	3,800	1.6
Totals	13,930	6.0

Above Grade Lost "Rentable" Space		
Space	Area (SF)	% of Building
1st, 2nd, 3rd Floors	165,000	70.5
Mechanical	3,280	2.0
Electrical	1,100	0.7
Totals	4,380	2.7

This lost "rentable" space is a small amount of the 234,000 SF. Using the central plant for the chillers and boilers helps to eliminate the lost space.

Mechanical System 1st Cost

Brinjac Engineering provided the mechanical system 1st cost for the Tyler School. The entire building cost is estimated at $75 million. The mechanical 1st cost is approximately $12 million dollars. For a 234,000 SF building, the cost/ft^2 is equal to $51.28/ ft^2. The mechanical cost is approximately 16% of the entire building cost.

Annual Energy Consumption and Operating Costs

The Trane Trace program as used to estimate the energy consumption and operating costs of the Tyler School of Art in this report. There was no energy analysis performed by the engineer of the Tyler School. Energy consumption was not a concern for the owner of the building as well as the primary design architect.

The estimated annual energy cost of the building is listed in the table below.

Annual Energy Cost

	Annual Cost ($/yr)	Annual Cost/ft^2
Electric	115,225	0.49
Natural Gas	66,965	0.29
Total	182,190	0.78

The table below shows the calculated tons for each unit and the area per ton.

	Computed Tons	Computed Load (ft^2/ton)
AHU-1	67	275.22
AHU-2	106	215.14
AHU-3/4	187	340.74
RTU-1	76	294.34
RTU-2	83	320.31
RTU-3	116	176.81

Annual Energy Consumption and Operating Costs

These tables show the design versus computed air flows. The design is much higher than the computed values. Categorizing the rooms differently in the energy modeling program could account for a small discrepancy, but this is pretty substantial.

	Area (ft^2)	Design CFM	Computed CFM	Ventilation CFM
AHU-1	18440	26000	13061	10938
AHU-2	22805	26000	16,502	13963
AHU-3/4	63718	124000	39139	27337
RTU-1	22370	24750	16,337	10543
RTU-2	26586	28000	18,938	9840
RTU-3	20510	31150	20,011	11286

	Design Supply Air (cfm/ft^2)	Computed Total Supply Air (cfm/ft^2)	Ventilation Supply (cfm/ft^2)
AHU-1	1.41	0.71	0.59
AHU-2	1.14	0.72	0.61
AHU-3/4	1.95	0.61	0.43
RTU-1	1.11	0.73	0.47
RTU-2	1.05	0.71	0.37
RTU-3	1.52	0.98	0.55

*The Supply Air and Ventilation Supply should be the same for AHU-3/4 and RTU-3 because they are both 100% OA.

The monthly energy consumption, equipment energy consumption, and the monthly utility costs are summarized in Appendix B. The total on peak kWh consumed by the Tyler School of Art over a year is 1,642,774 kWh. It also consumes 2,812 therms of natural gas on peak. These numbers work out to a building energy consumption of 108,038 Btu/(ft^2-yr**)**. The total cost for the utilities is $182,190/year. This includes about $115,000/year for electricity and $66,000/year for natural gas. The cost/SF to run the building is approximately $0.77/SF. This number is below what it should be, which is understandable by referring to the table above in which the computed supply air is much less than the actual.

The equipment energy consumption table shows that the primary heating contributes to 72% of the total energy consumed, while the cooling is only 13%. There clearly is a discrepancy here, but the problem was not able to be found. One of the limitations of the Trace energy modeling program is the difficulty in going back and reviewing or altering work. It is hard to find the mistakes in the program.

References

ASHRAE. 2004, ANSI/ASHRAE, Standard 90.1 – 2004, Energy Standard for Buildings Except Low-Rise Residential Buildings. American Society of Heating Refrigerating and Air Conditioning Engineers, Inc., Atlanta, GA, 2004.

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

Brinjac Engineering, Inc. 2007, Mechanical Construction Documents. Brinjac Engineering, Inc., Harrisburg, PA, 2007.

LEED-NC Version 2.2, Green Building Rating System for New Construction & Major Renovations. U.S. Green Building Council. 2005.

Appendix A

LEED for New Construction v2.2
Registered Project Checklist

Project Name: Temple University Tyler School of Art
Project Location: Philadelphia, PA

Yes	?	No			
3	5	6	**Sustainable Sites**		**14** Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
1			Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
1			Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	1		Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	1		Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles	1
	1		Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	1		Credit 5.1	**Site Development,** Protect or Restore Habitat	1
	1		Credit 5.2	**Site Development,** Maximize Open Space	1
		1	Credit 6.1	**Stormwater Design,** Quantity Control	1
		1	Credit 6.2	**Stormwater Design,** Quality Control	1
		1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
		1	Credit 7.2	**Heat Island Effect,** Roof	1
		1	Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
1	1	3	**Water Efficiency**		**5** Points
		1	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
		1	Credit 2	**Innovative Wastewater Technologies**	1
	1		Credit 3.1	**Water Use Reduction**, 20% Reduction	1
		1	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

	3	14	**Energy & Atmosphere**		**17** Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required

***Note for EAc1**: All LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1.

	1	9	Credit 1	**Optimize Energy Performance**	1 to 10
				10.5% New Buildings or 3.5% Existing Building Renovations	1
				14% New Buildings or 7% Existing Building Renovations	2
				17.5% New Buildings or 10.5% Existing Building Renovations	3
				21% New Buildings or 14% Existing Building Renovations	4
				24.5% New Buildings or 17.5% Existing Building Renovations	5
				28% New Buildings or 21% Existing Building Renovations	6
				31.5% New Buildings or 24.5% Existing Building Renovations	7
				35% New Buildings or 28% Existing Building Renovations	8
				38.5% New Buildings or 31.5% Existing Building Renovations	9
				42% New Buildings or 35% Existing Building Renovations	10
		3	Credit 2	**On-Site Renewable Energy**	1 to 3
				2.5% Renewable Energy	1
				7.5% Renewable Energy	2
				12.5% Renewable Energy	3
		1	Credit 3	**Enhanced Commissioning**	1
	1		Credit 4	**Enhanced Refrigerant Management**	1
	1		Credit 5	**Measurement & Verification**	1
		1	Credit 6	**Green Power**	1

continued…

Yes	?	No			
	4	9		**Materials & Resources**	**13** Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
	1		Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
		1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
	1		Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
	1		Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
		1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
	1		Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally	1
		1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally	1
		1	Credit 6	**Rapidly Renewable Materials**	1
		1	Credit 7	**Certified Wood**	1

Yes	?	No			
7	7	1	**Indoor Environmental Quality**		**15** Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	1		Credit 1	**Outdoor Air Delivery Monitoring**	1
1			Credit 2	**Increased Ventilation**	1
	1		Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	1		Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	1		Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	1		Credit 6.1	**Controllability of Systems**, Lighting	1
	1		Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
	1		Credit 7.2	**Thermal Comfort**, Verification	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			
1		4	**Innovation & Design Process**		**5** Points
		1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED® Accredited Professional**	1

Yes	?	No		
12	20	37	**Project Totals** **(pre-certification estimates)**	**69** Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 points

Appendix B

Monthly Energy Consumption

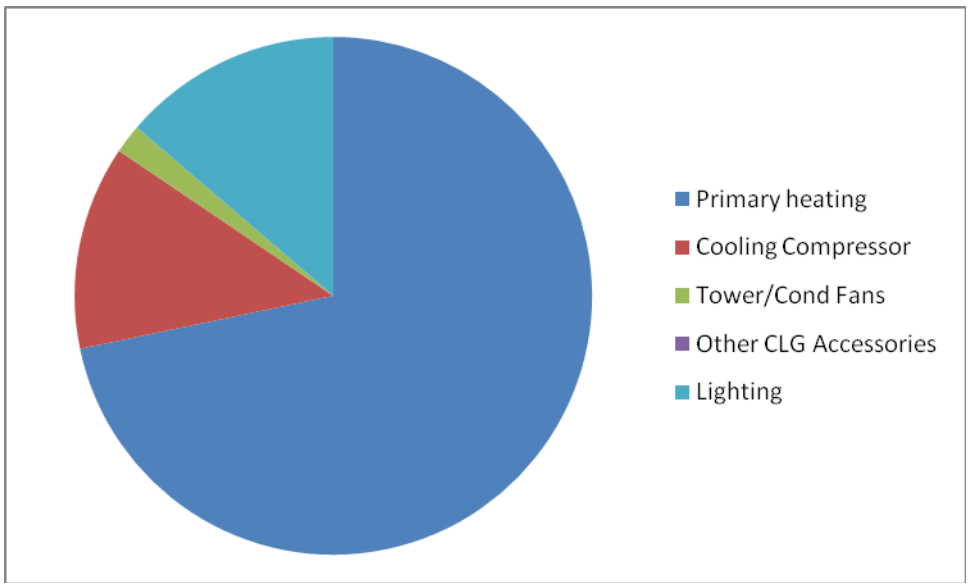
Utility		Jan	Feb	Mar	Apr	May	June
Electric	On-Pk Cons. (kWh)	69,867	63,094	77,384	72,445	137,950	241,750
	On-Pk Demand (kW)	229	228	238	272	605	785
Gas	On-Pk Cons. (therms)	24,852	23,210	15,821	9,729	4,655	2,812
	On-Pk Demand (therms/hr)	46	45	34	24	14	10

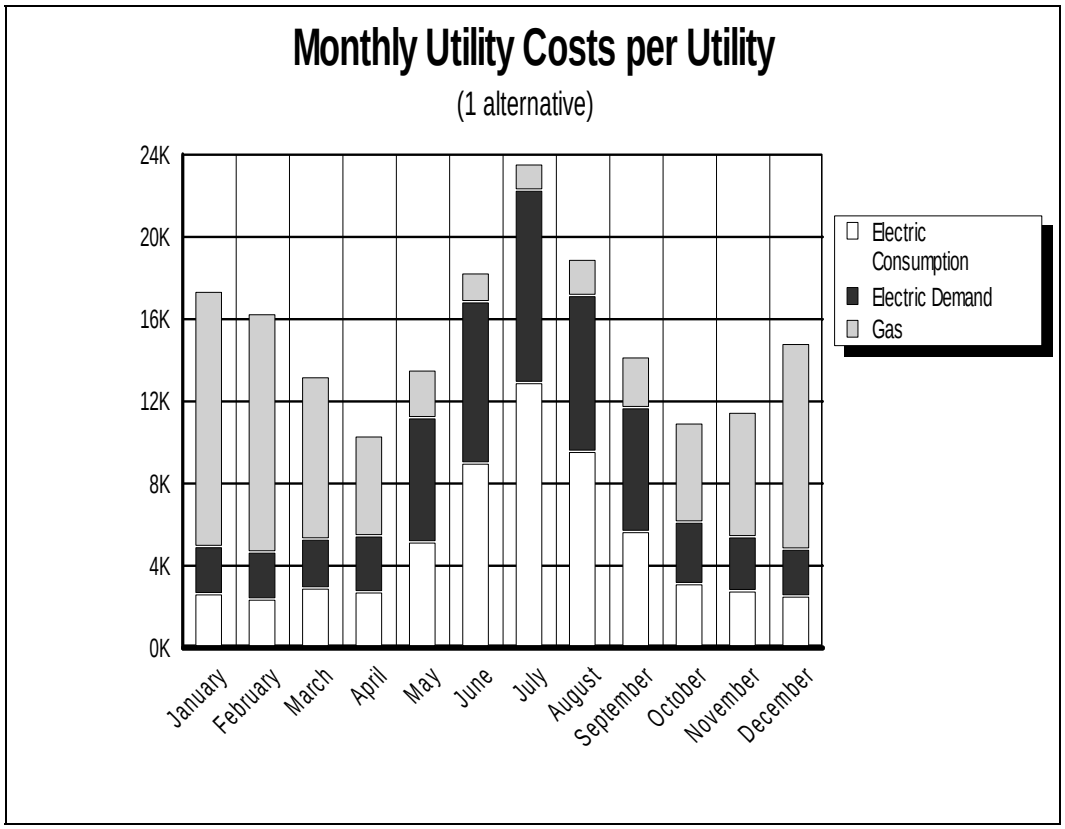
Utility		July	Aug	Sept	Oct	Nov	Dec	Total
Electric	On-Pk Cons. (kWh)	347,617	257,223	151,544	83,019	73,811	67,070	**1,642,774**
	On-Pk Demand (kW)	937	758	603	300	262	227	**937**
Gas	On-Pk Cons. (therms)	2,554	3,526	4,951	9,662	12,129	20,029	**133,931**
	On-Pk Demand (therms/hr)	9	11	13	23	29	36	**46**

Building Energy Consumption = 108,038 Btu/(ft^2-yr)

Equipment Energy Consumption

	Elect Cons. (kWh)	Gas Cons. (therms)	Percent of Total Energy	Total Source Energy (kBtu/yr)
Primary heating	68,258.31	133,930.59	71.72%	147,969.23
Cooling Compressor	709,590.62		12.75%	72,662.24
Tower/Cond Fans	100,908.19		1.81%	10,333.02
Other CLG Accessories	515.70		0.01%	52.81
Lighting	763,501.19		13.72%	78,182.70
Totals	**1,642,774.00**	**133,930.59**	**100.00%**	**309,200.03**





Monthly Utility Cost

Utility		Jan	Feb	Mar	Apr	May	June
Electric	On-Pk Cons. ($)	2,585	2,334	2,863	2,680	5,104	8,945
	On-Pk Demand ($)	2,291	2,279	2,379	2,724	6,046	7,851
	Total ($):	4,876	4,614	5,242	5,404	11,150	16,796
Gas	On-Pk Cons. ($)	12,426	11,605	7,911	4,865	2,327	1,406
	Monthly Total ($):	17,302	16,219	13,153	10,269	13,478	18,202

Utility		July	Aug	Sept	Oct	Nov	Dec	Total
Electric	On-Pk Cons. ($)	12,862	9,517	5,607	3,072	2,731	2,482	**60,783**
	On-Pk Demand ($)	9,367	7,579	6,034	2,996	2,622	2,275	**54,442**
	Total ($):	22,229	17,096	11,641	6,068	5,353	4,756	**115,225**
Gas	On-Pk Cons. ($)	1,277	1,763	2,475	4,831	6,065	10,015	**66,965**
	Monthly Total ($):	23,506	18,859	14,116	10,899	11,418	14,771	**182,190**

Cost/SF = $182,190/234,000 SF = $0.77/SF