Energy Data Attachment

University of Minnesota – Duluth Civil Engineering Building

LEED Energy Modeling

The energy modeling for LEED –NC 2.2 was performed against ASHRAE 90.1-2004 Appendix using eQUEST version 3.61b. The EAc1 Optimize Energy Performance Credit from is included on the following pages. An exceptional calculation was done through an additional baseline model with increased outdoor air volumes that would have been required if the building did not have the enhanced ventilation effectiveness provided by thermal displacement ventilation. The template subtracts this impact from the proposed model but technically it should be added to the baseline and doing so shows 32.3% energy savings and 35.6% energy cost savings.

2030 Challenge & Minnesota Sustainable Buildings 2030

While Energy Star does not address university buildings, the building design meets the 2030 Challenge for 60% energy reduction as adopted by the state of Minnesota. After the building design was complete, Minnesota Sustainable Buildings 2030 issued statewide energy and carbon standards various building types for 2010-2015. Based upon the LEED energy model results, the design achieves both lower energy intensity and lower carbon emissions.

Minnesota Sustainable Building 2030 Standards for 2010-2015			
Building Type	Site Energy Use Intensity kBtu/sf/yr	Carbon Emissions* lbs/sf/yr	Project Area Percentage
College Classroom	78.4	25.6	20%
College Laboratory	199.5	55.3	60%
Office	46.8	19.8	20%
Project (area weighted average)	144.9	42.3	100%

	Sustainable Building 2030 Standard for 2010-2015	Design Model
Site Energy Use Intensity (kBtu/sf/yr)	144.9	82.9
Site Energy Use (MBtu)	5,110	2,924
Carbon Emissions Intensity* (lbs/sf/yr)	42.3	27.2
Carbon Emissions Intensity* (kg/sf/yr)	19.2	12.4
Carbon Emissions* (metric tons/yr)	338	218

*The carbon intensity of electricity in the Minnesota Sustainable Buildings 2030 program is higher EPA published values because it includes a pre-combustion component.

(Responsible Individual) (Company Name)

I, _____ , from _____

verify that the information provided below is accurate, to the best of my knowledge.

CREDIT COMPLIANCE

(Please complete the color coded criteria(s) based on the option path selected)

Please select the appropriate compliance path option

- (●) Option 1 (Pg 2): Performance Rating Method, ASHRAE 90.1-2004 Appendix G or equivalent (up to 10 points possible)
- ( ) Option 2 (Pg 14): ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004 (4 points)
- ( ) Option 3 (Pg 14): Advanced Buildings Benchmark™ Version 1.1, Basic Criteria & Prescriptive Measures (1 point)

OPTION 1: PERFORMANCE RATING METHOD

☒ I confirm that the energy simulation software used for this project has all capabilities described in EITHER section `G2 Simulation General Requirements' in Appendix G of ASHRAE 90.1-2004 OR the analogous section of the alternative qualifying energy code used.

☒ I confirm that the baseline building and proposed building in this project's energy simulation runs use the assumptions and modeling methodology described in EITHER Appendix G of ASHRAE 90.1-2004 OR the analogous section of the alternative qualifying energy code used.

Complete the following sections to document compliance using Option 1:

Section 1.1 - General Information
Section 1.2 - Space Summary
Section 1.3 - Advisory Messages
Section 1.4 - Comparison of Proposed Design Versus Baseline Design Energy Model Inputs
Section 1.5 - Energy Type Summary
Section 1.6 - On-Site Renewable Energy *(if applicable)*
Section 1.7 - Exceptional Calculation Measure Summary *(if applicable)*
Section 1.8 - Performance Rating Method Compliance Report

Section 1.1 - General Information

Provide the following data for your project

Simulation Program:	eQUEST 3.61e / DOE-2.2-44e4	Quantity of Stories:	3
Principal Heating Source:	Fossil Fuel	Weather File:	Duluth MN TMY 2
Energy Code Used:	ASHRAE 90.1-2004 Appendix G	Climate Zone:	7a
New Construction Percent:	100 %	Existing Renovation Percent:	0 %

Enter the Target Finder score for your building from the Energy Star website (http://www.energystar.gov/index.cfm?fuseaction=target_finder.&CFID=154897). The score has no bearing on the number of EAc1 points earned. Use the following process to evaluate the Target Finder score:

1. Enter the facility information
2. Enter the facility characteristics. Select each primary and secondary space type that applies to the project. Then complete the required information for each space type.
4. Enter the total energy use per energy source for your project based on the totals reflected in the Proposed Design energy simulation output report.

Target Finder Score:

Section 1.2 - Space Summary

Provide the space summary for your project
(click "CLEAR" to clear the contents of any row All numeric entries must be entered as whole numbers without commas):

Table 1.2 - Space Summary

Building Use (Occupancy Type)	Conditioned Area (sf)	Unconditioned Area (sf)	Total Area (sf)	
High Bay Laboratory	10,600		10,600	CLEAR
Classroom & Low Bay Laboratory	6,400		6,400	CLEAR
Office	3,600		3,600	CLEAR
Support Spaces	14,700		14,700	CLEAR
				CLEAR
				CLEAR
				CLEAR
				CLEAR
				CLEAR
				CLEAR
				CLEAR
Total:	35,300		35,300	

Section 1.3 - Advisory Messages

Complete the following information from the simulation output files (all entries should be entered as whole numbers, without commas)

TABLE 1.3 - Advisory Messages	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met:	1	2	1
Number of hours cooling loads not met:	22	38	16
Number of warning messages:	1	0	1
Number of error messages:	0	0	0
Number of defaults overridden:	0	0	0

Section 1.4 - Comparison of Proposed Design Versus Baseline Design Energy Model Inputs

Use **Table 1.4** to document the Baseline and Proposed design energy model inputs for your project. Include descriptions for:

1. Exterior wall, underground wall, roof, floor, and slab assemblies including framing type, assembly R-values, assembly U-factors, and roof reflectivity when modeling cool roofs. (Refer to ASHRAE 90.1 Appendix A)
2. Fenestration types, assembly U-factors (including the impact of the frame on the assembly), SHGCs, and visual light transmittances, overall window-to-gross wall ratio, fixed shading devices, and automated movable shading devices.
3. Interior lighting power densities, exterior lighting power, process lighting power, and lighting controls modeled for credit.
4. Receptacle equipment, elevators or escalators, refrigeration equipment, and other process loads.
5. HVAC system information including types and efficiencies, fan control, fan supply air volume, fan power, economizer control, demand control ventilation, exhaust heat recovery, pump power and controls, and any other pertinent system information. (Include the ASHRAE 90.1-2004 Table G.3.1.1B Baseline System Number).
6. Domestic hot water system type, efficiency and storage tank volume.
7. General schedule information

Documentation should be sufficient to justify the energy and cost savings numbers reported in the Performance Rating Table.

(Click "CLEAR" to clear the contents of any row.)

TABLE 1.4 - Comparison of Proposed Design Versus Baseline Design

Model Input Parameter	Proposed Design Input	Baseline Design Input	
Roof Construction	Steel framed with an assembly U=0.027. Reflective areas with a reflectance of 0.45.	Steel framed with an assembly U=0.063 and all with reflectivity of 0.30.	CLEAR
Skylights	Skylights with an assembly U=1.55, SHGC=0.78, and VT=92%.	Skylights with an assembly U=0.87 and SHGC=0.77.	CLEAR
Exterior Wall Construction	Mass walls with an assembly U=0.066.	Non mass walls with an assembly U=0.064.	CLEAR
Vertical Fenestration Area	As designed amount and location which equals at 32% gross window to above grade wall ratio.	Proposed amount but distributed in uniform horizontal bands across all above grade walls.	CLEAR
Vertical Fenestration Properties	Vertical glazing with an assembly U=0.436, SHGC=0.358, and VT=59%.	Vertical glazing with an assembly U=0.57 and SHGC=0.49.	CLEAR
Opaque Doors	Bi-Fold door with assembly U=0.150.	Bi-Fold door with assembly U=0.500	CLEAR
Slab on Grade Floors	Mass floors with F=0.840.	Mass floors with F=0.840.	CLEAR
Below Grade Walls	Mass walls with C=0.119.	Mass walls with C=0.119.	CLEAR
Interior Lighting Power Density	Space by space method detailed in the support document.	Space by space method detailed in the support document.	CLEAR
Occupancy Sensor Control of Lighting	Occupancy sensors in numerous spaces as detailed in the support document.	None.	CLEAR
Daylighting Controls	Continuous dimming controls with zone fractions as detailed in the support document.	None.	CLEAR
Misc. Equipment	Design space by space equipment power densities detailed in the support document.	Design space by space equipment power densities detailed in the support document.	CLEAR

TABLE 1.4 - Comparison of Proposed Design Versus Baseline Design

Model Input Parameter	Proposed Design Input	Baseline Design Input	
HVAC Systems 1-4	AHU's 1, 2, 3, & 4 are displacement VAV AHU's with fan VFD's, campus chilled and hot water.	Per Tables G3.1.1A & B, System 3 PSZ-AC: CAV DX with 10.1 EER cooling & campus hot water.	CLEAR
HVAC System 5	AHU 5 is a conventional mixing VAV AHU with fan VFD's, campus chilled and hot water.	Per Tables G3.1.1A & B, System 3 PSZ-AC: CAV DX with 10.1 EER cooling & campus hot water.	CLEAR
HVAC System 6	System 6 is a CAV fan coil with with campus chilled and hot water.	Per Tables G3.1.1A & B, System 3 PSZ-AC: CAV DX with 10.1 EER cooling & campus hot water.	CLEAR
Supply Air & Outside Air Volumes	Total design supply air volume = 32,700 CFM Total design outside air volume = 10,400 CFM.	Total autosized supply air volume = 46,600 CFM Total design outside air volume = 10,400 CFM.	CLEAR
Heat Recovery	AHU 1 has exhaust air heat recovery. The support document addresses wrap around heat recovery.	None.	CLEAR
Economizer and outside air control	Differential enthalpy based economizers for all air handlers. Fixed outside air for fan coil.	No economizers required per Table G3.1.2.6A.	CLEAR
Fan Power	Design fan power detailed in the support document.	Baseline fan power detailed in the support document.	CLEAR
Zone level HVAC	As designed minimum air flow ratios and hot water radiation.	Constant volume air flow and as designed hot water radiation.	CLEAR
Heating Water Circulation Loop	Temperature differential of 20F & pumps w/90 feet of head & VFD's.	Temperature differential of 20F & pump w/60 feet of head riding the pump curve.	CLEAR
Secondary Chilled Water Loop	Temperature differential of 12F & pumps w/ 155 feet of head & VFD's.	Not applicable since baseline HVAC systems are direct expansion cooling.	CLEAR
Chiller Plant	Water cooled centrifugal chiller at 0.61 kW/Ton.	Not applicable since baseline HVAC systems are direct expansion cooling.	CLEAR
Primary Chilled Water Loop	Temperature differential of 12F & constant flow pumping w/ 40 feet of head.	Not applicable since baseline HVAC systems are direct expansion cooling.	CLEAR
Condenser Water Loop	Temperature differential of 10F & constant flow pumping w/ 60 feet of head.	Not applicable since baseline HVAC systems are direct expansion cooling.	CLEAR
Cooling Tower	Variable Frequency Driven Fans	Not applicable since baseline HVAC systems are direct expansion cooling.	CLEAR
Hot Water	Instantaneous electric hot water heaters.	Instantaneous electric hot water heaters.	CLEAR
Exterior Lighting Power	Total design exterior lighting power of 1.9 kW, entirely tradeable.	Total baseline exterior lighting power of 2.1 kW.	CLEAR
General Schedule	Building & HVAC operation detailed in supporting documentation.	Building & HVAC operation detailed in supporting documentation.	CLEAR
			CLEAR
			CLEAR
			CLEAR
			CLEAR

Section 1.5 - Energy Type Summary

List the energy types used by your project (i.e. electricity, natural gas, purchased chilled water or steam, etc.) for either the Baseline or Proposed design. Also describe the utility rate used for each energy type (i.e. Feswick County Electric LG-S), as well as the units of energy used, and the units of demand used. (Click "CLEAR" to clear the contents of any row):

TABLE 1.5 - Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of demand	
Electricity	Blended Rate of $0.062/kWh	kWh	kW	CLEAR
Campus Hot Water	Assumed rate of $14/MBtu	MBtu	MMBtuh	CLEAR
				CLEAR
				CLEAR

Energy Units:

1 kBtu = 1,000 Btu	1 MBtu = 1,000 kBtu
1 kWh = 3.412 kBtu	1 MWh = 3,412 kBtu
1 therm = 100 kBtu	1 ton hr = 12 kBtu

Demand Units

1 MBH = 1,000 Btu/h	1 MMBtuh = 1,000 MBH
1 kW = 3.412 MBH	1 ton = 12 MBH

Section 1.6 - On-Site Renewable Energy

If the project does not include on-site renewable energy, skip to Section 1.7

☐ The project includes On-Site Renewable Energy

How is the on-site renewable energy cost calculated?

- ◉ This form will automatically calculate the *Renewable Energy Cost* based on the "virtual" energy rate from the proposed design energy model results. This form will subtract the *Renewable Energy Cost* from the proposed design energy model results to calculate the *Proposed Building Performance Rating*. (You do NOT need to fill out the "Renewable Energy Cost" field in Table 1.6 below)
- ○ Renewable Energy Cost for each on-site renewable source is analyzed separately from the energy model based on local utility rate structures. The Renewable Energy Cost for each renewable source is reported in Table 1.6 below, This form will subtract the reported Renewable Energy Cost from the proposed design energy model results to calculate the Proposed Building Performance Rating.
- ○ On-site renewable energy is modeled directly in the energy model. *Renewable Energy Cost* is already credited in the proposed design energy model results (i.e. the energy model already reflects zero cost for on-site renewable energy, and this form will NOT subtract the *Renewable Energy Cost* a second time).

Indicate the on-site renewable energy source(s) used, the backup energy type for each source (i.e. the fuel that is used when the renewable energy source is unavailable - ASHRAE 90.1-2004, Section G2.4), the rated capacity for the source, and the annual energy generated from each source.

TABLE 1.6 - Renewable Energy Source Summary

Renewable Source	Backup Energy Type	Annual Energy Generated		Rated Capacity	Renewable Energy Cost	
						CLEAR
						CLEAR

Section 1.7 - Exceptional Calculation Measure Summary

(If the energy analysis does not include exceptional calculation methods, skip to Section 1.8)

☒ The energy analysis includes exceptional calculation method(s) (ASHRAE 90.1-2004, G2.5)

How is the exceptional calculation measure cost savings determined?

○ This form will automatically calculate the exceptional calculation measure cost savings based on the "virtual" energy rate from the proposed design energy model results. This form will subtract this cost savings from the proposed design energy model results to calculate the *Proposed Building Performance Rating*.

◉ Exceptional calculation measure cost for each exceptional calculation measure is analyzed based on local utility rate structures. The *cost savings* for each exceptional calculation is reported below, This form will subtract the reported exceptional calculation cost savings from the proposed design energy model results to calculate the *Proposed Building Performance Rating*.

For each exceptional calculation method employed, document the predicted energy savings by energy type , the energy cost savings (if option 2 above is selected), and a narrative explaining the exceptional calculation method performed, and theoretical or empirical information supporting the accuracy of the method. Reference any applicable Credit Interpretation Rulings. [Note: if an end-use has an energy loss rather than an energy savings, enter it as a negative number]

Exceptional Calculation Measure Short Description: Baseline Ventilation Effectiveness — CLEAR

Energy Type(s)	Annual Energy Savings by Energy Type	Annual Cost Savings
Electricity	-398.6 (kWh)	$0
Campus Hot Water	295.8 (MBtu)	$4,109

Exceptional Calculation Measure Narrative:

The following brief narrative is expanded upon in RevisedEAc1Support.doc:
Four project air handlers are displacement ventilation units with separate radiant heating achieving a ventilation effectiveness of 1.2 compared to conventional mixing system at 1.0. Per Appendix G, the Baseline and Proposed energy models documented in Table 1.8.1 include the proposed outside air volume. Four additional baseline energy models were performed with 20% increased outside air and averaged to determine the higher ECM baseline energy consumption. The net energy dollar impact was entered because the template rejected negative dollars. Since this ECM asserts higher baseline energy consumption rather than lower proposed consumption, a corrected Table 1.8.2(b) is included in the supporting documentation.

Exceptional Calculation Measure Short Description: — CLEAR

Energy Type(s)	Annual Energy Savings by Energy Type	Annual Cost Savings

Exceptional Calculation Measure Narrative:

Section 1.8 - Performance Rating Method Compliance Report *(Option 1 Compliance Only)*

In **Table 1.8.1**, list each energy end use for your project (including all end uses reflected in the baseline and proposed designs). Then check whether the end-use is a process load, select the energy type, and list the energy consumption and peak demand for each end-use for all four Baseline Design orientations. In **Table 1.8.1(b)** indicate the total baseline energy cost for each energy type for all four Baseline Design orientations. If either the baseline or proposed design uses more than one energy type for a single end use (i.e. electric resistance reheat, and central natural gas heating), enter each energy type as a separate end use (i.e. *Heating - Electric*, and *Heating, NG*).

Fill out the Proposed Design energy consumption and peak demand for each end use in **Table 1.8.2.** In **Table 1.8.2 (b)** indicate the total proposed energy cost for each energy type. [Note: Process loads for the proposed design must equal those listed in the Baseline design. Any process load energy savings for the project must be reported in Section 1.7.]

(Click "CLEAR" to clear the contents of any end use)

Table 1.8.1 - Baseline Performance - Performance Rating Method Compliance

End Use	Process?	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0° rotation)	Baseline (90° rotation)	Baseline (180° rotation)	Baseline (270° rotation)	Baseline Design	
Interior Lighting	☐	Electricity	Energy Use (kWh)	109,526	109,526	109,526	109,526	109,526	CLEAR
			Demand (kW)	41.1	41.1	41.1	41.1	41.1	
Receptacle Equipment	☒	Electricity	Energy Use (kWh)	169,644	169,644	169,644	169,644	169,644	CLEAR
			Demand (kW)	69.4	69.4	69.4	69.4	69.4	
Space Heating	☐	Campus Hot Water	Energy Use (MBtu)	1,673	1,653	1,608	1,627	1,640.3	CLEAR
			Demand (MMBtuh)	1.6	1.6	1.6	1.6	1.6	
Space Cooling	☐	Electricity	Energy Use (kWh)	55,421	59,662	59,312	59,939	58,583.5	CLEAR
			Demand (kW)	107	108.3	108	108.3	107.9	
Heat Rejection	☐	Electricity	Energy Use (kWh)	0	0	0	0	0	CLEAR
			Demand (kW)	0	0	0	0	0	
Pumps & Aux	☐	Electricity	Energy Use (kWh)	30,696	30,826	31,300	30,806	30,907	CLEAR
			Demand (kW)	4.9	4.9	4.9	4.9	4.9	
Ventilation Fans	☐	Electricity	Energy Use (kWh)	308,391	319,604	322,246	324,974	318,803.8	CLEAR
			Demand (kW)	54.8	56.2	56.1	56.9	56	
Domestic Water Heating	☐	Electricity	Energy Use (kWh)	6,204	6,204	6,204	6,204	6,204	CLEAR
			Demand (kW)	2.7	2.7	2.7	2.7	2.7	
Exterior Lighting	☐	Electricity	Energy Use (kWh)	5,525	5,525	5,525	5,525	5,525	CLEAR
			Demand (kW)	2	2	2	2	2	
	☐		Energy Use						CLEAR
			Demand						

Table 1.8.1 - Baseline Performance - Performance Rating Method Compliance

End Use	Process?	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0° rotation)	Baseline (90° rotation)	Baseline (180° rotation)	Baseline (270° rotation)	Baseline Design	
	☐		Energy Use						CLEAR
			Demand						
	☐		Energy Use						CLEAR
			Demand						
	☐		Energy Use						CLEAR
			Demand						
	☐		Energy Use						CLEAR
			Demand						
	☐		Energy Use						CLEAR
			Demand						
	☐		Energy Use						CLEAR
			Demand						
Baseline Energy Totals:		Total Annual Energy Use (MBtu/year)		4,012	4,045	4,009	4,038	4,026	
		Annual Process Energy (MBtu/year)						579	

Note: Process Cost accounts for 24% of Baseline Performance. Process cost must equal at least 25% of Baseline Performance, or the narrative at the end of this form must document why this building's process costs are less than 25%

Table 1.8.1(b) - Baseline Energy Costs

Energy Type	Baseline Cost (0° rotation)	Baseline Cost (90° rotation)	Baseline Cost (180° rotation)	Baseline Cost (270° rotation)	Baseline Building Performance
Electricity	$42,495	$43,462	$43,633	$43,811	$43,350
Campus Hot Water	$23,420	$23,147	$22,513	$22,782	$22,965
Total Baseline Costs:	$65,915	$66,609	$66,146	$66,593	$66,315

Table 1.8.2 - Performance Rating Table - Performance Rating Method Compliance

End Use	Process?	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Baseline Building Units	Baseline Building Results	Percent Savings
Interior Lighting		Electricity	Energy Use (kWh)	46,075	Energy Use (kWh)	109,526	57.9 %
			Demand (kW)	21.5	Demand (kW)	41.1	47.9 %

Receptacle Equipment	X	Electricity	Energy Use (kWh)	169,644	Energy Use (kWh)	169,644	0	%
			Demand (kW)	69.4	Demand (kW)	69.4	0	%
Space Heating		Campus Hot Water	Energy Use (MBtu)	1,870	Energy Use (MBtu)	1,640.3	-14	%
			Demand (MMBtuh)	1.4	Demand (MMBtuh)	1.6	12.5	%
Space Cooling		Electricity	Energy Use (kWh)	18,170	Energy Use (kWh)	58,583.5	69	%
			Demand (kW)	33.4	Demand (kW)	107.9	69.3	%
Heat Rejection		Electricity	Energy Use (kWh)	329	Energy Use (kWh)	0	0	%
			Demand (kW)	1.6	Demand (kW)	0	0	%
Pumps & Aux		Electricity	Energy Use (kWh)	26,116	Energy Use (kWh)	30,907	15.5	%
			Demand (kW)	8.9	Demand (kW)	4.9	-87.5	%
Ventilation Fans		Electricity	Energy Use (kWh)	37,331	Energy Use (kWh)	318,803.8	88.3	%
			Demand (kW)	28	Demand (kW)	56	50.3	%
Domestic Water Heating		Electricity	Energy Use (kWh)	6,204	Energy Use (kWh)	6,204	0	%
			Demand (kW)	2.7	Demand (kW)	2.7	0	%
Exterior Lighting		Electricity	Energy Use (kWh)	5,132	Energy Use (kWh)	5,525	7.1	%
			Demand (kW)	1.8	Demand (kW)	2	0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
			Energy Use		Energy Use		0	%
			Demand		Demand		0	%
Energy Totals:		Total Annual Energy Use	(MBtu/year)	2,924		4,026	27.4	%
		Annual Process Energy	(MBtu/year)	579		579	0	%

Table 1.8.2(b) - Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design		Percent Savings	
Energy Type	Energy Use	Cost	Energy Use	Cost	Energy Use	Cost
Electricity	309,001 kWh	$19,158	699,192 kWh	$43,350	55.8 %	55.8 %
Campus Hot Water	1,870 MBtu	$26,178	1,640 MBtu	$22,965	-14 %	-14 %
	0		0		0 %	0 %
	0		0		0 %	0 %
Subtotal (Model Outputs):	2,924 (MBtu/year)	$45,336	4,026 (MBtu/year)	$66,315	27.4 %	31.6 %

On-Site Renewable Energy	Energy Generated	Renewable Energy Cost

Exceptional Calculations	Energy Savings	Cost Savings	
Baseline Ventilation Effectiver	294 (MBtu/year)	$4,109	(subtracted from model results to reflect Proposed Building Performance)

	Proposed Design		Baseline Design		Percent Savings	
	Energy Use	Cost	Energy Use	Cost	Energy	Cost
Total:	2,630 (MBtu/year)	$41,227	4,026 (MBtu/year)	$66,315	34.7 %	37.8 %

DOCUMENTATION DESCRIPTION LOG

Please upload the compliance summaries for ASHRAE 90.1-2004 (or qualifying local energy code) and/or LEED if available from the energy simulation software used. Please also upload the energy rate tariff from the project's energy providers if the project is not using the default rates in the LEED-NC v2.2 Reference Guide.

If the software is incapable of producing the energy code or LEED compliance summaries please provide output summaries and example input summaries for both the baseline and proposed buildings that support the data entered in the template tables above.

* Output summaries must include simulated energy consumption by end use as well as total building energy consumption and cost by energy type used in the building.
* Example input summaries must be a sampling of model input assumptions, focusing on the most common systems present in the building. The example input summaries should be taken from the simulation software's standard input reports if available; if the software will not produce input summary reports then screen captures of representative inputs are acceptable. The example input summaries must include samples of the following input information:

1. Occupancy and usage patterns
2. Assumed envelope component sizes and traits (area, R-value, U-value, etc.)
3. Assumed mechanical equipment types and traits (capacity, efficiency, etc.)

Please note that uploaded documents should be SUMMARIES, and not large quantities of detailed data

Documentation Description Log

In the text box below, please reference the file name of each uploaded file (e.g. simulationsummary.pdf)

1 - Revised EAc1Support.doc - Requisite comprehensive support document addressing: review comments point by point, building operation, utility services & rates, campus hot water pumping power, baseline fan power, baseline exterior lighting, detailed space inputs, wrap around coil heat recovery, displacement ventilation, and ECM for baseline ventilation effectiveness method and results

2 - Revised Proposed Model Summary Data.txt - Select simulation output reports for the proposed energy model
3 - Revised Baseline Model Summary Data.txt - Select simulation output reports for the un-rotated baseline energy model
4 - Revised ECM Baseline Model Summary Data.txt - Select simulation output reports for the un-rotated ECM baseline energy model

☒ I have provided the appropriate supporting documentation in the document upload section of LEED Online. Please refer to the above sheets.

OPTION 2: ASHRAE ADVANCED ENERGY DESIGN GUIDE FOR SMALL OFFICE BUILDINGS, 2004

The building complies with all the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004. The following restrictions are applicable:

☐ The project is less than 20,000 square feet.

☐ The project is office occupancy.

☐ The project has fully complied with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located

_____ Climate zone

OPTION 3: ADVANCED BUILDINGS BENCHMARK ™ VERSION 1.1

☐ The project fully complies with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections: 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control.

_____ Climate zone

NARRATIVE (Optional)

Please provide any additional comments or notes regarding special circumstances or considerations regarding the project's credit approach.

1.Review comment responses are in Revised EAc1Support.doc which is a requisite part of this submittal.

2.Target Finder does not have a space type appropriate for university buildings.

3.The ECM asserts higher baseline energy consumption rather than lower proposed consumption and thus a corrected Table 1.8.2(b) is included in the support document. The correct energy cost savings is 35.6% which results in 8 EAc1 points.

☐ The project is seeking point(s) for this credit using an alternate compliance approach. The compliance approach, including references to any applicable Credit Interpretation Rulings is fully documented in the narrative above. *(Indicate the number of points documented in the "Alternative Compliance Points Documented" field below).*

Alternative Compliance Points Documented

Project Name: Civil Engineering Building

Credit: EA Credit 1: Optimize Energy Performance

Points Documented: 0

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