The following Energy Perfromance Analysis is based on the current Design Center design.

LEED 2009 Energy Performance Analysis

Design Center
University of Illinois at Urbana, Champaign, Illinois
95% CD - UIUC submission

IMEG #15.0770.00
Dec 20, 2017

A. SUMMARY

This preliminary energy study was performed to determine the energy efficiency of the New Design Center at University of Illinois, Champaign IL. The energy cost of the proposed design was compared to the energy cost of the base case building per the specifications of ASHRAE 90.1 2007 Appendix G. The analysis was performed to determine the number of LEED EAc1 credits achievable. The energy analysis was performed using Design Builder, which uses the Energy Plus engine.

The building hot water and chilled water is supplied from a central plant. The central plant is not included in this analysis. This analysis used follows the ASHRAE 90.1 2007 addendum ai method to determine the savings.

The analysis resulted in **31.0%** energy cost savings based on ASHRAE 90.1 2007 Appendix G, resulting in 10 LEED points.

Including photovoltaics on the roof increases savings to 41.3%, giving 15 LEED EAc1 points.

B. BUILDING DESCRIPTION

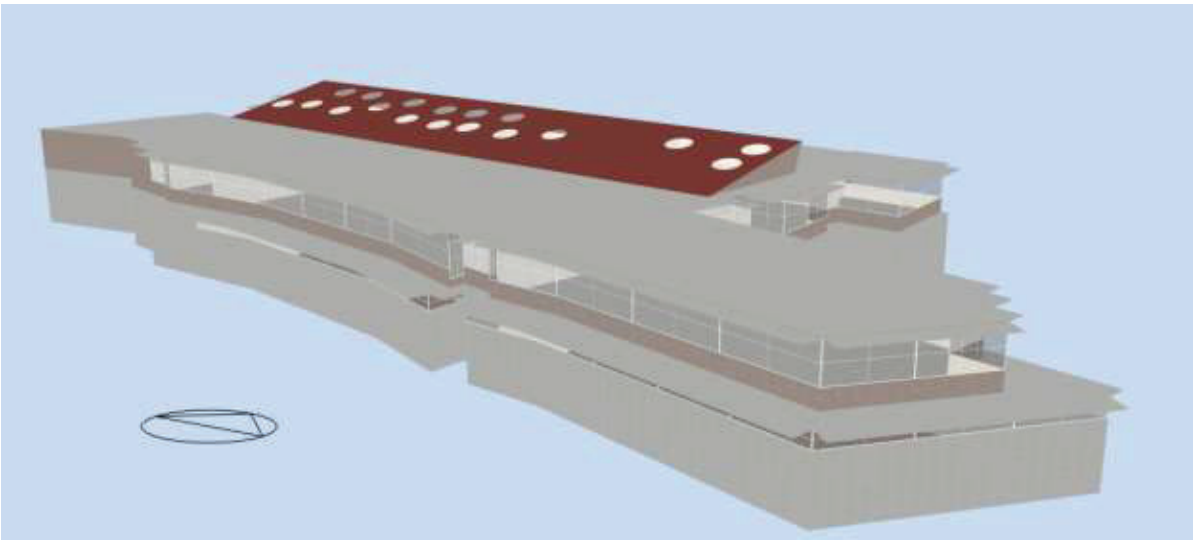
The building is intended to be an educational facility that includes labs and maker spaces. The building includes spaces for meeting and collaboration. The lab spaces include a variety of equipment with high design loads. The building is designed to provide abundant daylighting and exterior views. Heating for the building is provided by high efficiency onsite boilers. Chilled water for the building is obtained from a campus chilled water system. Space cooling is achieved using a displacement ventilation system and a chilled beam system.

C. ENERGY EFFICIENCY MEASURES

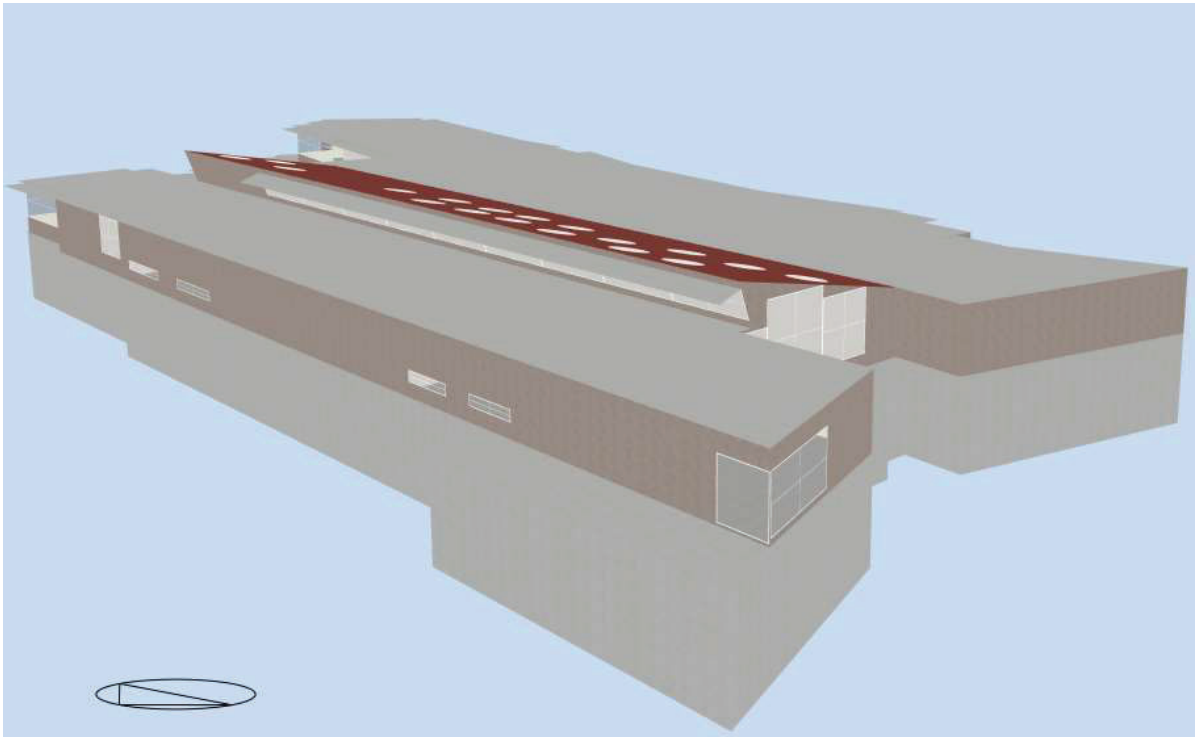
The following are the energy efficiency measures implemented to achieve energy savings in the proposed building:

1. Chilled beam system for space cooling and heating.
2. Displacement ventilation spaces.
3. Improved lighting power density with LED lights.
4. Occupancy and daylight sensors.
5. Improved envelope performance.
6. High performance glazing.
7. Photovoltaics.

D. BUILDING MODEL RENDERINGS



Building norheast view



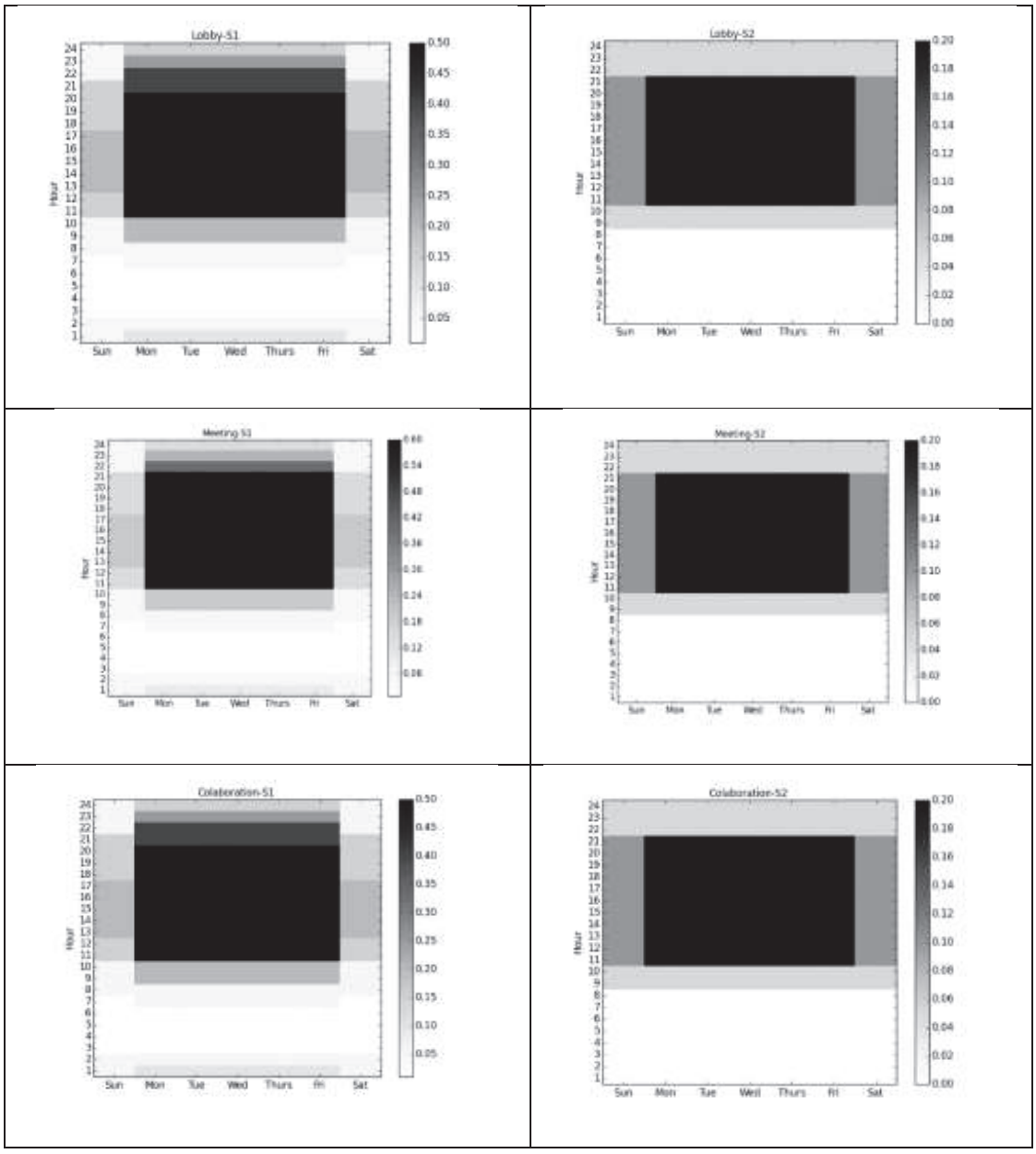
Building northwest view

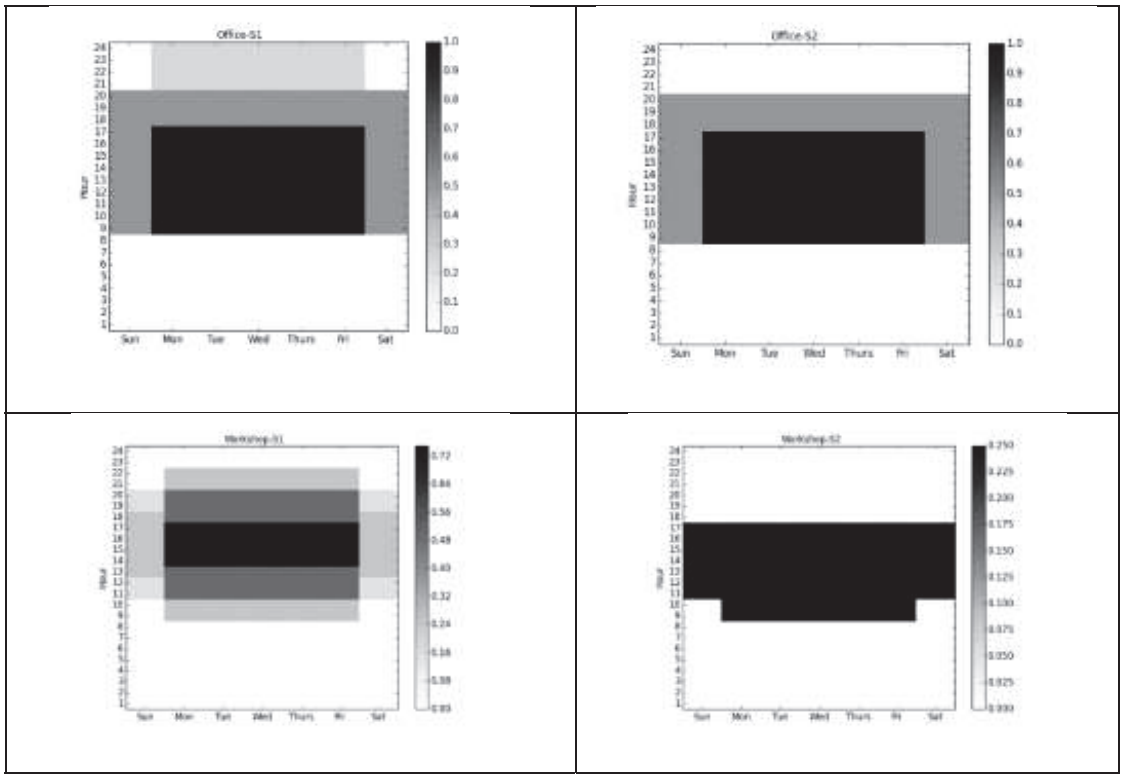
E. OCCUPANCY SCHEDULES

The building operating schedules have been divided into three types based on the occupancy:

Period	Date Ranges
S1 [regular occupancy]	01/17-03/17 03/27-05/14 08/21-12/15
S2 [Summer]	05/15-08/20
S3 [Breaks]	12/16-01/16 03/18-03/26

The following plots provide the relative occupancy of the periods S1 and S2. The space is assumed to be unoccupied during period S3.




Office-S1
Office-S2
Hour
Sun
Mon
Tue
Wed
Thurs
Fri
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F. PROPOSED AND BASE CASE INPUT COMPARISONS

Table 1 - Proposed and Base Case Input Data Comparison

Zone:5A	Proposed Design Case	ASHRAE-90.1-2007 App G
Envelope		
Wall	ICF Wall with Mineral wool insulation U-0.03	Steel Framed wall U-Values:0.064
Roof	Polyiso insulation above deck U-Value:0.024	Insulation entirely above deck U-Value:0.048
Below Grade Wall	6 in concrete with R-30 Insulation: F-0.032	6 in concrete with R7.5Ci: C-0.119
Skylights	Skylight ratio:2.2% Tubular: U-Value 0.35 SHGC: 0.3	Skylight ratio:2.2% Glazing assembly U-Value:1.17 Glazing SHGC: 0.39
Glazing	Glazing Ratio: 40% Assembly U-Value 0.33 SHGC: 0.23	Glazing Ratio: 40% Glazing assembly U-Value:0.45 Glazing SHGC: 0.40
Electrical systems and Process loads		
LPD	Whole building [W/sqft]: 0.61 Occupancy sensors installed in all spaces except lobby. Daylight control in perimeter spaces	Whole building [W/sqft]: 1.2
Exterior Lights	2 kW	2 kW
Mechanical and Plumbing systems		
HVAC	Chilled beams and Displacement ventilation FCU for Mechanical/Elec Spaces HW from condensing boiler and Chilled water from campus.	System#7 VAV with reheat Single Zone AHU w/Furnace for Mech/elec HW from boiler and Chilled water from campus.
Fans	AHU-1: Supply 86 BHP Exhaust: 11 BHP	AHU-Basement: 15 BHP AHU-Ground: 33 BHP
Ventilation	AHU-1: 15,000	AHU Basement: 5,000 AHU Ground: 10,000
Boiler Eff	91%	80%
Economizer	Differential enthaply economizer Included for spaces with Displacement ventilation	Included with high limit shut off 70 F
Heat Recovery	Enthalpy wheel Heat recovery with 66% eff	n/a
HW Supply temp reset	110 F above 69 F ambient. 140 below 40 F ambient	150 F below above 50 F ambient 180 below 20 F ambient.
HW Pump	District CHW: 16 W/GPM HW: 14 W/GPM	District CHW: 16 W/GPM HW: 19 W/GPM
DHW	1000 Gal/Day	1000 Gal/Day

J. CONCLUSION

Based on the analysis, the project is anticipated to achieve 31.4% savings, resulting in 10 EAc1 points for LEED 2009. With the inclusion of photovoltaic panels the savings is estimated at 41.3% giving 15 points.

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Proposed Building Outputs

	Electricity [kBtu]	Natural Gas [kBtu]	District Cooling [kBtu]
Heating	50.67	719816.93	0.00
Cooling	0.00	0.00	985651.12
Interior Lighting	154528.18	0.00	0.00
Exterior Lighting	29828.37	0.00	0.00
Interior Equipment	232365.44	0.00	0.00
Fans	274046.90	0.00	0.00
Pumps	17862.03	0.00	0.00
Water Systems	0.00	179103.82	0.00
Total End Uses	708681.58	898920.75	985651.12

Basecase Building Outputs

	Electricity [kBtu]	Natural Gas [kBtu]	District Cooling [kBtu]
Heating	0.00	1691320.32	0.00
Cooling	0.00	0.00	1245192.32
Interior Lighting	395657.47	0.00	0.00
Exterior Lighting	29828.37	0.00	0.00
Exterior Equipment	0.00	0.00	0.00
Fans	229918.41	0.00	0.00
Pumps	21139.41	0.00	0.00
Water Systems	0.00	202366.72	0.00
Total End Uses	908909.10	1893687.04	1245192.32