

Block 10 NE Building Modeling Results



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Energy Modeling Assumptions & Methodology

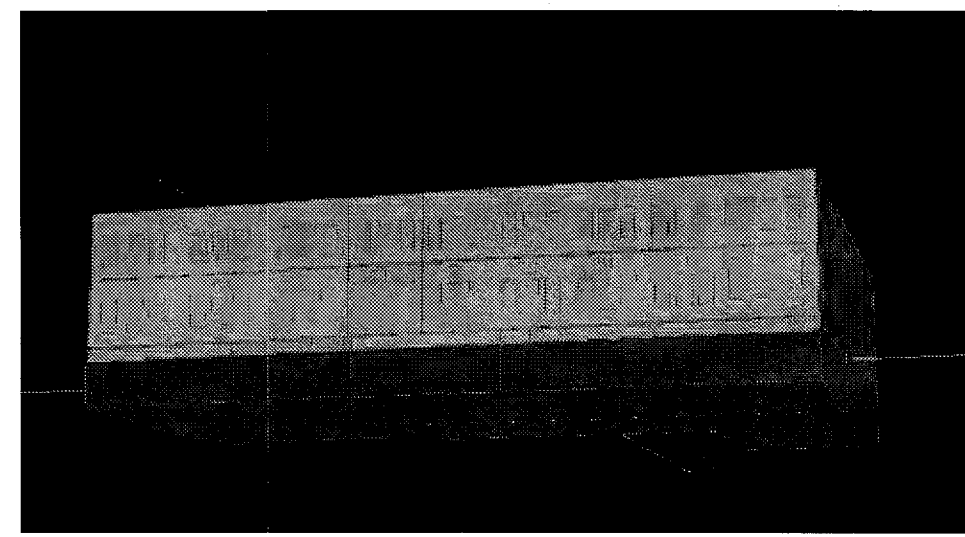


Figure 1: eQuest Model Screenshot

The building was entered into eQUEST to match the actual geometry as closely as possible, including the facade openings and zoning, as these won't change significantly in the re-model. The daylight monitor was simplified to a sky-light with the same amount of glazing area and wall height. The basement was modeled with varied depths of below grade walls, to approximate the actual building.

The baseline model was developed to meet the requirements of ASHRAE 90.1-2007. Basic assumptions for the Baseline model are as follows:

- Envelope: In accordance with Appendix G, ASHRAE 90.1-2007 the existing envelope was used for the baseline building.
- Internal Gains:
 - Dining - 2 W/SF LTG, .05 W/SF EQP, 100 SF/PERSON.
 - Kitchen - 1.2 W/SF LTG, 11.15 W/SF EQP, 200 SF/PERSON
 - Storage - .8 W/SF LTG, NO EQP, NO PEOPLE
 - Retail - 1.7 W/SF LTG, 2 W/SF EQP, 300 SF/PERSON
 - Office - 1.1 W/SF LTG, .75 W/SF EQP, 200 SF/PERSON
 - Corridor/Bathroom/Mech - .8 W/SF LTG, NO EQP, NO PEOPLE
- Ventilation: ASHRAE 62.1 - 2007 requirements.
- Mechanical: VAV w PFP Boxes, DX cooling, Electric Resistance Heat, 75F drybulb economizer, .3 minimum primary air, 9.5 EER

Conclusion

Each of the measures was added in the order above to the baseline model. The savings shown in Table 1 are cumulative. Some of the measures, particularly measures that reduce the heating energy use, interact and won't necessarily save the predicted amount with a different suite of measures. Final choices about envelope materials, detailing, and mechanical system type will also change the final savings predictions.

In addition to LEED points, the project has a goal of meeting the 2030 Challenge. Using the 70% savings goal set for 2015 by the 2030 Challenge gives the following energy use intensities for the different occupancy types:

Occupancy	EUI 2015 (70% Savings)
Retail	24.8
Restaurant	90.6
Office	12.9
Weighted Average	30

The proposed package of measures achieves the 2030 target for this building. LEED EA credit 1 points are relatively simple to achieve with envelope improvements, because the existing envelope is completely un-insulated, there are a lot of single pane windows, and the building is likely to be very leaky. Achieving the 2030 challenge EUI goals is more challenging, and will require a high efficiency mechanical system and tenant guidelines that specify mechanical system type and performance, and lighting power densities. EUI goals are also more subject to tenant behavior. For instance, a busy restaurant with more intense cooking equipment loads could have double the EUI, which would push the laundry building over the 2030 Challenge limits for 2015.

Executive Summary

We performed an analysis to determine the effects of the various energy savings measures proposed for the Laundry Building, both in terms of annual energy use and potential LEED points compared to an ASHRAE 90.1 2007 baseline building. The proposed energy efficiency measures are:

- WSEC-2009 Zone 1 Insulation & Lighting Power Density Reductions
- WSEC-2009 Zone 2 Insulation
- High Performance Glazing
- Daylighting
- Variable Refrigerant Flow Split System Heat Pumps

Predicted savings and LEED points for the above measures are shown in Table 1. Note that the measures listed in the tables are cumulative, so each measure added assumes that the earlier modeled measure is in place.

Table 1: Commercial Analysis

Run Name	Run Number	EUI (BTU/SF)	Energy Cost (\$/SF)	% \$\$ Savings	LEED Points
ASHRAE BASELINE	1	75,816	1.88	NA	NA
WSEC ZONE 1 INSULATION	2	62,487	1.37	31%	14
WSEC ZONE 2 INSULATION	3	51,478	1.34	32%	15
HIGH PERFORMANCE GLAZING	4	38,660	1.00	46%	21
DAYLIGHTING	5	35,387	0.92	54%	21
VRF	7	25,294	0.65	67%	21

With all of the proposed measures, the project should be able to save roughly 67% over the baseline for a total of 21 EA credit 1 points under LEED CS - 2009.

Each of the energy efficiency measures was modeled as follows:

- WSEC 2009 - Zone 1 Insulation & Lighting Power Density Reduction:
 - Below Grade Walls & Above Grade Walls: Internal 2x6 wood-frame w/ R-21 batt insulation.
 - Roof: Continuous R-30 rigid insulation entirely above deck
 - Windows: Existing Single-Pane Windows
 - Lighting Power density reduced to WSEC-2009 levels for occupancy types listed above.
- WSEC 2009 - Zone 2 Insulation:
 - Below Grade Walls & Above Grade Walls: Internal 2x6 wood-frame w/ R-13 batt + R 7.5 continuous insulation.
 - Roof: Continuous R-38 rigid insulation entirely above deck
- High Performance Glazing: NFRC U-Value of .25 (includes frames), SHGC .59
- Daylighting: The daylight zones are modeled with the following controls:
 - Lighting setpoint: 50 fc
 - Control Type: Continuous.
 - Minimum Power Fraction: .3.
- Variable Refrigerant Volume Split System Heat Pumps:
 - Ductless indoor heat pump units per zone
 - Heat recovery ventilation with ERV