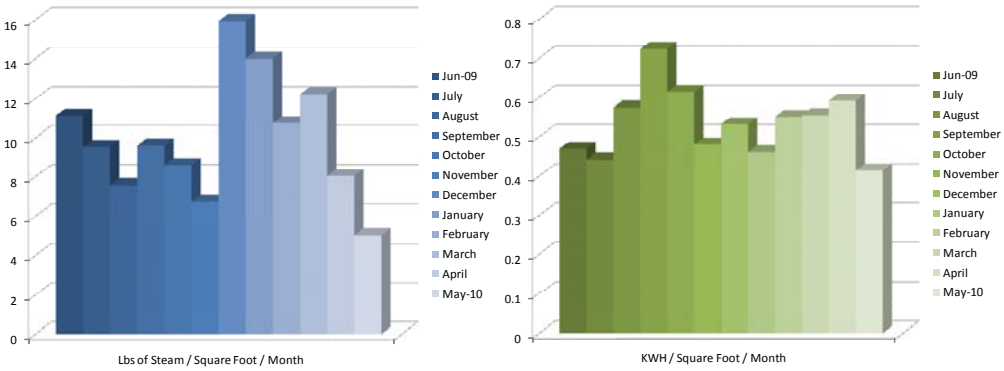
Art + Architecture North

By Monika Kuhnau and David Pagel

The Art and Architecture North building has been serving students at the University of Idaho since 1966. As the college has grown the building has moved from housing Architecture and Interior Design studios, to including Art, Virtual Technology & Design, and some faculty offices. Today Art and Architecture North (AAN) serves as studio spaces and computer labs for over 800 students at the university.

The only major remodel to affect the space was the inclusion of 2 level sky bridge to connect AAN to an elevator as well as the neighboring Art and Architecture South. Then in 2008 a large scale lighting systems upgrade took place across campus changing out all T-12 fluorescent bulbs for the more efficient T-8 bulbs.

Over the course of the Fall 2010 semester, information was gathered, hypothesis were made and tested, and suggestions were proposed by students of Bruce Haglund's Building Vital Signs class. The following is an overview of this information.



Steam and Electric Use 09-10 year

The Building as a Whole

The initial study was to assess how well the building functioned in terms of electricity use and steam consumption (the main source of heating), when compared to other buildings on the University of Idaho campus. After obtaining monthly readings from the 07-08 and 09-10 school years (readings from June to May), the buildings overall EUI was calculated. AAN's EUI for 07-08 was 202, and for 09-10 it was 164. When compared to the University of Idaho average of 166, AAN scores slightly better than the average campus building.

EUI

Annual Building Energy Use (kBtus or MJ)/ Building Area (ft^2 or m^2) = EUI

2010

147879 KWH = 504563.148 kBtu
504563.148 kBtu/23100 sq.ft. = 21.84 EUI
2758730 lbs = 3293923.62 kBtu
3293923.62 kBtu/23100 sq.ft. = 142.59 EUI
Total 2010 EUI = 21.84+142.59 = 164

2008

220319 KWH = 751728.428 kBtu
751728.428 kBtu/23100 sq.ft = 32.54 EUI
3276980 lbs = 3912714.12 kBtu
3912714.12 kBtu/23100 sq.ft. = 169.38 EUI
Total 2008 EUI = 32.54 + 169.38 = 202

BUILDING AT A GLANCE

Name Art and Architecture North

Location Moscow, Idaho

Architect Hummell, Hummell, Jones & Shawver (Boise, ID)

Owner University of Idaho

When Built Construction begun 1965, occupied 1966

Major Renovation 2007

Renovation Scope Lighting upgrade, lighting occupancy sensors

Principal Use Studios, computer lab, faculty offices

Occupants 830

Gross Square Footage 23,100

Cost $475,000

DISPLAY ENERGY CERTIFICATE

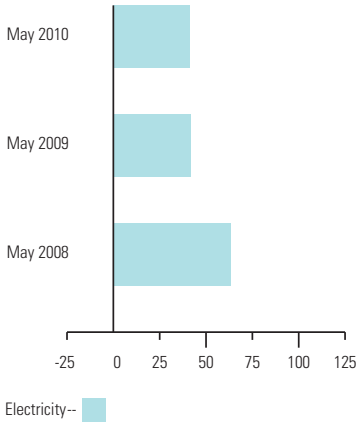
Art + Architecture North

University Ave
Moscow, ID 83844

Certificate Reference Number:
17C4-45B2-5A45-0003

Total CO_2 Emissions

This chart shows you the annual Carbon Dioxide emissions that the building emits. It shows tons per year of CO_2.



Technical Information

This tells you technical information about how energy is used in this building. Consumption data based on actual readings.

Main heating fuel: Steam
Building Environment: Air Conditioned
Total useful floor area (Sqft): 23,100

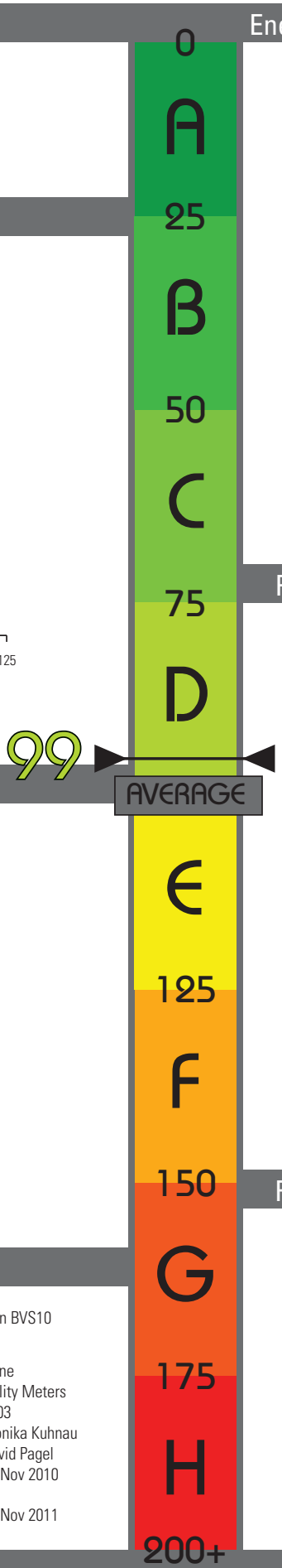
	Heating	Electrical
Annual Energy Use (Sqft/year)	119 Lbs	6.4 kWh
Typical Energy Use (Sqft/year)	126 Lbs	7.4kWh
Energy from renewables	100%	58%

Administrative Information

This a Display Energy Certificate as defined in BVS10

Assessment Software: None
Assessment Tools: Utility Meters
Property Reference: 0003
Assessor Names: Monika Kuhnau
David Pagel
Issue Date: 11 Nov 2010

Valid Until: 11 Nov 2011



Energy Performance Operational Rating

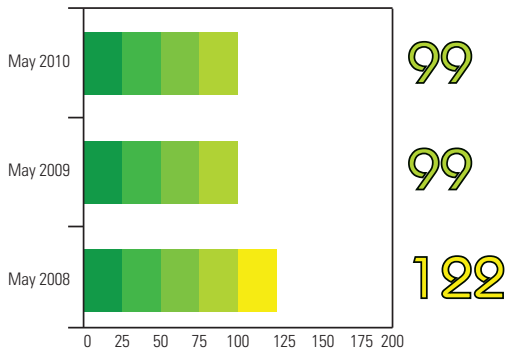
The sliding chart in the middle describes how efficiently energy has been used in the building of note. These numbers do not represent actual units of energy consumed but are adjusted numbers based on the Energy Use Intensity (EUI) for comparison to the average energy use from buildings of this type. 100 is the adjusted average.

The Energy Performance Rating for this building is determined through use of the following equations:

X*Y = 100
(A/B) * Y = Energy Performance Rating
where,
X= Average EUI for this building type (KBTU/sqft)
Y= Adjustment Factor (sqft/KBTU)
A= Total Energy Usage for one year in the building of note (KBTU)
B= Total Floor Area in the building of note(sqft)

Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods.



Recommendations

This area of the text is for any recommendations that should or can be made to the building to improve its performance.

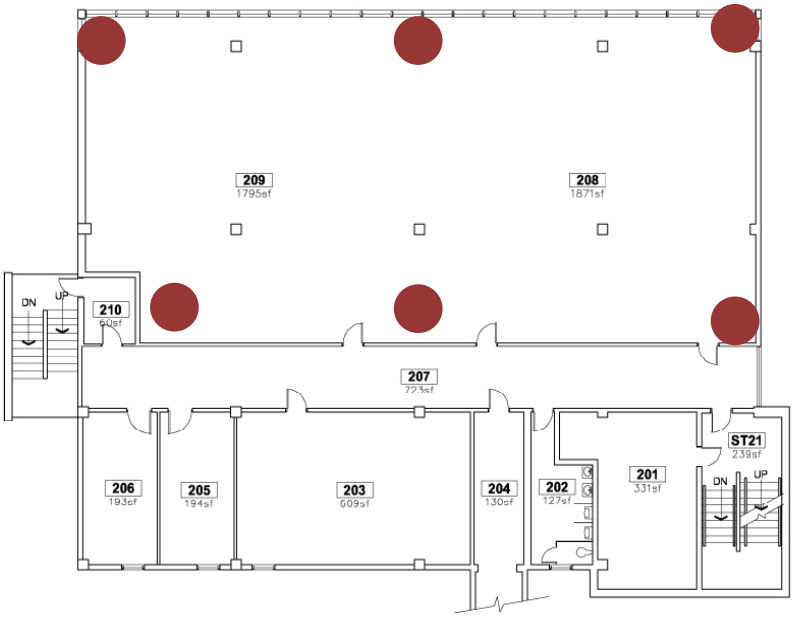
Recommendations for improving the energy efficiency of the building are contained in:
High Performing Buildings Article AAN Winter 2010 issue

Second Floor Temperatures

The first hypothesis proposed was simple, to test the HOBO's used to gather data: Studio spaces closer to the windows on the second floor in AAN experience more extreme temperature variations than those at the back of the room.

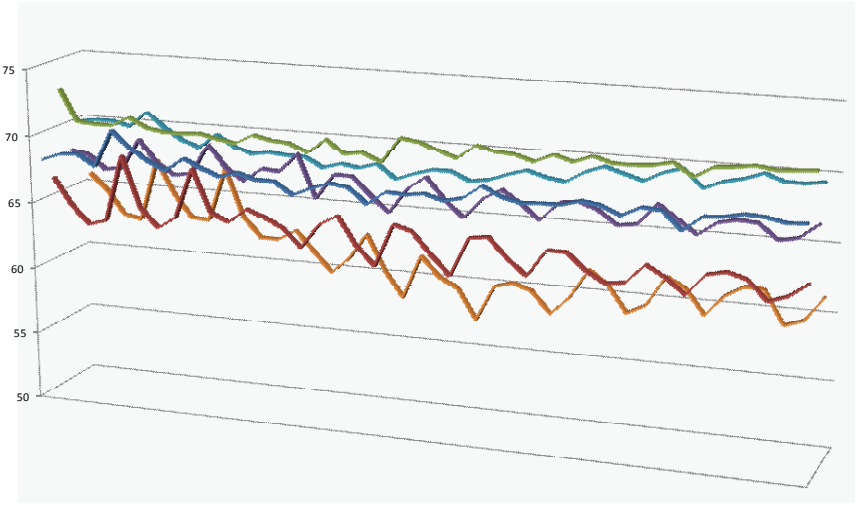
Six HOBO's were placed throughout the space for 10 days gathering temperature data every 10 minutes. After the testing period was up and data collected, this hypothesis was proven correct (see sidebar).

Based on these results a few suggestions were made to improve the space for current and future students. The first is to replace the existing single pane glazing with a higher quality, better insulating glass. The second was to encourage the use of the operable windows in the space for better ventilation when temperatures reach the high levels of the comfort zone. A final suggestion was to adjust the air supply system so that a more even distribution of temperature controlled air would reach all zones within the space.



Location of the temperature HOBOs

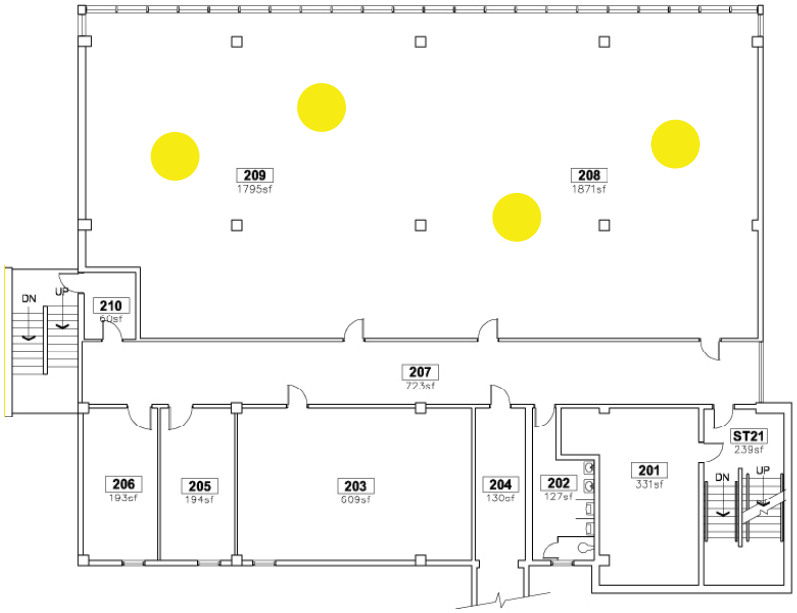
Previous Page:
Building Performance certificate for the building under study as displayed in the studio space.



Temperature readings from the HOBOs over the period from Nov 17 to Nov 27 2010. The orange, red and purple were the HOBOs located near the windows. The green, light blue, and dark blue, were the HOBOs located at the back of the room. Temperatures ranged from a low of 58 degrees to a high of 73 degrees Fahrenheit.

Second Floor Lighting

The second hypothesis tested stated: The occupancy sensors installed in the 2nd floor studio space inefficiently provide excess light during hours where daylight is sufficiently present. HOBO's were again used to test this hypothesis. The same period of 10 days was set with the HOBO's collecting temperature and luminosity readings every 10 minutes. After analyzing the data, it was shown that the electric lights were on during hours where students occupied the space even though there was a sufficient amount of daylight

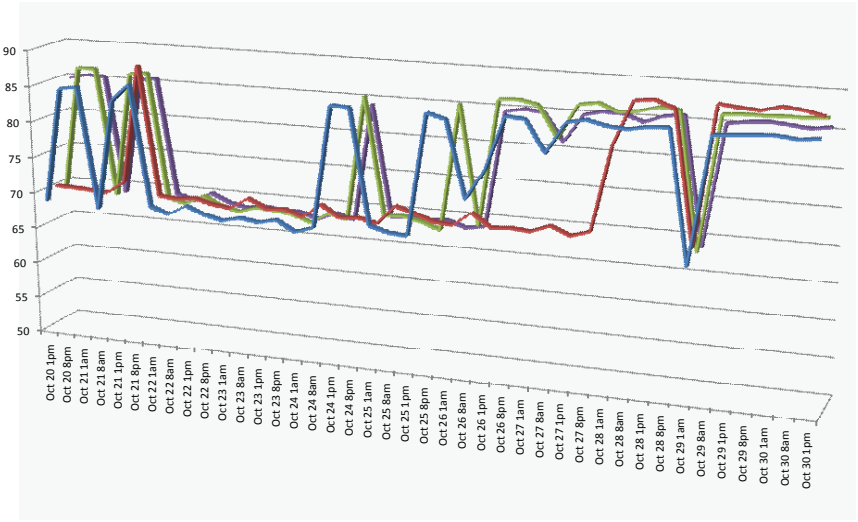


Location of the lighting HOBOs

Digital model analysis of how natural daylighting penetrates into the 2nd floor studio space.

present for the tasks at hand.

Again suggestions were made as to how to alleviate this problem. The first was to remove the occupancy sensor in the room and replace with a luminosity sensor. The second would be to provide each desk with an individual task light so that extra lighting may be obtained by choice. This would also eliminate the need to light the entire space when only one or two people need the extra light.



Temperature readings from the HOBOs placed within lighting fixtures.

Conclusion

While the University of Idaho Art and Architecture North building is one of the older building on campus it has been shown to perfom above average when compared to other buildings nearby. The previous studies have shown that the building as it curently exists does experience some design flaws. First with innefficient window insulation and second with a poor lighing plan. With simple changes to the existing program the question then arises as to how much better it would perform once a few changes take place.

ABOUT THE AUTHORS

Monika Kuhnau, is a Masters student of Architecture at the University of Idaho expected to graduate in 2012. She also has a BFA in Interior Design.

David Pagel, is a Masters student of Architecture at the University of Idaho expected to graduate in 2011. He plans to continue his education in law upon completion of this degree.