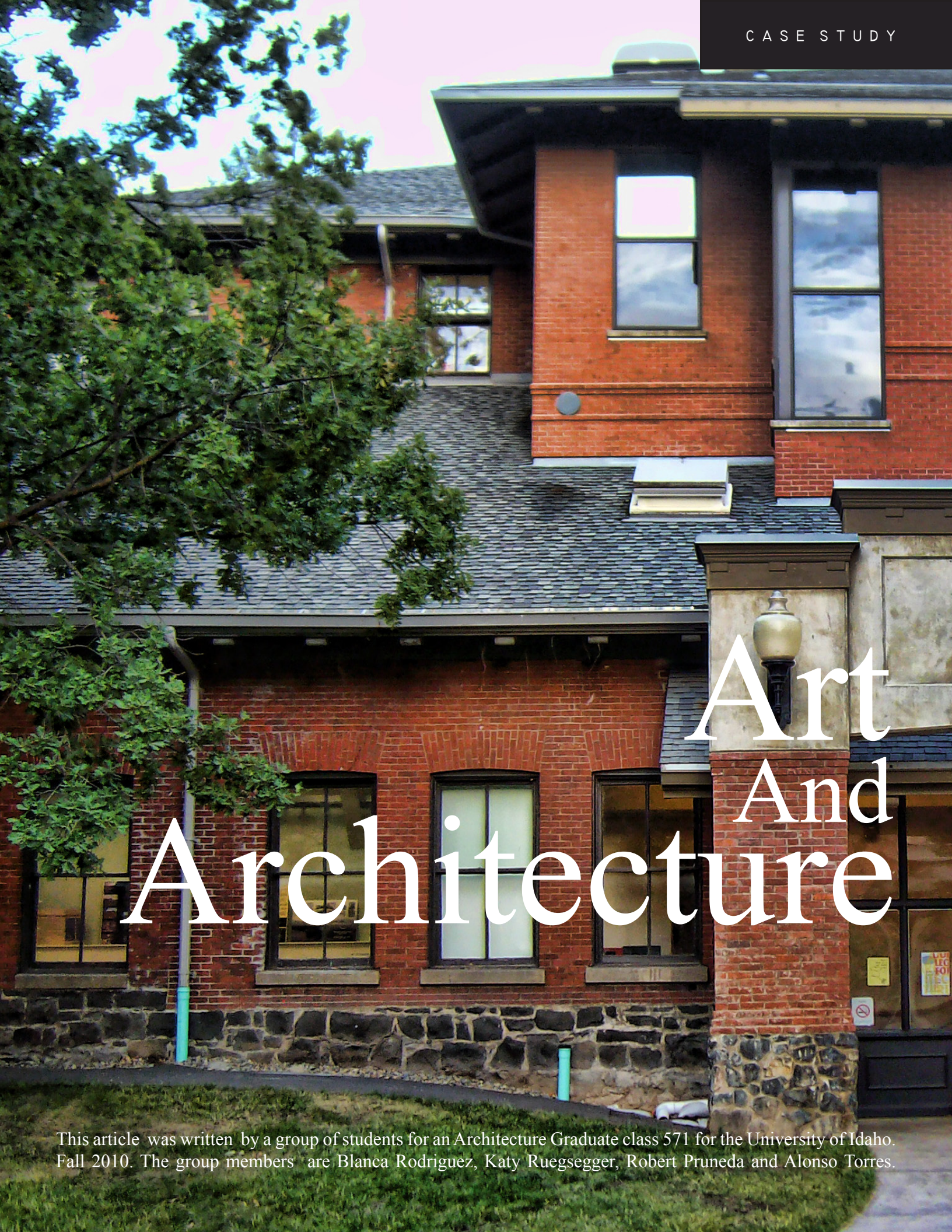
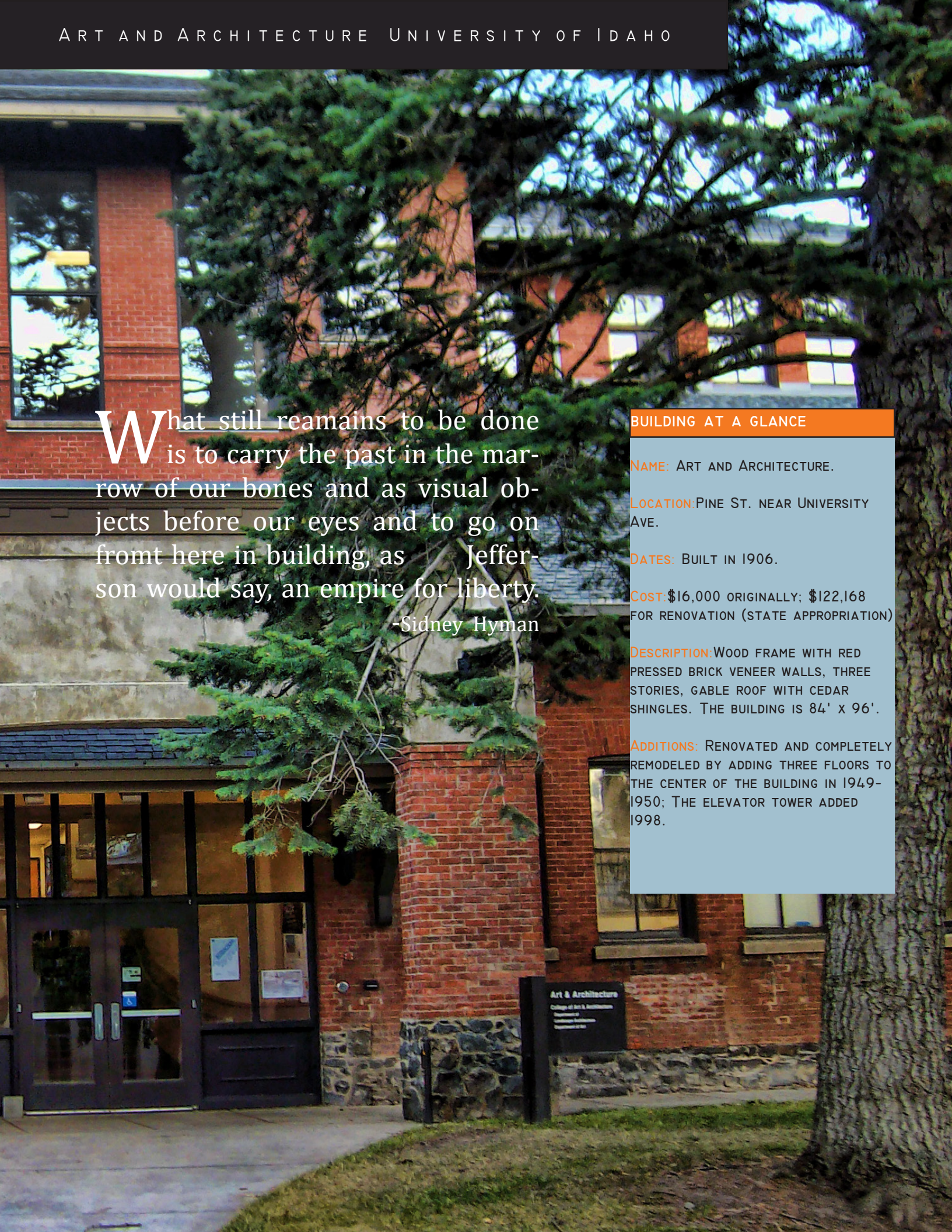


Art And Architecture

This article was written by a group of students for an Architecture Graduate class 571 for the University of Idaho. Fall 2010. The group members are Blanca Rodriguez, Katy Ruegsegger, Robert Pruneda and Alonso Torres.



What still reamains to be done is to carry the past in the marrow of our bones and as visual objects before our eyes and to go on fromt here in building, as Jefferson would say, an empire for liberty.

-Sidney Hyman

Building at a glance

Name: Art and Architecture.

Location: Pine St. near University Ave.

Dates: Built in 1906.

Cost: $16,000 originally; $122,168 for renovation (state appropriation)

Description: Wood frame with red pressed brick veneer walls, three stories, gable roof with cedar shingles. The building is 84' x 96'.

Additions: Renovated and completely remodeled by adding three floors to the center of the building in 1949-1950; The elevator tower added 1998.

History

The University of Idaho is known to be the school of the arts. Architecture along with the arts has been a very competative program. The college of Art and Architecture has evolved over the years into one of the most looked up to colleges of the state.

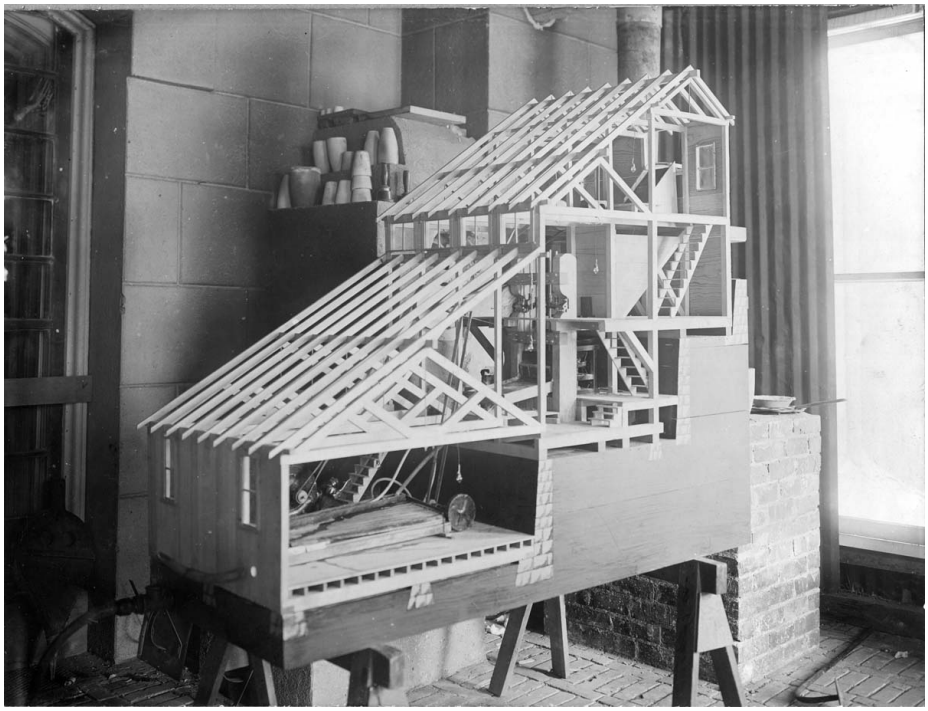
The current building where the college of Art and Architecture is located was originally a metallurgical laboratory used for student work and metallurgical research. It was originally constructed as a heating plant then later transformed into the university maintenance shop in 1927. The completion for the building was done in 1909 with a renovation in 1950-1951 to become the Agricultural Engineering Mines Building. Later, in 1961 it became the Psychological Building housing classrooms, offices and laboratories. In 2001, the once Agricultural Engineering Building became the College of Art and Architecture. Historically the building has had various names starting with Metallurgical Building, Mines Building, Psychological Building and presently the Art and Architecture Building.

The building initially cost $16,000 to build, and after all renovations the final cost according to state appropriation $122,168. The construction of the building is a three story, gable roof with cedar shingles, wood frame with red pressed brick veneer walls.

The building currently is separated into a variety of spaces for students and faculty. The Art and Architecture college administration

offices are located on the second floor where they house the college dean Mark Hoversten, art faculty, bioregional planning faculty, landscaping architecture faculty and a staff meeting room. There are classrooms studio spaces located on a every floor, on the first level they are used by the graduate study architecture students as well as bioregional planning students. On the upper floors the classroom studio spaces are used by the landscape architecture students. Students and faculty have a space where they are able to do research and explore different materials for design projects.

Images gathered from the University of Idaho Special Collections Library.



With its competitive programs to help students exceed and teach evolving ways of creating and recreating the built environment with innovative design, the college of Art and Architecture is located centrally on the center core of the University of Idaho campus. The 15,330 square feet art and architecture building is located on the North West corner of University Avenue and Line Street. Neighboring the building is the Interior Design building to the North, the Life Science Building to the East, the Administration Lawn and Building to the South, and the Common Grounds Building along with trees to the West.

The image above is a smaller model of the building showing the structural components of the building. The section is through the basement and staircase. To the right, the image is taken of the back of the building. The image below is showing the relationship of the building and it's connected site compared to the rest of campus. The image below was taken directly from GoogleMaps after the construction of the Commons building to the West.

SURVEY & FIELD RESEARCH

Through the survey research method we gathered data which produced deductive investigation to either prove or disprove the basic hypothesis that there is a lack of correct manipulation of the space for occupant comfort. We constructed a fifteen question survey to not only receive information from the occupants but educate them as well about what they experience every day and how they can improve it.

According to the results we collected from the surveys, we found that all of the users of these areas are Graduate Students, half in room 100 and the other half across the hall in room 101. Approximately fifty percent of the students have been using the space anywhere between one and two years. The rest of the students have only been using the space for a year or less. They usually are in these spaces five days a week (Monday through Friday) and occassionally on the weekends when the building is not very populated. percent of the students inhabit the space for approximately six hours during the morning, noon, and afternoon (during daylight hours).

We discovered that seventy percent of the students are comfortable with the temperature and are able to change the thermostat.

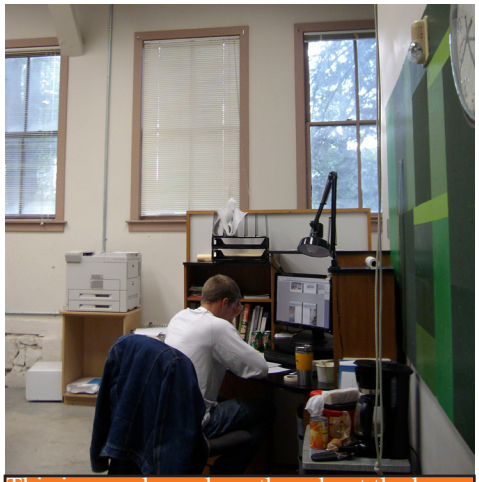
We believe that the reasoning behind the comfortability level of the students while using the space is because of the particular time of day they are occupying it. However, students in the southern classroom are exposed to more direct sunlight at more times during the day; in contradiction, the students in the northwestern classroom do not receive the harsh sunlight that the other students do. When speaking with the Bio-regional planning students, they seemed oblivious to the thermostat settings, they did not change it, yet they seemed generally comfortable.

We also recognized that the classroom 101 has smaller windows on the north wall due to the topography of the hill which deprives natural light from infiltrating the room. This situation intensified the usage of electrical lighting (it stays on all day long regardless of natural light).

According to these intial findings, it is suffice to say that this is primarily a transition space where students do not stay very long therefore are unfamiliar with its innerworkings nor are they well informed about them.

We found that four out of five students that we questioned sit within about five feet of a window. The layout and placement of the desks line the exterior walls which have windows. They are also able to manipulate the blinds and open and close the windows. Since accessibility to controlling the amount of natural light entering in is easily attainable by the occupants, there is no need for artificial lighting.

This image shows a newer renovation done by the University Facilities Team in 2008. The retaining walls include native foilage to keep a year round elegance.



This image shows how thoughout the hours students spend time in the studio spaces there is enough lighting in the space for comfortable working.

The Materials lab is used by students of the College of Art and Architecture. Materials are used for research when working on projects for classes.

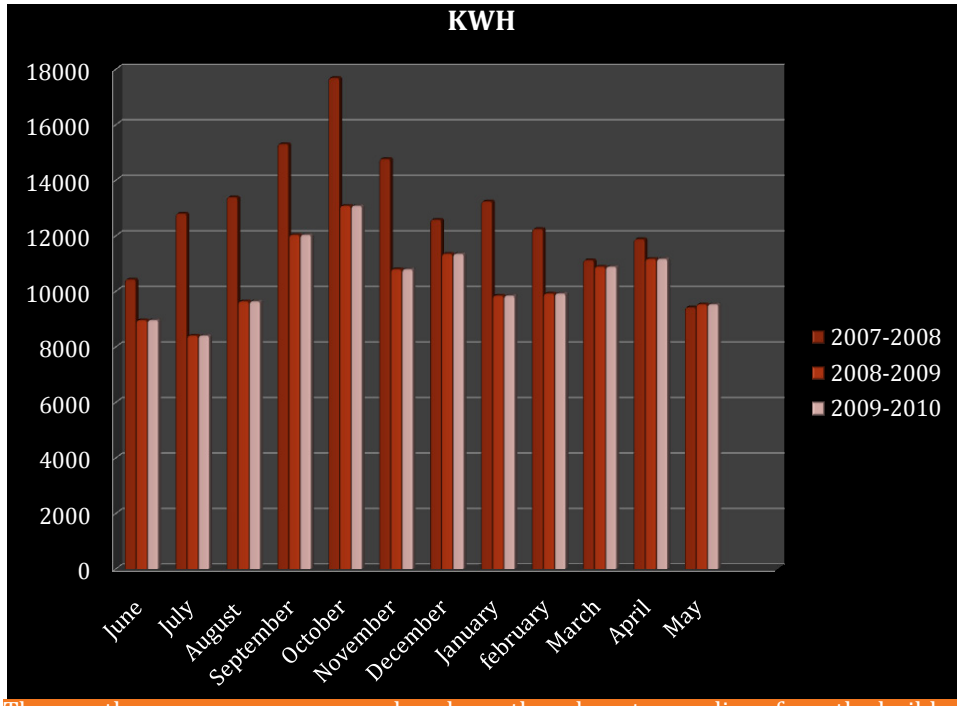
PERSONAL OBSERVATION

The majority of our group has experienced, first hand, what these spaces are like. The majority of the time spent there was during the daytime where sufficient light penetrates via the glazing system. We were able to manipulate the blinds and during the warmer seasons (spring and summer) there was more glare to deal with. People sitting in the far back corners are deprived of most of the natural light coming in. Depending on the angles at which people are sitting or have their computers set up, glare can be a problem even without direct sunlight.

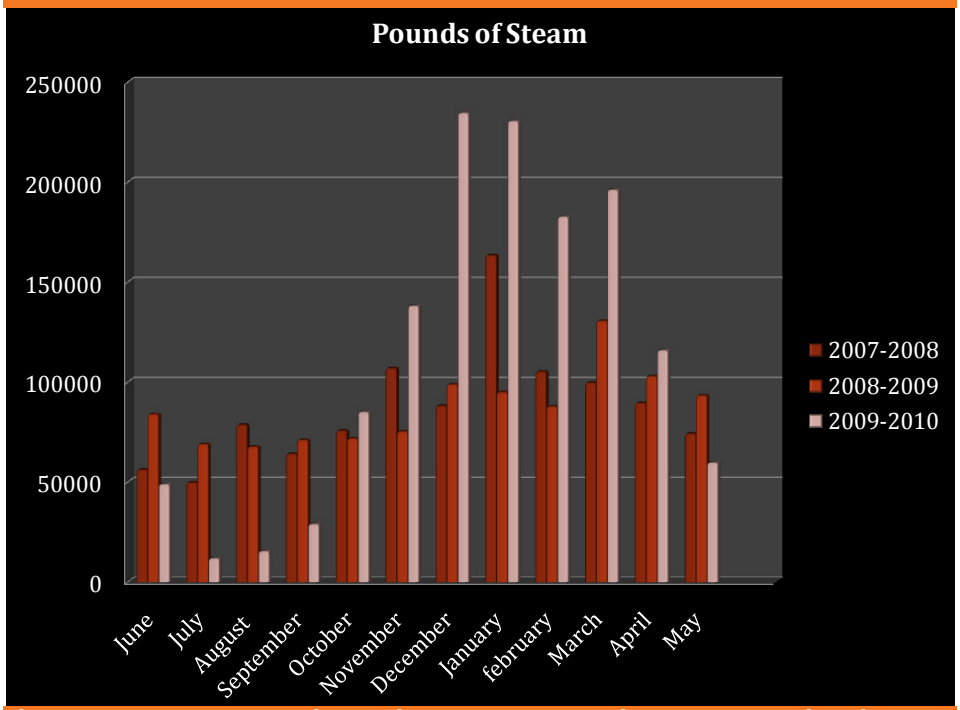
In room 101, the windows on the north wall are about 1/3 the size of the windows on the southern-most wall in room 100. The north side of the building is also bordered by a small 15' space to the Interior Design building along with trees. These factors tend to mitigate potential natural light penetration.

The main foyer located on the west side of the building has a high percentage of glazing. The windows are inoperable (with the exception of the doors). There are no blinds and the lights are almost always on (day or night). The electrical lighting in this area is an overabundance and mostly unnoticeable since (either on overcast days or with clear skies) there is more than enough daylight to see things clearly. This area is mainly a transition space used to get from one area to another with entrances to the bathroom and elevator here as well.

Students typically leave their belongings and spend numerous hours in the space thoroughout the year. These spaces are like another home for students.



The way the energy usage was analyzed was though meter readings from the building of three fiscal years that were analyzed (2007-2010). Through the observation and conversion of all of these three years, it is apparent that the lowest month energy usage is the month of July. This is due to the reduction of energy use during the summer. The month with the highest is October because of the increase in the need for mechanical lighting. The increase in mechanical lighting comes because of the reduction of day light as the days get shorter. In addition there is a significant drop in energy usage from the fiscal year 2007-2008 to 2008-2010 because between these years the types of lighting fixtures were changed to more efficient ones.



The same strategy was used to analyze steam usage. This steam is produced through a steam plant on campus that provides steam for heating to a large number of buildings through a serious of ducts. The AA is one of these buildings. Throughout these three years the year with the most usage is 2009-2010 because during that year renovations were made and more steam was available. The month with the greatest usage is December because of the increase in heating requirements and July is the month with the lowest as it is summer and heating is not required.

Energy Usage Analysis

The energy certificate is used to showcase the way energy and the amount of energy the Art and Architecture building uses. There are different areas that were studied each dealing with energy levels.

The total CO2 emissions of the Art and Architecture building were compared over three years on the month of March for each year. The years were; 2008, 2009, and 2010. The graph shows two different sources that produce CO2 if the energy that is used to produce these sources. The third source on the graph is renewable energy, which indicates such resources as wind and hydro power. As seen in this graph the only source that produces CO2 levels in the Art and Architecture building is electricity. Heating does not produce CO2 because steam-powered energy from the Steam Plant (located on the campus) is used to heat the building. Currently the university is not implementing any form of renewable resources.

The information that is presented in technical information is one that shows how energy is used throughout the building. As seen on this section, the typical energy heating levels is 120 while electrical is 95. This building uses 97 in heating and 79.2 for electrical. Also it gives the percentage of energy that is renewable. In administrative information, information such as occupancy, date, floor area, number of floors and building usage can be found. Operational ratings can also be found on the certificate. Three years where compared and they were done in the month of March as well during the 2008, 2009 and 2010 years. The number that is associated with the graph is the Energy Use Intensity (EUI). The measurement ruler in the center of the certificate indicates the EUI, the higher the number the less efficient the use of energy is. As you can see, 100 is an average score; the one displayed for Art and Architecture is 110, a little below average but not by far. This number can be brought down with strategies that will be discussed later.

DISPLAY ENERGY CERTIFICATE

University of Idaho Art & Architecture

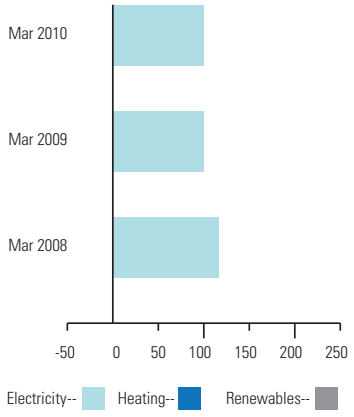
Studio spaces & Foyer

Moscow, ID 83844

Certificate Reference Number:
1232-3453-5345-3188

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 Exchange
Total useful floor area (m2): 107.137
Asset Rating:

	Heating	Electrical
Annual Energy Use (kWh/m2/year)	97	79.2
Typical Energy Use (kWh/m2/year)	120	95
Energy from renewables	100%	60%

Administrative Information

This a Display Energy Certificate as defined in SI2007:991 as amended.

Avg. Occupancy/ Day: 100
Certificate Issue Date: Nov. 16, 2010
Total Floor Area: 18,397 sqft.
Number of Floors: 3
Building Usage (hours/week): 40

Energy Performance Operational Rating

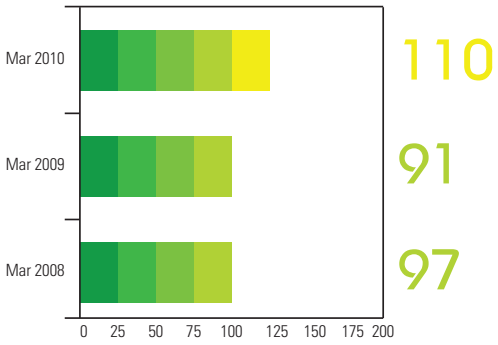
The sliding chart in the middle describes how efficiently energy has been used in the building of note. These numbers do not represent actual units of energy consumed but are adjusted numbers based on the Energy Use Intensity (EUI) for comparison to the average energy use from buildings of this type.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

In order to decrease electrical bills, turn thermostat to a lower than comfortable temperature and turn off lights when not in use (after building hours). Integrate ample shading devices to diffuse direct sunlight and provide ambient light for students. Glazing can be upgraded to more suffeicient standards (ie; double pane, low E, tighter seal in frame) so as to not let in harsh sunlight and outdoor temperatures.

Recommendations for improving the energy efficiency of the building are contained in Report Reference Number 1234-1234-1234-1234

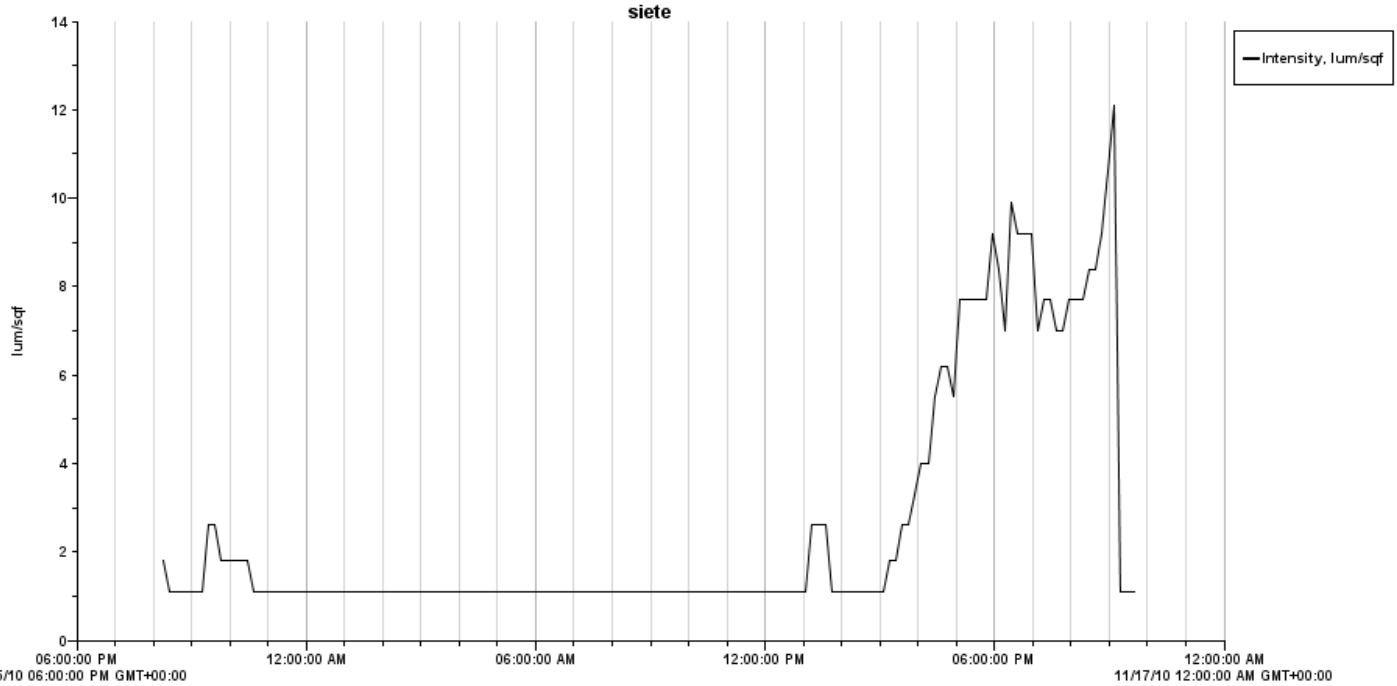
Lighting

The west façade receives enough daylight to avoid the use of the indoor mechanical lighting during the day in both the foyer, the landscape and architecture studios on either side. There is a superfluous usage of electrical lighting that could be mitigated by integrating certain daylighting design strategies. There are several large trees that also filter the sunlight in the afternoon. The only direct sunlight is at midday because there are no obstructions.

We placed HOBOs in strategic areas in each of the studios and by the entrances in the main foyer to test the luminosity that penetrates through the windows. These also measured temperature and relative humidity of each of the locations.

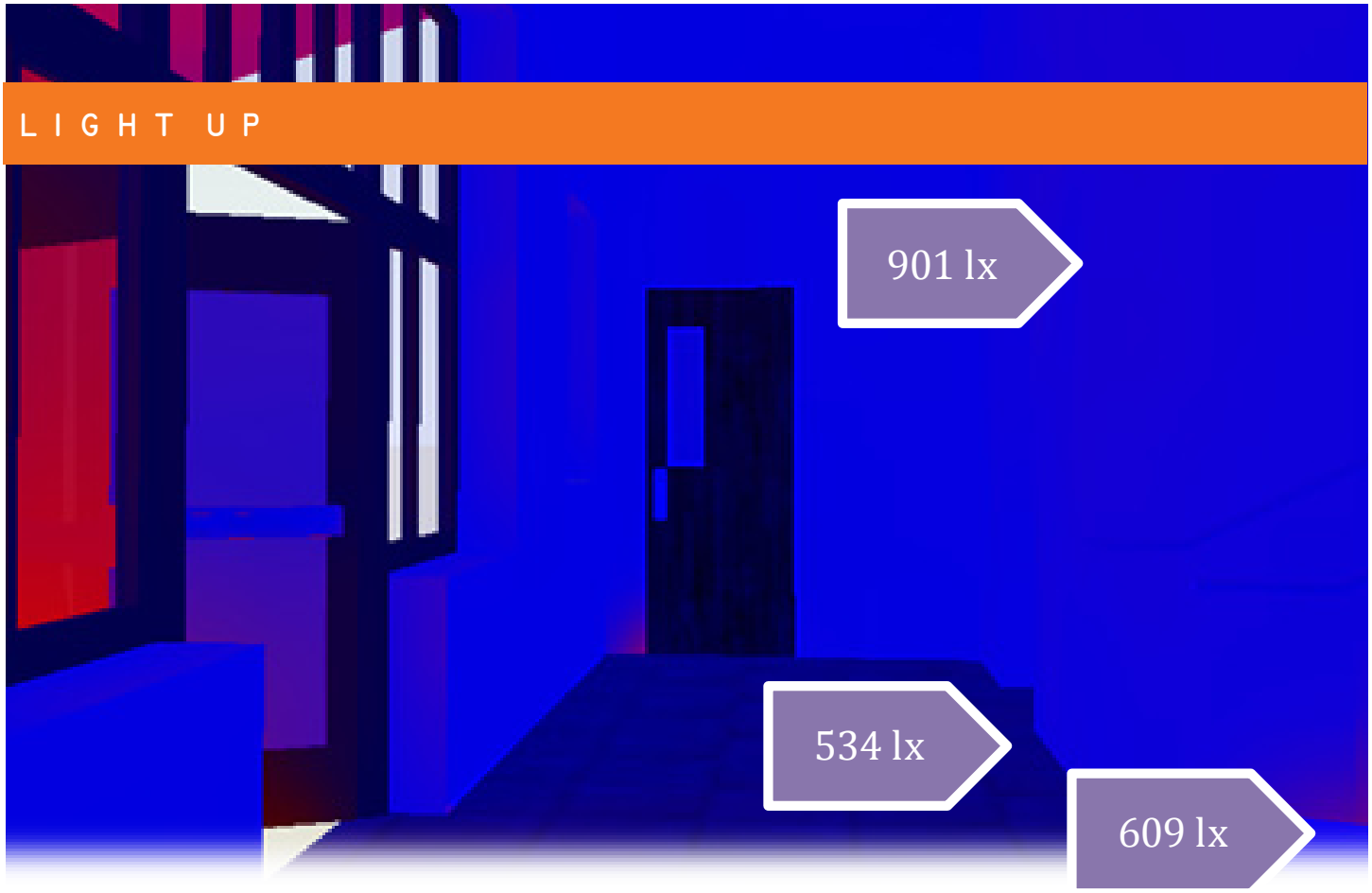
Current lighting conditions consist of florescent light fixtures that are located in the foyer as well as in the studio spaces. These light fixtures are on even when there is sufficient day light entering the space, thus using more energy then what is needed.

There are windows in on the west façade as well as the north and south. The west façade has a total of 12 windows which provide sufficient day lighting throughout the day. The north facade does not recieve direct day light but it still filtered light into the space during daylight hours. In addition the southern façade also provides enough daylight through three windows. If used correctly these windows provide sufficient light to work without the need for mechanical lighting. The windows are also shaded with internal shades do to the fact that some of these windows give out a lot of glare to the many computers that are within the studio spaces.

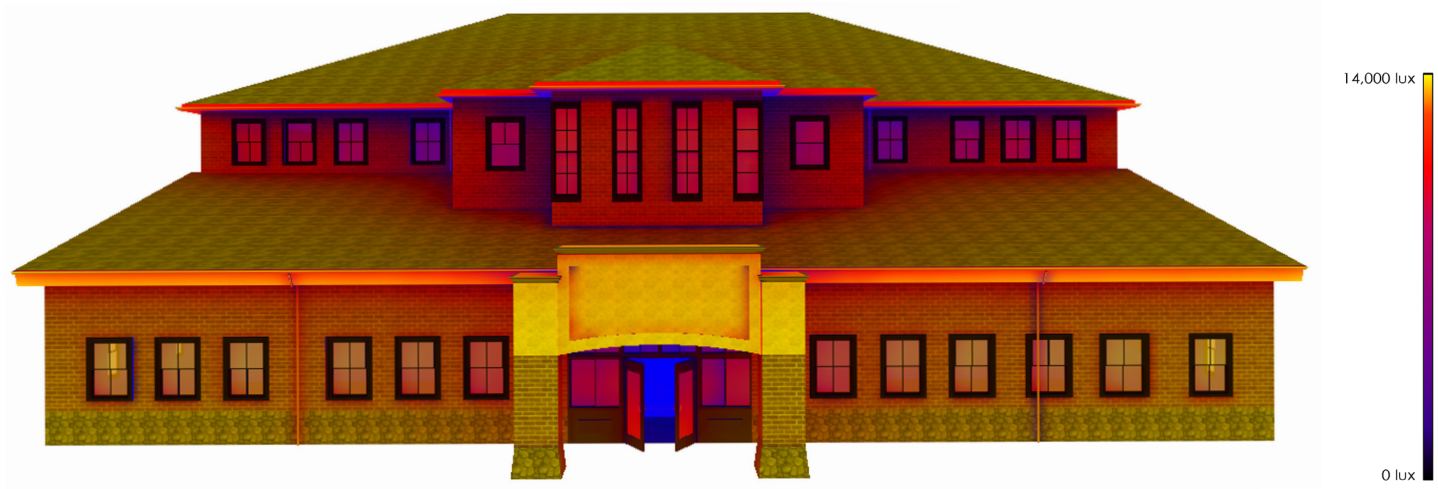


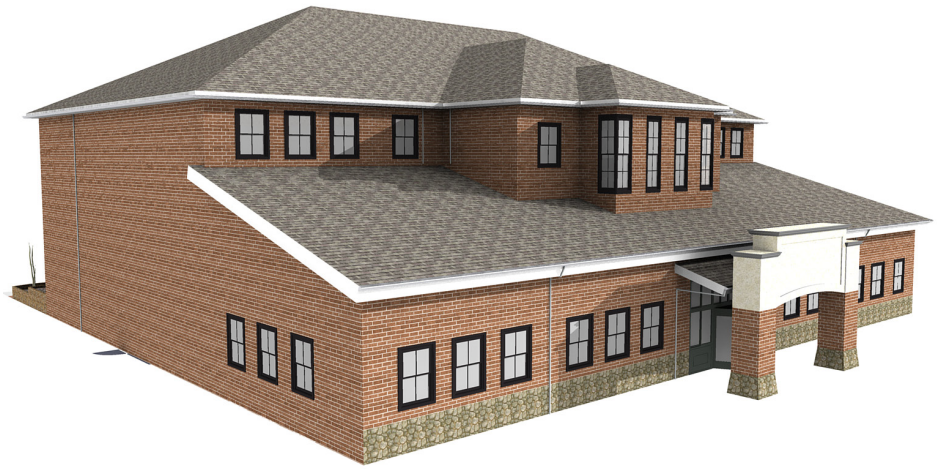

Tool used on Focus Area
Art & Architecture

LIGHT UP



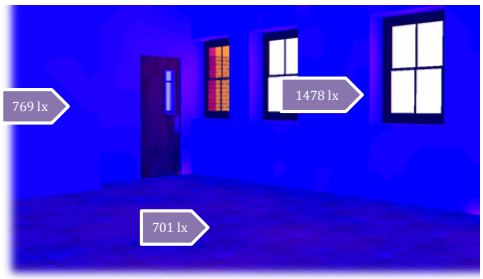
The lighting analysis for the digital 3D model was primarily done with LightUp for Sketchup which is a plugin that adds realistic, real-time lighting to Sketchup models. LightUp helped us produce pseudo colored renderings of the college of Art & Architecture showing the distribution of light throughout the building. From those renderd images we gathered lux (lumens per square meter) data. They revealed the the distribution of direct local light in the model and provided us with a real time light meter to take spot lux measurements. The insolation analysis of this plug-in took into account the Geo-Location of our model as well as the current time of year, to produce a daily Kwh/m²/day visualization. In addition, the light meter gave us spot results for the surface being hovered over, while also tracking the value of the surface to aid in the solar energy analysis.



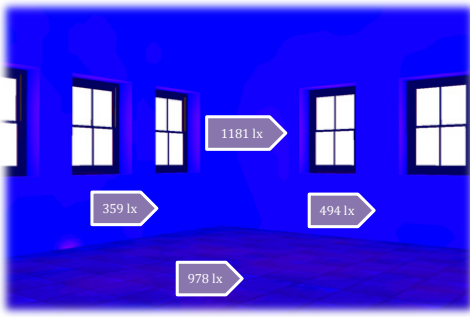


Design

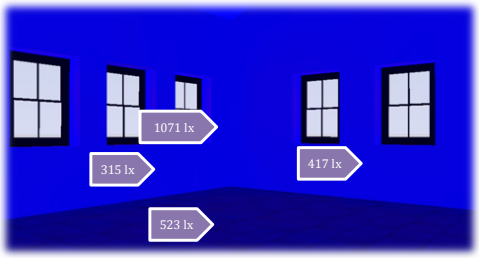
As you may see in these first renderings of the current conditions of the building, the light levels are that on the low spectrum. Not enough sunlight is distributed further into the rooms, which in turn makes the space look rather dark where there are no windows (back of the room). One other problem we noticed while researching was that the height and position of the windows created a glare issue directly on the students work spaces.



The rendering above shows the entrance of the Bio Regional studio space showing the amounts of light entering the space on October 5, 2010 3:03pm.

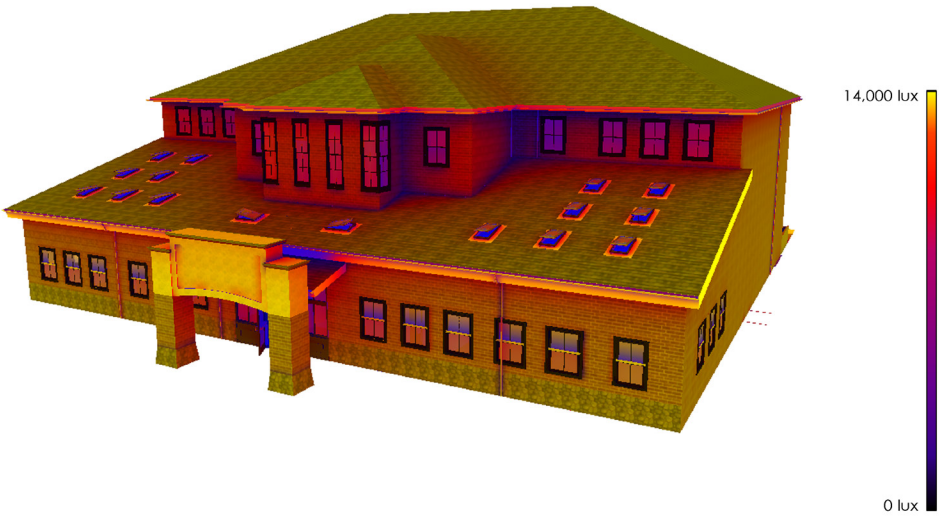


Images derrived from the North East studio space where Bio Regional Students reside as well as the South West studio where graduate Architecture students reside.



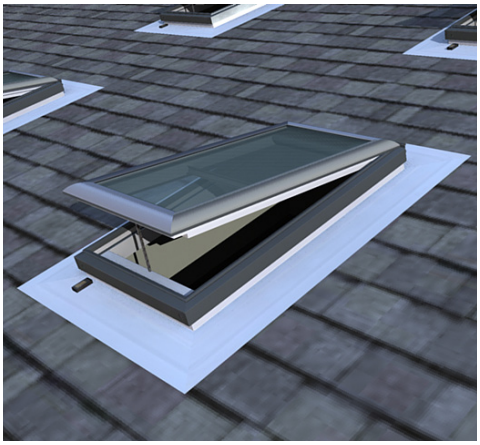
Redesign

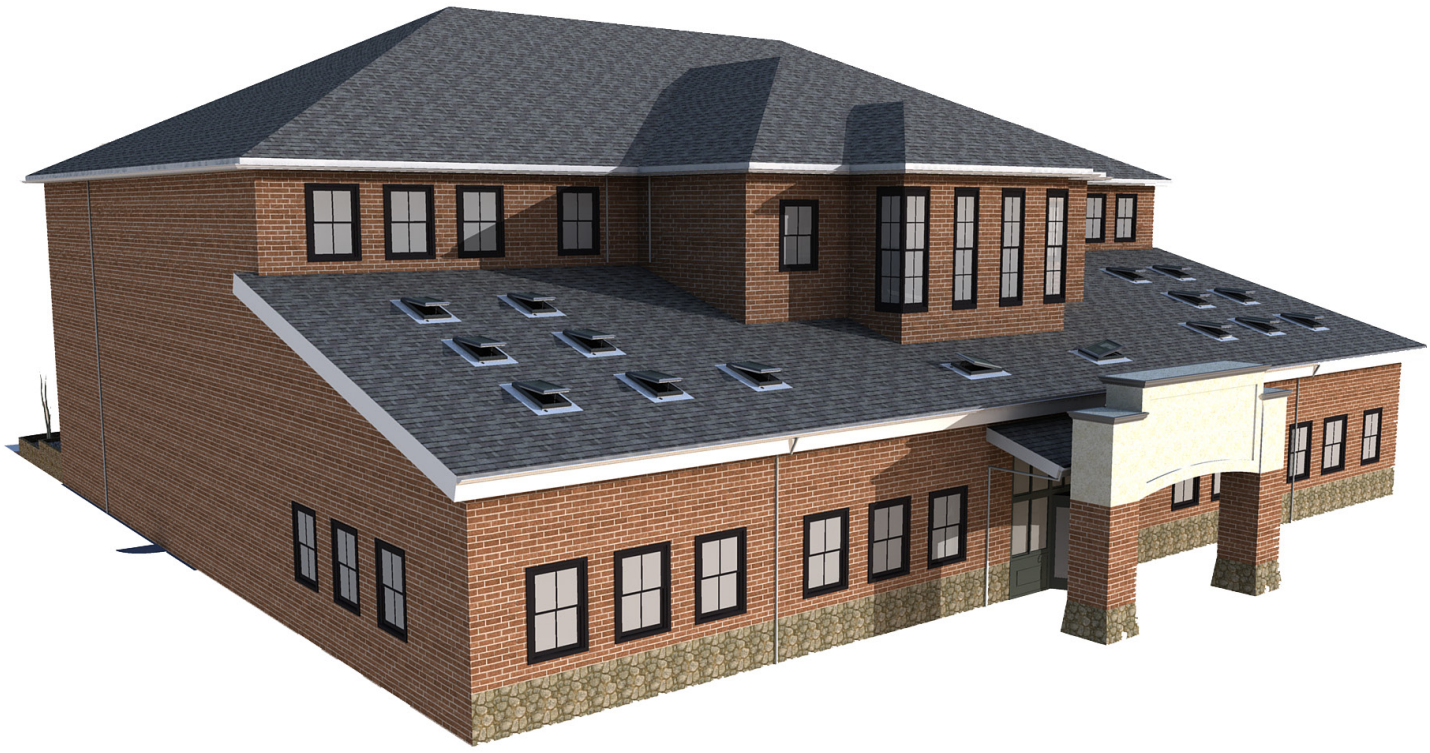
To solve the present issues, we decided to implement two redesign strategies to further distribute light into the rooms, whilst eliminating the glare problems on the student work areas. First we incorporated operable skylights to the design which in turn brought in a little more daylight, but not as much as needed; the operability of the skylights also provided a heat release mechanism for the summer. To further distribute light into the rooms, we attached light shelves to the windows which definitely brought light further in the spaces and completely eliminated the glare problem. The lux levels on these renderings are noticeably higher than the previous renderings on the current design. The integration of the skylights and the light shelves were a complete success; not only did they bring in more light and eliminate glare problems, but they were also useful to exhaust hot air through the roof during the summer.



This image shows the lighshelves that were installed as part of our redesign.

The skylights used on both sides of the building and lobby space.





CONCLUSION

Overall, the methods we used for researching this facility in regards to the natural lighting was sufficient.

After surveying the students that use these two classrooms, we were able to establish a more concrete basis by which experiential data could be manifest. It was interesting to see the responses not only from collecting the data from the questionnaires, but by communicating with the regular users first hand. They seemed to be genuinely interested in how to enrich these spaces with qualitative and quantitative design strategies.

We also were able to incorporate personal input by using our own familiarities from having class in these spaces to provide even more experiential perspectives to enhance our design efforts. This allowed us to understand more fully what the comfort level of the regular users is and how to respond to that.

In addition, we used light measuring instruments (HOBOs) to evaluate the amount of light penetrating particular areas that occupants use frequently. Although this does not decipher the electrical lighting from the natural lighting, we can determine from the users input combined with HOBO placement just how much of each source is illuminating that area. HOBOs are more susceptible to the intensity of natural light rather than the electrical lighting. We also must take into consideration that the electrical lighting hangs approximately two to three feet from the ceilings and the ceilings are 14 feet in height. The placement of the HOBOs was substantially low (on desks and tables) in relation to the light fixtures. Supplemental to HOBO placement, the times that measurements were taken transpired during the winter solstice. There was not sufficient direct sunlight to affect our data dramatically, most days that measurements were obtained were overcast therefore light was diffuse when permeating through the glazing systems.

We also used digital models to simulate existing situations and strategic placements of skylights as a possible solution to the problem of overusing electrical lighting, we discovered that skylights were not enough. We implemented light shelves in addition to the skylights -- this dispersed the light more evenly and further back in the spaces. The latter solution deemed satisfactory in alleviating a major issue of energy usage in this building. Two of the four walls have no direct access to natural light, consequently, allowing light from above is the most feasible option in supplying sufficient light for those students sitting in that area. Because of these tactical simulations, the strategies discussed previously could potentially be implemented with a better understanding of how it will affect the everyday occupants. We believe that these matters of the overuse of electricity for even just these two spaces of one building on our campus could shed some light on how straightforward such ideas could be executed in an aesthetically pleasing manner.