Design Team

Roof
Type Garland R-Mer Lite Roof System, EPS Board, 6" Rigid Insulation
Overall R-value 45.6
Reflectivity 69%

Walls
Type 1x8 TG Vertical Siding, 10" DBL 2x4 Wall Framing, R-38 Batt Cellulose Insulation
Overall R-value 42.4
Glazing Percentage 25%

Windows
U-value 0.31
Solar Heat Gain Coefficient (SHGC) 0.61
Visual Transmittance 80%

Location
Latitude 46.7300° N, 117.0000° W
Orientation E-W

BUILDING AT A GLANCE

Name

Location Moscow, ID

Owner University of Idaho

Principal Use University office building
Includes Classroom, faculty offices, sales room and flex space

Occupancy
Peak Transient Occupancy 10
Daily Average 4
Peak Full-Time Equivalent (FTE) 5
Total peak Building Users (FTE + Peak Transient) 15

Gross Square Footage 2,130
Conditioned Space 2,000
(does not include mechanical room)
Mechanical Room 130

Distinction/Awards
2014 AIA Idaho Honor Awards

Total Cost $495,000 capital

ABOUT THE AUTHORS

Matt T. Garr, LEED T.B.D., ASHRAE T.B.D., NCARB Memeber T.B.D., is currently a graduate student at the University of Idaho and an aspiring architect at Castellaw Kom Architects in Lewitson, ID.
Wesley A. O'Brien, LEED T.B.D., ASHRAE T.B.D., NCARB Memeber T.B.D., is also working for a graduate degree at the University of Idaho and specializes in building energy simulation.

Below The cedar screen stands out as the most prominent feature to the building and was intentionally left unfinished so it could achieve its natural silver patina as it weathers over time.

Basic Information

-

- University of Idaho

History

Located on the University of Idaho's Pitkin Forest Nursery, home for the "Center for Forest Nursery and Seedling Research", sits a new addition to the University the "Reveley Classroom Building (RCB)." The new classroom is sited on land that is dedicated to native plant growth and research it only seems fitting that the entire building from exterior cladding to structure and interior finishes are all locally grown and milled Idaho wood. Local mills joined together to help accommodate the University and architects, Patano Studios, wishes to use all locally grown wood.

The modest sized building only 2000SF it is simply an elevated wood box clad with a rich variety of

Above Upon entering the building, you are first greeted with the 'Flex Space' which can be used for a variety of functions when hosting events. The inclusion of a mini kitchen further expands the possibilities, providing caterers an easy to use station.

?

Renewable Energy Net Zero energy ready with planned addition of a solar panel array.

Envelope Integrated exterior shading and double wall construction.

Site Project footprint on disturbed site, replacing existing doublewide building.

Daylighting Large windows allow natural light into all of the spaces, substituting the need for electric lights.

HVAC High efficiency rooftop units used along with an economizer.

Materials All of the wood used in con - struction was locally procured through Idaho Forestry products.

Carbon Footprint Wood was used as the primary building material, resulting in high amounts of embodied carbon.

locally grown and harvested wood. The classroom building sits up on a concrete platform and the elevated quality of the building gives it a visual presence elevating it above the surrounding green houses and shops. The vertical tongue and groove cedar, that clads the Reveley Classroom Building, is stained black which creates a pleasant contrast that offsets the raw un-stained cedar plank screen that extends off the north face of the building as well as the glue-lam beams that protrude out of the south side of the building. On the east side of the northern facade the sales office cantilevers outward through the raw cut wood plank screen, showing off the black stained cedar as well as a contemporary take on a natural wood store front. Patano Studios added subtle uses of steel and concrete to contrast the natural wood materials of the building, contributing to the overall earthy material tone. The dark and rich materials on the exterior are nicely contrasted by the soft almost white quality of the wood floors and paneling on the interior. The light wood color of the interior is nicely contrasted by the black pellet stove as well as the stained green doors and cabinets. An all wood building sounds overwhelming, yet as seen in the photos, it was carefully detailed and contrasted by small uses of other materials and stains, bringing the components together into a building that rests beautifully on the Pitkin Forest Nursery.

Design

Floor Plan, Double Hung Window, Brick Material

BUILDING TEAM

Building Owner/Representative
University of Idaho

Architect of Record
Patano + Hafermann Architects

Design Architect
Hafermann Architects

General Contractor
University of Idaho

Mechanical Engineer
Energy Control, Inc

Electrical Engineer
Eidam & Associates

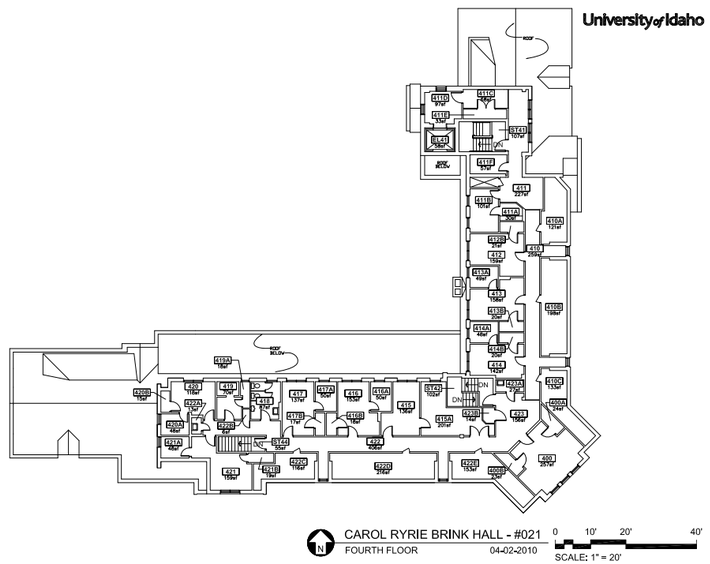
Structural Engineer
DCI Engineers

Civil Engineer
Tate Engineering

classroom takes up the west most third of the building. The classroom has two large sliding doors that give the room the ability to be closed off providing a more quiet setting as well as opened up; creating a large open space that can be taken advantage of for small banquets. The RCB is programed to have: one large classroom, three research offices, two unisex restrooms, a sales/promotions office, a large foyer complete with a quaint pellet stove and large south facing deck that the classroom can slip out onto. This building is composed of a variety of wood types and species. The exterior cladding is all locally grown cedar being utilized outside for its natural ability to withstand moisture without rotting. The interior floors, except in the restrooms, are all locally grown western larch as it is the hardest and most durable of the softwoods, it also has a light finish which helps to bounce light further into the building. The Larch was procured within 25 miles of the building. The untreated wood larch, tamarack and knotty pine wood panels on the interior also helps to bounce light through the building giving it a very light and comfortable feeling. The median distance for acquiring wood was 59 miles and the longest distance wood was harvested or milled was 215 miles, which was for the interior wood veneer. Another key element of the project is the double wall construction which significantly decreases the thermal bridging of a normal stick framed building. The only potential thermal bridging happens where the glue-lam rafters extend through the wall creating the overhang on the south side of the building; however, the sheer size of the members gives them enough of an insulation value that thermal bridging is almost non-existent. Another design element that makes this project sing is the daylighting system, nothing advanced but the narrow nature of the building enables daylight to be utilized as the main source of light as long as daylight is available.

Above Five foot overhang showing off exposed roof structure and T&G soffit. The contrast of the rich natural wood color with the dark wood stain shows off the aesthetic versatility of wood.

Below The naturally light quality of the veneer helps to evenly disperse light throughout the class room space.



Above **Energy efficient LED track lighting** doesn't impede the lofty feel and adds an elegant touch of spot lighting.

ENERGY AT A GLANCE

Annual Energy Use Intensity (EUI) (Site)	37.2 kBtu/ft2
Electricity (From Grid)	37.2 kBtu/ft2
Annual Source Energy	58.9 kBtu/ft2
Annual Energy Cost Index (ECI)	$.38/ft2
Savings vs. Standard 189.1-2009 Design Building	35%
Heating Degree Days (base 65°F)	6637
Cooling Degree Days (base 65°F)	735
Average Operating Hours per Week	45

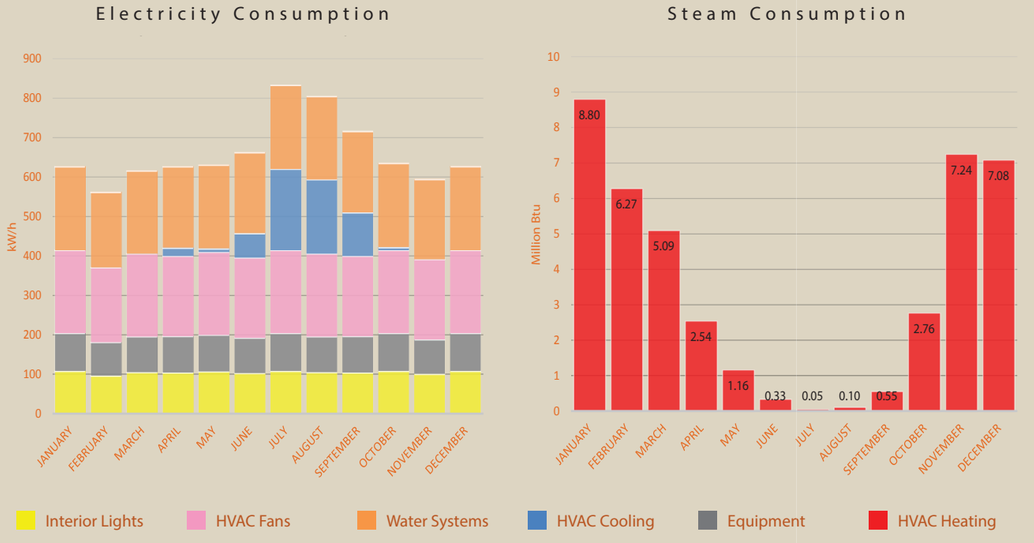
Performance

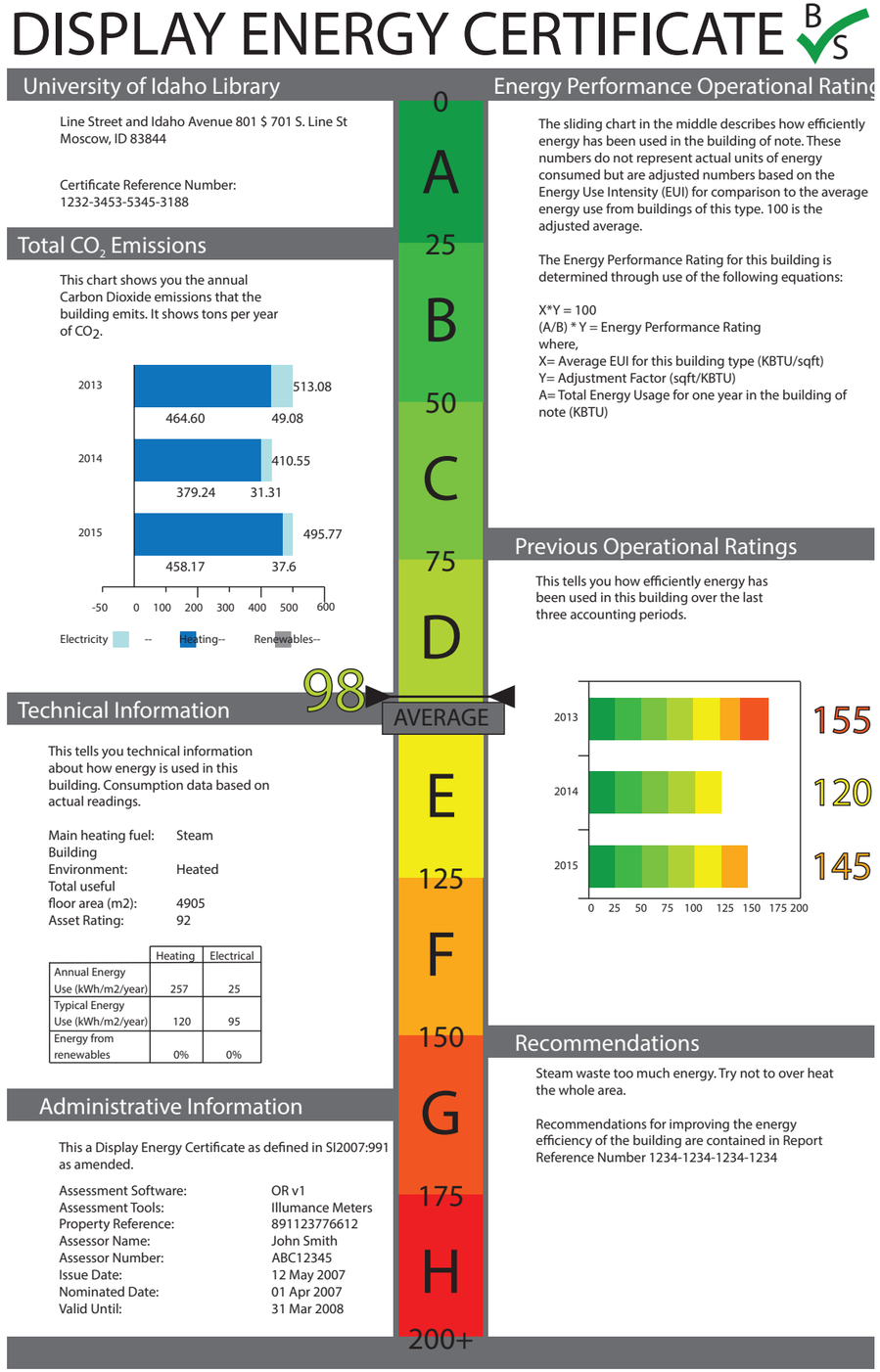
As this is a new building, the primary means of performance analysis relies heavily on simulated results and as such, the results listed here should be interpreted under this pretence. The primary software used to predict the building's performance (*OpenStudio*) was calibrated to actual meter readings done between October and November and as such, should be representative of actual building performance. This period, while short, still has the benefit of showcasing the range of climate conditions found in Northern Idaho. Between late September and late November, the outdoor temperatures were able to give a fair representation of the variety of conditions found in Northern Idaho, with late September showcasing warmer temperatures found in the summer months and late November the colde
With thi
conditions, it is easy to interpret real world results from data loggers (HOBO ware), showing the various performance indicators of the building and giving a good picture of its performance.

Energy Performance

The Revely Classroom was designed to be an energy efficient building, with the architect striving to reach an EUI under 30 kBtuh/sf/yr and simulated results indicate that the design efforts have paid off for the most part. Simulated results, calibrated to real world readings, indicate that an EUI of 37 kBtuh/sf/yr was achieved, falling short of expectations but far and exceeding the CBECS 189.1-2009 construction standards model of 57 kBtuh/sf/yr, resulting in an energy savings of 35%. Worthy of noting on these results is that while the envelope

ENERGY TYPE USE





fire place offers a practical
eating the flex space that is
nage to Idaho forestry prod -
a fitting aesthetic focal point
he building.

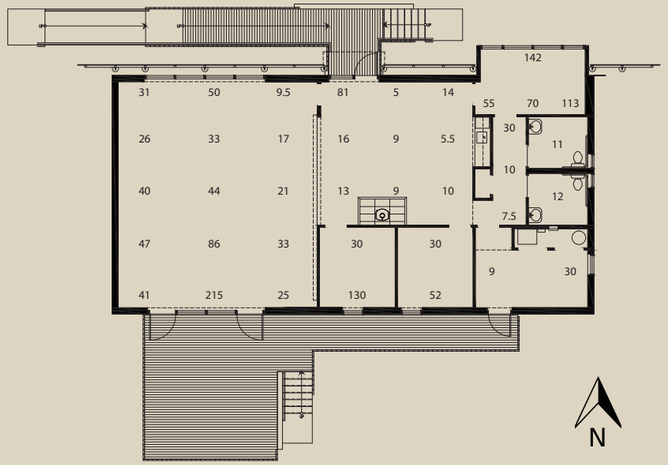
eeds typical CBECS
ons, additional energy
ce can be achieved by
ore passive systems
tially using a higher
HVAC. While the rooftop
a COP (coefficient of
ce) of about 3.5, slightly
ent units could have
ified, resulting in reduced
ge. Additionally, the
ily setpoint is set at 68°F
55°F unoccupied for
d 72°F occupied/75°F
d which has resulted
nergy demands than

observation to make
he fact that there are
al zones; one for the flex
classroom, the other for
and sales area. While
d to greater energy
overall, proper calibration
to ensure both systems
vely competing with each
y are on different heating/
cles. Results from the
model and actual readings
clusive in this regard but
measure can be taken
ng a cooling/heating
o make sure there isn't
t between the two thermal
their related schedules.

Performance Analysis

Double Hung Window

FIGURE 1 LIGHT DISTRIBUTION



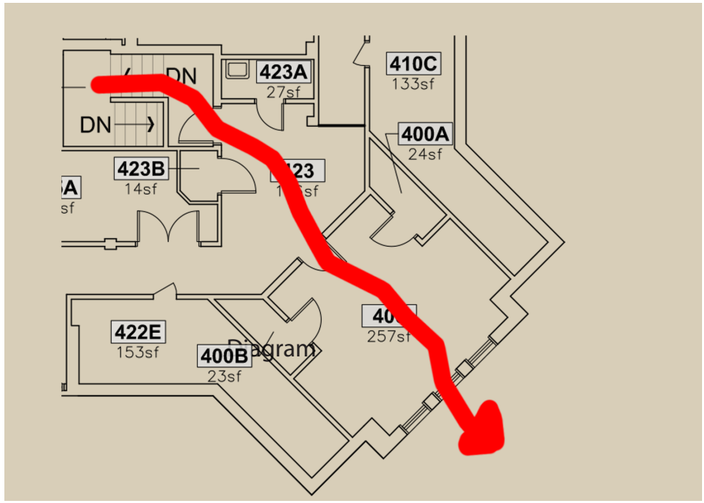
Lighting

With a narrow footprint and proper allocation of windows (window to wall ratio of 25%), the Revely Classroom has been shown to have ample daylighting throughout the day. Generally, 30-50 *footcandles* is the recommended minimum for task lighting in an office space and 80-125 for higher education, and while no values dip below 30 (figure 1), very few met the higher education threshold. This of course is a somewhat subjective criteria but it is in our opinion the natural ambient daylighting is adequate for the intended programs the vast majority of the time. All of the data to make this interpretation was collected every two weeks around noon which was then averaged out. The sky also varied from entirely overcast to clear over the different reading sessions, resulting in a general representation of the lighting condition of the spaces.

While the daylight penetration was adequate, it was apparent that as the sun's angle fell lower on the horizon with the colder seasons, glare become more apparent in the classroom. The southern windows have no means to offer shading past the 5' roof overhang and as a result, direct sunlight became overwhelming due to the specular nature of the varnished wood floors.

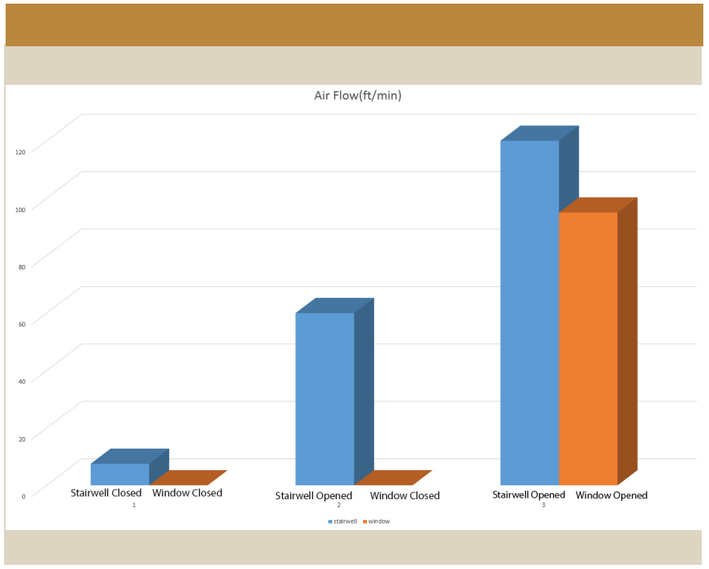
Stairwell

Stack Ventilation



Using software analysis (*Culplite* spreadsheet in *Excel*), it was further confirmed that the resulting glare became uncomfortable from November onward.

When natural daylighting does become insufficient to provide reasonable lighting into the various spaces, highly efficient LED and fluorescent lighting was used to illuminate the building. 15W LED track lighting was used in the flex space and store, providing an elegant use of spotlighting that helps to enhance the character of the space. The offices and classroom opted for T8 32W fluorescent lighting that was designed to provide a wash of ambient light (direct and indirect) by fully illuminating the room floor to ceiling, helping give off that natural warmth that wood provides. Outdoor lighting also consists of LED wall washes which help showcase the tongue and groove cedar siding, complementing the other lighting scheme techniques. found throughout the building.

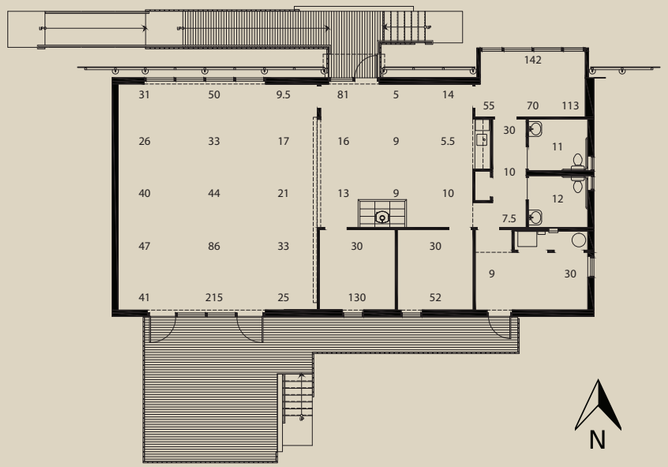


Conclusion

Given the challenge to build the CNR Pitkin Classroom entirely from donated Idaho forestry products while having to keep the design open to change based on the acquired materials, it is fair to say the outcome is an all around success. The shortcomings are very few and far between resulting in a building that not only represents Idaho wood products, but also showcases the beauty that an all wood building can achieve. The energy performance exceeds the recommendations for this particular building type but there is still the potential for improvement. A more intense thermostat schedule could result in significant savings and the addition of screening hardware in the classroom would eliminate glare issues as well. With such a low EUI and minimal electric load as well, it is quite possible to entirely supplement the power demands through the addition of solar panels or other on-site renewable sources. Overall, the building is a showcase piece for sustainable design, a true representation of the beauty that wood can grant, and a perfect representation for the College of Natural Resources for the University of Idaho. ●

Night Flush

FIGURE 1 LIGHT DISTRIBUTION



Above Large custom built picture frame windows allow ample light into the offices allowing the space to give off the warm glow from the all wood interior.

Below South facing windows in the Revely classroom invigorate the space with a flood of natural light allowing the complete substitution for electrical lighting during the day. The sun does begin to become problematic in the winter as the deeper penetration results in disabling glare.

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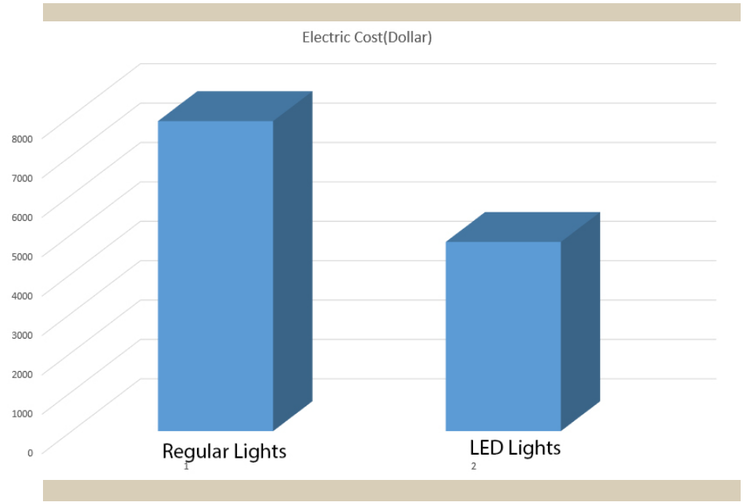
LED



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LESSONS LEARNED

Despite the overwhelming logistics of procuring locally donated Idaho forestry products, the architects were able to create a design that wasn't compromised even if they couldn't acquire something they were initially planning for. This called for the plan to be loose and ingenuity was needed to make sure that the variety of materials became cohesive in the end. The architects also discovered that many of the local mills were more than willing to do custom dimensions and products, only requiring a short lead time.

Use a more aggressive thermostat schedule and setpoint

The existing thermostat schedule and setpoint has resulted in higher than needed energy demand to run the HVAC. Slight modifications to the setpoint range as well as a more aggressive scheduling that corresponds with actual occupancy, would result in moderate utility savings.

Glossy varnish results in increased glare

While it is useful to design for direct solar penetration in the cooler seasons (reduces heating requirements), it is important to consider the specular level of the finishes. The high gloss varnish results in uncomfortable glare that can then compromise the usability of the space, in this case the classroom. Blinds or exterior screening would dramatically improve the current situation and should be considered in the future.

Double wall construction shows little to no signs of thermal bridging

Proper detailing and the use of a double wall construction has resulted in little to no perceivable thermal bridging. With an R-value of 42.4 in total, estimated performance exceeds that of a typical CBECS 189.1-2009 climate zone 5 building by nearly 35%, indicating the performance value this wall type grants.

Conclusion

Given the challenge to build the CNR Pitkin Classroom entirely from donated Idaho forestry products while having to keep the design open to change based on the acquired materials, it is fair to say the outcome is an all around success. The shortcomings are very few and far between resulting in a building that not only represents Idaho wood products, but also showcases the beauty that an all wood building can achieve. The energy performance exceeds the recommendations for this particular building type but there is still the potential for improvement. A more intense thermostat schedule could result in significant savings and the addition of screening hardware in the classroom would eliminate glare issues as well. With such a low EUI and minimal electric load as well, it is quite possible to entirely supplement the power demands through the addition of solar panels or other on-site renewable sources. Overall, the building is a showcase piece for sustainable design, a true representation of the beauty that wood can grant, and a perfect representation for the College of Natural Resources for the University of Idaho. ●

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