Micron Center for Materials Research
Boise State University
Sustainable Design Considerations

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During the initial design efforts, our team researched and compared our building type to various building types in related climate zones and found, according to the Department of Energy Commercial Building Energy Consumption Survey, that on average, lab buildings consume more energy than inpatient hospitals and almost three and a half times as much energy as an office building.

Throughout the design, our team explored a variety of sustainable design features for the project. The summary below captures the sustainability features that have been included in the final design.

Site Improvements

- On-site stormwater retention
- Use of native and adaptive plant material based on the local climate
- High-efficiency irrigation system

Architectural

- A comprehensive energy model was developed to evaluate building energy consumption during design.
- Ceramic Frit on south-facing windows to help reduce peak cooling loads during the summer.
- Sunshade devices at the "Gallery" curtain wall to help reduce peak cooling loads during the summer.
- Exterior walls insulated with both continuous insulation and spray foam within the exterior wall cavities, creating a "tight" building envelope that mitigates thermal bridging and direct air infiltration through the exterior wall assemblies.

Mechanical & Plumbing

- Energy monitoring and utility measuring will be provided at the energy plant for each system. Utility meters will include air, chilled water, heating water, domestic and industrial water, and electrical power. BAS will monitor other system settings and input for use in calculating space utility usage. These outputs can be displayed to occupants on electronic signage for educational and energy-use-reduction purposes.
- The following mechanical and plumbing considerations are included in the design of this project that helps achieve best energy conservation, water conservation and indoor environment:
    - Variable Speed drives for air handling and water handling equipment throughout
    - Premium efficiency motors throughout
    - Variable air volume laboratory systems
    - Outside air economizer for recirculating air handling units
    - CO2 monitoring of high-density occupant spaces
    - Waterside economizer (chilled water)

HA PN: 16018
DPW PN: 16207

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- Direct evaporative cooling
- Ultra-low flow plumbing fixtures
- Process cooling in lieu of domestic water cooling
- Low-pressure drop air handling systems
- Third-party wind tunnel testing of building for optimizing air intakes versus contaminated air sources
- Increased outdoor air quantity for better indoor air quality
- High-efficiency chillers
- Perimeter heating, in conjunction with warmer discharge air temperature in lieu of reheating cold air
- Point of use cooling (Fan coil units), in lieu of exhausting conditioned air
- High performance, low-flow fume hoods
- Occupied/unoccupied controls for offices, general spaces, and laboratories
- Displacement ventilation in classrooms and lecture hall spaces

Electrical

- LED lighting was used throughout to drive energy usage down 50% below energy code levels.
- The lighting control system utilizes scheduling, occupancy sensors, and dimming to respond to the building's occupants and turn down the lights when not required at full brightness.
- An active harmonic filtering system was installed to optimize power system performance.

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Center for Visual Arts Green Building Guidelines - 104,820 sq ft

Regarding the envelope:

- Energy model was generated/used to validate envelope efficiency and allow more options in selecting a more economical sheathing/insulation/skin system. Musgrove should be able to indicate how much better than current code the energy model performed.
- Glazing utilizes low-e coating and low U-values to reduce heat gain. Additionally, frit is used to reduce solar heat gain at south elevation.
- For the certification of the Gallery, certain temperature and humidity levels are to be maintained. To protect against interior condensation, the gallery envelope includes continuous exterior rigid insulation with thermally broken structural clip system for mounting of exterior sheathing to eliminate thermal bridges to the greatest degree possible. The roof is a hybrid adhered/mechanically attached system to eliminate thermal bridging opportunities at roof insulation fasteners.
- Building takes advantage of siting to place long east/west axis which allows for better solar control.
- Lighting systems are nearly all LED products for reduced electrical loads for lighting. Daylight sensors and occupancy sensors, along with programmable lighting relay panel provide energy savings as well.
- Primary entrances/exits all have been provided with vestibules to reduce energy loss.

Below are several high points for the Mechanical System.

Heating Water System:

1. Geothermal Heating Water: Renewable heat that is continuously generated from the earth's core.
2. High Efficient Gas-Fired Boilers: Provides 90%+ efficiency to heat the building in the event the Geothermal System is disabled.

Chilled Water System:

1. Variable Speed Chiller Compressor: Provides very efficient part load control.
2. Variable Primary Chilled Water Flow: All chilled water is pumped through the chillers reducing the pump energy required and increasing the chiller's overall efficiency.

Air Handling Units:

1. The Air Handling controls provide a supply air temperature reset schedule. This reduces energy consumption by allowing the supply air temperature to increase when colder air temperatures are not required.
2. The Air Handling controls provide a duct static pressure reset schedule. This reduces energy consumption by allowing the supply fan speed to decrease whenever a lower supply airflow is sufficient.

Energy Recovery Units:

1. Two large energy recovery units were utilized to exchange energy exhausted from the building to the incoming outdoor air.

Chilled Beams:

1. Chilled beams utilize induced air from the space and by doing so, reduce the fan energy consumption from the associated Air Handling Unit.
2. Chilled beams utilize a higher chilled water temperature which ultimately increases the efficiency of the chiller.

Variable Air Volume Boxes:
1. Variable Air Volume Boxes were utilized in several areas to allow the system the opportunity to reduce the amount of conditioned air into the space. This results in a more precise temperature control and essentially an overall lower energy consumption from the Air Handling Unit Supply Fans, Chillers and Boilers.

Variable Frequency Drives:
1. Variable Frequency Drives were used in the exhaust systems to allow lower levels of exhaust airflow volumes when the circumstances permitted. This allowed the fans to operate at a reduced level of energy consumption.

Adjustable Canopy Hoods, Snorkel Hoods:
1. For several processes, adjustable hoods that could be lowered down to the equipment served were utilized in order to reduce the amount of exhaust required. This greatly reduced the amount of conditioned make-up air (outside air) that was necessary.

Classroom Controls:
1. The occupancy of each classrooms is always monitored. In the event, a classroom is unoccupied, the mechanical system will essentially “turn off” and allow the space temperature to drift.