



# Boise State University

## Utilities and Metering Guidelines

Updated Mar 14, 2023

### Summary

The purpose of this document is to provide the design team with an easy to reference document containing Boise State University's guidelines for construction projects on campus and is intended as a resource to inform the design process. This document does not remove responsibility from the designer, preclude the use of engineering judgment, or relieve the designer from meeting all adopted code requirements. Questions, clarifications, or suggestions can be directed to the Boise State University Project Manager.

These guidelines have been developed as a joint effort between the Facilities, Operations and Maintenance (FOM) team and the Architectural and Engineering Services (AES) team to help ensure the resiliency of our campus by considering maintenance needs, sustainability goals, future expansion, and responsible stewardship of our resources. These guidelines are created from both common industry standards and lessons learned through the practice of engineering and maintenance.

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## Utilities Summary

### Central Steam System

The Boise State University central steam plant consists of two 600 horsepower (HP) boilers and one 200-HP boiler plus a deaerator. The plant has an approximate capacity of 50,000 lbs/hr at 30 PSI to 25 buildings on campus through utility tunnels with a few limited direct buried steam lines. The steam is only used for campus heating during the heating season, typically October through May. No lab equipment is connected to the campus steam system. From the Heat Plant, a 12" steam main branches into two 12" steam mains serving portions of the Northwest (NW) and Northeast (NE) side of campus while a separate 5" steam main serves the Student Union Building and Special Events Center. Condensate is either pumped or gravity drained through the utility tunnels back to the heat plant. Currently, Boise State University is not looking to add buildings to the central steam plant.

### Central Chilled Water System

The Boise State Central Chilled Water Plant is operated based on seasonal demand for space comfort. No laboratory equipment is supported from this system. The chilled water plant serves 7 buildings on the Northwest (NW) side of campus and has a nominal cooling capacity of 1075 tons via one 625 ton centrifugal chiller and one 450 ton screw chiller. One 60 horsepower (HP) end suction pump and one 75-HP split case pump, each designed for a maximum flow of 1200 GPM distribute chilled water through the 8" CHWS/R main pipe. The central chilled water plant has some limited extra capacity. Additions to the district loop should be discussed with the Boise State University Project Manager and Facilities team.

### Geothermal Water System

In 2013 the City of Boise Geothermal Heating District was expanded to include the Boise State University campus. A 10" supply and 8" return main (8" GWS/R after crossing Earl St.) was installed underneath University Dr. from Capital Boulevard and is routed through campus to Broadway Ave. where a bypass loop is installed. The geothermal system currently serves 11 buildings around campus and Boise State University would like to pursue adding more buildings to the geothermal system.

The University is an interruptible customer therefore any geothermal heating system on campus requires a backup heating system. Typical integration is via a Plate and Frame (P&F) heat exchanger with geothermal as the first stage of heating. Condensing boilers are used in series with the geothermal system for supplemental and backup heat.

The University is billed by the gallon, therefore a strong financial incentive exists to extract as much heat as possible from any geothermal system. At a minimum, systems should be designed for a 50°F temperature differential between geothermal supply and return water. Secondary uses such as snow melt, make-up water preheat, or domestic water heating should be considered on geothermal projects.

For questions related to the geothermal system contact the Boise State University Facilities team and Jon Gunnerson with the City of Boise.

## **Electrical Power System**

The University's normal power primary distribution is a 12.47 kV 3 phase, 4-wire system from Idaho Power Company. Metal enclosed switchgear distributes an incoming total capacity of up to 20 MW of power to three primary electrical loops and utility meters. These "loops" are referred to as Northeast (NE), Northwest (NW), and South (S) loops.

The cables for each primary loop pass through multiple pad mounted sectionalizing switches which can be used to isolate portions of the loop while maintaining power throughout the rest of the system. New buildings or services added to the primary electrical loops shall be made by adding a new sectionalizing switch to the primary loop or by replacing existing four-compartment sectionalizing switches with 6-compartment sectionalizing switches. It is not acceptable to create "spurs" by feeding new transformers via looped power through existing transformers. Most transformers on the campus are owned by Idaho Power Company, however any new transformer on campus must be purchased by the University.

Some buildings on campus are powered and metered independently by Idaho Power and are not connected to the primary campus power loops. Coordinate with the University Project Manager and Facilities team.

See the BSU Metering standards below for more information on metering requirements.

## **Natural Gas**

Coordinate with Intermountain Gas Company for questions regarding the natural gas distribution system on campus.

## **Domestic Water**

Water distribution on campus is supplied from Veolia water company. Demolition and new installations of water meters / water service must be performed by a Veolia approved contractor. Coordinate with Veolia for questions regarding the water distribution system and related requirements.

## **Irrigation Water**

Irrigation is currently supplied via two sources, the South Boise Water District which feeds canal water from the Boise River, and backflow protected city water from Veolia.

### South Boise Water District

Irrigation water from the main headwater gate is fed to the Northeast (NE) and Northwest (NW) sections of campus via a 24" concrete piping main. Gravity fed irrigation water passes through a bubbler on its way to the main wet well irrigation pump skid where it then becomes pressurized irrigation. The main irrigation pump skid is designed to provide 1000 gallons per minute (GPM) at a pressure of 80 psi. As of early 2023, a project is in design to move the existing pump station to the headwater site and transition the backflow protected irrigation system on the south side of campus to the canal irrigation system.

A 45 GPM irrigation pump and wet well taps off the gravity fed system to water the lawn at Sawtooth Hall.

Overflow of irrigation water during off hours discharges to the Boise River.

### Backflow System

The south campus irrigation system is currently served by approximately 60-70 backflow preventers. The University is exploring opportunities to serve south campus properties with water from the irrigation district instead of potable water.

### Goals

Boise State University's goals include:

1. Increasing the use of eco-turf type lawns, drought resistant landscape, hardscapes, etc. to decrease water consumption on campus.
2. Standardizing control clocks to a single manufacturer.
3. Transitioning sprinkler and irrigation controls to utilize moisture sensors for controlling sprinkler operation where possible.
4. Adding more flow meters to the irrigation system.

### **Storm Water**

Boise State University holds authority with the other Boise metropolitan area jurisdictions to discharge stormwater and allowable non-stormwater from Municipal Separate Storm Sewer System (MS4) outfalls to the Boise River and its tributaries under the National Pollutant Discharge Elimination System (NPDES) Permit. Contact the Boise State University Environmental Health, Safety, and Sustainability (EHSS) department for specific requirements related to stormwater drainage, or to obtain a copy of the University's Storm Water Management plan and applicable permits.

Boise State University maintains and oversees approximately 200-acres of main campus as well as various operations at off site locations. This includes the BOAS Tennis Complex (10.5 acres) on Highland Avenue, the Yanke Research Park (8 acres) on Parkcenter Boulevard, and the University Plaza Building (3.4 acres) on University Drive. All of these offsite locations have impervious surfaces such as parking areas, sidewalks, and rooftops which drain to the Boise River or a surface water canal system via storm water outfalls. In total, the Boise State Campus has ten sub-basin drainage areas and utilizes a number of onsite infiltration amenities for stormwater treatment on the premises rather than direct discharge to the storm drain system. These methods include Aqua-Swirls with vortex-type treatment of sediment and debris, oil and water separators, onsite infiltration systems, and catch basins.

Evaluate measures for improving Boise State University's impact on storm water quality by incorporating runoff reduction techniques into the repair of streets, roads or parking areas by using canopy interception, bioretention, soil amendments, evaporation, rainfall harvesting, engineering infiltration, rain gardens, infiltration trenches, extended filtration and/or evapotranspiration, and/or a combination of the aforementioned practices.

# BSU Metering Standards

## BTU Meters

### General Design Considerations

Flow Meters and Sensors must be installed in locations that comply with manufacturer's requirements for straight, unobstructed upstream and downstream piping. Additionally, access to meters / sensors must be ensured. For example, installation of the flow meter such that its removal is blocked by other piping / equipment is unacceptable. The design engineer must identify the optimal locations for these components in their construction documents.

The BTU meter enclosure must be mounted in an accessible location, preferably on a wall or on strut channel support if needed. To minimize the amount of wiring required, the preferred location would be near both the geothermal, chilled, or heating water heat exchanger (as applicable) and the building's power meter (since the BTU meter communicates serially to the power meter).

### Communication Protocols, Hardware, and Integration

The basis-of-design product uses a DualNet communication card to provide both IP and RS485 communication for simultaneously communicating via BACnet and MODBUS protocols. The reasons for this are described below. If project-specific factors prevent the topology described in this section, coordinate with the University to identify alternatives.

The meter must communicate with the University's Schneider PME metering software. The preferred approach is for the meter to communicate serially to the building's power meter using MODBUS protocol. In this scenario the power meter acts as a gateway site for the BTU meter, accepting the MODBUS input from the BTU meter and passing it to the Schneider PME software using ION protocol. Any BTU meters that are provided or modified as part of the project must be integrated into the University's Schneider PME metering software. This includes setup and mapping of the devices in PME and the creation of any new device diagrams such that the meter's data can be displayed and reported in PME consistent with other campus BTU meters. Specifically, the PME web client page for this meter must include real-time supply and return temperatures, flow rates (including bypass if applicable), and BTU/hr, as well as historical totalization of BTUs, gallons, and bypass gallons (if applicable). Schneider authorized personnel must be engaged to support the PME integration process.

Additionally, the meter must communicate with the Building Automation System (BAS) controlling the operation of devices (e.g. control valves, pumps, etc.). The BAS must include a real-time display of temperatures, flow rates, and BTU/hr, and trends must be configured in the BAS to track historical performance. Engage the BAS vendor to perform this work.

### Geothermal System Metering

Provide a geothermal BTU meter for any building served by the City of Boise's geothermal system. These meters are used for the University's energy management purposes and for the City of Boise's geothermal billing purposes.

The University's basis of design meter is identified below. Specific installations may require variations to the meter model number; these must be verified with the University. Any alternate manufacturers or

models require prior approval from the University, as much of the University's existing metering infrastructure is designed around the basis-of-design product.

- Manufacturer: Onicon
- Meter Model: SYS-10-1250-1102
  - This describes a System 10 BTU meter in a NEMA 13 enclosure w/ LCD display, 120V input power, a DualNet serial communication card (see communication discussion below), no analog output, auxiliary pulse inputs / outputs, and current-based temperature sensors in the heating hot water temperature range.
- Flow Meter: Onicon F-1000 Series
  - For any pipe sizes over 2.5", the dual turbine option shall be provided for reduction of flow distortion.
  - Meter shall be hot-tap compatible, capable of being removed by hand without a shutdown.
  - Other options such as pipe size range to be verified on an application-specific basis.

#### Chilled and Heating System Metering

The metering design conditions listed above for geothermal meters shall also apply to hydronic metering systems and will generally be the same product as the geothermal meters. However, coordinate with Boise State University's Facilities, Operations, and Maintenance (FOM) team to clarify where chilled water, heating water, and other general hydronic metering is required.

#### **Power Metering**

Each building shall have a power meter for each electrical service supplied to the building. For example if the building is fed by 480/277V and 208/120V services, two meters shall be provided.

For buildings metered independently by Idaho Power, the Idaho Power meter is sufficient. For buildings served from one of the main campus power "loops" (Idaho Power rate schedule 19), the project will need to provide a building-level submeter.

The campus standard building-level power submeter is the Schneider PM8000 series. New meters must be integrated with the University's Schneider Power Monitoring Expert (PME) software as part of the project scope. This integration requires adding the device in the PME software and updating the graphics, and shall be performed by Schneider authorized personnel. Note that Schneider offers turnkey installation and integration services.

Where an existing meter is being replaced with a new meter, take advantage of Schneider's "Trade Up" program to obtain a 25% discount.

During installation, record all relevant parameters such as voltage, CT ratio, IP address, etc.

Coordinate with Boise State's Office of Information Technology (OIT) to obtain an IP address for the meter (or to validate IP address when replacing an existing meter, as University IP addressing standards have changed).

## **Steam and Condensate Metering**

Coordinate with Boise State Facilities Operations and Maintenance (FOM) team regarding steam and condensate metering for projects where scope of work includes steam / condensate systems.