Interesting Facts About CU Boulder Utility Services

Facilities Operations is currently engaged in an effort to **'green'** our operations. Recent commitments made by the University, as well as the State legislature, have primarily focused these efforts in the areas of conservation, carbon neutrality and zero waste.

Billions of dollars are wasted every year by appliances even when they are not being used. Save money and the environment by having all your entertainment equipment plugged into a power strip that you manually turn off when you're done.

Approximately 3,600 faucets, 2,000 showers, and 2,000 toilets were retrofitted with low-flow kits. Which, in addition to irrigation improvements, lab water conservation and water conservation campaigns, have saved the campus nearly 100 million gallons of water over the past few years.

CU estimates a savings of $440,000 a year from using ditch water instead of treated City-water.

All 50,000 sprinkler heads in the CU system are controlled by radio from a computer in a small room off Folsom Stadium.

The City of Boulder regulates CU-Boulder wastewater discharge to comply with Colorado Department of Public Health and Environment, and Federal EPA, regulations.

Our campus is among the top in the nation in regards to its energy conservation focus and environmental stewardship.

The cost of energy on our campus is about $25 million/year and growing. Almost 100% of our campus electricity is purchased from Xcel Energy. We use about 15,000 desktops/laptops which consume about 4%-5% of total campus electricity (not including associated HVAC cooling load for campus data centers and desktops). The University consumes 120 million kWh (kilowatt hours) of electricity per year.

The University consumes an average of 4,200,000 Ton Hours of chilled water per year and 575 million lbs of steam.

The CU Main campus peak demand for electricity is 19MW, and 150,000 lbs per hour for steam.

A typical 2000 sq ft. house uses 20 mmbtu/yr of natural gas. The Campus plant uses 20 mmbtu/10min.

Two gas turbine generators are each capable of producing 15.2 mW of power.

Facilities Management

MISSION

To plan for and provide a physical and operational environment that supports the University of Colorado at Boulder's mission of education, research and outreach.

VISION

To be a progressive, customer-focused organization that is recognized as a national leader in service and the stewardship of resources for the 21st century.

VALUES

We value our campus community, our employees and our institutional heritage.

We achieve organizational excellence through the following core values: A safe environment, an engaging workplace, staff development, teamwork and partnership, integrity and accountability, open and respectful communication, an inclusive community, quality, competitive, value-added services, innovation and continuous improvement, and environmental sustainability.

PROGRAM OF EMPHASIS

1. Improve Campus Appearance and Functionality
2. Create a Customer Service Driven Culture
3. Create an Inviting and Invigorating Work Environment
4. Focus on Process, Performance and Productivity Improvement
5. Focus on Responsible Fiscal Management

Facilities Operations Goal

Our common goal, as a team, is to provide a physical environment that promotes the advancement and transfer of knowledge. We are a dynamic, customer focused organization that provides high quality, competitive services and is recognized as a national leader in the stewardship of our physical facilities.

For other departments within Facilities Management, please visit our website: http://fm.colorado.edu

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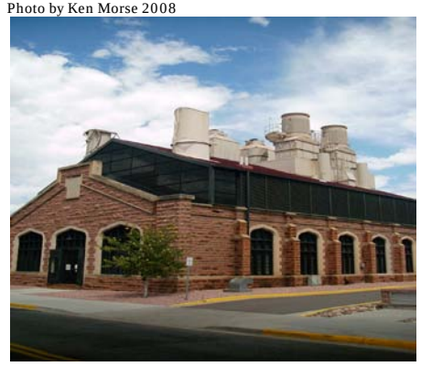
UTILITY SERVICES

Photo by Ken Morse 2008



Objective and Goals of Utility Services
Our objective as part of the Facilities Management team is to operate and maintain a safe, reliable, and energy efficient utility system. It is our goal to operate and maintain the utilities in a manner that assures the reliability of service and longevity of the campus utilities, while balancing the need for environmental responsibility. We strive to work as a team to promote honesty, professionalism and accountability. Our vision for the future is to be a progressive, customer-focused organization that is recognized as a national leader in service and the stewardship of resources for the 21st century.

University History

After Boulder was selected as the site of the State University in 1872, Boulder citizens rallied to raise $15,000 in matching funds to construct CU's first building, now known as Old Main; completed in 1876.

Eight years later, smaller buildings were added nearby housing men, women, and the university president. In the next 30 years, the university grew around a large cruciform-shaped open space that became Norlin Quadrangle. Significant buildings added during this time include Buckingham Library (now the University Theatre), Guggenheim Law (now Guggenheim Geography), Macky Auditorium, additions to Hale Science, and **a Power House for steam generation.**

Power House Circa 1910

First Utility Services to Main Campus

The Power House at the University of Colorado was constructed in 1909 and utilized coal fired boilers to distribute steam at 125 psig, 60 KW of DC and 225 kW of AC power. Since AC commercial power use was still in its infancy period at this time, this choice of electrical generation was quite extraordinary.

June of 1939, the Public Service of Colorado first ran a 2,400 volt electric powerline to the campus and the plant became strictly a steam producer.

Boulder Campus Circa 1920-30

1950-1960's

In 1950 the plant was converted to clean burning natural gas and in 1960 a #6 fuel oil system was added to provide a back-up fuel source to the plant. In 1965 the University upgraded its electrical system to 13,800 volt electric powerline.

Boulder Campus Circa 1960

Post World War II

CU grew rapidly after World War II. In addition to the flood of students funded by the GI Bill came families and older students. In the 1950's and 1960's, the university embarked on a more expansive land acquisition program. It purchased 220 acres of farmland, now known as the East Campus and the University Research Park. It also accepted, with fiscal obligations, the Williams Village property as a location for housing students. The University of Colorado at Boulder became three campus areas - the Main Campus, the East Campus, and Williams Village - within the city of Boulder.

In order to support the student population, The Williams Village Heating and Cooling plant was constructed.

1965 - Williams Village Heating and Cooling Plant

The Williams Village Heating Plant was built in 1965 and provides steam and chilled water to the Williams Village Complex which includes Darley Towers, Stearns Towers, Darley Commons, and the Bear Creek Apartments. Major equipment consists of 2-30,000 lb/hr boilers, 1-250 ton centrifugal chiller, 1-350 ton centrifugal chiller, and 1-800 ton absorption chiller. The main fuel supply is natural gas backed up by #2 fuel oil.

1980-1990's

In the 1980's and 1990's, attention turned to older buildings needing rehabilitation, such as Old Main, Macky, Hale, **the Power House**, and the Women's Cottage, all of which have benefited from appropriate renovations, giving the oldest buildings new life while preserving their heritage.

1990-2009

With the campus constituency of over 32,000, the University of Colorado at Boulder is, in essence, a "city within a city" and the electrical system service from the utility became less and less reliable. Fall of 1992 the University issued $41 million dollars in Certificates of Participation to finance a 33 megawatt dual fuel cogeneration (CHP) facility. It was in the early 1990's that a combined heat and power system was installed and was designed to provide self-generation of all campus electrical power needs. It was at this time, in 1992 that the power plant switched to using #2 fuel oil and in 1999 removed the remainder of the #6 fuel oil system.

This CHP system utilizes two conventional boilers, 130,000 lb/hr and 100,000 lbs/hr, as well as two 16 MW gas combustion turbines coupled to two 80,000 lb/hr heat recovery steam generators. A 1 MW steam turbine is used to provide 10 PSIG steam. Also, two additional steam absorption chillers were added bringing the total plant cooling capacity to 3,300 tons. Currently, the University is served by three 13.2 kV distribution system branch feeders from Xcel energy.

Most recently, the challenge again is to accommodate an increase in enrollment and at the same time, preserve its reputation as one of the most beautiful higher education campuses in the nation. To meet this challenge and to serve our campus clients, the University of Colorado at Boulder is served by a variety of utilities that are essential to campus operations.

Services We Provide:

Electrical services

The University of Colorado distributes high voltage electricity at both 13.2 kV and 4160 V through University owned transmission cables.

Steam/condensate distribution

Steam is exported to either the 130 psig or the 10 psig steam header for delivery to the campus. Approximately 80% of our condensate is returned 300 psig steam is exported to the gas turbines for Nox control and steam injection for power augmentation.

Tunnel systems

The Main Campus utility tunnel system transports steam, condensate, chilled water, compressed air, electrical and telecomm. The age of the utility tunnel dates to the turn of the century, with the majority being constructed in the 1920 – 1960 timeframe.

Chilled water

The 10 psig steam is used to generate chilled water. 3300 tons of absorption chilling capacity on the plant site and chilled water is distributed through the underground tunnels to 14 buildings on the central campus.

Compressed air

Compressed air is used for building control systems and in laboratories using pneumatic tools.

Natural gas

A high-pressure natural gas line provides service to the Power House for conventional and co-generation operation.

Irrigation water

CU uses shares of Anderson Ditch and Smith-Goss Ditch to water nearly 100% of its main Boulder campus, and most of the East Research Park and Newton Court. The use and payment for treated water was significantly reduced when large parts of the Main Campus irrigation systems were converted from treated water to untreated ditch water during the mid-1980's.

Potable water

The potable lines provide water for domestic, laboratory and fire protection needs.

Sanitary sewer

Wastewater leaving the campus in sanitary sewers is delivered to the City of Boulder wastewater treatment plant that regulates CU-Boulder wastewater discharge to comply with C D P H E, and Federal EPA, regulations.

Storm drainage

Storm water is collected by a complex system of on-grade facilities and university storm sewer lines. Most storm-water runoff is routed to Boulder Creek or other creeks.

Outdoor lighting

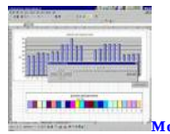
The campus outdoor lighting system provides night time lighting to illuminate campus walkways, streets, parking lots, and building entry ways. Photograph by Surmonk

Mapping/Locate Services

Before construction starts on the campus the University of Colorado Locate Technician marks and identifies lines that are underground.

Metering

Most campus buildings are metered for steam, chilled water, electric, water & irrigation use.



Monitoring/recording cost and consumption/ Billing process and utility budget estimates.

The short-term and long-term data collected from metering is used to verify performance, initiate trending, or validate energy efficiency improvements, bill campus auxiliaries and to report the annual utility budget.