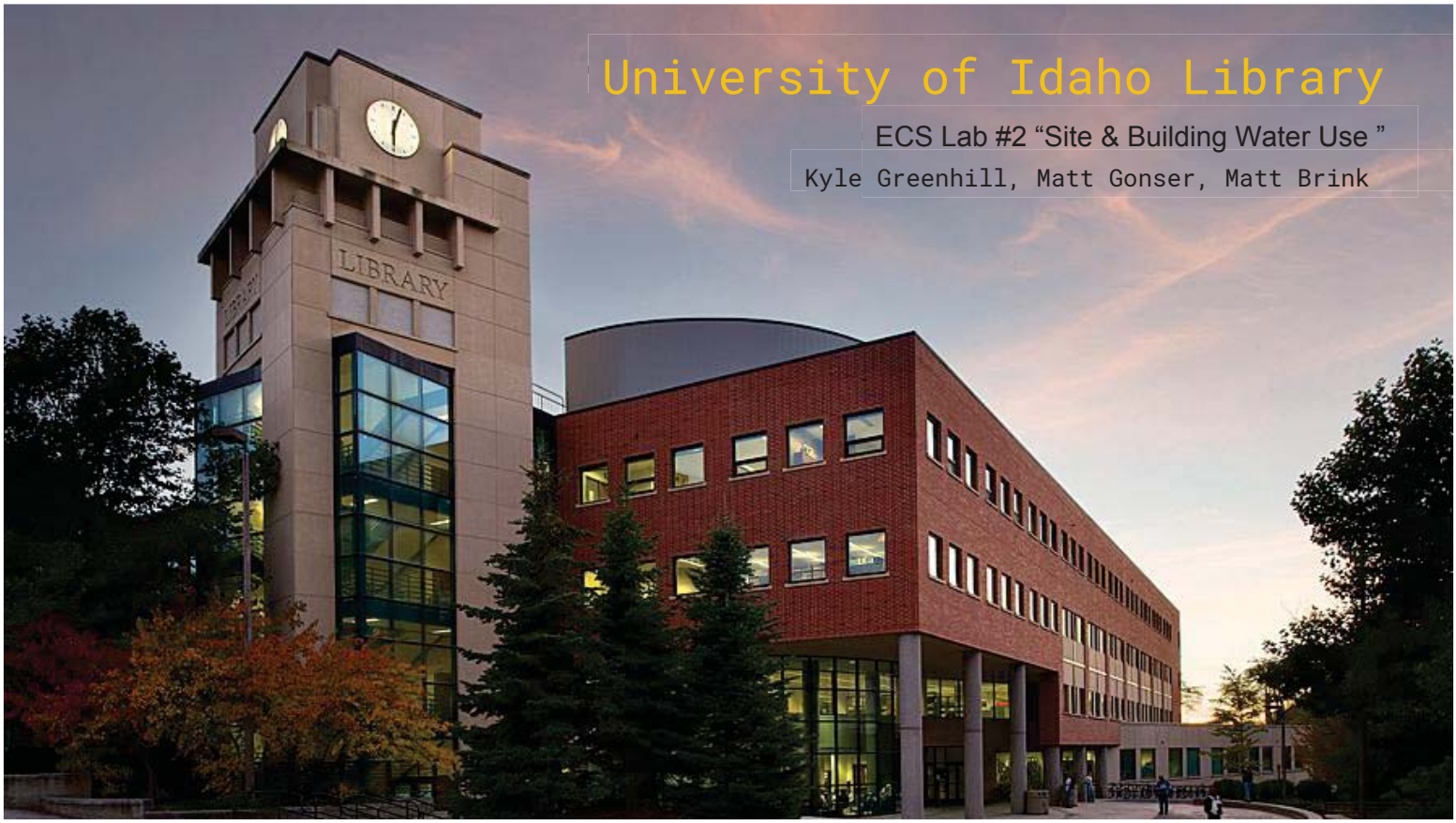


University of Idaho Library

ECS Lab #2 “Site & Building Water Use ”

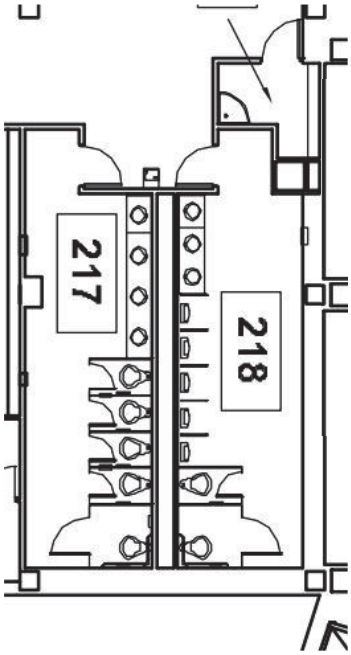
Kyle Greenhill, Matt Gonser, Matt Brink

BUILDING DESCRIPTION

The library on the campus of the University of Idaho campus is the largest library in the state of idaho with over a million books within. It consists of 5 floors 4 of which have public access and restrooms and the fifth floor being the basement. With a recent remodel of the first floor it has created a much more modern and new feel when entering

- Each of the four publice floors contains both men's and women's restrooms which are consistent in size on every floor

- Women’s restrooms contain 5 toilets and 4 sinks



- Men’s Restroom contains 5 urnials, 2 toilets and 3 sinks

WATER FIXTURE INVENTORY

Fixture Type	Men	Women	Recyclable
Toilet	8	20	No/ Blackwater
Urinal	20		No/ Blackwater
Drinking Fountain	8	8	Yes/ Greywater
Sink	12	16	Yes/ Greywater

Per Capita Use: 25 gallons/day
Peak Hourly Occupancy Load:750 people
Total Gallons/Day:(WU)(25x750)=18,750

Toilets=1.6 Gallons
Urinal=0.6 Gallons

CONVENTIONAL WATER SUPPLY

GPFU= (WU) / (fu)
WU= total conventional water use (gallons/ day)
fu= total number of conventional fixture units

(18,750)/298=
62.91 gallons/fixture

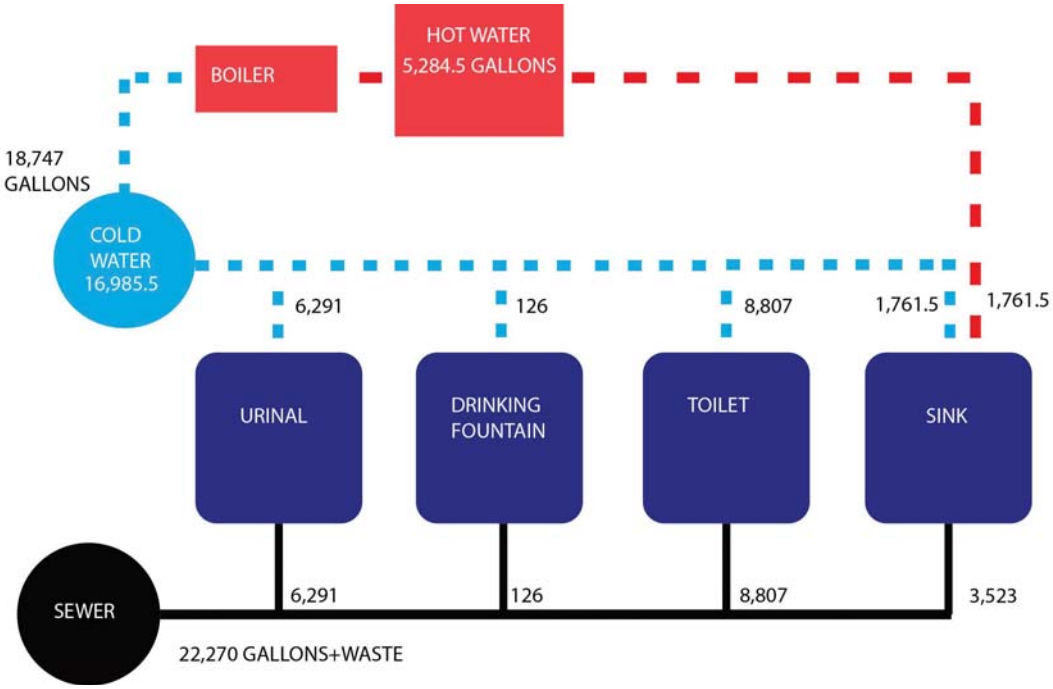
Fixture	Occupancy	Type of supply control	Number	Cold	Hot	WFSU	Total FU
Toilet	Public	flush tank	28	5	0	5	140
Urinal	Public	3/4 in. (19mm) flush valve	20	5	0	5	100
Drinking Fountain	Offices, etc.	3/8 in. (9.5 mm) valve	8	0.25	0	0.25	2
Sink	Public	faucet	28	1.5	1.5	2	56
Total			84				298

Fixture	Total FU	GPF
toilet	140	8,807
urinal	100	6,291
drinking fountain	2	126
sink	56	3,523

CONVENTIONAL SUPPLY FIXTURE ESTIMATES

GPF=(GPFU)(FU)
GPF=gallons/day/fixture
GPFU=gallons/day/supply fixture unit
FU= weight in supply fixture units
Total Supply: 18,747 gallons/day

SYSTEM DIAGRAM



MONTHLY RAINFALL

Moscow, ID

The University of Idaho Library features a unique stormwater rainfall response system that uses 15 spouts located near the top of each of the building's facades. The library also uses a unique gutter system located at the south of the building, and steel overhangs located over entryways.

Season	Precipitation (IN)
Spring	7.74
Summer	3.85
Fall	6.99
Winter	8.49

Monthly Average Rainfall: ***2.26 IN***

Yearly Rainfall: ***27.07 IN***

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Precipitation (IN)	3.14	2.37	2.69	2.52	2.53	1.88	.97	1.00	1.21	2.17	3.61	2.98

SITE STORMWATER INVENTORY

UIDAHO LIBRARY

Stormwater Treatment Device Key | Spout | Steel Overhang | Diffused Aluminum gutter

Library First Floor (Plan)

Library Basement Floor

SPOUT STORMWATER TREATMENT

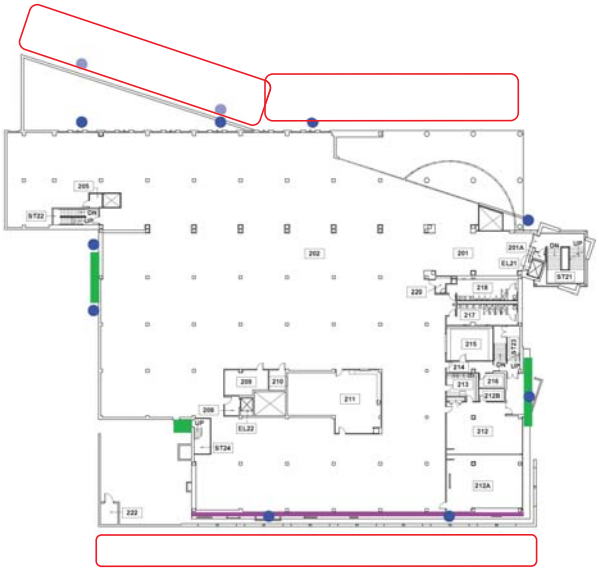
UIDAHO LIBRARY

Highlighted Drainage Collection Units Located on top of the Roof Structure

ADVANTAGES

- This method of water removal is innovative, allowing the roof of the structure to collect the water, pass through the top walls, and spill out of the corresponding spout.
- This also allows water too be evenly dispersed throughout the top of the roof, not letting an area collect more water eventually leading to a potential collapse of structure.

SPOUT STORMWATER TREATMENT UIDAHO LIBRARY



Negative Rainfall Effects, Buildup of Excess Runoff

DISADVANTAGES

- Despite being innovative, the drainage spouts can tend to lead to over flowing, landing on passersby.
- This can also lead to excess water buildup and runoff throughout the North and South sides of the building.

Western Facade Spout Location

MODIFIED GUTTER STORMWATER TREATMENT UIDAHO LIBRARY

ADVANTAGES

- The gaps between each of the aluminum diffusers allow rain to be deflected away from the building, while also not compromising the structure to an overabundance of water buildup.

This method of rainfall misdirection doesn't allow an excess of water to become contained on the top of the structure.

MODIFIED GUTTER STORMWATER TREATMENT

UIDAHO LIBRARY

DISADVANTAGES

- Despite a positive of being open, the rainfall received is able to directly hit the soil below on the south side of the building.
- This allows a buildup of excess mud, soil corrosion, and an overall negative aesthetic.

STEEL OVERHANG STORMWATER TREATMENT

UIDAHO LIBRARY

ADVANTAGES

- With steel overhangs, there is a direct coverage of an entry area. This allows the entryway to remain try, promoting its main purpose: to allow people to enter the building unobstructed by rainfall or other barriers.

STEEL OVERHANG STORMWATER TREATMENT

UIDAHO LIBRARY

DISADVANTAGES

- Despite the obvious of cost, these overhangs can produce an excess of rain buildup, causing the overhang to become very contained with water.
- This also can lead to poor drainage and runoff posing a threat to its surroundings.

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Water Conservation Re-Design

Problem:

Stormwater can hardly sustain gardens all year, toilets and other fixtures waste a considerable amount of water without reuse.

Solution:

Eliminate unnecessary water waste by installing more advanced fixtures. Reuse the available greywater to reduce overall water supply needed

Water Conservation Re-Design

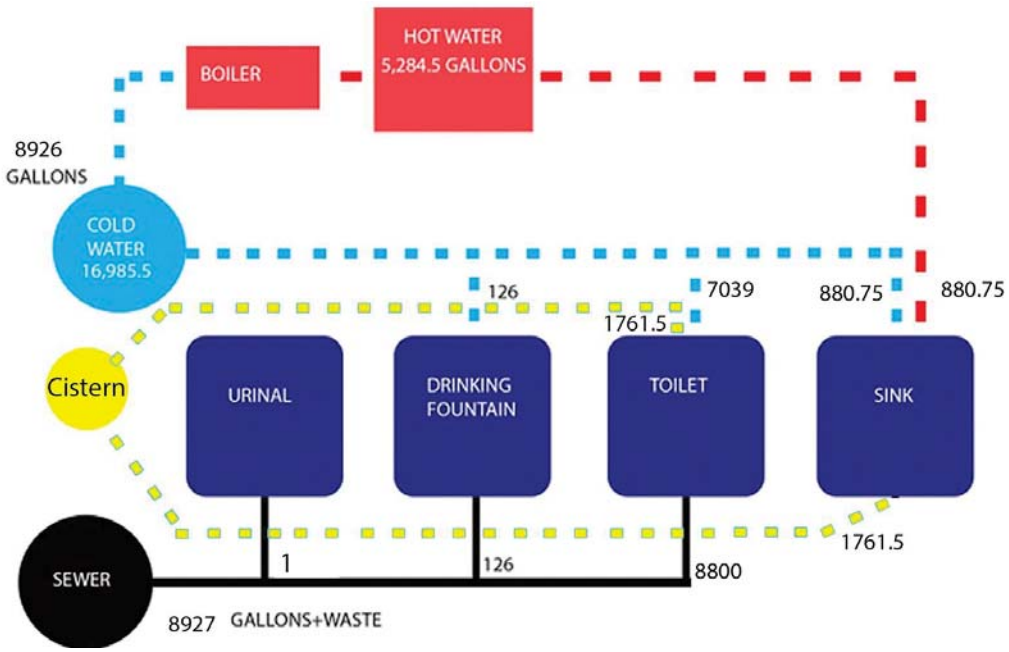
Fixture	Occupancy	Type of supply control	Number	Cold	Hot	WFSU	Total FU
Toilet	Public	Low Flush (by cistern)	28	5	0	5	140
Urinal	Public	Waterless	20	0	0	0	0
Drinking Fountain	Offices, etc.	3/8 in. (9.5 mm) valve	8	0.25	0	0.25	2
Sink	Public	Motion Sensor	28	.5	.5	1	28
Total			84	.75	.5	1.25	30

Fixture	Total FU	GPF
toilet	140	8807
urinal	0	0
drinking fountain	2	126
sink	28	1761.5

Before: 18,767 gallons/day
After: 10,694.5 gallons/day

Savings: 8,072.5 gallons/day

Water Conservation Re-Design



Water conserved: 9821 gallons/day

Conclusion

Problem: All greywater is sent to sewage

Solution: Send available greywater into cistern to be used for ultra low toilets to eliminate sink waste. Waterless urinals also cut out a majority of the blackwater waste.

Average water saved with redesign: **9821 gallons/day**