

Defining a New Standard for Laboratory WELLness & Sustainability

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Learning Objectives

- ④ **Understand and put into practice the role of an integrated design process and clear design goals in defining a WELL Certified and LEED Gold building with 50% less energy than a typical Laboratory**
- ④ **Describe the synergy between WELL, LEED and High Performance Design while maintaining a very tight budget**
- ④ **Understand how to enhance student success and safety through LEED and WELL metrics in a higher education teaching laboratory**
- ④ **Put into practice the ability to create scientific moments of learning with LEED and WELL principles**



Performance-based university funding formula approved by Ky Senate



LEGISLATIVE RESEARCH
COMMISSION

FEBRUARY 23, 2017 3 MIN READ NEWS

UPDATED: Oct. 2, 2019

How many nonprofit colleges and universities have closed since 2016?

By Education Dive Staff

How university officials are combating the enrollment decrease



Our New Reality

THIS IS NOT A PASSING TREND

89%

of Americans are very
concerned about the
environment

93%

agree that saving energy
helps the environment

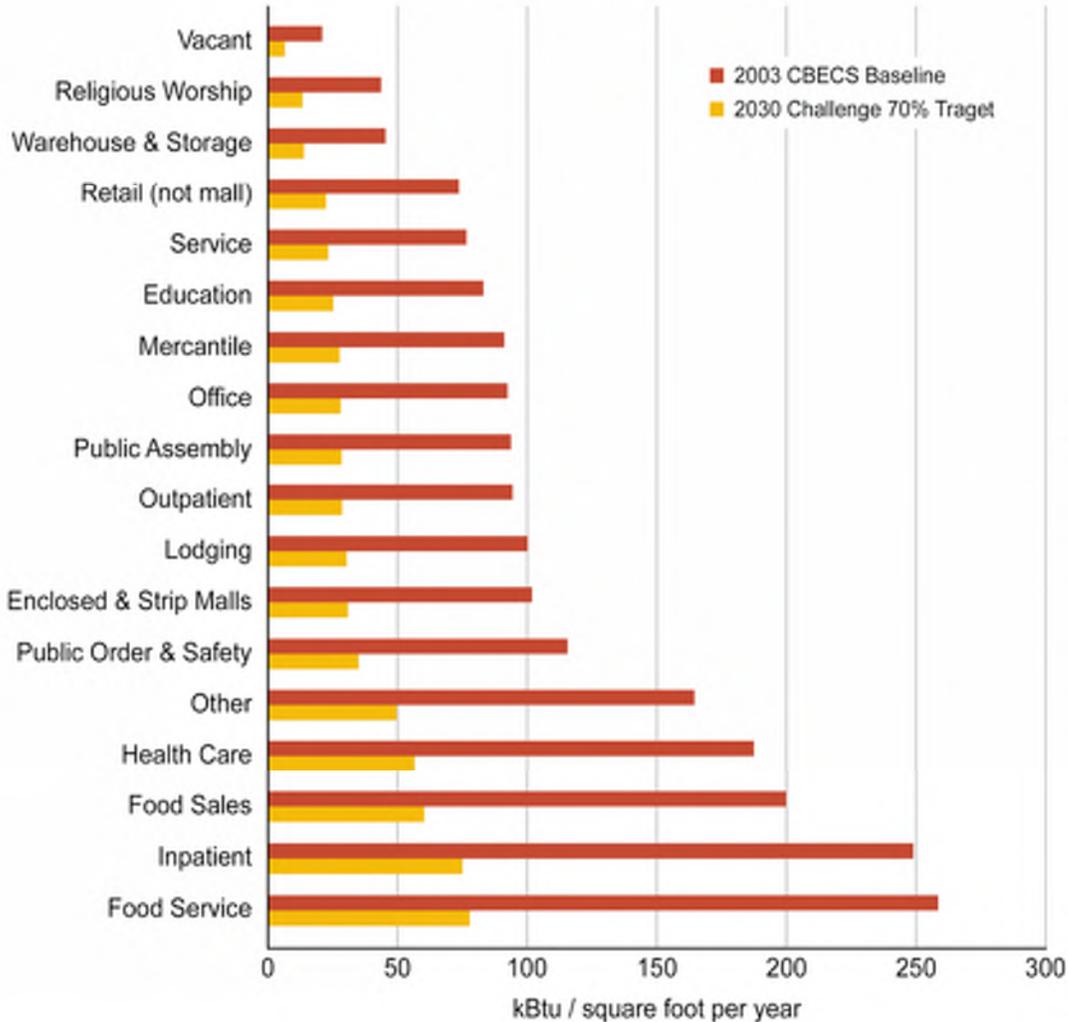
Your Students Perceptions Are Your Realities

SCUP: The biggest challenge of our lifetimes is here. Colleges and universities need to prepare for the effects of climate change, but we're not just passive victims of circumstance.

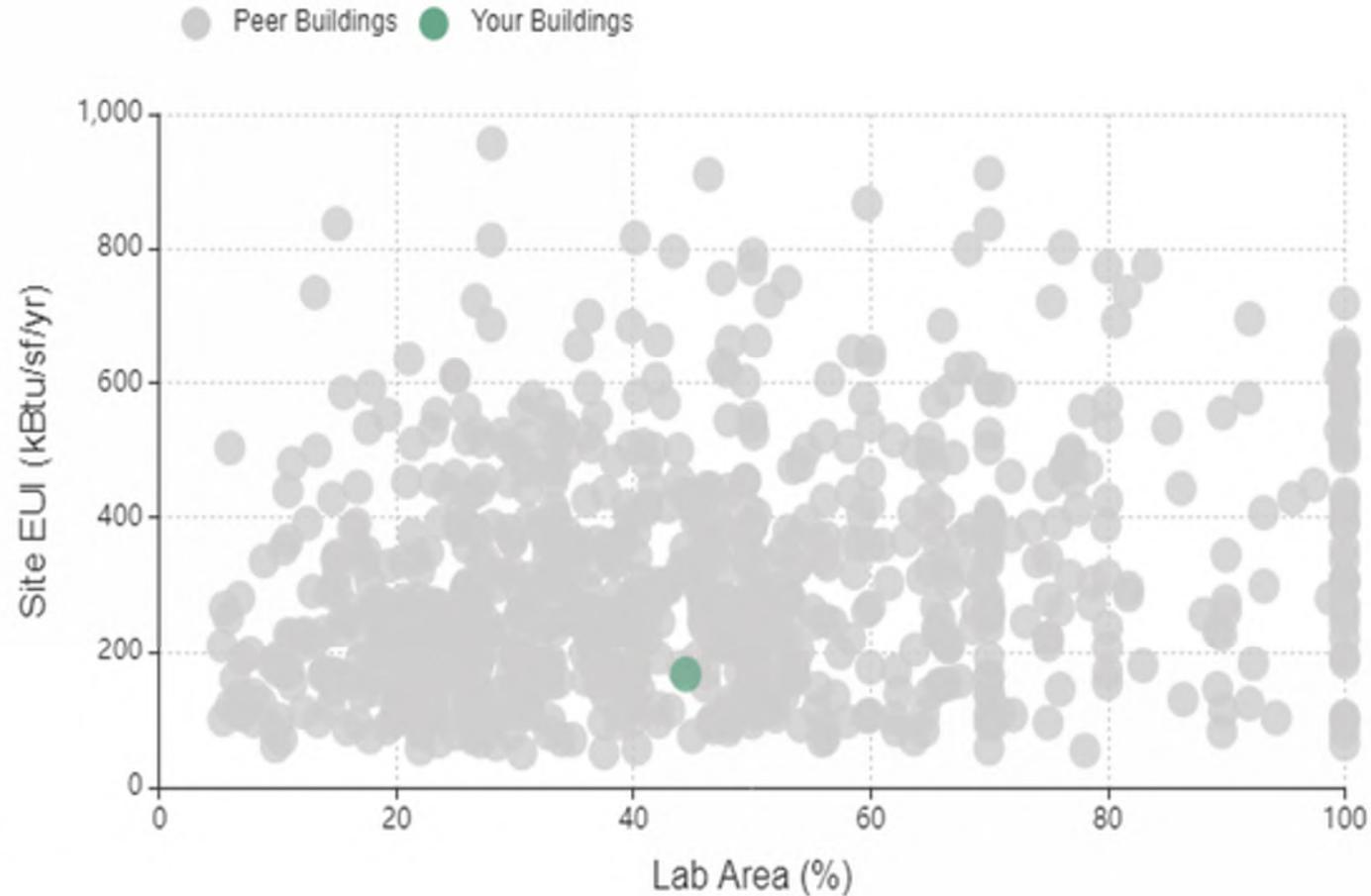


Higher Education Laboratory: Big Offender

Site Energy Use Intensity (EUI) by Building Type



Laboratory Buildings



Ogden College Hall

Learning Environment

Student Success

Energy Efficiency



Added Steps to Integrative Process

Project
Kick-off
Programming
Sustainability
Goals

Sustainability
Collaborative
Brainstorming
LEED Checklist
ECMs

Project Budget
Alignment
Culture Change
Maintain
Programming
ECMs

WELL
Kick-off
WELL Checklist
Funding
Differentiate
PR opportunities

WELL
Charrette
Assignments
Documents
Implement

TODAY
LEED Gold
WELL GBCI
PV scheduled

Engineer

Architect

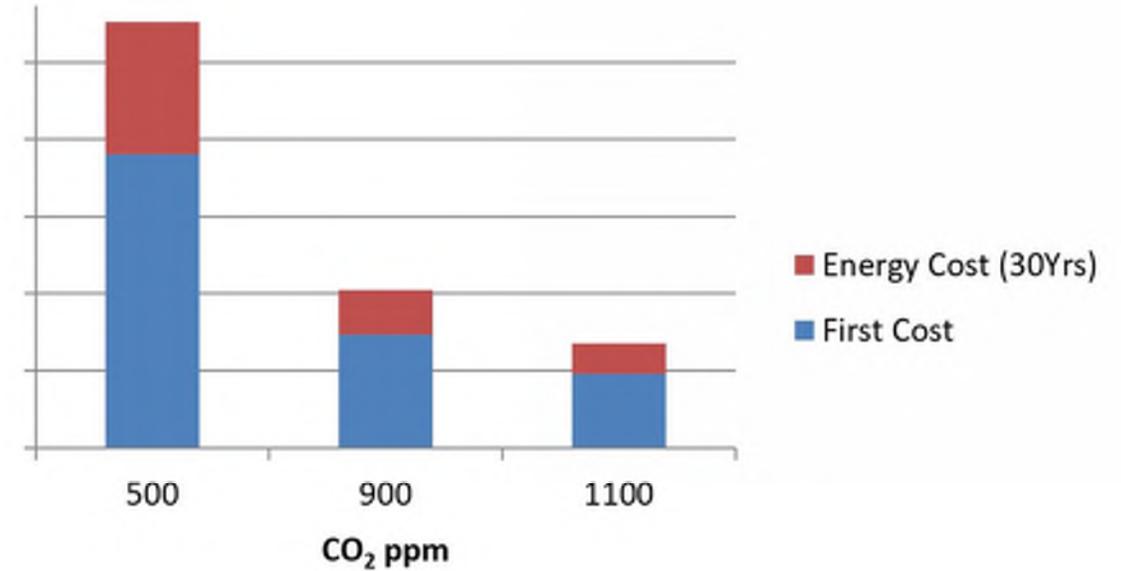
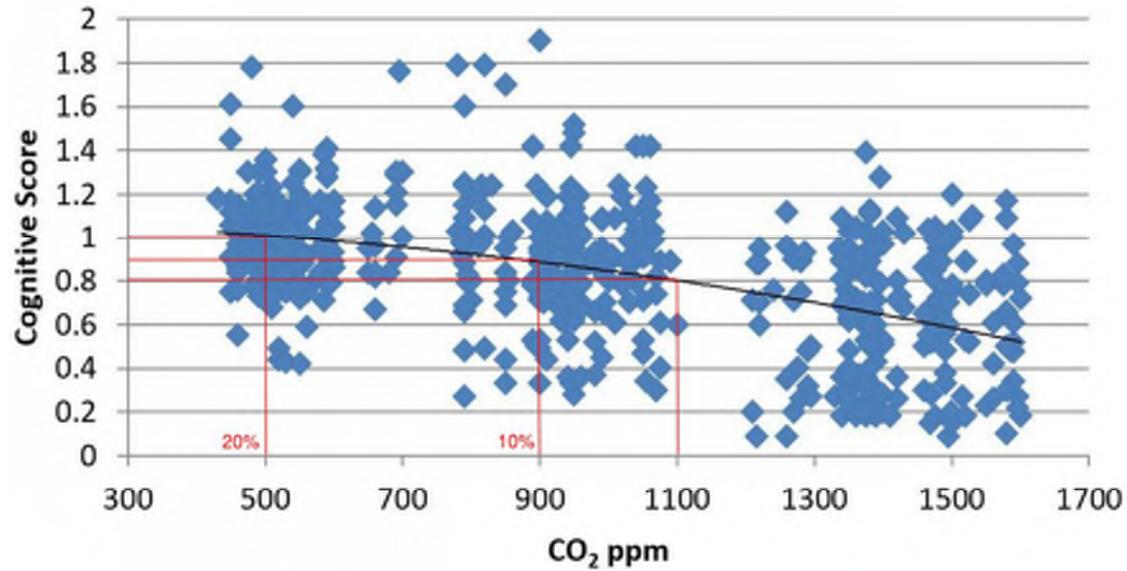
WKU

**Lab
Designer**

**Planning,
Design,
Construction**

Faculty

Cognitive Performance vs. Cost



THE IMPACT OF GREEN BUILDINGS ON
COGNITIVE FUNCTION

Synergy: LEED - WELL

WELL - AIR

Fundamental Air Quality
Smoke-Free Environment
Ventilation Effectiveness
Construction Pollution Management
Enhanced Air Quality
Enhanced Ventilation
Pollution Infiltration Management
Source Separation
Air Filtration
Fundamental Material Precautions
Long-Term Emission Control
Short-Term Emission Control

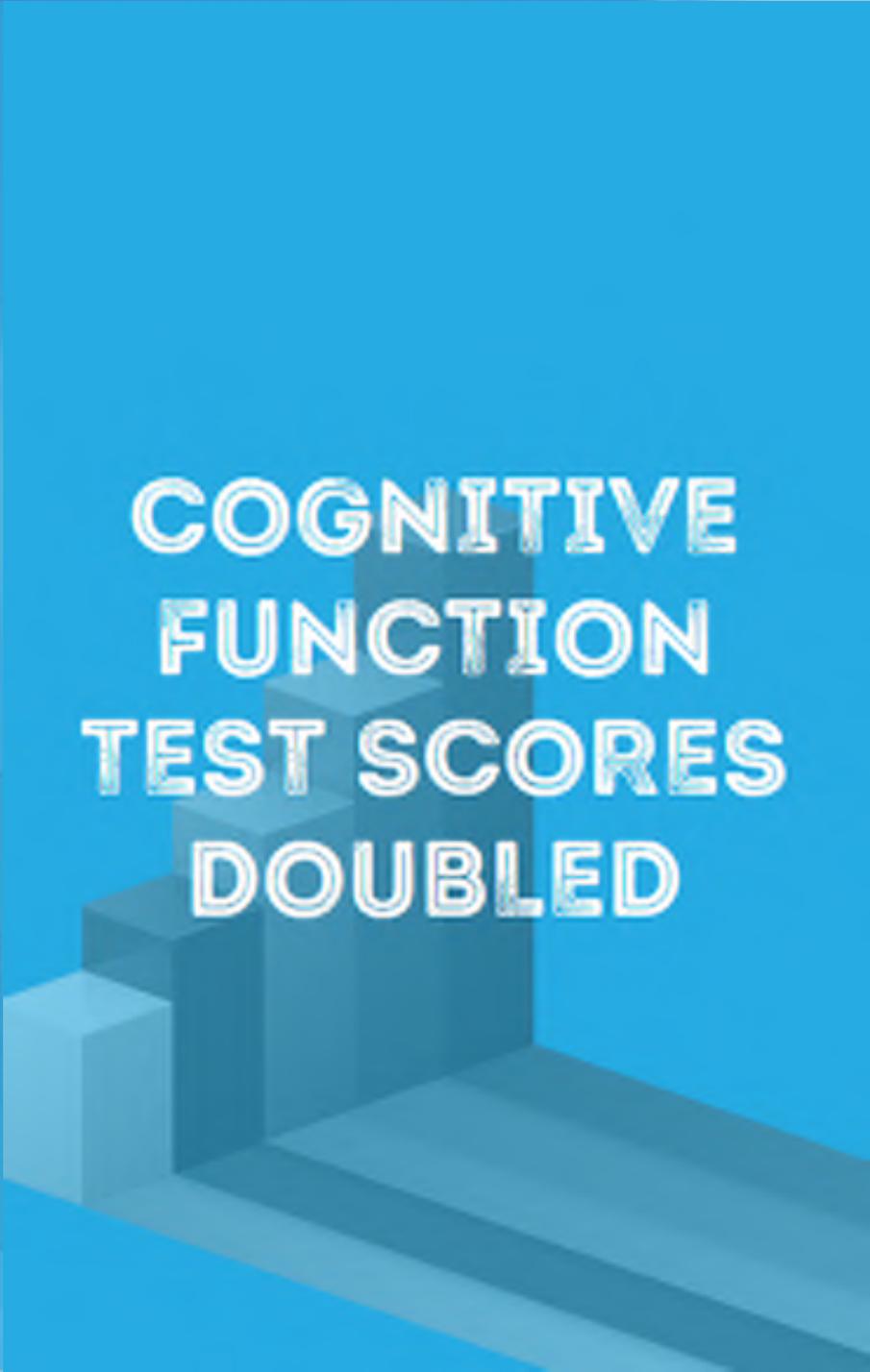
WELL - THERMAL COMFORT

Thermal Performance
Enhanced Thermal Performance
Individual Thermal Control

LEED - INDOOR ENVIRONMENTAL QUALITY

Minimum Indoor Air Quality Performance
Environmental Tobacco Smoke (ETS) Control
Increased Ventilation
Construction Indoor Air Quality Management Plan
Low-Emitting Materials - Adhesives and Sealants
Low-Emitting Materials - Paints and Coatings
Low-Emitting Materials - Flooring Systems

Controllability of Systems -
Thermal Comfort
Thermal Comfort - Design
Thermal Comfort - Verification

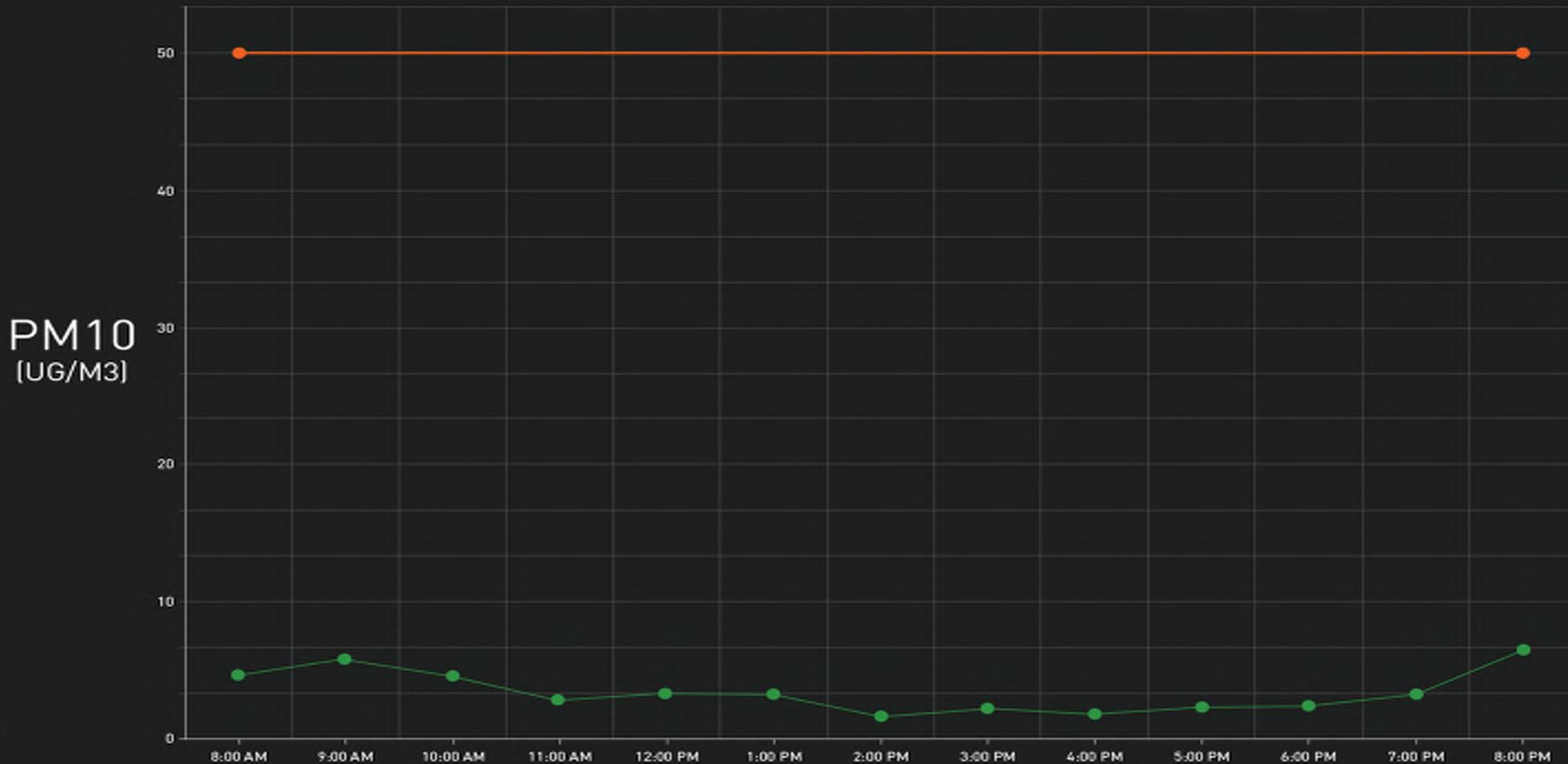


COGNITIVE
FUNCTION
TEST SCORES
DOUBLED

Indoor Air Quality Testing

Air Pollution - Biology Lab

● WELL Air Pollution Limit ● Ogden College Hall



PM10
[UG/M3]

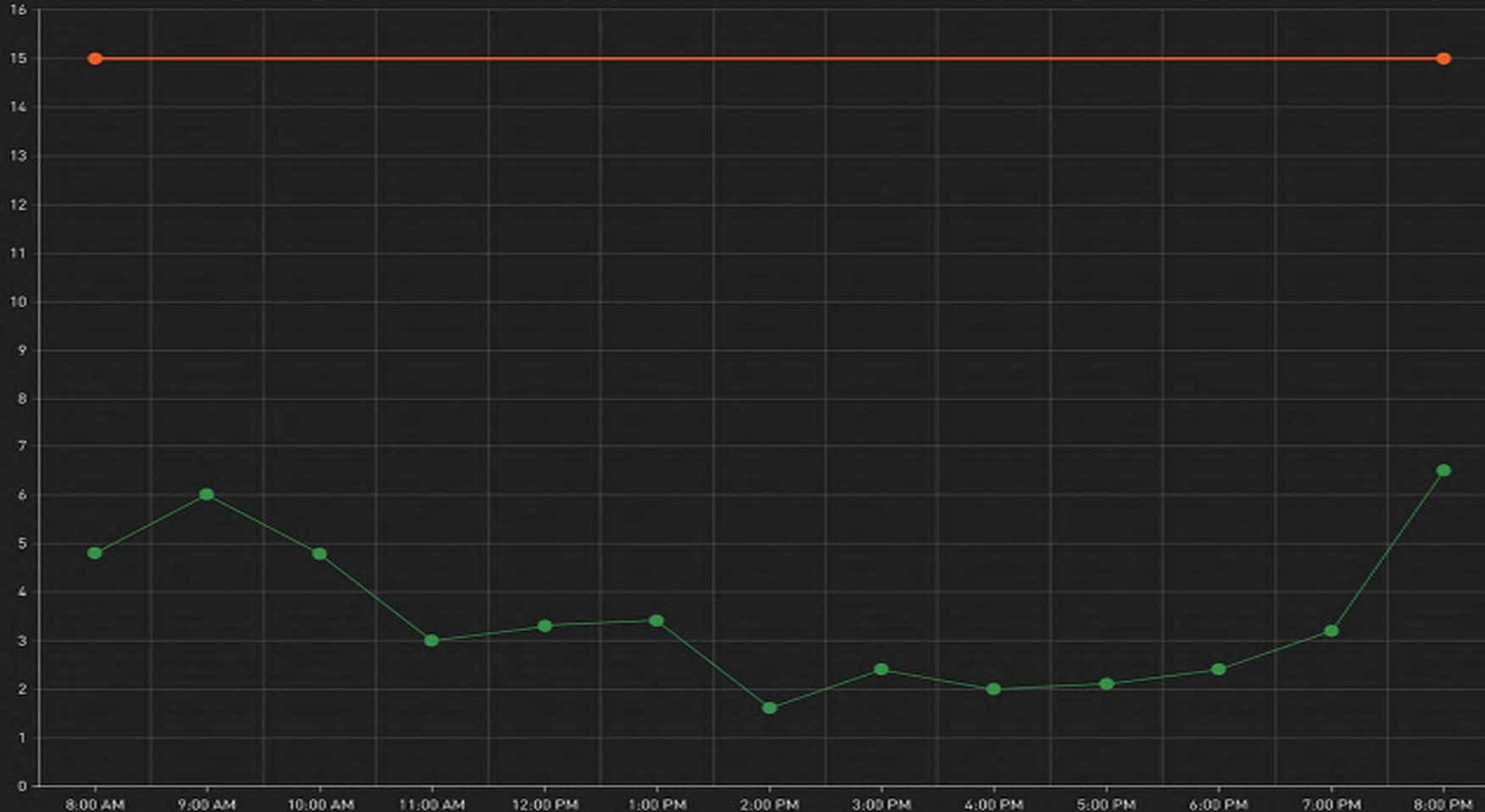
PERCENT
CHANGE
-92.8%

Indoor Air Quality Testing

Air Pollution - Chemistry Lab

—●— WELL Air Pollution Limit —●— Ogden College Hall

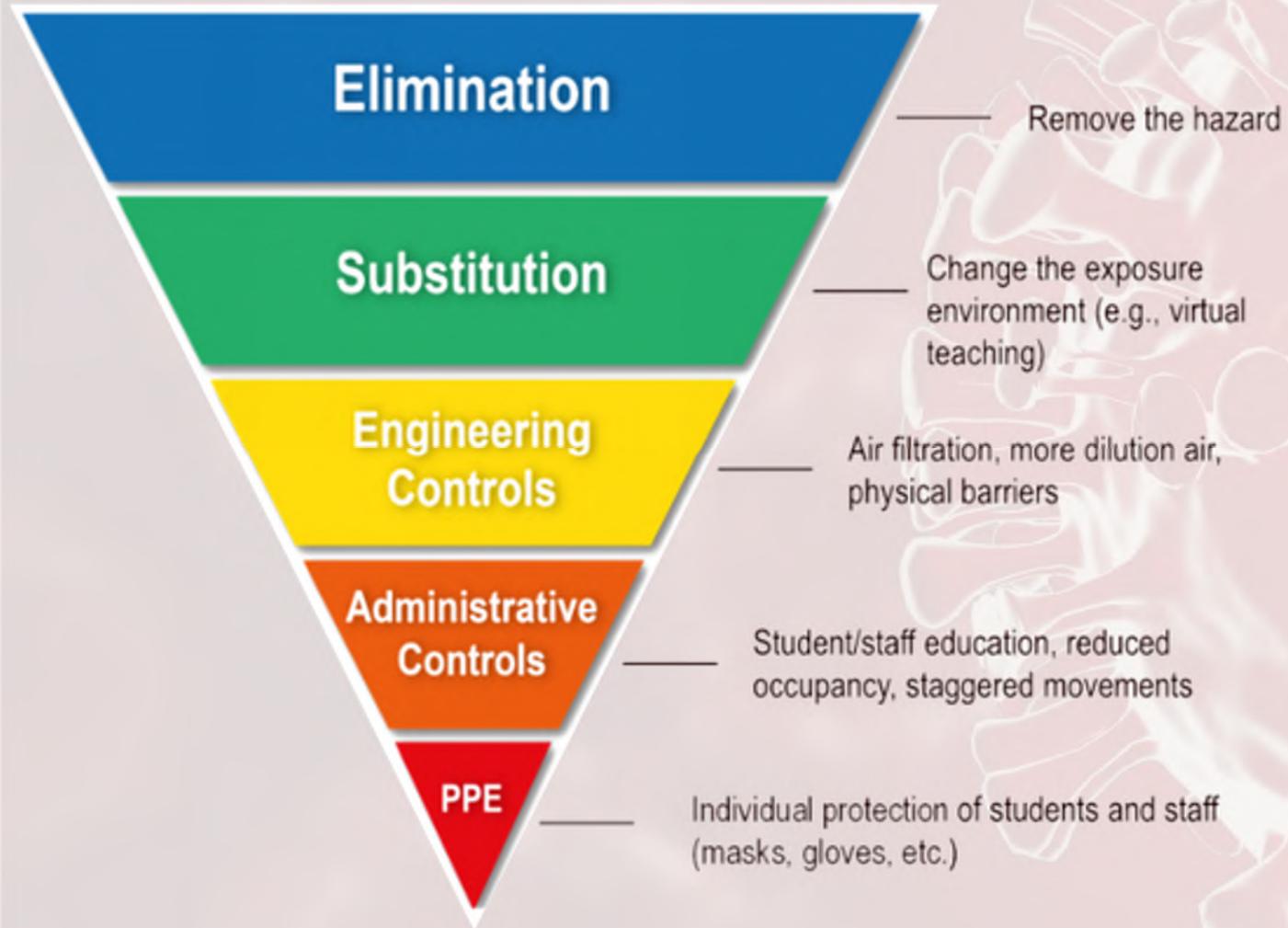
PM2.5
(UG/M3)



PERCENT
CHANGE

-76.6%

Pandemic Resilience



Remove the hazard

Change the exposure environment (e.g., virtual teaching)

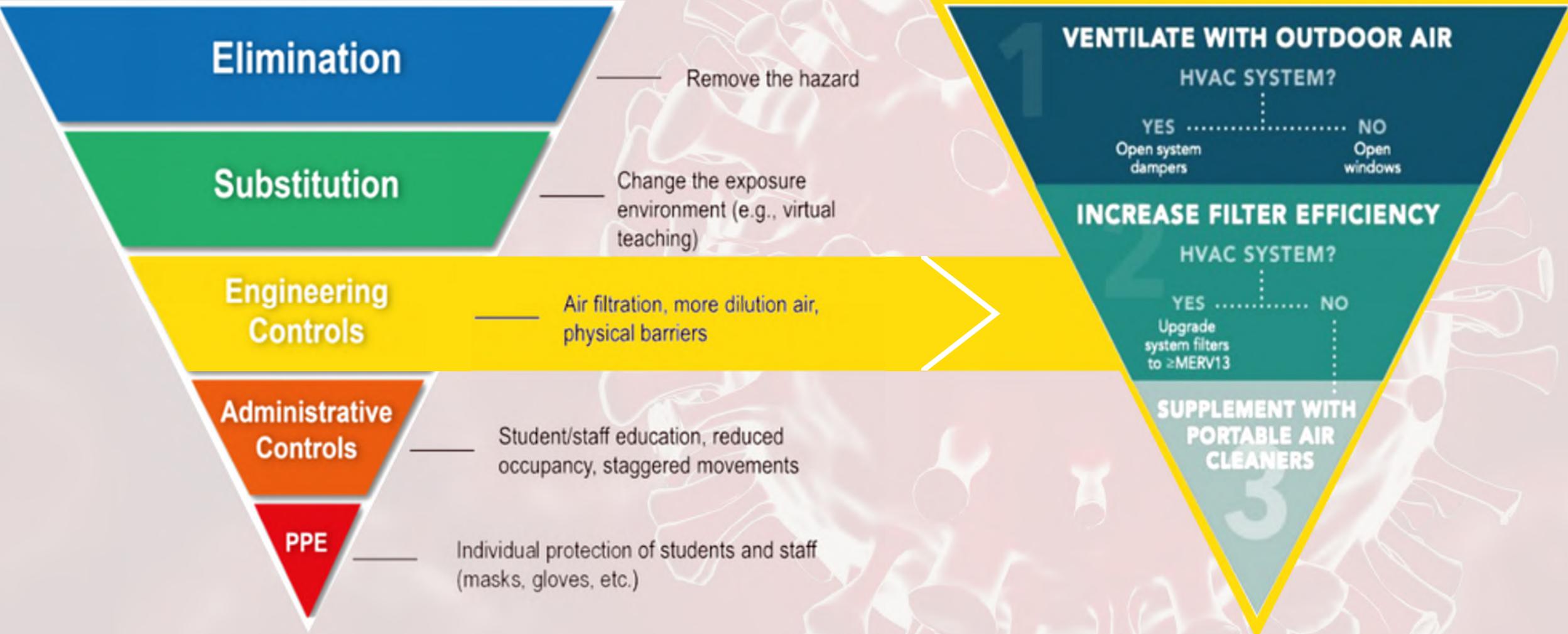
Air filtration, more dilution air, physical barriers

Student/staff education, reduced occupancy, staggered movements

Individual protection of students and staff (masks, gloves, etc.)



Pandemic Resilience



Balance

LEED + WELL + Energy Performance

Energy and Atmosphere

Indoor Environmental Quality

- Fume Hood Auto-Closers
- 12" Sash Stops
- Safety & Energy Signage
- Air Change Rates
- ANSI Z9.5-2012 Laboratory Ventilation
- Chemical Storage Cabinets
- Laboratory Hood Face Velocities
- Chemicals for Academic Labs
(Not Routinely Stored in Academic Labs)





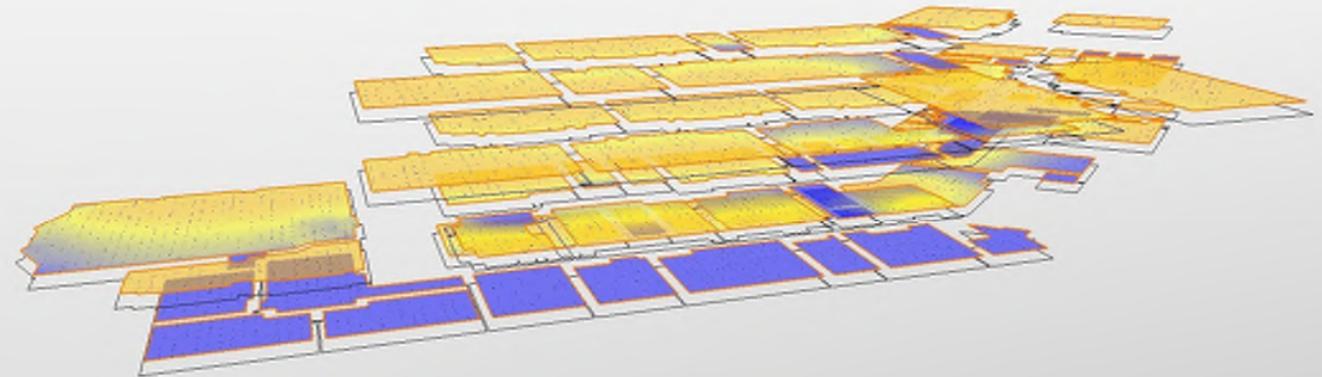
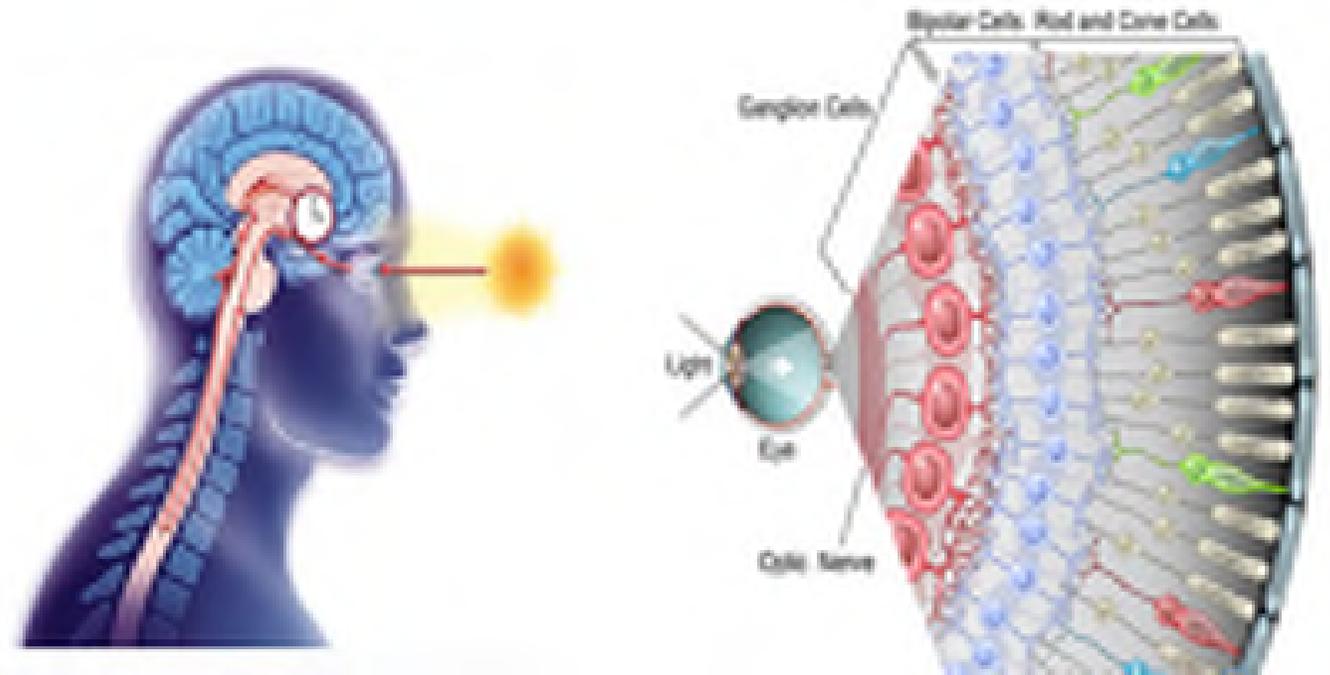
Daylighting

Spatial Daylight Autonomy

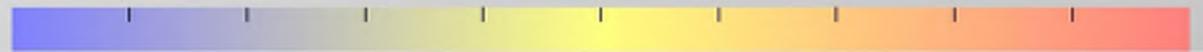
(sDA) > 55%

Annual Sunlight Exposure

(ASE) < 10%

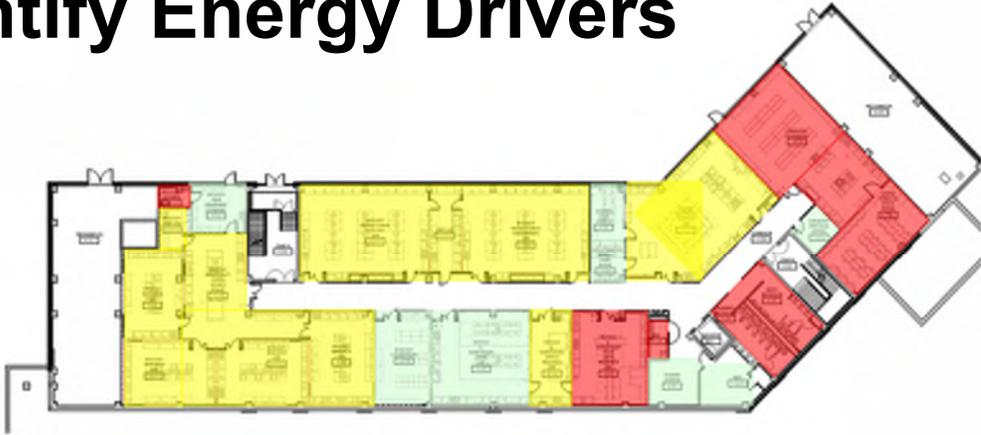


Basic Daylight Autonomy [%] Spatial = 63 %
0 10 20 30 40 50 60 70 80 90 100



Balance LEED + WELL + Energy Performance

Identify Energy Drivers



Air Change Driven



Fume Hood Driven



Loads Driven



Lab Intensity



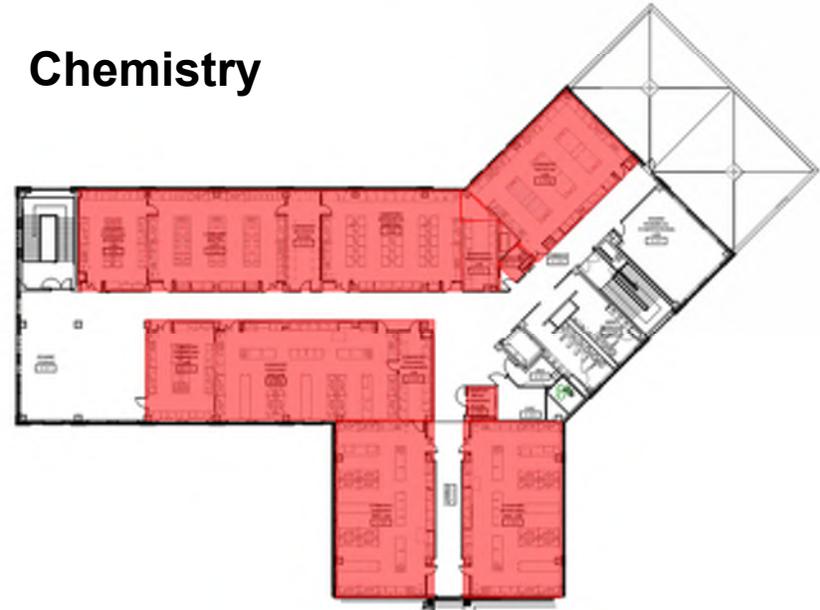
Biology / Physics / Shared



Chemistry



Physics



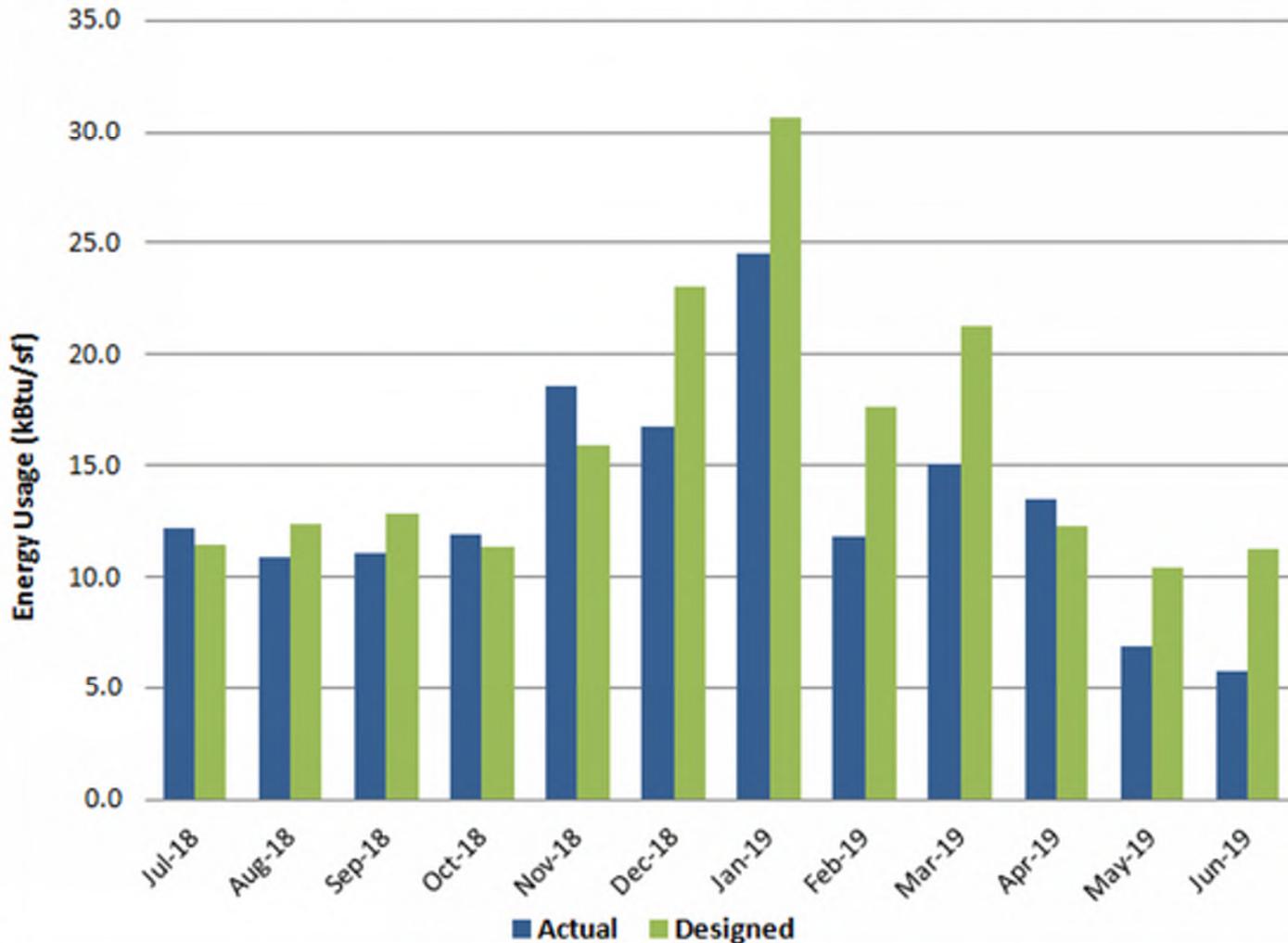
$$\frac{4C^3}{44} = \frac{C^3(4)}{4 \times 3}$$
$${}^{13}E(-) + H_2O = 3 \times H_2$$


PROVE IT!

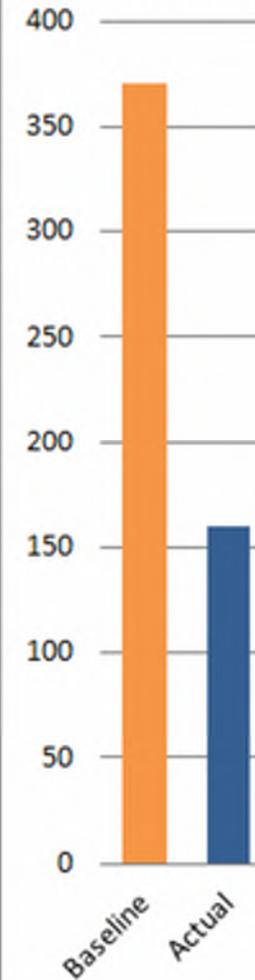


Western Kentucky University – Ogden College Hall

Monthly Energy Consumption (kBtu/sf)



Energy Reduction



Energy Reduction= 57%

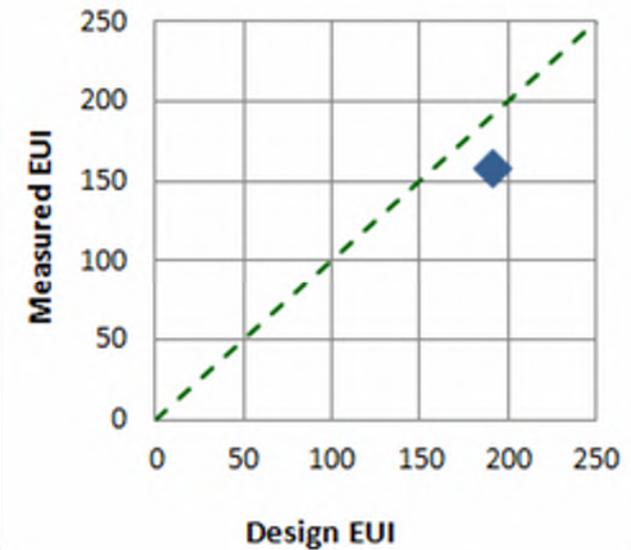
I2SL Baseline= 370

Designed EUI= 191

YTD kBtu/sf= 159

Actual EUI= 159

Measured vs. Designed EUI





OGDEN COLLEGE

Ogden College Hall



KENTUCKY SPOTTED BASS
(MICROPTERUS PUNCTULATUS)



BLACKBERRY
(RUBUS ALLEGHENIENSIS)



GRAY SQUIRREL
(SCIURUS CAROLINENSIS)



SYMBOLS OF OUR COMMONWEALTH

VICEROY
(LIMENTIS ARCHIPPUS)



KENTUCKY AGATE



GOLDENROD
(SOLIDAGO GIGANTEA)



TULIP POPLAR
(LIRIODENDRON TULIPIFERA)





54

Xe

Xenon 131.293



NEOGENE

QUATERNARY

2.58 - PRESENT

HOMO
HABILIS

23



Periodic Table of the Elements

Group 1		Group 2										Transition Metals										Group 18																														
Alkali Metals		Alkaline Earth Metals										Transition Metals										Noble Gases																														
Li, Na, K, Rb, Cs, Fr		Be, Mg, Ca, Sr, Ba, Ra										Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr, Rb, Sr, Y, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, I, Xe, Cs, Ba, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn, Fr, Ra, Rf, Db, Sg, Bh, Hs, Mt, Ds, Rg, Nh, Fl, Mc, Lv, Ts, Og										He, Ne, Ar, Kr, Xe, Rn																														
H	He																																																			
Li	Be																																																			
Na	Mg																																																			
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Cs	Ba	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Nh	Fl	Mc	Lv	Ts	Og																																					
La		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Ho	Er	Tm	Yb	Lu																																							
Ac		Th	Pa	U	Np	Pu																																														





LET THE LIGHT IN

Exposure to sunshine can support mental health and improve sleep quality

GET SOME FRESH AIR

Fresh air cleans your lungs and gives you more energy



LET THE LIGHT IN

Sunshine can be good for you



WEAR LAYERS

Wearing layers allows you to control your own thermal comfort

TAKE THE STAIRS

Stair climbing can help you build and maintain healthy bones, muscles, and joints



GO OUTSIDE

Spending time outdoors helps reduce stress levels and improves physical health

WASH UP

Proper hand hygiene is the #1 way to prevent the spread of germs



RIDE A BIKE

Cycling builds muscle, strengthens your immune system, and lowers your risk for heart disease

STUDY

Sit in the study lounge to reduce distractions and help your mind focus



DRINK WATER

Drinking 8 glasses of water day can increase your metabolism, remove toxins, and put you in a better mood

EAT NATURAL

A healthy eating plan rich in fruits and vegetables can help lower your risk for chronic health conditions



WELL
Community



WUJ Health
& Wellness

WELL Credit:
C01 Health & Wellness Awareness



WELL Credit:
L01 Light Exposure & Education





Burn calories,
take the stairs

**Stair climbing can
help you build and
maintain healthy
bones, muscles
and joints.**



Burn calories,
take the stairs

**Climbing stairs helps
our body produce
endorphins – the
hormones known for
creating a sense of
happiness in our
mind.**



WELL Credit:
V03 Movement Network &
Circulation



4

floors

28

ave. steps
per floor

112

total steps

4.76

calories per
floor up

1.4

calories per
floor down

24.6

total calories
per day



WELL Credit:
V03 Movement Network &
Circulation



4

floors

28

ave. steps
per floor

112

total steps

4.76

calories per
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1.4

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24.6

total calories
per day

EAT NATURAL FOOD
NOT PACKETS & PROMISES
CHANGE ONE LITTLE THING A WEEK
DRINK MORE WATER
TAKE A COOKING CLASS
INSIST ON ETHICAL
COOK FROM THE ❤️
GROW YOUR OWN
LESS CORN & SOY
SAY A LOUD NO! TO GMO
FOCUS ON INGREDIENTS
SAY YES TO LOCAL & ORGANIC
CELEBRATE FOOD TOGETHER
SUPPORT LOCAL FARMS
SPREAD THE WORD!



WELL Credit:
N04 Promote Healthy Nutritional Messaging



DRINK MORE WATER

8 glasses per day



visit your nearest
water fountain & bottle
refilling station



WELL Credit:
N04 Promote Healthy
Nutritional Messaging

Questions



