

BUILDER'S BREAKFAST, FEBRUARY 10, 2021

High Performance Buildings

*ABC 2020
Project of the Year*



NeoCity Academy, School District of Osceola County, FL

WHAT WE'LL TALK ABOUT

- 1) What is a High Performance Building
- 2) The “WHY” → Reducing Operational Costs
- 3) Cost Premiums and (Return on Investment) ROI
- 4) Terminology & De-mystifying the Details
- 5) Mock-ups & Testing
- 6) Recommended Next Steps
- 7) Q&A



MARC CLINCH
CHIEF FACILITIES OFFICER
School District of Osceola County

What is a High Performance Building?

A building that integrates and optimizes

- Ultra-low energy usage
- Durability
- Life-cycle performance
- Occupant productivity



The “Why”



U.S. school districts spend **\$6B**
each year on energy —
second only to
salaries.



On average, high-performance schools can use between **65%–80% less energy** than traditionally constructed schools.

<https://betterbuildingsinitiative.energy.gov/accelerators/zero-energy-schools>

TRADITIONAL

Completed in 2017



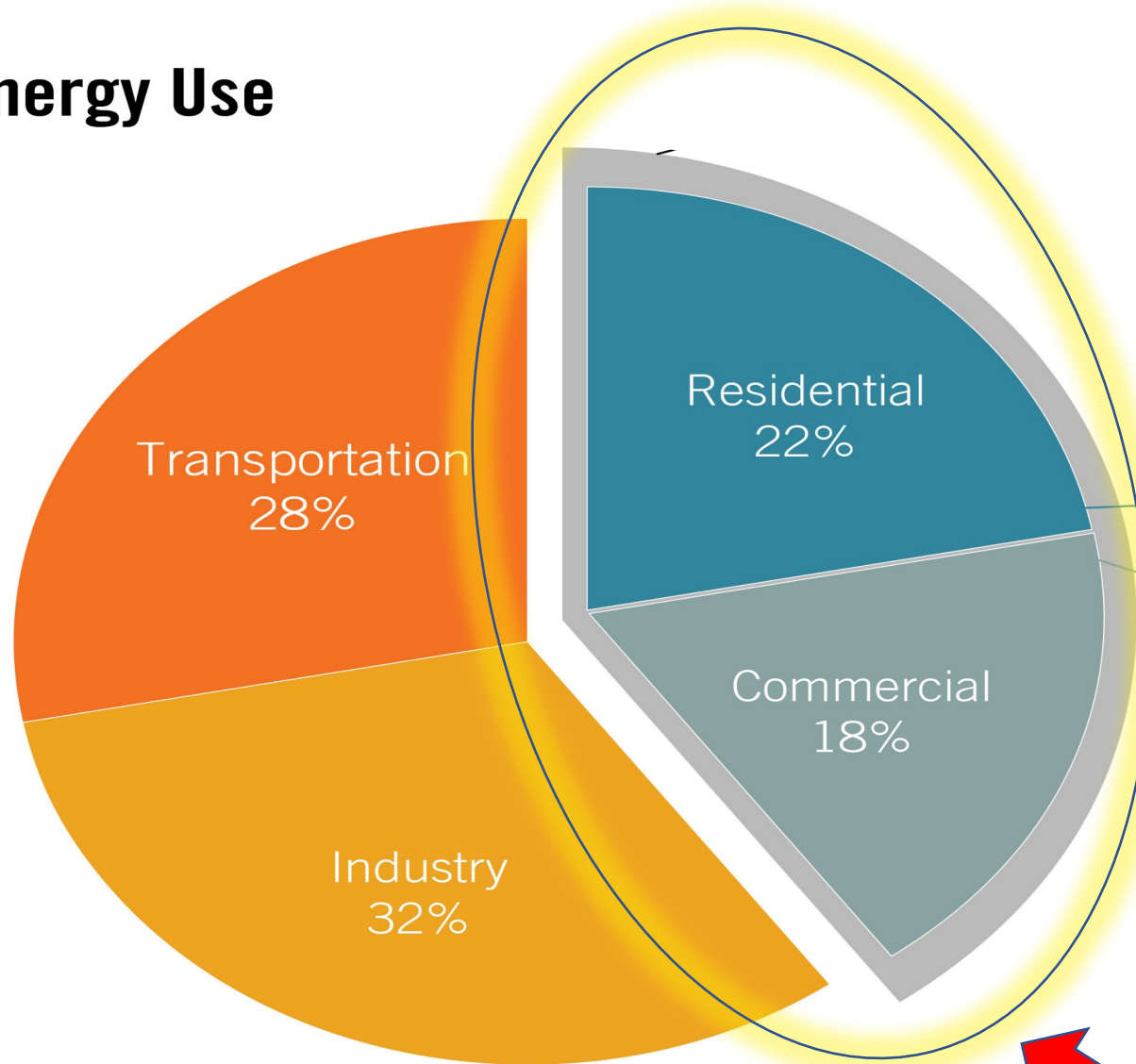
VS



HIGH PERFORMANCE

Completed in 2020

U.S. Energy Use



**At Osceola
Schools, 90%
of our utility
costs are
electricity
alone**

Buildings make up 40%

NEOCITY ACADEMY - LIFECYCLE COSTS

(VS TYPICAL SCHOOL BUILDING)

It's not about First Costs



\$115K

**SAVED PER YEAR
ON ENERGY COSTS**

\$3.2M

**SAVED OVER 20 YRS ON ENERGY
& MAINTENANCE COSTS**



44,820 SF

500

STUDENTS
(CAPACITY IS 625)



**WITHIN COST
PER STUDENT
STATION &
SREF**



HIGH PERFORMANCE
BUILDING PREMIUM

+ 5.2% Premium

ROI = 4.5 YEARS

Originally projected 6-years



NeoCity Academy



Completed in 2019

HIGH PERFORMANCE & NET ZERO-
ENERGY PREMIUM

i.e., to add Solar PV

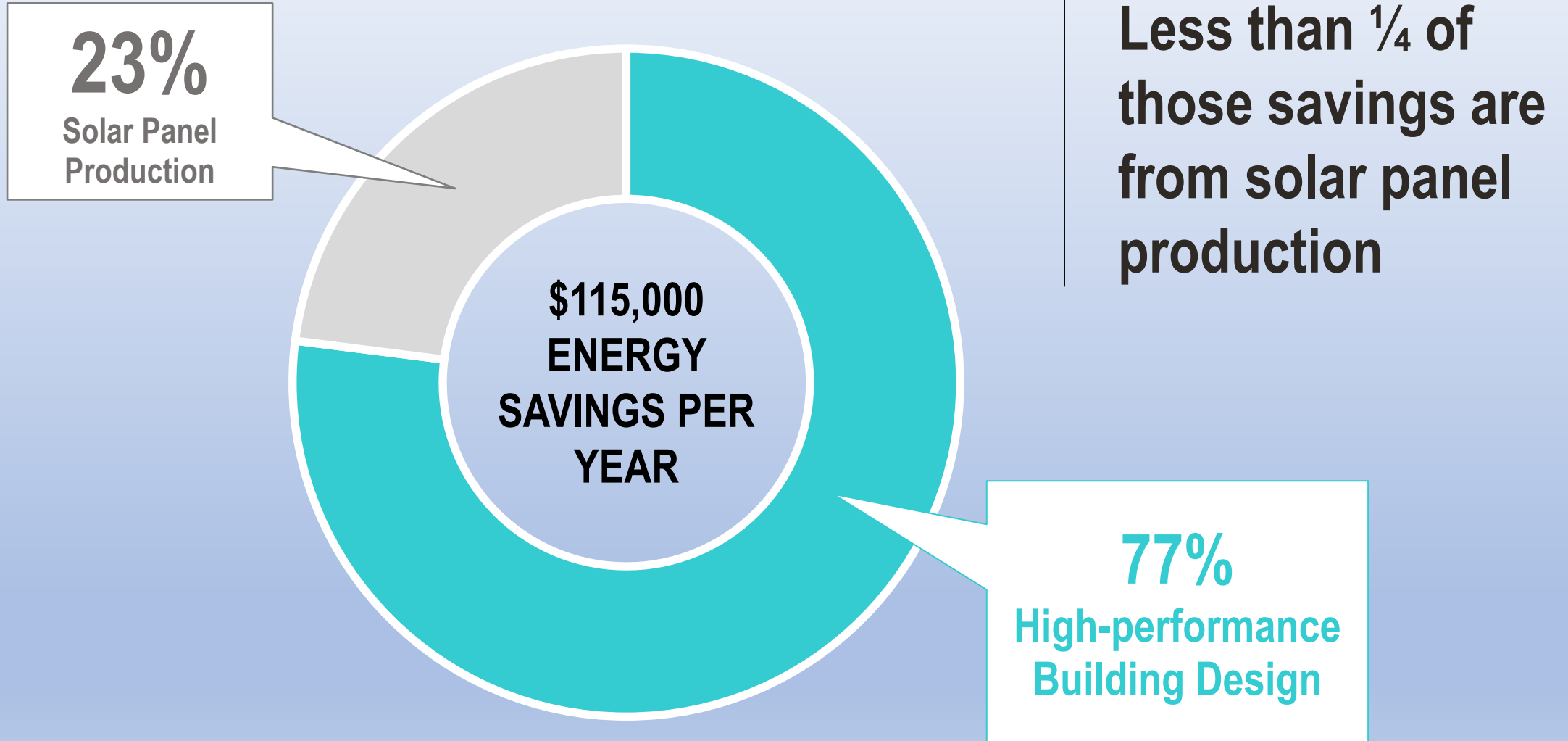
+ 9.1% Premium

ROI = 7.5 YEARS

Originally projects 9.5-years



NeoCity Academy



HIGH PERFORMANCE
BUILDING PREMIUM

+ 1% Premium

ROI = 5.3 YEARS

Originally projected 7-years



Osceola Business Academy



26,794 SF

Completed in 2020

**Will save an
estimated
\$14,000 per year**

HIGH PERFORMANCE
BUILDING PREMIUM

+ 1.5% Premium

ROI = 2.9 YEARS

Originally projected 6-years



91,813 SF



Canoe Creek K8



**Will save an
estimated
\$125,000 per year**

Scheduled Completion - August of 2021

High Performance (HP) Versus Zero Energy (ZE)

**High
Performance**

Building that has an ultra-low energy usage

NO SOLAR

VS

Zero Energy

**Net Zero
Energy**

**Net Positive
Energy**

Buildings that incorporates High Performance strategies and Renewables (i.e., Solar)

High Performance + Solar = Zero Energy

High Performance Building Components

Some examples/not all inclusive

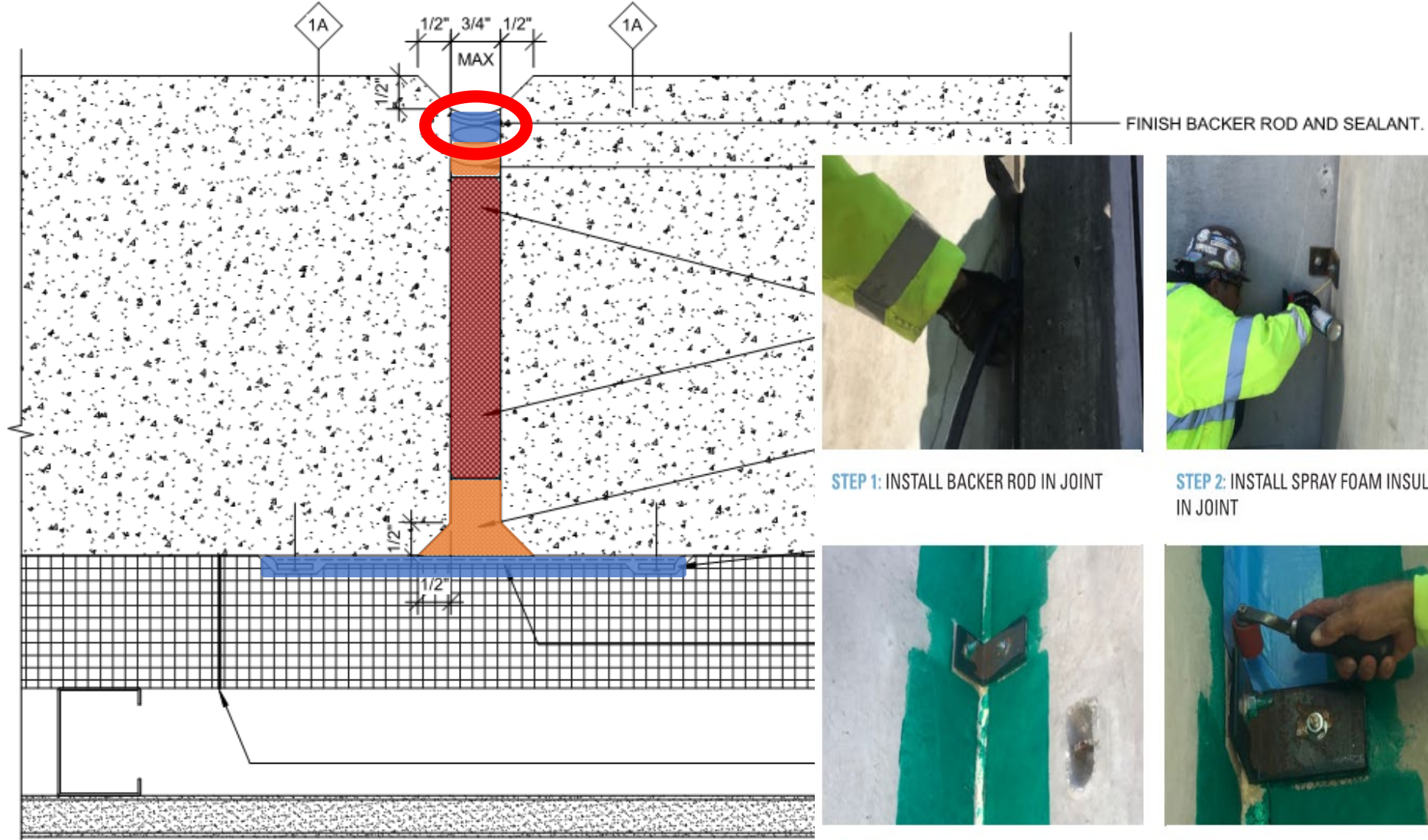
- ✓ Site/Building Orientation
- ✓ Energy Modeling
- ✓ Thermal Massing
- ✓ Tight Building Envelope
- ✓ Highly Efficient HVAC Equipment
- ✓ Right-sizing HVAC System
- ✓ Decoupled HVAC System
- ✓ Dedicated Outdoor Air
- ✓ Air Filtering/Purification
- ✓ High performance windows/doors
- ✓ Cool/reflective roofing
- ✓ Daylighting
- ✓ LED Lighting

Zero Energy Building Components

- ✓ Photovoltaic (PV) Panels

Getting to Zero Energy is the final push to address the remaining Energy Use Intensity (EUI)

TIGHT BUILDING ENVELOPE



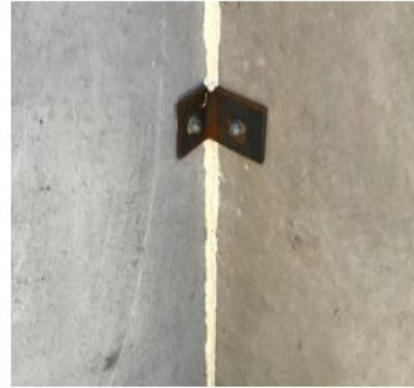
STEP 1: INSTALL BACKER ROD IN JOINT



STEP 2: INSTALL SPRAY FOAM INSULATION IN JOINT



STEP 3: TRIM SPRAY FOAM FLUSH WITH WALL



STEP 4: APPLY TRANSITION PRIMER TO BOTH SIDES OF JOINT



STEP 5: APPLY TRANSITION MEMBRANE AND ADHERE WITH WEIGHTED ROLLER



STEP 6: SEAL EDGES OF MEMBRANE WITH BUTYL SEALANT



1

A500

TYP. DETAIL AT TILT PANEL JOINTS

6" = 1'-0"

IMPROVING STUDENT PERFORMANCE

CREATING HEALTHIER BUILDINGS

A DOAS, as opposed to recycled air, allows NeoCity Academy to maintain CO₂ levels at 700-1,000ppm. According to a Harvard Study, CO₂ in excess of 1,500ppm is counterproductive to human cognitive function.

NATURAL DAYLIGHTING

DEDICATED OUTDOOR AIR SYSTEM (DOAS)

NATURAL DAYLIGHTING – Studies reveal:

- Better Test Scores
- Higher Employee Production
- Better Regulation of Hormones
- Improved Circadian Rhythm

<https://www.hsph.harvard.edu/news/press-releases/carbon-dioxide-levels-on-flight-deck-affect-airline-pilot-performance/>

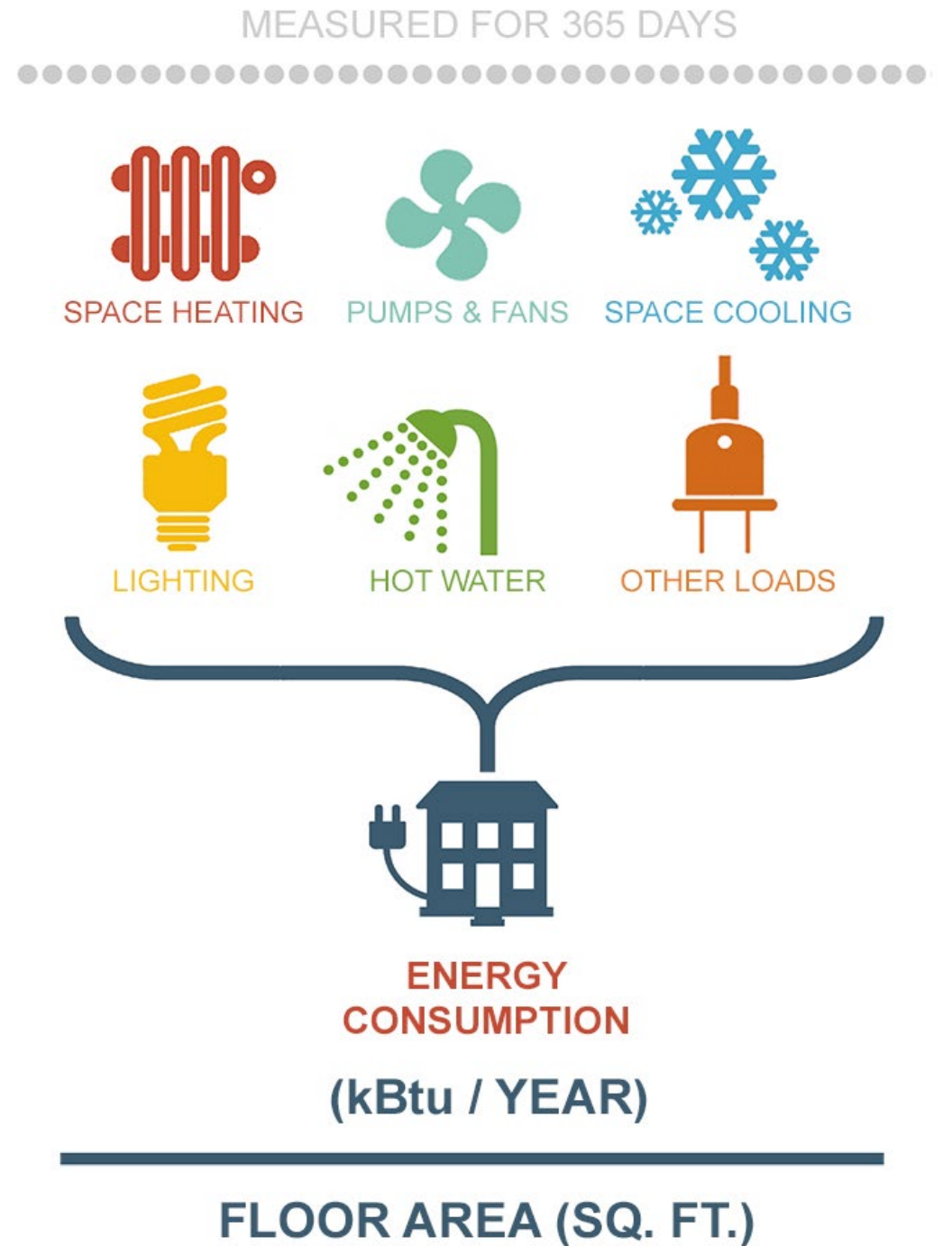
<https://archive.thinkprogress.org/exclusive-elevated-co2-levels-directly-affect-human-cognition-new-harvard-study-shows-2748e7378941/#:~:text=In%20a%20landmark%20public%20health%20finding%2C%20a%20new,today%20inside%20classrooms%2C%20offices%2C%20homes%2C%20planes%2C%20and%20cars.>

WHAT IS EUI?

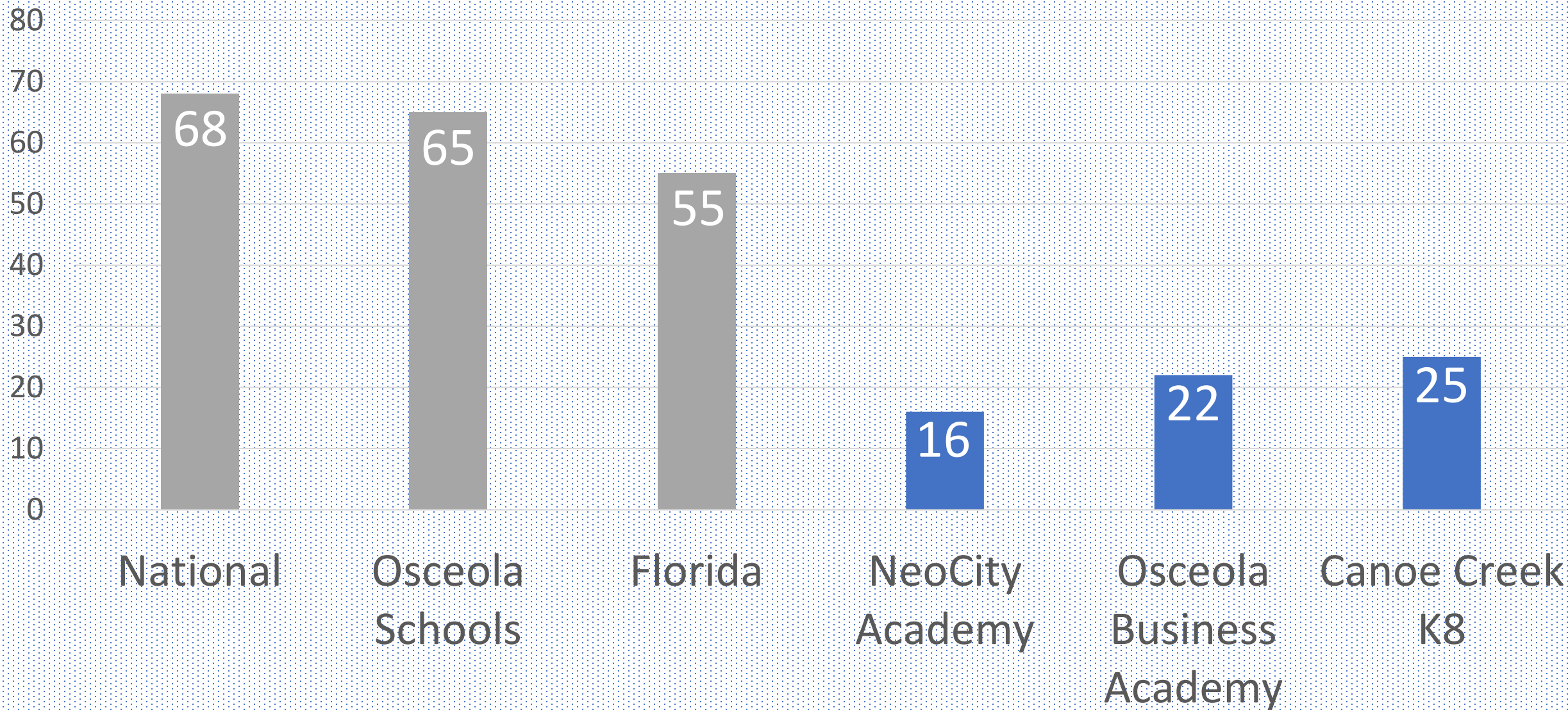
Energy Use Intensity

Everything that consumes power in the building divided by square footage

The lower the number, the lower the energy use



Comparable EUI's





**A major portion of
a building's energy
loss is by air
leakage through
the building's
envelope**

MINIMIZE AIR LEAKAGE >>

RIGHT SIZE MECH. SYSTEM >>

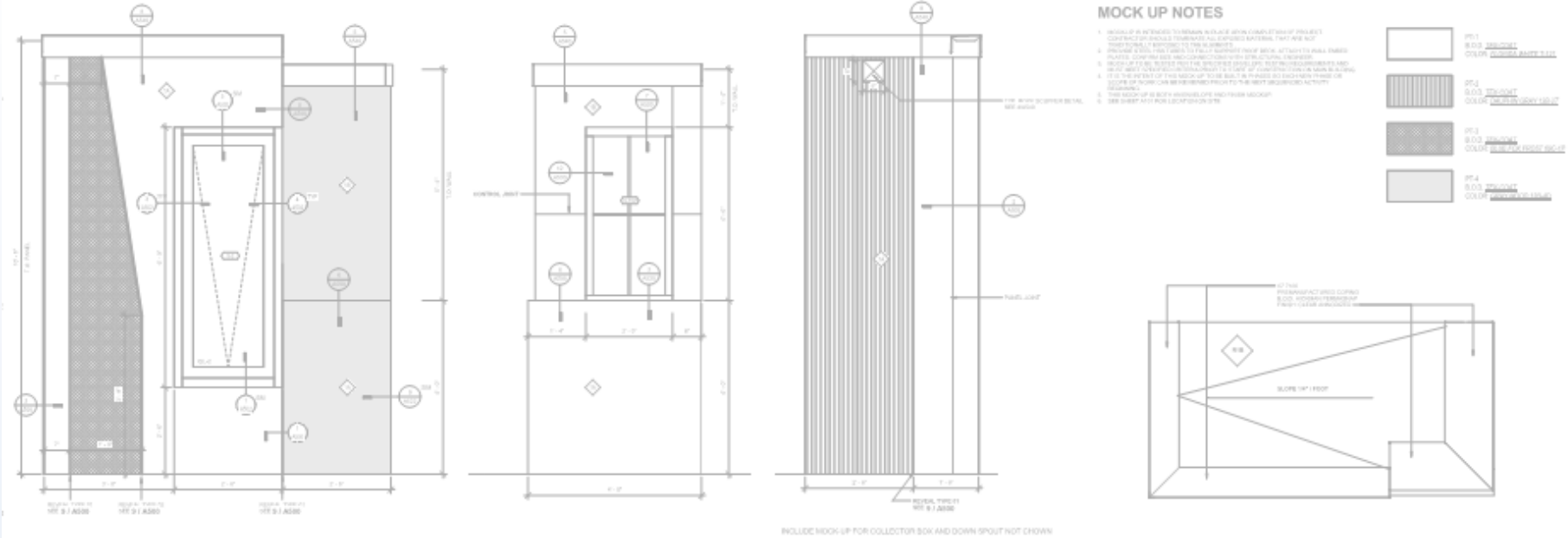
REDUCE ENERGY FOOTPRINT

“WE’VE ALWAYS DONE IT THIS WAY”

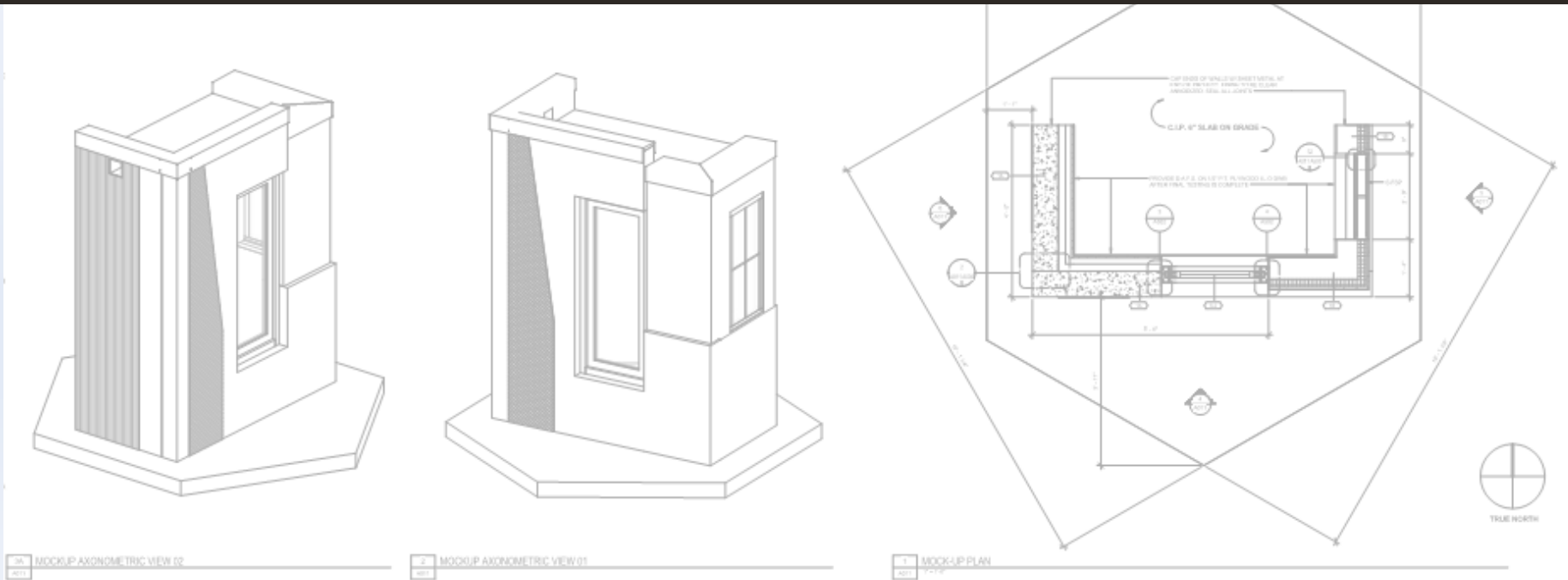
The most dangerous phrase in the language is, “We’ve always done it this way.”

*Rear Admiral Grace Hopper
Pioneering Computer Scientist
1906-1992*





MOCK-UPS ARE NON-NEGOTIABLE



TESTING

“TRUST, BUT VERIFY”

- Ronald Reagan



ASTM E779 “Air Leakage Testing by Fan Pressurization”

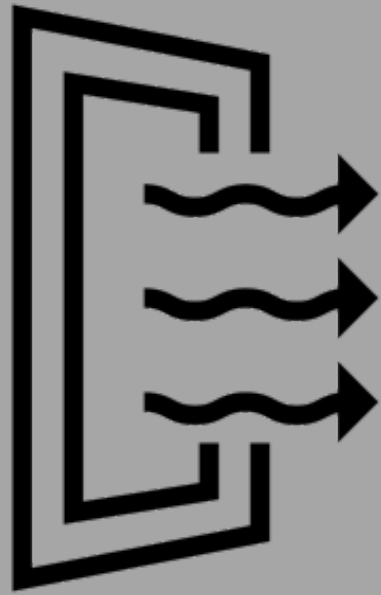


Osceola Business Academy Mock-up



NeoCity Academy Mock-up

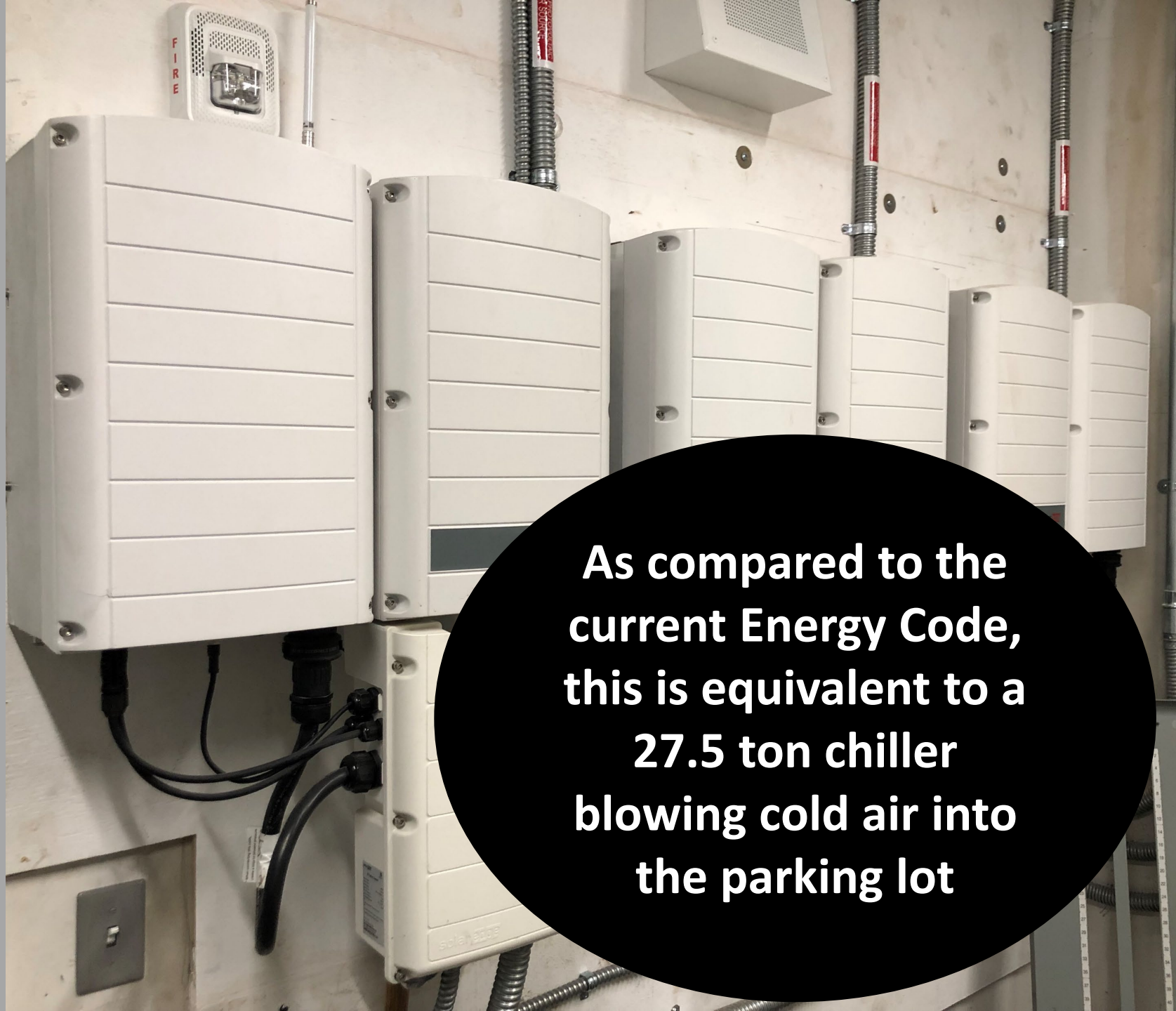
WHOLE BUILDING AIR LEAKAGE
AREA OF ENVELOPE: 73,286 SF



10,993 CFM

0.15 CFM/SF

REQUIRED RATE



**As compared to the
current Energy Code,
this is equivalent to a
27.5 ton chiller
blowing cold air into
the parking lot**

WHOLE BUILDING AIR LEAKAGE
AREA OF ENVELOPE: 73,286 SF



1,970 CFM

0.027 CFM/SF

TESTED RATE

**82% better
than
required**



What about Renovations?

What is the cost premium for HP?

- Variables - Extent of the renovation
- Extensive – Building Envelope Opportunities
- Light Renovation – HVAC/Lighting

Starts with Benchmarking

- Determine the EUI and perform an Air Leakage Test

Commissioning (Cx) Retro Commissioning (RCx)

- Verification of the Owner's Project Requirements (OPR's)
- Quick ROI that ensures that the Design Intent has been achieved
- RCx identifies overrides and other anomalies



Recommended Next Steps

1. The architectural firm will prepare design documents for the construction of a High Performance/Zero Energy Ready building
2. Maximum Energy Use Intensity (EUI) of 25. EUI Goal is 25 or less
3. Maximum Air Leakage of 0.20 CFM/SF



Challenge the design team – Efficiency does not have to cost more ¹⁴

Other considerations:

1. Select a design professional a successful HP track record
2. Identify an Internal Project Champion
3. Weigh ALL the Benefits...

Minimal Cost Premiums

Quick ROI

Use Building as a
Teaching Tool

Reduce Operational Costs

Healthier Buildings

Better Performing Buildings

Paves the way for Solar

Awards and Recognition



NEOCITY ACADEMY OPENS ITS CAMPUS TO “DISRUPT” TRADITIONAL EDUCATION

Aug 15, 2019 | Kissimmee News, Osceola News, Osceola Schools | ★★★★★

NETWORKING

How Smart Buildings Are Helping Schools Go (and Save) Green

Smart building upgrades bring energy savings and cost-effective facilities management to K–12 schools.

A Zero-Net Energy Reality: Lessons Learned From A Decade Of High-Performance, Zero-Energy Building Design

By Philip Donovan, AIA LEED AP BD+C NCARB Community Studio Principal Little Diversified Architectural Consulting

First Net Zero School Opens in Florida

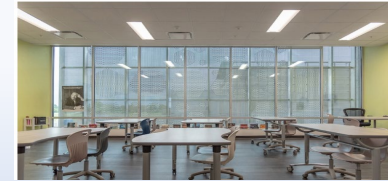
By Dian Schaffhauser | 08/19/19



Florida's first net-zero K-12 school opens

The building is distinguished by its rooftop solar array and its airtight envelope.

ENERGY EFFICIENCY | AUGUST 08, 2019 | JOHN CAULFIELD, SENIOR EDITOR



At NeoCity Academy, student performance enhancement features include air purification technology, enhanced and natural daylighting, and collaboration laboratories. Image: Little Diversified Architectural Consulting

Osceola County School Board and NeoCity Academy Win Three Prestigious Construction Industry Awards For Florida's First High-Performance, Net-Zero Energy School



High school is billed as Florida's first public K-12 net-zero energy campus

The Osceola County district is opening NeoCity Academy, a STEM-themed campus, in a high-tech corridor in Kissimmee.



NeoCity Academy, located in Kissimmee, is Florida's first Net-Zero Energy K-12 School. The school celebrated its official opening with a ribbon-cutting ceremony today. Located within the NeoCity Campus, one of only 10 high-tech corridors in the world, the 44,820 square foot school will use 76 percent less energy than a regular school and save an estimated \$115,000 yearly on energy costs.

A Call To Action

Paradigm Shift
Adjusting Mindset
Transformational Time
A Growing Trend

LEADERSHIP

Questions?

Marc.Clinch@osceolaschools.net



MARC CLINCH
CHIEF FACILITIES OFFICER
School District of Osceola County