

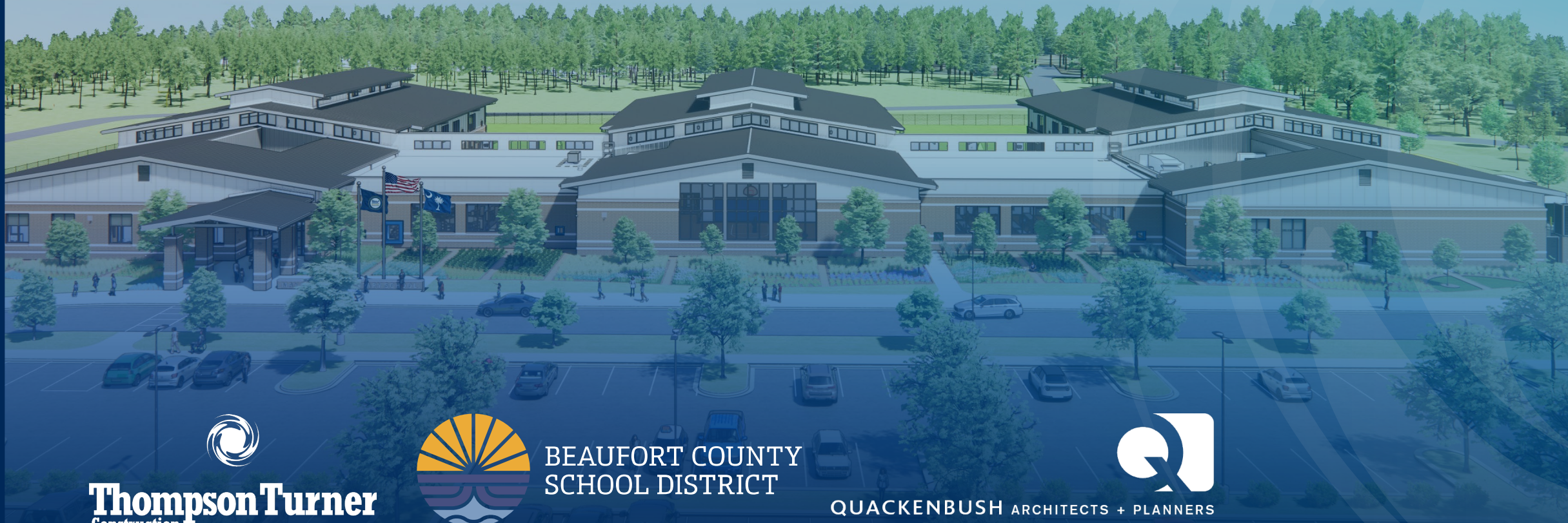
# Investigating ICF

for use in the Lowcountry of

Sc

**Alexander Marshall, Blake Stancil**, LEED AP BD+C, AC, **Barbara Haller**, AIA LEED AP BD+C

March 5, 2025 2:30-3:30pm





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Construction



BEAUFORT COUNTY  
SCHOOL DISTRICT



## LEARNING OBJECTIVES

- Understand the principles of **Insulated Concrete Forms (ICF)** and their relevance to HSW in K-12 schools
- Analyze the **performance benefits of ICF** specific to the coastal South Carolina environment, including resistance to mold, fire, and impact
- Discuss **case studies of ICF implementation in K-12 projects** and lessons learned
- Evaluate the **energy efficiency and economic benefits of ICF** for educational facilities and their long-term impact on welfare in the educational sector

LEARNING OBJECTIVES

# PRINCIPLES OF INSULATED CONCRETE FORMS (ICF)

Understand the principles of Insulated Concrete Forms (ICF) and their relevance to Health, Safety, and Welfare in K-12 schools



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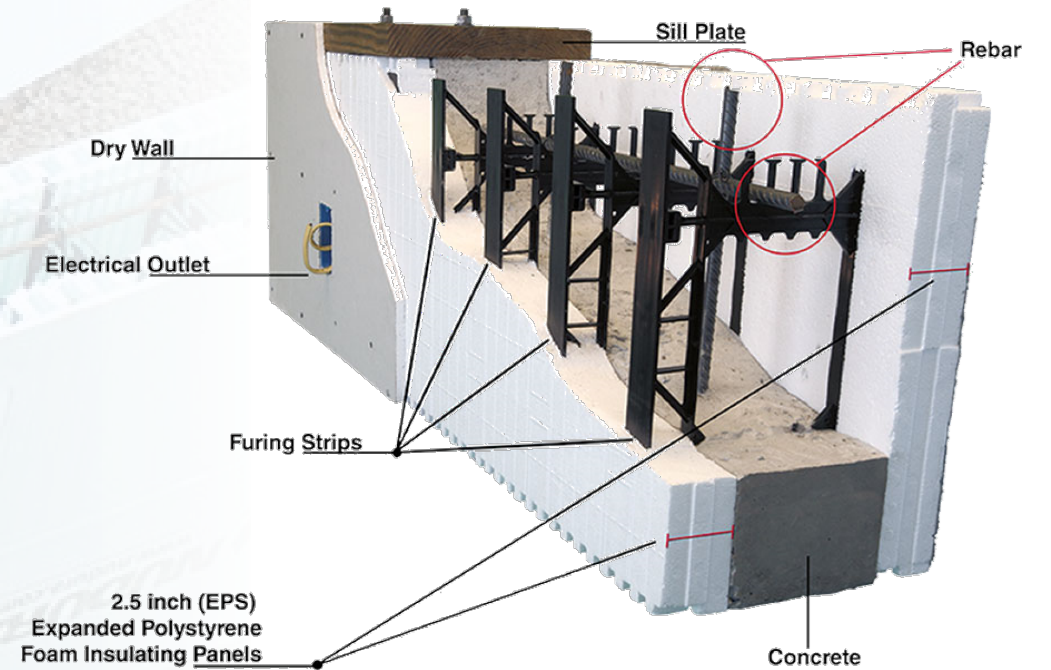




# WHAT IS ICF?

## *Insulated Concrete Formwork*

- Expanded polystyrene
- Plastic webs
- Plastic studs



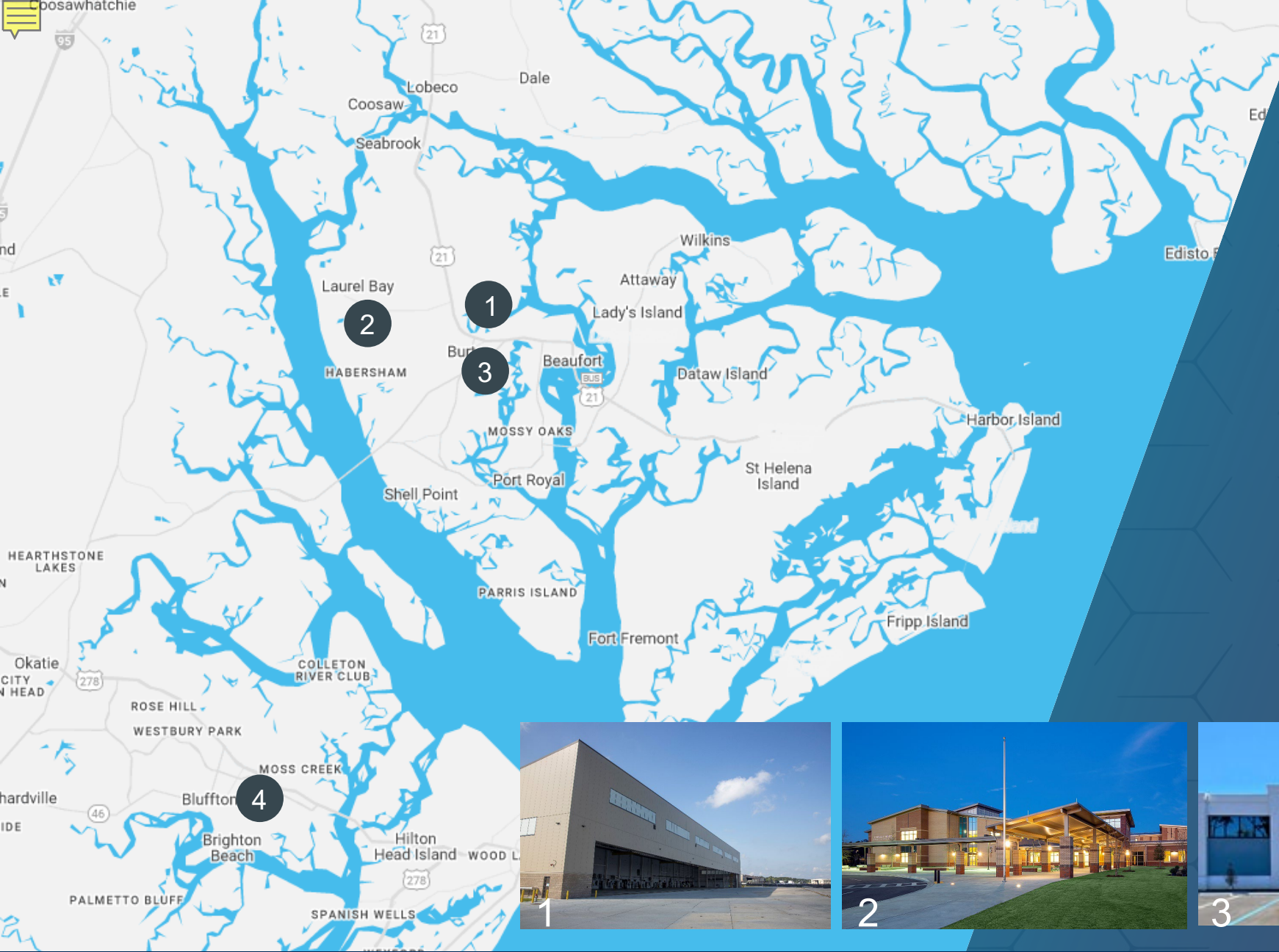
# HISTORY OF ICF

- **1937** First ICF developed in Belgium
- **1980's** became more popular
- **1990's** The Insulating Concrete Form Association (ICFA) formed
- **2000's** ICF construction became more common in schools

# Manufacturers

- Logix / Element ICF
- Quad-Lock
- Nudura
- SuperForm
- BuildBlock Building Systems
- Fox Blocks
- Integraspec
- Amvic





# HISTORY OF ICF IN BEAUFORT

1. Beaufort Marine Corp Flight Simulator Building
2. Bolden Elementary-Middle (Military School)
3. Harbor Freight Tools in Beaufort
4. May River Elementary School





## Health

- Indoor Air Quality
- Airtight Construction
- Moisture Resistance (prevent growth of mold and mildew)
- Higher performance building - test scores, acoustics

## St c r a t i n g s a n d i c f S

STC Rating	What is audible?
25	Soft speech can be heard and understood.
30	Normal speech can be heard and understood.
35 <small>Fiberglass insulated wood framed walls measure around 38.</small>	Loud speech can be heard and understood.
40	Loud speech can be heard, but not understood
45	The threshold at which privacy begins.
50+ <small>Nudura 6-inch ICF walls measure 52</small>	Loud sounds heard faintly or not at all.



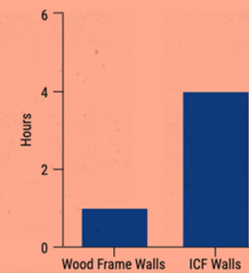
# Relevancy to HSW K- 12 schools

## Safety

- *Fire resistance* – concrete, foam fire retardant additive
- *Natural disaster resistance* – hurricanes, tornadoes
- *Security* – Blast ratings, secure zones

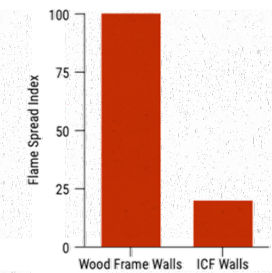
### Intertek Firewall Testing

In most cases, the baseline for a graph is 0. But writers can skew how data is perceived by making the baseline a different number. This is known as a "truncated graph".



#### Fire Ratings

During testing each wall was exposed to temperatures of up to 2,000 degrees Fahrenheit which is much hotter than a typical house fire. Wood framed walls failed to withstand testing for more than an hour without collapsing whereas ICF walls remained unscathed after four hours.



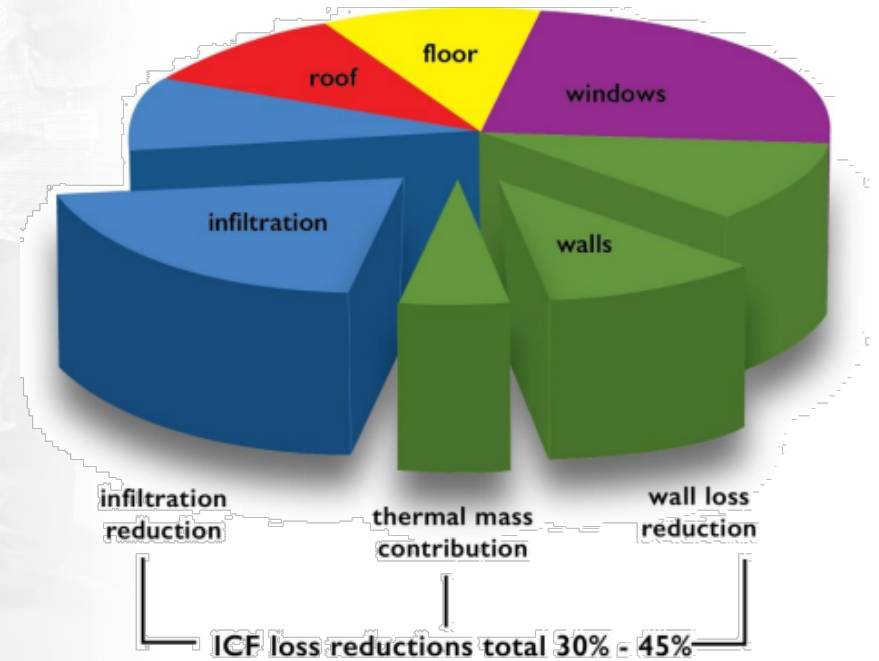
#### Flame Spread Index

Part of the firewall testing included identifying each wall's flame spread index. Wood frame walls typically allowed both flame and fire-starting heat through in an hour or less. The ICF walls that were tested did not allow any flame through.

# Relevancy to HSW K- 12 schools

## Welfare

- Energy Performance
- Operational Costs
- IRA (Inflation Reduction Act)



## LEARNING OBJECTIVES

# performance benefits of ICF

Analyze the performance benefits of ICF specific to the coastal South Carolina environment, including resistance to mold, fire, and impact.



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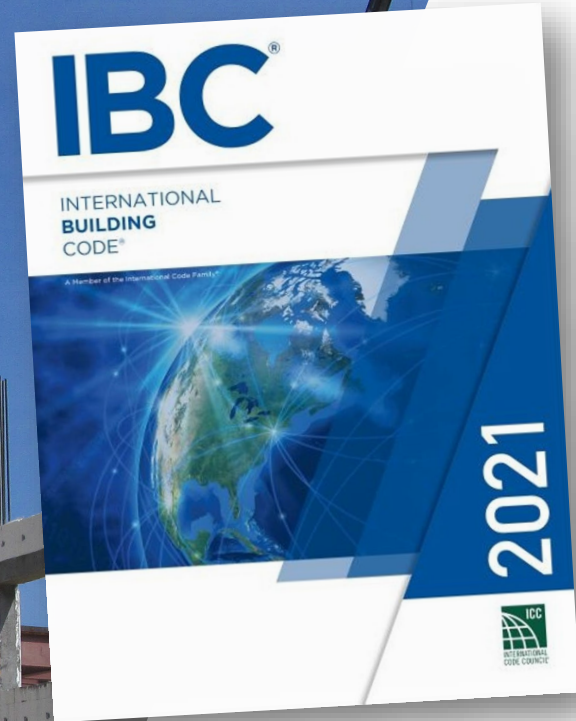
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# Benefits to owner

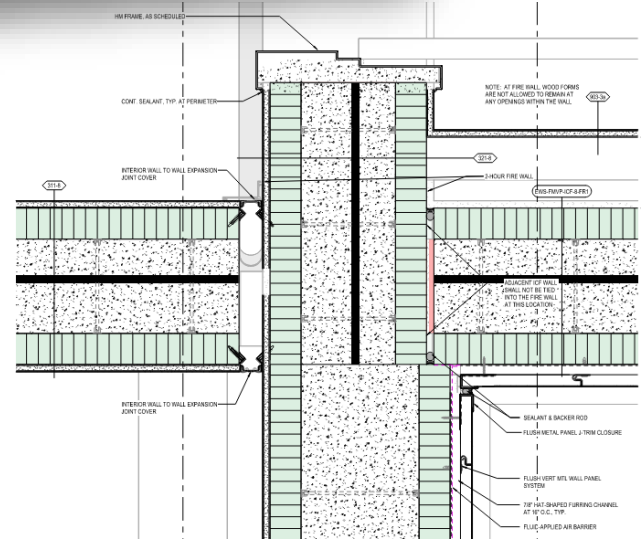
- Security
- Durability & Longevity
- Blast ratings
- Secure zones
- Flexibility





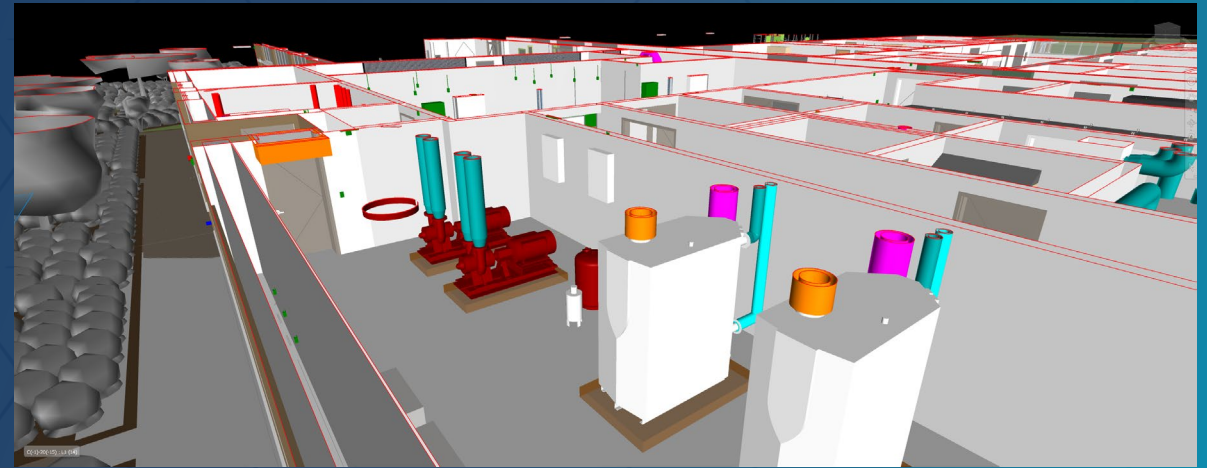
# Design criteria

- IBC 2021 – 1902.4 Flat wall insulating concrete form (ICF) systems – conform to ASTM E2634
- Review system with OSF – first public school in SC with ICF
- Fire ratings – remove wood forms, conceal insulation
- Covering of plastic insulation in concealed spaces (above ceiling)



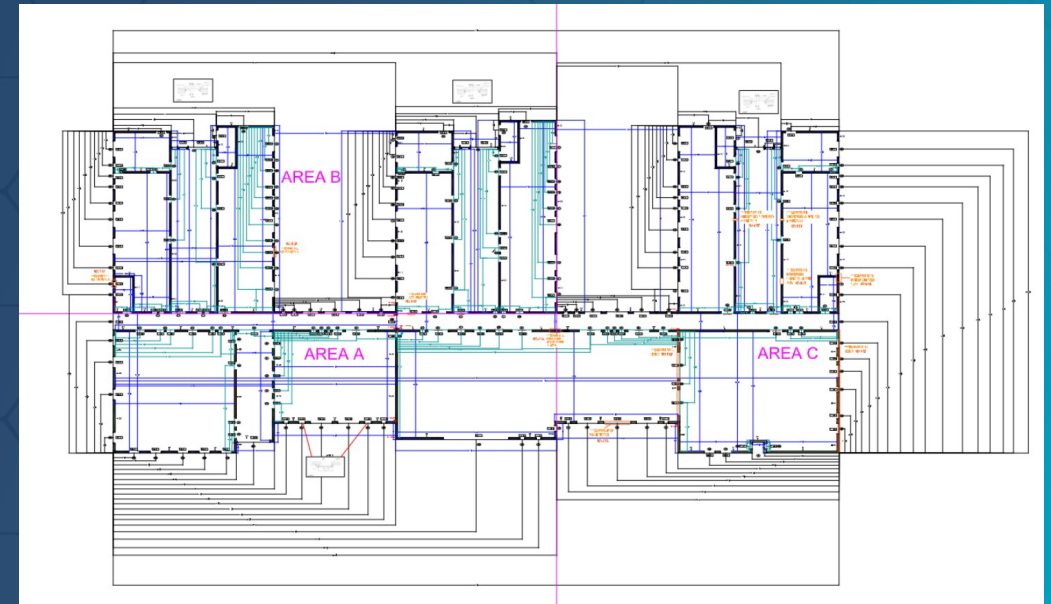
## Schedule efficiency

- 10-15% faster than traditional load bearing masonry
- Concrete lifts
- Electrical rough-in (no mason chasing)
- Location conflict
- Pre-planning / ICF Shop Drawings / BIM Coordination



## Working conditions for contractors

- In wall rough-in
- Construction site cleaner
- Construction site cooler



LEARNING OBJECTIVES

# case studies of ICF implementation

Discuss case studies of ICF  
implementation in K-12 projects  
and lessons learned



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# ASPIRE TRADE SCHOOL

Charlotte, NC



# Case study tours

## *Under Construction School*

- Lessons learned for brick veneer anchors.
- Emphasis on accuracy of openings and sizes.
- Emphasis on not only selecting a qualified installer but education of all subcontractors that will penetrate or touch the ICF system

## *Completed School*

- Durability of finishes, maintenance feedback, adjustments made after turnover.





## Case studies: Lessons learned

### *Tours of buildings under construction in Baltimore School District*

- Discussed best practices for in-wall rough-ins. Opportunity to spend time with tradesmen working with the product.
- Took their advice, after building mock-up and able to develop tools and best practice for rough-ins.

### *Collaboration with other general contractors w/ ICF experience*

- Bartlett Cocke General Contractors, Austin Texas. Specifically, Jay Klein, Regional Self Perform Manager was instrumental in assisting with lessons learned and providing feedback on buyout coverage advice, schedule efficiency expectations, and general scope discussions.



## Case studies: Lessons learned

- Trade contractor hands-on training with ICF manufacturer – MEP and finish trades
- MEP Subcontractors concerns
- Vetting installer of ICF
- Training / mock up / penetrations / conduit within the insulation installation
- Procurement / shop drawings / BIM Coordination

# Case studies: Lessons learned

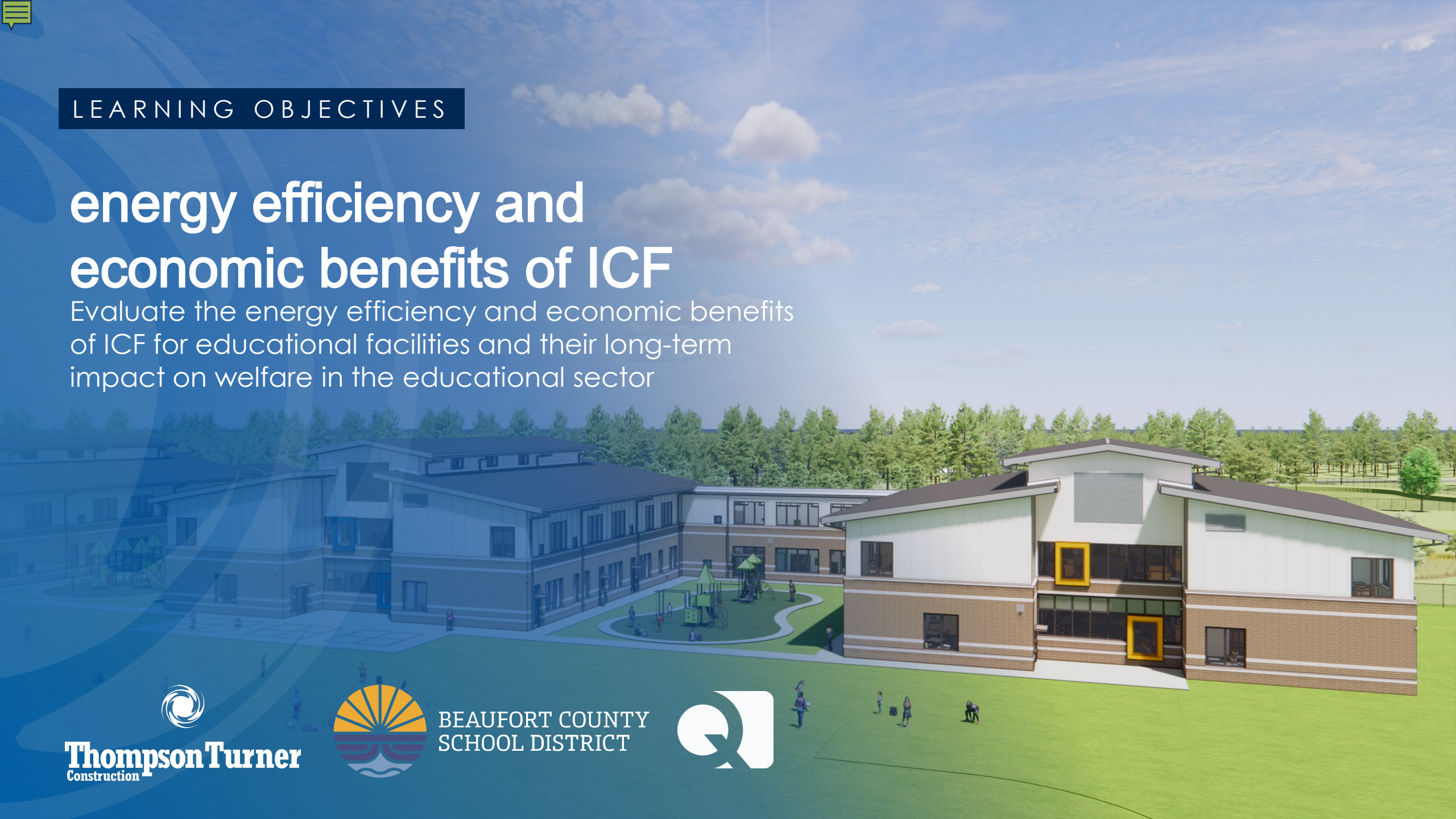
- Tours of ICF schools
- Design Flexibility
- Concrete structure – lintels
- Cladding Options



## LEARNING OBJECTIVES

# energy efficiency and economic benefits of ICF

Evaluate the energy efficiency and economic benefits of ICF for educational facilities and their long-term impact on welfare in the educational sector



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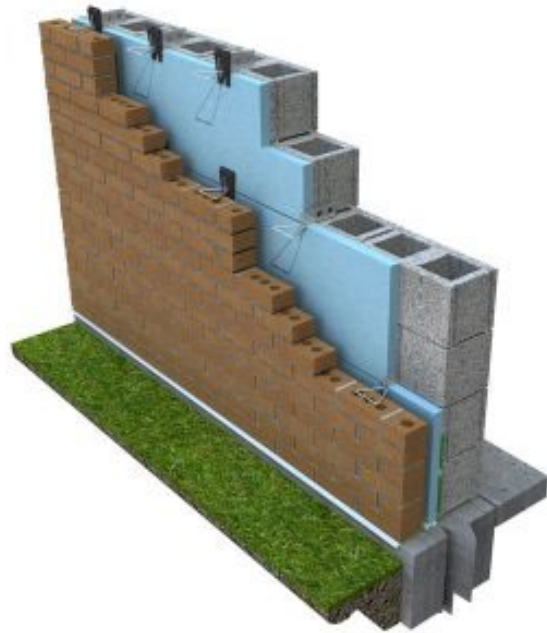




# Energy efficiency and economic benefits

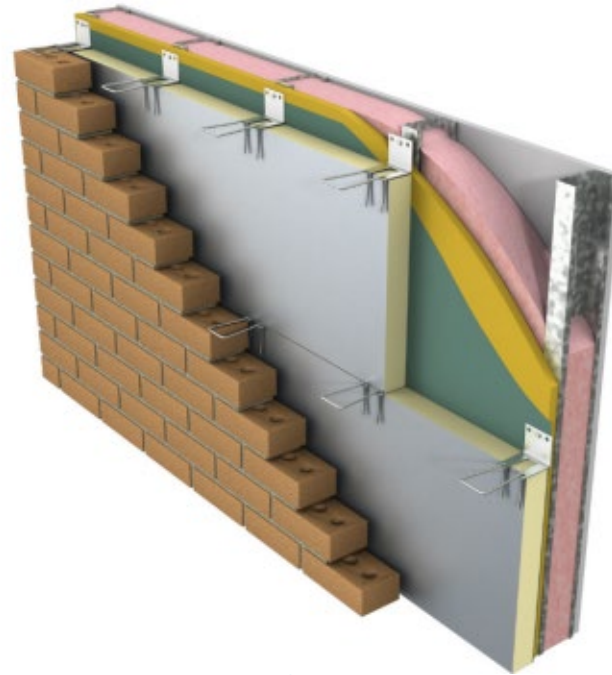


- Higher R-value
- Airtight



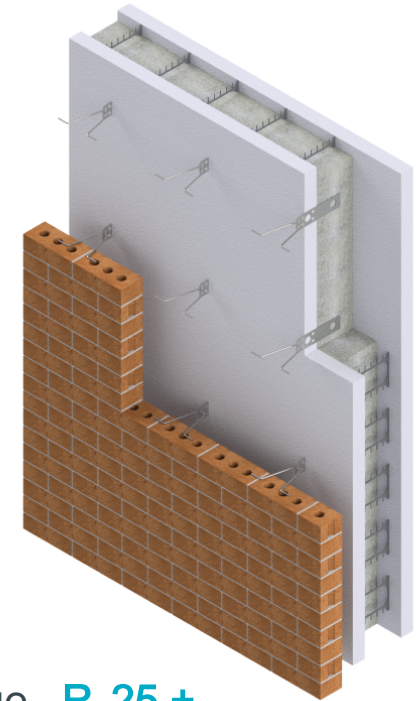
R- Value **R- 17**

Traditional CMU with continuous insulation and brick veneer



R- Value **R- 24**

Metal stud back up with continuous insulation and brick veneer



R- Value **R- 25 +**

Insulated Concrete Formwork with Brick veneer

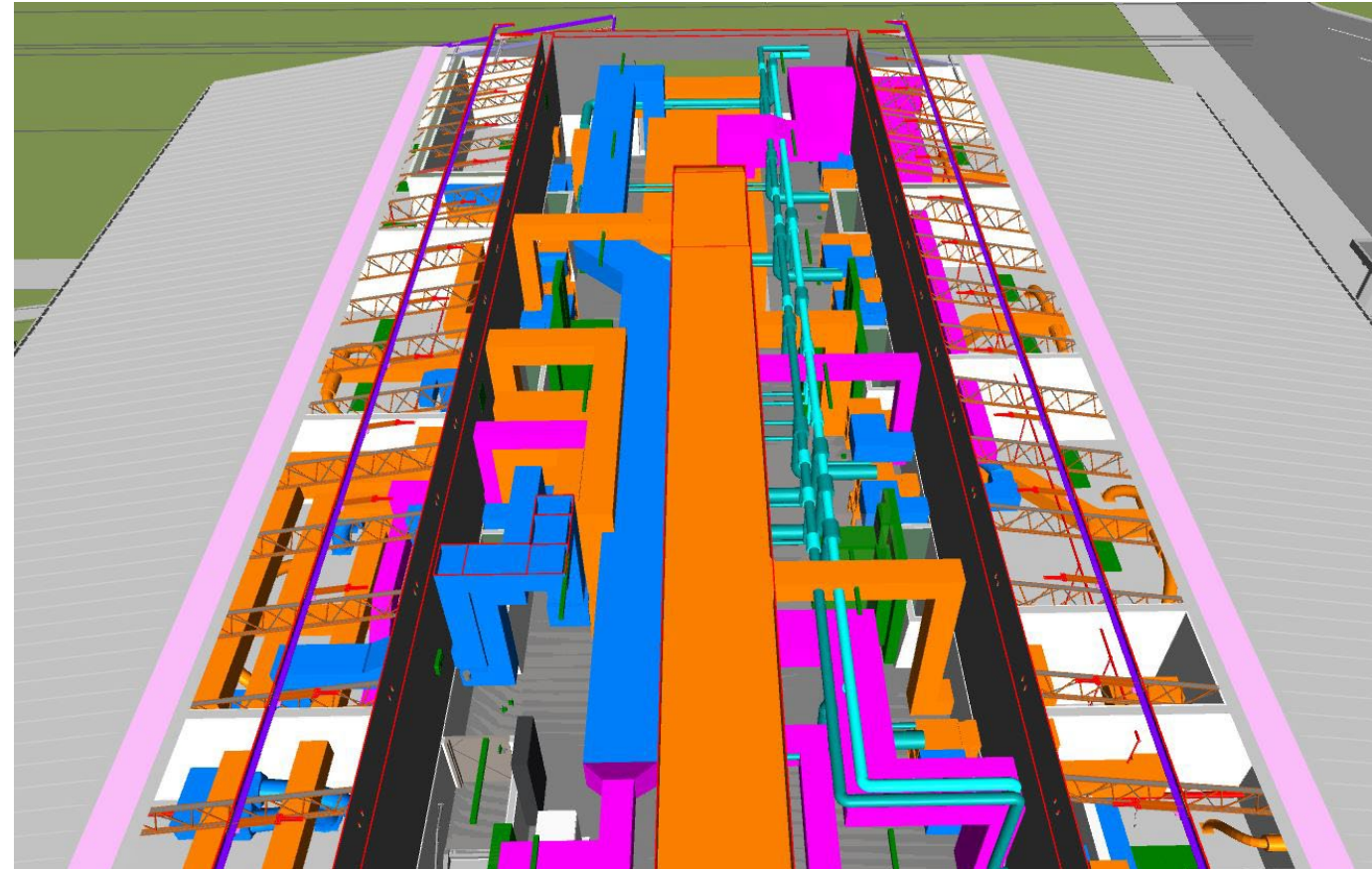
# Energy efficiency and economic benefits

## **ICF HVAC benefits:**

- Reduced equipment tonnage for the classrooms (30 %+)
- Reduction of energy plant sizing
- Building energy performance increased (energy usage -50%)
- Air and humidity transfer from the exterior to the spaces reduction

## **ICF in Humid Climates**

- Build up of humidity in the space (from space loads, windows, etc.)
- Separate dehumidified outside air to the space to control the space relative humidity





## Energy efficiency and economic benefits

- Heat pumps
- Geothermal
- Solar Panels



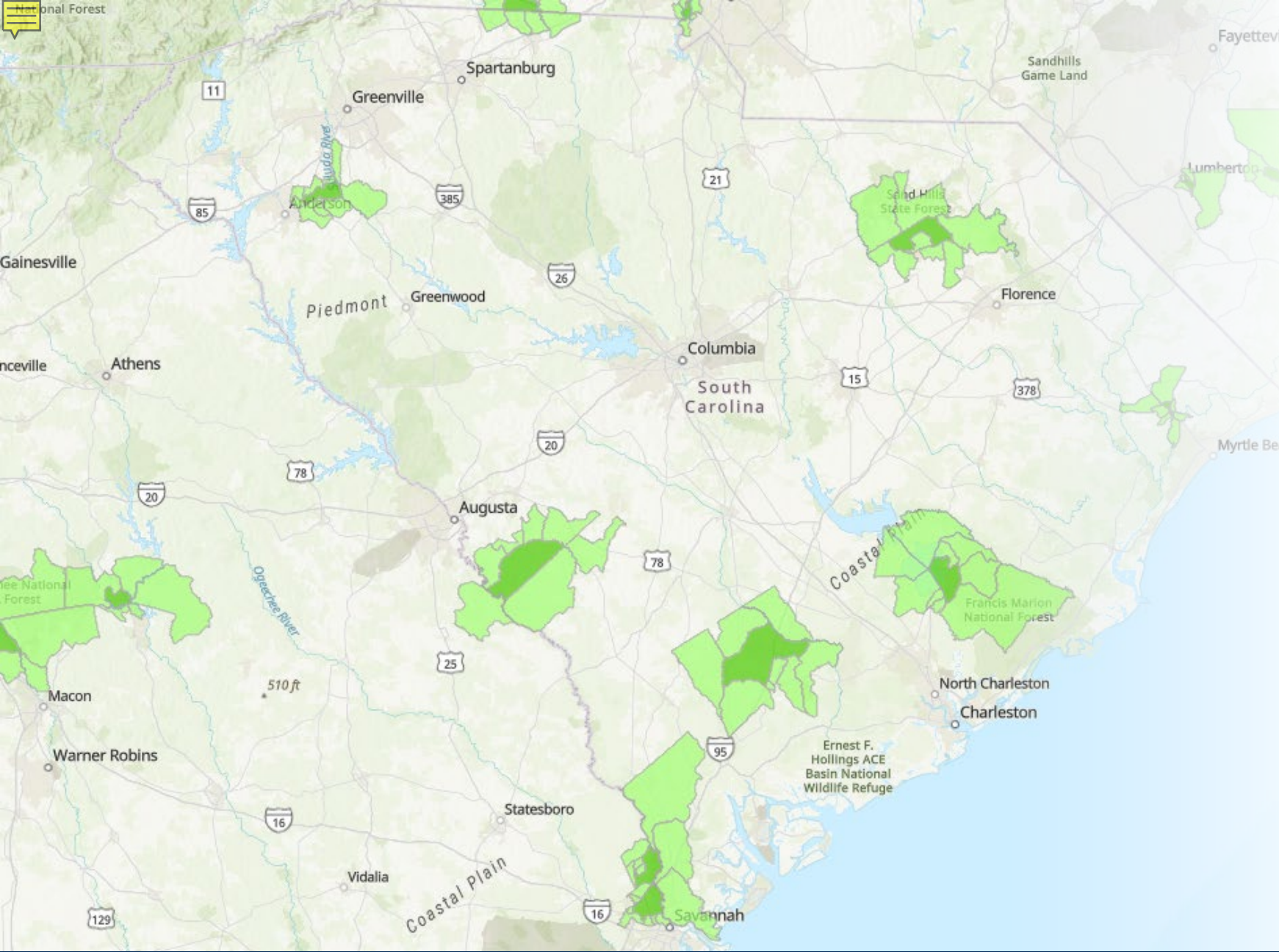
*Higher R value, heat pumps don't have as much recovery, equipment will live longer, longer life cycle, interior mezzanines*



# Energy efficiency and economic benefits

- EUI – Energy Use Intensity (BTU/SF/Year)

Facility	Building Age / Last HVAC Upgrade	HVAC System Type	Total Annual Energy Use (kBtu )	Average Floor Area (SqFt )	EUI (kBtu / SqFt / Yr )
St. Helena ECC/Beaufort Jasper EOC	1993	RTU and Package units	1,914,931	34,787	55.05
Michael C. Riley Elementary School	1990/2003	RTU and Package units	3,785,651	71,597	52.87
Joseph S. Shanklin Elementary School	1993/2010	RTU and Package units	3,936,862	74,986	52.50
Hilton Head Island Middle School	1989/2024	Cooling Tower and WSHP	4,403,555	143,065	30.78
Pritchardville Elementary	2010	Chiller, WSHP, RTU	3,636,965	123,284	29.50
Hilton Head Island Early Childhood Center	1994/2014	VRF System & Outdoor Air	2,658,733	100,118	26.56
<b>May River Elementary School</b>	<b>2026</b>	<b>Cooling Tower and WSHP</b>		<b>100,000</b>	<b>EST 25.00</b>



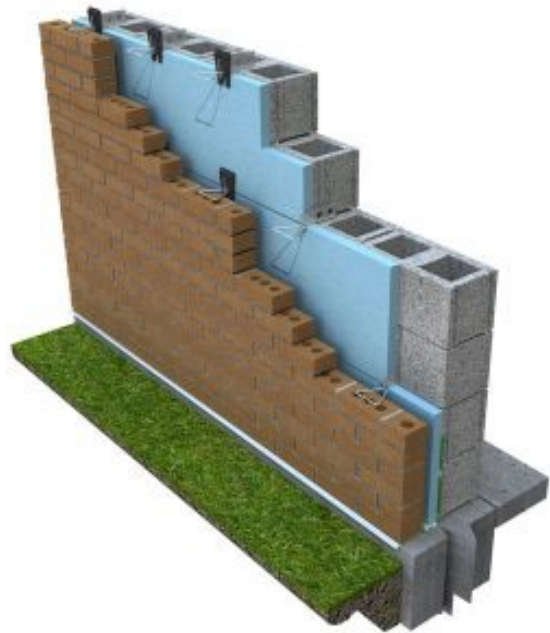
# Energy efficiency and economic benefits

- IRA – Inflation Reduction Act August 2022
- IRA Map
- Tax Credit

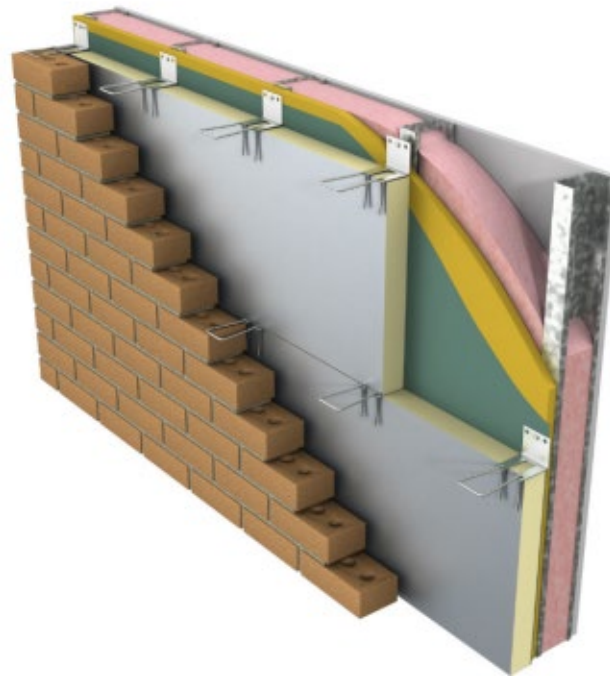
# Energy efficiency and economic benefits



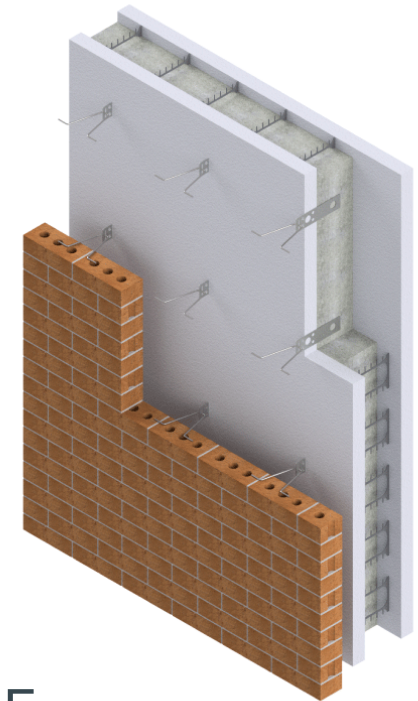
- Schedule impact
  - Availability of material
  - Speed of erection, shift of critical path
- Budget impact



\$58/S F



\$61/SF



\$50/SF

# Energy efficiency and economic benefits

## *Construction safety*

- Decreased people on site
- Less heavy machinery

## *ICF vs Flexibility*

- Readily available material / reduced laydown





## WHY CHOOSE ICF?

- High Performance
- Cost Savings & Schedule Efficiency
- Safety & Security

## Future Conference

- May River Elementary School
  - Data on EUI performance
  - Analysis of construction time savings

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THANK YOU AND DISCUSSION

