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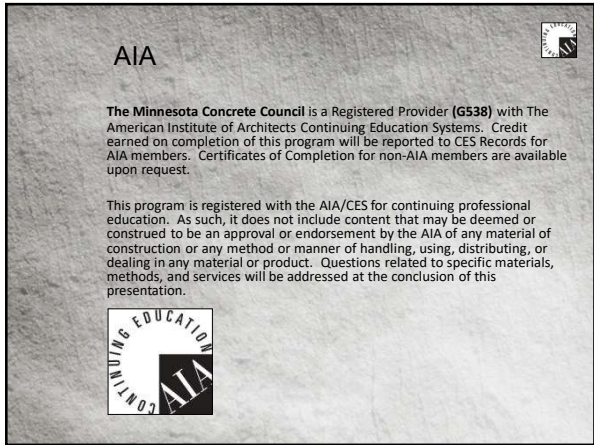
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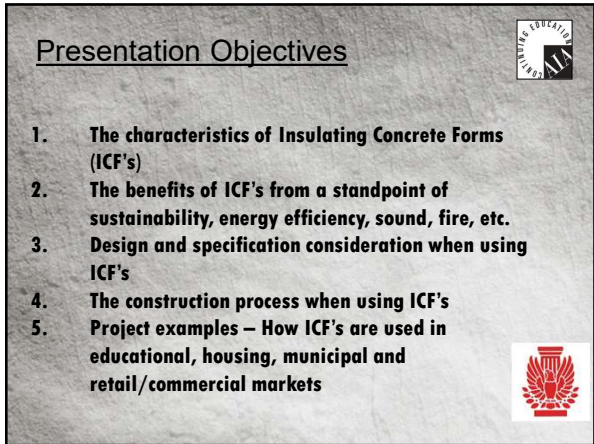
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**ICF Wall Assembly =**  
Concrete, Steel + Recycled Plastic and EPS Foam

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**Plastic Webs/Ties + EPS Panels:**

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ICF Recycled content is typically the polypropylene plastic webs

- Chair Horizontal Rebar
- Concrete Head Pressure
- Furring System for Finishes

Ratio of high density plastic (webs and brackets) to foam weight of ICF is indicator of strength and value of system

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## Expanded Polystyrene

Polystyrene Plastics Invented in 1839

1951:  invented the technology of *expanding* the **Polystyrene (Styropor®) Expanded Polystyrene (EPS)** is utilized in building construction for perimeter and cavity wall insulation to keep buildings comfortable and increase energy efficiency



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## Expanded Polystyrene

- Returns in energy savings 150 times the BTUs used during manufacturing
- Typically R-4 Per Inch insulating qualities
- 100% Recyclable
- No CFCs, HCFCs, Formaldehydes
- Will not facilitate mold or mildew growth
- Stable in high moisture, high and low temps, not subject to rot
- Not a food source for insects
- Continuous lifecycle energy performance versus single use products



One 600 lb 5' square tote of EPS produces one 53' trailer load of ICF forms



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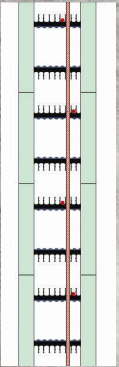

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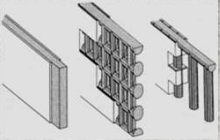
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## Historic ICF Types

Flat wall core with foam in place



- Flat Wall is most widely used 99+% of the time
- Some flat wall forms (knockdowns) must be assembled at the jobsite
- Most ICF's come in common 4'x16" pre-assembled forms also 8' x 18" in size.
- Many sizes and shapes for design needs and speed of construction

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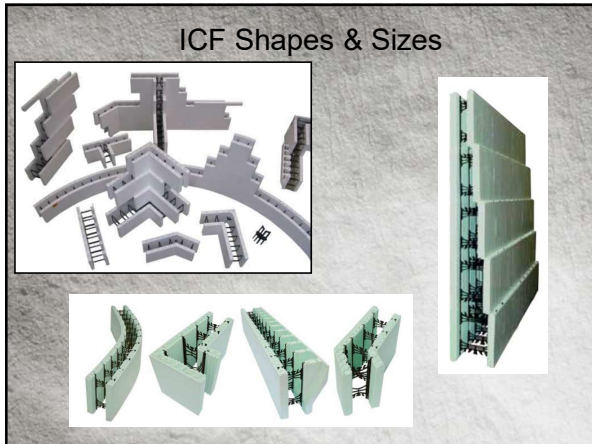
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### ICF Advantages

1. **5 in 1 Full Assembly = Efficiency\$**
2. **Fewer Building Site Materials & Fewer Sub-Trades to schedule**
3. **Speed of Construction**
4. **Superior Strength & Building Security**
5. **Design Flexibility**
6. **Superior Thermal Performance (CI)**
7. **Reduction of Building HVAC & Annual Maintenance Costs**
8. **Healthy Indoor Environmental Air Quality IAQ**
9. **Provides Sound Suppression (High STC Rating)**
10. **Compatible with ALL Finish Materials**
11. **Sustainable Products – Green Building Performance**
12. **USGBC LEED or other Green Building Program "Contributor or Enhancer" in many categories**

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### 5-IN-1 System Common Elements of an Exterior Wall

1. **Solid Monolithic Cast-in-Place Reinforced Structural Concrete Mass Wall**
2. **Continuous Insulation (CI) 2-5/8" Each Side**
3. **Air Barrier - Code compliant**
4. **Vapor Barrier - Code compliant**
5. **Double Furring - 8" – 12" OC vertically each side of wall for finish attachment**

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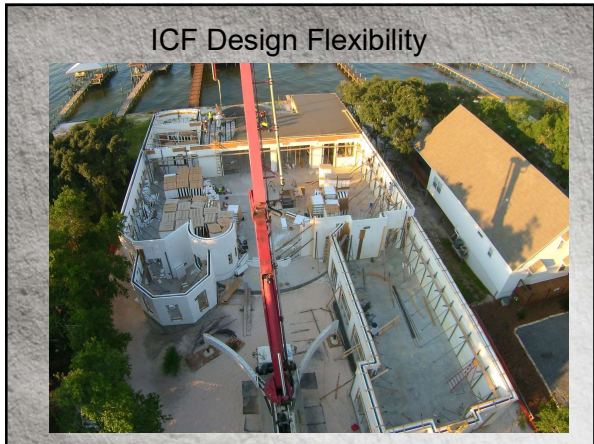
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**ICF Safety & Security = Insurance Saving**

- **Superior Fire Rating**
  - 2 to 4 Hour UL fire rated walls
  - Lower flame spread index than wood
  - Lower Toxicity when compared to other construction materials
- **Structural Strength**
  - Structural concrete engineered for use in areas with high seismic conditions
  - Ballistic Resistance DoD & Municipal
  - Hurricane & Tornado Resistant Wind Loads
    - Design strength to easily exceed *wind loads* required by local codes
    - Design strength to easily exceed *seismic loads* required by local codes

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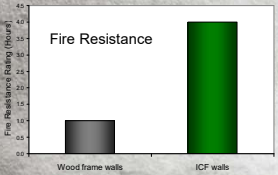

**ICF Fire Ratings**

Many ICF's have UL (ASTM) listings up to a 4 hour fire rating (FRR)

Third Party Testing & Performance-Expanded Polystyrene (EPS):  
ICF Flame Spread / Smoke Development Index

Flame Spread Index (FSI) is less than 25  
Max. per Code is 75

Smoke Development Index (SDI) is less than 450  
Max. per Code is 450


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**ICF Safety & Security = Insurance Saving**

Structural Safety & Sustainability

***Among the Ruins of Mexico Beach Stands One House, Built 'for the Big One'***




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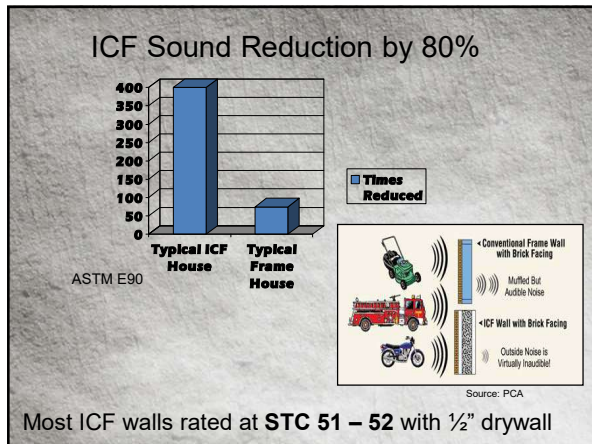
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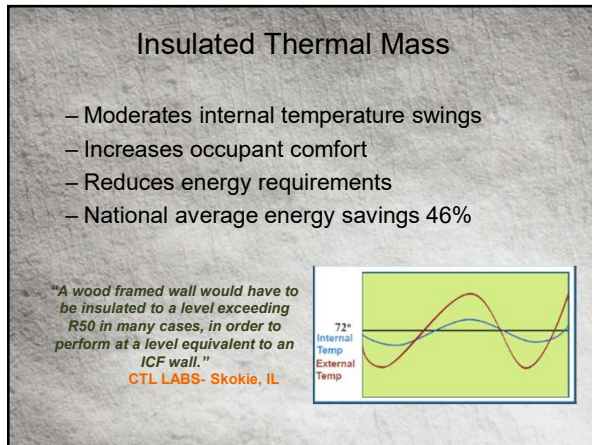
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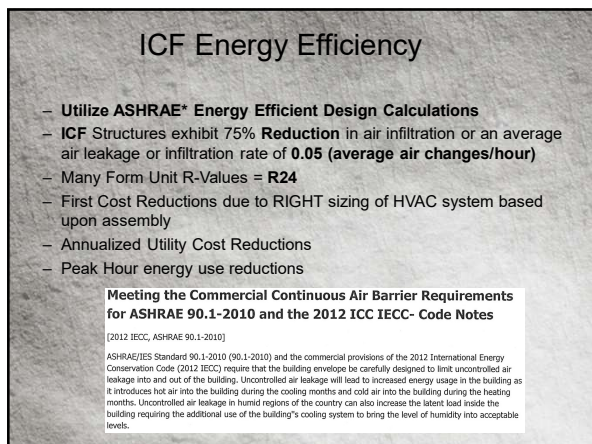
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## ICF Energy Efficiency

**ICFMA**  
INSULATING CONCRETE FORMS  
MANUFACTURERS ASSOCIATION

HOME WHY ICF'S ABOUT THE ICFMA BUILDING WITH ICF DESIGNING WITH ICF EVENTS RESOURCES

### Thermal Study

**THERMAL STUDY PROVES AN INSULATING CONCRETE FORM WALL CAN ACHIEVE UP TO 60% ENERGY SAVINGS AND 58% GREATER R-VALUE/RSI FOR HOME AND BUILDING OWNERS**

The Insulating Concrete Forms Manufacturers Association (ICFMA) recently commissioned CLEB Laboratories (formerly known as Air-Tek Inc.) to conduct the first in a series of accredited whole wall thermal studies. This installment compared a 2" x 6" traditional insulated wood frame cavity wall to a standard 6 inch (150mm) core insulating concrete form (ICF) wall. The study was overwhelmingly revealing, confirming dramatically superior energy-efficiency performance and an overall better R-Value/RSI demonstrated by the ICF Wall assembly.

- <https://icf-ma.org/resources/thermal-study/>

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## ICF Interior Air Quality (IAQ)

- Controlling indoor air reduces reactions to respiratory allergies, asthma, and other related health concerns.
- ICF's contain no CFC's HCFC's Formaldehydes or off-gassing
- Air handling and filtration components more efficient
- Dust and blown particulates minimized due to low air infiltration
- No Mold or Mildew
- American Lung Association Clean House designate
- Insulation and webbing material completely inert
- Higher IAQ result

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## Construction Efficiencies

- Less trades on site
- On time deliveries
- Cleaner jobsite
- Safer Jobsite
- No winter protection

**BUILD WITH STRENGTH**  
IOWA

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### Lifetime Maintenance Costs

- No hollow cavities to promote mold growth
- No settling cracking popping warping walls
- No food value for termites or vermin
- Minimal shrinkage and/or expansion
- Lower Utility Costs
- Drywall pops minimized
- Stucco cracking minimized

Black mold on stick frame on multi story above grade on podium deck



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### ICF – SUSTAINABLE?

- Safe-Secure-Long Lasting Materials
- Recycled Materials and Recyclable
- Energy Efficient & Return on Energy
- Reduced Materials – Waste
- Local Materials














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### ICF Markets - Residential







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### ICF Markets - Residential



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### ICF Markets - Residential



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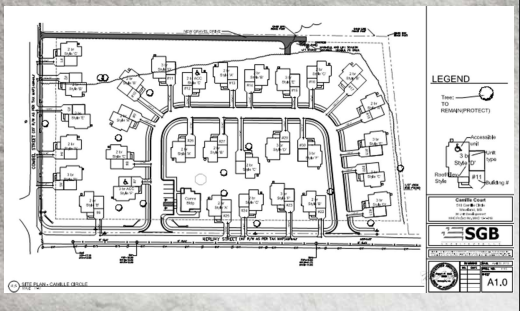
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### ICF Markets - Residential

**Affordable & Safe Housing: 82 Homes 2010 & 30 Homes 2015**



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ICF Markets - Commercial



CMTA Office Building - Lexington, Kentucky

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ICF Markets - Commercial



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ICF Markets - Retail  
Apple Valley, MN



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ICF Markets - Retail



MESKWAKI TRAVEL PLAZA

BUILD WITH STRENGTH  
IOWA



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ICF Markets - Retail



MESKWAKI TRAVEL PLAZA

BUILD WITH STRENGTH  
IOWA

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ICF Markets - Retail



NEW PHILADELPHIA, OHIO

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ICF Markets - Municipal



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ICF Markets - Municipal



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ICF Markets - Municipal



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ICF Markets - Municipal



Farmington Public Safety Building, Farmington, New Hampshire

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ICF Markets - Municipal



Farmington Library - Farmington, Illinois

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ICF Markets - Municipal  
Walker, MN



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ICF Markets – Municipal  
Walker, MN



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ICF Markets – Municipal  
Walker, MN



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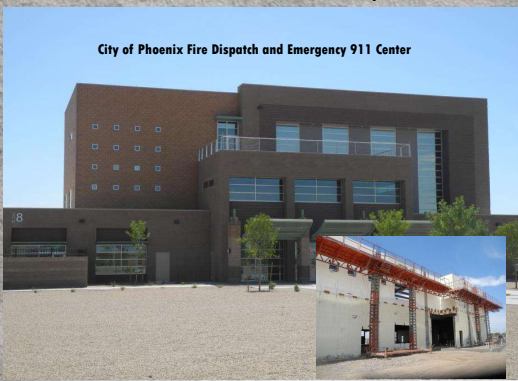
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ICF Markets - Municipal



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### ICF Markets – Event/Meeting Center



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### ICF Markets – Light Commercial



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### ICF Markets – Light Commercial Giants Ridge- Biwabik, MN



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**ICF Markets – Light Commercial**




**Location:** Tampa (Ybor City) Florida  
**Type:** Manufacturing + Packaging  
**Size:** 15,600 sq. ft. (floor)  
**ICF Use:** 10,600 sq. ft.  
**Cost:** \$3 million  
**Total Construction:** 52 weeks  
**ICF Installation Time:** 45 days  
**Owner:** Ostra Holdings  
**General Contractor:** ARCO/Murray Construction  
**ICF Installer + Form Distributor:** Turning Leaf Construction  
**Architect:** Florida Design Studio – Alan Dobbs




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**ICF Markets – Hospitality**

**East Bay Suites, Grand Marais**

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**ICF Markets - Hospitality**



- Multi Story Floor by Floor Construction

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ICF Markets - Hospitality



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ICF Markets - Hospitality



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ICF Markets - Hospitality



Hospitality & Multi Unit Multi Story Residential

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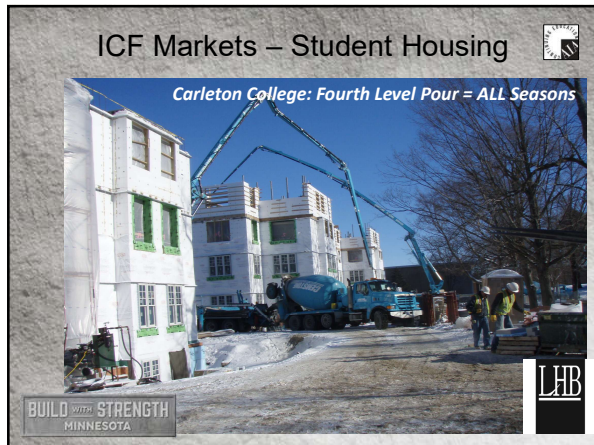
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## ICF Markets – Student Housing



**OWNER:**  
Texas Tech University System

**ARCHITECTS:**  
Barnes, Gromatzky, Kosarek Architects  
1508 West 5th Street, Suite 200  
Austin, TX 78703  
&  
Mackey Mitchell Architects  
900 Spruce St. #500  
St. Louis, MO 63102

**CIVIL ENGINEER:**  
Hugo Reed and Associates  
1601 Avenue N.  
Lubbock, TX 79401

**STRUCTURAL ENGINEER:**  
Dallum Goler Engineering  
5929 Balcones Dr. Ste. 100  
Austin, TX 78731

**CONTRACTOR:**  
The Whiting-Turner Contracting Company  
14100 San Pedro Ave. Suite 101  
San Antonio, Texas 78232

**ICF PACKAGE\_14110-03B  
NEW STUDENT HOUSING COMPLEX  
Insulated Concrete Forming (ICF) Structural Walls**

TEXAS TECH UNIVERSITY - Lubbock, TX

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## ICF Markets – Student Housing



This student housing project constructed 455 new beds in a two building four story complex. It includes 61 Singles, 47 Doubles, 75 Quadraple units and an integrated retail/food service facility called Raider Exchange. Building amenities include lobby and mailroom space, offices, study rooms with technology tables and laundry facilities. Each living unit is equipped with a full size kitchen. The existing tree ally on the north side of the complex known as Aggie Grove was incorporated into the landscape of the project.

TEXAS TECH UNIVERSITY - Lubbock, TX

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## ICF Markets – Senior Living



**211** Addition of 211 Units  
Silver Creek Senior Living Facility  
6501 W. Ardmore Dr.  
Dallas, TX 75231

**SILVER CREEK**  
Senior Living

**Baker Barrios**

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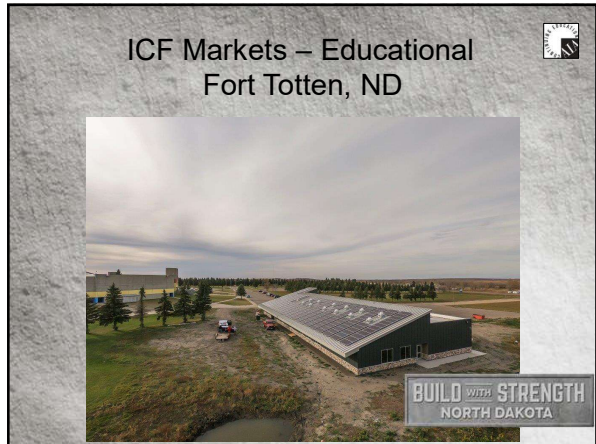
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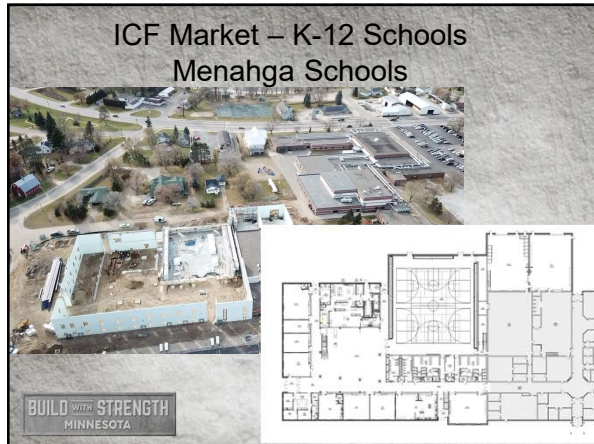
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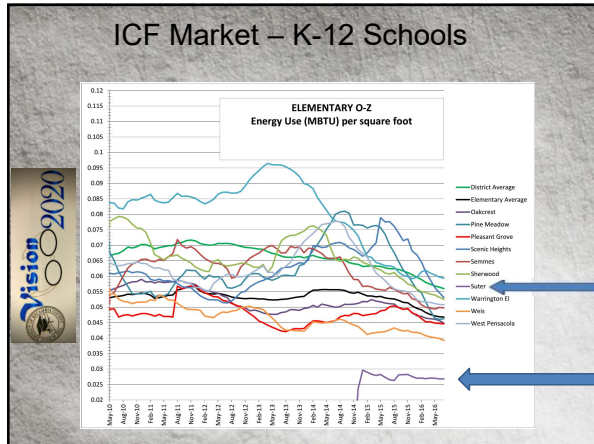
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### Texas ICF Schools Partial Listings 2012 – 2017 Construction period

- Central Elementary School Stephenville TX
- Chamberlain Primary School Stephenville TX
- HER ISD Eules TX
- Kilgore Elementary School Kilgore TX
- Elementary School IS4 Mansfield TX
- Junior High School Perrytown TX
- Elementary School Stafford TX
- Middle School Stafford TX
- Copper ISD Elementary Copper TX
- Alice Ponder Elementary School Mansfield TX
- Pflugerville Elementary School #20 Pflugerville TX
- Frisco Middle School #14 Frisco TX
- Frisco Middle School #15 Frisco TX
- Killeen Elementary School #33 Killeen TX
- Vividan Elementary School Arlington TX
- Whitney Middle School Whitney TX
- Beauld Middle School Georgetown TX
- McGregor Primary School McGregor TX
- Grenbury High School Grenbury TX
- Rick Reedy High School #8 Frisco TX
- San Marcos ISD Pre K San Marcos TX
- Janie Barron Elementary Palmer TX
- Gatesville Elementary School Gatesville TX
- Frisco High School #9 Frisco TX
- West High School West TX
- Duncanville ISD Hastings Elem School Duncanville TX
- Frisco ISD Melson Middle School Frisco TX
- Frisco ISD Pearson Middle School Frisco TX
- Denton ISD Gonzalez Middle School Denton TX
- Timmerman Elementary Pflugerville TX
- Rancho Sierra Elementary Liberty Hill TX
- Godley High School Godley TX
- Keller ISD Elementary School Keller TX
- Prosper Elementary Prosper TX
- Joshua ISD Elementary Joshua TX
- Dimmitt ISD Elementary Dimmitt TX
- Killeen ISD Elementary School Killeen TX
- Manor ISD Elementary School Manor TX
- Price 1 Young Elementary Marshall TX
- Texas Tech Dorms Lubbock TX
- Prosper ISD Elementary 8 Prosper TX
- Prosper ISD Elementary 9 Prosper TX
- Northwest ISD Elementary 18 Ft Worth TX
- Prosper ISD Middle School 3 Prosper TX
- Eagle Mountain Saginaw ISD Middle Sch 6 TX
- Mansfield ISD Early Lit Center Arlington TX
- Agnew Middle School Mesquite TX
- Van Alstyne Middle School Van Alstyne TX
- Mesquite ISD High School Mesquite TX
- Joshua ISD Middle School 5 Joshua TX
- Jack C Hays High School Buda TX
- Eagle Mtn Saginaw Mid School 6 Ft Worth TX
- Beck Elementary School Trophy Club TX
- Frisco ISD Independence High School Frisco TX
- Frisco ISD Lawler Middle school Frisco TX
- Sunnyvale ISD High School Sunnyvale TX
- Sunnyvale ISD Middle School Sunnyvale TX
- Plano ISD Plano East High School Plano TX

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### ICF Market – K-12 Schools



*MacArthur Elementary School – Leavenworth, KS*



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### ICF Market – K-12 Schools

*MacArthur Elementary School –Leavenworth, KS*



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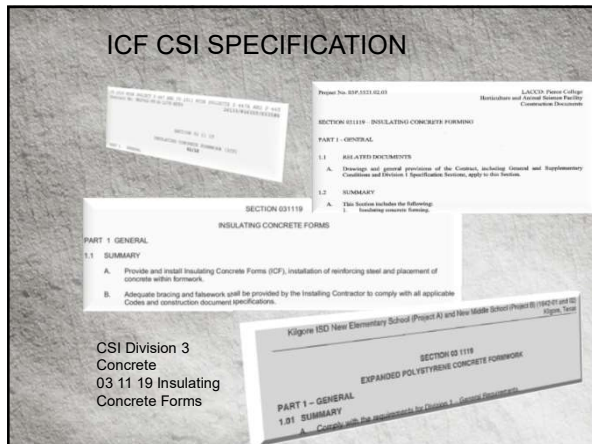
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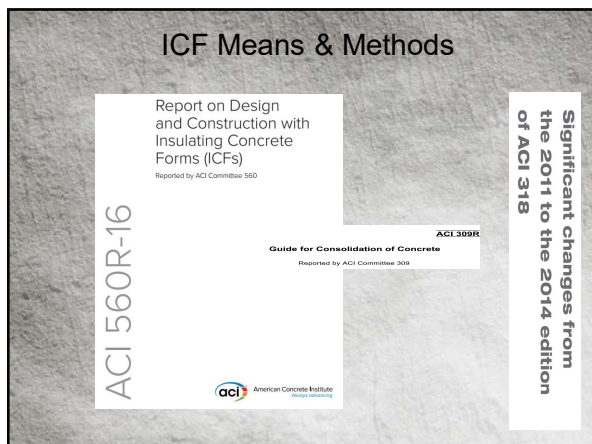
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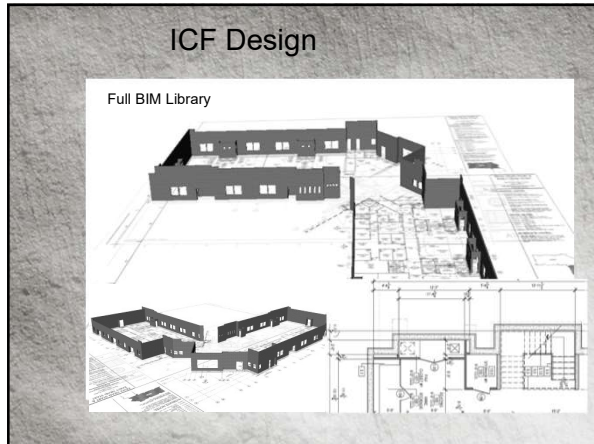
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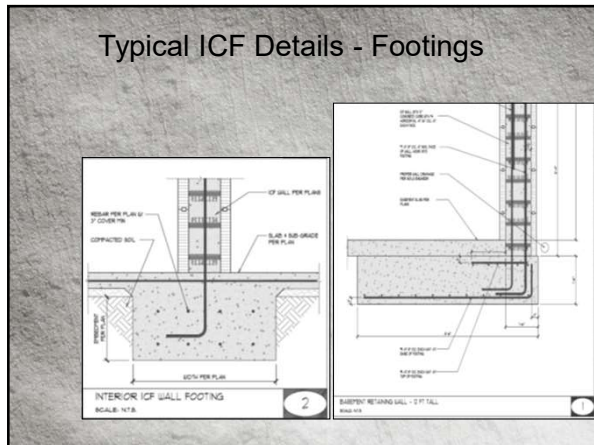
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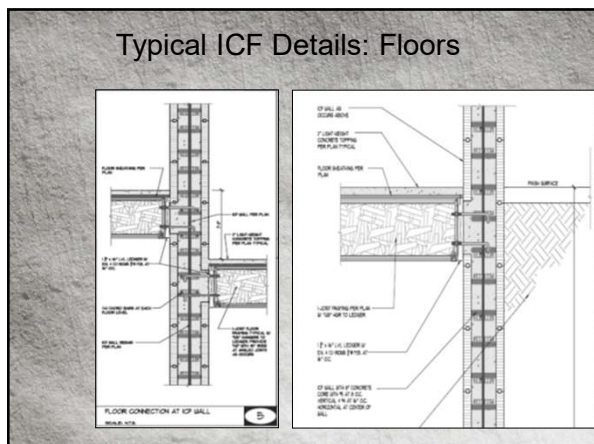
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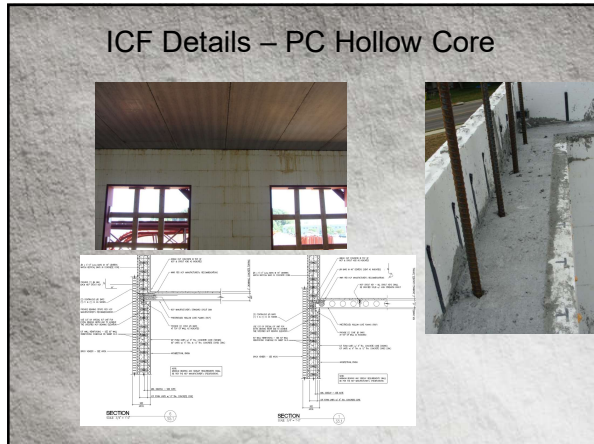
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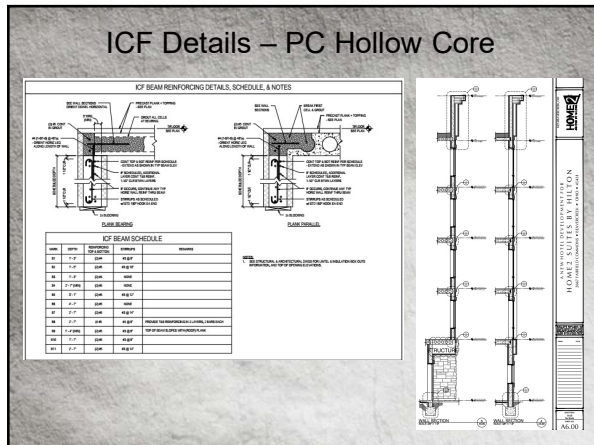
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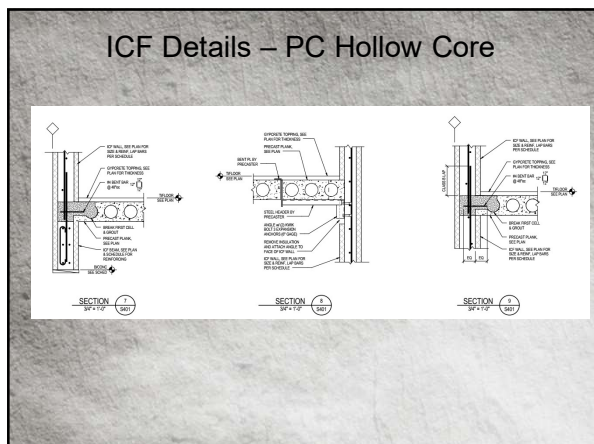
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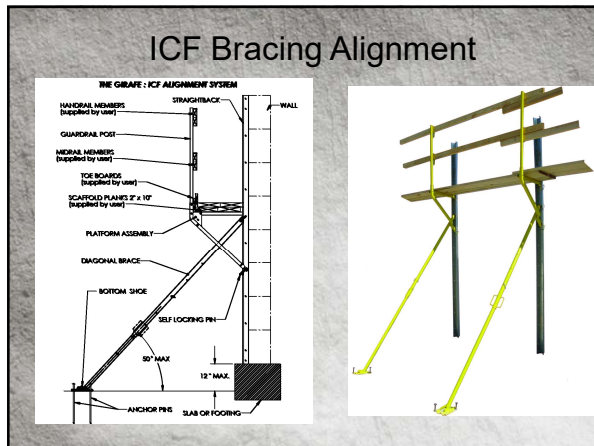
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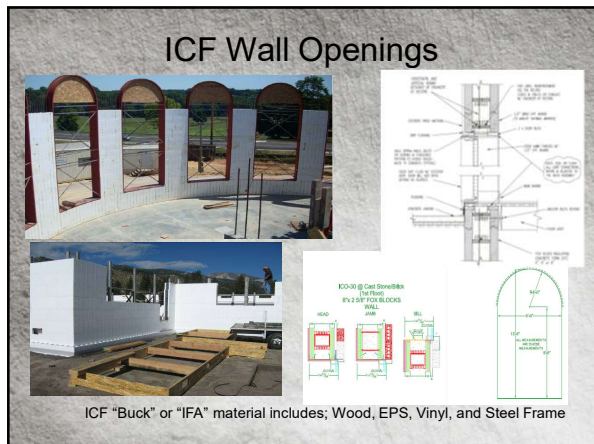
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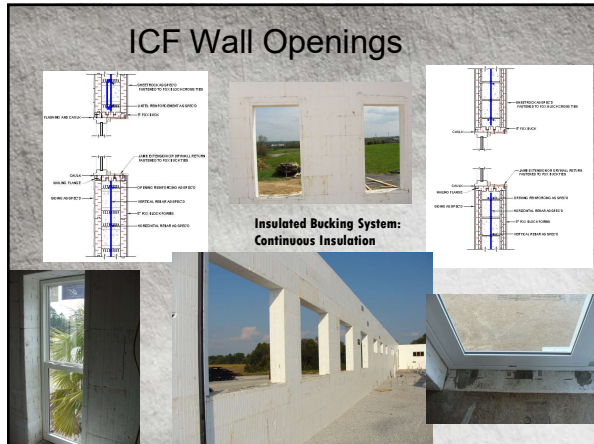
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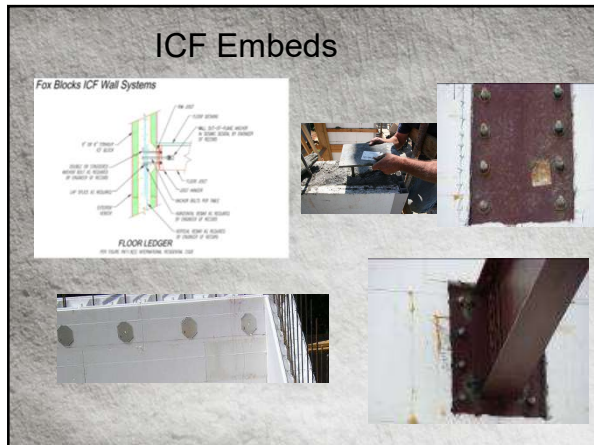
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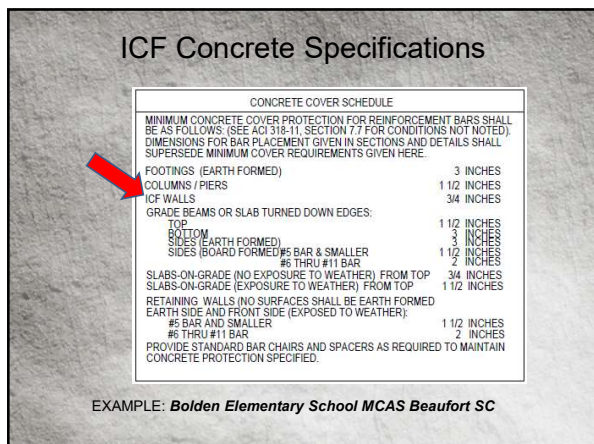
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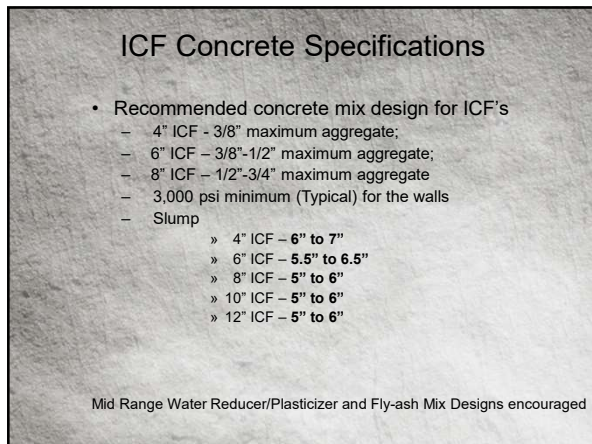
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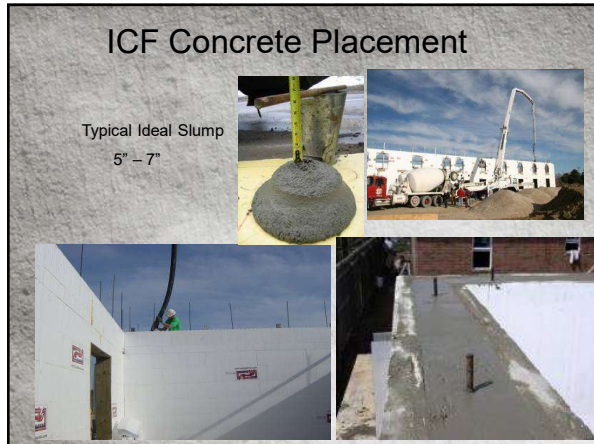
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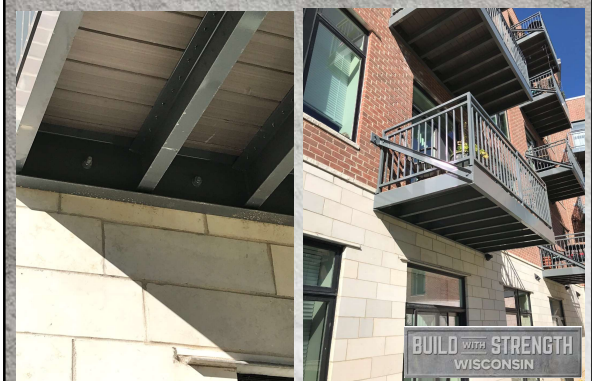
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Balconys



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Balconys



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ICF: Plumbing+Electrical



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### ICF Finish Compatibility

- Drywall
- Hardened Materials
- Brick & Stone Masonry
- Sidings
- Synthetic Stucco
- Cementitious Stucco



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### ICF Interior Finishes



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### ICF Interior Finishes Underground Garage



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### ICF Hardened Coatings

**Hardened Coatings with High PSI -Fire Resistance**

- Parex
- Master Wall
- Dryvit
- BASF, Synergy etc.
- Sto





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### ICF Stucco Finish





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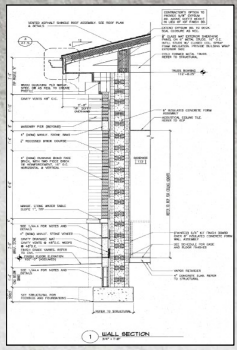
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### ICF Brick Finishes

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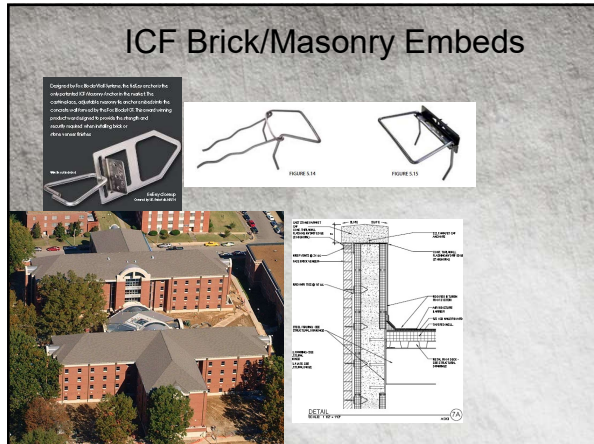
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## ICF Man-Hour Rates

- No heavy lifting or transporting of equipment required...
- Labor pool can be quickly trained to become certified ICF installers.
- No heavy metal forms to transport, strip and maintain.



Typical ICF Bundle: (84 Lbs) at 64 Sq Ft of Wall. vs CMU equivalent (1,680 Lbs)

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## Thank You

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John Lee, P.E. - [jlee@cemstone.com](mailto:jlee@cemstone.com) - (612) 760-9390

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