Methods for Economical Concrete Construction

Ceco Concrete Construction, L.L.C
Rick Eder, P.E.
Director of Engineering

Stories Built

CECO

A bit about me…

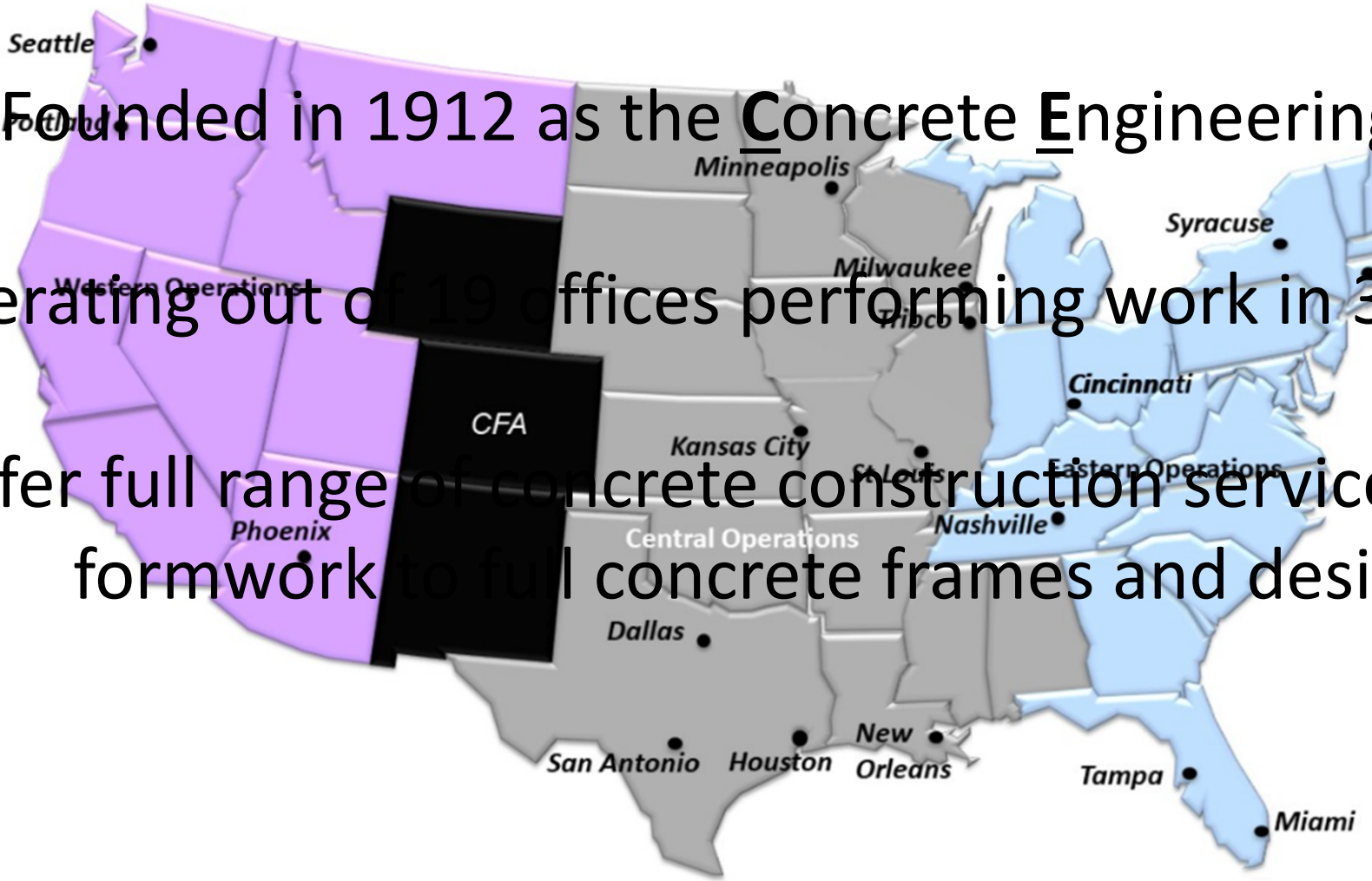
- With Ceco since 2004
  - 5 Years as local Cincinnati formwork engineer
  - 5 Years as East Region Engineer
    - Managed Cincinnati, Hartford, Detroit, DC
  - Ceco's Director of Engineering since 2014
    - Create Ceco Standards and Manuals based on industry standards and Codes
    - Product development & Value Engineering
    - Work with Safety, Quality Control, IT
    - Manage team of 5 Engineers including BIM Manager; Direct team of 50
- Chair of American Concrete Institute (beginning in April)
  ACI 347 Committee on Concrete Formwork

reder@cecoconcrete.com

Stories Built

CECO

Ceco Concrete Construction



Founded in 1912 as the **C**oncrete **E**ngineering **Co**.

Operating out of 19 offices performing work in 30 states

Offer full range of concrete construction services from formwork to full concrete frames and design

CECO

LEARNING OBJECTIVES

- Building Design Factors Affecting Construction Economy
- Understanding Impacts of Reshoring
- Innovation in Concrete Construction
- Concrete Construction Economy and Constructability

Building Design Factors Affecting Construction Economy

Location Location Location

- Access to and for material delivery
- Crane Air Space
- Material Storage and Make-up
- Street Closures

Building Design Factors Affecting Construction Economy

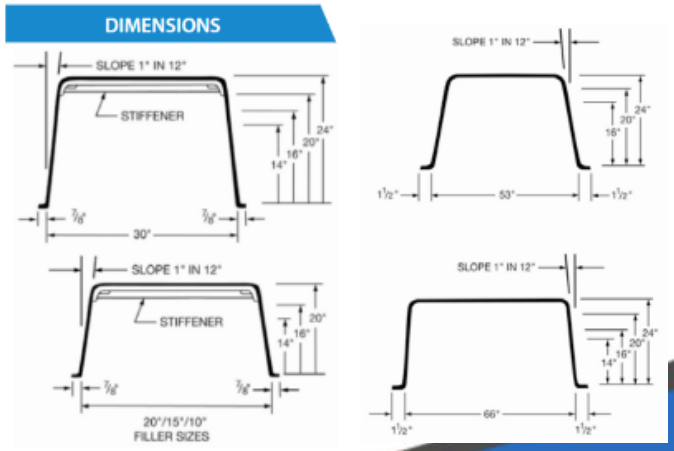
Consistency Leads to Repeatability

- Inconsistency = Cost
- Inconsistency = Time
- Consider Construction Cost not just Building Material Quantity
  - Increase in form cost to reduce a column width by 1” will likely outweigh the concrete material savings

Building Design Factors Affecting Construction Economy

Stick to Standards

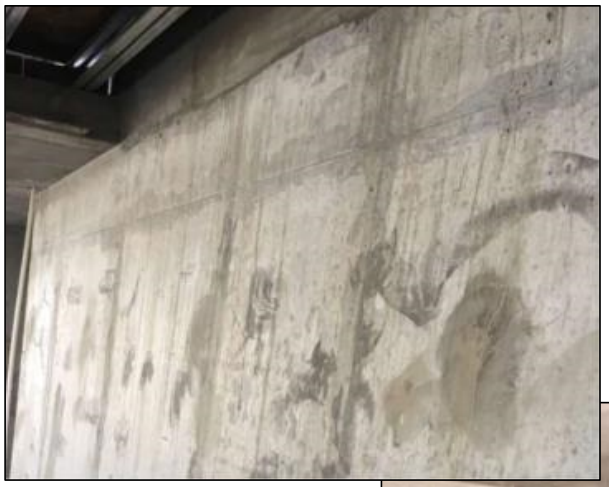
- Discover what industry standards are and use them
  - Call Ceco. We set a lot of the standards
- Custom = Cost
- Formwork is ~1/2 cost of concrete structure



Building Design Factors Affecting Construction Economy

Visual Quality

- Higher Quality = Higher Cost
- Does it need to look that nice?
  - Exposed vs. “Critically” Exposed
- Set clear expectations



Building Design Factors Affecting Construction Economy

Material Properties

- Balance Concrete Strength for Cost vs Schedule
  - Stronger Concrete is more Expensive
  - Faster concrete comes to strength the faster the schedule can go

- Conventional Rebar vs Post-Tension

Understanding Impacts of Reshoring

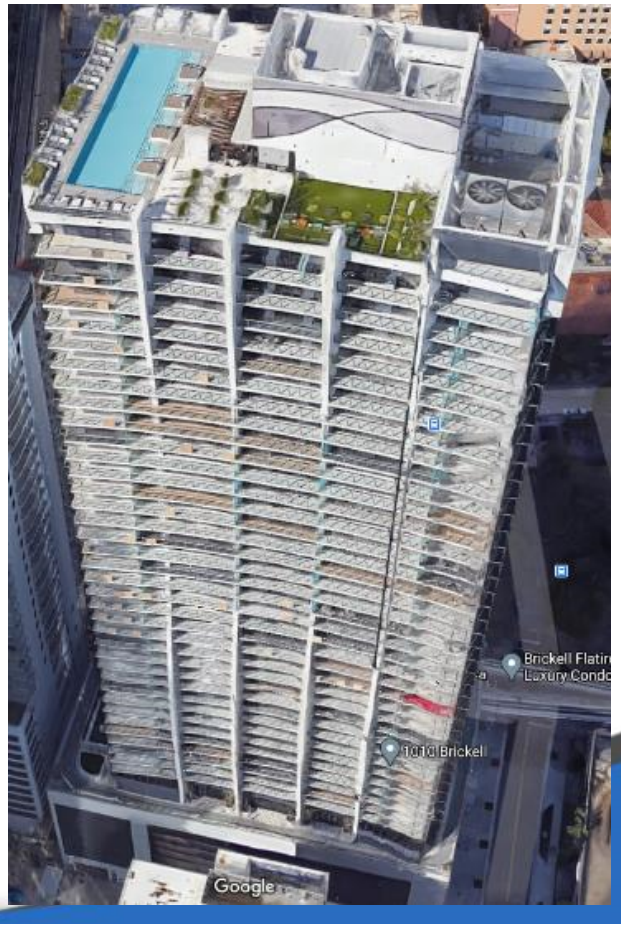
Distribution of Construction Loads

- Construction loads are generally the highest loads a structure will experience
- Shoring between already cast floors (Reshoring) increases as slab strength decreases
  - # Floors = Construction Load / Strength of Floors
- Increased floors of reshoring slow the construction process

Understanding Impacts of Reshoring

"The Pool Deck"

- Very heavy floors high in a building result in many floors of reshores
- Strengthening of floors below can speed up finishing of interior spaces below

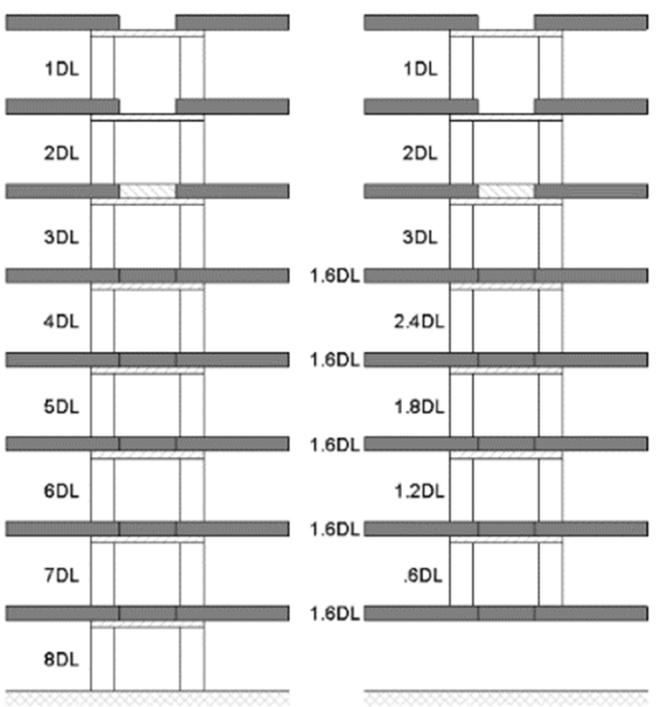


CECO

Understanding Impacts of Reshoring

Delay Strips – Cause Delay

- Strips of concrete left out to prevent cracking from concrete shrinkage
- Many levels of shoring to support incomplete floors
- Longer strips are open, more floors of reshores are needed
- Seek Alternate Methods



Understanding Impacts of Reshoring

Correct Reshoring is Critical

Skyline Towers: Alexandria, VA
March 1973
14 Dead

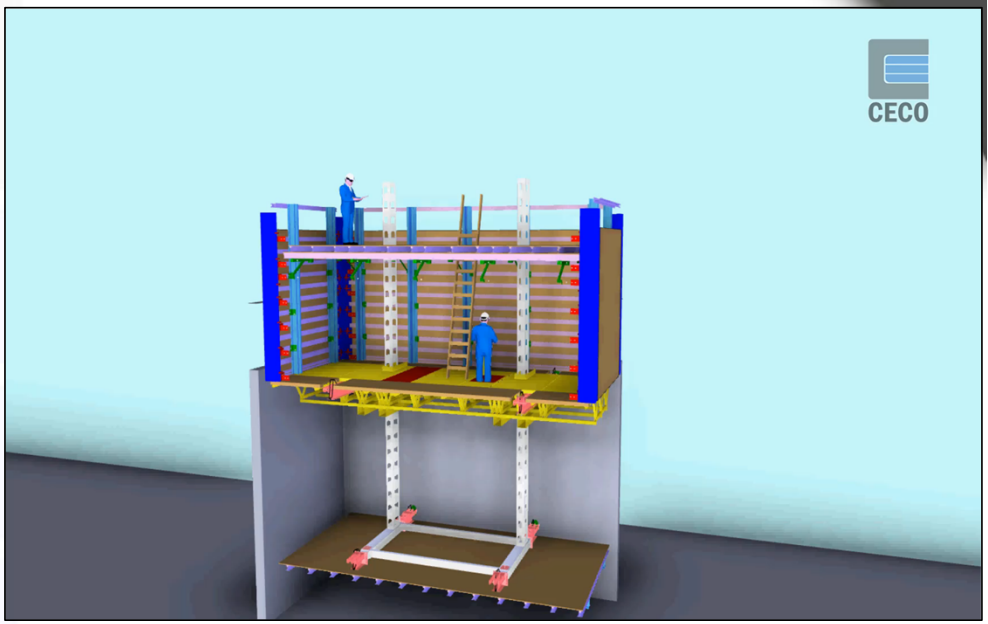
Berkman Plaza 2: Jacksonville, FL
December 2007
1 Dead, 21 Injured

Innovation in Concrete Construction

Focus Innovation

- Reduce Labor
- Reduce Materials
- Reduce Schedule
- Increase Safety

Reduce Labor



- Large Flying Systems
- Panelized Decking
- Self-Climbing Systems

CECO

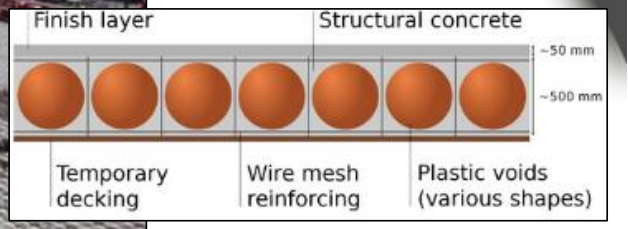
Reduce Schedule

- Self-Climbing Systems
- BIM Integrated Planning & Coordination Tools
- 3D Printed Walls

Stories Built

CECO

Reduce Materials



- Slab & Joist Systems
- “Bubble” Slab Systems
- Less Concrete = Less Carbon Impact
- High Strength Concrete to reduce concrete volume

Stories Built

CECO

Increase Safety

- Perimeter Enclosure Systems
- Wearable Exoskeleton

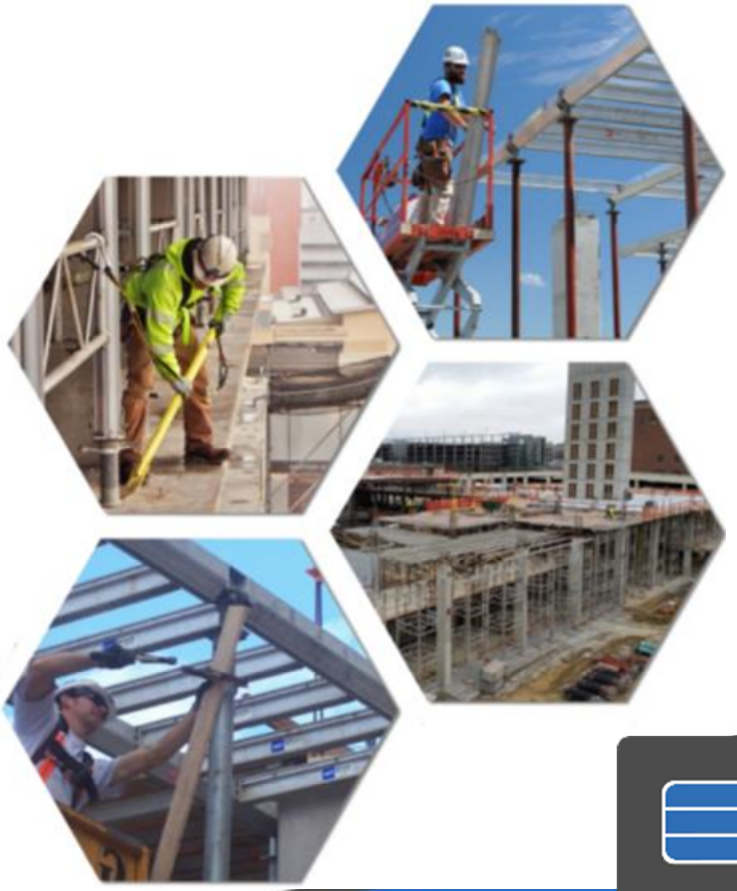
Stories Built

CECO

Concrete Construction Economy and Constructability

Focus on Labor

- Highest and Most Variable Cost is Labor
- The Human Element
- Understand the limits of the labor force



Concrete Construction Economy and Constructability

Material Movement

- The right Crane for the job
- Self-Climbing Systems
- Moveable Platforms

Concrete Construction Economy and Constructability

Schedule

- Lots of pieces and all need to know where and when they fit in
- Any delay on material deliveries or completion of tasks can cause large impacts
- Use of technology to make processes concurrent

Concrete Construction Economy and Constructability

Safety is Economy

- Build safety into the construction process
  - Eliminate Fall Potential
  - Eliminate Repetitive Lifting
  - Limit Field Modifications

- Efficient Form Design = Fewer Workers = Less Injury Potential = Less Liability

In Summation…

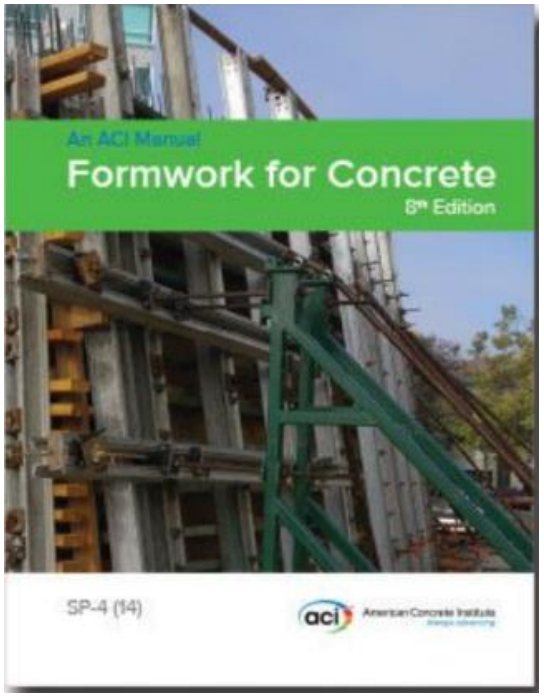
- See the whole picture
- Repeatability and Consistency
- Look at strength from a Construction perspective
- Use innovation to reduce labor and increase speed

CECO

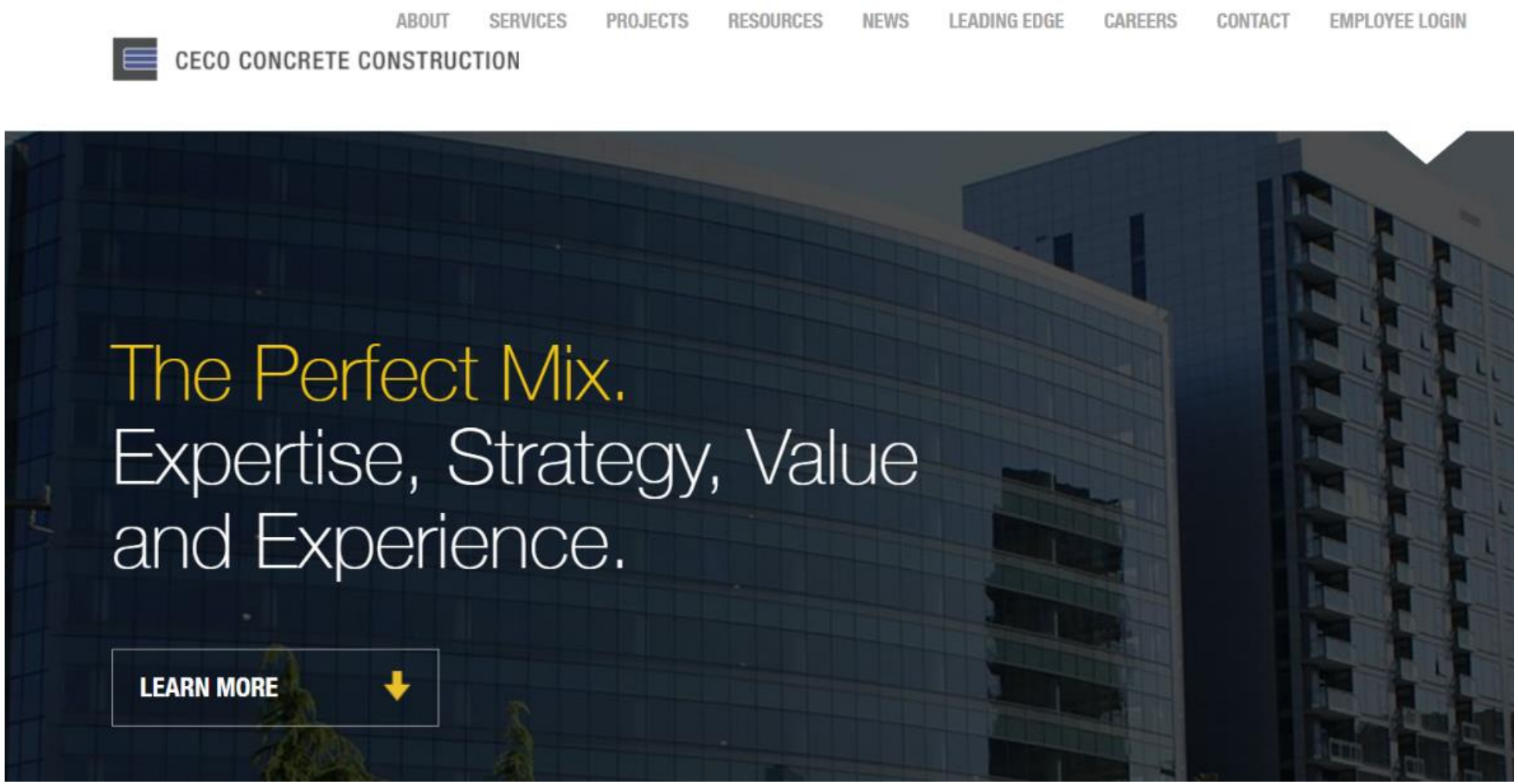
Concrete Construction References

- ACI 347 Guide to Formwork for Concrete
- ACI SP-4 Formwork for Concrete Manual
- ACI Concrete International Magazine
- Supplier Websites
  - Titan, EFCO, Doka, Peri, Aluma

OR…



Visit us at cecoconcrete.com



Thank You!

Any Questions?

Stories Built

CECO