

PRO

An ACI Center of Excellence
for Advancing Productivity



Phil Diekemper
Executive
Director

www.concreteproductivity.org



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About me.....Short Bio – Real Bio

- PRO Executive Director
- Retired as Senior VP of Ceco Concrete Construction
- BS-CE Structures, MBA
- Active in ASCC, AGC, ACI, SEA, ASA
- Author of several articles in CI and STRUCTURE
- Creator of PRO's *Constructability Blueprint*
- Founder of PD Advisory, LLC
- Grew up a farmer in Illinois
- Worked construction to pay for college
- Managed concrete construction from coast-to-coast and Singapore.
- Always on the critical path.....every project.
- Successful projects: Early-stage design assist.
- Always a “student of labor”.
- Now seeking to improve fragmented commoditized industry.



About you....??

- Academia
- Project Owners
- Architects
- SEORs
- Contractors
- Material Suppliers



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What to Expect....like no other Chapter Mtg.

- History and Creation, the “Why?” of PRO
- What is PRO? Productivity? Constructability?
- Design is the opportunity!
- PRO Initiatives
- PRO Resource Demonstration
- PRO Membership

Welcome Questions!



If Possible, go to: <http://www.concreteproductivity.org/>

Download: Constructability Blueprint

Will access it later in the presentation.



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What is PRO?



A catalyst for **solving constructability barriers** to advance concrete construction productivity. Through a collaborative approach, PRO aims to optimize labor and time against materials by improving structural design and construction processes.



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Why focus on Concrete Industry Productivity?

“Errors in designs- and inefficient designs- have a cascading effect throughout the project that seriously inhibits productivity. **In the MGI Construction Productivity Survey, respondents who cited inefficient design as an important root cause attributed this to a lack of stakeholder collaboration and insufficient emphasis on planning.** Constructability reviews are an important part of planning.” – The McKinsey Global Institute, 2017.



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United States, gross value-added*
Per hour worked, 1947=100

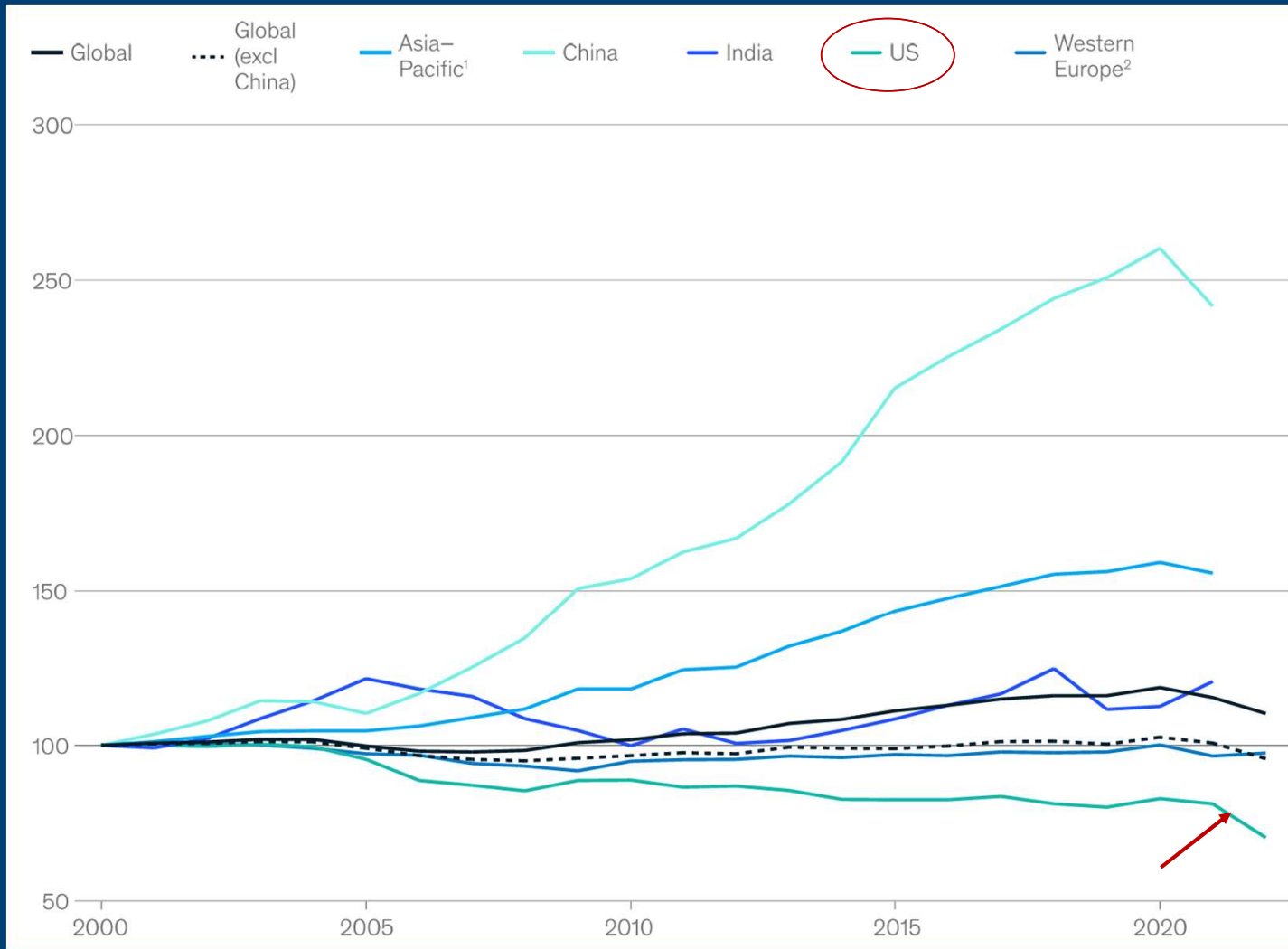


Source: McKinsey Global Institute *At constant prices



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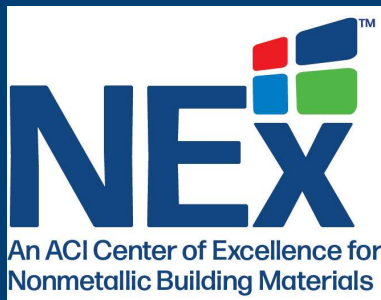
ACI's Response to the Productivity Challenge

- ACIF "Productivity in Concrete Construction" workshop in February 2020
- Formation of an ACI Task Group that developed recommendations for how ACI could use its resources to improve constructability and productivity
- ACI University has developed a Concrete Constructability Certificate Program to encourage individuals to continue their education on the topic.



ACI's Task Group Recommended: PRO

- A Center of Excellence (PRO) was created in early 2023 as an independent, member funded non-profit 501(c)(3).
- Centers of Excellence are singularly focused on the research and development of key industry sectors.



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PRO's Structure

- Staff:
 - Executive Director
 - Shared services with ACI staff
- Board of Directors:
 - Cary Kopczynski, Chair: Senior Principal & CEO of CKC Structural Engineers
 - Mike Tholen: ACI Managing Director, Engineering and Professional Development
 - Jeffrey Coleman, PE, FACI: Partner, Coleman and Erickson Law Firm
 - Mike Schneider: Retired VP, CPO at Baker Concrete Construction
- **Members fund and direct the PRO's activity.**



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What PRO is not....

- Focused on trade skills.
- Focused on crew leadership, scheduling or planning.

A PRO premise...

- Concrete Construction Productivity can be improved by and during design.



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“Productivity” knowledge is elusive

- No open access concrete productivity data base.
- Contractor’s data considered proprietary.
- Variables that impact productivity, contractors consider competitive advantages
- Little research or articles about industry productivity.
- Very few resources for designers.
- Design software optimize materials, not labor or time



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PRO: Advancing productivity?

- Optimize field labor and construction speed.
- Reduce concrete conflicts with other trades.
- Increase project value to owners.
- Reduce project RFIs, design changes & change orders.



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PRO: Guiding Principles

- Creating collaboration
- Aligning risk & rewards
- Supporting education
- Embracing innovation
- Fostering trust and respect among project stakeholders
- Encouraging industry-wide involvement



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PRO Initiatives to remove productivity **barriers**

1. Improve the Constructability of Concrete Structures.
2. Contractually align the Risk & Reward of Concrete Design, Construction, and Ownership.
3. Incentivize Innovation in Concrete Design and Construction.
4. Improve Collaboration and Teamwork among All Project Stakeholders.
5. Improve Construction Document Completeness and Coordination.
6. Accelerate adoption of productivity enhancing products, tools, and systems.



PRO Initiatives → Volunteer Task Groups Creating Change

1. TG established in 2024
2. TG: 5 to 8 industry leader volunteers for each TG.
3. TG has a chair, not bound by ACI consensus protocol.
4. Singular focused, seeking faster impact.
5. Outcomes target Project Owners for change
6. Members include:
 - Designers
 - Contractors
 - Material Suppliers
 - Project Owners or Reps



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PRO Initiatives → Volunteer Task Groups

1. Create content to influence industry stakeholders
2. Address a fragmented, risk adverse industry
3. Enhance contractor/designer collaboration
4. Improve poor rewards for intellectual value and risk.
5. Become a productivity resource for:
 - Allied Organizations
 - ACI Committees
 - Project Owners
 - Designers



What is Constructability?

“The effective and timely integration of construction knowledge into the conceptual planning, design, construction, and field operations of a project to achieve the overall project objectives in the best possible time and accuracy at the most cost-effective levels.”

– The Construction Industry Institute

- According to the Construction Industry Institute Task Force, early introduction of constructability practices can account for a *10:1 return on investment* for owners.

PRO defines constructability as the effective integration of construction knowledge into the planning and design of a project to optimize construction cost, schedule and maximize value to the owner.




ACI Constructability Certificate – 298+ Completed!



Certificate Program: Concrete Constructability

Currency Display
US Dollar \$

Your Price: **\$ 279.00** USD
Member Price: \$ 279.00 USD

 **FREE TO
ACI
MEMBERS**

SEOR: Utilize Certificate to Differentiate
Owners: Hire Designers with Concrete Constructability Certificate

Constructability Blueprint Now Available!

- PRO Initiative #1
- Digital Format
- Embedded Links
- Links to resources
- Use pdf viewer tools
- Search for topics
- Not just What, but Why
- Ever expanding



Open for
Demonstration

400+ Downloaded



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Constructability Blueprint....Scroll to Page 2

PRO: An ACI Center of Excellence for Advancing Productivity was established in 2023 by the American Concrete Institute. Its purpose is to be a catalyst for solving the barriers of constructability to advance concrete construction productivity, leveraging ACI's role as a world-leading authority for the development, dissemination, and adoption of consensus-based standards for concrete design, construction, and materials.



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SECTION 1: VALUE OF DESIGN COLLABORATION

SECTION 2: CONSTRUCTABLE DESIGN PRINCIPLES*

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CB....Mouse click on Section 1

SECTION 1: VALUE OF DESIGN COLLABORATION

- 1.1 What is Constructability?
- 1.2 Improving Productivity via Constructability
- 1.3 Status of Construction Productivity
- 1.4 Constructability Economics
- 1.5 Collaborative Relationships
- 1.6 Design Collaboration is the Key
- 1.7 Timing of Collaboration to Maximize Results
- 1.8 Outcomes of Constructability Focus
- 1.9 Concrete's Design Advantages Versus Constructability
- 1.10 The Path to Concrete Productivity—A Summary
- 1.11 Additional Resources for Those Seeking to Improve Concrete Productivity

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Early Collaboration is key!

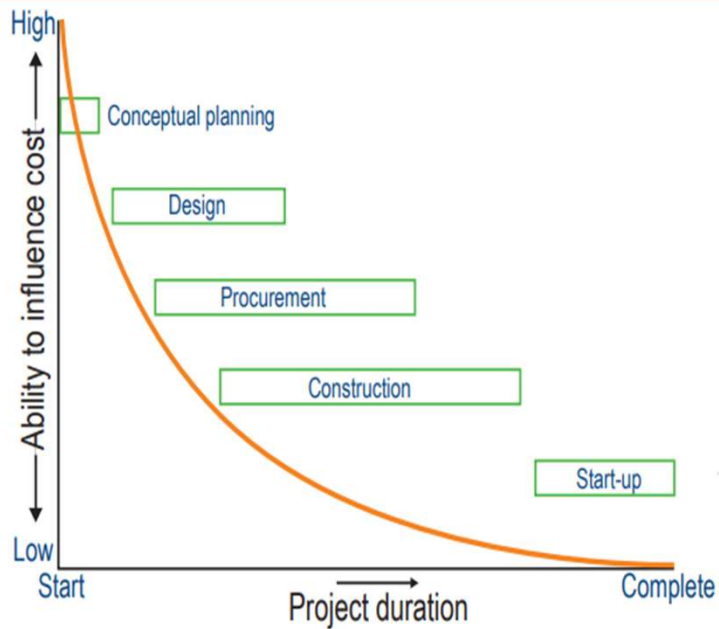


Fig. 1.1.1: The ability to influence the final cost of a project decreases rapidly with each phase of the project ("Constructability: A Primer, Construction Industry Institute," Austin, TX, 1986, 24 pp.)

Use pdf tool
Search:
Section 2



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Constructability Blueprint

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SECTION 2: CONSTRUCTABLE DESIGN PRINCIPLES

- 2.1 Pathways toward Constructable Design
- 2.2 Code-Compliant Design versus Code-Constructable Design
- 2.3 Permanent Material versus Construction Labor and Time
- 2.4 Where to Start as a Designer
- 2.5 Horizontal Framing
- 2.6 Formwork Logic
- 2.7 Reinforcement Logic
- 2.8 Mixtures, Pumping, Placing, and Finishing
- 2.9 Logistics, Hoisting, and Safety
- 2.10 Vertical Elements
- 2.11 Lateral-Force-Resisting Systems
- 2.12 Foundations
- 2.13 On-site Testing and Inspection
- 2.14 Specifications for Constructable Concrete
- 2.15 Coordination and Completion of Drawings
- 2.16 Summary of Constructable Design Principles

Click: Chapter 2.8



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CB....Mouse click on Chapter 2.8

PRO Constructability Blueprint

Section 2

Once the LDP has approved the stressing operation, the contractor must:

- Cut the tendon tails within 1 day after approval (Fig. 2.7.55);
- Install encapsulation caps within 8 hours after cutting tails; and
- Grout stressing pockets within 1 day after cutting tails.

(oo) Post-tensioning offers constructable solutions to mitigate cracking. **DC20.2-22: Restraint Cracks and Their Mitigation in Unbonded PT Building Structures**, published by PTI, provides strategies and constructable details to address cracking.

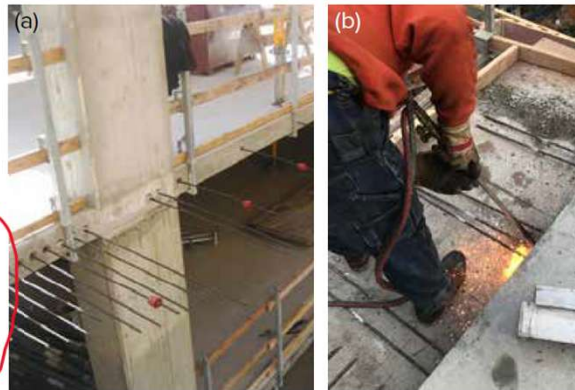


Fig. 2.7.55: PT strand tails must be cut to allow protective systems to be installed at the anchors: (a) strand tails extending from a PT slab (image courtesy of PTI); and (b) a worker cuts a tail using an acetylene torch (image courtesy of Conco).

Click Blue Font for Resource Info.

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2.8 MIXTURES, PUMPING, PLACING, AND FINISHING



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PRO Constructability Blueprint

Section 2

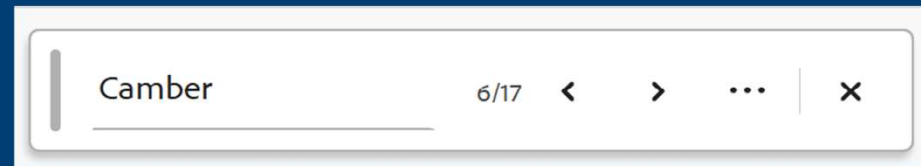
Warping top and bottom surfaces (Fig. 2.6.29) is the most extreme impediment to productivity, as it requires intricate, expensive carpentry that must be precisely installed. Further, it is difficult to place and finish concrete with curved top and bottom surfaces, as adjacent beam side, column, and wall elevations become variable and are therefore difficult to accurately fabricate. Most constructable solutions have slopes for drainage and **camber** in a single direction or plane. An even better solution is to maintain a level slab soffit elevation and modify the thickness of the slab in a single direction to achieve the desired drainage while maximizing construction productivity.

Consider the conditions where **camber** is needed. A nonprestressed podium slab that will support many levels of wood framing presents a particular condition that requires significant **camber** to address long-term creep. But also consider the limitations of **camber**. **Camber** is a poor solution, for example, when standard span-to-slab-depth minimums are exceeded (Tables 2.6.1 through 2.6.4). In most cases, **camber** should be avoided as it adds complexity to the formwork and concrete placing operations. Further, **camber** will invalidate FF/FL testing and flatness expectations. If required, one-way **camber** of a mildly reinforced slab can be achieved with best results when the **camber** requirement is the same in all bays. **Camber** requirements should be a minimum of 1/2 in., with additional **camber** in 1/2 in. increments. Using topping slabs to achieve greater slopes and drainage are another recommended option. Noting that the allowable tolerance for form elevation is $\pm 3/4$ in., it makes little sense to overthink a detailed customized **camber** plan for each bay. Simplify one-way **camber**, if necessary, for better constructability. For additional information on deflection limits for nonprestressed slabs, refer to "Span-Depth Ratios for One-Way Members Based on ACI 318 Deflection Limits," published in the *ACI Structural Journal*, Sept.-Oct. 2009. While ACI 318-19(22) allows designers to exceed the limits in Tables 2.6.1 through 2.6.4 by predicting deflection through calculations, constructability invariably suffers when the limits are exceeded.

Table 2.6.1: Minimum thickness of nonprestressed one-way slabs comprised of normalweight concrete per ACI 318-19(22) Section 7.3.1.1

Support condition	Minimum slab thickness		
	$f_y = 60,000$ psi	$f_y = 80,000$ psi	$f_y = 100,000$ psi
Simply supported	$\ell/20$	$1.2\ell/20$	$1.4\ell/20$
One end continuous	$\ell/24$	$1.2\ell/24$	$1.4\ell/24$
Both ends continuous	$\ell/28$	$1.2\ell/28$	$1.4\ell/28$
Cantilever	$\ell/10$	$1.2\ell/10$	$1.4\ell/10$

Note: ℓ is span; f_y is slab reinforcement yield strength.



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CB.....Final Note



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CB.....You may be a SME!

- Constructability Blueprint is ever evolving.
- You will find information gaps!
- Send your experience, knowledge, and reference documents.
- To: Phil.Diekemper@concreteproductivity.org

PRO extends gratitude to PRO Members!



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Who should be interested in PRO membership?

- Industry leaders improving the concrete industry
- Innovative minds developing tools of change
- Companies that seek to increase project ownership value
- Concrete contractors that wish to eliminate productivity obstacles
- Designers seeking improved results

Membership directs and funds PRO's work. If membership is not an option, consider volunteering for PRO's Task Groups to tackle initiatives using your expertise in the industry. Be part of the future!



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Membership Levels: PRO, a non-profit, member funded entity.

Selection	Membership Category	Seat on Board of Direction	Project selection and guidance of work products	Strategic Planning Steering Committee member	Recipient of quarterly updates	Access to PRO content	Presence on PRO website	Annual commitment (USD)
<input type="radio"/>	Platinum Member	✓	✓	✓	✓	✓	✓	\$100,000
<input type="radio"/>	Gold Member	2 at-large	2 at-large	✓	✓	✓	✓	\$50,000
<input type="radio"/>	Silver Member	1 at-large	1 at-large	✓	✓	✓	✓	\$25,000
<input type="radio"/>	Bronze Member	—	—	—	✓	✓	✓	\$10,000

ACI will provide complimentary one-year Individual Memberships to a portion of members of the Centers of Excellence (COE) according to the following schedule:

COE Member Dues	Complimentary ACI Individual Memberships
>\$99,999	4
\$25,000-\$99,999	2
\$10,000-\$24,999	1

Choice of recipients of complimentary ACI Individual Memberships will be at the discretion of Phil Diekemper, PRO Executive Director.



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Announcing: New ACI Chapter Membership!

ACI Chapter Cost / Benefits!

- Annual contribution - \$5,000 per Year.
- Chapter Logo presence on PRO Website.
- Access to PRO Content.
- PRO will speak at one Chapter meeting per year.
- Chapter involvement opportunity w/ Task Groups.
- One Chapter Rep, information conduit.
- Recipient of Quarterly Updates (Member meeting).



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