



American Concrete Institute®
Advancing concrete knowledge

Sustainable Design in Structural Concrete, Part 3

ACI Spring 2010 Xtreme Concrete Convention
 March 21 - 25, Chicago, IL

ACI WEB SESSIONS

ACI Web Sessions

The audio for this web session will begin momentarily and will play in its entirety along with the slides.


Note: If the slides begin to lag behind the audio, back up one slide to re-sync.

ACI WEB SESSIONS

ACI Web Sessions

ACI is bringing you this Web Session in keeping with its motto of "Advancing Concrete Knowledge." The ideas expressed, however, are those of the speakers and do not necessarily reflect the views of ACI or its committees.

Please adjust your audio to an appropriate level at this time.




ACI WEB SESSIONS

ACI Web Sessions

ACI Web Sessions are recorded at ACI Conventions and other concrete industry events. At regular intervals, a new set of presentations can be viewed on ACI's website free of charge.

After one week, the presentations will be temporarily archived on the ACI website or made part of ACI's Online CEU Program, depending on their content.




ACI WEB SESSIONS

Fall 2010 ACI Seminars

- **Concrete Repair Basics**
- **Troubleshooting Concrete Construction**
 - New York, NY - 10/12
 - Dallas, TX - 12/7
- **Concrete Slabs on Ground**
 - Chicago, IL - 11/3
 - Atlanta, GA - 11/7
 - Salt Lake City, UT - 10/13
 - Orlando, FL - 12/8
 - Louisville, KY - 11/4
- **Anchorages to Concrete**
- **Simplified Design of Reinforced Concrete Buildings**
 - Phoenix, AZ - 10/14
 - Atlanta, GA - 12/2
 - Detroit, MI - 10/7
 - Los Angeles, CA - 11/30
 - Minneapolis, MN - 10/6
 - Charlotte, NC - 11/17
 - Pittsburgh, PA - 10/28
 - Des Moines, IA - 12/14
 - Boston, MA - 10/20
 - St. Louis, MO - 12/1
 - Seattle, WA - 11/10
 - Houston, TX - 12/15

Visit www.concrete-seminars.org for more information.



ACI WEB SESSIONS

ACI Fall 2010 Convention

Pittsburgh

The Westin Convention Center Hotel &
 David L. Lawrence Convention Center
 October 24-28, 2010 • Pittsburgh, PA



ACI Conventions are dedicated to improving the design, construction, maintenance, and repair of concrete structures by offering 300+ committee meetings, 30+ technical and educational sessions, a number of networking events, and the opportunity to visit with exhibitors.

To coincide with the growing focus on "green" building practices, ACI has tailored numerous aspects of this fall's convention to place emphasis on sustainability. Learn about the methods for reducing environmental impact and increasing the efficiency of concrete during committee meetings, sessions, and other events at the ACI Fall 2010 Convention. For more information and to register, visit www.aciconvention.org.





ACI WEB SESSIONS

ACI Web Sessions

This ACI Web Session includes one speaker presenting at the ACI Xtreme Concrete convention held in Chicago, IL, March 21st through 25th, 2010.

Additional presentations will be made available in future ACI Web Sessions.

Please enjoy the presentations.



ACI WEB SESSIONS




American Concrete Institute®
Advancing concrete knowledge

**Sustainable Design in
Structural Concrete, Part 3**


ACI Spring 2010 Xtreme Concrete Convention
March 21 - 25, Chicago, IL



ACI WEB SESSIONS



Mark Chrzanowski is the Operations leader for the Civil/Geotechnical/Structural Groups in the CH2M HILL's design center in Gainesville, Florida. He has nearly 29 years of experience that include the design and construction of water and waste water containment structures, aquatic entertainment-themed structures, and commercial, educational, health, industrial, power-generating, and retail facilities. As an employee/owner of CH2M HILL, Mr. Chrzanowski participates in project designs as a Lead Engineer, QC Reviewer, or Structural Consultant, and serves as Technical Specification Coordinator. He also recently served as an expert consultant in concrete materials to the Panama Canal Authority. He is an active member of several ACI committees, and a member of ITG-8 (Performance Criteria for Concrete Materials).



ACI WEB SESSIONS

**Sustainability and
Performance Criteria for
Concrete**

Mark F. Chrzanowski P.E.
Spring 2010 ACI Convention
Chicago, IL

ACI WEB SESSIONS

- A Quick Handshake
- Target Zero Culture
- Sustainability Driving the Need for Performance Specification?
- Prescription vs. Performance
- Challenges to Performance
- Industry Moving Toward a Performance Alternative?
- A Pearl of Wisdom

ACI WEB SESSIONS

A Quick Handshake

ACI WEB SESSIONS

Mark F. Chrzanowski, P.E.

- Principal Structural Technologist for the Water Business Group of CH2M HILL
- OL for Civil/Geotechnical/Structural Groups in Gainesville, Florida Design Center of CH2M HILL

ACI WEB SESSIONS

Mark F. Chrzanowski, P.E.

- Charter Member of ITG-8, Performance Criteria for Concrete Materials
- ACI Committee 130, Sustainability of Concrete
 - Main Committee
 - Co-Chairman Subcommittee ACI 130 E
- Member of ACI 301 Committee, Specifications for Structural Concrete
 - Main Committee
 - Subcommittee ACI 301C
- ACI 329 Committee, Performance Criteria for Ready Mixed Concrete
 - Founding Chairman

ACI WEB SESSIONS

Target Zero Culture

ACI WEB SESSIONS

Commitment to Health, Safety, Environment, and Quality

“Target Zero Culture”

- Zero injuries and illnesses (World-class safety)
- Zero errors, omissions, and defects (first-time quality)
- **Zero adverse impacts (Environmental Stewardship)**



HSEQ Target Zero
World-Class Performance
CH2MHILL

ACI WEB SESSIONS

Target Zero Culture

ACI WEB SESSIONS

Target Zero Culture

Culture ... What you do when nobody is looking

ACI WEB SESSIONS

Target Zero Culture

Sustainability

ACI WEB SESSIONS

Target Zero Culture Sustainability

Historically recent Atmospheric CO2 based on high deposition ice cores and reading taken at Mauna Loa Observatory (Sarmiento and Gruber 2002)

ACI WEB SESSIONS

Target Zero Culture Sustainability

Correlation between CO₂ and temperature based on ice core data from Petit al. (1999, 2000)

ACI WEB SESSIONS

Target Zero Culture Sustainability

ACI WEB SESSIONS

Target Zero Culture Sustainability

Environmental Stewardship

Doing the Right Thing

When Nobody is Looking!

ACI WEB SESSIONS

“The U.S. National Academy of Sciences sees 1979 as the year of the earth’s ‘tipping point’ – the year when consumption of natural resources exceeded the earth’s ability to replenish them” (Mongan 2008).

ACI WEB SESSIONS

In the production of concrete, PC accounts for:

- 96% of the carbon dioxide production
- 85% of the embodied energy in a unit of concrete
- In the U.S., PC is responsible for about 2% of the country's total CO₂ emissions.

Portland Cement Association (2006)

ACI WEB SESSIONS

Concerns about concrete's impact on the world

- Greenhouse gas production
- Embodied energy
- Water consumption
- Material resource consumption

ACI WEB SESSIONS

Target Zero Culture *Sustainability*
Environmental Stewardship

Doing the Right Thing
When Nobody is Looking!

ACI WEB SESSIONS

The Vision of the Ready Mixed Concrete Industry is to Transform the Built Environment by Improving the Way Concrete is Manufactured and Used in Order to Achieve an Optimum Balance among Environmental, Social and Economic Conditions*

* NRMCA Sustainability Initiatives

ACI WEB SESSIONS

Objectives of NRMCA Sustainability Initiatives

- Minimize Energy
- Reduce Emissions
- Conserve Water
- Minimize Waste
- Increase Recycled Content

ACI WEB SESSIONS

Goals of NRMCA Sustainability Initiatives

- **Minimize Energy Use - Embodied energy per unit of concrete produced**
 - Reduce by 20% by 2020
 - Reduce by 30% by 2030
- **Reduce Emissions – Carbon footprint per unit of concrete produced**
 - Reduce by 20% by 2020
 - Reduce by 30% by 2030

ACI WEB SESSIONS

Goals of NRMCA Sustainability Initiatives

- **Conserve Water – Potable water used per unit of concrete produced**
 - Reduce by 10% by 2020
 - Reduce by 20% by 2030
- **Minimize Waste – Waster per unit of concrete produced**
 - Reduce by 30% by 2020
 - Reduce by 50% by 2030
- **Increase Recycled Content – Recycled content per unit of concrete produced**
 - 200% increase by 2020
 - 400% increase by 2030

ACI WEB SESSIONS

Sustainability Driving the Need for Performance Specification?

ACI WEB SESSIONS

Sustainability Driving the Need for Performance Specification?

Not Really!

ACI WEB SESSIONS

Prescription vs. Performance

ACI WEB SESSIONS

Prescription

- Has been the standard method of doing concrete in the US for the first 100 years
- Basis of Governing Codes and Specifications in US (i.e., it's the law)
- Engineer says Thou Shall
 - Use these Materials
 - Use these Methods of Construction
- And if You do That We Know the Final Product will be Good
- **Sustainable Elements when Used Correctly**

ACI WEB SESSIONS

Prescription

Problems with Prescriptive Criteria of Materials

- Boiler Plate Solution of One Size Fits All
 - Use these Materials ... Regardless
- Does an Engineer Really Understand
 - Material Science Better than a Concrete Producer?
 - Availability of Materials Better than a Concrete Producer?
 - Market Economies Better than a Concrete Producer?
 - Why the Concrete is Problematic?
- Who Owns the Problem?
- Stifles Innovation of those Who Can

ACI WEB SESSIONS

Prescription

Problems with Prescriptive Criteria of Procedures

- Boiler Plate Solution of One Size Fits All
 - Use these Methods of Construction ... Regardless
- Does an Engineer Really Understand
 - How the Concrete Contractor is Best Suited to Execute Work?
 - Constructability Issues?
 - What the Contractor Can Tweak in the Process to Reduce Cost without Impacting Final Result?
 - What the Contractor Can Tweak in the Process, to Mitigate Concrete Issues?
- Who Owns the Problem?
- Stifles Innovation of those Who Can

ACI WEB SESSIONS

Performance Criteria

End Result

- Does the Owner Really Care about Anything Other than the End Result?
- **Alternative to Prescription**
- Redefines Traditional Roles
- Opens the Door for Innovation of those Who Can
- **Not for Every Project**

ACI WEB SESSIONS

Performance Criteria

Who are Project Stakeholders?

- Owner
- Design Team
- Contractor
- Concrete Producer
- Code Officials
- Others?

ACI WEB SESSIONS

Performance Criteria

Roles of Owner and Design Team

- Define Desired End Results
 - Strength
 - Exposure Conditions - Freeze/Thaw, Sulfates, Chlorides, etc
 - Durability Requirements - Abrasion, Fire, Leakage, etc.
 - Life of Structure - XX Year Life Cycle

ACI WEB SESSIONS

Performance Criteria

Roles of Owner and Design Team

- Provide Standardized Method to Verify End Results
 - Strength Measured using ASTM C ?????
 - Chloride Intrusion Measured using ASTM C ?????
 - Leak Test per ACI 350.2????
 - Life of Structure verified using Stadium Program

ACI WEB SESSIONS

Performance Criteria

Roles of Owner and Design Team

- Define a Bonus/Penalty System that is Fair
 - When Final Product is Better than Required
 - When Final Product falls Short of Desired End Results

ACI WEB SESSIONS

Performance Criteria

Roles of Concrete Contractor/Concrete Producer

- **Concrete Producer**
 - Take Ownership of Design Mix and Materials
 - What Combination of Materials are Required?
 - What Materials are Available?
 - QC Requirements for production
 - Work with Contractor to Ensure End Results can be Achieved

ACI WEB SESSIONS

Performance Criteria

Roles of Concrete Contractor/Concrete Producer

- **Concrete Contractor**
 - How to get Concrete in Place?
 - What has to be done once Concrete is in Place?
 - QC Requirements During Work
 - Work with Contractor Producer to Ensure End Results can be Achieved

ACI WEB SESSIONS

Performance Criteria

Challenges with Performance Based Specifications

- **Not for Every Project**
- Changes How an Industry Does Business
- Change Roles of Stakeholders
- Open the Door to Innovation while Not Letting Bubba In
- **Requires Individual Commitments**
 - From Those Who Know What They Are Doing
 - From Those Who Are Focused on the Client's Desired End Result

ACI WEB SESSIONS

Industry Moving Toward a Performance Alternative?

ACI WEB SESSIONS

2004: SDC identifies the move from prescriptive to performance-based specifications as an industry-critical technology

ACI WEB SESSIONS

2004: SDC identifies the move from prescriptive to performance-based specifications as an industry-critical technology

2007: ACI Technical Advisory Committee (TAC) reviews and approves creation of ITG-8

ACI WEB SESSIONS

Who is ITG-8?

2004: SDC identifies the move from prescriptive to performance-based specifications as an industry-critical technology
2007: ACI Technical Advisory Committee (TAC) reviews and approves creation of ITG-8
Fall 2007: First ITG-8 Meeting

ACI WEB SESSIONS

Who is ITG-8?

Chairman: Kenneth B. Rear
Principal Author: Nicholas J. Carino
Members: John A. Bickley
Mark F. Chrzanowski
Ross S. Martin
Contributing Authors:
R. Doug Hooton
Kenneth C. Hover

ACI WEB SESSIONS

Mission Statement of ITG-8

To Develop a Report on Performance Criteria and Test Methods for Concrete Materials that could be used in Codes and Specifications.

ACI WEB SESSIONS

Status of ITG-8

- 8 Work Sessions Since Fall 2007
- Completed Draft in June, 2009
- Internal Ballot
- Officially Balloted July 2009 to September, 2009
- Has Been Through TAC Review
- Currently Resolving TAC Comments
- **Look to Publish Report 2010**



ACI WEB SESSIONS

ACI 329 Committee Performance Criteria for Ready Mixed Concrete

- First Meeting March 24, 2010
- Chairman – Mark F. Chrzanowski
- Secretary - Colin Lobo
- Members of ITG-8
- Others - Apply at <https://www.concrete.org/>

ACI WEB SESSIONS

ACI 329 Committee Draft Mission Statement

- To develop the report from ITG 8 into an ACI consensus technical document
- To evaluate barriers to the acceptance of performance criteria in ACI documents
- To propose Code and Specification language recommendations on performance criteria for ready mixed concrete, to code and specification committees.

ACI WEB SESSIONS

Leave You with a Pearl of Wisdom

ACI WEB SESSIONS

*Today's Performance
is
Tomorrow's Prescription*







Claude Bedard/Euclid Chemical

ACI WEB SESSIONS

*Thank You
Questions?*

ACI WEB SESSIONS

Click on the text below to go to the web page.

 Seminar Schedule	 Bookstore	 Web Sessions	 Conventions
 Online CEU Program	 ACI eLearning	 Concrete Knowledge Center	

ACI WEB SESSIONS