



**American Concrete Institute®**  
*Advancing concrete knowledge*


## Fly Ash Contributes to Sustainable Concrete Construction

123 Forum, 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.

However, if you wish to skip to the next speaker, use the scroll bar at left to locate the speaker's first slide (indicated by the  icon in the bottom right corner of slides 10, 19, 21, and 33). Click on the thumbnail for the slide to begin the audio for that portion of the presentation.


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

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## 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.

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## 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.



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## Spring 2010 ACI Seminars

- ACI/PCA Reinforced Concrete Design
- **Location and Date:** Simplified Design of Reinforced Concrete Buildings of Moderate Size and Height  
 • San Francisco, CA Apr. 20-21  
 • New Brunswick, NJ May 25-26
- **Location and Date:** Troubleshooting Concrete Construction  
 • Chicago, IL May 12-13  
 • Los Angeles, CA May 18-19
- **Location and Date:** Concrete Repair Basics  
 • San Diego, CA Mar. 25  
 • Washington, DC Apr. 7-8
- **Location and Date:** Concrete Slabs on Ground  
 • Miami, FL Mar. 29  
 • Phoenix, AZ May 5  
 • San Antonio, TX May 20
- **Location and Date:** Concrete Slabs on Ground - No more  
 • Portland, OR Apr. 14  
 • Dallas, TX May 10
- **Location and Date:** Concrete Slabs on Ground - No more  
 • Milwaukee, WI May 18  
 • Indianapolis, IN May 18
- **Location and Date:** Concrete Slabs on Ground - No more  
 • Charlotte, NC Apr. 15  
 • Chicago, IL May 18
- **Location and Date:** Concrete Slabs on Ground - No more  
 • Baltimore, MD Apr. 15  
 • Chicago, IL May 18
- **Location and Date:** Concrete Slabs on Ground - No more  
 • Boston, MA Apr. 20  
 • Boston, MA Apr. 29





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## ACI Conventions

ACI conventions provide a forum for networking, learning the latest in concrete technology and practices, renewing old friendships, and making new ones. At each of ACI's two annual conventions, technical and educational committees meet to develop the standards, reports, and other documents necessary to keep abreast of the ever-changing world of concrete technology.

With over 1,300 delegates attending each convention, attendees are afforded ample opportunity to meet and talk individually with some of the most prominent persons in the field of concrete technology. For more information about ACI conventions, visit [www.aciconvention.org](http://www.aciconvention.org).

Chicago, IL, March 21 – 25, 2010
Pittsburgh, PA, Oct. 24 – 28, 2010

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## ACI Web Sessions

This ACI Web Session includes four speakers presenting at the ACI Xtreme Concrete convention held in Chicago, IL, March 21<sup>st</sup> through 25<sup>th</sup>, 2010.

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

Please enjoy the presentations.

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## Fly Ash Regulation Update

On May 4, 2010, the U.S. Environmental Protection Agency (EPA) announced a public comment period on two approaches for addressing the risks of coal ash management under the Resource Conservation and Recovery Act (RCRA). One approach would regulate fly ash under RCRA Subtitle C, and the other would regulate fly ash under Subtitle D. The Bevill exemption for beneficial use of fly ash would remain in place under both approaches.

View the EPA [press release](#).

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## Fly Ash Contributes to Sustainable Concrete Construction

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March 21 - 25, Chicago, IL

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**Thomas H. Adams** is Executive Director of the American Coal Ash Association. Prior to joining the ACAA, he was employed by ACI as Manager, Chapter and International Relations, and Executive Director of the American Shotcrete Association, under an agreement between the ASA and Creative Association Management, an ACI subsidiary. Mr. Adams has also worked in the ready mixed concrete industry in management of sales, marketing, technical services, product development, and operations. He also served as the COO of the Michigan Concrete Association. He attended Wayne State University (Detroit) and Aquinas College (Grand Rapids), studying Business Administration.

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## LIABILITY, LITIGATION, AND STIGMA – 3 BARRIERS TO PROGRESS

Thomas Adams, Executive Director  
American Coal Ash Association

ACI Spring Convention

March 21, 2010

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## CCPs – a Recycling Success Story

- Since 2000 recycling has grown from **30% to 44%**
- Over **117 million tons** of CO<sub>2</sub> emissions avoided
- **1.1 billion tons** produced
- **430 million tons** recycled

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## Liability Concerns

- Exposure to elevated levels of **heavy metals** in disposal and beneficial uses
- **Mobility**
- Paths for **ingestion**
- **Legacy** issues
- **Insurance** for engineers and contractors
- **Workers' compensation**
- **Environmental justice**

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## Litigation Concerns

- A hazardous waste rule invites creative litigation with or without real damages  
See "Sulfate Wars" for a real example.
- Suits must be defended
- What is a "legitimate" beneficial use?  
**If a material is hazardous in one context, why not in others?**
- Who are potential defendants?

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## Stigma

- Definition: a mark of disgrace or infamy; a stain or reproach.
- Alternate materials are available; most consumers would choose a product without a stigma.
- EPA's examples of hazardous materials recycled into new products do not work in institutional/residential markets.

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## Impacts of a Hazardous Rule

- Land use – more landfills needed
- **Green jobs** – estimates run as high as 20,000 jobs that are tied to recycling of CCPs
- Commerce – domestic and international
- Product performance
- Disposal costs will have a significant impact on ratepayers
- Beneficial use will be severely crippled

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## The Solutions

- Subtitle D (non-hazardous) rule for disposal of coal combustion products
- National enforcement authority for EPA
- Provide incentives for recycling
- Increase the beneficial use rate to decrease the material directed to disposal

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American Coal Ash Association  
Aurora, Colorado  
[www.acaa-usa.org](http://www.acaa-usa.org)  
(720)870-7897

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**Anne Ellis, P.E.**, is Vice President, Government Services of AECOM. She is a past member of the ACI Board of Direction and a Fellow of the Institute, and has 30 years of progressively responsible experience in engineering and business. Ms. Ellis serves on the Environmental Technologies Trade Advisory Committee by appointment of the U.S. Secretary of Commerce. She has served on the Washington Building Congress Board of Governors, the Board of the Tilt-up Concrete Association, and the Board of Women in Water. She is active in the Professional Services Council, ASCE, the Defense Industry Initiative, and the Ethics and Compliance Officer Association. Ms. Ellis received a Bachelor of Science in Civil Engineering from Virginia Tech. In 2007, she was inducted into the Virginia Tech Department of Civil and Environmental Engineering Academy of Distinguished Alumni.

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### Reclassification Impacts – a Global Perspective

Trade:

**Will there be a business case to export excess ash?**

- What potential will be created for "dumping" and retaliation against US:
  - "Dumping: one country exports a significant amount of goods to another country at prices much lower than in the domestic market."
- What kind of competitive pressures would the export penetration impose on our trading partners?

**Will there be a business case to import blended cements containing fly ash?**

- What kind of competitive pressures would the import penetration impose on our domestic market?
  - "Domestic cement production alone does not satisfy total United States cement consumption, even in economic downturn."

Financial Markets


**What will be the impact on the valuation of credits traded by companies and nations for carbon-emissions reduction associated with beneficiated fly ash?**

"Wal-Mart Stores Inc. announced a new store and other facility construction contract provision: Any carbon dioxide emission reduction credits from specification of fly ash in concrete mixes will become Wal-Mart property."

Model Regulation

**How will the rest of the world respond to the characterization?**

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**Christopher Ferraro** is a Post-Doctoral research associate with the Department of Civil Engineering at the University of Florida. He also serves as a structural materials research engineer with the Florida Department of transportation, State Materials Office, in Gainesville, FL. He received his PhD from the University of Florida in Civil Engineering. Christopher is a member of three ACI committees (207, 228, and 236). He has also authored or co-authored over 20 publications including book chapters, refereed journal and conference proceedings, and technical reports.

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## Potential Consequences of Reclassifying Fly Ash as a Hazardous Waste in Florida

Christopher C. Ferraro, Ph.D.

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### Portland Cement Usage in Florida

- Florida consumed 7.8 million tons of cement in 2007 <sup>[1]</sup> <sup>[2]</sup>
- 12-15% of kiln raw feed is fly ash <sup>[2]</sup>

- Figures are approximate based on 2007, 2009 data
- PCA, 2009 North American Cement Industry Annual Yearbook, ER395, Portland Cement Association, Skokie, Illinois, USA, 2009, 69 pages.

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### Fly Ash Usage in Florida

- 1.7 million tons/year <sup>[3]</sup> fly ash used to replace portland cement in structural concrete
- 1.1 million tons/year <sup>[3]</sup> are produced locally
- 600 million tons/year <sup>[3]</sup> are imported (Texas)
- 60 – 70% of fly ash produced is recovered and used <sup>[4]</sup>

- Figures are approximate based on 2007 data
- Buckley & Pflughoeft (2006) Review of Florida Regulations, Standards and Practices Related to the Use of Coal Combustion Products, Final Report

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### Concrete Usage in Florida

- In 2007 Florida consumed 29M cubic yards of concrete
- The FDOT currently has 5,582 concrete mix designs approved for use
- 2,104 of those mixes contain fly ash
- 38% of all concrete mixes used in Florida contain fly ash

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### Environmental Classification

- The majority of the population of Florida lives within 25 miles of the coastline
- Approximately 30% of land mass of Florida is considered “extremely aggressive environment”
- Over 65% of the land mass in Florida considered to be a “moderately aggressive environment”

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### Concrete Use in Florida

- FDOT specification requirements

	Component	Environmental Classification		
		Slightly	Moderately	Extremely
Bridge Superstructures	Precast / Prestressed	Type I, III	Type I or III with Fly Ash and or Slag, Type II, IP, or IS	Type II with Fly Ash and or Slag
	Cast In Place	Type I	Type I with Fly Ash and or Slag, Type II, IP, or IS	Type II with Fly Ash and or Slag
All other Structures	All Elements	Type I, III	Type I with Fly Ash and or Slag, Type II, IP, or IS	Type II with Fly Ash and or Slag

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### Concrete Usage in Florida

- FDOT specification requirements
- Mass concrete must contain at least 18% fly ash or 50% slag by weight
- Mass concrete in slightly or moderately aggressive environments must contain at least 20% fly ash

*Supply of slag alone does not sufficiently meet the needs of the SCM requirements per the FDOT specification*

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### Fly Ash as a Hazardous Material

*“If fly ash is reclassified as a hazardous material, utility companies will no longer allow for it to be transferred off site” [5]*

5. American Coal Ash Association

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### Fly Ash as a Hazardous Material

- The price of concrete would increase
- Many FDOT construction specification requirements would not be met

*“We would have to go back to the drawing board”*

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**Acknowledgments**

- Florida DOT State Materials Office
- University of Florida Department of Civil and Coastal Engineering
- David Marshall of Headwaters Resources
- Colin Lobo of NRMCA
- Nathaniel Mohler of PCA

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**Thank you for your attention**


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**Leif Wathne** is Vice President of Highways and Federal Affairs of the American Concrete Pavement Association, where he is responsible for various technical, policy, and federal/state agency issues related to concrete highway pavements. Prior to joining ACPA in 2005, he served within the Federal Highway Administration's (FHWA) Office of Pavement Technology in Washington DC, and at Turner-Fairbank Highway Research Center in McLean, VA. He earned a Bachelor of Science degree in Civil Engineering from University of Connecticut, and a Master of Science degree in Civil Engineering from Pennsylvania State University, and he is a Registered Professional Engineer (PA #: PE 052260E).

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**Beneficial Use of Fly Ash:  
Concrete Pavement  
Industry's Perspective**



Committee 123 Forum  
ACI Spring Convention  
Chicago, IL  
March 21<sup>st</sup> 2010

Leif Wathne

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**Who is ACPA?**

- National trade association for the concrete pavement industry (network of 21 chapters)
- Represent ~425 companies, primarily:
 

Contractors	Cement Companies
Equipment Makers	Materials Suppliers
Consulting Engineers	Academia
- Purpose: *"To expand the use and improve the quality of concrete pavement..."*  
Through: *Strategic Leadership, Technical Expertise and Persuasive Advocacy.*

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**Concrete Pavements?**



- **How much?**  
Nationally, roughly 65-70 million square yards of concrete pavements in '09.
- Vast majority of state DOTs allow and encourage the use of fly ash in concrete pavements
- Typically 20-25%. As low as 15%, and as high as 50% (of cementitious content)

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### Why use fly ash?



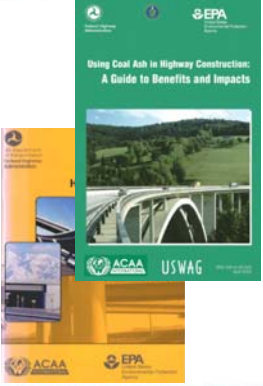
- Improved performance
  - Longevity
  - Strength
  - Durability
- Sustainability enhancements
  - Reduced cement intensity, diversion from waste stream and **enhanced longevity**
- Cost effectiveness

...All compelling reasons!

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### Why use fly ash?

- Much literature substantiating these benefits...
- Long history of advocating for the use of fly ash by EPA and FHWA!
- Huge advancements made over decades




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### Longevity means...

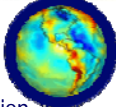
#### Less-frequent reconstruction

- Lower consumption of raw materials
  - Cement, aggregates, steel
- Lower energy consumption
  - Raw material processing
  - Rehab and reconstruction
  - Congestion!



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### Longevity means... (cont.)



- Reduction in pollutants
  - Manufacturing, construction, congestion
- Safety enhancements
  - Rigid structure, profile durability and infrequent construction zones
- All these translate into economic benefits...

**Longevity is the most significant sustainability characteristic of our built environment!**

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### Why is ACPA engaged?

- Concern about a potential EPA classification of fly ash as a hazardous waste (RCRA c)
- Believe such reclassification would have significant unintended negative consequences (even with exclusions)
  - Stigma, legal exposure → crippling effect on use
  - Future handling (sawing, grinding, recycling)
- Potentially undo decades of advancement
- Viable substitutes?

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### How is ACPA engaged?

- AASHTO SOM...
- Letters
  - to EPA, Aug 2009
  - to OMB, Oct 2009
  - to FHWA, Nov 2009
- Communicate with membership and allied organizations.



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In Conclusion...

- The dike rupture at the TVA facility in November 2008 was tragic!
- Steps should be taken to reduce the likelihood of another such catastrophic release
- Labeling fly ash as a hazardous waste is not one of them
- The negative unintended consequences of such a ruling are potentially enormous, and likely not fully appreciated by regulators.

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THANK YOU!



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**Related Documents**

**Fly Ash and Other Supplementary Cementitious Materials**

- ACI 232.2R: Use of Fly Ash in Concrete
- ACI 232.1R: Use of Raw or Processed Natural Pozzolans in Concrete
- E3: Cementitious Materials for Concrete
- SP 199: Seventh CANMET/ACI International Conference on Fly Ash, Silica Fume, Slag, and Natural Pozzolans in Concrete
- SP 221: Eighth CANMET/ACI International Conference on Fly Ash, Silica Fume, Slag, and Natural Pozzolans in Concrete
- SP 242: Ninth CANMET/ACI International Conference on Fly Ash, Silica Fume, Slag, and Natural Pozzolans in Concrete
- High-Performance, High-Volume Fly Ash Concrete for Building Sustainable and Durable Structures, 3<sup>rd</sup> Edition, published by Supplementary Cementing Materials for Sustainable Development

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