




American Concrete Institute®
Advancing concrete knowledge

CLSM from Practice to Theory


ACI Fall 2011 Convention
October 16 – 20, Cincinnati, OH

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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 9 and 35). 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 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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ACI Online CEU Program



ACI offers an easy-to-use Online CEU Program for anyone who needs to earn Continuing Education credits.

Once registered, you can download and study reference material. After passing a 10-question exam on the material, you will receive a certificate of completion that you can present to local licensing agencies.

Visit www.concrete.org/education/edu_online_CEU.htm for more information.



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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, there is 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.

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This ACI Web Session includes 2 speakers presenting at the ACI fall convention held in Cincinnati, OH, October 16 – 20, 2011.

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

Please enjoy the presentations.


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ACI Fall 2011 Convention
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Bruce Ramme, P.E., Vice President, Environmental Department, We Energies, Milwaukee, WI. Dr. Ramme has a BS, MS and PhD in engineering, and an EMBA, all from the University of Wisconsin in Milwaukee. He manages an environmental department of engineers and scientists with responsibility for all environmental aspects of the electric, gas and steam utility businesses. He has 35 years experience as a civil engineer and has published numerous technical reports, papers, and a handbook on coal combustion products utilization. Dr. Ramme has obtained nine U.S. patents and has two others pending. He is a fellow of the American Concrete Institute, and member of the American Society of Civil Engineers, and National Society of Professional Engineers. He is a member of ACI Committees 213, Lightweight Aggregate and Concrete; 229, Controlled Low Strength Materials, 230, Soil Cement, and 232, Fly Ash and Natural Pozzolans.

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Production and Use of “Green” – CLSM for Sustainability

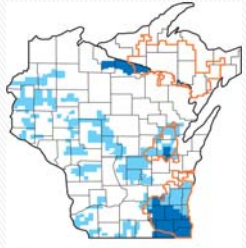
Bruce W. Ramme
 Vice President Environmental
 We Energies

October 19, 2011
 ACI Committee 229 - Fall Convention Session
 “CLSM From Practice to Theory”
 Cincinnati, Ohio

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We Energies Electric and Gas Utilities

- Largest electric and gas company in Wisconsin
- 1.1 million electric customers
- 1.0 million natural gas customers
- 450 steam customers



■ Wisconsin Electric Gas Service Area
■ Wisconsin Electric Electric Service Area
■ Wisconsin Gas Service Area


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“Green” - CLSM



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Sustainable Progress and Change



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ACI Terminology

controlled low-strength material (CLSM) — self consolidating cementitious mixture that is intended to result in a compressive strength of 1200 psi (8.3 MPa) or less.


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Technical Notes

3.2.2.1.3 Technical notes (TechNotes)
TechNotes are narrowly focused, single-topic guides, usually practice oriented. A TechNote presents specific direction on a particular issue, and may contain pictures, figures, and numeric examples. TechNotes can cover topics such as design, construction, or repair methods, or can provide recommendations on a concrete technology. Tech-Note language shall be nonmandatory.

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Materials



The Three R's:

- Reduce
- Reuse
- Recycle

Aggregates:

- Crushed Concrete
- Foundry Sand
- Glass Cullet
- Non-Standard

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Sustainability

The essence of sustainability is to make complete and efficient use of the natural resources that we tap today while conserving energy and natural resources to the maximum extent possible for future generations.

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100% Recycled Content (Dry Basis)



Composition:

- Gypsum
- Slag
- Water

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Environmental Considerations

- Regulatory Compliance
- Bulk Chemistry
- Leachability
- Compatibility with Utilities, Structures, etc.
 - Plastics
 - Metals
 - Other Materials
- Physical Properties

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STRENGTH



RESULTS


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Flowable, Self Leveling & Compacting




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Weather, Water and Undermining



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Underground Mine Subsidence



CHAPIN MINE, IRON MOUNTAIN

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Bridge Replacement in Iowa



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Fluffy vs. Not So Fluffy

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Benefits of Air

- Conservation of Raw Materials
- Transportation (air addition on-site)
- Insulating Properties
 - Water Mains
 - Energy Conservation
- Ease of Removal
- Lower Density

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Geotechnical Applications

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Thermally Conductive CLSM

➤

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Electrically Conductive CLSM

Lightning does an estimated \$4 billion in damages in the U.S. each year, much of which is due to poorly grounded equipment and facilities

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Construction Cautions

- Liquids exert hydrostatic pressure
- Consider adjacent structures' capacity
- Place in lifts if necessary
- Quick sand hazard until set in deep fills
- Protect construction site from accidental entry
- TOO STRONG for later excavation

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Construction Cautions

- Liquids will splash and spill
- Transport stiff and add water at site
- Segregation for long flow distances with coarse aggregate components
- Is a coarse aggregate really needed?
- Pipes, tanks, and cables will float

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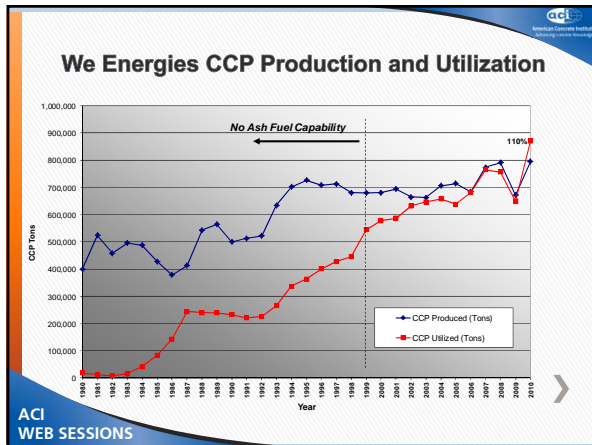
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Sustainable Conclusions

- Conservation of Materials
 - Low Strength for Excavatability
- Construction Efficiency and Safety
 - Transportation
 - Rate of Placement
- Energy Efficiency
 - Insulating Properties
- Long Life without Rework
 - No Settlement
 - Thermal Dissipation
 - Lightning Path to Ground

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Thank You – Questions ?

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Edward "Ned" Glysson handles the Director of Research and Operations duties for Elastizell Corporation of America in their Dexter, Michigan Research Facility. Ned is a past Chair of ACI Committee 523, Cellular Concrete, and has been working with that material for 39 years. He is also a member of ACI Committee 229, Controlled Low-Strength Materials. His educational background is in biochemistry, as he received his Bachelor of Science degree from the University of Wisconsin-Madison. In his spare time he is the Associate Head Coach of the University of Michigan's Women's ACHA Ice Hockey team and is enjoying his new role as a grandfather of two under two!

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ACI Committee 229
CLSM from Practice to Theory
Low Density - Controlled Low Strength Material...
How Practice Lead to Theory

Wednesday, October 19,
9am – 12:00pm
C-Junior A

ACI Fall Convention, Cincinnati, OH
presented by
Ned Glysson – Director of Research & Operations
Elastizell Corporation of America

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What is Low Density – Controlled Low Strength Material (LD-CLSM)?

For this presentation LD < 50 pcf and CLSM = cellular concrete utilizing preformed foam (air), water, cement and/or other pozzolans.

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Preformed Foam Generating



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Batching




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Placement



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Historical cellular concrete uses included lightweight floor fills and low slope roof decks.




~ 100 pcf ~ 40 pcf

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- Reduced loads require less structural capacity.
- Improved sound and thermal insulative properties.
- Excellent fire rating.
- Ease of handling and installation.

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How Practice Lead to Theory



Johann Wolfgang von Goethe the German scientist and writer wrote, "Unless one is committed, there is hesitancy, the chance to draw back, always ineffectiveness. The moment one definitely commits oneself, then Providence moves too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, raising in one's favor all manner of unforeseen incidents and meetings and material assistance which no man could have dreamt would come his way. Boldness has genius, power and magic in it."

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In other words consider:


**THINKING OUT OF THE BOX
TAKING CALCULATED RISKS
DARING TO BE DIFFERENT
USING ONE'S IMAGINATION**

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Based upon a need to improve poor soil stability and for a low density fill, LD-CLSM was developed and placed beginning in the early 1970's. From that innovation and early practice, theories, specifications and new design applications were born and continue to flourish today.



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US250 New Philadelphia, OH
331 cubic yards



LTV Steel Cleveland, OH
7500 cubic yards




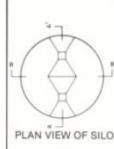
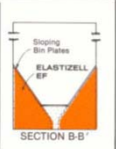


Bridging culverts and road widening compensating for poor soils. Yesterday's trials and practice lead to today's theory and massive applications.

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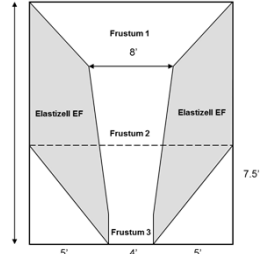

Coal silo fill Oak Creek, CO 1980

Practice was to reduce lateral pressure on sloped steel plates with LD-CLSM and save lives.

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A2 Lime Silos

Ann Arbor, MI water treatment plant lime silo fill

03/22/2011

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One of the biggest advancements from early practice to later practice and theory was job size.

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St. Clair MI bridge approach
1976
2500 cubic yards

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I-94 @ 7th & Lyndale, Minneapolis, MN
1981
40,000 cubic yards

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Mechanically Stabilized Earth (MSE) Applications



MN Hwy 55 Golden Valley, MN
1985

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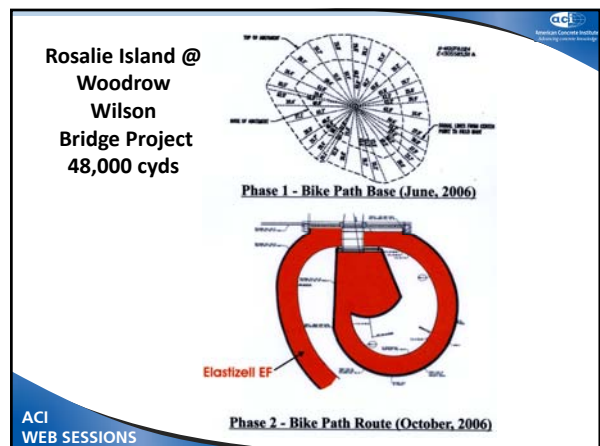
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Golden Valley Project



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Golden Valley Project





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Rosalie Island Project



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Rosalie Island Project



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Rosalie Island Project

Conventional Pervious Concrete

Pervious Cellular Concrete

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Demo conventional pervious concrete with pervious cellular sub base
Jacksonville, FL
2010

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Rainbow Dam Great Falls, MT Powerhouse Wall Fill
May 2011, 3060 cyds

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In conclusion,
THINKING OUT OF THE BOX
TAKING CALCULATED RISKS
DARING TO BE DIFFERENT
USING ONE'S IMAGINATION
 has been a beneficial policy and one that should be continued
DO NOT ALLOW OUR LITIGIOUS SOCIETY
TO STIFLE IMAGINATIVE DESIGN

LET PRACTICE LEAD TO THEORY

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Related Documents

CONTROLLED LOW-STRENGTH MATERIALS

- [229R-99](#), "Controlled Low-Strength Materials"
- [SP-150](#), "Controlled Low-Strength Materials"
- [523.1R-06](#), "Guide for Cast-in-Place Low Density Cellular Concrete"
- [ACI eLearning course](#): "Controlled Low-Strength Materials (CLSM) Fundamentals"

SUSTAINABILITY

- [ACI eLearning course](#): "Concrete Sustainability: Basics" and "Concrete Sustainability: Incorporating Environmental, Social, and Economic Aspects"

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