ACI Sustainability Initiatives

A World of Opportunity

Florian Barth

NRMCA Concrete Sustainability Conference
Technical Session 4
Concrete Industry Sustainability Initiatives

Tempe, AZ -- April 13-15, 2010
Concrete and Sustainability

1. ACI’s Role in Sustainability
2. Opportunity for cooperation – the “Joint Sustainability Initiative” (JSI)
3. Current and future ACI activities related to sustainability
4. Thoughts on the future
ACI’s Sustainability Activities

• TG- Sustainable Development (2000)
• BAC – Sustainable Development (2004)
• ACI Board of Direction policy statement on sustainable development (adopted April 21, 2005)
• SDC’s Concrete Summit on Sustainable Development (March 2007)
SDC - Concrete Sustainability

• Three year anniversary next month of SDC hosting Concrete Summit on Sustainable Development in Washington DC
• Goal: an Industry Vision and Roadmap
  • Common Voice
  • Setting of Targets
  • Monitoring Progress
But then, in June 2008, a lack of consensus from the Concrete and Masonry-Related Associations (CAMRA)…..

- **No consensus** on what the message should be
- **Divergent views** on the wisdom of targets
Since then industry segments and individual organizations began independently:

- forging ahead using the outline and work of the SDC
- examining targets within their industry segments
ACI’s Role in Sustainability

ACI Board & Executive Committee (2008)

- ACI Strategic Plan (developed 2008)
- ACI Leadership commitment (Pres. Obj)
Goal #2: Sustainability

ACI will lead efforts that position concrete as sustainable and environmentally friendly.

Approved April 3, 2008
ACI Board of Direction
Goal #2: Objectives

- Expand understanding of the sustainability issue among membership.
- Expand resources to support sustainability issues.
- Increase the content on sustainability in ACI documents and products.
- Improve the perception of concrete relative to sustainability.
ACI’s Role in Sustainability

ACI “call for action” of resources (TAC, EAC, CPC, BACSD, etc.)

Review all current technical and education documents

Involve the industry, public and ACI members.

Collaboration with industry associations and participating in key “green” Organizations
ACI Fall 2008 Convention
— St. Louis —

• ISO TC 71 - SC8 Workshop
• BAC-Sustainable Development
• Technical Chairs Breakfast discussed importance
• Formation of ACI Committee 130
• Forum and other presentations
• Exec Committee – TAC – EAC – CPC Call for Action
• Pre-Board Planning Session
• TAC launched Technical Committee survey
ACI Spring 2009 Convention – San Antonio –

- Hosted USGBC - LEED NC Course
- BAC – Sustainable Development
- TAC Chair Breakfast Sustainability Presentation
- ACI Committee 130 (first meeting - sub-committees)
- Three Technical Sessions
- Gail Vittori (USGBC Chair) / Pliny Fisk at Board Planning Meeting
- ACI 318-A Sustainability change submittal
- Formation of JSI
ACI Fall 2009 Convention
– New Orleans –

- ACI 130 with 7 new subcommittees
- Formation of BIM Committee 130
- Sustainability Forum (sponsored by 130)
- Second ISO TC 71 SC8 – ACI Technical Committee workshop – (joint workshop)
- Committee 801 approving Sustainability Student Competition
- TAC document review includes sustainability
- ACI provides input to JSI (technical)
ACI Spring 2010 Convention – Chicago –

- ACI Committee 130 – third largest ACI Committee with 7 new Sub-committees.
- First Sustainability Student Competition (Pervious Concrete) with two Awards. Student Competition was Sponsored by ACI, CMPBS and USGBC.
- Launching “Sustainable Concrete Guide” Book
- TAC document review includes sustainability
- Technical Session by Committee 130
- Successful meeting of Committee 131 BIM
For the upcoming Fall 2010 ACI Convention expect

- Student competitions with sustainability component
  - Again possibly co-sponsored with the “Center for Maximum Potential Building Systems” and USGBC

- Launch second Sustainability publication “The Sustainable Concrete Guide – Applications”

- Five Technical Sessions by Committee 130
  - Sustainable Design with Concrete, Part I; Sustainable Design with Concrete, Part II; Green Binders Technology; A Sustainability of Concrete Pavement; Design of Sustainable Concrete Bridges.
ACI and Sustainability

• Strategic Plan
• Commitment of ACI Leadership
  – Board and Executive Committee involvement
  – TAC, EAC, and CPC involvement
• Enthusiasm of ACI membership

ACI is on the way

Sustainability and ACI
The Concrete Industry’s Vision for a Sustainable Future
Joint Sustainability Initiative (JSI)

Opportunity for cooperation –

• Volunteer leadership of ACI / NRMCA and PCA
• led the way (January 2009)
• 2/17/09 – ACI  NRMCA  PCA  developed MOU
• March – all Boards approved the MOU
• 4/08/09 – ACI  NRMCA  PCA signs MOU
Joint Sustainability Initiative (JSI)

Other interested associations invited to participate

- 5/11/09 – CRSI NCMA NPCA PCI participate
- 5/27/09 – CAMRA members briefed
- 6/16/09 – meeting in Washington DC
Concrete Joint Sustainability Initiative

www.sustainableconcrete.org

• Currently involves 26 of the almost 3 dozen concrete and masonry-related associations

• **Common** interest and vision – CONCRETE STRUCTURE

• **Common** identity and message

• Pool Resources

• 4 Meeting/Year in person
In sustainability we’re all on the same boat

• The image of any one industry segment cannot stay higher than that of the industry as a whole

• The image of any one company cannot stay higher than that of its industry segment
ONE Sustainable Face to the World

Sum of the Supply Chain Segments
Rock + Cement + Cementitious + Additives + Production + A&E + Construction + Maintenance

= Concrete Structures
All vertical & horizontal applications and concrete products

Sustainability and ACI
Reframe the issue

From:

$CO_2$ footprint of cement

To:

Lifecycle eco-footprint of concrete structures
Joint declaration of industry vision for a sustainable future

- The charter document
- Contains 9 declarations
- Lists 8 social values of concrete structures
Declaration #1:
“Concrete structures are the core of our industry identity that include all vertical and horizontal applications and concrete products”

• Move away from thinking and acting as fragmented segments
• Concrete structures are the visible end-result of our industry supply chain
Declaration #4:
“Our integrated thinking will focus on the following social values provided by concrete structures”

1. Resource efficiency
2. Safety/protection
3. Financial responsibility
4. Operational continuity
5. Longevity/durability
6. Byproducts reduction
7. Esthetics
8. Societal connectivity
8 social values of concrete structures

• These are the real reason we exist as an Industry
• Our future prosperity depends on delivering, enhancing and communicating these social values
Current Joint Sustainability Initiative actions

- Develop and deliver alignment/call-to-action **presentations** for within our Industry
- Association collaboration to **compile and unify industry sustainability messages**
- Compile/organize supporting facts for **matrix to measure sustainability efforts**
- **International Outreach** - “Alliance Organization” (sustainableconcrete.org.uk/nz)
  - UK concrete industry agrees to sustainability targets and 2\(^{nd}\) performance report last week.
  - Thermal Mass Calculator at the concrecentre.com website
Developing two Books
US Green Concrete Council (USGCC)

Part of “Creative Association Management”
(a for-profit subsidiary of ACI)

• The “green” movement is moving rapidly
• Need for rapid dissemination of concrete sustainability information
• Goal is two books on sustainability
  – Targeted for Spring and Fall of 2010
“The Sustainable Concrete Guide”

Introduction to Sustainability

The introduction clearly outlines and quantifies the total CO2 release during concrete structures by product production.
ENERGY: Sustainability of Concrete

The thermal mass properties of concrete, when applied effectively, are second to none among structural framing materials.

As a building material, concrete functions similar to a solar panel: it acts as a “solar collector” and temporary “storage facility” at the same time.
LIFE CYCLE: Sustainability of Concrete

Concrete is unchallenged for it’s **longevity** and **durability** characteristics.

A composite of cement, sand, pebbles and water, concrete is the oldest manmade building material. The Romans used it as early as 509 B.C. They built extensively and impressively during the Roman Republic era. The ruins that people flock to see -- the Pantheon, the Coliseum, Pompeii -- were built of, and stand in testament to the durability of, concrete.
Stormwater Management

Using pervious concrete as the solution for reducing water leaving the site.

5 gal/sf/min

20 to 35% voids
Example: A change in slab soffit can **improve light reflection** and it’s **thermal mass** can bridge short term temperature delta radiation behavior. In addition, the selected shape can **reduce sound reflection** off hard surfaces; this shaped soffit serves as **finished room**, eliminating dropped ceiling grid and panels.
Practice Innovative Resource Conservation

Design and construct with the innovative use of construction materials as catalyst for “greener” project performance. (This will guide in finding multiple functions/use for a single building element).

Example: a concrete wall can function as structural framing element, finish wall surface, architectural feature, no paint (or paint maintenance), energy storage element (thermo mass), fire separation (between diff. occupancies), moister separator etc.
Social Value: Resource Efficiency

- **Indoor Environmental Quality**
  - Improved indoor air quality through reduction of floor and wall finishes (eliminate volatile organic compounds)
  - Concrete *improves thermal comfort* via thermal mass
  - Reduced sound transmission and vibrations
  - Concrete reduces the potential for *mold growth* (no organic source for mold).
Local Investment in Community

The concrete industry creates local jobs

• In 2005, cement industry employed 16,877 workers.

• Translates to 1+ million direct and indirect jobs.

Source: www.cement.org\econ\industry
Safety and Security

Tornados, fire, hurricanes, blast and impact are just a few of the natural or man made events that concrete structures can withstand.

Sustainability and ACI
Compatibility with other innovative sustainable strategies

Some of the qualities that make concrete an easy choice as a compatible material include:

- The ability to mold to any shape;
- The flexibility to cast on or off-site;
- The low cost per unit volume;
- Resistance to aggressive environments;
- High stiffness;
- High thermal mass; and
- Light color

- Can be finished surface.
Strategies to reduce the carbon footprint of concrete in place

- Reduce cement content
- Replace cement with SCMs
- Reduce the total amount of concrete (and therefore the amount of cementitious material)
REDUCE the carbon footprint

<table>
<thead>
<tr>
<th></th>
<th>4000 psi (28 MPa) concrete</th>
<th>9000 psi (62 MPa) concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cementitious materials, lb/yd$^3$ (kg/m$^3$)</td>
<td>550 (330)</td>
<td>865 (510)</td>
</tr>
<tr>
<td>Supplementary cementitious materials, lb/yd$^3$ (kg/m$^3$)</td>
<td>110 (65)</td>
<td>40 (24)</td>
</tr>
<tr>
<td></td>
<td>fly ash</td>
<td>silica fume</td>
</tr>
<tr>
<td>Portland cement, lb/yd$^3$ (kg/m$^3$)</td>
<td>440 (260)</td>
<td>825 (490)</td>
</tr>
<tr>
<td>Column dimensions, in. (mm)</td>
<td>36 x 36 (910 x 910)</td>
<td>24 x 24 (610 x 610)</td>
</tr>
<tr>
<td>Concrete per column (15 ft height [4.6 m]), yd$^3$ (m$^3$)</td>
<td>5.0 (3.8)</td>
<td>2.2 (1.7)</td>
</tr>
<tr>
<td>Volume aggregate reduction</td>
<td></td>
<td>55%</td>
</tr>
<tr>
<td>Portland cement per column, lb (kg)</td>
<td>2200 (1000)</td>
<td>1800 (820)</td>
</tr>
<tr>
<td>Volume of cement reduction</td>
<td></td>
<td>18%</td>
</tr>
</tbody>
</table>

A designer may utilize high strength concrete to reduce the size of concrete column, and therefore the amount of concrete and cement.
Thoughts on the future

• A lot has happened in one year
• The concrete industry makes a landmark change towards a unified front as it relates to sustainable concrete.
• We are lucky to work with a product that has unparalleled sustainability characteristics
We can’t through things away!

Because there is no “away”!!

THANK YOU