




American Concrete Institute®  
Advancing concrete knowledge

## Shrinkage-Compensating Concrete—Past, Present, and Future, Part 2

ACI Fall 2012 Convention  
October 21 – 24, Toronto, ON

ACI  
WEB SESSIONS

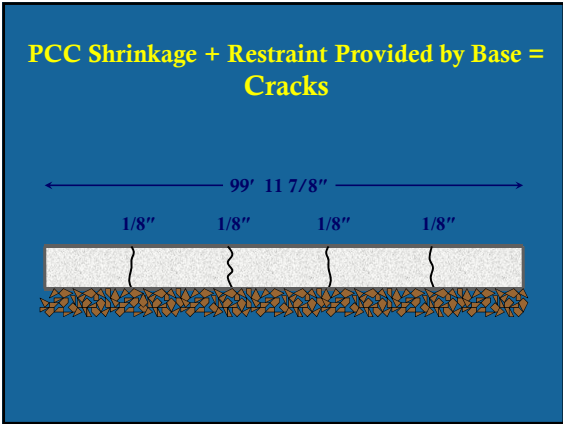
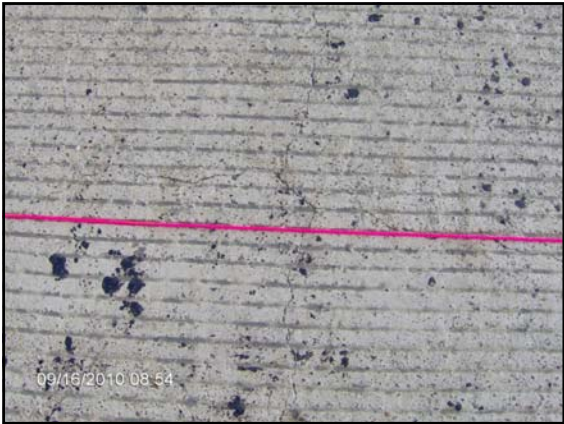


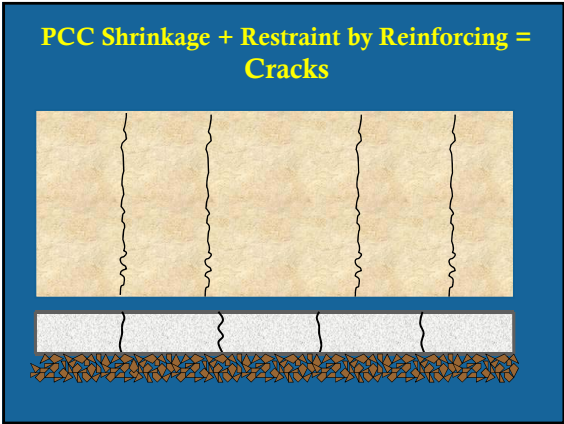
**Edwin (Ed) A. McLean** Civil Engineer Bradley University Peoria, IL 1979  
“Certified Concrete Technologist” 1982. Southern Illinois Native Raised in family owned limestone quarry business having learned production, quality control and customer service, sold company in 1982. Started concrete pump company in 1984. In 1985 purchased control interest in 5 ready mix concrete plants with 55 truck mixers, sold these business ventures in 1989. Western Sales Engineer for Lone Star Cement developing/promoting blended cement technology and assisting the sales staff. January 2004 General Manager for three profit centers including concrete production, concrete block production and building material resale in central Illinois. 1999 SI Concrete (Fibermesh): Western Regional Support Engineer - Mississippi River West and Western Canada. Provided SFRC design suggestions for SOG construction and championed the two steel/polypropylene blended fiber systems that have ICBO (ICC) and Steel Deck Institute certifications. 2004 CTS Cement Manufacturing – Central US - Director of Engineer Sales promoting solutions using pure hydraulic CSA cement and Type K expansive cement. Championed Rapid Set LowP Cement for structural wearing surface overlays and structural repairs. Assisting in various research projects and University of Oklahoma efforts in developing current stress/strain information in mass shrinkage compensating concrete. McLean Consulting – various concrete construction projects over 30 years.



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### Extending Joint Spacing With Shrinkage-Compensating Concrete

*Ed McLean*  
Director of Engineer Sales  
Central USA

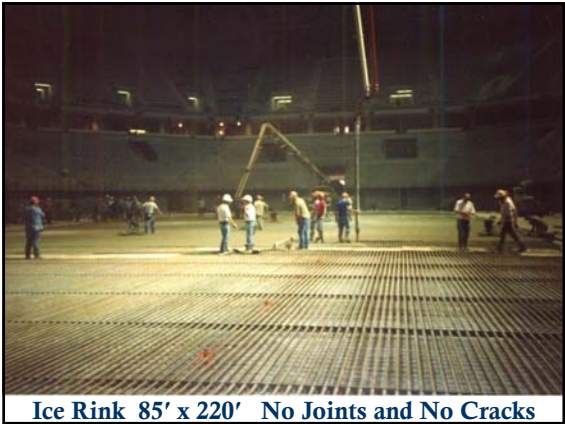
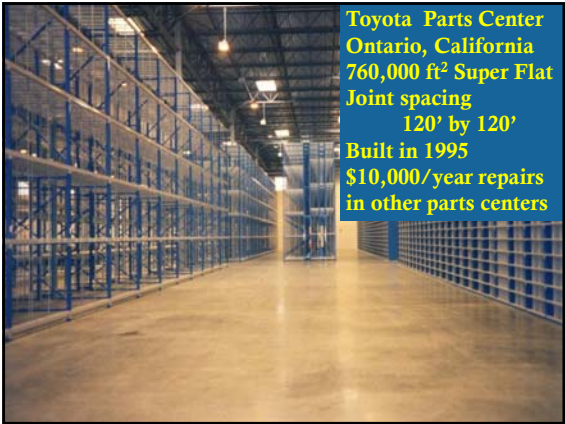


**ASTM C-845 Type K Cement**  

**Standard Specification for Expansive Hydraulic Cement**

“Induces both compressive stress in the concrete and positive steel strain that approximately off-sets tensile stresses and negative strains induced by drying shrinkage”

- ◆ Increase joint spacing – L/W ratio can be extended – 20,000 to 30,000 sf
- ◆ Adjust for high shrinkage aggregates





**2 Typical Floors**  
 210' by 240' = 50,400ft<sup>2</sup> Each

CTS CEMENT KSC

**2 Typical Floors** 210' by 240' 50,400ft<sup>2</sup>

#1 #2

Portland Concrete  
 6270 lf of joints

**Compare:** 210' by 240' 50,400ft<sup>2</sup>

#1

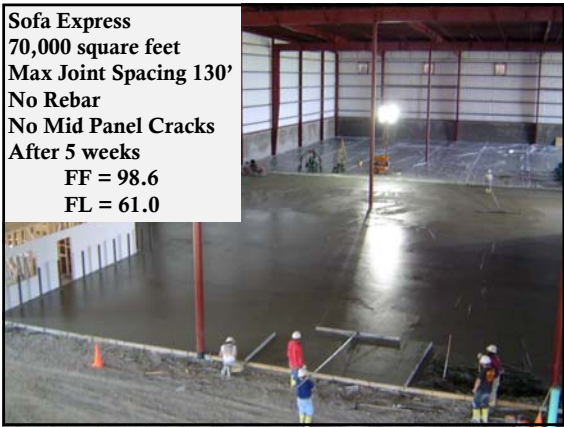
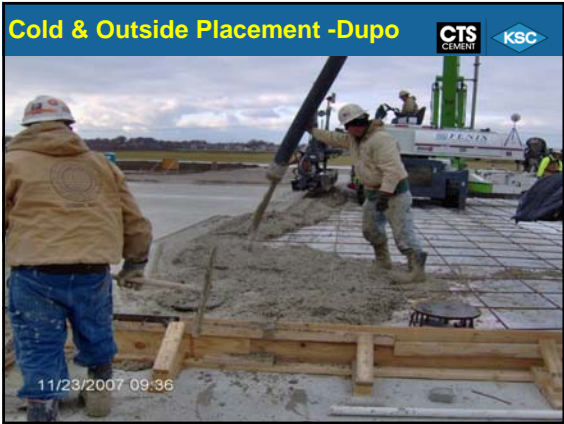
Typical 1 day pour  
 25,200 ft<sup>2</sup>

#2

SAVES OVER A MILE OF JOINTS

Portland Concrete 6270 lf of joints      Type K Concrete 210 lf of Joints





**ASTM C-845 Type K Cement** CTS CEMENT KSC

- ◆ Typical mix designs can incorporate fly ash, Slag Cement, water reducer, superplastizer (when needed), retarders and air entrainment
- ◆ .44 w/c Ratio (6" slump) – high water demand (.42 to .55 w/c ratio allowable)
- ◆ 418 lb Type I, 90 lb Komponent, 57 lb C Fly Ash – 4000 psi in 7 days
- ◆ Easy control of air, production slump and slump loss in transit





**Long and Narrow Elevated Slabs** CTS CEMENT KSC

- ◆ Shrinkage Compensating Concrete – Type K Komponent Concrete can address the long and narrow length to width ratio type construction without cracking – again 600 plus bridges as proof
- ◆ Structural Slabs – Elevated Decks
- ◆ No Special Structural Re-design Using Shrinkage Compensating Concrete







**Containment** CTS CEMENT KSC

- ◆ Shrinkage Compensating Concrete – Type K Komponent Concrete can address the long and narrow length to width ratio type construction without cracking
- ◆ Long wall sections between joints
  - ◆ 100' to 125' long
  - ◆ less joints in slabs
- ◆ NO LEAKS

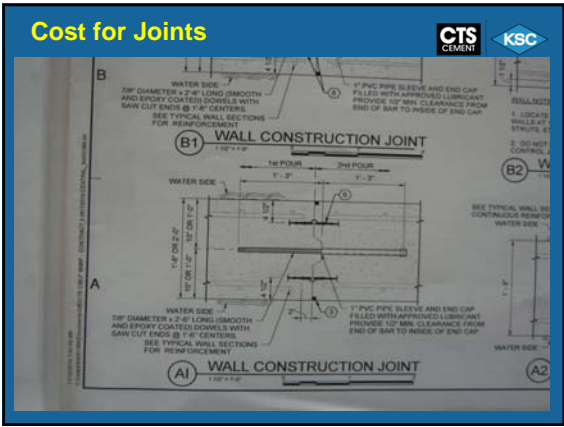
**1970**  
 Water treatment plant at Midland, Texas with below grade clearwells 320 ft. by 130 ft. has a storage capacity of 4.5 million gallons. Water stop locations at 110 ft. intervals—a 60% joint reduction from normal practice.

OWNER: City of Midland, Texas  
 ENGINEER: Freese, Nichols & Endress, Ft. Worth, Texas  
 STRUCTURAL CONSULTANTS: Splawn & Munir, Dallas, Texas  
 CONTRACTOR: Butler Construction Co., Salt Lake City, Utah









**Research – University of Oklahoma**

- ◆ Shrinkage Compensating Concrete produced using Type K (Komponent) Cement
  - ◆ is extremely stable, with
  - ◆ little to no long term shrinkage, cracking or warping
  - ◆ stability both in early age and at 15 months
- ◆ Shrinkage Reducing Admixtures have:
  - ◆ minor impact at early age but
  - ◆ do not impact long term sectional stability
  - ◆ shrinkage, cracking and warping nearly same as PCC control sections and
  - ◆ slightly better than HPC

CTS CEMENT KSC

**Cost Reduction with SCC**

CTS  
CEMENT

KSC

- ◆ Lower Unit Costs and Less Work Days
  - ◆ Larger pour/placement sizes
  - ◆ Gang forming
  - ◆ Reduced equipment hours
  - ◆ No checkerboard sequencing
  - ◆ Backfilling sooner
  - ◆ Continuous Rebar Through Joints
- ◆ Eliminates need for crack repairs
- ◆ Subcontractors gain earlier access to areas
- ◆ Project safety costs reduced

