



Concrete Cracking Workshop
August 18 & 19, 2005
Northwestern University, Evanston, IL

Crack Control in Concrete Bridges

Presented By
M. Myint Lwin, Director
FHWA Office of Bridge Technology

Crack-free Structures



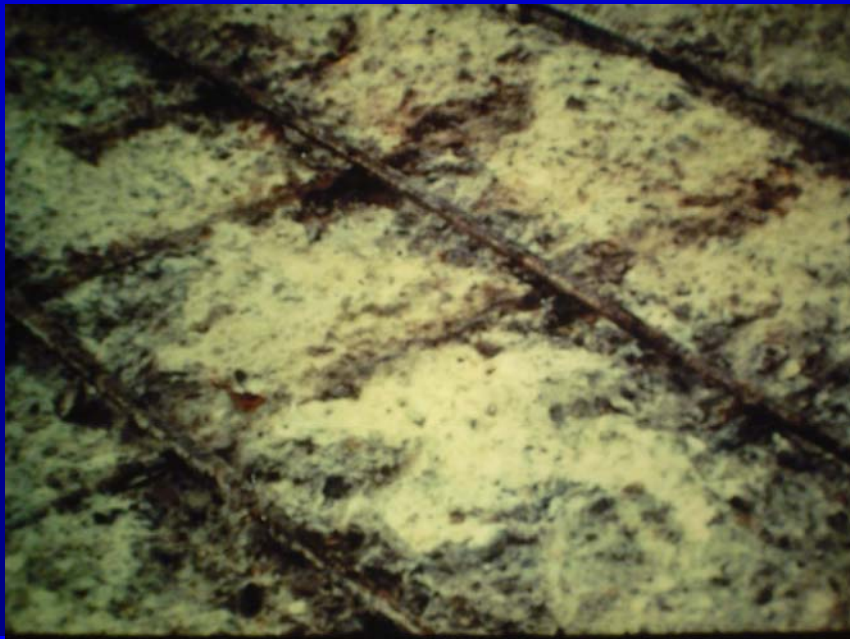






Concrete Cracking





Concrete Repair



What Cause Cracking

➡ **Materials?**

➡ **Structural/Architectural Design?**

➡ **Construction Practices?**

Constituent Materials of Concrete

☞ **Cement**

- Fly Ash
- Silica Fume
- Slag

☞ **Fine and Coarse Aggregates**

☞ **Admixtures**

☞ **Corrosion Inhibitors**



Constituent Materials of Concrete (Contd)

- **Water-Cementitious Materials Ratios**
- **Permeability**
- **Compressive Strength**
- **Reinforcement**



Structural Design Practices

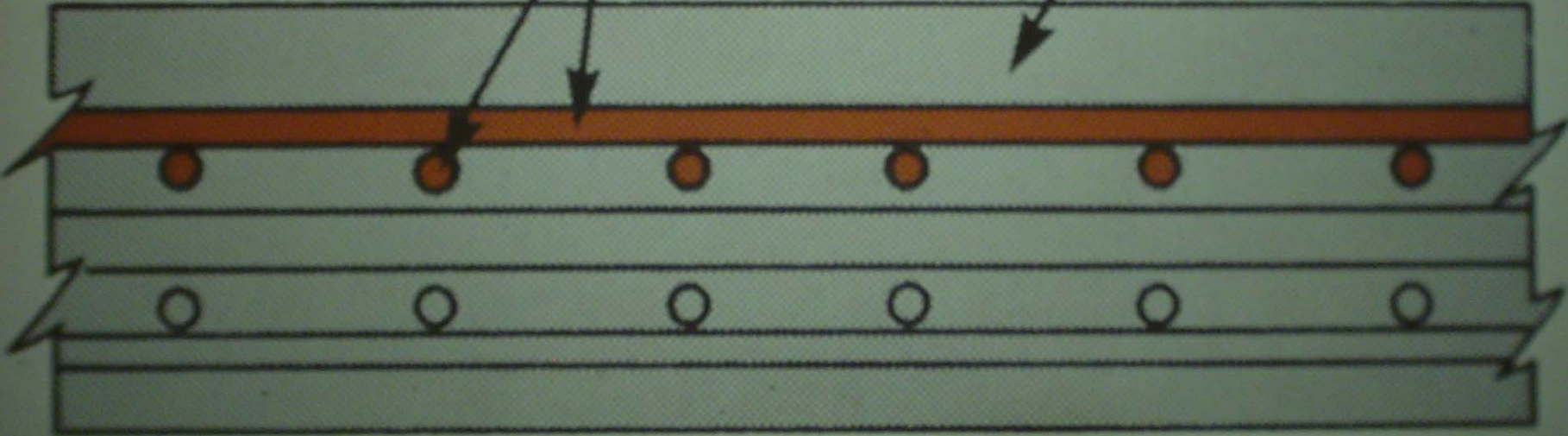
- **Stress intensity**
- **Member size**
- **Reinforcement details**
- **Cover to reinforcement**



New Bridge Decks

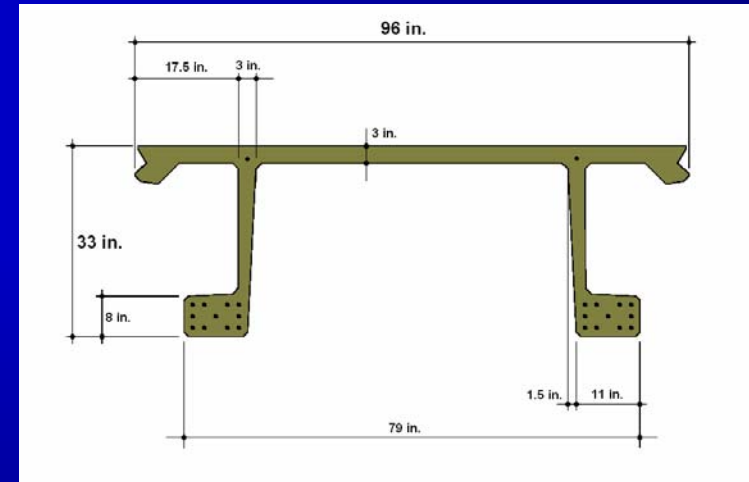
Epoxy Coated

2 1/2" Clear



Ultra High-Performance Concrete (UHPC)

☞ Cost = 10 times more!



☞ Challenge = Optimize Section; Minimize Structure



Construction Practices

- Concrete Temperature
- **Weather Conditions**
- Concrete Placement
 - Consolidation
- **Curing**



Crack Widths

	Reinforced Concrete		Prestressed Concrete	
	English (in.)	Metric (mm)	English (in.)	Metric (mm)
Hairline	< 1/16 < 0.0625	< 1.6	<0.004	< 0.1
Narrow	1/16 to 1/8 0.0625 – 0.125	1.6 to 3.2	0.004 to 0.009	0.1 to 0.23
Medium	1/8 to 3/16 0.125 – 0.1875	3.2 to 4.8	0.010 to 0.030	0.25 to 0.76
Wide	3/16 > 0.1875	> 4.8	> 0.030	> 0.76



Challenges

- **Eliminate Time-Dependent Factors**
- **Eliminate Corrosion**
- **Produce Self-Healing Concrete**
- **Improve tensile strength significantly.**
- **Develop effective crack sealing materials**
- **Develop crack control methods**





Closing Remark

- **Our lofty goal = crack-free concrete.**
- **Working together**
 - **Materials scientists/engineers**
 - **Structural engineers**
 - **Admixture suppliers**
 - **Contractors**
- **Integrating knowledge and skills, research, technologies and innovations**



Closing Remark

Let the ideas from this workshop:

Plant the seeds

For research that

Lights the way

To Crack Free Concrete!!!



Research Funds

☞ Research, Deployment and Education

- HPC = \$4.1M/Year
- LTBP = \$7.75M/Year
- IBRD = \$13.1M/Year
- UHPC Demo = \$0.625M/Year

☞ Exploratory Advanced Research = \$14.0M/Year

☞ Highway for Life

- \$15.0M/Year
- For Market-Ready Technology

