A Review of Joint Durability

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The problem?

- Some joints are deteriorating faster than we would like
Outline

• Mechanisms of Failure
• Why Now, What’s New?
• Current Recommendations
What Do We Know?

• Cold states
• Water
• Not all the same
Saturation of the Paste
Typical Symptoms

- Shadowing
- Thin flakes
- Clean aggregates
Saturation

- Damage occurs where the concrete does not dry out
Saturation

• Bottom Up Moisture
Saturation

• Tunneling – water trapped in saw-cut
Saturation

• Top-Down
Purdue Work

• Damage depends on degree of saturation
Salts can cause chemical attack

- Calcium oxychloride
- Friedel’s salt
- Ettringite

- Rates and amount are limited though
Incremental Cracking

• Not typical freezing and thawing
  ➢ No thin flakes
Other Causes

• Traffic - unlikely – stress is ~50psi
• Sawing - unlikely (Kevern)
Mechanisms Summary...

- Many things contribute
  - Water
  - Salts
  - Air void system
  - Chemical
  - Loading
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Questions

- Why now?
  - Salting / Brines
  - Marginal air in situ
  - Changing system chemistry
  - Lack of inspection
Questions

• Why in some joints
  • Batch variability
  • Drainage
  • Salt treatment
  • Hand placed
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So...

- The game has changed
  - Water has to be prevented from saturating the concrete
- Permeability of the concrete should be as low as practical
- The air void system in the in-place concrete must be adequate
Review

• Life is getting more complicated
  • Checklists may not be adequate
  • Think through the system
• Ensure you get what you pay for
  • Specifications
  • QA