

# A Review of Joint Durability

National Concrete Pavement  
Technology Center



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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

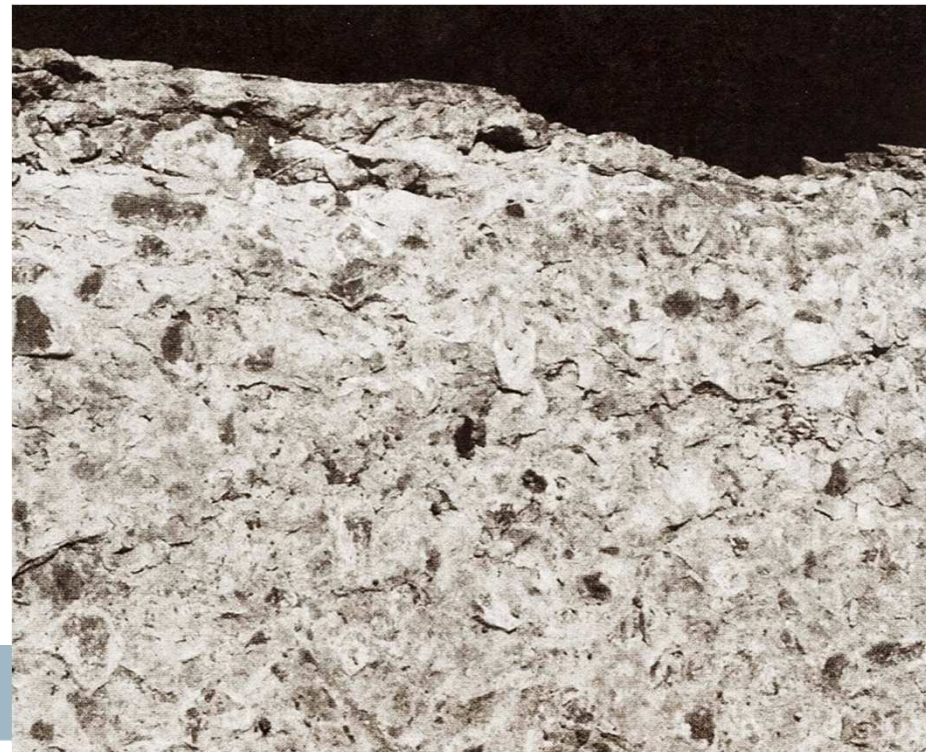


# Saturation of the Paste



# Typical Symptoms

- Shadowing
- Thin flakes
- Clean aggregates



# Saturation

- Damage occurs where the concrete does not dry out



# Saturation

- Bottom Up Moisture



Daugherty



# Saturation

- Tunneling – water trapped in saw-cut



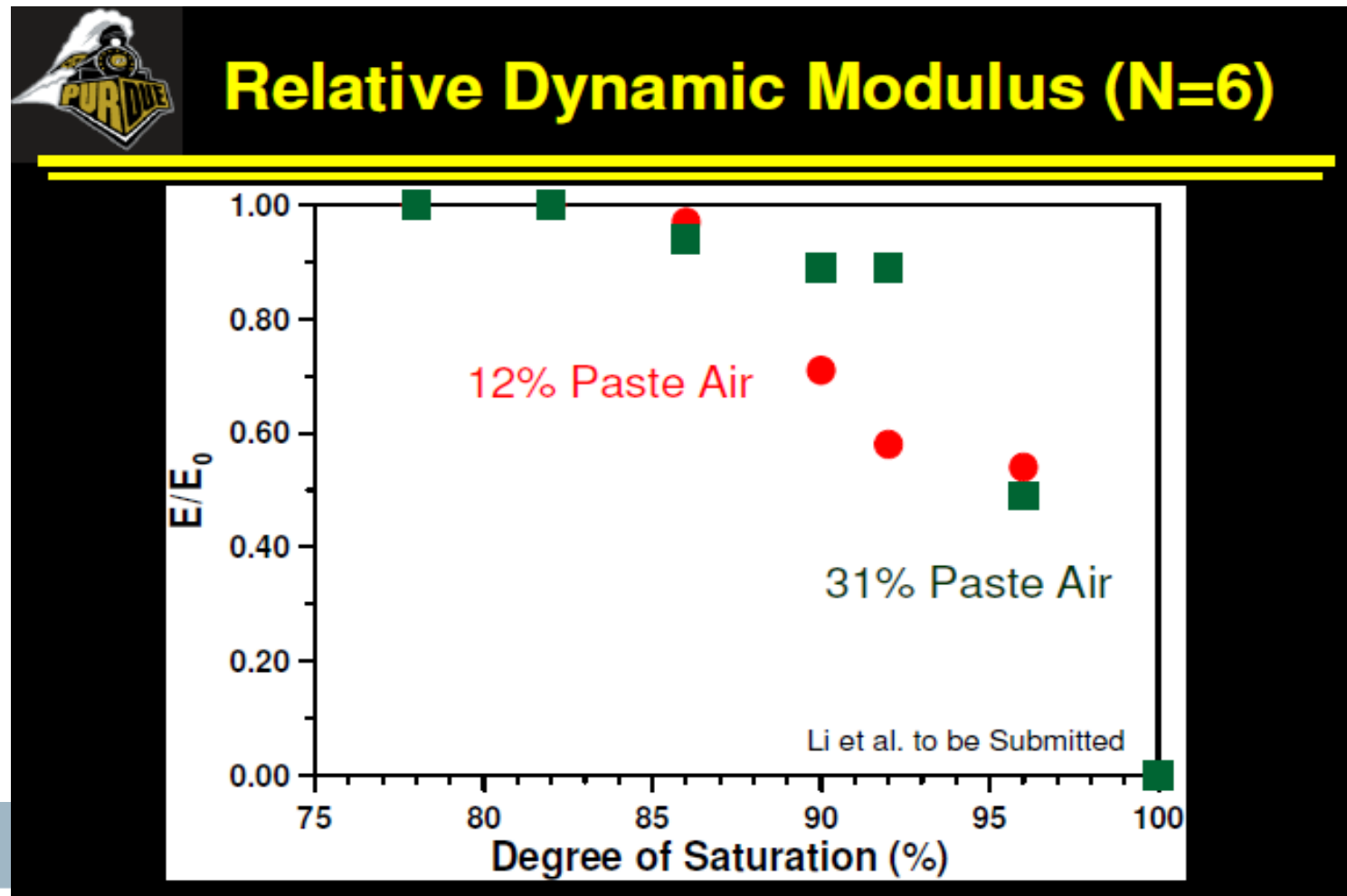
# Saturation

- Top-Down



# Purdue Work

- Damage depends on degree of saturation



12:0508 AM



MgCl<sub>2</sub>

4:0027 AM



MgCl<sub>2</sub>

# Salts can cause chemical attack

- Calcium oxychloride
- Friedel's salt
- Ettringite
  
- Rates and amount are limited though



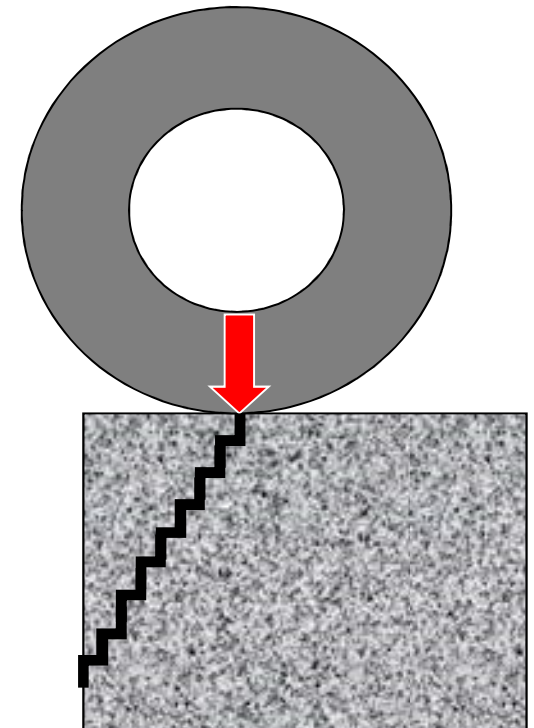
# Incremental Cracking

- Not typical freezing and thawing
  - No thin flakes



## Other Causes

- Traffic - unlikely – stress is  $\sim 50\text{psi}$
- Sawing - unlikely (Kevern)



# Mechanisms Summary...

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





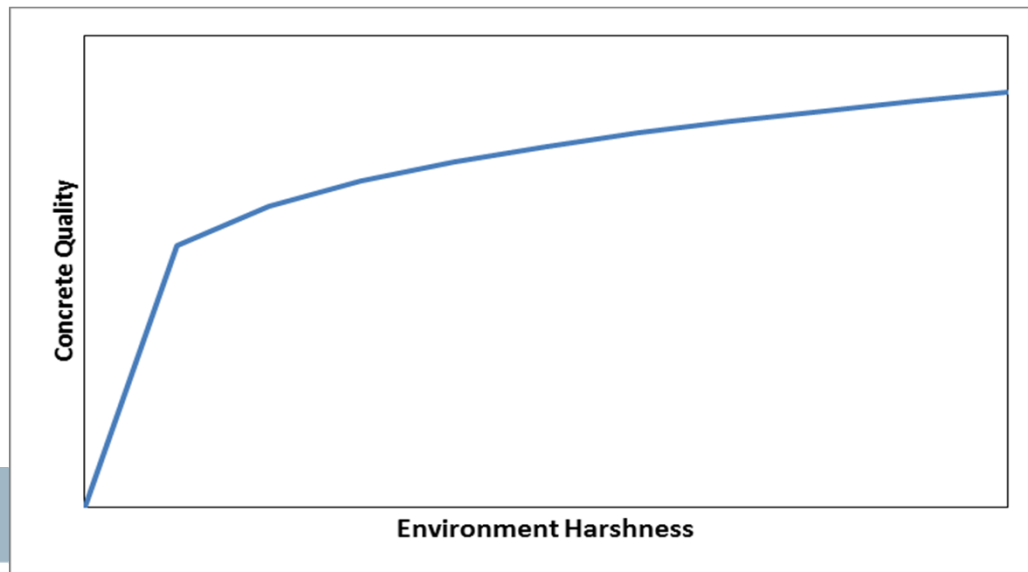
# Outline

- Mechanisms of Failure
- **Why Now, What's New?**
- Current Recommendations



# 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



# Outline

- Mechanisms of Failure
- Why Now, What's New?
- **Current Recommendations**

## 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

