



A Day Of  
CONCRETE  
**knowledge**

## Practical Guide to Pervious Concrete

Thursday, September 27, 2018  
Redstone Federal Credit Union Atrium  
220 Wynn Drive NW  
Huntsville, AL

**Alabama Concrete Industries Association**



# ProCure

a division of Advanced Chemical Technology

**Dale Fisher**

**CEO, ProCure**

**@dalefisher\_pro**

**dfisher@procureusa.com**

A gravel driveway leads to a stone house with a wooden garage door. The driveway is made of light-colored gravel and is bordered by concrete on the left and large, flat stones on the right. The house in the background has a stone facade, a wooden garage door, and a window with a black frame. A green lattice fence is visible in the background on the left.

A beautiful tool for stormwater control.



This is not pervious concrete.







SCHWING  
Sioux Falls

16282

Wheelco  
TRUCK & TRAILER PARTS  
SIOUX FALLS  
MITCHELL  
WATER TOWN  
ST. CLOUD





STOP

CK 41649











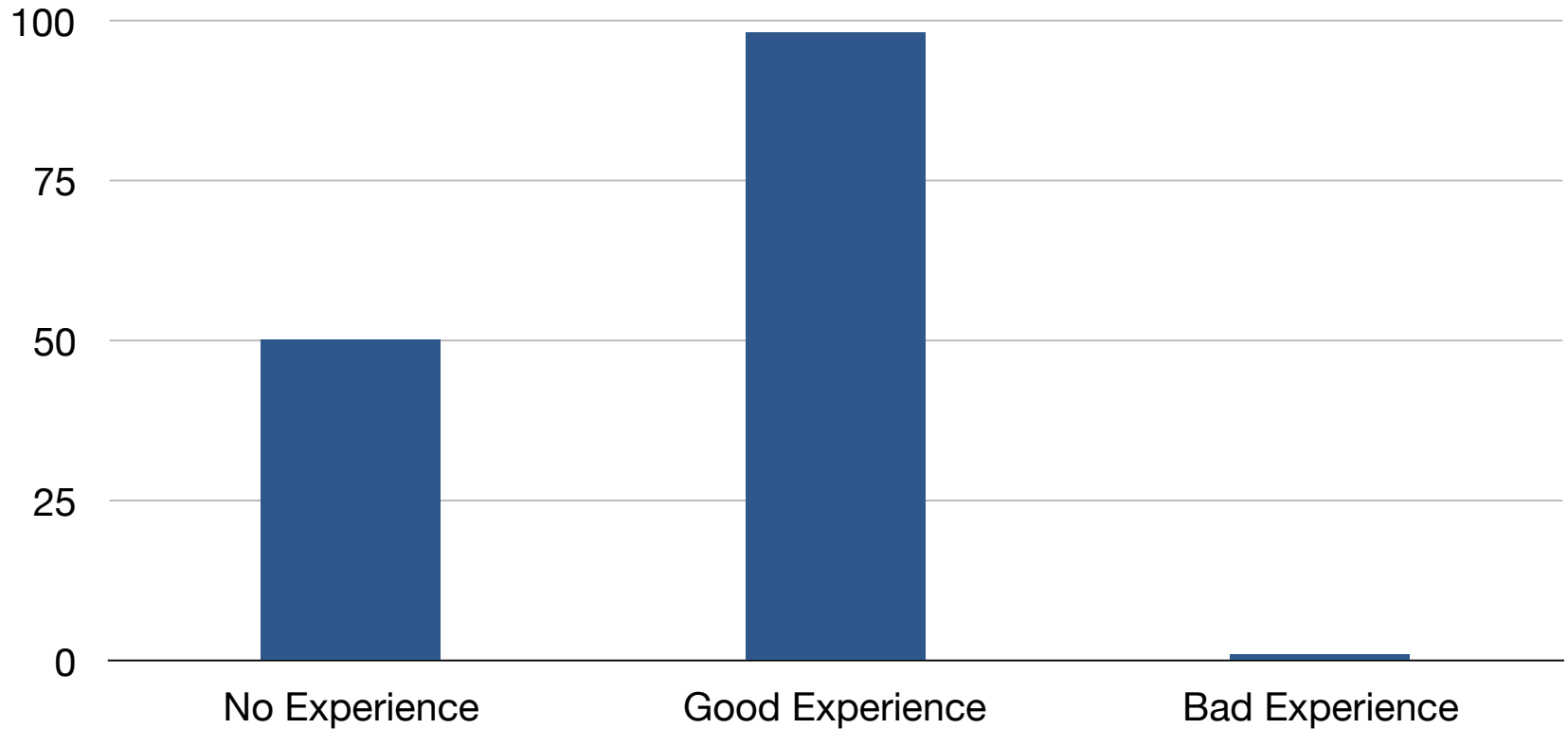


# Non-Technical Research

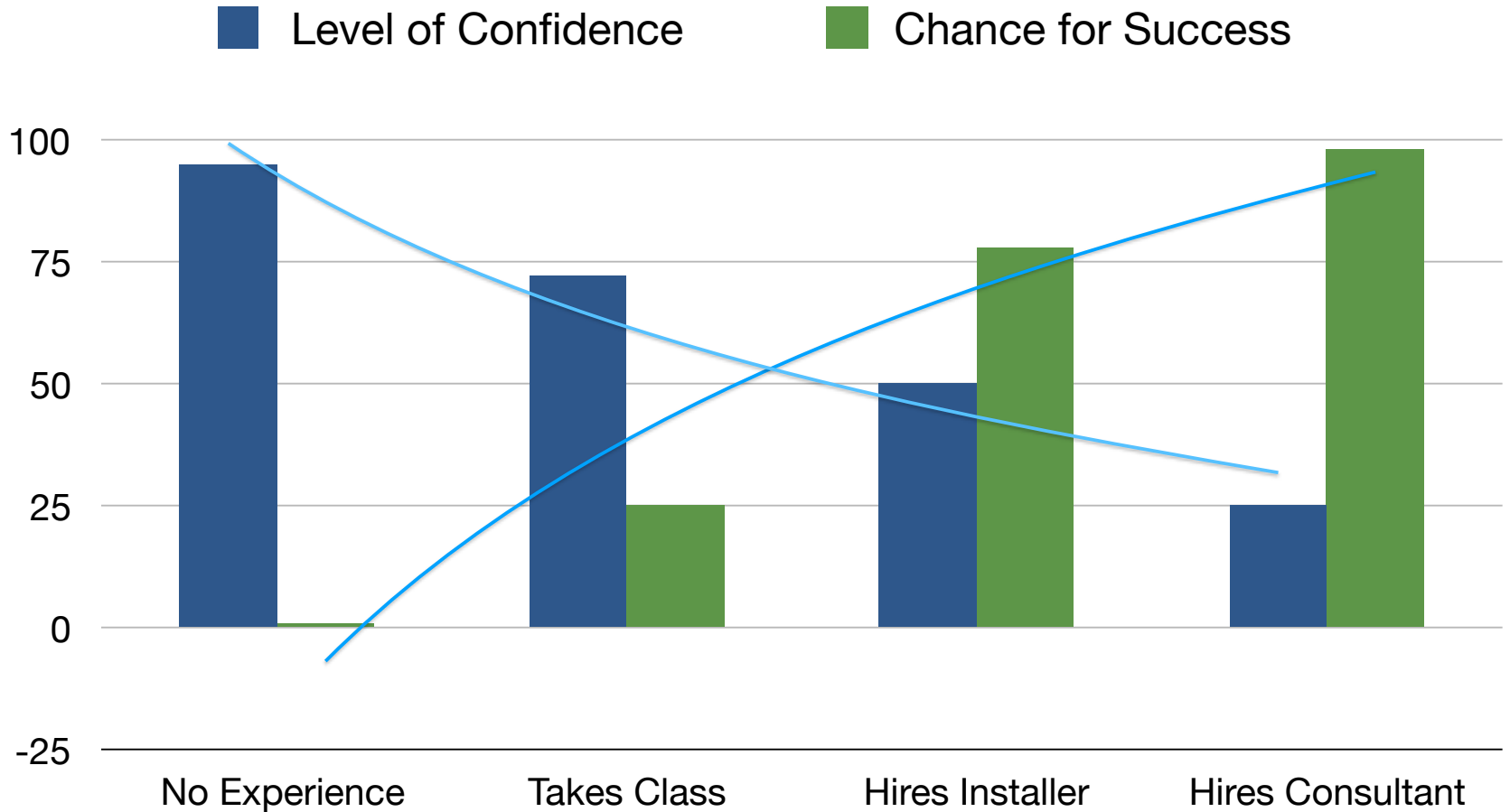
a.k.a “Insightful Observations”



# Chance of Specifying Pervious Concrete

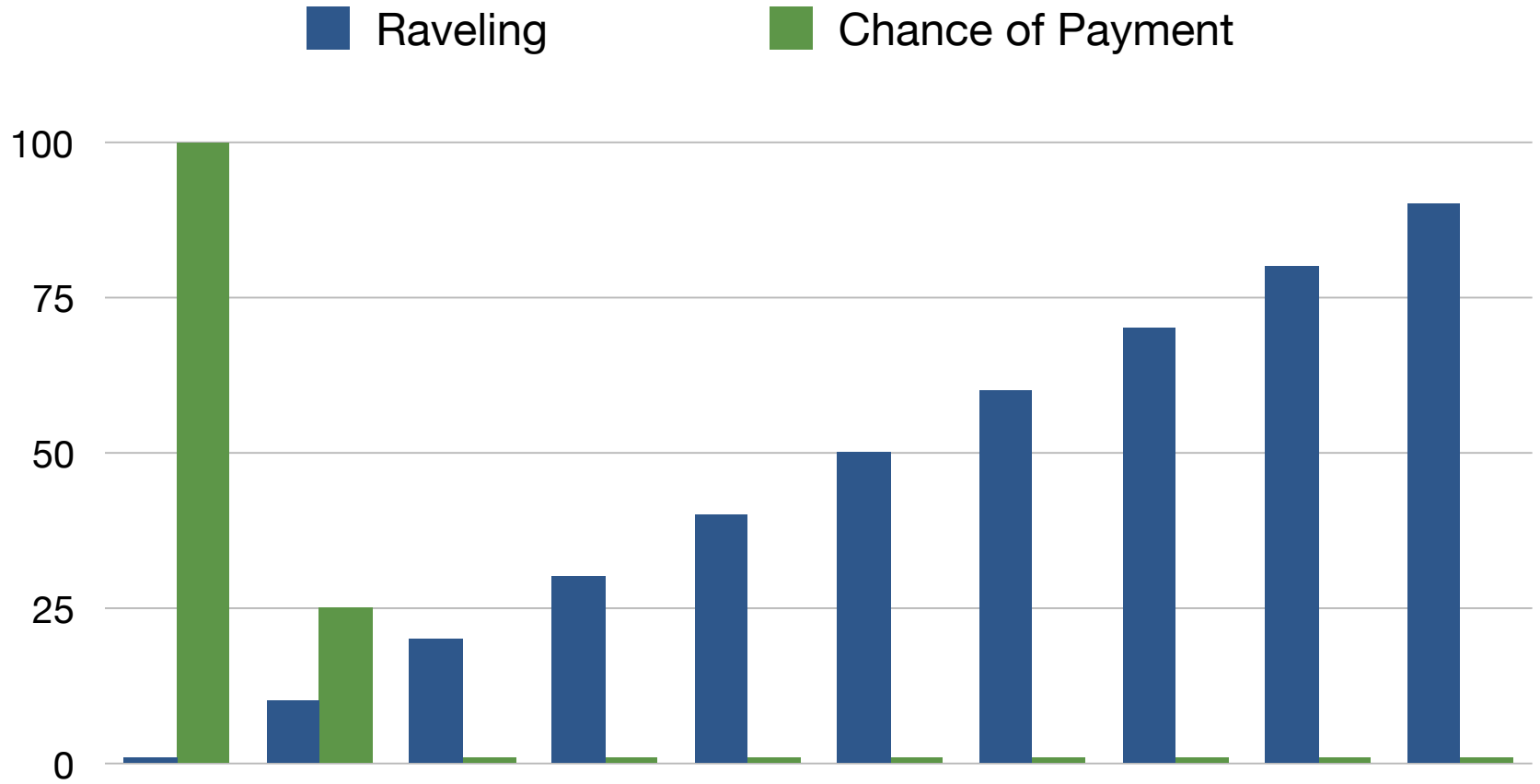


# Chance of Successful Project Based on Contractor Experience/Confidence



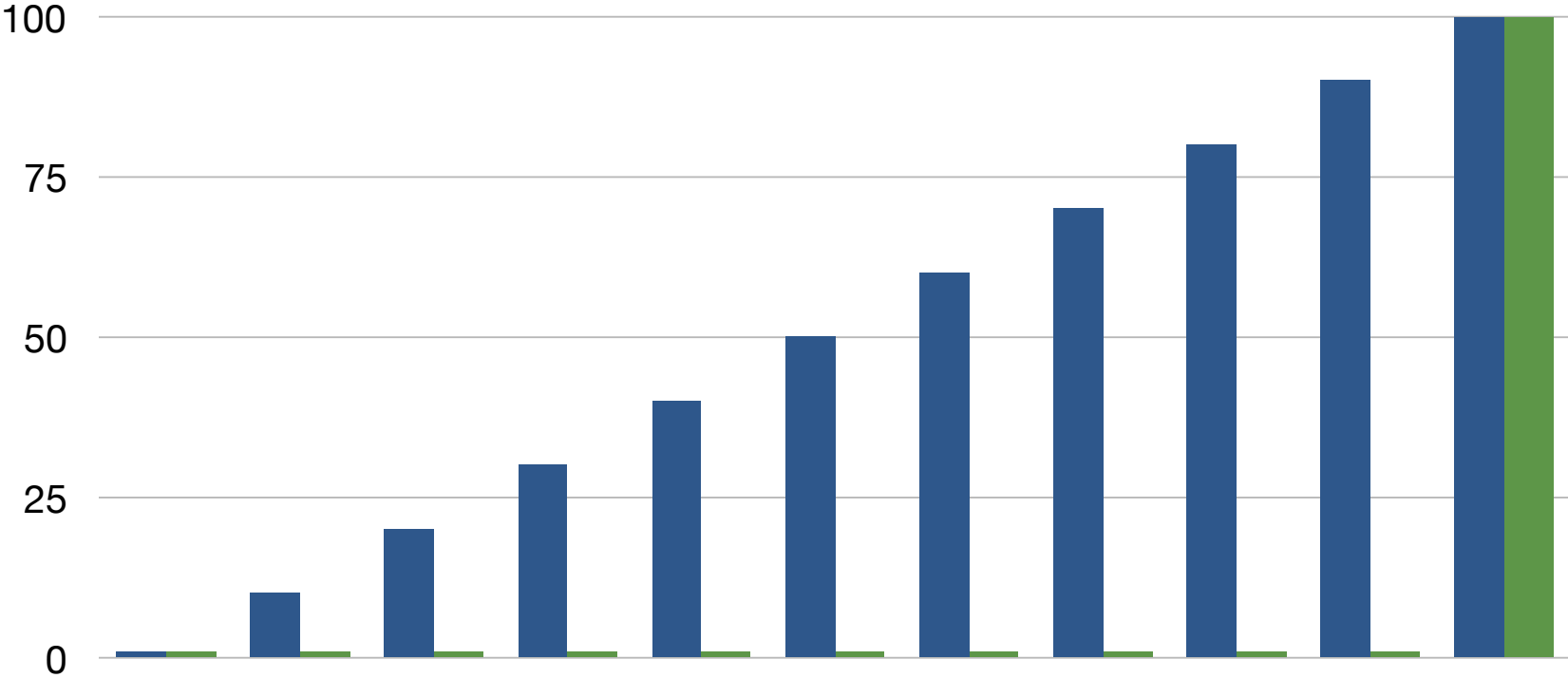


# Correlation Between Successful Project and Receiving Payment



# Correlation Between Contractor Payment and Happiness

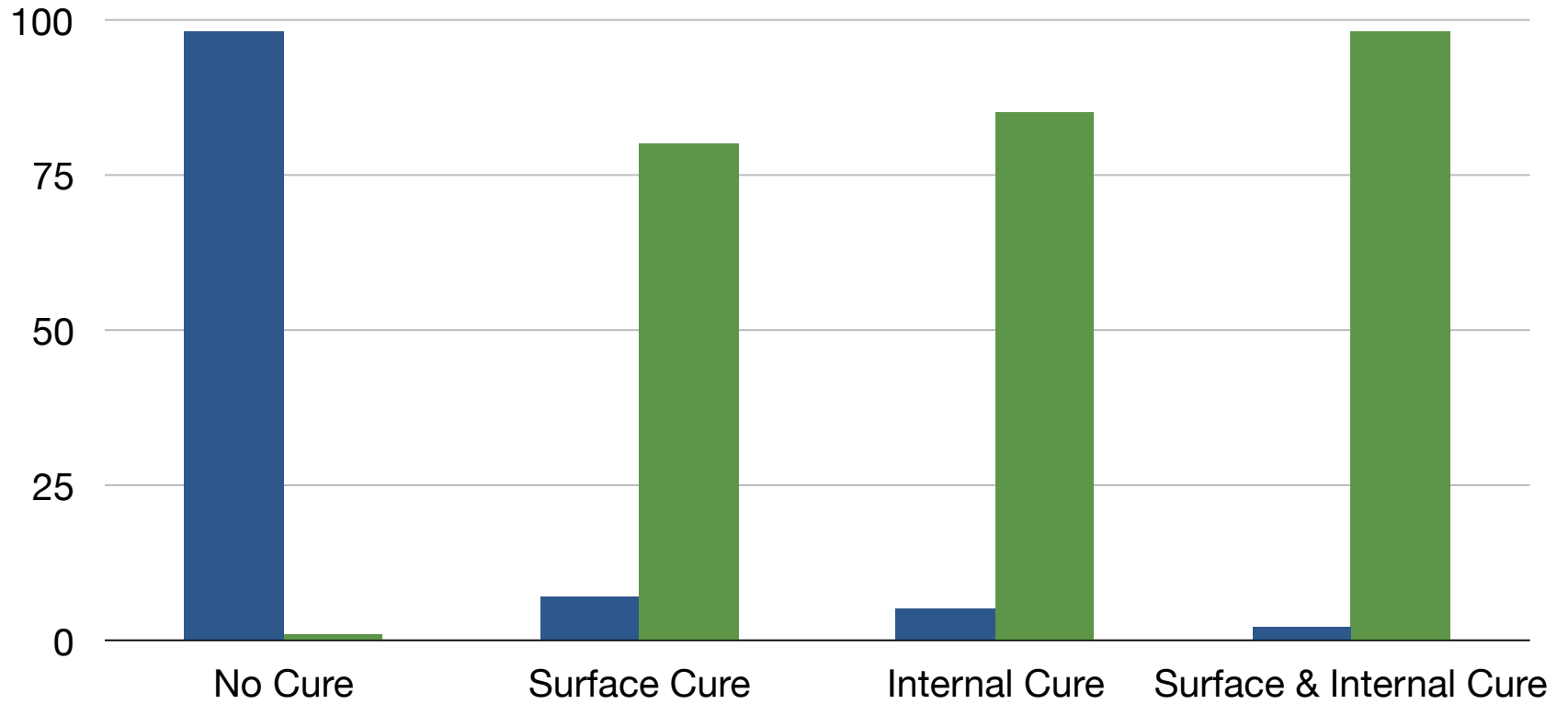
■ Payment      ■ Happiness



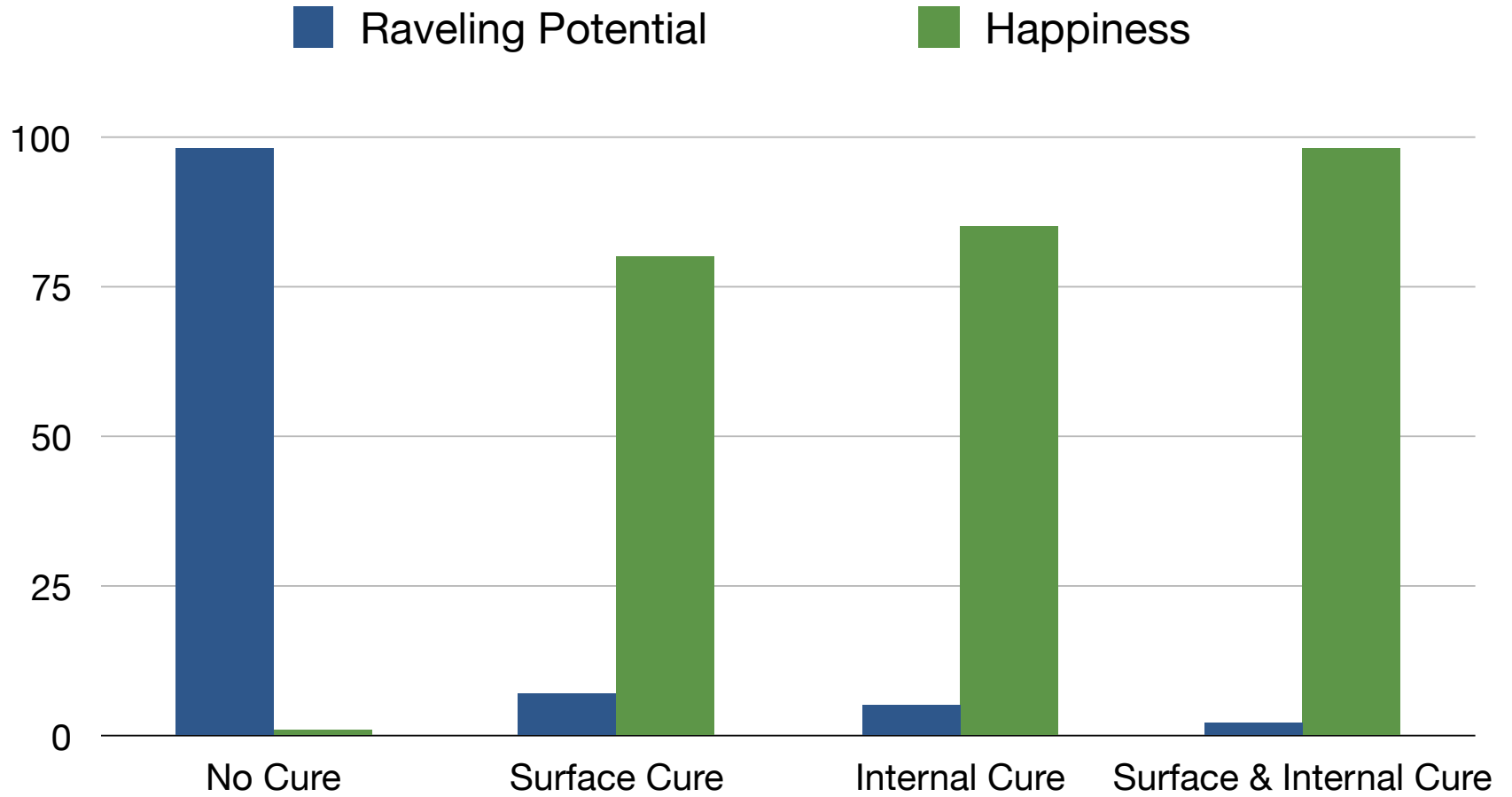


# Effect of Curing on Raveling/Durability

■ Raveling Potential      ■ Durability



# Effect of Curing on Happiness



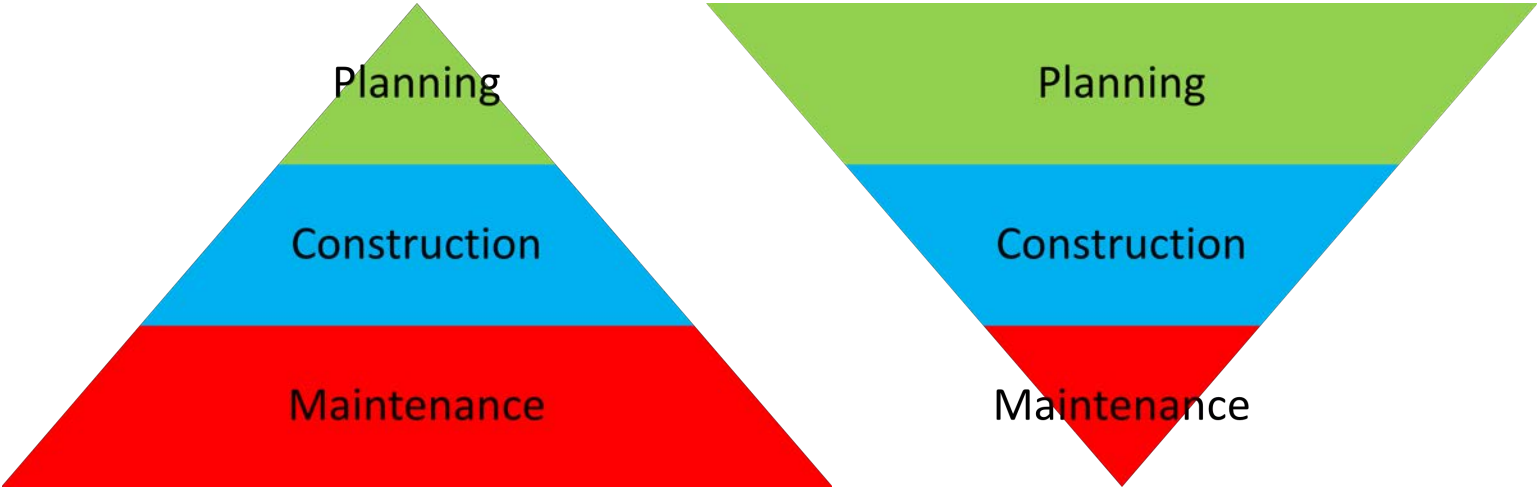
Curing = Happiness





# Pre-Construction Planning

# Effect of Pre-Construction Planning on Project Maintenance





# Pre-Bid Meeting

- Emphasize everything should be performed in accordance to the specification. Have a copy of the spec at the meeting and someone who understands and knows the content present.
- Qualify Bidders
  - Ready Mix Certified? Past experience? Projects?
  - Contractor Certified? Past experience? Projects?
  - Field Testing Personnel Certified? Know and understand the ASTM tests for Pervious Concrete?





# Pre-Construction

- Build Mock up in accordance with the specification
- Test for Density-Unit Weight, ASTM C1688
- Test for Hardened Density, 3 cores, ASTM C1754
- Test for Infiltration, ASTM C1701
- Does the data meet expectations? How does the slab look?
  
- Same mix design and same contractor team placing as mock-up (text panel)



# Testing

- **ASTM C1688**, Standard Test Method for **Density and Void Content** of *Freshly Mixed* Pervious Concrete
- **ASTM C1701**, Standard Test Method for **Infiltration Rate** of In Place Pervious Concrete
- **ASTM C1754**, Standard Test Method for **Density and Void Content** of *Hardened* Pervious Concrete
- **ASTM C1747**, Standard Test Method for Determining the Potential **Surface Durability** of Pervious Concrete

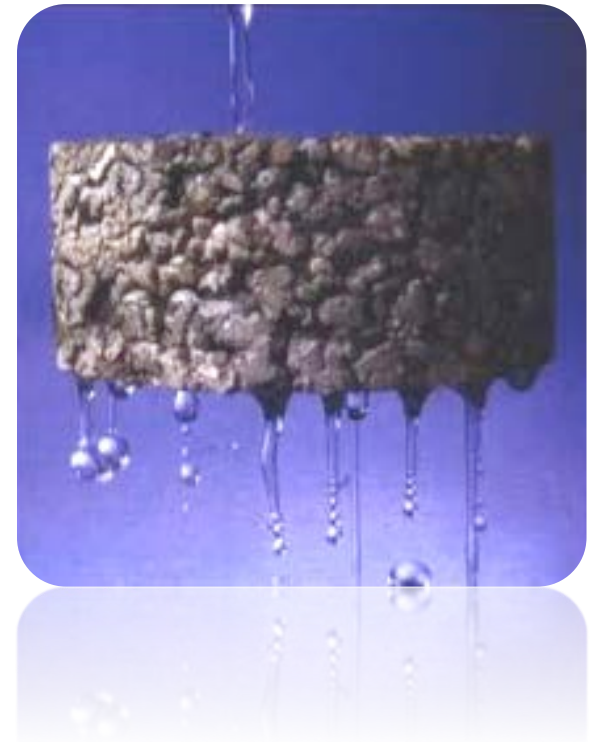
A balanced mix  
is the key.





# Mix Design

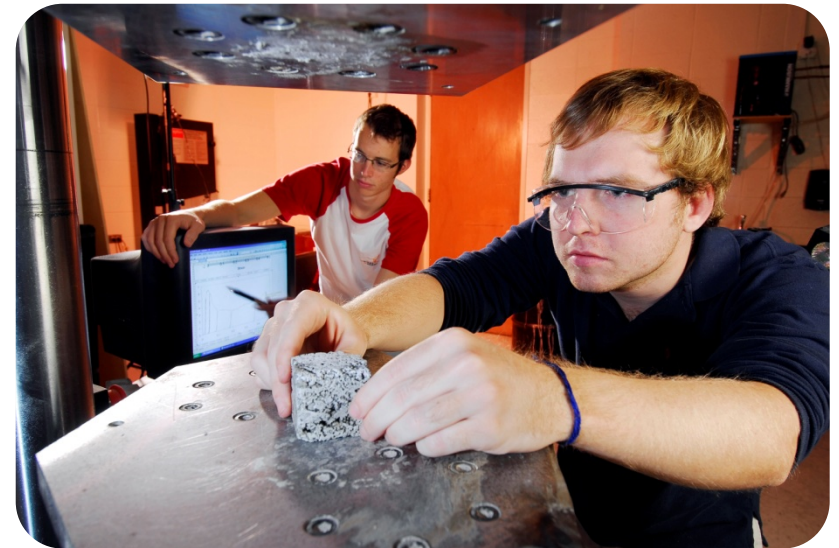
- Interconnected voids are termed “porosity”
- Design Void Content (DVC), typically around 20%
- Quality controlled by the design unit weight for a corresponding DVC



# Mix Design

The primary considerations when determining a mixture design are:

- Strength for loading
- Freeze-thaw resistance
- Porosity



# Mix Design

## Aggregate

- Crushed (angular)
- Gravel (rounded)
- S.G.  $> 2.5$
- Absorption  $< 2.5\%$
- Well graded
- Clean





# Mix Design

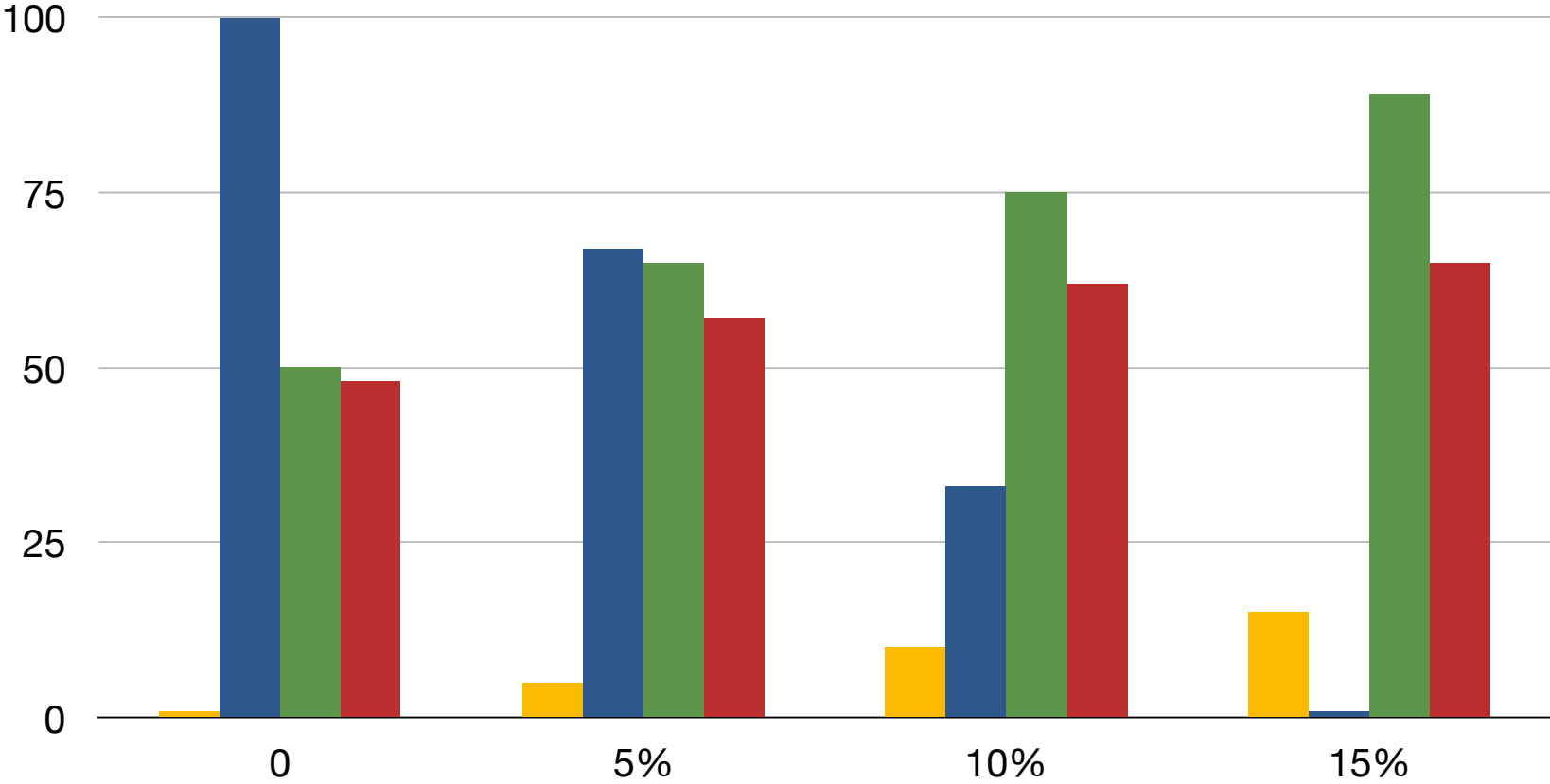
## Sand

- Porosity and permeability decrease
- Unit weight, compressive and tensile strength increase
- Improves freeze-thaw response



# Effect of Fines (Sand) on Perm/Durability/Freeze-Thaw

Fines (Sand)    Permeability    Durability    F/T Resistance



# Mix Design

## Macro-Synthetic Fibers

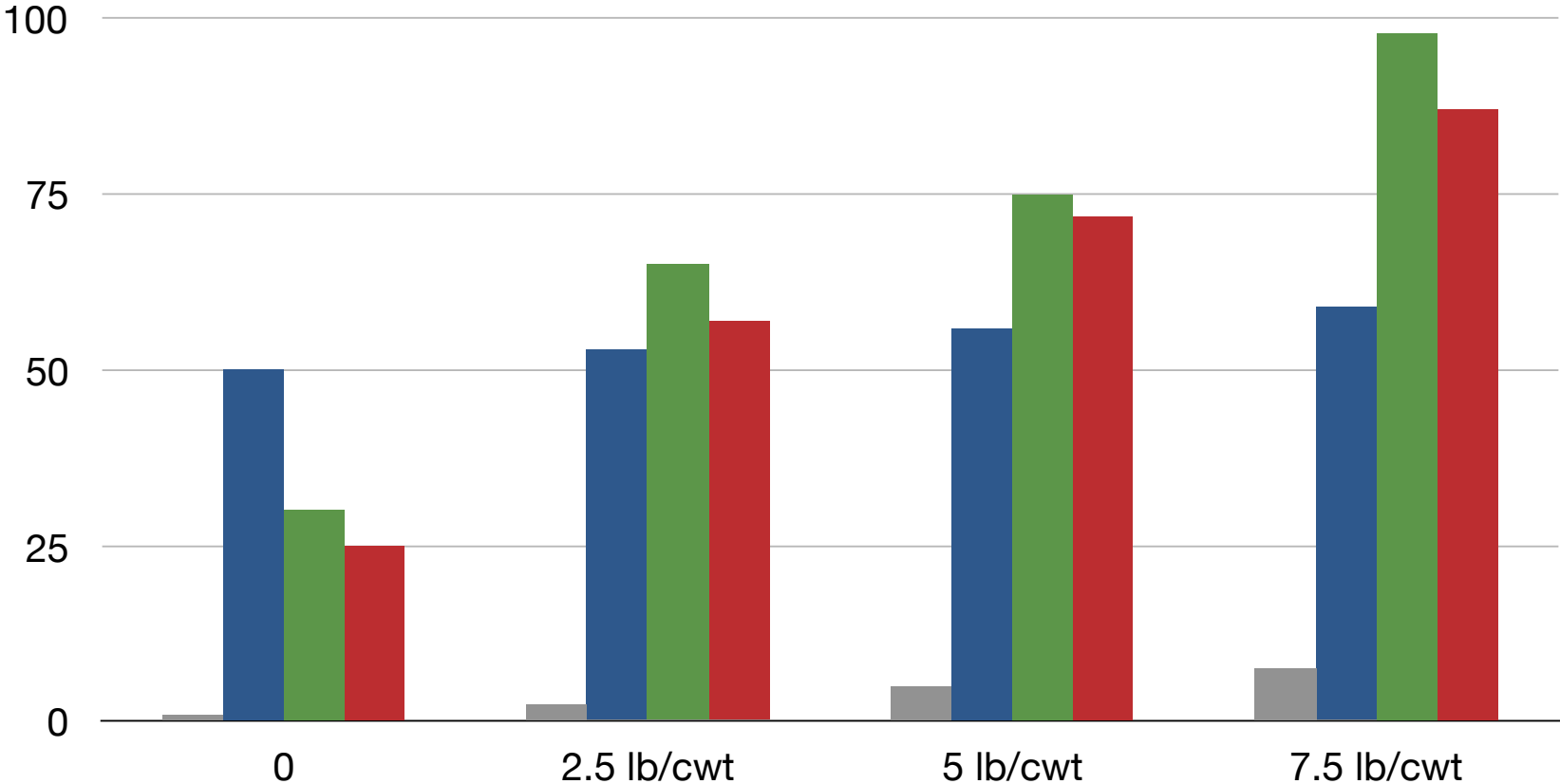
- Permeability increases
- Unit weight, compressive and tensile strength increase
- Improves freeze-thaw resistance



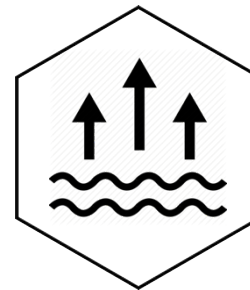
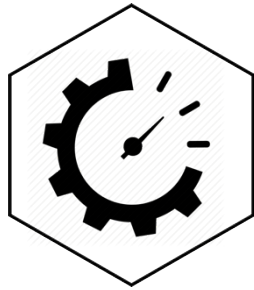


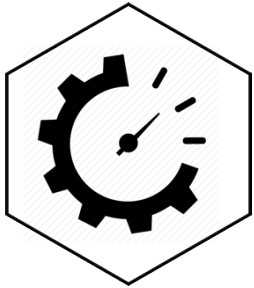
# Effect of Macro Fiber on Porosity/Durability/Freeze-Thaw

■ Fiber   ■ Permeability   ■ Durability   ■ F/T Resistance



# Admixture effects on fresh concrete.





Setting time.

Hydration-Controlling Admixture







Moisture loss.

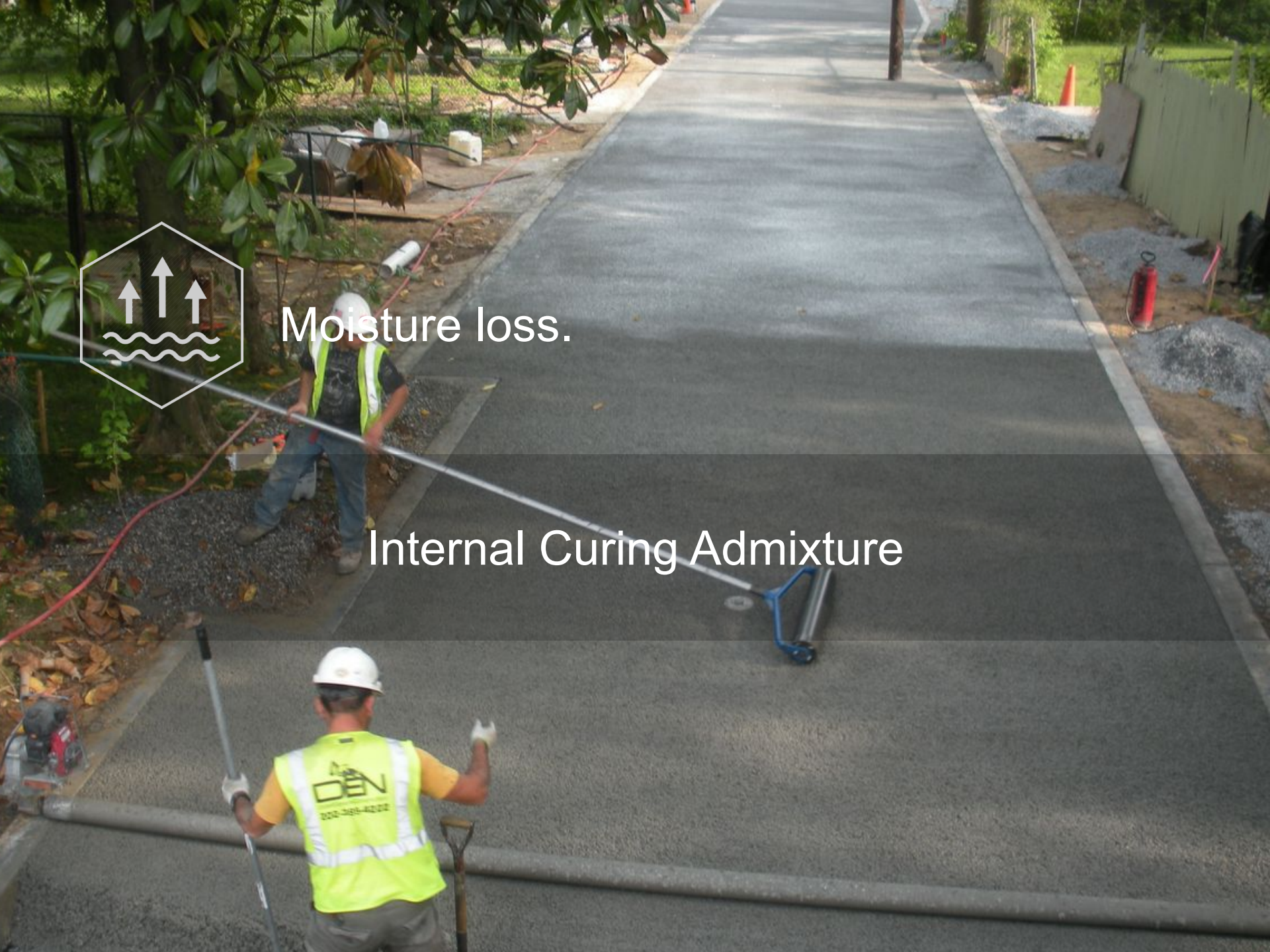






Moisture loss.

Internal Curing Admixture





Workability.

Workability is **VERY** important.



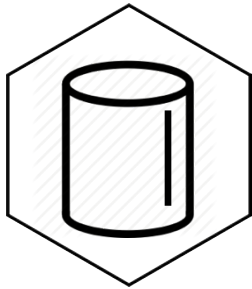








## Effects of ICA on hardened concrete.



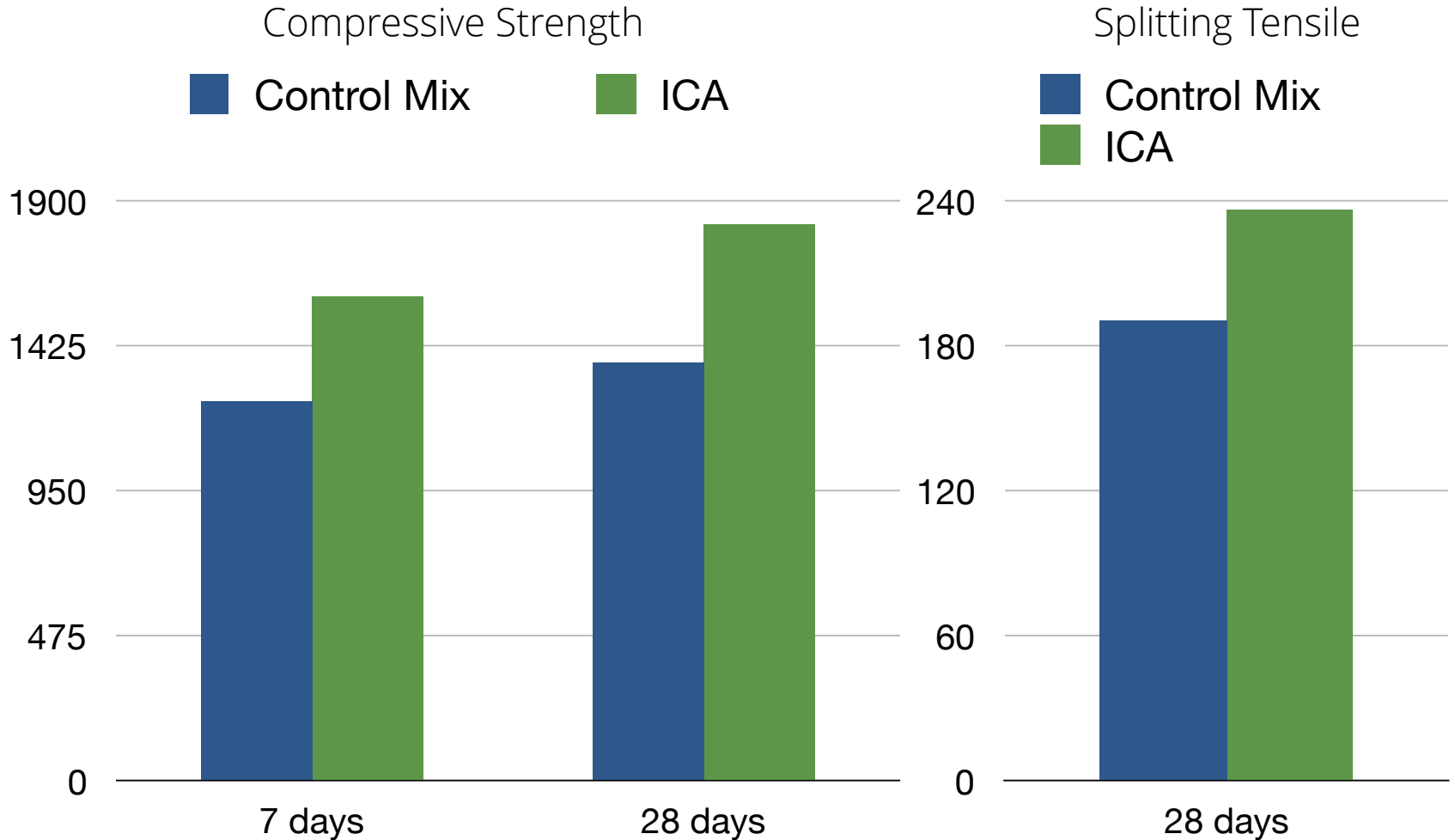


Strength

Strength greatly influenced.

# Hardened Pervious Concrete Test Results

*Reducing Curing Requirements for Pervious Concrete with a Superabsorbent Polymer for Internal Curing. (John T. Kevern and Chris Farney)*





BRANDON  
TODD



Durability.

Resistance to Raveling.





Freeze-Thaw Resistance.

More info available...

ACI 212.3R-16  
Report on Chemical  
Admixtures for Concrete  
Chapter 21

ACI 212.3R-16

Report on Chemical  
Admixtures for Concrete

Reported by ACI Committee 212



# Branded Mixes





## Why use a branded mix?

- Designed to meet specific needs
- Have approved/trained installers
- Working with a “team”
  
- Producers are invested



More info available...

ACI 522.R-10  
Report on Pervious Concrete

ACI 522R-10

Report on Pervious Concrete

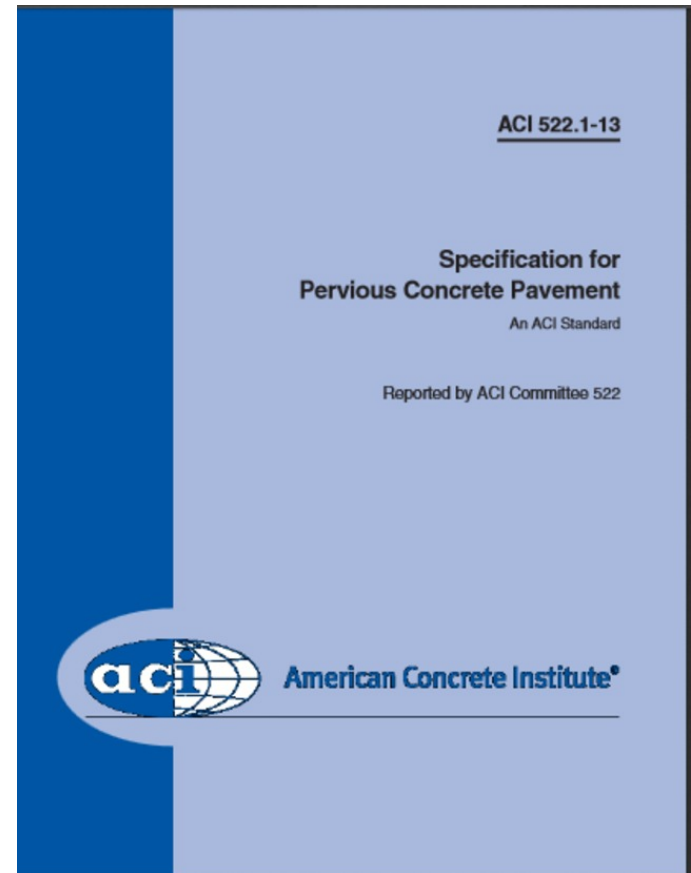
Reported by ACI Committee 522



American Concrete Institute®

More info available...

ACI 522.1-13  
Specification for Pervious  
Concrete Pavement





**Thank You!**

Questions???