



**Concrete  
Thinking**  
for a sustainable world



Portland Cement Association

2009 Fall TTCC/NCC

# Cement Standards of the Future

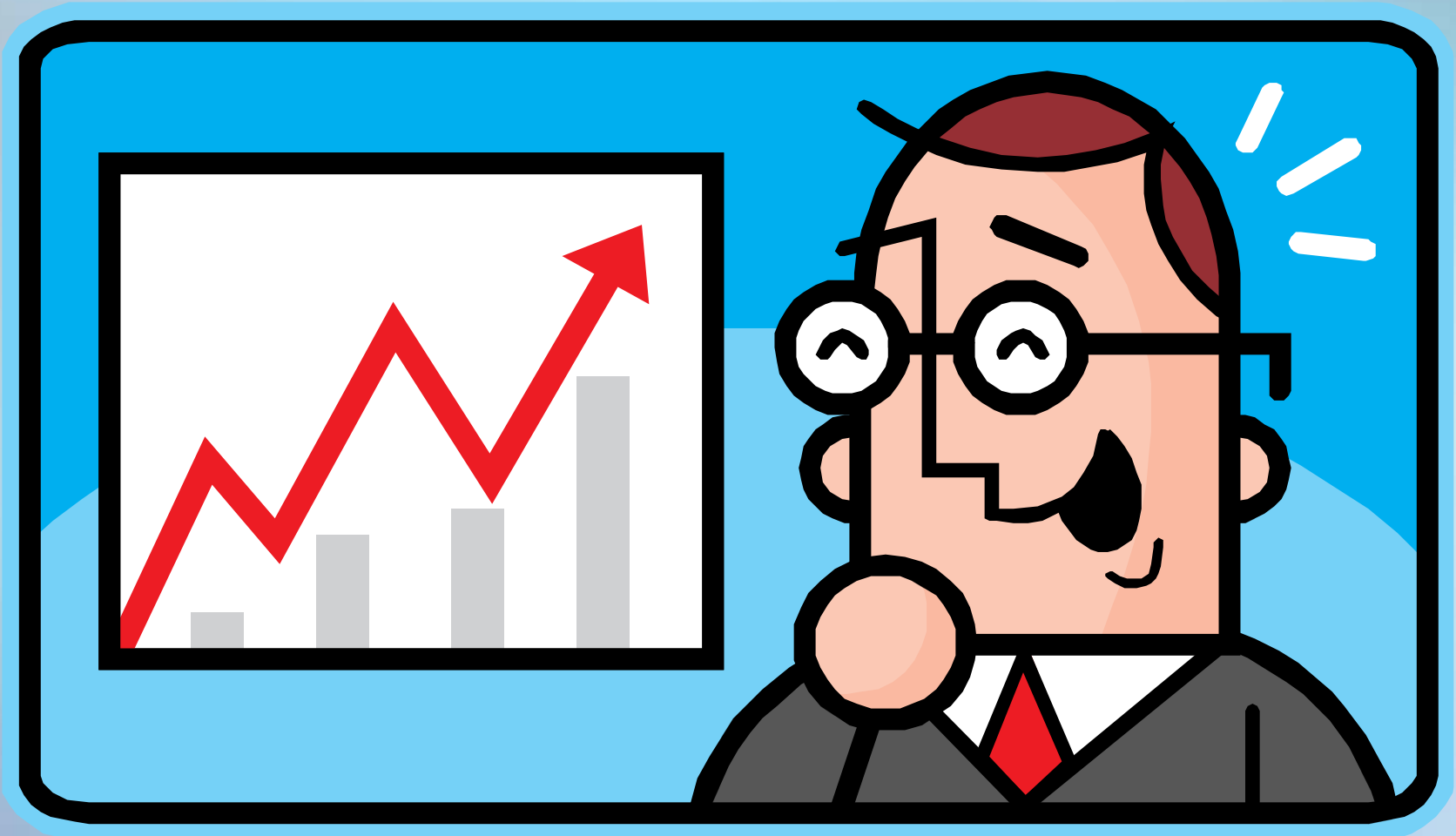
*John Melander*



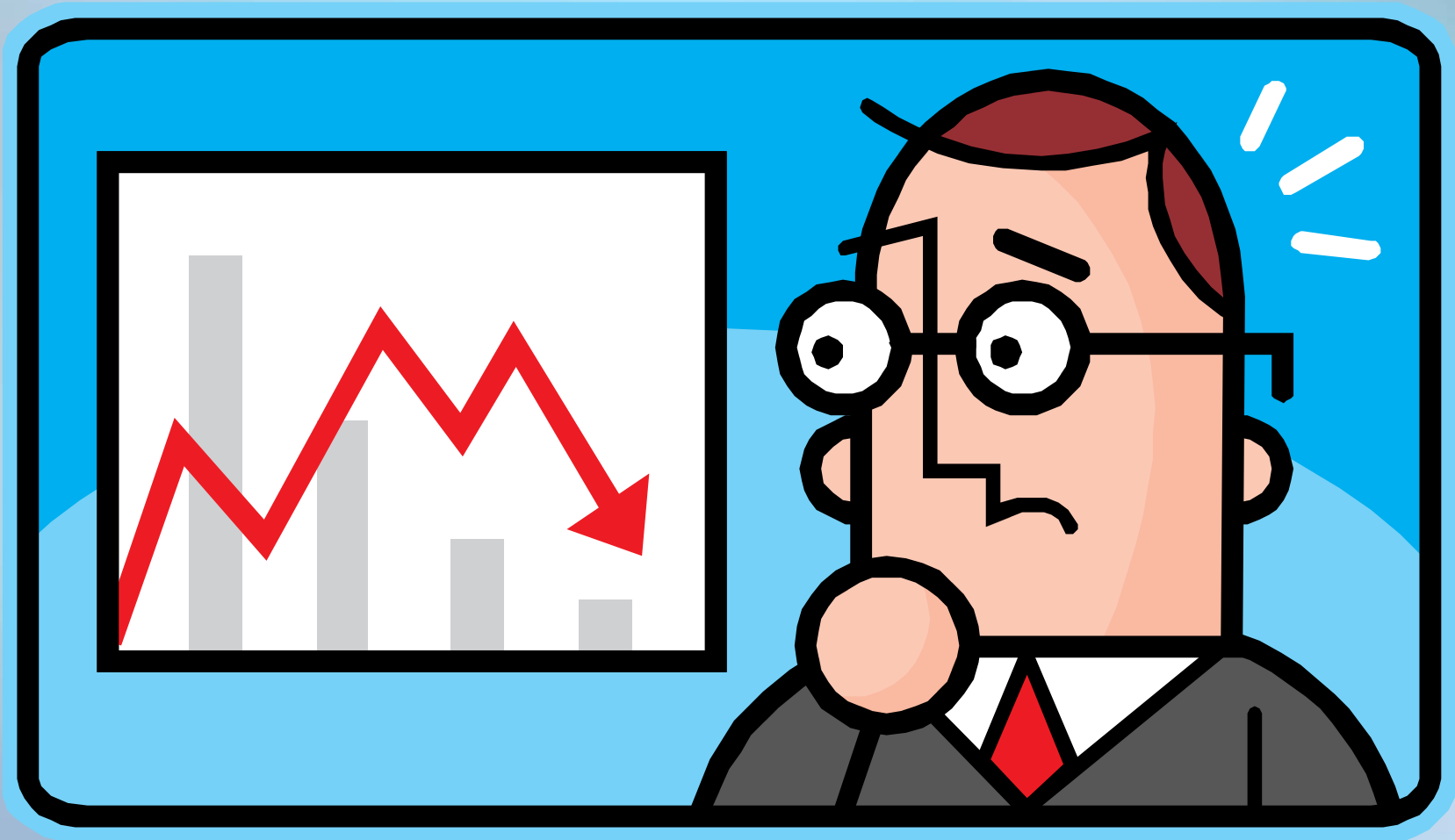
# Mystical Approach



# Historical Approach



# Historical Approach



# Wise Council Approach

We should all be concerned about the future because we will have to spend the rest of our lives there. ~Charles F. Kettering

I never think of the future - it comes soon enough. ~Albert Einstein

# Analytical Approach

- Will cement standards of the future be different from those of today, if so how?
  - Cement standards change through consensus processes – do we (users of the standards) believe there is a need for them to change?
    - Examine what we need from cement standards
    - Review past changes and current status
    - Consider key issues that are or are likely to create the need for future changes

# Cement Standards – What we need

- Basic function - Define key information between a buyer and seller to facilitate commerce
  - To have an impact, standards must be accepted and used
  - Standards generally define key information using prescriptive criteria, performance criteria, or a combination of the two

# Cement Standards – What we need

- Ensure concrete performance
  - Focus on end use and user
  - Identify key performance attributes
  - Recognize that concrete is more than cement
- Unambiguous acceptance criteria
  - Use clear and mandatory language
  - Use simple and reliable test methods
- Permit optimization of natural resources and manufacturing technology



# Cement Standards – First 50 Yrs.

1902  
ASTM “C”  
on Cement  
Formed

1910  
Committee  
“C”  
becomes  
“C-1”

1930  
C74 Spec  
for High-  
Early  
Strength  
Cement  
adopted

1942  
C175 T  
Spec for AE  
PC issued

1904  
Std Spec  
for Cement  
(PC & Nat)

1917  
Std Spec  
for Cement  
Split  
C9 Std  
Spec for  
PC  
C10 Std  
Spec for  
Nat  
Cement

1941  
C150  
Standard  
Spec for  
PC  
adopted –  
has 5  
Types  
C9 and  
C74  
dropped.

1946  
C205 T  
Spec for  
Portland  
Blast-  
Furnace  
Slag  
Cement  
issued

# Cement Standards – Second 50 Yrs.

1954  
C340 T Spec  
for Portland  
Pozzolan  
Cement  
issued

1967  
C595 Std  
Spec for  
Blended  
Hydraulic  
Cement  
adopted.  
Replaces  
C205, C340,  
and C358

1992  
C1157 Std  
Perf Spec for  
Blended  
Hydraulic  
Cement  
adopted

1962  
C358 T Spec  
for Slag  
Cement  
issued

1970  
C150 includes  
AE cements.  
C175 dropped

1998  
C1157  
includes  
portland  
cements and  
becomes Std  
Perf Spec for  
Hydraulic  
Cement



# Cement Standards – 2000 to Present

2003  
JAAHTG formed to develop recommendations for having consistent provisions in C150 & M85

2006  
C595 Type designations indicate SCM content

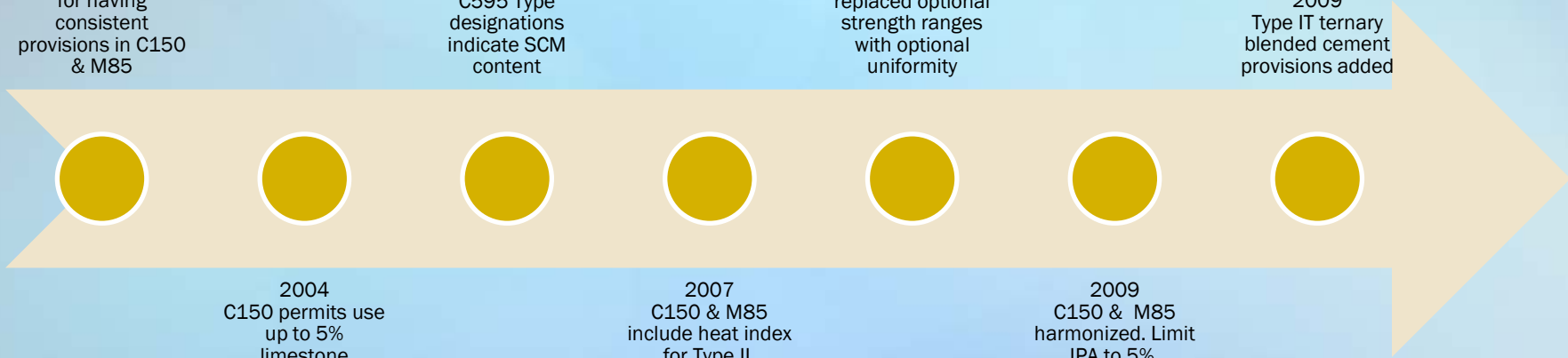
2008  
C1157 simplified terminology, replaced optional strength ranges with optional uniformity

2009  
Type IT ternary blended cement provisions added

2004  
C150 permits use up to 5% limestone

2007  
C150 & M85 include heat index for Type II, fineness limits modified. M85 permits up to 5% limestone

2009  
C150 & M85 harmonized. Limit IPA to 5%. Separate Type II(MH)



# Cement Standards – Current Status

- ASTM C150/AASHTO M85 – Portland Cement
  - Widely used and accepted
  - Has prescriptive and performance criteria
  - Prescriptive provisions limit optimization of natural resources and manufacturing technology
  - Active issues being considered
    - New business items from recent balloting process
    - New method for measuring heat of hydration
    - Alternate approaches to addressing Bogue calculations

# Cement Standards – Current Status

- ASTM C595/AASHTO M240 – Blended Cement
  - Widely referenced, but limited use
  - Has prescriptive and performance criteria
  - Prescriptive criteria provides options for use of SCMs
  - Active issues being considered
    - New business from recent ballot to establish designation for ternary blended cements

# Cement Standards – Current Status

- ASTM C1157 – Performance Specification for Hydraulic Cement
  - Referenced in most codes and standards, but not often used by DOTs
  - No AASHTO Counterpart
  - “Pure” performance approach offers greatest flexibility for optimizing resources and technology
  - No active work items for additional changes

# Cement Standards – Performance

## *“Concrete is more than Cement”*

- C150, C595, & C1157 address virtually the same cement related concrete performance issues
  - Fresh properties – setting time, false set, heat of hydration
  - Hardened properties – strength, strength gain
  - Durability – soundness, internal sulfate, external sulfate, ASR
- Prescriptive and performance criteria are both intended to ensure or assure concrete performance

# Key Issue(s) Driving Change





# **WHAT CHANGES WILL WE MAKE TO OUR CEMENT STANDARDS?**

# Cement Standards Development Principles

- Performance includes consideration of sustainable development
- Strength and durability are key components of concrete's sustainability
- Look at what we need in addition to what we have – search for alternate solutions
- Engage producers, users, and general interest representatives in process

# Cement Standards – Discussion/Questions

- Cement Standards Development Options to Support Concrete Sustainable Development Goals
  - Modifications to existing prescriptive standards
  - Increased use of performance specifications
  - New cement standards
  - Combination of existing standards



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A close-up photograph of various concrete materials. On the left, there is a clear glass graduated cylinder with markings for 100 and 200 mL, partially filled with a clear liquid. The background is a mix of fine brown powder, larger brown granules, and dark, smooth, rounded stones or pebbles. The lighting is dramatic, highlighting the textures of the different materials.

**Thank you!**