Honoring Bruce Suprenant Concrete Construction Contributions

What It Takes to Make Good High-Performance Concrete

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Master Builders Solutions

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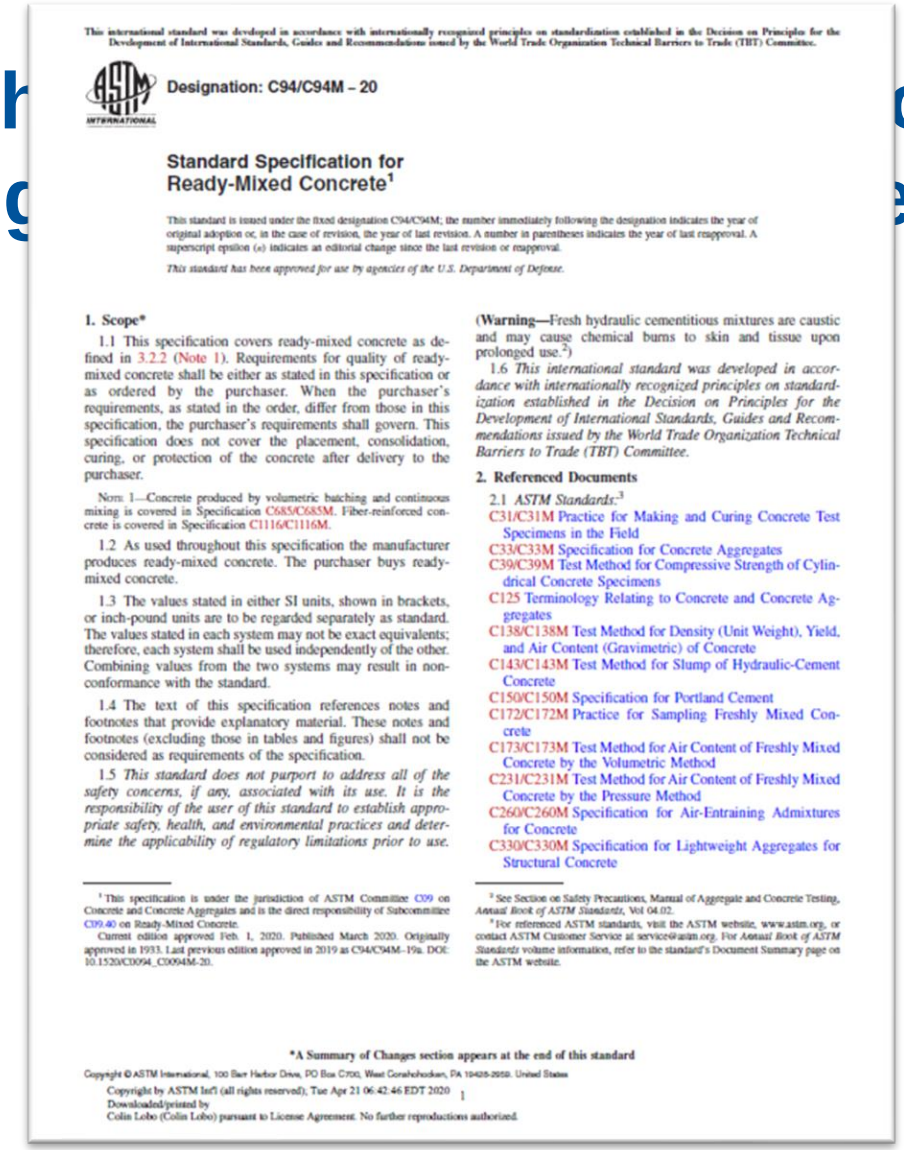


This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: C94/C94M – 20

Standard Specification for Ready-Mixed Concrete[1]

This standard is issued under the fixed designation C94/C94M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers ready-mixed concrete as defined in 3.2.2 (Note 1). Requirements for quality of ready-mixed concrete shall be either as stated in this specification or as ordered by the purchaser. When the purchaser's requirements, as stated in the order, differ from those in this specification, the purchaser's requirements shall govern. This specification does not cover the placement, consolidation, curing, or protection of the concrete after delivery to the purchaser.

NOTE 1—Concrete produced by volumetric batching and continuous mixing is covered in Specification C685/C685M. Fiber-reinforced concrete is covered in Specification C1116/C1116M.

1.2 As used throughout this specification the manufacturer produces ready-mixed concrete. The purchaser buys ready-mixed concrete.

1.3 The values stated in either SI units, shown in brackets, or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.4 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* (**Warning**—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged use.[2])

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field
C33/C33M Specification for Concrete Aggregates
C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens
C125 Terminology Relating to Concrete and Concrete Aggregates
C138/C138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C143/C143M Test Method for Slump of Hydraulic-Cement Concrete
C150/C150M Specification for Portland Cement
C172/C172M Practice for Sampling Freshly Mixed Concrete
C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C231/C231M Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C260/C260M Specification for Air-Entraining Admixtures for Concrete
C330/C330M Specification for Lightweight Aggregates for Structural Concrete

[1] This specification is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.40 on Ready-Mixed Concrete.
Current edition approved Feb. 1, 2020. Published March 2020. Originally approved in 1933. Last previous edition approved in 2019 as C94/C94M–19a. DOI: 10.1520/C0094_C0094M-20.

[2] See Section on Safety Precautions, Manual of Aggregate and Concrete Testing, *Annual Book of ASTM Standards*, Vol 04.02.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

What It Takes to Make Good High-Performance Concrete

It's Always About PEOPLE and CHARACTER

Especially, HONESTY

Definition of honesty, noun

1a: adherence to the facts : **SINCERITY**

doubted the *honesty* of the witness

1b: fairness and straightforwardness of conduct

calling for *honesty* in politics

What It Takes to Make Good High-Performance Concrete

1b: fairness and straightforwardness of conduct

calling for *honesty* in ~~politics~~ concrete

Synonyms & Similar Words

Relevance

integrity	sincerity	truthfulness
reliability	authenticity	probity
credibility	veracity	frankness
forthrightness	candor	reliableness
truth	candidness	verity
straightforwardness	accuracy	scrupulousness
trustworthiness	dependability	objectivity
honorableness	ingenuousness	guilelessness
incorruptibility	uprightness	rectitude
artlessness	righteousness	scrupulosity
good faith	genuineness	honor

What Do We Need to be Forthright, Candid, and Frank About re. Concrete?

What's the ***REAL STRENGTH*** and ***WHEN*** do we need it?

NOT f'_c or f'_{cr}

Let's call it: $\boldsymbol{f'_{REAL}}$

- An example:
  - f'_c = **6,000** psi @ 28 days – No history or lab trials
  - f'_{cr} = **?,???** psi @ 28 days (hint: 1.1Xf'_c + 700)
  - GC wants to post-tension @ 48 hours (or 72 hours)
  - SE wants 75% of f'_c to PT – PTI says 3,000 psi is enough
  - Formwork sub wants to strip or raise the forms at 24 hours

Continuing the Example

What's the ***REAL STRENGTH*** and ***WHEN*** do we need it?

- Let's add some complexity:
  - f'_{cr} = 7,300 psi @ 28 days
  - Owner wants Low-Embodied Carbon Concrete
  - Maximum GWP on concrete
  - Carbon budget is pushing on the concrete in the PT decks
  - Cement limited to PLC and there are limited SCMs
  - Schedule isn't driving the project – or more likely . . . .

Now what's f'_{REAL}?

Let's add reality to a discussion about strength

What's the ***REAL STRENGTH*** and ***WHEN*** do we need it?

- Eammon discussed low strength
- Ken discussed overdesign requirements
- Raise your hand if you've ever been . . . .
- Now sit on your hands
- Did the EOR accept . . . .

So, what was the f'_{REAL}?

Can We Be Honest About Water?

- What's the water demand of the selected materials?
- For my structural engineering friends
  - Do we need the *w/c* limits imposed on the project?
- For my concrete producer friends
  - How often is the moisture meter was calibrated?
  - Has all water in the batching, mixing, delivery, and placement process been accurately recorded?
- For my concrete pumping contractor friends
  - Do you really need access to city water DURING pumping?
- For my finishing contractor friends
  - What's really in that Hudson sprayer?

If we're honest with one another, how about schedule?

- When will the project really start?
- What's the real expected completion date? Costco vs La Sagrada Familia
- What day and time do you need concrete?
- How many yards of concrete per hour do you really need?
- How many yards of concrete per hour can you really deliver?
- How many yards of concrete per hour can you really pump?
- How many yards of concrete per hour can you really place, finish, and cure?
- Wait, there's curing? I wasn't told about curing!

We Need to be Honest About Concrete Appearance!

- Mike Ahern discussed Tolerances
- Chris Forster Exposed Concrete
- Mike Schneider described the National Veteran Memorial Museum
- Tipp and Scott Tarr talked about ‘flat’ floors and elevated decks
- What’s the **expected appearance** of the proposed concrete structure and **is the owner willing to pay** for that appearance?
- Is there anything in the specifications about architectural concrete?
- How many sets of aesthetic categories does ACI have?
- And . . . .

Now Let's

Another ingredient of "Good High-Performance Concrete"

What It Takes to Make Good High-Performance Concrete

It's About PEOPLE **SKILLS**

Especially, COMMUNICATION

Definition of communication, noun

1a: a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior

the function of pheromones in insect *communication*

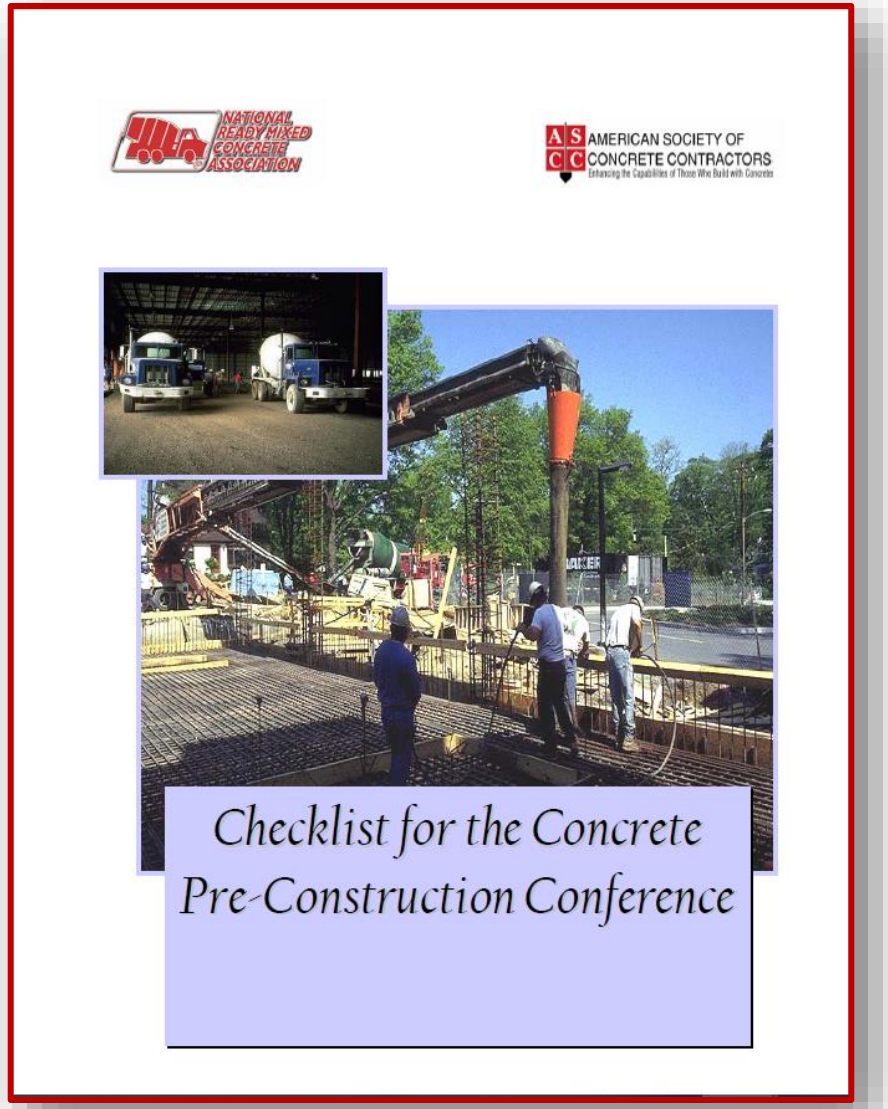
also **: exchange of information**

What Do We Need to Communicate About?

- Colin Lobo talked about Contractors and Producers
- Can we add Designers?
- Cary Kopczynski & Chad Hensley focused on Constructability
- Mix Design Development, especially on Fresh & Concrete Hardened Properties Nominal 6' Slump vs. SCC vs. Contractor-driven Workability
- Defining Success – What are the Expected Results?
- Accepting the Concrete and Repairing the Inevitable Failures
- What's the Dispute Resolution Process?

When Do We Need to Communicate?

- Ideally, we're all involved from PP to CD
- Mix Design Development – 6 or more months in advance
- Pre-Bid – Depends on the project
- Post Award – Depends on the project
- Mock-ups? Add ___ months
- Pre-Placement – 4 weeks in advance of the first placement
- Honest, intelligent orders
- Post-Construction, sometimes called Post-Mortem


NATIONAL READY MIXED CONCRETE ASSOCIATION
AMERICAN SOCIETY OF CONCRETE CONTRACTORS
Checklist for the Concrete Pre-Construction Conference

Improving Your Communication Skills

1. Be clear and concise
2. Prepare ahead of time
3. Be mindful of nonverbal communication
4. Watch your tone
5. Practice active listening
6. Build your emotional intelligence
7. Develop a workplace communication strategy
8. Create a positive organizational culture

From Harvard Professional Development

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Building Innovation through Research

Assessing the Impact of "Green" Concrete Mixtures on Building Construction

Submitted By

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December 2013

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PROVIDING THE MEANS TO ADVANCE CONCRETE CONSTRUCTION

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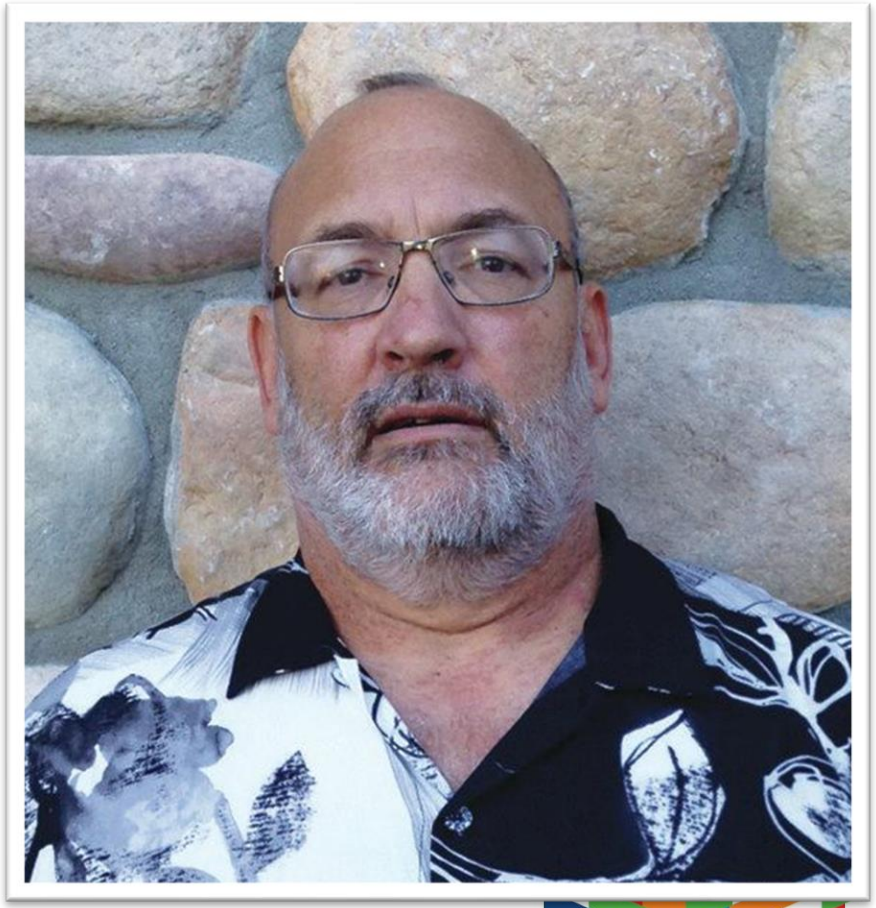
Honesty, Communication Skills = LEADERSHIP

At the PROJECT level

At the FIRM level

At an INDUSTRY level



Thank you!

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