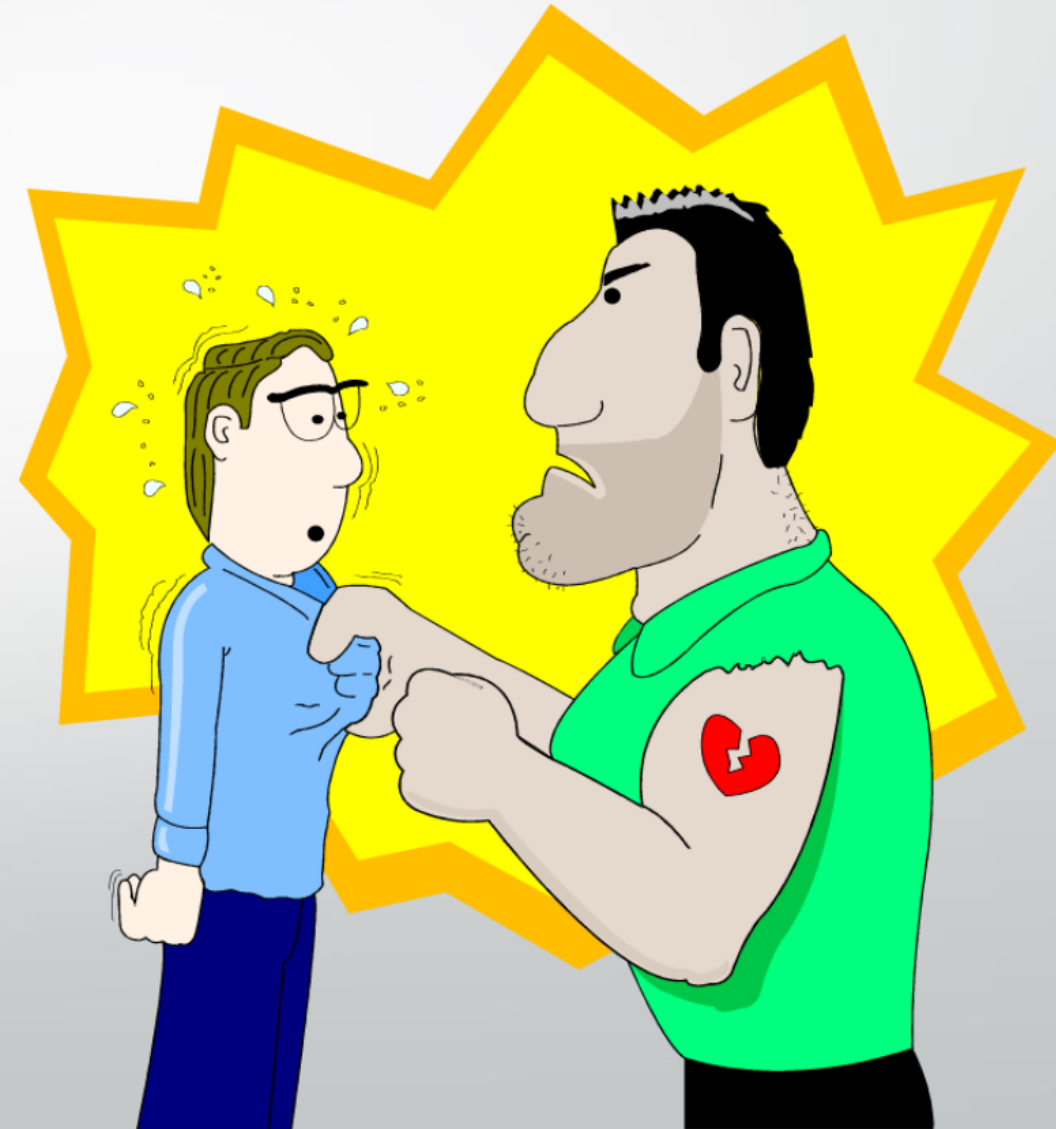


When Specifications Clash with Low-Carbon Expectations



Do Not Turn an Expectation into a Requirement

The clashes may be due to expectations in concrete properties rather than clashes meeting low carbon requirements

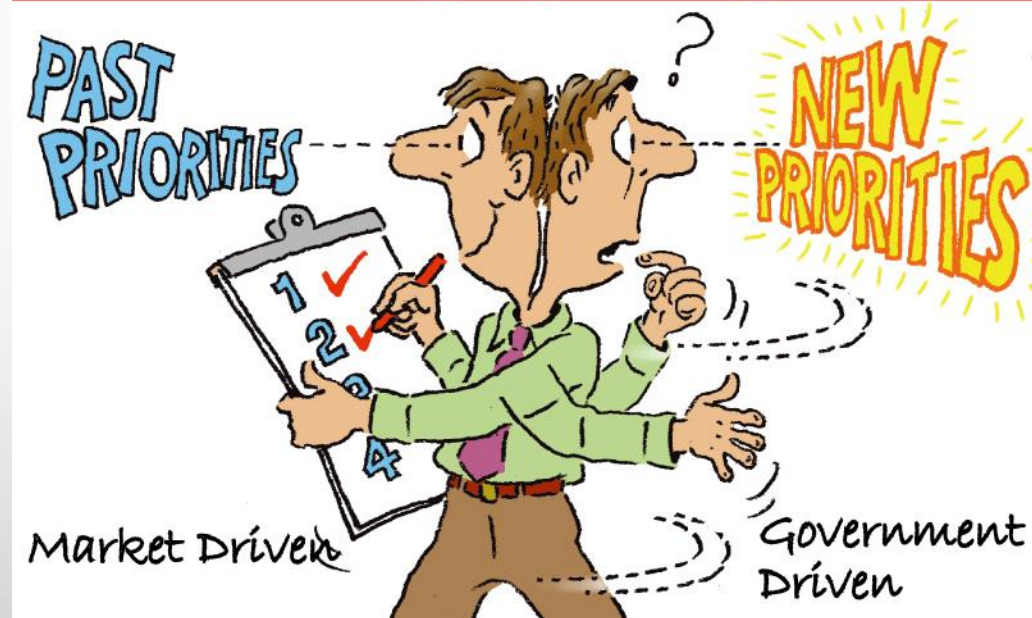
Sales verses Technical Services

- **Business development, sales engineers, sales associates, sales men, sales women, sales people, marketing people and etc. are required to sell**
- **Good ones do it well—and they do not worry about the small details**
- **The sales group do not always thoroughly read or understand all of the technical requirements in the Contract Documents especially those related to carbon requirements.**
- **Sales is necessary**
- **Know what you implied that you will do or what you agree to do**

Concrete Construction has Changed and Will Continue to Change

- Most previous changes have been market driven—concrete producers and contractors had a choice
- Some of these changes are government driven—no choice
- Concrete industry is and has always been fragmented
- There has never been a better time for collaboration and cooperation between concrete materials suppliers, concrete producers, and concrete contractors
- It is time to stop complaining—We got what we got

Managing Change



The Second **Biggest** Secret in the Concrete Construction Industry

- There is much more to concrete than **Compressive Strength**



Quality Concrete Projects Require a Team Effort

- Ready mix supplier
 - Materials selection
 - Mix design
 - Batching
 - Mixing
 - Delivery
 - Setting times
 - Early strength development
 - Quality control



Quality Concrete Projects Require a Team Effort

- Ready mix supplier
- Contractor
 - Transporting
 - Placing—form pressures
 - Finishing—setting times
 - Protection—may be longer
 - Curing—may require longer curing periods
 - Quality control



Engineer



Contractor

Quality Concrete Projects Require a Team Effort

- Ready mix supplier
- Contractor
- Engineer
 - Drawings
 - Specifications
 - Environmental requirements
 - May not be possible with local material

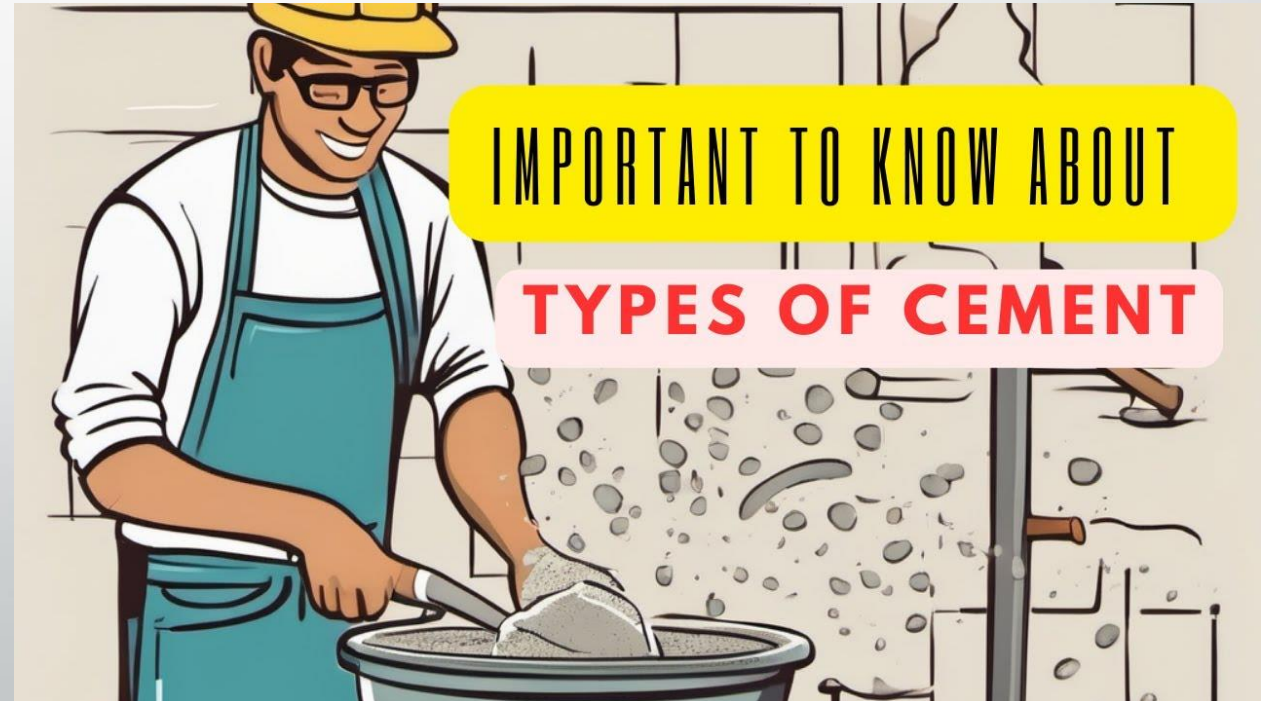


Quality Concrete Projects Require a Team Effort

- Ready mix supplier
- Contractor
- Engineer
- Testing agency
 - Proper testing—early cylinder protection and curing becomes critical
 - Prompt reporting

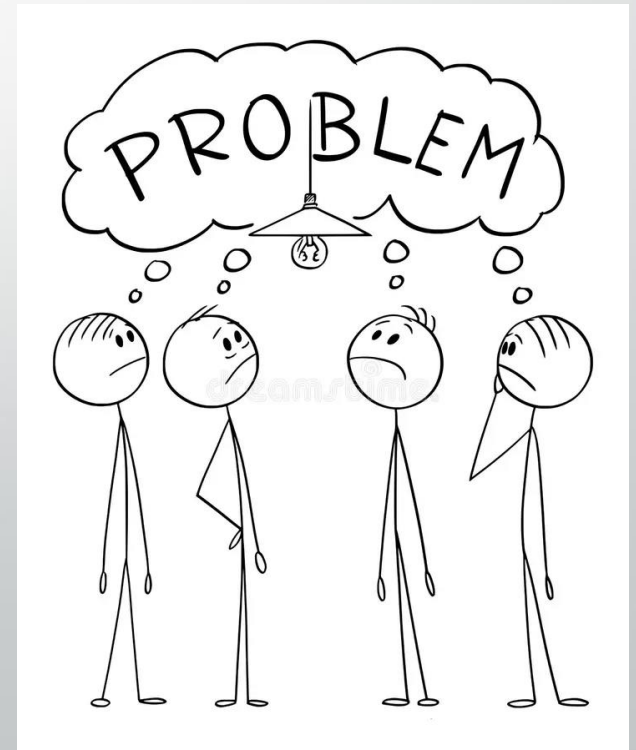
The **Third** Biggest Secret in the Concrete Construction Industry

- Different cements affect concrete plastic and hardened properties



Low-Carbon Requirements Are Here to Stay

- We are at the tip of the iceberg
- Type IL cements
- More cements with less clinker are coming
- Concrete mixtures with less clinker
- If you are a cementitious materials supplier or a ready mix concrete supplier and you think that you can change a Type I/II for Type IL, you have a problem
- If you think that you can substitute different Type ILs, you have a problem



Things to Consider with Low-Carbon Concrete Mixtures

- **Shrinkage**—more water or admixtures more shrinkage
- **Durability**—we may not know
- **Cracking potential**—more shrinkage, slower setting
- **Concrete may be more sensitive to changing weather conditions**
- **It is not all about carbon requirements for cements; It is about carbon requirements for concrete**

Difference Between Low Carbon **Expectations** and Low Carbon **Requirements**

Low-Carbon Expectations

- **Expectations—a belief that someone will or should achieve something**
 - **If expectations are not part of the Specifications; they are only expectations not requirements**
 - **Do not let someone convert expectations into requirements**
 - **Especially requirements that you cannot achieve**
 - **Especially requirements that you can achieve**

Expectations Clashes

- Negotiate—if expectations can be accomplished, no problem
- Change Order—if it requires more cost or **risk**, submit a change order
- Do not arbitrarily reduce the cement content by 50% and add 50% supplementary cementitious materials without a thorough understanding of plastic and harden properties
- Remember—it is not all about strength



Not Meeting Expectations

- Nuisance
- What did you agree to provide?
 - Contract documents
 - Purchase orders
 - Meeting minutes
 - Someone's expectations



Expectations Versus Requirements

- Requirements—a thing that is compulsory; a necessary condition
 - Contract Documents
 - You agreed to meet the Contract Documents



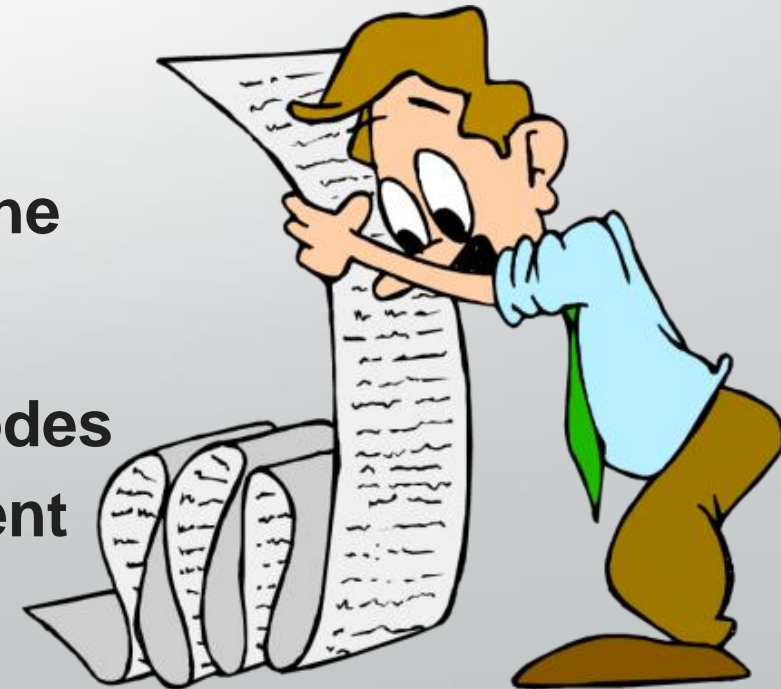
Not all Requirements are Created Equal

- **Code requirements**
- **Specifications**

Building Codes—More Complicated

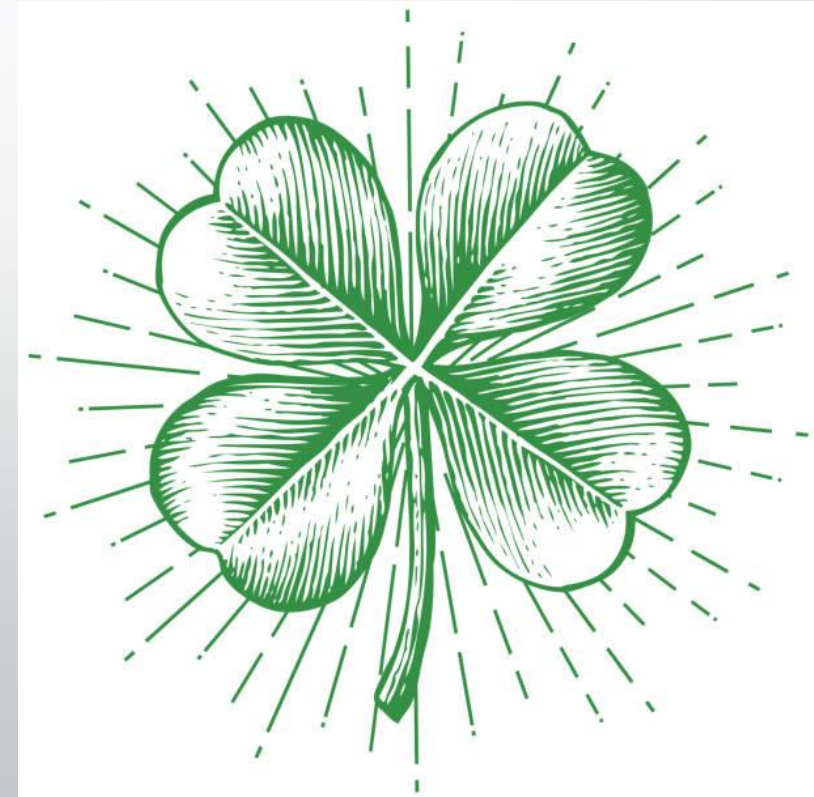
- Reference Building codes
 - ACI 318 Building Code Requirements For Structural Concrete
 - ACI 319 Precast Concrete Structural Code
 - ACI 320 Post-Tension Structural Concrete Code
 - ACI 321 Post Concrete Durability Code
 - ACI 323 Low Carbon Concrete Code
 - If ACI 323 becomes is adapted it is now the law
- Designers are required to design structures in accordance with up to 5 reference Building Codes
 - If you are a designer and you are at retirement age—now may be a good time

**Codes
documents and
specifications**



Designer's are Required to Design in Accordance with Codes

- **Who can accept a variance**
 - **Not the Owner**
 - **Not the Designer**
 - **Not the Contractor**
 - **Building Official**
 - **Good Luck**



Project Specifications

- **Who can change**
 - **Owner**
 - **Engineer**

Reality Versus Perception

- **Anything Can be Accomplished**
 - **If money is not an object**
 - **If time is not a concern**
- **Just because you can mix in the lab, does not mean that you can deliver it to project**
- **Lab-crete versus Real-crete**

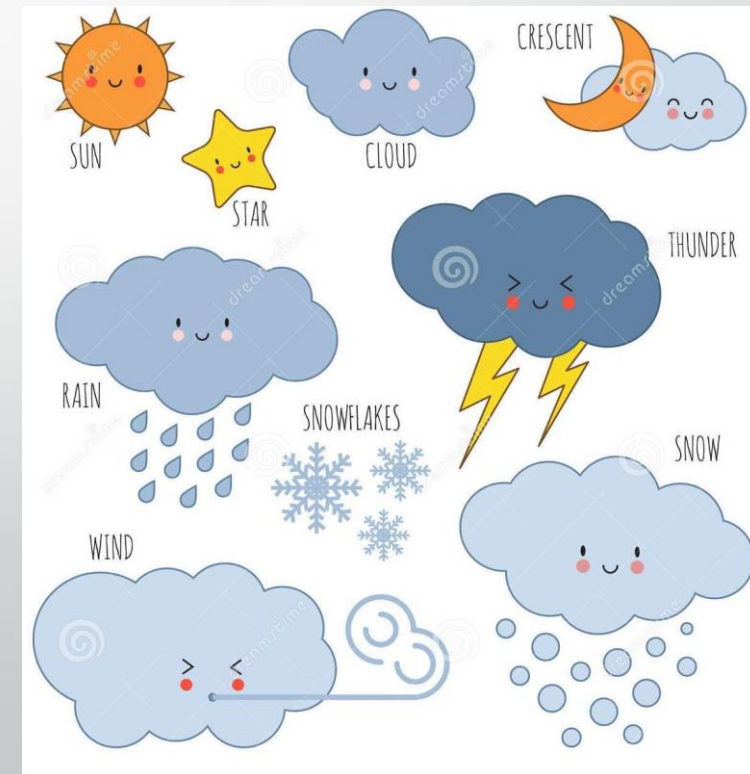


Not Always the Fault of Owners or Designers

- **The Owner, Architect, and Engineer may not understand the impact of the low carbon requirements**
- **The impact of a cement with reduced clinker, 50 % slag or 40% fly ash replacement values cast in cold weather**
- **What is required in placing and finishing 60,000 square feet of industrial floors slabs in an open environment requiring a FF of 50 and a FL of 35 with above referenced mixtures**

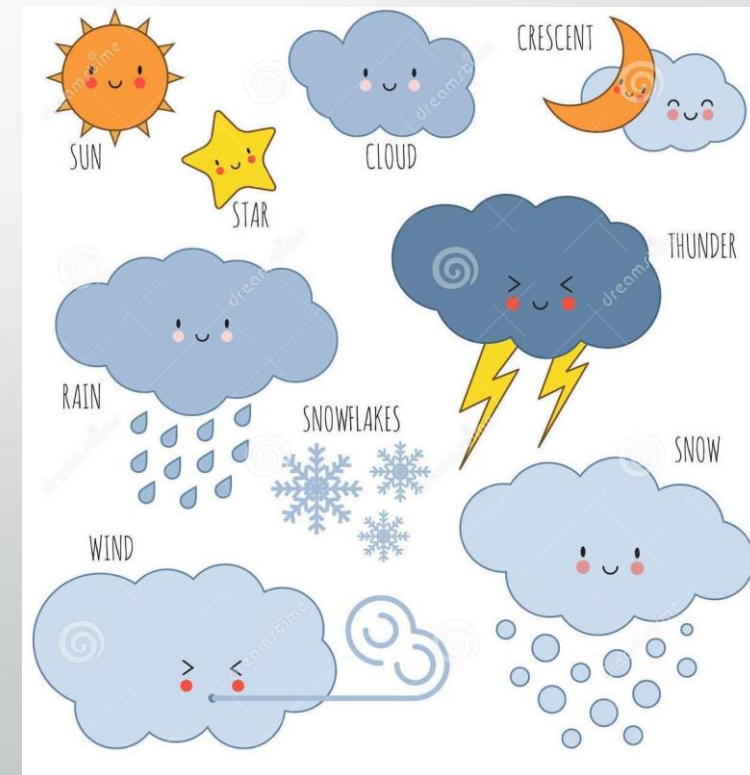
Not Always the Fault of Owners or Designers

- The value of proper testing
- The necessity for flowable concrete delivered to the project
- What is required to place a structural slab, develop 3000 psi in two days so that forms can be removed and flown to the next level using a concrete mix with low carbon mixes
- What works in July does not work in February



Not Always the Fault of Owners or Designers

- What works in Phoenix, Arizona does not work in Two Dot, Montana
- The fallout from producing a concrete mixture with a maximum water cementitious materials ratio of 0.40 with maximum cementitious material content of 500 pounds per cubic yard



Specifications

- If you agree to build a structure, or supply a material in accordance with the Specifications—you own it
 - Drawings
 - Structural notes
 - Specifications



So You Own it, Now What?

- Is it possible to comply with the Specifications
- Are the materials available at any price
- Does technology exist to meet the requirements
 - High supplementary cementitious materials
 - High early strength



So You Own it, Now What?

- **Extend acceptance from 28 and 56**
- **Remove cement**
- **Add supplementary cementitious materials**
- **Add strength enhancing admixtures**

So You Own it, Now What?

- **Optimize GWPs**
- **Propose a mix with reduction in GWPs for mixes with high GWPs**
- **Use weighted options**
- **If you are religious, pray**
- **If your are not religious, curse**

QUESTIONS

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