



# THE TEST REPORT

A Newsletter of the California Council of Testing and Inspection Agencies

## PRESIDENT'S CORNER –

By Elizabeth Levi

May 2007

Volume 8, Issue 1

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We are already into the second quarter of the year and the association has a lot of items coming out of the Annual Business

Meeting for action. The 2007 ABM was a great success and we all owe a big thank you to Miki Craig for planning and making the ABM a wonderful time for all. Outgoing President, Miki Craig, accepted a congratulatory award for her unwavering commitment to the Association. She has passed the gavel to me and I am flanked by my team of Greg Ruf (Vice President), Bob Joakimson (Secretary/Treasurer), Bill Cale (Director), David Chippero (Director), Michael Parker (Director), and Miki Craig (Immediate Past President). What a great group of leaders to work with in this Association! I am looking forward to serving as your President this year and doing my best at representing all of the firms within CCTIA. Our membership is growing strong with over 36 firms representing the state of California. As the number in members grow, so does our enthusiasm and strength in the industry grow.

One of the biggest items this year is the ASFE Regional Organization Affiliation for CCTIA. ASFE is the only nationally recognized organization that has been willing to address the certification/accreditation issue on behalf of our industry. They have the financial resources and political muscle to impact the

process far beyond what any of the RO's could provide on an individual basis. The ASFE Regional Conference is set for May 3-5, 2007 in Washington DC. We are fortunate to have both Jeffry Cannon of Terracon attending this conference to take our many industry issues to the conference for us. I am excited that the membership has agreed to be represented through this Regional affiliation which was spearheaded by Miki and Cliff Craig last year during the creation of this affiliation.

Another issue on the hot seat for us is still the local ICC Special Inspection criteria from the various Building Departments. We understand that a small group of Building Officials have started meeting again to discuss the possibility of a new Special Inspector Program, but we have not been privy to the discussions. The ICC Tri-Chapter meeting is scheduled for June 1, 2007 in Santa Cruz and CCTIA plans to have representation there by means of myself and Miki and Cliff Craig. Please plan to attend this meeting and get your reservations into Craig Oliver with the City of Marina as soon as possible. They are only allowing 70 attendees this year.

This year's board has decided to take a strong approach to education in our industry. Greg Ruf of Krazan will head this committee for us and with the help of membership determine what programs and seminars we should be moving forward with in order to be an industry leader. Please continue to bring your ideas

and suggestions to Greg so that we can finalize planning in the upcoming months.

Also, SEAONC is looking to work with CCTIA on updating their publication "Guidelines for Special Inspection and Structural Observation." Terry Egland with TEI heads up this liaison and we have discussed with the membership in our March 2007 meeting to consider allowing CCTIA to rewrite the guideline and CO-publish the new document. This would give us considerable professional recognition. This guideline quotes the code and then comments on the content. Through recent correspondence with SEAONC QA Committee, Cliff Craig with DCI has been asked to champion efforts to standardize a Special Inspection and Testing Form.

My hat goes off to Michael Parker with TEI who has decided to take over the Newsletter; this is not an easy task as you know. Please remember to get articles into Michael so that we can continue to publish quarterly. We need your news items to notify the membership!

With the many issues currently surrounding our industry, we have a lot of work to accomplish. Acting collectively, I believe CCTIA can improve our Professional image. With membership we not only have the expertise through our own firms, but the strength that comes from standing together.

We're on the Web!  
<http://www.cctia.org>



## President's Corner Continued

By Elizabeth Levi

There has never been a more important time to be a member of CCTIA. With so many issues directly impacting our firms, as well as the

industry as a whole, the benefits of being a part of this organization are clearly evident. I am profoundly grateful for the trust you have

placed in me to represent our industry as your President, and look forward to working with all of you to our mutual benefit. Let's bring it on!

## The 3rd Annual CCTIA Golf Classic

By Bill Cale



Once again the weather was perfect at Las Vegas National. Conditions were hard and fast. Participation was down from last year but new blood in the form of Bob Joakimson and Rick Van Horn complimented returning veterans Dan Cherrier and myself.

No one got hurt this year and play was spirited. Bob took over Dan's role from last year as having found most every bunker on the course.

After a shaky start, we all managed to settle down, having our way on the back nine and sprinting to the house with our heads held high.

Word on the street is that 2006 and 2007 veterans will return in 2008 as well as a few newcomers (Madam President?). 2008 is shaping up to be a milestone CCTIA event. Tentative dates are January 18 or 25.

## 6 x 12 vs. 4 x 8 Cylinders

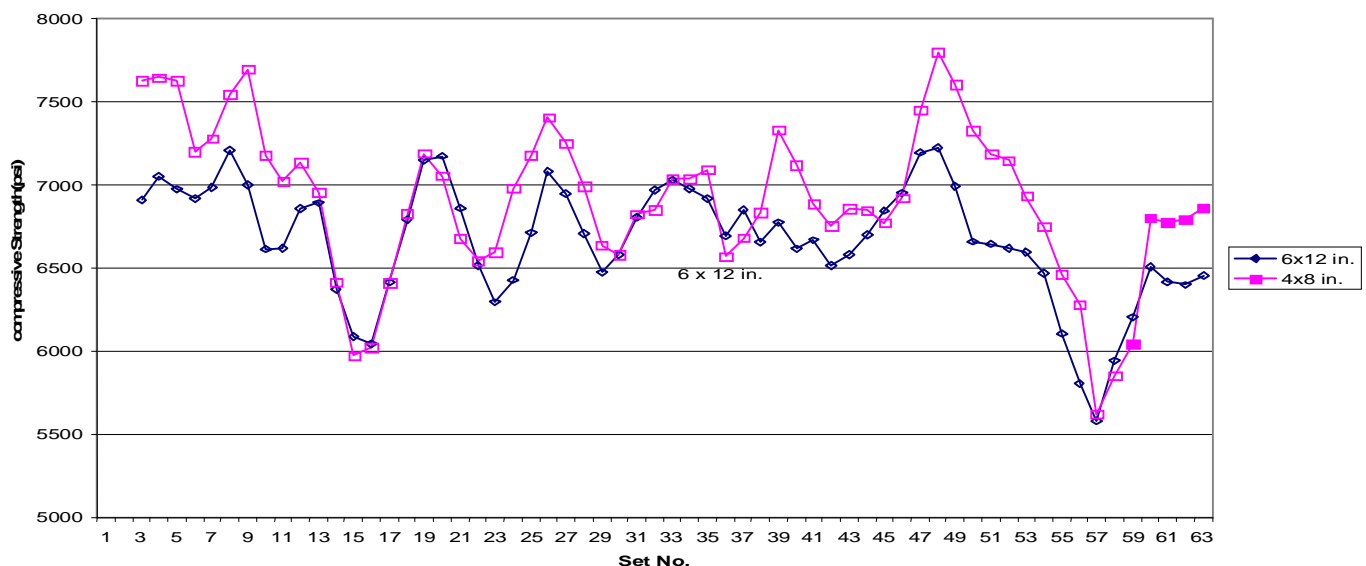
By Rick Van Horn—Engineering Manager, Construction Services (Terracon)

As codes, standards, and specifications move towards the use of 4x8 cylinders for acceptance testing, the industry wants to know – are the results from these smaller and lighter cylinders statistically reliable and comparable to those from the time-tested 6x12 cylinders? The short answer is yes, but it is crucial to owners, contractors, and testing agencies to understand the variances between the results, and the significance of these differences. This article will discuss results comparing compressive strength testing for 4x8 and 6x12 cylinders, and the advantages of using the smaller size for acceptance testing.

In-house research performed by Terracon consisted of making companion 4x8 cylinders when standard 6x12 cylinders were cast for testing. Several offices participated in the research by making a minimum of 30 companion specimens, with the resulting data analyzed in general accordance with ACI 214. The following chart presents the compressive strengths for 61 sets of 6x12 test cylinders and their 4x8 companions.

From the results of the in-house testing, it is clear that the 4x8 cylinder strengths are generally higher than their 6x12 counterparts.

6x12 vs 4x8 Rolling Average Strength





## 6 x 12 vs. 4 x 8 Cylinders (Cont'd)

In fact, they average 5% higher, which when compared to similar testing results reported in national publications, seems typical. The industry has accepted these marginally higher testing results, with such organizations as the Port Authority of New York and New Jersey and the Canadian Code Authority going so far as to eliminating the 5% correction factor. It is important to realize that compressive strength results are *correlated to*, but not directly representative of, field strength of concrete. Keeping that in mind, the continued use of 4x8 cylinders will only strengthen and clarify the *correlation* between test results and field strengths. The reasons behind the higher testing results are beyond the scope of this article.

The range between two break results is another variance in test results that increases with the use of 4x8 cylinders. As with the increase in compressive strength, this divergence was noted during in-house testing, as well as in national publications. ACI 214 uses a *within-test coefficient of variation* to determine the class of operation for different control standards. Based on the in-house testing performed, the within-test COV for the range of compressive strengths between two breaks rose almost one percent for 4x8 cylinders (3.46%), when compared to 6x12 cylinders (2.52%). Thus, the "Class of Operation" rating was changed from excellent to very good, and testing agencies in general may be hesitant to use smaller cylinders for this very reason. Again, it is important to realize that the current "Class of Operation" rating system is based on the use of 6x12 specimens, and the continued emergence of 4x8 cylinder results will most likely result in a re-examination of what constitutes "good-better-best".

To ease concerns that the increased within-test COV for the range of compressive strengths between two breaks has diminished the correlation between test results and field strengths of concrete, ACI has introduced a change in the 2008 version of Structural Concrete Code to address this issue. Acceptance testing for concrete strengths will be based on an average of three tests when

using 4x8 cylinders, and will remain at the average of two tests for 6x12 cylinders.

Though the variations in test results brought on by the use of 4x8 cylinders may seem formidable, it seems clear that time (and an increased number of 4x8 cylinder test results) will result in the widespread acceptance of utilizing 4x8 specimens for compressive strength acceptance testing. There are also some immediate upsides to using the smaller cylinders, such as:

- Worker safety – the 4x8 specimens weigh approximately 1/3 what a 6x12 cylinder weighs. Consequently, a significant reduction in capping accidents, back strain, and weight-related Worker's Compensation claims has been noted by Terracon's Safety Committee.
- Cost – there is a substantial reduction in the cost of molds, the time involved in preparing, stripping, and testing the cylinders, and in the disposal of the spent concrete.
- Storage and testing capacity – Field storage and protection is considerably easier with the smaller cylinders, and moist cure room storage capacity is greatly increased. In addition, with the introduction of stronger concrete mixes, the reduced cross-sectional area of smaller specimens will counteract the need for new strength-testing equipment.

In conclusion, there is sufficient information available to justify the use of 4x8 cylinders for compressive strength acceptance testing. There are benefits to owners, contractors, and testing agencies alike. As acceptance of this new "standard" grows, the accumulated data will counteract the perceived obstacles, and new precision statements will be forthcoming from the industry.

## FAQ: Floor Flatness & Levelness

### CONCRETE STRENGTH TESTER

Q: My laboratory has ACI Concrete Laboratory Testing Technicians – Grade I. Recently we were informed by ACI that we should be using ACI Concrete Strength Testing Technicians to break concrete. This does not seem correct since the tests for the strength tester are also in the grade I. Please advise?

A: The ACI Concrete Laboratory Testing Technician – Grade 1 certification includes capping and testing concrete cylinder specimens for compressive strength, but does not include flexural strength testing. Certification for this test may be obtained by obtaining the Concrete Strength Testing Technician or Concrete Laboratory Testing Technician – Grade 2 certification. If certification for performing only compression tests is required, the Concrete Laboratory Testing Technician – Grade 1 certification should be sufficient

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### FLOOR FLATNESS & LEVELNESS

Q: What is the difference between the new floor flatness numbers FF and FL and the old straight-edge specifications of 1/8" in 10 ft?

A: The FF and FL numbers represent a statistical calculation of the flatness and levelness of a concrete slab as determined with slope measuring equipment. Testing is performed in accordance with ASTM E1155 *Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers*. The higher the F-number the better the characteristic of the floor.



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## FAQ: Floor Flatness & Levelness

The straightedge method specifies that the gap observed under a free-standing or leveled 10 ft long straightedge shall not exceed 1/8". The problem with this method is that there is no standard method for taking measurements (i.e. number of tests, location, direction) or quantitative procedure for establishing compliance of a test surface.

The following excerpts from ACI help clarify some of the industry guidelines.

**ACI 302 *Guide for Concrete Floor and Slab Construction***  
Section 8.15.1.1 - "It is recommended that both flatness and levelness requirement be described by Face Floor Profile Number. Two separate F-numbers are required to defined the required flatness and levelness of the constructed floor surface."

Section 8.15.1.2 - "The older method of using a 10-ft straightedge can also be used to measure floor flatness, but it is much less satisfactory than the F-number system. There is no nationally accepted method for taking measurement or for establishing compliance of a test surface using the tolerance approach." This can often lead to conflict and litigation.

#### **ACI 117 *Standard Specifications for Tolerances for Concrete Construction and Materials***

Section 4.5.6 Floor finish tolerance as measure in accordance with ASTM E1155 Standard Test method for Determining Floor flatness and Levelness Using the F-Number System.

Section 4.5.7 Floor finish tolerance as measured by placing a freestanding (unleveled) 10 ft. straightedge anywhere on the slab and allowing it to rest upon two high spots within 72 hr after slab concrete placement. The gap at any point between the straightedge and the floor (and between the high spots) shall not exceed:

Conventional	
Bullfloated.....	1/2 inch
Straightedged.....	5/16 inch
Very flat.....	1/8 inch

#### **CONCLUSION**

The 1/8 inch in 10 ft specifications has been a common specification. However, it is seldom measured and rarely enforced due to it's unscientific and non-repeatable method. It is approximately equivalent to an FF of 50, which is, a very flat floor, not normally required for typical concrete slab surfaces. Most conventional slabs have flatness readings (FF) between 20 and 30.

The F number system is the preferred method of specifying and verifying compliance of floor finish tolerances and should be used in lieu of the archaic 1/8" in 10'.

Published February 2007

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#### **Got a question?**

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