Analysis of High Replacement Fly Ash in Masonry Grout
Second Test Program

In June of 2009, CMACN initiated a second test program to determine a possible maximum amount of Fly Ash that could be incorporated into a masonry grout mix proportioned by weight; rather than proportioned by volume (as outlined in Table 1 of ASTM C 476) in our initial test program. The final test results of the first test program are shown in Graph “A” (see page 2). The base-line grout mix design for our new program was proportioned by weight to meet the requirements of the 2007 California Building Code (CBC) 2103A.12.2. The base-line mix design used 564 pounds of cement per cubic yard of grout.

Twining Laboratories was again selected to prepare the samples and perform all of the tests required by the test program. Twining was selected due to their experience with our initial test program and a similar program initiated by the California Department of Transportation (Caltrans) to test high volumes of Supplemental Cementitious Materials (SCM) in their Portland Cement Concrete paving materials.

A cubic foot of Fly Ash weights approximately twenty pounds less than the equivalent volume of Portland cement. When batching by weight that is not much of a problem. The designer of the mix removes a certain weight of Portland cement and replaces it with an equivalent weight of Fly Ash. The volume of the mix is balanced by reducing the amount of fine or course aggregate. It took some time, but Twining was able to create consistent grout mix batches based on weight as outlined in CBC 2103A.12.2.

The test program required fabrication of 144 test specimens. Creating that amount of specimens with the traditional pinwheel method would have been very cumbersome, requiring a large number of CMUs and a significant amount of lab floor space. To simulate the absorption of water from the grout mix, and curing of grout in concrete masonry units, the specimens were cast in the cells of 8”X8”X16” concrete masonry units. Each specimen was saw cut out of the concrete masonry units with a wet diamond saw a couple of days before testing.

All samples were cured in a moist room complying with ASTM C 511. Each mix design sample included six sets of three specimens that were tested at 7, 14, 28, 42, 56, and 180 days.

Results to date are interesting and can be found in Graph “B” (see page 2). Each mix design has now been tested at 28 days. Results show that the base-line grout mix batched by weight and meeting the requirements of CBC 2103A.12.2 exceeds by two times the minimum grout strength required by the building code. Even the mix with 50% replacement exceeds 2,500 psi at 28 days. It is also interesting to note again the significant drop off in strength with the grout mix that replaced 60 percent of the Portland cement with Fly Ash. The Caltrans test program only replaced up to 50 percent of the Portland cement with SCM’s so they have been very interested in this apparent reduction in strength.

CMACN will continue to keep you updated with the results of the second test program. 180 day tests will be completed in mid June 2010. The initial test program has been compiled into our latest “Masonry Chronicles,” which has been mailed to all architects and engineers in California and Nevada and can be found on the CMACN website.

Continued on Page 2
Analysis of High Replacement Fly Ash in Masonry Grout
Second Test Program, Continued

Graph A

Grout Strength - Fly Ash Replacement
Batched by Volume, Table 1 - ASTM C476

Graph B

Grout Strength - Fly Ash Replacement
Batched by Weight
2010 Annual Meeting and Golf Tournament

The 2010 Annual Meeting is Thursday March 25 - Sunday March 28, 2010 at the wonderful Hilton, Torrey Pines, La Jolla, California. Our Friday afternoon forum topic will be “Codes and Standards.”

The golf registration cut-off date is February 12th, and the hotel and CMACN Registration cutoff date is February 24th.

PLEASE SEND IN YOUR CMACN REGISTRATIONS.

If you are having difficulty making hotel reservations, please contact the CMACN Office.

Galen has again selected the perfect golf course for the Saturday Tournament at Torrey Pines South Course, home of the 2009 US Open. The cost is $310, which includes everything but food and beverages. Galen booked space for 32 golfers and we now only have 5 slots left. Tee times will start at 8:30 a.m. It has been said that the views alone are worth the price, so please send your golf registrations in before February 12th.

2010 Fall Meeting /Design Awards Note

We are very excited to announce that the Monterey Plaza Hotel & Spa has been selected as the new site for our 2010 Fall Meeting. The Monterey Plaza Hotel & Spa is perched on the edge of Monterey Bay in the heart of Cannery Row. Activities, wildlife and scenery abound.

Our meeting will take place Thursday, September 23rd, through Sunday, September 26th, 2010. The Friday afternoon forum topic will be announced after our Annual Meeting. We are sure our Golf Chairman, Galen Thurner, will select the perfect golf course for the Saturday tournament.

NOTE: At the January Executive Committee Meeting, the Committee voted to postpone the CMACN/AIACC Concrete Masonry Design Awards Competition until 2011. We unfortunately lost our venue for the 2010 program at Quail Lodge due to their bankruptcy and during the aftermath, we conducted an informal architect poll that determined it was mutually agreeable to hold off the award program until 2011. This change will be announced to all architects on the January issue of “CMU Profiles in Architecture”, which will be mailed the last week of January.
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### CALENDAR

**Note:** There are instances when scheduled events may be changed or our participation in them may be changed due to unexpected events that arise prior to the actual date of the event reported.

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<tr>
<th>Month</th>
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<th>Event</th>
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<td>NCMA Energy Training</td>
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<td>January</td>
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<td>CCTIA Meeting, Las Vegas, NV</td>
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<td>World of Concrete, Las Vegas, NV</td>
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<tr>
<td>February</td>
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<td>President’s Day Holiday - Office Closed</td>
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<td>March</td>
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<td>Seminar at RCP Block &amp; Brick, Lemon Grove, CA</td>
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<td>March</td>
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<td>California Green Summit, Sacramento, CA</td>
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<td>March</td>
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<td>NCMA Annual Convention, San Antonio, TX</td>
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<tr>
<td>March</td>
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<td>CMACN Annual Meeting, La Jolla, CA</td>
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<tr>
<td>March</td>
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<td>April</td>
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Please contact the CMACN office with any questions or concerns. (916) 722-1700, E-mail info@cmacn.org, Fax (916) 722-1819 6060 Sunrise Vista Drive, Suite 1990 Citrus Heights, CA 95610 [www.cman.org](http://www.cman.org)