

Trinic LLC Test Results –Pozzolans

Notes:

In this round of testing we used slag and bright white silica fume (BriteFume) in the mixes.

We once again maintained a water to cement ratio of .31 for most of the tests. We did however drop to a .24 w/c ratio on a silica fume mix to show what was possible with Trinic’s admixtures.

We used minimal heat for curing. We covered the samples in plastic then we used homeowner type electric blankets to cure overnight.

We continued to cure the samples (after stripping) at our ambient shop temperature of 60 degrees. We did this to assimilate winter shop conditions in the majority of our customer’s shops.

Test 1 - Wet Cast about 50-50-38 (90-10 cement slag)-11 per cubic foot

- 34.2 lbs. Trinity Type 1 White Cement – 90%
- 3.8 lbs. Lafarge Slag – 10%
- 50 lbs. ASTM C-33 concrete sand, sedimentary type.
- 50 lbs. 3/8” well graded pea gravel
- 11.8 lbs. potable water
- 3% Trinic WetCast Admixture (3% of 38 lbs. cement = 1.14 lbs)
- Mix consistency – close to self consolidating, no vibration required
- Overnight heat = 110 degrees

Compressive test results:

1 Day			7 Day			28 Day		
Time / Date	Break	Average	Date	Break	Average	Date	Break	Average
3/22/2013	5293	5261	3/28/2013	7676	7476	4/19/2013	9776	9837
7:00 AM	5228		cure=60	7275			9897	
17 hrs								

Test 2 – GFRC 60-60 (90-10)-18 about 1 cubic foot

- 54 lbs. Trinity type I White Cement
- 6 lbs. Lafarge Slag
- 60 lbs. Quikrete medium concrete sand – the composition of this sand varies depending on where you buy it, the gradation should be the same no matter where you buy it.
- 18.6 lbs. potable water
- 3% Trinic, GFRC Admix (3% of 60 = 1.8 lbs)
- Mix consistency – flowable

Trinic LLC 2nd Round Test Results –Pozzolans

Compressive test results:

1 Day			7 Day			28 Day		
Time / Date	Break	Average	Date	Break	Average	Date	Break	Average
3/22/2013	5762	5856	3/28/2013	6918	6902	4/19/2013	9423	9545
7:00 AM	5949		cure=60	6885			9666	
16.5 hrs								

Conclusions and observations:

- On both WetCast and GFRC type mixes using a 10% cement replacement with slag had minimal effect on strength. They next day results were a little lower than similar cement only mixes.
- This is typical of the performance of most average pozzolans.
- One advantage to using a pozzolan is the lowering of calcium hydroxide or free lime within the concrete matrix. This advantage would not be applicable to topical sealer but does enhance the performance of Trinic’s penetrating and hybrid sealers.

White Silica Fume (BriteFume) Mixes

We started by testing silica fume (white and grey) from various manufacturers to evaluate water demand as well as strength development and color. We were fortunate to find a bright white silica fume (BriteFume) that not only had the lowest water demand but also strength enhancement similar to a well know brand of dark grey silica fume which has become the pre-cast and ready mix industry’s go to product when high strength concrete is required .

We used Q-Rok sand from US Silica for the tests: Q-Rok sand has a very low absorption factor so we were able to evaluate water demand of different fumes without worrying about absorption.

Test 3 – GFRC 60-60 (95-5)-18 about 1 cubic foot

- 57 lbs. Trinity type I white cement – 95%
- 3 lbs BriteFume White Silica Fume – 5%
- 60 lbs. Q-Rok #1 Silica Sand from US Silica Corp
- 18 lbs. potable water
- 3% Trinic, GFRC Admix (3% of 60 = 1.8 lbs)
- Overnight Cure - 110
- Mix consistency – Flowable

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Compressive test results:

1 Day			7 Day			28 Day		
Time / Date	Break	Average	Date	Break	Average	Date	Break	Average
3/29/2013	6828	6833	4/5/2013	8664	8560	4/26/2013	11456	11777
7:00 AM	6837			8456			12098	

Test 4 – GFRC 60-60 (90-10)-18 about 1 cubic foot

- 54 lbs. Trinity type I white cement – 90%
- 6 lbs BriteFume White Silica Fume – 10%
- 60 lbs. Q-Rok #1 Silica Sand from US Silica Corp
- 18 lbs. potable water
- 3.5% Trinic, GFRC Admix (3% of 60 = 1.8 lbs)
- 20 ounces/cwt Trinic Stage 2 Accelerator
- Overnight Cure - 110
- Mix consistency – Flowable

Compressive test results:

1 Day			7 Day			28 Day		
Time / Date	Break	Average	Date	Break	Average	Date	Break	Average
3/29/2013	7150	7145	4/5/2013	9967	9517	4/26/2013	12986	12665
7:00 AM	7141			9067			12343	

Test 5 – GFRC 60-60 (90-10)-14.4 about 1 cubic foot

For test 5 we lowered the w/c ratio to .24 and added an additional 1% Trinic Plasticiser for fluidity.

Actual test can be view here: <http://www.youtube.com/watch?v=lf0pd0kcitc>

- 54 lbs. Trinity type I white cement
- 6 lbs BriteFume White Silica Fume
- 60 lbs. Q-Rok #1 Silica Sand from US Silica Corp
- 14.4 lbs. potable water
- 3.5% Trinic, GFRC Admix (3% of 60 = 1.8 lbs)
- 1% Trinic Plasticiser (1% of 60 = .6 lbs.)
- 20 ounces/cwt Trinic Stage 2 Accelerator
- Overnight Cure - 110
- Mix consistency – Flowable

Compressive test results:

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1 Day			7 Day			28 Day		
Time / Date	Break	Average	Date	Break	Average	Date	Break	Average
4/5/2013	7598	7643	4/12/2013	11234	11455	5/10/2013	14980	15327
7:00 AM	7688			11675			15673	

Conclusions and observations:

- Silica fume is the most powerful pozzolan available. The particle size is 100 times small than cement and other pozzolans such as VCAS, Slag, or Bottle Pozz.
- The increased water demand was minimal with the BriteFume Silica Fume we tested.
- 5% cement replacement is adequate for most mixes with diminishing returns as you approach 10% cement replacement.
- There was no loss of next day strength that occurs with other pozzolans.
- The bright white color had no negative effects on the mix color.
- By incorporating Trinic Stage 2 accelerator in the mixes we were able to exceed 7,000 PSI overnight with minimal heat.
- Mixes in excess of 10,000 PSI are easily possible with 15,000 PSI concrete within the reach of every fabricator.
- The increased density and lower calcium hydroxide of silica fume mixes enhance the performance of Trinic SB Sealer, more tests to follow.

Please contact me with any questions, thanks.

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