



Concrete Masonry Block

Concrete products made with waste glass as aggregate can be categorized as either “commodity” products or “value-added” products. The primary purpose of commodity products is to use as much waste glass as possible. Concrete masonry blocks were felt to be suitable for absorbing large quantities of it. Such blocks are manufactured by relatively few producers with good quality control in typically highly automated facilities. By initially limiting the goal of aggregate replacement by glass to 10%, the solution of the ASR problem seemed to be manageable. In addition, it was found that very finely ground glass (of size 38 μm or less) has pozzolanic properties and therefore may serve as an effective partial cement replacement.

It was found that, for reasons not yet completely understood, very small glass particles cause no measurable expansions in the ASTM C 1260 test. Therefore it was proposed to grind the glass so finely that it passes US standard sieve #100 (0.15 mm). It is virtually impossible to see without magnification whether blocks contain glass of such fineness.

Trial Batches

Four trial batches were produced, using the facilities of Barrasso and Sons of West Islip, Long Island:

- Batch A – manufacturer’s standard concrete block mix;
- Batch B – replace 10% of the fine aggregate (sand) by New York City waste glass, ground to size -#30 (0.6 mm);
- Batch C – replace 10% of the cement by glass powder of size -#400 (38 μm);
- Batch D – replace both 10% of the sand and 10% of the cement.

Strength results showed no significant differences between the four batches.



Acceptance Testing for Certification by Building Officials

In order to get approval from building officials for general use of the glass concrete blocks it needs to be shown that all performance specifications can be met, such as strength, linear shrinkage, absorption, and fire rating. None of these requirements appear to be difficult to satisfy.

Economics

An economical analysis has been performed to show that a 10% glass substitution for sand and cement can be commercially viable in the New York Metropolitan area. In particular, it was found that the block machine throughput was improved by about 6%, presumably because the glass particles improved the flow properties of the concrete mix.

Research Sponsor

- New York State Energy Research and Development Authority