Silica Fume - High Strength Concrete

Silica fume high strength concrete is now readily available from many concrete plants. Strengths of 100MPa are available in some locations.

**Economics**

The drive behind silica fume high strength concrete is economics.

- **Columns.** Figure 2 shows that the lowest column cost to carry a given load results by using silica fume high strength concrete and deleting expensive reinforcing steels.

- **Shaft Walls.** The great economic benefit is indirect. For example the value of extra floor space when 80MPa silica fume high strength concrete is used instead of 40 Mpa concrete could be as much as 50% of the core construction cost.

- **General.** Wherever concrete is in compression high strength concrete can be used to reduce material cost. Inevitably other cost savings are even greater. For example thinner tunnel segments leads too a great saving in excavation costs.

**Physical Properties**

Strength requirements are balanced between early age for stripping and long term structural performance. Silica fume is a key component of high strength concrete as it contributes to strength at early and later ages (fig 3).
Concrete shall be supplied with the specification:

- Silica fume high strength concrete shall be placed these calculations shall be approved by the Engineer.

**TECHNICAL SUPPORT**

High strength concrete

High strength concrete is far more difficult to achieve at the job site than in the laboratory. Factors like pumpability (fig 1) and setting time for slip forming makes it is essential that the project team (fig 7) work together for success. Our group can assist in establishing a functional project team.

**GENERAL**

Scancem Materials are able to provide technical support related to most aspects of the use of concrete in construction. This support takes the form of:

- Meeting with the Owner, Architect, Engineer and/or Contractor to develop a cost effective and technically appropriate silica fume concrete option that invariably offers advantages to all parties, “the win, win approach”.
- Presentation to interested parties on the mechanisms by which silica fume concrete provides solutions to construction problems.
- Report preparation that details the design methods and assumptions used for any analysis undertaken and includes published papers supporting the use these design methods.
- Use of computer models to calculate the dosage of special additives.

**SUGGESTED READING**


**SPECIFICATION**

Where silica fume concrete is to be used the general specification clauses outlined on the “Silica Fume ” brochure shall be included in the concrete specification. Additionally, silica fume high strength concrete shall be specified by including the following clauses in the standard concrete specification:

- Concrete shall be supplied with the following physical properties:
  - Min. Characteristic Strength:
    - 7 day  ____ Mpa
    - 28 day  ____ Mpa
    - 90 day  ____ MPA

  Maximum Shrinkage at 50 days  ____ ustrain.

  Test reports showing that the proposed mix will meet these requirements shall be provided before placing any silica fume high strength concrete.

  Creep, E-modulus and tensile strength shall be calculated using design formula developed for use with silica fume at the designated strength. Before silica fume high strength concrete shall be placed these calculations shall be approved by the Engineer.

**Figure 6 - Shrinkage of silica fume high strength concrete. Provided silica fume high strength concrete is cured for 24hrs shrinkage is likely to be similar or less than normal concrete. (ref I.Burnett CSR)**

**Figure 7 - Teamwork for Silica Fume high strength concrete. To successfully design, manufacture, transport, place and finish silica fume high strength concrete all parties must work together (ref Paver, 1993)**

**Figure 8 - Melbourne Central. Silica fume was used to provide high strength pumpable concrete.**

The information given is based on knowledge and performance of the material. Every precaution is taken in the manufacture of the product and the responsibility is limited to the quality of supplies, with no guaranty of results in the field as Scancem Materials has no control over site conditions or execution of works.

Scancem Materials

Products For Engineered Concrete

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