By substituting up to 4 parts of cement with 1 part of silica fume the total heat generating capacity of concrete is reduced. Weight for weight silica fume generates approximately the same amount of heat as cement, so the temperature rise and differential are reduced at all element thicknesses.

By slowing the rate of hydration, thereby giving time for heat to escape, slag and fly ash reduce temperature rise and differential. Bamforth’s curves (fig 1) show that the effectiveness of this diminishes as the element thickness increases. In thick sections the heat is locked in.

Using Bamforth’s curves we can establish that there is a point where the silica fume reduces heat more effectively than slag (fig 2).

To more precisely quantify the relative effectiveness of different cementitious systems tests were undertaken at Taywood Engineering’s laboratories in Perth, Australia.

The adiabatic temperature rise of four concretes mixes (Table 1) designed to have the same 28 day compressive strengths. In thicker sections the silica fume low heat concrete performs better than the slag.

Figures 5 and 6 shows that insulation would be used to minimise temperature differentials as peak temperature is not an issue. In the 800mm section silica fume low heat concrete is as effective as the slag concrete but has far higher early age strengths. In thicker sections the silica fume low heat concrete performs better than the slag.

Silica fume low heat concrete is designed to meet the specific maximum temperature and temperature differential requirements of a project.

### Table 1 - Mix designs for OPC, silica fume and slag concrete’s designed to have the same strength.

<table>
<thead>
<tr>
<th>Slab Thickness (m)</th>
<th>OPC</th>
<th>CSF</th>
<th>Slag</th>
<th>Slag &amp; CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>3.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Low Temperature Rise and Temperature Differential
- Silica fume is the only effective supplementary cementitious material in thick sections.

### High Early Age Strength
- No delay to prop and formwork removal
- Early finishing

### High Durability
- Resistant to sulphates, chlorides and acids
- Shorter curing period

### Waterproof
- The silica fume low heat concrete will act as an integral waterproofer as well

### Simple Placing
- Less risk of segregation
- Improved pumpability

### Low Shrinkage and Creep

Figures 5 and 6 shows that insulation would be used to minimise temperature differentials as peak temperature is not an issue. In the 800mm section silica fume low heat concrete is as effective as the slag concrete but has far higher early age strengths. In thicker sections the silica fume low heat concrete performs better than the slag.

Silica fume low heat concrete is designed to meet the specific maximum temperature and temperature differential requirements of a project.
LOW HEAT CONCRETE

Detailed advice can be provided on the potential temperature rise and differential for Silica fume Low Heat Concrete as placed in various curing situations. The effect on thermal cracking can be provided.

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, 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 of these design methods.
- Use of computer models to calculate dosages of special additives.

SUGGESTED READING