

Tecnosil Silica Ativa, Bairro São Roque da Chave, Itupeva, SP – Brazil

## Nanosilica with microsilica – a more than efficient combination

One of the largest construction sites in SP, the Madeira Building, is located in the city of Barueri and consists of 26 floors, with the purpose of mixed commercial and residential use. This construction required special attention because, due to the schedule, concrete with high strength at an early age was needed, approximately 40.0 MPa at the age of 5 days, even with the use of CP II or CP III cements. In the tests done on the concrete it is possible to observe strengths at 28 days of around 70.0 MPa in some cases, and a modulus of deformation of up to 50.0 GPa, something very difficult to achieve with the conventional materials used by concrete mixers. The technological control performed by Qualitec required a high degree of technical competence, because to achieve numbers of this magnitude it was necessary to use the latest equipment and trained professionals alert to any possible interference in the processes.

■ Eng. Laertes Brangioni Jr.,  
Qualitec Controle Tecnológico ■

As for the results achieved in concrete, they were only possible thanks to the bonding of the nanosilica present in the additive used together with the microsilica, which works as follows.

Basically, microsilica acts in two ways:

- The chemical effect: the pozzolanic reaction of silica with the calcium hydroxide forms more CSH gel until the final development of the mechanical properties.
- The physical effect: microsilica is 100 times smaller than cement. Microsilica fills the empty spaces and participates in the hydration of the cementitious paste, offering less porosity and greater compactness, which results in a denser concrete with a higher modulus of elasticity.

With nanosilica these actions can be leveraged both in terms of their mechanical properties and in the durability of concrete. That is due to the increase of the specific surface acting on the nucleation of the precipitation of the CSH gel. Thus, higher initial



*Approximately 23,000 m<sup>3</sup> of concrete have been poured into this construction*

strengths are obtained. With the features presented, there would be a greater need for water, which must be avoided through the use of an additive capable of efficiently dispersing the ultrafine particles.

Furthermore, nanosilica makes a major contribution in the paste-aggregate transition zone, which allows a high performance in flexural strength and compressive strength to be obtained. With the use of nanosilica it is important to check the compatibility of

the mechanical properties of the materials constituting the concrete, including the mechanical strength and porosity of the small-size and coarse aggregate. Concrete with nanosilica exhibits a more uniform and compact microstructure. Nanosilica reacts with the CaOH<sub>2</sub> crystals, thus reducing them. ■

### FURTHER INFORMATION



Tecnosil Silica Ativa  
Rua América Simões, 119<sup>a</sup>  
Bairro São Roque da Chave, Itupeva, SP – Brazil  
T +55 11 4591 2078  
F +55 11 4593 1593  
[tecnosil@tecnosilbr.com.br](mailto:tecnosil@tecnosilbr.com.br)  
[www.tecnosilbr.com.br](http://www.tecnosilbr.com.br)



Qualitec Controle Tecnológico  
Av. Dr. Silvio Margarido, 12  
São Paulo, Brazil  
T +55 11 3782 5300  
[www.qualitec.eng.br](http://www.qualitec.eng.br)



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