

# Sika ViscoCrete®

Self Compacting Concrete



**No more vibration**

- ▲ Cost effective technology
- ▲ Faster placing with reduced labour and equipment
- ▲ No vibration and less finishing
- ▲ Reduced noise in the environment
- ▲ Improved health and safety condition
- ▲ Improved quality and durability



# Sika ViscoCrete® Technology

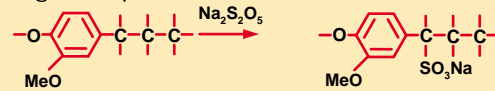
## Sika – Leading Through Constant Innov

The Major Advances  
in Admixture  
Polymer Chemistry

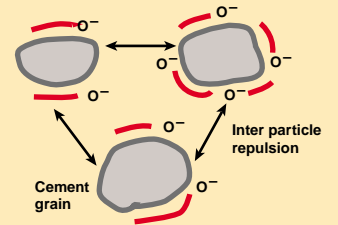
The Leading  
Products and  
Technologies

1930

Lignosulphonates

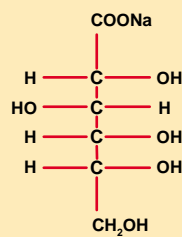


Plastocrete®

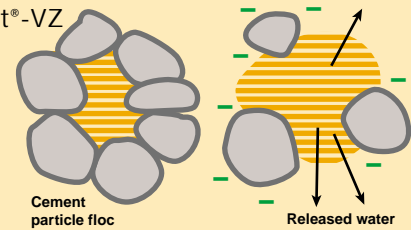


1940

Gluconates



Plastiment®-VZ

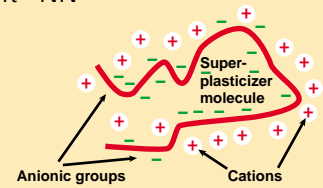


1970

Sulphonated naphthalene  
polymers

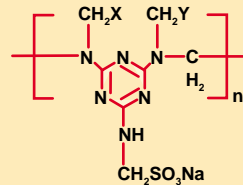


Sikament®-NN

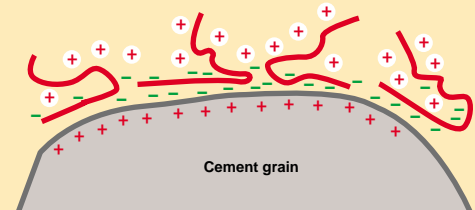


1980

Sulphonated melamine  
polymers

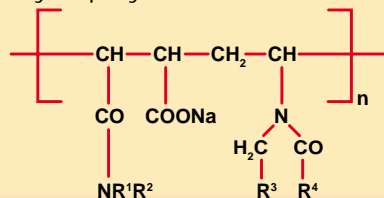


Sikament®-300/-320

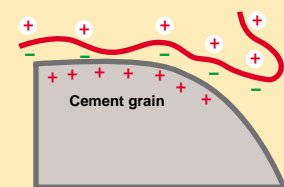


1990

Vinylcopolymers

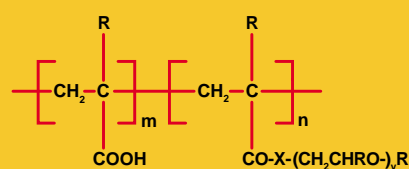


Sikament®-10/-12

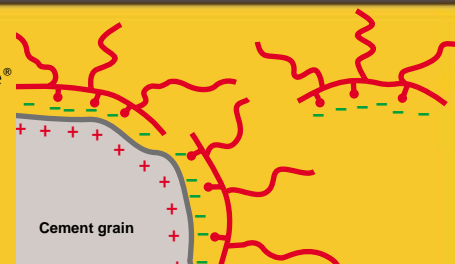


2000

Modified polycarboxylates

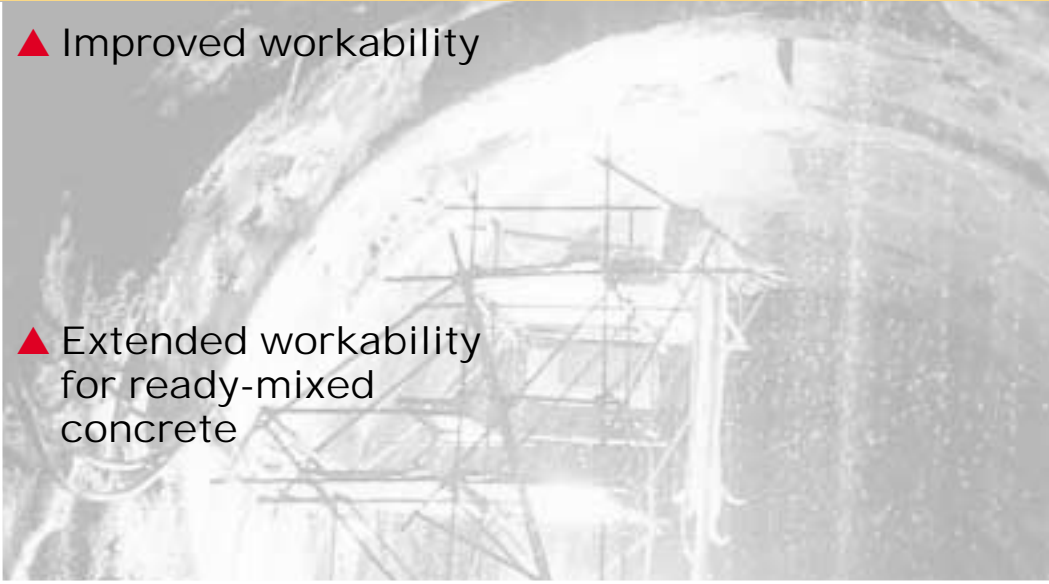
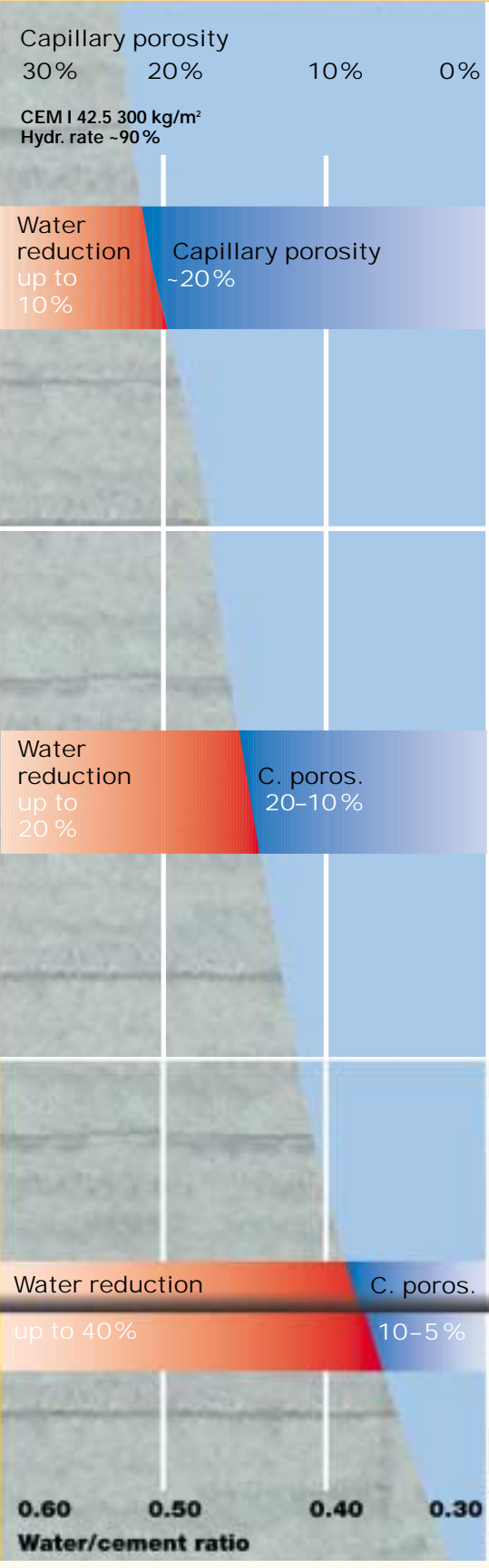


Sika  
ViscoCrete®



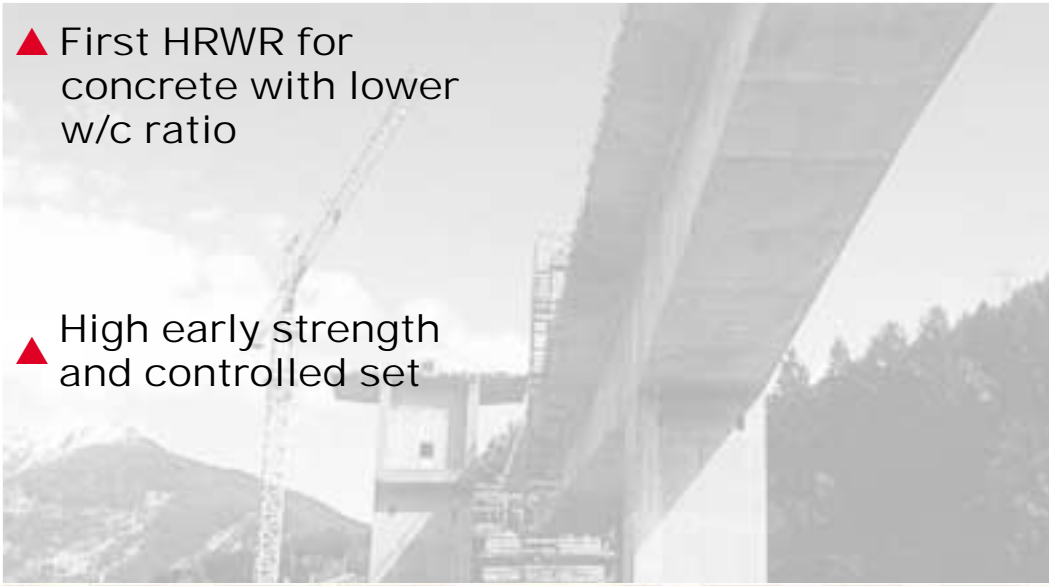
## Continuous Improvement in Performance

## Technical Advances



▲ Improved workability

▲ Extended workability for ready-mixed concrete



▲ First HRWR for concrete with lower w/c ratio

▲ High early strength and controlled set



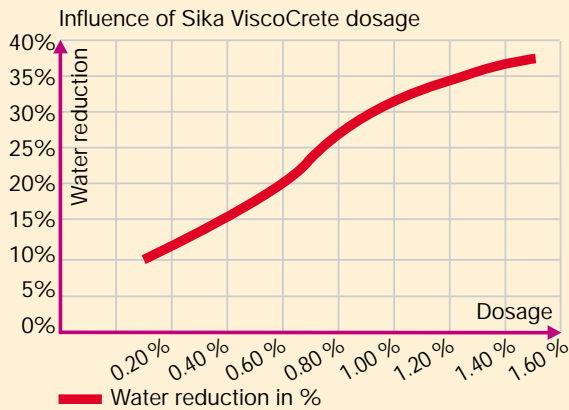
▲ Improved HRWR for concrete with extended workability and very low permeability

▲ Self Compacting Concrete

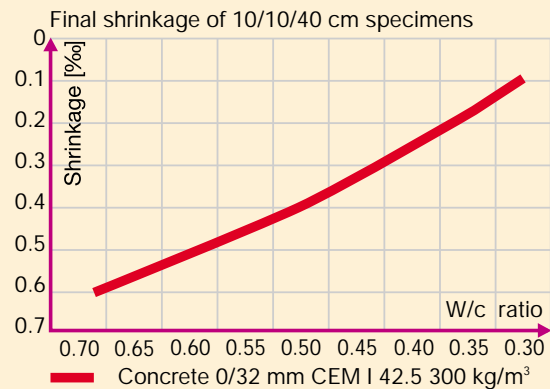
# Sika ViscoCrete® Technology

## Sika ViscoCrete® Admixture Technology for High Range Water Reduction

### Water Reduction in Relation to Dosage



### Reduced Shrinkage by Water Reduction



#### Double Action Dispersing Effect

- ▲ Revolutionary possibilities to control the dispersing effect because of chemically designed polymers.
- ▲ The early contact of hydrating cement grains is sterically hindered by three-dimensional polymers.



## Advantages of Sika ViscoCrete® as a Powerful Super-plasticizer

#### Fresh Concrete

- ▲ Outstanding workability
- ▲ Tremendous flowability because of optimized combination of polymers
- ▲ Very homogeneous and stable concrete because of special additives
- ▲ Extremely smooth finish with proper mix design

#### Hardened Concrete

- ▲ Highest density because of strongest water reduction
- ▲ High strength because of minimum voids
- ▲ Excellent waterproofing performance
- ▲ High durability because of low permeability
- ▲ Reduced shrinkage by reducing water content
- ▲ Reduced rate of carbonation and chloride ingress due to reduced porosity

# Sika ViscoCrete® Concrete Technology for Self Compacting Concrete (SCC)

## ▲ No Vibration

Sika ViscoCrete® SCC is extremely cohesive and flowable without segregation. These excellent properties make the SCC capable of being placed without vibration.

## ▲ Flowability

Because of its special mix design, SCC shows a most smooth and flowable consistency. Dependent on the method of placing and the mix design, the slope of SCC will be lower than 3% and might be down to 0% installed under pressure.

## ▲ Properties of Sika ViscoCrete® SCC Technology

Sika ViscoCrete® gives a very low water content, strong internal cohesion and the concrete will have extremely good workability.

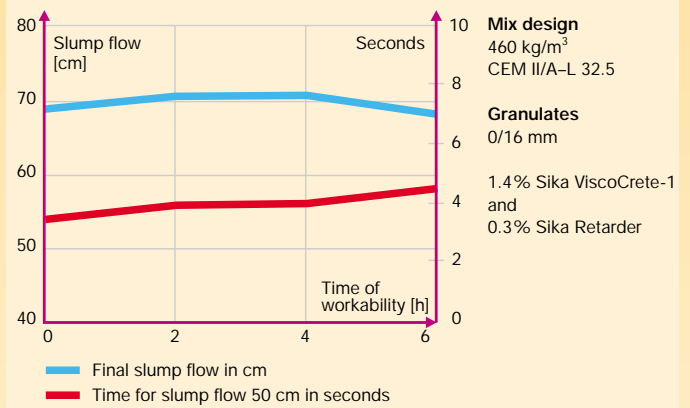
## ▲ Application

SCC can be produced in most concrete batching equipment in ready mix or precast plants. It can be placed as pumped concrete, poured directly or by skip.

## ▲ Less prone to Grout loss from joints in shuttering.



## Flowability of Self Compacting Concrete (SCC)



# Advantages of Sika ViscoCrete® for Self Compacting Concrete (SCC)

## ▲ Performance

The extremely fluid and soft consistency allows fast placing of concrete.

## ▲ Noise Reduction

Placing the concrete without vibration gives a dramatic reduction in noise. This greatly improves the environment for both employees and neighbours.

## ▲ Economy

Speed of placing, highest quality without defects to rectify and possible reductions in manpower and equipment result in lower overall cost.

## ▲ Quality

Consistent high standards can be achieved.

## ▲ Health Benefits

"White finger syndrome", a serious injury from vibration equipment is prevented.

## ▲ Flowability

The outstanding flow properties of Sika ViscoCrete® SCC allow production of complex and fine elements even through congested reinforcement.

## ▲ Durability

The cohesion of the fresh concrete and no negative effects from vibration result in a more homogeneous surface layer. This will reduce the permeability and increase resistance against chloride ingress, carbonation and other chemical attack.

# Sika ViscoCrete® Self Compacting Conc

## Guidelines for the SCC Mix Design

### Aggregates

Preferably maximum grain sizes between 10 and 20 mm are used, but other sizes are also possible.

#### Typical Aggregate Content

0-5 mm	50 %
5-10 mm	25 %
10-20 mm	25 %

### Fines $\leq 0.125$ mm

The necessary fines content of the mix depends primarily on the maximum aggregate size, but also on the use of the concrete. The fines content is generally much higher than with conventional concrete. The total fines content includes the cement, fines from sands and additives such as silicafume.

#### Typical Fines Content

SCC 10 mm	$\geq 550$ kg/m <sup>3</sup>
SCC 20 mm	$\geq 475$ kg/m <sup>3</sup>

### Binder

The cement/binder content is determined by the required quality and the fines content and also depends on the maximum aggregate size.

#### Typical binder content

SCC 10 mm	450-500 kg/m <sup>3</sup>
SCC 20 mm	375-450 kg/m <sup>3</sup>

### Water

The water content in SCC has an influence on the quality of the hardened concrete regarding final strength, capillary porosity, etc. Generally the water content in concrete of low to medium quality is above 200 l/m<sup>3</sup>, while concrete of medium quality has between 180 and 200 l/m<sup>3</sup>, and high quality concrete typically has less than 180 l/m<sup>3</sup>.

### Concrete Admixtures

In order to achieve the low water content, cohesion and viscosity of SCC with a homogeneous mix, it is necessary to use a high quality Sika ViscoCrete® admixture.

## The Sika Products

### Sika ViscoCrete®-5

For Self Compacting Concrete with extended workability or for higher ambient temperatures

### Sika ViscoCrete®-2015

For Self Compacting Concrete with normal workability or for cooler ambient temperatures

### Sika ViscoCrete®-2200

For Self Compacting Concrete in low ambient temperatures

### Sika ViscoCrete®-2010

Powerful Super-plasticizer for precast concrete production and for strongest water reduction in ready mix concrete

### Sika ViscoCrete®-Stabiliser

For Self Compacting Concrete in all applications

## Fresh Concrete: Measuring and Assessment

### Slump Flow Test



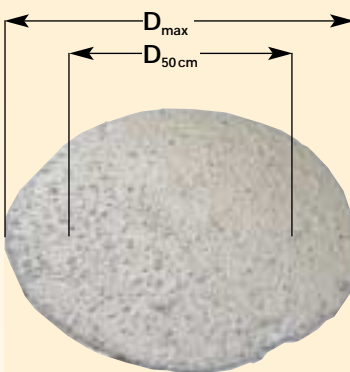
Filling the slump cone without compacting. The surface should be horizontal and the cone filled completely.



Carefully lift the cone from the level surface. The concrete flow should not be broken by lifting the cone too quickly.



Assessment of flowability: Measure time until diameter of 50 cm is achieved. Measure maximum diameter. Check homogeneity and segregation especially at the edge.



Diameter  $D_{max}$ : 65–75 cm  
Flow:  $D_{50cm}$  after 3 to 6 seconds  
Check homogeneity at the edge

### L-Shaped Box



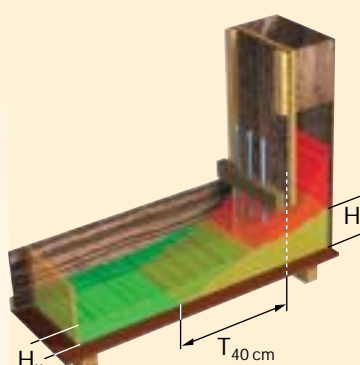
Fill the box without compacting: The surface should be even and the cylinder completely filled. Check for no segregation on the surface.



Quick lifting of the gate: The concrete flow has to be continuous whilst lifting the gate.



Assessment of flowability: Measure time until concrete has reached 40 cm. Measure time until concrete reaches end of box. Measure height difference of concrete after flow has stopped.



**European L-Box**  
Flow:  $T_{40\text{ cm}}$  after 3 to 6 seconds  
 $H_{x\text{ cm}} / H_{0\text{ cm}} > 0.80$

**Japanese L-Box**  
Flow:  $T_{50\text{ cm}}$  after 3 to 6 seconds  
 $T_{83\text{ cm}}$  after  $\geq 45$  seconds

# Sika ViscoCrete® Technology: International

## Concrete for a Revolving Restaurant in Lucerne, Switzerland

### Main Project Description

The owner of a historical building wanted to build a revolving restaurant on the ground floor. Because of the difficult conditions it was necessary to have a very high reinforced concrete.

### Why SCC was Used

The existing building was built on piers, and erecting a new structure on these piers was a difficult challenge. The problem was solved by using the new Sika ViscoCrete® SCC technology.

### Sika Solution

#### Concrete Mix Design

Aggregate grading	0/32 mm
Binder	350 kg/m <sup>3</sup> CEM I 42.5 + 75 kg fly ash
Admixture	1.2% Sika ViscoCrete-2

### Sika ViscoCrete® Solution

The first use of SCC concrete in Switzerland with aggregates of maximum 32mm.

### Test Results

#### Fresh concrete

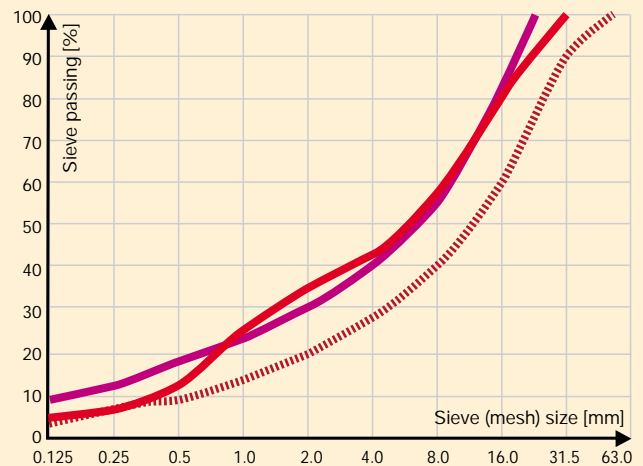
W/B ratio	0.40
Density	2445 kg/m <sup>3</sup>
Air content	0.5%
Slump flow	SF <sub>50cm</sub> = 4' SF <sub>max</sub> = 69 cm

#### Hardened concrete

F<sub>cw</sub> 7 d = 45.9 N/mm<sup>2</sup>

### Project Requirements

- Concrete compressive strength: B 40/30
- Application on concrete without vibration
- Pumped concrete





# nal Case Studies



## Concrete Column Encasements, M61, England

### Main Project Description

The project used SCC to upgrade bridge columns on a motorway bridge. In total more than 60 columns were produced in Self Compacting Concrete.

### Why SCC was Used

This technology was used due to the difficulty of ensuring adequate compaction in columns which were heavily congested with reinforcement.

### Sika Solution

#### Concrete Mix Design

Aggregate grading	0/20mm
Binder	480 kg/m <sup>3</sup>
Admixtures	2% Sika Viscocrete-2015
	0.15% Viscocrete Stabiliser

### Test Results

#### Fresh concrete

W/B ratio	0.38
Density	2400 kg/m <sup>3</sup>
Air content	aprox 1%
Slump flow range	700 - 800

#### Hardened concrete

Compressive strength @ 1 day	17N/mm <sup>2</sup>
Compressive strength @ 28 days	72 N/mm <sup>2</sup>



CLIENT: Highways Agency  
CONSULTING ENGINEERS: Parkman  
CONTRACTOR: Eric Wright C.E.  
CONCRETE SUPPLIER: Hanson Premix



# Sika ViscoCrete® Technology: Internatio

## Shark and Penguin Aquariums at the Oceanopolis Marine Park in Brest, France

### Main Project Description

An extension of the marine park Oceanopolis near Brest in Brittany. Building of two giant aquariums with very large openings in the fair faced concrete walls.

### Why SCC was Used

Very dense network of reinforcing bars. Better placing rates of concrete were desired. Surfaces with very regular aspect and colour were required. No segregation at the bottom of the walls.

### Project Requirements

Concrete with high flow characteristics to completely fill the formwork, especially around the large openings for windows etc.

### Concrete Mix Design

Sand	0/3.15 mm	805 kg
Aggregate	6/10 mm	820 kg
Binder Cement	CEM I 52.5 R	290 kg
Filler		150 kg
Water		198 l
Admixtures	Sika ViscoCrete -3010 SCC (0.9%)	3.96 kg
	Sika ViscoCrete -2100 (0.4%)	1.76 kg



### Test Results

Fresh concrete	
Density	2295 kg
W/B ratio	0.45
Gravel/Sand ratio	1.02
Air content	0.8 %
Slump flow on site	75 cm
Outside air temperature	10 °C
Transport time	30 min
Placing time	25 min for 6 m³
Hardened concrete	
Fcw 28 d	38 N/mm²

## Basement for a new Research and Development Building in Tokyo, Japan

### Main Project Description

Erection of a new R&D building in Tokyo, Japan. For the complex basement, new concrete technologies were necessary.

### Why SCC was Used

High strength concrete was required for this structure to improve the earthquake resistance; for the construction and complex design with extreme reinforcement easy pumping and placing was required.

### Project Requirements

Flow target	65 +/- 5 cm for 120 min
Final strength	> 60 N/mm²
Concrete temperature	28 - 32 °C

### Concrete Mix Design

Belite Cement (Low Heat Cement) with 7% undensified silicafume	
W/B = 28%, 165kg water/m³ concrete	
Crushed sand and gravel (max. size: 20mm)	
Admixture	Sika ViscoCrete, dosage 2.8% on binder



### Test Results

Fresh concrete	
Slump flow	65-69 cm
SF <sub>50 cm</sub>	< 6 sec
Very soft concrete, easy to pump, excellent flow behaviour even at concrete temperature of 33 °C	
Hardened concrete	
Fcw 28 d	86 N/mm²

## Precast Concrete Units Factory Tallington, England

### Main Project Description

Tarmac Precast Concrete & Sika have combined their technological resources to introduce self compacting concrete into the production lines of the Tarmac pre-cast concrete factory at Tallington.

The Tallington factory is one of the largest predominantly wet cast production units in the UK. Superplasticising admixture is currently used in all the production processes. Self compacting concrete is seen as the next natural progression in admixture development, which will further improve Tarmac's quality pre-cast concrete.

It is Tarmac's wish to see as much of the production converted to self compacting concrete as possible.

### Why SCC was Used

- ▲ The customer requirements included the following:-
- ▲ Speeding up the concreting operations
- ▲ Labour savings related to mould filling
- ▲ improvements to the aesthetic quality of the de-moulded concrete; minimising the repairs required
- ▲ Elimination of noise from compaction equipment, improving the factory environment
- ▲ No further requirement to purchase or maintain compaction and ancillary equipment
- ▲ Elimination of grout loss from high vertical moulds



### Sika Solution

#### Concrete Mix Design

Aggregate grading	20 mm
Binder	480 kg/m <sup>3</sup> OPC
Admixture	2.5 % Sika ViscoCrete-2015 0.15 % Sika ViscoCrete-Stabiliser

#### Test Results

<b>Fresh concrete</b>	
W/B ratio	0.37
Density	2400 kg/m <sup>3</sup>
Air content	1.0%
Slump flow range	75cm - 80cm
<b>Hardened concrete</b>	
Compressive strength after 1 days:	20 N/mm <sup>2</sup>
Compressive strength after 28 days:	90 N/mm <sup>2</sup>



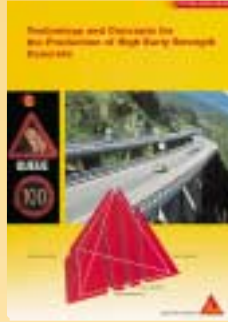
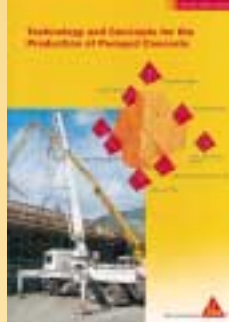
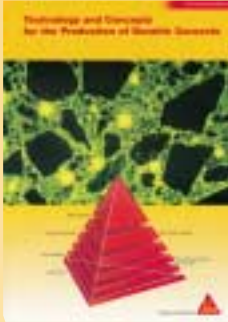


# Sika ViscoCrete®

## Self Compacting Concrete

Also Available from Sika

Sika Concrete Series



The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users should always refer to the most recent issue of the Technical Data Sheet for the product concerned, copies of which will be supplied on request.

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