

# Gardens by the Bay

A futuristic park in Singapore, that unites technology and biodiversity

An enormous city-garden with parks and tropical gardens surrounding every new dwelling; that is the way Singapore had been imagined when it gained its independence from the British Commonwealth in 1957. And today this tropical city is getting even closer to that ideal of perfection, thanks to the grand Gardens by the Bay project which had its first garden inaugurated recently.

In 2006 the English landscape gardeners Grant Associates and Gustafson Porter won an international contest to create the Gardens. Six years later the project, extending

over 101 hectares including a section of land reclaimed from the sea, has become reality. The gardens and greenhouses host an innumerable variety of plants and flowers from all over the world, with technology at the service of biodiversity. The large park is located near to the Marina Bay Sands Hotel and is divided into three distinct gardens: Bay East, Bay Central and Bay South. The first one to be completed was Bay South – covering an area of 540,000 m<sup>2</sup>, making it one of the largest gardens in the world – and was officially opened to the public last year.



Marina Bay Sands Resort, Singapore on page 22

**TO THE LEFT.** An aerial view of Bay South. The two large greenhouses and the SuperTrees can also be seen.

**TOP CENTRE OF THE PAGE.** A view by night of the SuperTrees.

**ABOVE RIGHT.** A view of Marina Bay complex. Particularly visible are the three Marina Bay Sands Resort towers (see the box on page 16) and, in the bottom left, the Art Science Museum (box on page 17).

**BELOW.** The gardens inside the Flower Dome.

### The Birth of a Grandiose Project

The Bay South Garden contains possibly the two largest greenhouses in the world, the Flower Dome and the Cloud Forest. In the first one, a climate has been created to mirror those found in Mediterranean and sub-tropical areas, while in the second greenhouse a rain forest at 2000 metres above sea level has been created.

In order to host the vegetation typically found in these zones, solar radiation had to be optimised as much as possible. It was decided to cover the two large theme gardens with cupolas made entirely of high efficiency glass that allows 65% of the sunlight to filter through while reducing the amount of heat from the sun by 35%, integrated with a system to shade the garden made from adjustable triangular sails.

Thanks to the application of technology with low energy consumption, and by making use of renewable energy sources, the greenhouses are self-sufficient. The two gardens offer a view of the eighteen SuperTrees, the most spectacular attraction at Gardens by the Bay. These SuperTrees, made from concrete and steel, are vertical gardens ranging in height

from 25 metres to 50 metres, and along their trunks they play host to 162,900 plants and more than 200 species of flower. The function of the photovoltaic cells inserted in the SuperTrees is to harvest solar energy to illuminate the trees during the night. A 128 metre long cable bridge connects the two tallest trees so that visitors can view the gardens from above from a height of 22 metres.

### The Greenhouses with the Mapei Signature: Flower Dome

The entrance to this spectacular greenhouse has a floor decorated with geometric inlays in the form of stylised trees (see the photo on the next page). The respective adhesives used to lay the white and grey granite slabs and the porcelain tiles were KERAFLEX MAXI S1 high performance cementitious adhesive with no vertical slip and KERAFLEX cementitious adhesive for floors subjected to high stresses. KERACOLOR SF ultra-fine cementitious mortar was then used to grout the joints.

In one of the other areas in the large greenhouse, palm trees sprout up from the granite floor. To lay the slabs of red granite around the trees KERAFLEX MAXI S1 was used,



**IN THE SPOTLIGHT**

**ADESILEX P10**

High performance white cementitious adhesive for glass, ceramic and marble mosaic. It has extended open time and no vertical slip. ADESILEX P10 mixed with the correct amount of water or ISOLASTIC becomes a creamy paste which is easily workable with an excellent adhesion to all conventional materials used in building. It get off a low level of volatile organic compounds (VOC). It can contribute up to **4 points** to obtain the **LEED** certification.



**PHOTO ABOVE.** The slabs of granite for the entrance of the Flower Dome were laid using KERAFLEX MAXI S1 and grouted with KERACOLOR SF.

**BELOW.** The floor tiles in the restaurant were bonded with KERAFLEX and grouted with KERACOLOR SF.

while KERAFLEX was used to bond the porcelain tiles. KERACOLOR SF was also used here to grout the joints. KERAFLEX MAXI S1 and KERACOLOR SF were also used to lay the yellow granite slabs for the curbs along the footpaths in the greenhouse, as well as for the grey granite to separate the area in which centuries old olive trees have been planted. The floor in the restaurant was covered with lively orange tiles, laid using KERAFLEX adhesive and grouted with KERACOLOR SF.

At the centre of the Dome there is the Flower Field, an area dedicated exclusively to flowering plants, offering an array of colours all year

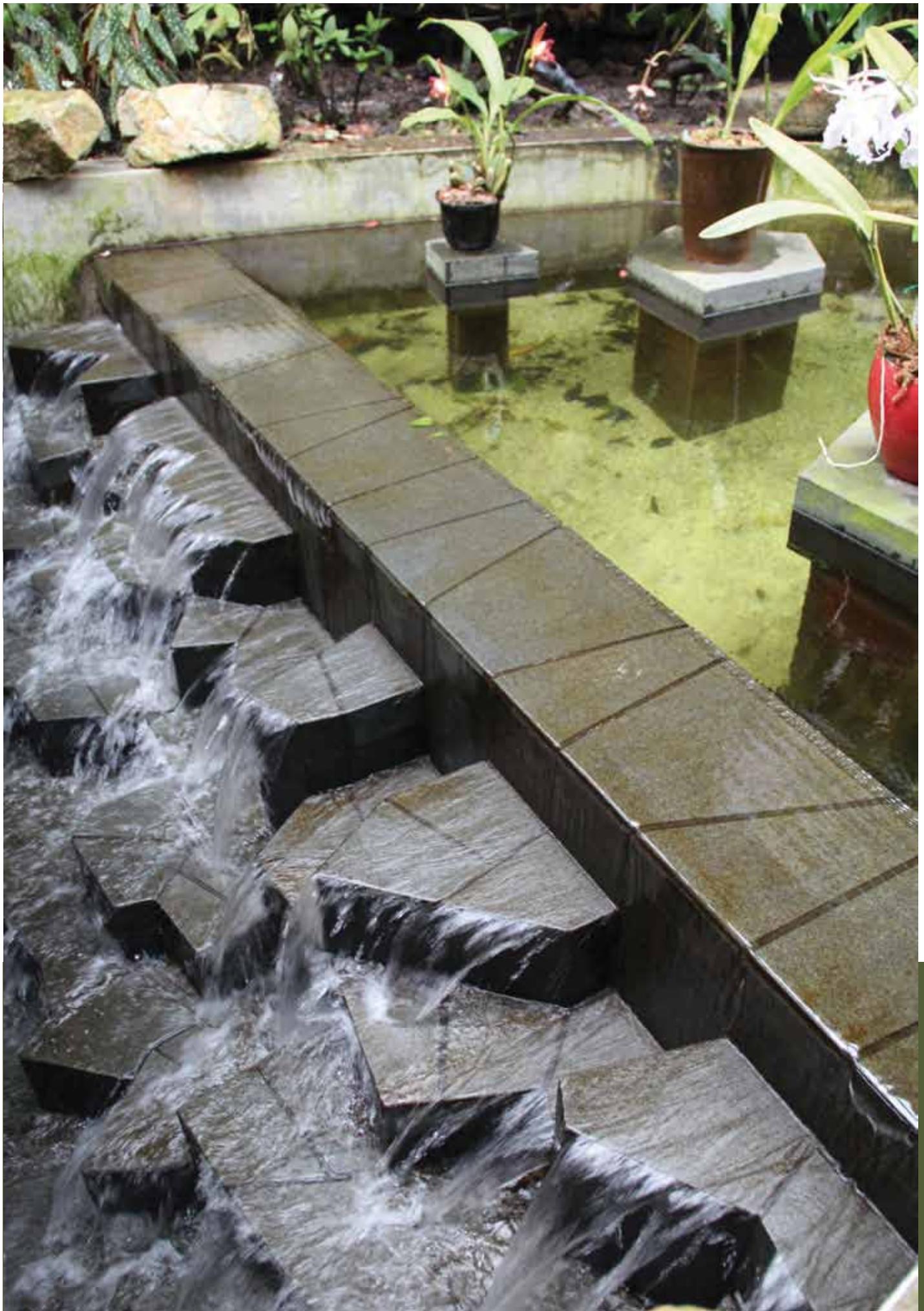
round thanks to their seasonal blooming cycle. The paths for the visitors running through this part of the garden are made from slabs of green granite laid using KERAFLEX MAXI S1 and KERACOLOR SF. In other areas of the greenhouse, the slabs of yellow granite were laid on the concrete substrate, with KERAFLEX MAXI S1 and KERACOLOR SF. The stairs that connect the different areas in the Flower Dome are also covered with slabs of yellow granite in various sizes laid using KERAFLEX MAXI S1 and KERACOLOR SF. The walls and floors in the bathrooms are tiled with porcelain bonded with KERAFLEX, and again grouted with KERACOLOR SF. To lay the granite slabs on metal substrates, such as access doors, KERAPOXY two-component epoxy adhesive with no vertical slip was used.

**Cloud Forest**

The footpaths running through the large greenhouse are covered in slabs of grey granite in various shapes and sizes. The products recommended for this job were again KERAFLEX MAXI S1 cementitious adhesive and KERACOLOR SF grouting mortar. All the metal stairs used by visitors to reach the various levels in the Cloud Forest are in slabs of grey granite bonded with KERAPOXY and grouted with KERACOLOR SF.

The walls and floors in the bathrooms in this greenhouse are covered with porcelain tiles bonded with KERAFLEX and KERACOLOR SF.





## PROJECTS LAYING PORCELAIN TILES AND MOSAIC



**TO THE LEFT.** Slabs of granite were covered around the edges of the ponds using KERAFLEX MAXI S1 and KERACOLOR FF.

**CENTRE OF PAGE.** On the metal surfaces, such as the access doors, slabs of granite were laid with KERAPOXY.

**BELOW.** The bathrooms were tiled with porcelain tiles bonded with KERAFLEX.

**BOTTOM OF PAGE.** The walls of the nappy-changing facilities were covered with mosaic bonded with ADESILEX P10.



The bathroom walls with nappy-changing tables, reserved for mothers and new-born babies, are covered with colourful mosaics, and to lay them the product recommended was white ADESILEX P10 cementitious adhesive with no vertical slip and extended open time. On the top level of the greenhouse, the area has feature by walls covered with granite in various irregular shapes and sizes laid with KERAFLEX MAXI S1.

Water is always present in this greenhouse, with waterfalls and ponds inspired by the vegetation typical of a rain forest. The ponds where these water features are contained are covered with slabs of granite laid with KERAFLEX MAXI S1 and KERACOLOR FF ready-mixed, high-performance, polymer-modified cementitious mortar, ideal for grouting joints up to 6 mm wide. Shortly after their opening, the greenhouses and the gardens in the greenhouses were awarded the "World Building of the year" prize by the World Architecture Festival. A well-deserved prize for Mapei products too.



### Technical Data

**Bay South Garden -**

**2 Greenhouses /**

**Gardens by the Bay, Singapore**

**Period of Construction:**

2007-2012

**Period of Intervention:** 2011-2012

**Intervention by Mapei:** supply of products for the laying and grouting of slabs of granite, porcelain tiles and mosaic in various areas of the Flower Dome and Cloud Forest

**Designers:** CPG Consultants Pte Ltd (Singapore), Wilkinson Eyre Architects (London); landscape architects Grant Associates Singapore Pte Ltd (Bath, UK)

**Client:** National Parks Board Singapore

**Works Direction:** PM Link Pte Ltd (Singapore)

**Contractor:** Woh Hup Pte Ltd (Singapore)

**Laid Materials:** granite, porcelain tiles and mosaic

**Mapei Co-ordinator:**

Jesseline Yap, Mapei Far East Ltd

### Mapei Products

Laying slabs of granite and porcelain tiles on cement: Keraflex Maxi S1, Keraflex, Keracolor FF, Keracolor SF

Laying slabs of granite and porcelain tiles on metal: Kerapoxy

Laying of mosaic: Adesilex P10

**For further information see the websites [www.mapei.com](http://www.mapei.com) and [www.mapei.sg](http://www.mapei.sg)**

