



Our Featured Facility - The Beijing Water Cub

The National Aquatics Centre, also known as 'The Water Cube', is one of the most dramatic and exciting venues to host sporting events for the Beijing Olympics in 2008.

In July 2003, the consortium of Arup, architecture firm PTW, the CSCEC (China State Construction and Engineering Corporation) and the CSCEC Shenzhen Design Institute (CSCEC+DESIGN) won the international design competition for the National Aquatics Centre for the 2008 Beijing Olympics.

The competition, was judged by a panel of international architects, engineers and pre-eminent Chinese academics, it commenced with submissions from ten international consortia and also involved a public exhibition and vote.

The Water Cube was completed in autumn 2007. Both the concrete and the steel structure were completed first and then 500 m² of prototype cladding was installed in April, 2006. The next phase saw the installation of all the cladding followed by de-propping the internal structure and then the completion of the interior.

The structural design is based on the natural formation of soap bubbles which give a random, organic appearance. To achieve this, research was undertaken by professors of physics into how soap bubbles might be arranged into an infinite array.

To bring the design to life, the individual bubbles were incorporated into a plastic film and tailored like a sewing pattern. An entire section was pieced together and then put into place within the structure. There are interior and exterior films. The plastic film was then inflated and is continuously pumped.



A close up of the Water Cube's innovative steel structure

The project was an opportunity for Arup to offer its expertise in sustainable services. The building uses solar energy to heat the pools and the interior area, and all backwash water is filtered and returned to the swimming pools.

Central to the design philosophy that underpins the Water Cube is the core objective of water conservation, more specifically, the design of water efficient systems. Water in Northern China is a valuable commodity and Beijing currently lacks a reliable water resource to meet existing and projected demand requirements.

A combination of poor water availability, high utilization levels, pollution, evapo-transpiration, and unreliable climatic factors all contribute to the inherent need to develop water efficient systems that maximized reuse and recycling opportunities.

Arup proposed the reuse and recycling of 80% of water harvested from the roof catchment areas, pool backwash systems and overland flows, by incorporating water sensitive urban design principles into the Water Cube. Principally, the design seeks to reduce the reliance and pressures on local receiving waters, district water supply system and the sewerage system.

The Water Cube's design harnesses solar energy and makes good use of natural light. The facility is designed to act as a greenhouse. This allows high levels of natural daylight into the building and, as swimming pools are predominantly heating driven, allows the scheme to harness the power of the sun to passively heat the building and pool water. It is estimated that this sustainable concept has the ability to reduce the energy consumption of the leisure pool hall by at least 30 per cent.

This US\$100 million premier recreation centre will have five pools, including one with a wave machine and water rides that are six times the size of an Olympic pool.



The structure

- The wall cavity is 3.6m deep and the cavity forming the roof is 7.2m deep
- The structure is made of approximately 6500 tons of steel
- There are 22,000 steel members and 12,000 nodes
- The steel beams would stretch for 90kms
- The structure of the building is so strong that it can be stood up on its end and retains its shape
- The overall size is 177x177x31m

Information supplied from Arup, a global firm of designers, engineers, planners and business consultants providing a diverse range of professional services to clients around the world.