IN DETAIL

22

Blackpool Rocks Kinetic Light Sculpture

Sculptor/designer: Bruce McLean & Will McLean

The sculpture will reflect sunlight through a prism on to seven rocks on the Blackpool promenade each positioned to catch a different colour of the refracted light. The rocks will vary in size and type and will be suspended on steel frames. The prism will be 5m high and 1m wide and made up from seven triangular blocks of optical-quality acrylic bonded and held together with mild steel tension rods.

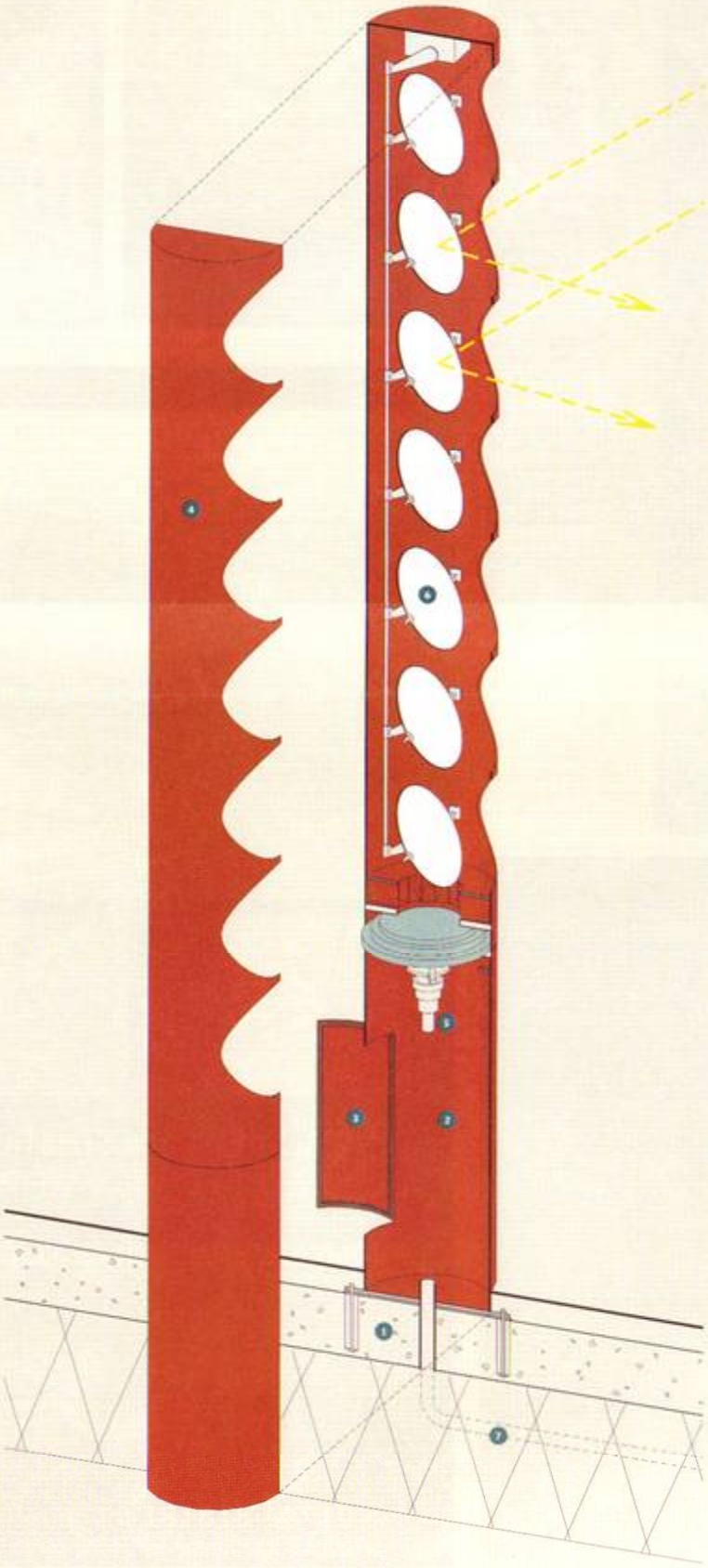
A reflector tower containing seven 800mm diameter polished stainless-steel mirrors will capture and direct the sunlight on to the prism. The tower is formed from two sections of 1,000mm diameter steel tube, a fixed plinth and a rotating upper section. The upper section sits on a turntable of slewed rings on ball bearings. A purpose-made gearbox with a 1:10,000 ratio allows the servo motor to make very precise adjustments to the tower angle to follow the sun's path at 0.25 degrees per minute.

The pitch of the mirrors will be adjustable by up to 20 degrees to maintain a constant altitude angle to the prism throughout the day. Each mirror will pivot on an adjustable bearing welded to the inside of the tube and all the mirrors will be connected to a servo motor with a drive rod to move together.

At night, and when there is weak sunlight, the tower will rotate to find the brightest alternative light source. The light from the pleasure beach illuminations or searchlights on the water will create a constantly changing glow on the rocks.

Text and drawing by Graham Bizley

Top left: An early prism experiment showing a collection of small stones that have been painted by coloured refracted sunlight.
Left: An early sketch design for the Blackpool Rocks sculpture showing the boulders lined up along the promenade.



Exploded view of reflector tower

1. Foundation
500mm-thick reinforced concrete raft foundation under whole area of sculpture.

2. Plinth
2,900mm-high x 1,000mm-diameter x 10mm-thick mild steel tube.
1,600mm-diameter x 25mm-thick mild steel base-plate welded to tube and fixed to concrete slab with resin anchor bolts.
Eight 150 x 150 x 25mm triangular mild steel stiffening plates welded between tube and base plate.
All steel shot-blasted, primed and coated with 2-pack epoxy paint system.

3. Door
90 x 6mm mild steel flat welded to inside face of tube to form door frame.
1,520 x 600mm curved 10mm-thick mild steel plate door with welded steel hinges to close flush.
Black rubber weatherseal gasket to all sides.

4. Rotating upper section
7,250mm-high x 1,000mm-diameter x 10mm-thick mild steel tube.
Seven 900mm-diameter holes cut out of steel tube.
All steel shot-blasted, primed and coated with 2-pack epoxy paint system.

5. Rotation mechanism
50mm-thick mild steel plate welded to top of plinth tube with fifteen 100 x 90 x 10mm-thick stiffening plates.
976mm-diameter drive support plate bolted to plate on top of plinth with M20 bolts at 300mm centres. Turntable formed from 835mm-diameter pre-loaded slewed rings with ball bearings.
Drive mechanism incorporating servo motor and 1:10,000 ratio gearbox.
Removable 145 x 5mm-thick tube section to allow access to slewing rings for lubrication.
Rotating upper section tube bolted to slewed ring turntable with M20 bolts at 300mm centres.

6. Mirrors
Seven 800mm-diameter x 2mm-thick polished stainless-steel mirrors clip fixed to steel subframe.
800mm-diameter mild steel sub-frames.
Two mild steel spindles on axis with front face of mirror connected to adjustable bearings on mild steel plates welded to inner face of tube to allow mirrors to rotate.
25mm-diameter mild steel drive arm connecting all mirror subframes to servo motor mounted on underside of plate at top of tower to alter pitch of mirrors by 20 degrees.

7. Cable duct
120mm-diameter steel tube welded to base plate with 100mm cut-out hole for incoming three-phase power and data cable from light sensor on furthest rock stand.

Visualising Wembley: How 3D software lights the way, page 18

A new sculpture destined for Blackpool promises an enlightening experience. Amanda Birch reports

Sunlight bathing

Hope for sunshine should you visit Blackpool next year. If there is none, you could miss out on the full working splendour of a new kinetic light sculpture that harnesses the sun to create a dramatic colourful effect.

Designed by acclaimed sculptor Bruce McLean and his architect son Will McLean, Blackpool Rocks will be positioned at the north end of the south promenade, between Blackpool's Pleasure Beach and the sea. Just follow the sounds of screaming children (and adults) being tossed around on the Pepsi Max Big One Europe's highest (72m) and fastest (87 mph) rollercoaster.

The thrilling ride will be a backdrop to the £250,000 sculpture which comprises three main elements: a 10m-tall reflector tower, a 5m-tall 60 degree triangular acrylic prism and seven raised positions or stands on which boulders of varying sizes will sit. The sculpture is one of the last pieces to be commissioned by Blackpool Borough Council through Manchester-based public art consultancy The Art Department as part of the council's programme of promenade refurbishment.

Beginning with the reflector tower and finishing with the pavilions, the different components will line the promenade. When the three components work together a route of coloured light will be cast along 16m of the site. On a sunny day, visitors will be bathed in colour as they walk among the pieces.

Mirrors positioned within the reflector tower will track the sun and reflect the sunlight through the prism. The refracted light is split into the seven colours of the spectrum, with each separate colour being cast on to one of the carefully elevated rocks. When the sun doesn't shine, the sculpture won't be as dramatic, although the reflector tower will still rotate slowly searching for any stray rays of sunlight. To make the sculpture interesting at night, the McLeans together with architect Chris Leung are exploring the possibility of arranging a small array of floodlights to be fixed on the edge of the promenade. This will mean that the reflector tower will come to a standstill as it fixes on capturing and refracting the white light from the floodlights. Will McLean insists that even at night, refracted colour will be cast upon the boulders.

Blackpool Rocks is a demonstration of the McLeans' fascination with light and refraction prism structures. The prism itself, considered by the design team as the single most important component of the sculpture, will be constructed in seven large triangular blocks – the largest will be approximately 600mm high and 1m wide – of optical quality acrylic clamped together with steel rods that run through the blocks and are fixed to a 3m-tall steel plinth. An orange-coloured acrylic block will be laid between the layers of clear acrylic and when assembled on site will look, says Will McLean, very much like a huge block of Toblerone, or perhaps more hauntingly, like the obelisk in Stanley Kubrick's film 2001: A Space Odyssey. It will also, claims Will McLean, be one of the largest refraction prisms in the world on an open-air site.

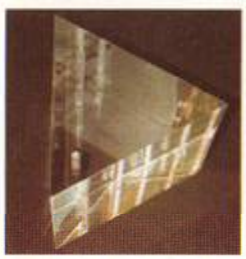
The reflector tower (see *In Detail*, opposite) says Bruce McLean, will look very much like "a big steel tube with a series of bites taken out of it". The base to the tower will contain both the motor that moves the mirrors and the software or control system.

"The software will compute the position of the sun and the geometry required to cast coloured light on the pavilions, while also monitoring data collected by sensor technology," explains Leung. "Feedback from the sensors embedded in the installation allows the control system to constantly reassess whether the computed position of the sun is observed in reality and will make compensations."

This means that the sensors will be embedded into one of the seven pavilions that will feed information back to the control system, such as light levels and colours, so that the reflector tower can respond accordingly.

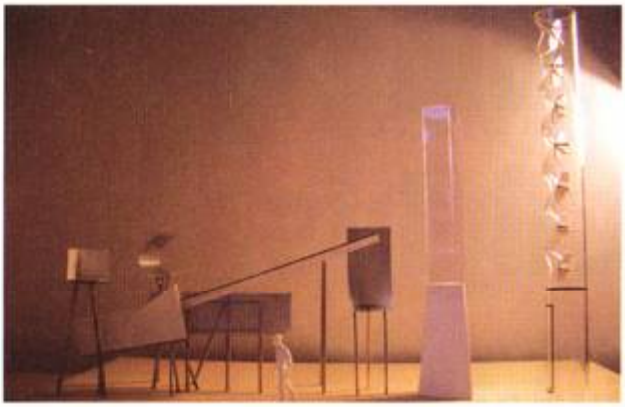
The pavilions are designed as elevated painted steel shelves supported by tubular steel stilts. They hold the all important rocks of varying sizes, which will be anchored with resin to the shelves, and elevate them enough to capture fragments of coloured light.

By making the instruments for measuring light visible in the sculpture, Will McLean hopes that after people have visited Blackpool Rocks early next year, they will walk away not just with the memory of a pleasant aesthetic experience, but with a richer understanding of how the whole process works.



The prisms are 5m high and made of seven triangular blocks of optical-quality acrylic. Sections of the prism are held together with steel rods.

Client Blackpool Borough Council and The Art Department
Design Bruce and Will McLean, Chris Leung and Kees van der Graaf
Structural engineer Adams Kara Taylor
Acrylic and prism engineer White Young Green
Mechanical engineer Host



Left: The arrangement of the different elements that make up the sculpture with the reflector tower on the far right.