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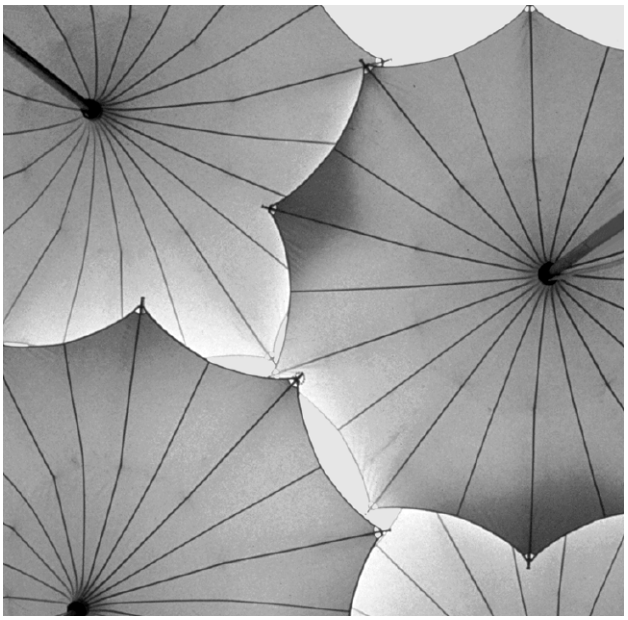

Frei Otto/Bodo Rasch: Finding Form. Towards an Architecture of the Minimal
240 pp. with 540 ill., 215 x 240 mm, hard-cover, English
ISBN 978-3-930698-66-0
Euro 49.00, £ 39.90, US $ 59.00

»Primeval architecture is an architecture of necessity. Nothing is there to excess, no matter whether stone, clay, reeds or wood, animal skins or hair are used. It is minimal. It can be very beautiful even amidst poverty and is good in the ethical sense.

Good architecture seems to be more important than beautiful architecture. Beautiful architecture is not necessarily good. Only buildings that are at the same time ethically good and aesthetically beautiful are worth preserving.

We have too many buildings that have become useless and yet we still need new buildings, from pole to pole, in the cold and in the heat.

Man's present areas of settlement are the new ecological system in which technology is indispensable, even in hot and cold areas. ...

Our age requires buildings that are lighter, more energy-saving, more mobile and more adaptable, in brief more natural, without disregarding the need for safety and security.

This logically leads to the further development of light constructions, to the building of tents, shells, awnings and air-supported membranes. It also leads to a new mobility and changeability. A new understanding of nature is forming under one aspect of high performance form (also called ›classical form‹), which unites aesthetic and ethical viewpoints.

Tomorrow's architecture will again be minimal architecture, an architecture of the self-education and self-optimization processes suggested by human beings.«

(Frei Otto and Bodo Rasch in their foreword of this book)

In 1992 the Bavarian branch of the Deutscher Werkbund awarded its first prize to Frei Otto, undoubtedly the most successful and many-sided protagonist of modern light construction, and with it a request to nominate a meritorious person to whom the prize could be passed on, and to design a joint exhibition with that person. Frei Otto chose his pupil Bodo Rasch, who had realized Otto's theories particularly in other cultures. The publication produced on this occasion provides information about scientific fundamentals and the working methods the two architects developed from these, which are characterized by »finding« not by »making«. This is supposed to produce buildings that could not be more beautiful and can scarcely be improved in terms of materials and load-bearing capacity.

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Primeval architecture is an architecture of necessity. Nothing is there to excess, no matter whether stone, clay, reeds or wood, animal skins or hair are used. It is minimal. It can be very beautiful even amidst poverty and is good in the ethical sense. Minimal architecture can be structure and ornament at the same time. Good archicture seems to be more important than beautiful architecture. But really good architecture is also beautiful, and only buildings that are at the same time ethically good and aesthetically beautiful are worth preserving.
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This logically leads to further development of light constructions, the building of tents, shells, awnings and air-supported membranes.
It also leads to a new mobility and convertibility.
The architecture of tomorrow will again be minimal architecture.
Without making any claims to completeness the working material shown illustrates the fundamentals and methods of finding form as a part of our working method.

Frei Otto and Bodo Rasch

049.00 Euro
039.90 £
059.00 US $

ISBN 978-3-930698-66-0
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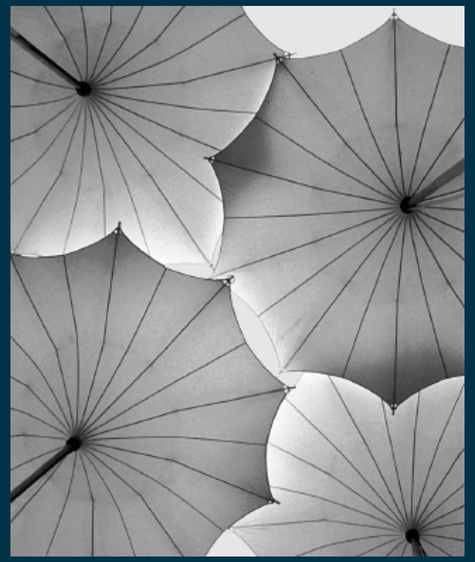
Frei Otto Bodo Rasch



Finding Form

Frei Otto, Bodo Rasch: Finding Form

Towards an Architecture of the Minimal

The Werkbund shows Frei Otto, Frei Otto shows Bodo Rasch

Exhibition in the Villa Stuck, Munich, on the occasion of the award of the 1992 Deutscher Werkbund Bayern Prize to Frei Otto und Bodo Rasch

Catalogue, scientific contributions and bibliography
edited by Sabine Schanz

Edition Axel Menges

Published by: Deutscher Werkbund Bayern,
Frei Otto und Bodo Rasch

With special thanks to: Deutscher Werkbund Bayern
Adelheid Gräfin Schönborn
Antoinette Cherbuliez
Gerd Pfafferodt
Ingrid Otto
Azeema Ally-Rasch
Christine Otto-Karstinger
Institut für Leichte Flächentragwerke, Stuttgart
The City of Munich
Sonderkonstruktionen u. Leichtbau GmbH, Leinfelden
Saudi Binladin Group, Jeddah, Saudi Arabien
Hebel GmbH, Fürstenfeldbruck
Koit, Rimsting
Liebherr, Ehingen
Maurer und Söhne, München
Speedwave, Jettingen
Stemmler, München
Wilkhahn, Bad Münder
World Centre, San Francisco

Edited by: Sabine Schanz

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Photographic work: Gabriela Heim, IL

Repro and printing: AWS, WWS

Title picture: Pink-Floyd-Schirme, 1978
Foto: Frei Otto

Font: "Atelier Warmbronn"

ISBN 3-930698-66-8

Contents

Tent Structures

relatively small roof (180 sq m) and solutions in principle sought. To give the spectators an open view of the playing field the front of the awning is supported by a broadly-spanned arc of rope along its whole length. The membranes find their curved, stable shape through the alternating high and low points of the rear edge. The awning itself, again a pure fabric structure, is made of PVC-coated polyester fabric, reinforced at the edges with polyester belts. A strap garland provides the connection to the peripheral arc rope.
Frei Otto designed two tents of similar size for special occasions for Queen Elizabeth II, the festival tent at Dyce near Aberdeen in Scotland (5) and a design that was not realized for a festival tent on the Shetland island of Sullom Voe (4). Both constructions were designed for frequent pitching and striking, like circus tents. The

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1–3 The membrane awning over the stand at the Tripoli sports field was built in 1997 as a pure fabric structure.

Aberdeen tent (later pitched in London's Hyde Park) covered an area of 3300 sq m, and the membrane was distorted to provide stability by hump supports and low points. In contrast, the plan for the Sullom Voe tent was to stretch the tent fabric over an area of 40 m by 80 m with guys suspended from masts. This is a simple solution, and particularly stormproof. The materials intended for both constructions are the same: membranes in polyester-reinforced cotton, masts and guys in hot-galvanized steel.

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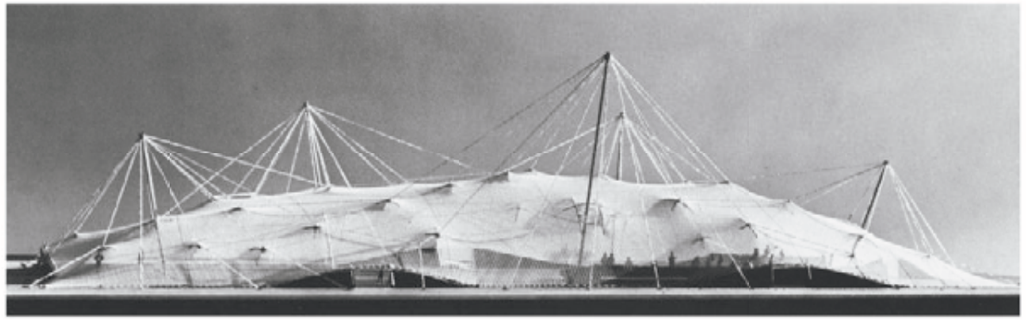

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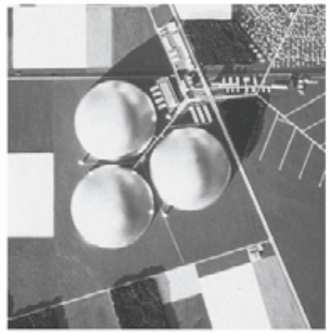
4 Anello support for the bumped tent at Dyce near Aberdeen, 1975.

5 Design model for Elizabeth II's festival tent in Sullom Voe, 1981.

6 Interior view of the bumped tent pitched in Aberdeen and later in Hyde Park.

Pneumatic Constructions



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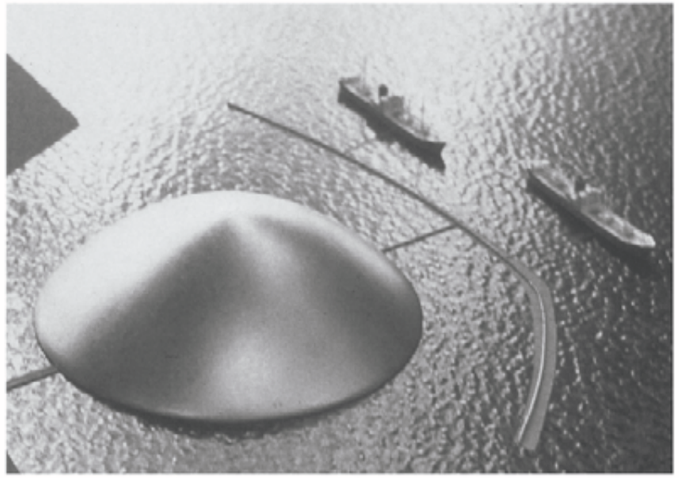
interior pressure is maintained by wind suction, or by fans when there is no wind. His first suggestions for wind-supported tents date from 1956/57. He planned the first air-supported tent for a factory with three domes each 800 m in diameter (literature: C. Roland, 'Frei Otto, Spannweiten'). The second suggestion was for a Stromeyer project, an exhibition pavilion for the 1958 Floriade in Rotterdam, but this was not built.

1958-61 saw intensive basic research by Frei Otto and his colleagues Siegfried Lohs, Dieter Frank and Ewald Bubner, in close co-operation with mathematician and structural engineer Rudolf Trostel. The key work "Zugbeanspruchte Konstruktionen Band I" (Tension-loaded Structures volume I) was produced, in which considerable space was devoted to pneumatically tensioned membrane constructions. This book, which appeared in 1962, contains projects and ideas for almost all the pneumatic



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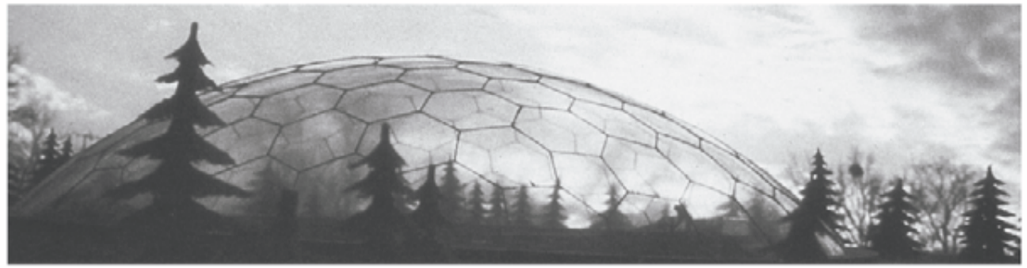
1 Industrial plant with three pneumatically supported domes, design 1958.

2 Design for a spherical pneumatic structure as a bulk material store.

3 Exhibition pavilion for the 1958 Floriade in Rotterdam. In this design a pneumatic structure is reinforced with a rope net with hexagonal mesh.



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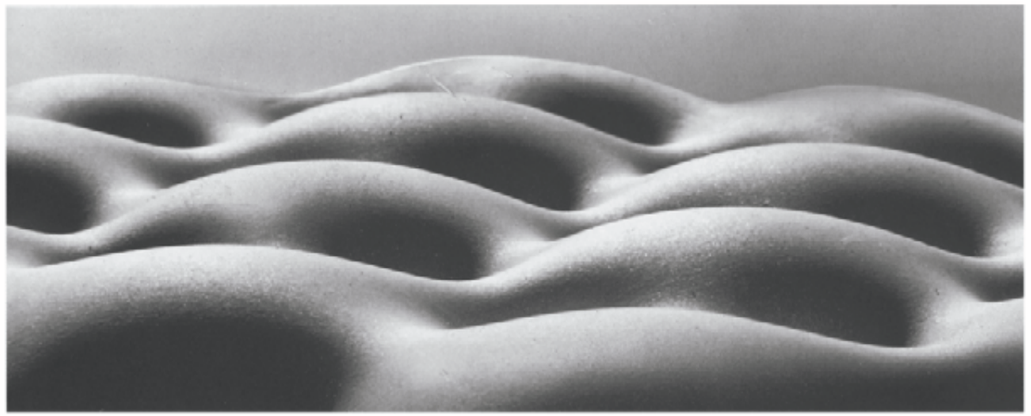

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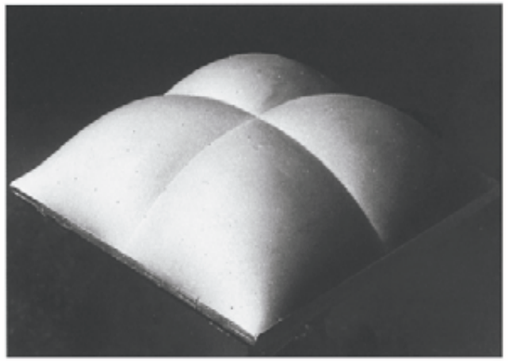
constructions known today - square, rectangular, indeed with any ground plan, also floating, as greenhouses or baths, with interior drainage, for unrestrictedly large areas, e.g. for the roofing of estates, and also for water- and earth-filled pneumatic constructions for dams, disaster protection, and many more.

The subsequent period was governed by practice rather than developments and inventions. Architects and engineers in the United States, Germany, England, France and Japan built, within a brief period, about 20 000 warehouses, sports facilities (especially swimming baths, indoor tennis courts, stadium roofs), greenhouses and exhibition buildings. Building was undertaken, with the exception of a small number of serious projects, without basic knowledge and at first without including the pioneers. There were many losses in severe storms, for example, in 1968 a single

4 Shape study for an air hall with internal drainage. Plaster model.

5 Plaster model of a pneumatic structure tied in crosswise.

6 Soap bubble model tied in crosswise.



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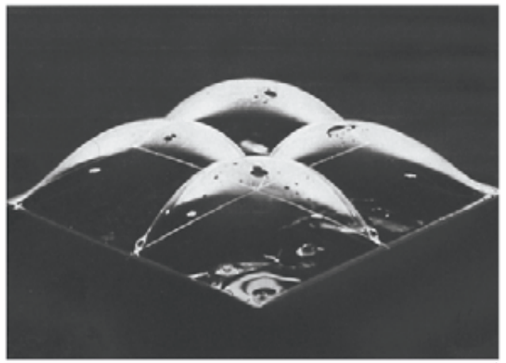

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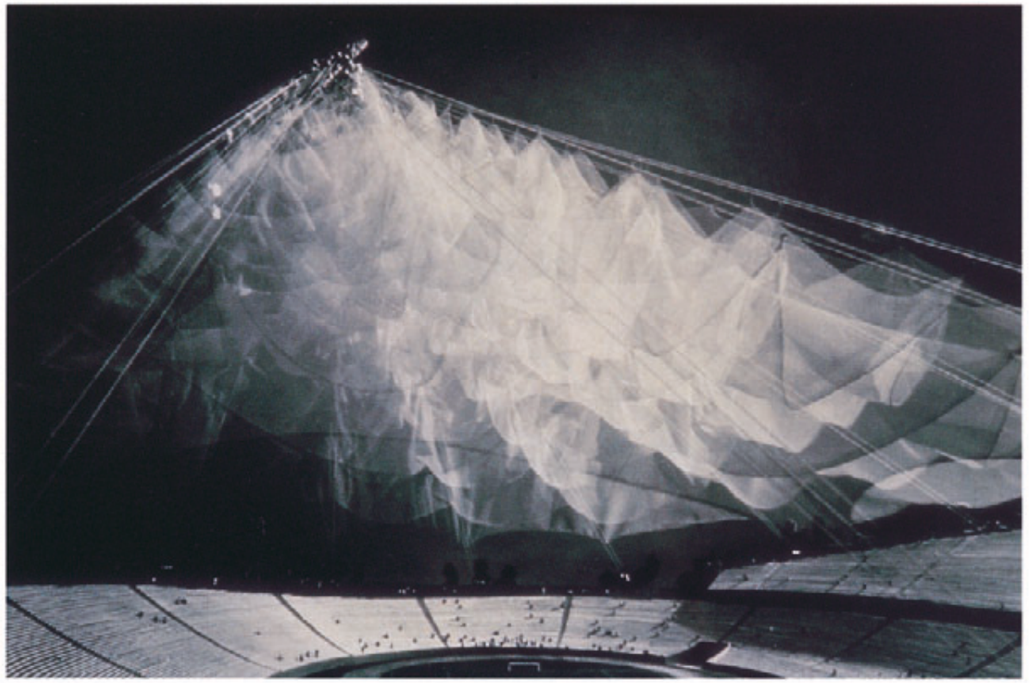
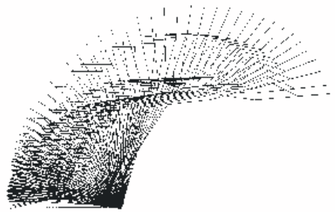
Convertible Constructions





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1 Extension curve and model of the "Cabrio" folding stand cover, of which one prototype was built, 1986.

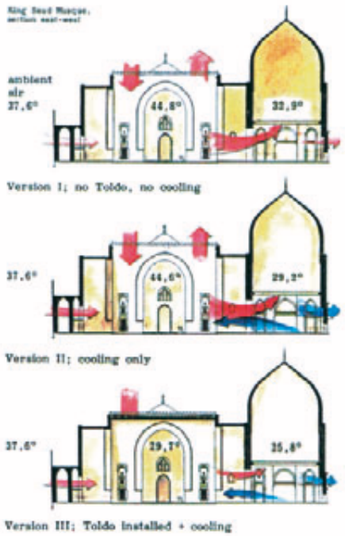
2 Convertible roof for a multi media stadium.

The great advantages of convertible roofs to provide shade lies in the fact that the climate of a building can be regulated in a way that is very effective ecologically and economically. The cooling effect is achieved by preventing the direct sunlight from reaching the surfaces of the building covered by the roof. Stored warmth can be released by opening the roof. This means that more energy is re-radiated than shines in during the day. The energy dynamics brought into being between all the surfaces involved means that in a few days the shaded surfaces are significantly cooler than their surroundings.

In 1987 Bodo Rasch devised a toldo to provide shade for the courtyard of the Quba Mosque in Madinah, Saudi Arabia. The two parts of the structure are suspended on cables and are moved into position laterally and folded. Support is provided by two lattice tube bearers on the long sides.

The translucent membrane is made up of two layers, a lower and an upper net held together in strips by aluminium tubes. They are suspended on rope trolleys by support cables and are moved by electric motors.

During the summer months the temperature in the building as a whole is lowered to a pleasantly moderate level. In winter the principle is reversed: heat is stored inside the mosque by opening the roof during the day and closing it at night.



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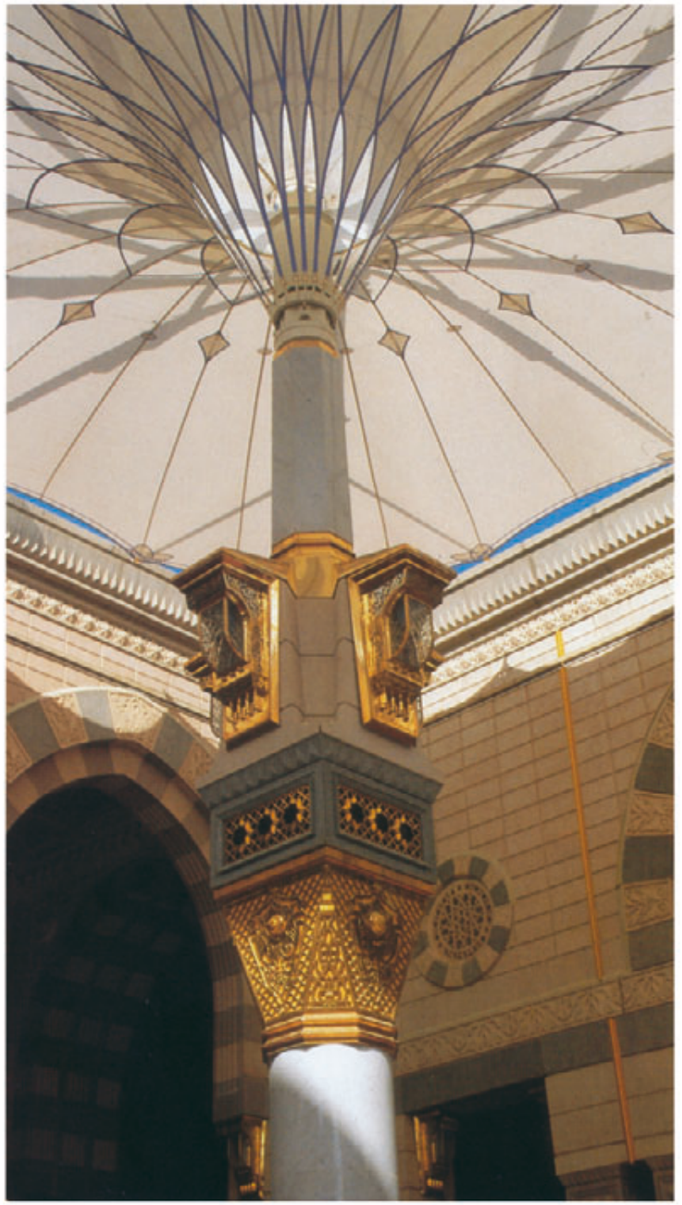
3 The climate in the inner courtyard of the King Saud Mosque in Jeddah was examined in a climate regulation study with the aid of convertible roof shading.

4,5 Toldo for the inner courtyard of the Quba Mosque, Madinah, Saudi Arabia, 1987.

Umbrellas



1 When closed the six light carbon fibre flaps and the fixed steel metal cladding in the upper arm area provide a solid cover for the membrane, which is then completely packed up. This principle was used for the first time for these umbrellas.

2 Detail of the column with integrated lighting and outlet vents for the cold air from the air-conditioning system. These were specially designed to distribute the cold air silently about 11m into the space. The system was constructed in co-operation with Dr. Kamal Ismail, the architect responsible for the mosque extension.

3 View of the six open umbrellas from above

4 Inner courtyard with the open umbrellas. They provide cooling shade for the pilgrims.

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