



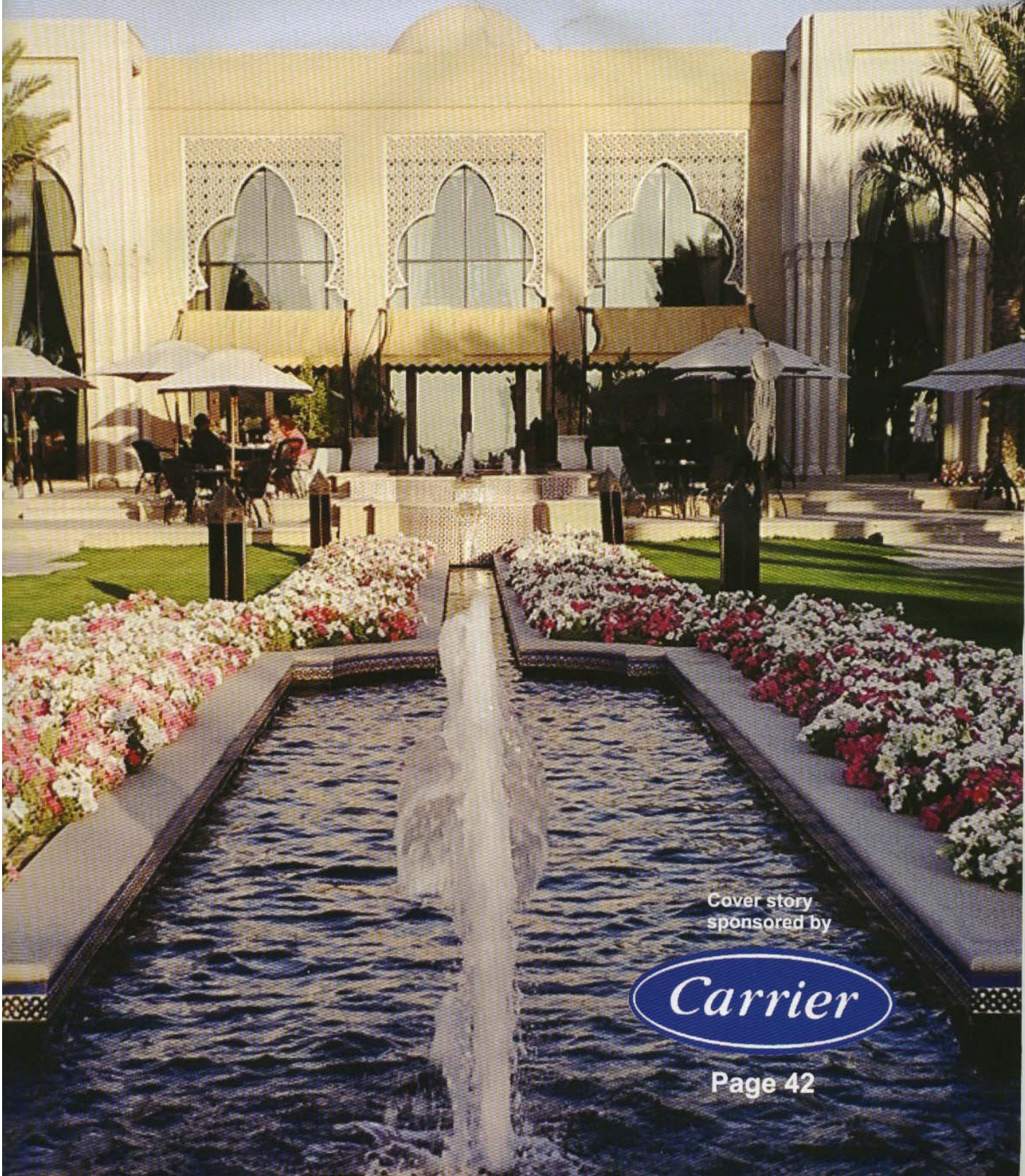
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# One&Only Royal Mirage Dubai – Arabian Court, Villa Residence & Spa

By Jean van Loggerenberg, Pr. Tech. (Eng.), RPW Consulting Engineers

The Royal Mirage Resort pays tribute to Arabian architecture and hospitality on a truly regal scale. Considered one of the most stylish resorts on Jumeira Beach, the Royal Mirage rests peacefully along one kilometer of private coastline. Already a landmark in Dubai, **THE PALACE OF THE ROYAL MIRAGE** has been joined by two new and equally beautiful developments – **THE ARABIAN COURT** and **THE RESIDENCE & SPA** nestled in 60 acres of landscaped gardens, where the clear blue water laps the beach and palm trees sway in the sea breeze.

The new developments include the 175-room Arabian Court, the 50-suite Villa Residence and Spa, four new restaurants offering a variety of cuisines, a Health & Beauty clinic with over 2000 m<sup>2</sup> of air conditioned space and the 'Spa by Givenchy' on the upper floor.

Apart from the spectacular grand gallery, reception areas, lobbies, bars, tea lounge and dining areas which all have incredible views of the landscape of fountains, walkways, lush gardens and Arabian Gulf, the hotel has



Conference and Banqueting facilities, a magical kids fortress, amphitheatre, beach restaurant and three Royal Villas.

## Construction process

Construction of the development began during September 2001 and opened to the public 16 months later, on programme and within budget on 15 December 2002.

In addition to continual value engineering and adopting economical design principals on their projects, RPW Consulting Engineers offer their clients the option of them taking financial control of the budget relating to their scope of work. It is interesting to note that a saving of approximately 16% was realized on the air conditioning and ventilation final account for Phase 2 when compared to the original Phase 1 final account. Phase 1 compares with Phase 2 in terms of total air conditioned floor area and was completed some three and a half years earlier.

Not only was the project fast track, but due to the client, developer and operator's attention to detail, many changes and improvements were made during the construction process. By the end of the project, a to-

tal of 80 Air conditioning and Ventilation drawings, 55 Drainage & Water Services drawings and 28 Fire Services drawings had been produced.

Early air conditioning is an essential part of most developments in the UAE in order to ensure that controlled conditions (both temperature and humidity) can be maintained within the shop fitted areas so as to prevent woodwork and finishes from swelling and bowing. It was therefore necessary to ensure that the district cooling plant was operational by May 2002, in time for the start of summer.

### Air Conditioning System

The entire development is served by means of a water cooled "district cooling" chilled water plant. The chiller plant consists of two screw and three centrifugal type chilled water generators. This optimum combination of screw and centrifugal chillers was chosen so as to ensure that the plant will operate at the most economical co-efficient of performance under all varying load conditions.

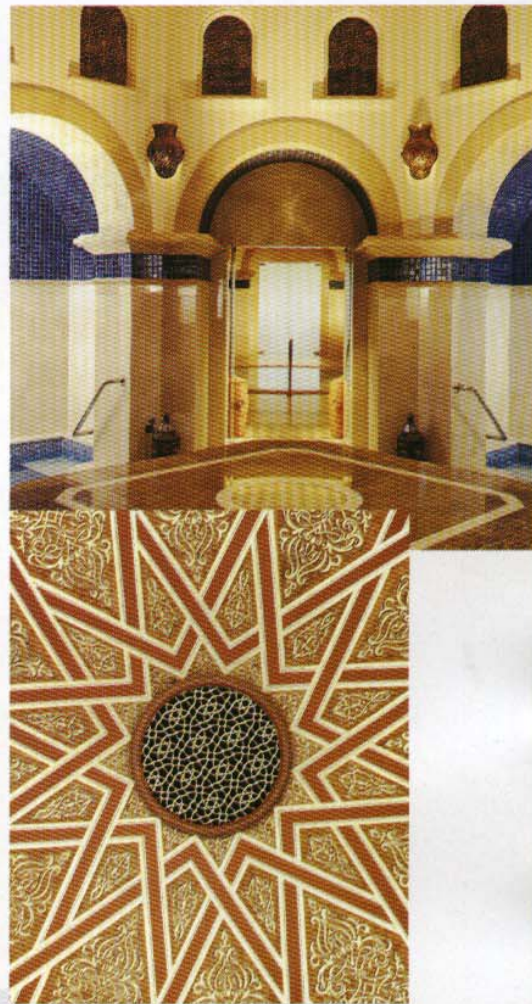
Due to the buildings being scattered over the development, a network of pre-insulated underground chilled

water piping was used to supply chilled water to all the individual buildings. A services trench was created in which all services to include chilled water, hot and cold water supply, electrical services, BMS cabling and sprinkler piping were run. Due to the potential risk associated with the underground chilled water piping, a leak detection system was installed within the insulation of the pre-insulated chilled water piping so as to be able to pinpoint a leak should this ever occur.

With summer design temperatures of 46/C db and 30/C wb, air conditioning in Dubai is definitely a necessity and by no means a luxury. Very high humidity conditions are experienced together with high dry bulb temperatures during summer (May to October) with especially high humidity levels being experienced in and around September.

The air conditioning system comprises 18 outside air handling units, 6 canopy make up air units, 38 recirculating air handling units and 297 fan coil units.

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All outside air handling units are fitted with heat pipes which "wrap around" the cooling coil and enable the unit to provide full dehumidification without overcooling the space.

By pre-treating the outside air, using heat reflecting double glazed glass, insulating the external walls and roof, the external loads have been largely reduced and the heat loads within the air conditioned spaces reduced considerably. This has resulted in smaller air handling units and fan coil units being required which occupy less space and subsequently reduce the amount of plant room area and ceiling void space required.

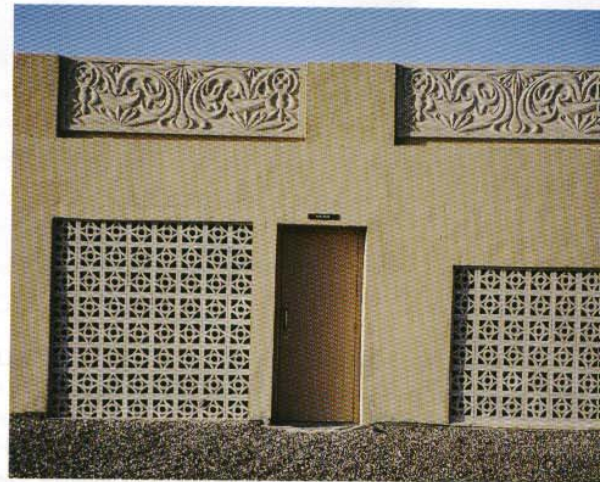
In general the air conditioning system can be perceived as being conventional in design for this type of system with a mixture of variable volume and constant volume air handling units to suite the various applications, however the following

features are of interest and have had to be adapted due to the unusual and extreme conditions experienced in this Gulf Region:

- It goes without saying that on this type of development a large number of kitchen canopies are required together with huge volumes of extract resulting in a vast amount of make up air being required. Usually filtered outside replacement air would be an acceptable solution to this problem, however due to these extreme conditions this would not be acceptable. After a great deal of investigation, RPW Consulting Engineers opted for proposing Halton canopies with integral make up and capture jet technology. These canopies are very efficient and reduce the volume of extract required considerably, thereby reducing the amount of pre-treated make up air required when compared with other canopy manufacturers.

- The desalinated municipal domestic water supply temperature entering the development can at times reach temperatures as high as 40/C. It is therefore necessary to chill this water down to 18/C in order to ensure that the water supplied to all guest rooms and public areas is supplied at a temperature

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acceptable to this type of establishment.

- Similarly, the swimming pools, of which there are no less than 6, are cooled in summer by means of chilled water and plate heat exchangers.
- Due to the large number of sand storms in the area, all outside air intakes are fitted with a specially produced Sand Trap type intake louver
- A large volume of water is consumed by the cooling towers due to evaporation and bleed off losses and in order to save on chemical water treatment costs, RPW Consulting Engineers opted for an Ozone water treatment solution.

In order to complement the traditional Arabic theming and interior design of the hotel, it was necessary to conceal as many grilles and diffusers as possible. This was achieved by means of careful co-ordination between the design engineers, architects and interior designers which resulted in various decorative type grilles and diffusers being used throughout the development. Many areas are served by means of linear "bar grilles" positioned discreetly within the lighting coves with return air entering the ceiling plenum by means of carefully designed ceiling slots. Probe type sensors were positioned discreetly instead of the conventional box type temperature sensors.

The air conditioning and ventilation installation is controlled by means of a central BMS which is also linked to other critical building services.

RPW Consulting Engineers pride themselves in being energy cost conscious. As a result of this, a district water cooled chilled water plant was proposed during the conceptual stages of the development. Calculations were carried out indicating that the payback period for a water cooled plant vs. air cooled plant would be less than 18 months. The first phase of the development has an air cooled chilled water plant and energy meters have been installed on both plants in order to assess the exact saving when comparing the two systems. In addition to extending the life of the plant due to lower

head pressures on the compressors of the water cooled plant, it is envisaged that the overall operating cost saving of the water cooled plant will be in excess of 30% lower than that of the existing phase 1 air cooled plant.

**Interesting Statistics**

Total air conditioned area	=	35 000 m <sup>2</sup>
Total Chilled water plant capacity	=	2100 TR
Total area of ductwork	=	18 600 m <sup>2</sup>
Total length of chilled water piping	=	14.4 km
Total volume of chilled water	=	77 m <sup>3</sup>
Total kitchen canopy area	=	109 m <sup>2</sup>

**Credits**

Owner	:	H.H. Sheikh Maktoum Bin Rashid Al Maktoum
Developer	:	Mirage Mille Leisure & Development
Operator	:	One&Only Royal Mirage Dubai
Concept Architect	:	Godwin Austin Johnson (Dxb)
Architect of record	:	RSL Architects (Jhb)
Interior Designer	:	Wilson & Associates (Jhb)
Structural Engineers	:	LC Consulting Engineers (Jhb & Dxb)
Air Conditioning Engineers	:	RPW Consulting Engineers (Dxb) in association with Richard Pearce & Partners (Jhb)
Wet Services Engineers	:	RPW Consulting Engineers (Dxb) in association with Richard Pearce & Partners Inc.(Jhb)
Fire Services Engineers	:	RPW Consulting Engineers (Dxb) in association with Specialized Fire Technology (Jhb)
Electrical Engineers	:	CKR Consulting Engineers (Jhb & Dxb)
Main Contractor	:	Bu Haleeba Contracting L.L.C (Dxb)
MEP Subcontractor	:	Trans Gulf Electro Mechanical L.L.C (Dxb)

**Suppliers**

Chillers	:	Carrier
Cooling Towers	:	Evapco (SA)
Air handling units	:	York
Fan coil units	:	Sinko & York
Fans	:	Donkin (SA)
BMS	:	Siemens
Grilles & Diffusers	:	Best Choice
Canopies	:	Halton

