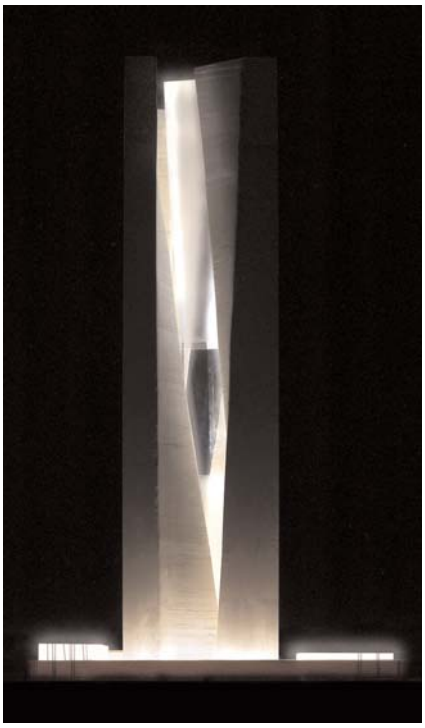
B A T T L E M c C A R T H Y©

Consulting Engineers & Landscape Architects



PROJECT:
ARB Riyadh

CLIENT:
Allied Riyadh Bank, Saudi Arabia

ARCHITECTS:
SOM, New York

BM SERVICES:
MEP Engineers and Landscape Architects

VALUE: **$110m**

DESIGN BRIEF
The headquarters of the Allied Riyadh Bank posing at a height of 240m must fit into the surrounding vicinity of other high rise “energy guzzler” buildings in the harsh desert environment of Riyadh.

However, the ARB tower must be an environmentally sound design to set the path for any future developments in the area.
In the harsh environments of this region, it is the air cooling systems which become costly in energy consumption, therefore the ARB Headquarters must provide an environmentally viable design which can reduce this energy intake whilst keeping the building at a comfortable, cool atmosphere.

London UK Office
T: +44 (0)20 7440 8282
F: +44 (0)20 7440 8292
E: admin@battlemccarthy.com
www.battlemccarthy.com

DESIGN INITIATIVES/ACTIONS UNDERTAKEN
The thirty storey building tower, square in plan is placed in the vicinity of other landmark towers namely the Kingdom Tower and the Al Faisaliah Tower. The proposed building rises to a height of 240 metres. Rising out of a moat type water feature at its base, the building can be categorised into two main areas, the main central glass tower and the protective concrete twisting corner spines.
With the cores placed at the highly exposed corners, they provide a protective cloak for maximum protection from solar heat gain whilst harnessing solar energy and maintaining exposure to panoramic views.
The external cores also serve as collection banks for exhaust air from various activity centered spaces, which is returned so that the corresponding embodied energy of this air can be re-used before the air is discharged to the atmosphere. The cores also offer opportunities of creating mini ecosystems to be used as recreational spaces, areas of tranquillity containing water features, flora and fauna.

The orientation if the building is such that it is towards Mecca within the property line and maintaining the preferable environmental orientation along the East-West axis.

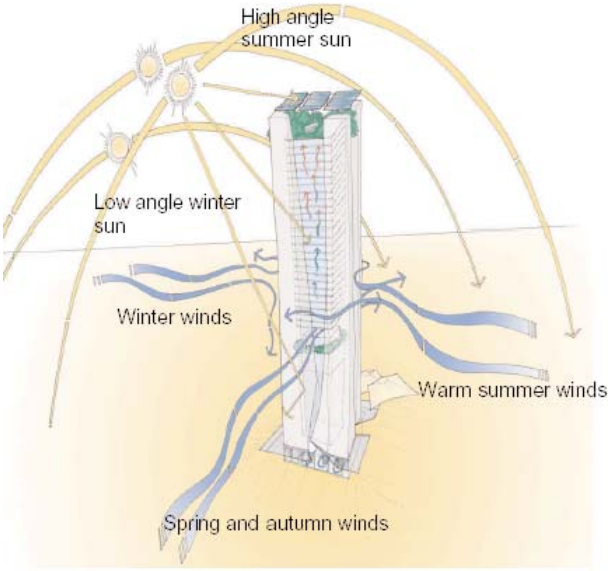
If the building was to incorporate full air conditioning systems throughout the occupied areas it would cost large monetary resources in energy bills.Therefore Battle McCarthy used advanced 3D thermal analysis techniques to analyse the building.
The analysis of the initial stage drawings revealed that different portions of the building were affected by direct solar glare and shadows caused by the protective cores as the sun made its way across the sky in different seasons.
By twisting the structure of the tower, it reduces the peak-cooling load for the building by 6%. In addition the peak loads are more evenly spread reducing costs in mechanical plant.

A passive evaporative loop has been provided at the base of the tower, just outside the water moat. This provides naturally conditioned air at lower temperatures to the internal building environment as compared to the outside air. The concept asserts the cooling down of the air passing above the water provided in the moat as the water evaporates. This cool air is introduced into the system by inlets / louvers provided in a well shaded and dust protected area of the building base.

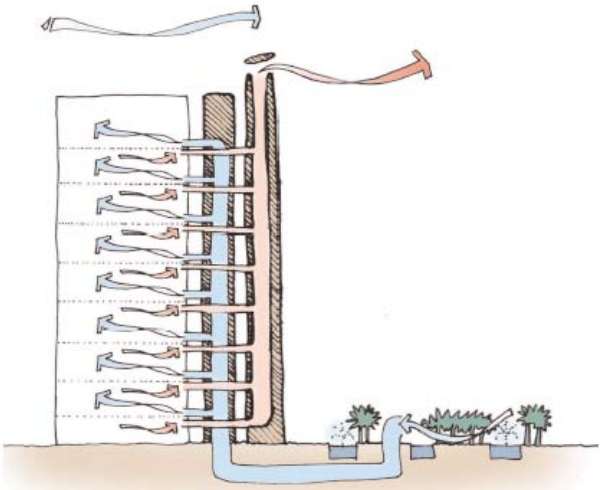
The harsh desert climate has also prompted the inclusion of a Thermal Mass Labyrinth within the building design. The concept involves use of extensive thermal mass (into he form of massive concentric concrete tubes) organised in a specific manner in the air conduit to cause a considerable drop in temperature of the air being introduced into the arrangement. Cool external air would be introduced into the Labyrinth at night such that its cool content would be absorbed by the mass which is then released into the AHU's present into eh twisting cores of the building.

Installation of integrated solar collectors on he roof of the building reduces direct solar gains incident on the atrium and central glass tower.

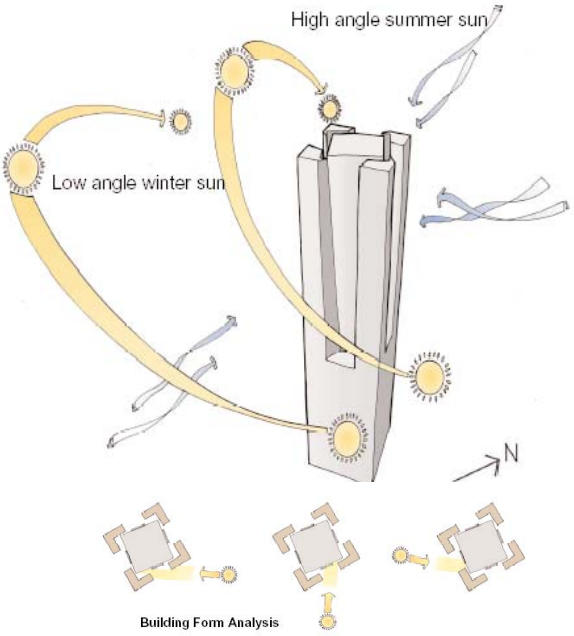
The building also employs a Grey water system centred around collecting condensate for the conservation of water.



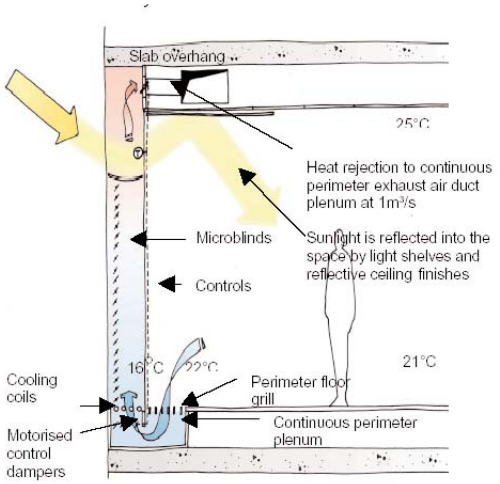
Solar and wind analysis of the building's orientation



Double use of vertical earth tubes to supply extract air from the space and the double skin facades

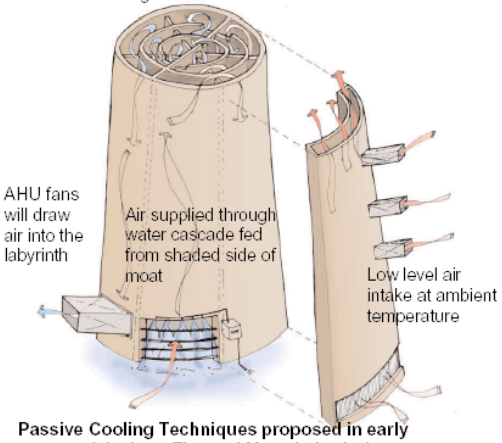


Building Form Analysis

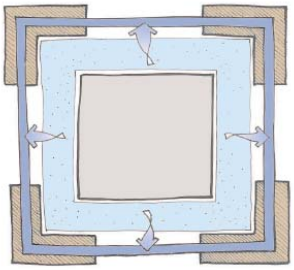


Summer daytime operation with exhaust air actively removed from double skin facade.

A large thermal mass can be utilised to store thermal coolth from nightime ambient conditions to pre-cool supply air to the air handling units.



Passive Cooling Techniques proposed in early stages of design - Thermal Mass Labyrinth



Evaporative water loop system placed at the base of the building promoting evaporative cooling into the inlet system.