

O-14 TOWER, Dubai, United Arab Emirates

STRUCTURAL HEIGHT / STORIES : 106 m / 24 (Ref. 3)

STATUS : Completed

CONSTRUCTION END: Fall 2010

CONTRACTOR : Dubai Contracting Company (Ref. 3)

STRUCTURAL SYSTEM :

Folded Exoskeleton (Ref. 1)

Diagrid Concrete Exterior Structure (Ref. 6)

Diagrid Trussed Tube (Ref. 8)

OWNER / DEVELOPER : Creekside Development Corporation

ARCHITECTS : Reiser + Umemoto RUR Architecture P.C.

STRUCTURAL ENGINEER : Ysrael A Seimuk PC

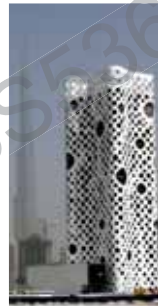
TOTAL AREA : 15,852 sq.m (Ref. 3)

BUILDING FOOTPRINT : 557 m² (typical Office Floor) (Ref. 7)

ELEVATORS : 3+1 Service Lift (Ref. 7)

The aspect ratio 106/37=3.50

The NFA/GFA=620/757=0.819



THE LOCATION OF THE BUILDING



The O-14 tower is:
On the Business Bay in Dubai,
on the waterfront esplanade.

(Ref. 1)

THE LOCATION OF THE BUILDING



The tower generated an extraordinary international interest,
as it's among the very first innovative designs in Dubai's current building boom.

(Ref. 1)

ARCHITECTURAL EXPRESSION



Modern concept of Functionalism
Structural Expressionism, "Matter-Force" arrangement

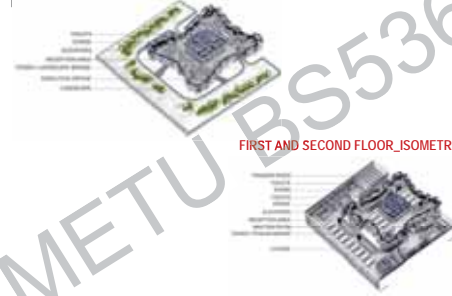
(Ref. 1)

TOWER ISOMETRIC_UPPER FLOORS



(Ref. 4)

THIRD FLOOR_ISOMETRIC

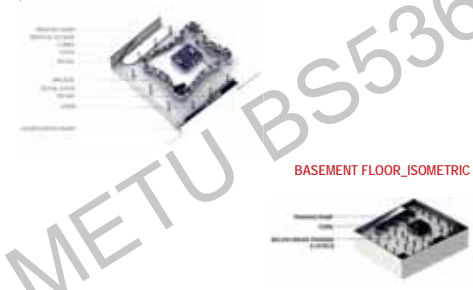


FIRST AND SECOND FLOOR_ISOMETRIC



(Ref. 4)

GROUND FLOOR_ISOMETRIC



BASEMENT FLOOR_ISOMETRIC



(Ref. 4)

THE EXOSKELETON



The concrete perforated structural exoskeleton:
-frees the core from burden of lateral forces
-allows the column-free office space
-acts as a sunscreen
-has 1326 openings in different sizes in a random pattern
-is used for both gravity and lateral forces
-The core is minimized for only
-Vertical loading, utilities, transportation

(Ref. 1)

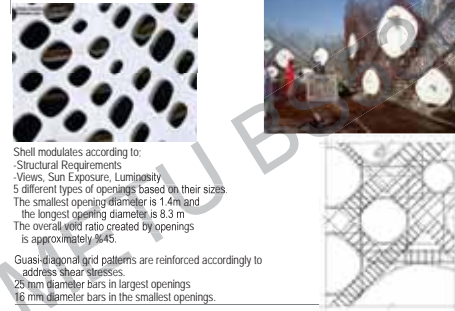
CHIMNEY EFFECT



This passive solar technique is a natural
component of the cooling system of O-14,
reducing energy consumption and
costs by more than 30.
(Ref. Citibuh journal, Research/Innovative, 2010, Issue 11)

Drawn by Seda Karabulut
(Ref. 1)

THE PATTERN

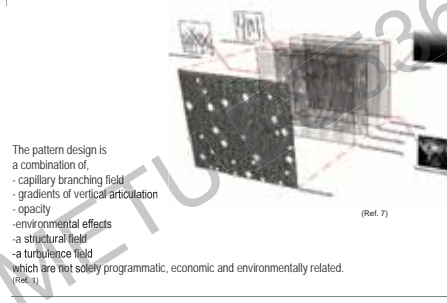


Shell modulates according to:
-Structural Requirements
-Views, Sun Exposure, Luminosity
5 different types of openings based on their sizes.
The smallest opening diameter is 1.4m and
the longest opening diameter is 8.3 m
The overall void ratio created by openings
is approximately 45.

Quasi-diagonal grid patterns are reinforced accordingly to
address shear stresses.
25 mm diameter bars in largest openings
16 mm diameter bars in the smallest openings.

(Ref. 1)

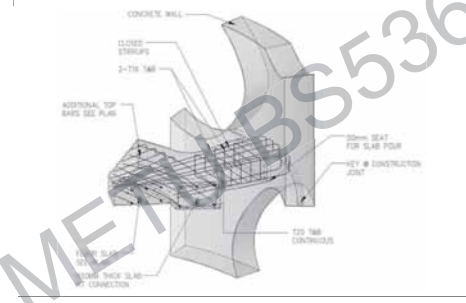
THE PATTERN



The pattern design is
a combination of,
-capillary branching field
-gradients of vertical articulation
-opacity
-environmental effects
-a turbulence field
-a turbulence field
which are not solely programmatic, economic and environmentally related.

(Ref. 1)

SLAB CONNECTION TO EXTERIOR WALL



O-14 SHELL STRESS DIAGRAM



O-14 stress diagram is analyzed with a collaboration between the architect and the engineer
based on a feedback system.
Gravity and lateral forces are applied to identify stresses in the elements between the openings.

(Ref. 1)

PLAN

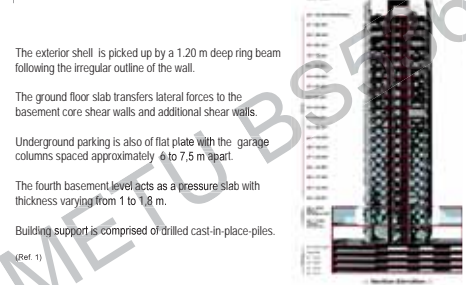


CONNECTIONS BETWEEN SHELL AND SLABS AND GLASS



(Photos: www.skyscraperly.com)

THE SECTION



The exterior shell is picked up by a 1.20 m deep ring beam
following the irregular outline of the wall.

The ground floor slab transfers lateral forces to the
basement core shear walls and additional shear walls.

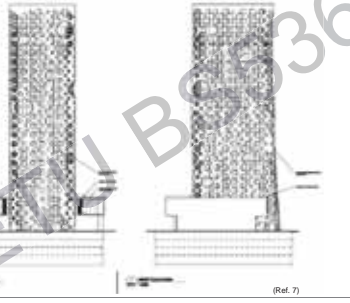
Underground parking is also of flat plate with the garage
columns spaced approximately 6 to 7,5 m apart.

The fourth basement level acts as a pressure slab with
thickness varying from 1 to 1.8 m.

Building support is comprised of drilled cast-in-place-piles.

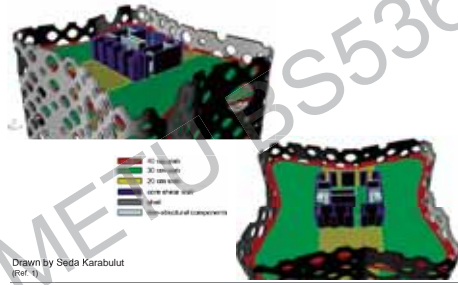
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ELEVATIONS



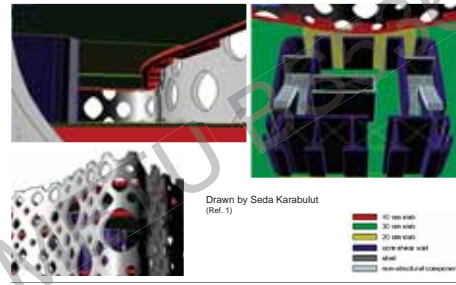
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PERSPECTIVE



Drawn by Seda Karabulut
(Ref. 1)

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CONCRETE CASTING SYSTEM



Step 1: polystyrene void forms in the rebar



Step 3: movement of the scaffolding



Step 2: casting a floor



Overview of the process

(Ref. 7)

NIGHT VIEWS



PODIUM AND INTERIOR



PODIUM AND INTERIOR



CEILING PHOTOGRAPHS



References

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- 2- Ocampo J., 'O-14 Elegant Rhythms in Concrete', Structure Magazine, Jan 2010.
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- 5- Concrete Technology Today, 'O-14', 2008 Issue.
- 6- Ali M., Moon K.S., 'Structural Developments in Tall Buildings: Current Trends and Future Prospects', Architectural Science Review, Vol 50-3, 2007.
- 7- Design Magazine for Middle East and North Africa, http://desmena.com/?p=170, 'O-14'.
- 8- Günel M.H., İlgin H.E., 'Yüksek Binalar: Taşıyıcı Sistem ve Aerodinamik Form', ODTÜ Mimarlık Fakültesi Basım İşliği – METU Faculty of Architecture Press, 2010.