MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ARCHITECTURE / BUILDING SCIENCE PROGRAM

BS 536
STUDIES ON TALL BUILDINGS: DESIGN CONSIDERATIONS
Fall 2011-2012

Case Study: **Strata**
by
Gökçe Ulusoy

Submitted to: Assoc.Prof.Dr. Mehmet Halis Günel
Assoc.Prof.Dr. Ali Murat Tanyer
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Case Study: **Strata** by Gökçe Ulusoy
Submitted to: Günel, Tanyer, Ilgın – Fall 2011

STRATA

OFFICIAL NAME: Strata
LOCATION: London, UK
USE: Residential
CONSTRUCTION: 2007-2010
ARCHITECTS: BFLS
(Bogle-Flanagan-Lawrence-Silver)
STRUCTURAL & MEP ENGINEERS:
WSP Group (William Sale Partnership)
CONTRACTOR: Brookfield Multiplex
CLIENT: Castle House Developments Ltd
STRUCTURAL MATERIAL:
Reinforced Concrete
ARCHITECTURAL HEIGHT: 147.9 m
OCCUPIED HEIGHT: 127.5 m
FLOORS ABOVE GROUND: 43
STRUCTURAL SYSTEM:
Shear Walled Frame System

* www.ctbuh.org
* Photo credit: www.skyscrapercity.com
* Photo credit: www.propertyguru.com.sg

STRATA

Strata is located on the site of Castle House, an early 1960s six-storey office building.[1]

It is the first significant private development in the ten-year regeneration of the area around the 'Elephant & Castle', a major road junction in the southern part of central London.[2]

The Strata tower takes advantage of high winds with turbines integrated directly into its facade.[3]

[1] www.wikipedia.org
[2] Hewitt, M. 2010, Tower Technology, Construction Europe, May 2010, pp. 46-47.
[3] http://highrise.bk.tudelft.nl/pdf/Strata_SE1.pdf
* Photo credit: James Brittain (retrieved in december,2011)

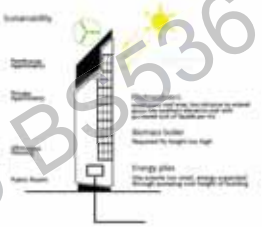
BUILDING LAYOUT

Number of apartments: 408
Number of lifts: 4

Aluminium-and-glass unitized cladding system with 3 layers: black-grey-white & silicon bonded glazing

* Cowan, D. 2010, 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6, pp.56-63.
* Photo credit: http://www.stratalondon.com/tower (retrieved in january, 2012) (penthouse) Matt Livey & (facade detail) Will Pryce

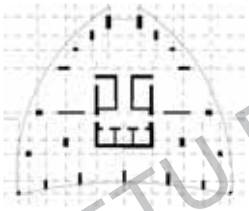
ENVIRONMENTAL FEATURES



- Three 9m diameter wind turbines producing 8% of the building's total energy demand.
- High performance glazing system reducing solar gain & heat loses
- Heat recovery system within the whole house ventilation system
- Centralized boilers with heat metering
- Grey water recycling [1]

[1]Cowan, D. 2010, 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6, pp.56-63.
* Photo credit: Yui Law @BFLS (retrieved in december,2011)
* Diagram: BFLS

STRUCTURAL DESIGN



TYPICAL FLOOR PLAN
(drawn by Gökçe Ulusoy)

STRUCTURAL SYSTEM:
According to Gunel & Ilgın:
"Shear Walled Frame System"
According to Smith:
"Wall-Frame Structure"
According to Taranath:
"Shear Wall-Frame Interaction"

MATERIAL: Concrete
To provide a stiff core and relatively high structural damping

In-situ concrete frame with post-tensioned flat slabs: Selected as optimum solution (C32/40 cylinder/cube strength)

High-strength concrete (C50/60) columns

Rotary-bored piles: 1,5m diameter & 44m deep

* Cowan, D. 2010, 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6, pp.56-63.

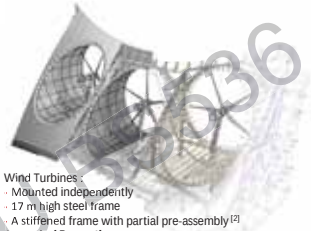
Walking Columns:
Better alternative than bulky transfer slabs or beams [1]

STRUCTURAL DESIGN

Reinforced Concrete Core

[1] Alexander's. Walton, M. 2011, Strata SE1, London, UK: 'The First In-House Wind Generator' , Structural Engineering International, 1/2011, pp. 37-40.
* Photo Credits: Cowan, D. 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6 (left) www.wikipedia.org (right).

WIND TURBINES



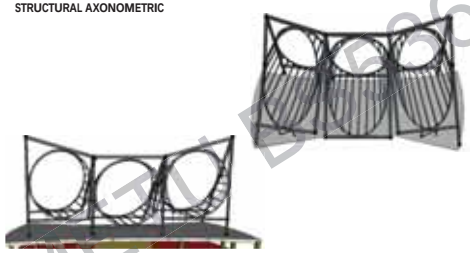
Wind Turbines :
- Mounted independently
- 17 m high steel frame
- A stiffened frame with partial pre-assembly [2]

Acoustical Precautions:
- Venturi-like enclosures focusing the noise into two sound cones away from the apartments
- Each turbine is sitting on masts mounted on isolation pads
- 5-bladed turbines, instead of 3, offer further noise reductions [3]

SOUTH-WEST is the dominant wind direction in London.
Concave south elevation was oriented to capture the wind from this direction. [1]

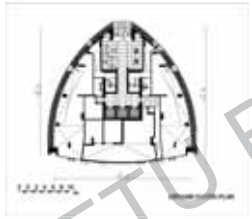
[2] Bogle, I. 2011, Integrating Wind Turbines in Tall Buildings, CTBUH Journal, 2011, Issue 4, pp.30-34.
[1]Alexander's. Walton, M. 2011, Strata SE1, London, UK: 'The First In-House Wind Generator' , Structural Engineering International, 1/2011, pp. 37-40.
[3]Bogle, I. 2011, Integrating Wind Turbines in Tall Buildings, CTBUH Journal, 2011, Issue 4, pp.30-34.
* Axonometric Drawings: BFLS

WIND TURBINES
STRUCTURAL AXONOMETRIC



*Drawn by: Gökçe Ulusoy

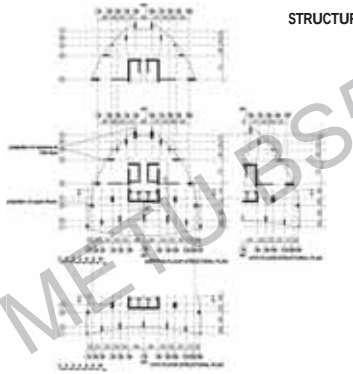
STRUCTURAL DESIGN



G. Floor Area: 775 m2
Core A. / GFA:0.14
NFA/GFA: 0,83

* Drawing (Plan) from: BFLS
* Drawing (Structural) from: Cowan, D. 2010, 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6, p.56-63.

STRUCTURAL DESIGN



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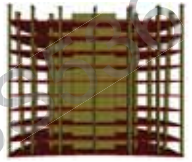
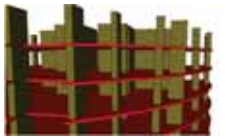
STRUCTURAL AXONOMETRIC

From Ground Floor to 9th Floor

STRUCTURAL PERSPECTIVE



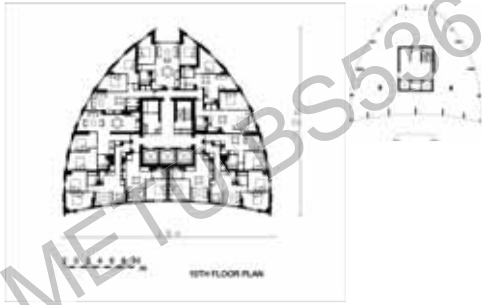
From Ground Floor to 9th Floor



From 5th Floor to 9th Floor

*Drawn by: Gökçe Ulusoy

STRUCTURAL DESIGN



* Drawing (Plan) from: BFLS
* Drawing (Structural) from: Cowan, D. 2010, 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6, p.56-63.

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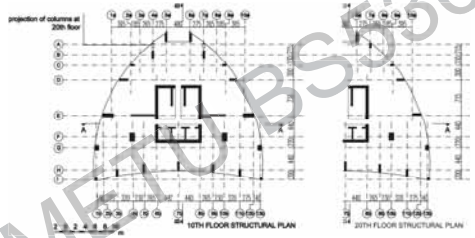
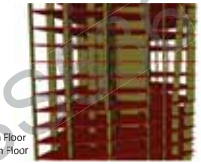


*Drawn by: Gökçe Ulusoy

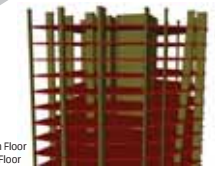
STRUCTURAL AXONOMETRIC

From 10th Floor to 19th Floor

STRUCTURAL PERSPECTIVE



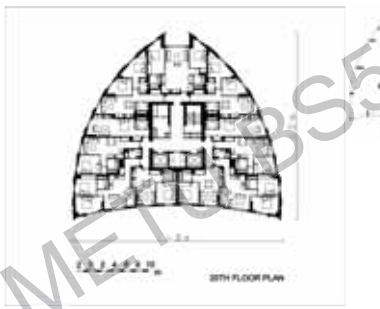
From 6th Floor to 16th Floor



From 10th Floor to 19th Floor

*Drawn by: Gökçe Ulusoy

STRUCTURAL DESIGN



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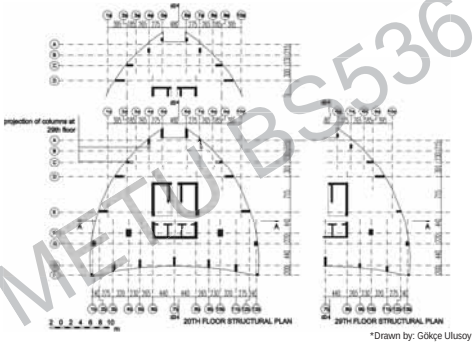

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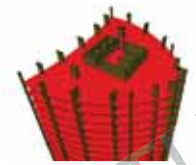
STRUCTURAL AXONOMETRIC



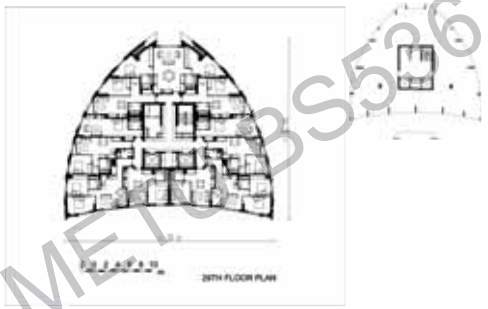
From 20th Floor to 28th Floor

STRUCTURAL PERSPECTIVE

From 23rd Floor to 30th Floor

*Drawn by: Gökçe Ulusoy

STRUCTURAL DESIGN



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STRUCTURAL DESIGN

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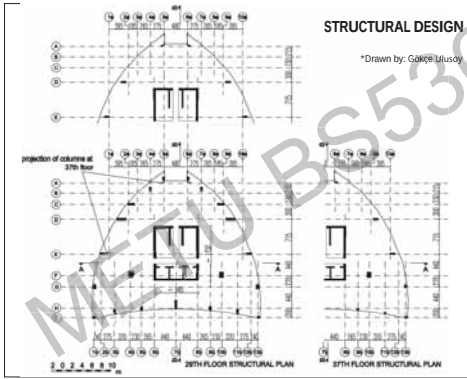


STRUCTURAL AXONOMETRIC

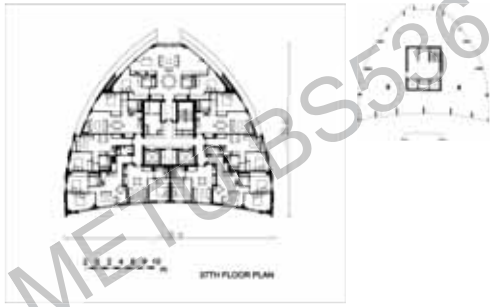
From 28th Floor to 36th Floor

STRUCTURAL PERSPECTIVE

From 34th Floor to 36th Floor

*Drawn by: Gökçe Ulusoy

STRUCTURAL DESIGN



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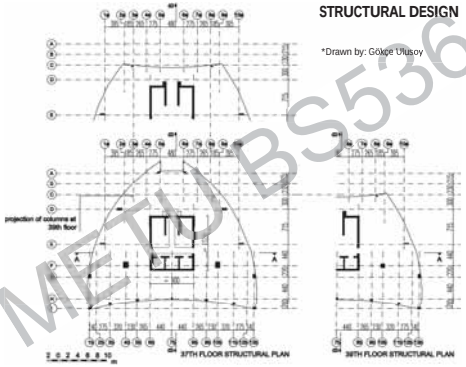

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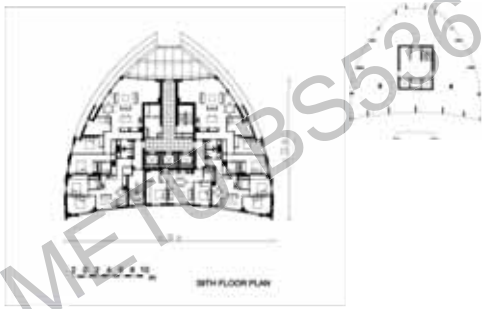

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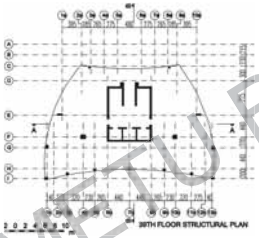
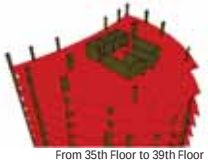


STRUCTURAL AXONOMETRIC

From 33rd Floor to 37th Floor



From 35th Floor to 39th Floor

*Drawn by: Gökçe Ulusoy

PARTIAL STRUCTURAL PERSPECTIVES

*Drawn by: Gökçe Ulusoy

STRUCTURAL PERSPECTIVES

*Drawn by: Gökçe Ulusoy

REFERENCES:

1) Alexander, S. Walton, M. 2011, Strata SE1, London, UK: 'The First In-House Wind Generator' , Structural Engineering International, 1/2011, pp. 37-40.
2) http://buildingdb.ctbuh.org/building.php?building_id=4131
3) http://www.skyscrapercity.com/showthread.php?t=1437252
4) www.propertyguru.com.sg
5) http://en.wikipedia.org/wiki/Strata_SE1
6) Hewitt, M. 2010, Tower Technology, Construction Europe, May 2010, pp. 46-47.
7) http://highrise.bk.tudelft.nl/pdf/Strata_SE1.pdf (document is damaged.)
8) Cowan, D. 2010, 'Strata SE1, London-Propelling Sustainable Regeneration', Proceedings of ICE-Civil Engineering, 2010,163,No.CE6, pp.56-63.
9) http://www.stratalondon.com/tower
10) Bogle, I. 2011, Integrating Wind Turbines in Tall Buildings, CTBUH Journal, 2011, Issue 4, pp.30-34.
11) Robert Torday @ BFLS (e-mail)