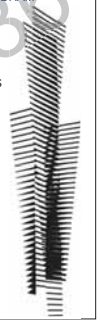
MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ARCHITECTURE / BUILDING SCIENCE PROGRAM

BS 536
STUDIES ON TALL BUILDINGS: DESIGN CONSIDERATIONS
Fall 2010-2011

Case Study: **Eureka Tower**
by
Sinan Bilgen

Submitted to: Assoc.Prof.Dr. Mehmet Halis Günel
Arch. H.Emre Ilgın (MSc.)



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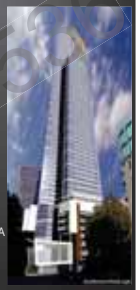
Submitted to: Günel, Igın – Fall 2010

EUREKA TOWER

LOCATION:	MELBOURNE, AUSTRALIA
USE:	RESIDENTIAL
STATUS:	IN USE
START OF CONSTRUCTION:	2001
COMPLETION:	2006
STRUCTURAL HEIGHT:	297 METERS
FLOORS:	91 FLOORS + 1 FLOOR BELOW GROUND
ARCHITECT:	FENDER KATSALIDIS ARCHITECTS
STRUCTURAL ENGINEER:	CONNEL MOTT MAC DONALD
CONTRACTOR:	GROCON
STRUCTURAL HEIGHT:	297 METERS
OBSERVATORY HEIGHT:	282 METERS
ASPECT RATIO:	7/1
TOP DRIFT:	600 mm (1/500)
MATERIAL:	CONCRETE
CONCRETE STRENGTH:	HIGH STRENGTH CONCRETE UP TO 100 MPA
DAMPER:	MASS LIQUID DAMPER



MOST NUMBER OF OUTRIGGER FLOORS IN THE WORLD
79 OUTRIGGER FLOORS

*http://buildingdb.ctbuh.org/?do=building&building_id=544 (Retrieved in December 2010)
*Photography (front page): http://www.eurekatower.com.au/logo.jpg&imgrefurl (Retrieved in January 2011)
*Photography: http://www.architectureweek.com/2003/0305/tools_1-1.html (Retrieved in December 2010)
*Owen Martin, Advances In The Structural Design Of High-Rise Residential Buildings in Australia (2005)

NAME

Eureka Tower is named after the Eureka Stockade, a rebellion of gold miners in 1854. This has been incorporated into the design, with the building's gold crown representing the gold rush and a red stripe representing the blood spilt during the revolt. The blue glass cladding that covers most of the building represents the blue background of the stockade's flag and the white lines also represent the eureka stockade flag. The prospectus of the building suggests the white horizontal stripes represent the marking units on a surveyor's measuring staff

* http://en.wikipedia.org/wiki/Eureka_Tower (Retrieved in December 2010)
* http://en.wikipedia.org/wiki/Eureka_Rebellion (Retrieved in December 2010)

STRUCTURAL SYSTEM :

GUNEL & ILGIN: OUTRIGGERED FRAME SYSTEM

TARANATH: NA, BUT SIMILAR TO OUTRIGGER AND BELT TRUSS SYSTEM IN STEEL

SMITH & COULL: NA, BUT SIMILAR TO OUTRIGGER BRACE STRUCTURES

DEAN, MARTIN, EMERY, CHANCELLOR: " THE STRUCTURAL STABILITY IS PROVIDED BY A COMPOSITE SYSTEM COMPRISING THE FOLLOWING COMPONENTS:
- COUPLED LIFT CORES
- EXTERNAL TUBE BEAM COLUMN AND FRAME INCORPORATING TWO MEGA COLUMNS
- AN EAST-WEST AND NORTH-SOUTH OUTRIGGER SHEAR WALL SYSTEM LINKING THE CENTRAL CORE TO THE PERIMETER FRAME."

STRUCTURAL MATERIAL : HIGH STRENGTH CONCRETE

STEEL: FAST ERECTION BUT MORE CRANE DEPENDENT
REDUCING MASS

MELBOURNE: LOW SEISMICITY, FREQUENT WINDS

CONCRETE: RESISTANT TO THE WIND LOADS
MUCH MORE EFFECTIVE TO MATCH THE SPEED VS. TO STEEL IN AUSTRALIA

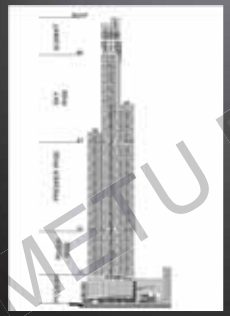
* Dean,Martin,Emery and Cahncellor (2001)

SITE

- PROXIMITY TO THE YARRA RIVER.
- WATER TABLE ONLY 2m BELOW GROUND.
- MAKING BASEMENTS UNECONOMICAL.
- 35 m DEEP PILED FOUNDATION SYSTEM ON THE 30 m DEEP SILT AND GRAVEL SITE.

•http://en.wikipedia.org/wiki/Eureka_Tower (Retrieved in January 2011)
•http://www.keller.co.uk/keller/services/studies/row/3420444 (Retreved in November 2010)

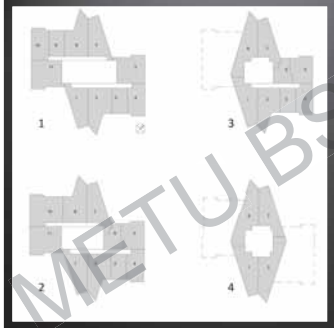
LEVELS



- Levels 0 to10 Podium
- Levels 11 to 24 River Rise
- Levels 25 to 52 Premier Rise
- Levels 53 to 80 Sky Rise
- Levels 81 to 91 Summit
- 10 storey car park rises to 31 m and floor plan measures 60m x 80 m approx.
- The western wing terminates at level 56.
- The eastern wing terminates at level 65.
- Mechanical Levels at 25,53,81,90,91,92

•101 Of The World's Tallest Buildings, Eureka Tower (2006)
•Image: AEC Bytes, a case study of Advanced BIM Implementation (2004)

PLAN ORGANIZATIONS

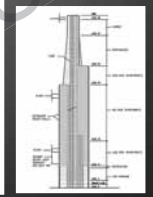


1-River Rise; Levels 11-24

2-Premier Rise; Levels 25-52

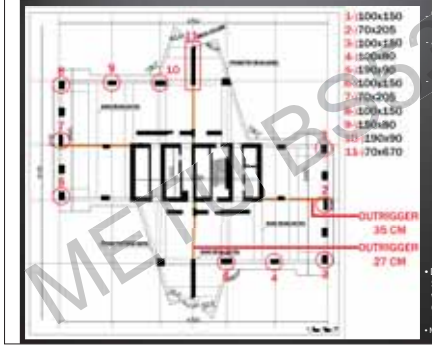
3-Sky Rise Levels 56-64

4-Sky Rise;Levels 65-80



•101 Of The World's Tallest Buildings, Eureka Tower (2006)
•Dean,Martin,Emery and Cahncellor (2001)

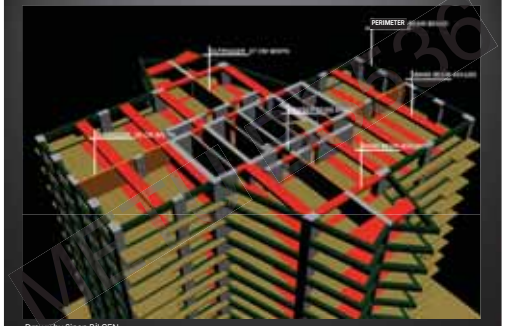
RIVER RISE LEVELS 11 TO 24



- NFA/GFA = 0.83
- 80 MPa Concrete in Core Walls.
- 100 Mpa Concrete in Columns.

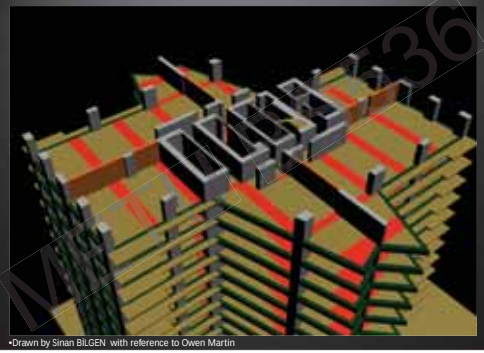
• Drawn by Sinan BILGEN with reference to Owen Martin
• Mix (2003)

RIVER RISE LEVELS 11 TO 24



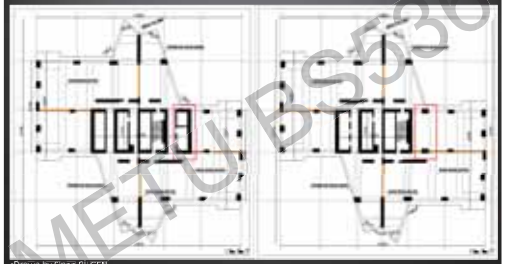
•Drawn by Sinan BILGEN
with reference to Owen Martin

RIVER RISE LEVELS 11 TO 24



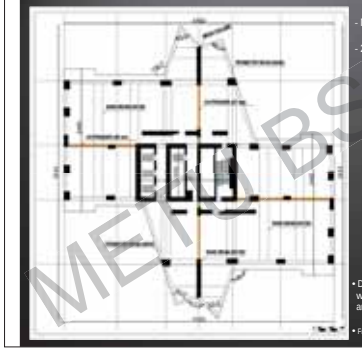
•Drawn by Sinan BILGEN with reference to Owen Martin

LEVELS 24 TO 25



•Drawn by Sinan BILGEN
with reference to Dean,Martin,Emery and Cahncellor

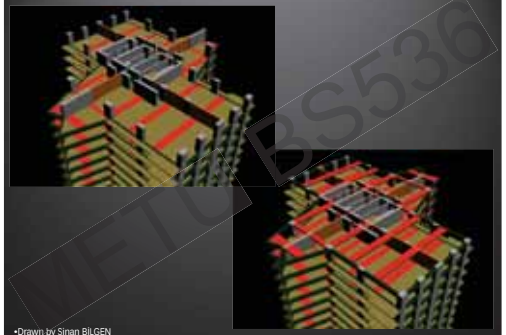
PREMIER RISE LEVELS 25 TO 52



- NFA/GFA = 0.87
- 21 cm Post Tensioned Concrete Slab

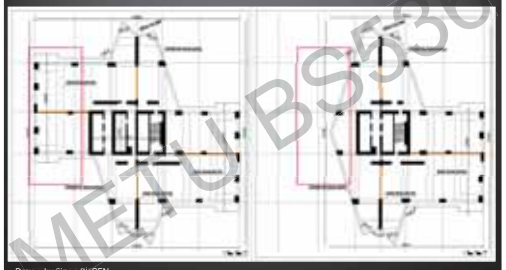
• Drawn by Sinan BILGEN with reference to Dean,Martin,Emery and Cahncellor
• Freyssinet Eureka Tower

PREMIER RISE LEVELS 25 TO 52



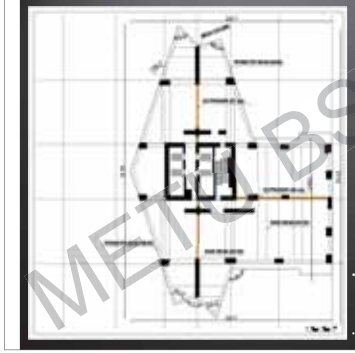
•Drawn by Sinan BILGEN
with reference to Dean,Martin,Emery and Cahncellor

LEVELS 55 TO 56



•Drawn by Sinan BILGEN
with reference to The Eureka Tower: A Case Study of Advanced BIM Implementation (2004)

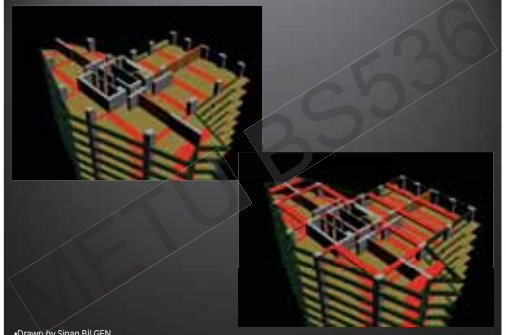
SKY RISE LEVELS 56 TO 65



- NFA/GFA = 0.87
- First Drop off at level 56.
- 21 cm Post Tensioned Concrete Slab

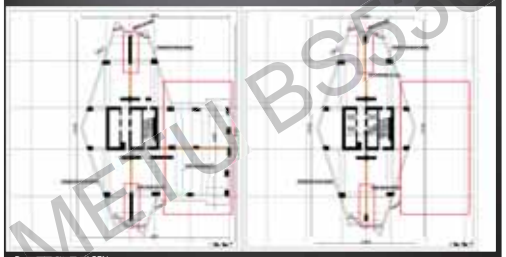
• Drawn by Sinan BILGEN with reference to The Eureka Tower: A Case Study of Advanced BIM Implementation (2004)
• Freyssinet Eureka Tower

SKY RISE LEVELS 56 TO 65



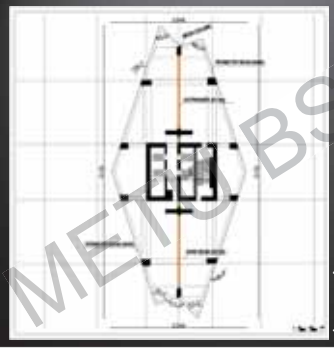
•Drawn by Sinan BILGEN
with reference to The Eureka Tower: A Case Study of Advanced BIM Implementation (2004)

SKY RISE LEVELS 65 TO 66



•Drawn by Sinan BILGEN
with reference to The Eureka Tower: A Case Study of Advanced BIM Implementation (2004)

SKY RISE LEVELS 66 TO 80



- NFA/GFA = 0.83
- Second Drop off at level 65.
- 40 MPa Concrete in Core Walls.
- 60 MPa Concrete in Columns.

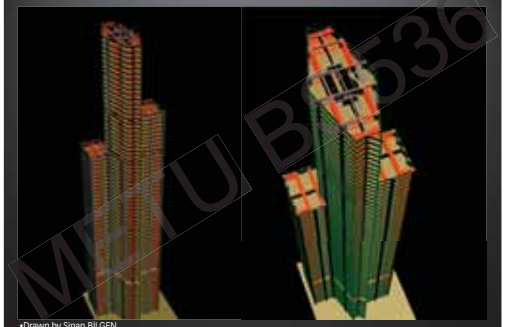
• Drawn by Sinan BILGEN with reference to The Eureka Tower: A Case Study of Advanced BIM Implementation (2004)

• Mix (2003)

SKY RISE LEVELS 66 TO 80

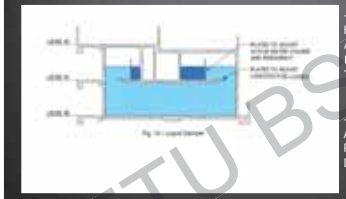
•Drawn by Sinan BILGEN
with reference to The Eureka Tower: A Case Study of Advanced BIM Implementation (2004)

GENERAL PERSPECTIVE



•Drawn by Sinan BILGEN

LIQUID DAMPER



- A LIQUID MASS DAMPER HAS BEEN ADOPTED ON 90 AND 91st FLOORS AS A ROOFTOP WATERSTORAGE TANK.

-300.000 LITRES OF WATER IS ALSO USED FOR EMERGENCY FIRE SPRINKLERS AND DOMESTIC CONSUMPTION.

* Owen Martin, Advances In Structural Design Of High- Rise Residential Buildings In Australia (2005)

SITE PHOTOS 2004

March 2004

April 2004

May 2004

August 2004

September 2004

October 2004

November 2004

December 2004

*Hesham Mohamed Hassan El-Shahawy

SKYDECK

*Photography: *www.eurekaskydeck.com.au/pdf/visitorguides/English.pdf (Retrieved in Nowember 2010)*

SKYDECK

*Vertical City Tv Programme Season 1 Episode 3 (Retrieved in Nowember 2010)

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- Dean,Martin,Emery and Cahncellor . Tall Buildings and Urban Habitat Cities In Thi d Millenium. 6 th World Congress of CTBUH (2001) Pages:395-399.
- Australian Council On Tall Buildings and Urban Habitat, Australia by 2010 (2006)
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-Mix (2003)
-Vertical City Tv Programme Season 1 Episode 3 (Retrieved in Nowember 2010)
-Freyssinet Eureka Tower