MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ARCHITECTURE / BUILDING SCIENCE PROGRAM

BS 536
STUDIES ON TALL BUILDINGS: DESIGN CONSIDERATIONS
Spring 2016-2017

Case Study: **Merdeka PNB 118**
by
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Submitted to: Assoc.Prof.Dr. Mehmet Halis Günel
Assist.Prof.Dr. Bekir Özer Ay

MERDEKA PNB 118
KUALA LUMPUR, MALAYSIA

Figure 1a: Southeast view[1]

Figure 1b: Northeast night view[2]

[1] Retrieved from https://assets.nst.com.my/images/articles/PNB118.transformed.jpg
[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City

Figure 1c: Day view[2]

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Submitted to: Günel, Ay – Spring 2017

GENERAL INFORMATIONS

Official Name: Merdeka PNB 118 [3]
Other Names: Heritage of Independence, KL118 Tower, Menara Warisan Merdeka, PNB Headquarters [3]
Location: Kuala Lumpur, Malaysia [3]
Height to tip/architectural: 644 m. [3]
Height Occupied: 500 m. [3]
Floors Above Ground: 118 [3]
Aspect Ratio: 6,7
Structural System: Outriggered Frame System[4]
Structural Material: Composite[4]
Architecture: Fender Katsalidis Architects [3]
Structural Engineer: Leslie E. Robertson Associates; Robert Bird Group & ARUP [3]
Building Function: Hotel/ Office [3]
Status: Under Construction (by 2017) [3]
.Proposed: 2010
.Construction Start/End: 2014/2020
City/ Regional/ Global Ranking: 1- 2- 3 (by 2017) [3]

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[3] Retrived from https://skyscrapercenter.com/building/merdeka-pnb118/10115
[4] According to classification of Günel, Ilgin (2014), Tall Buildings: Structural Systems and Aerodynamic Form

World's 10 tallest buildings

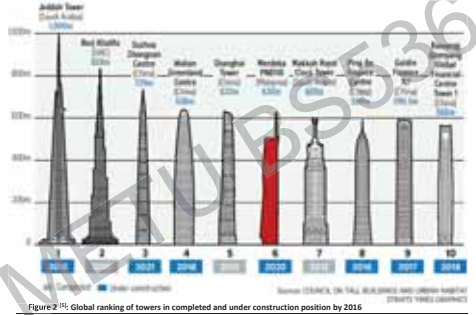

Figure 2 [3]: **Global ranking of towers in completed and under construction position by 2016**

[3] Retrieved from http://www.straitstimes.com/asia/se-asia/malaysian-pm-najib-to-build-tower-to-rival-mahathirs-twin-towers

Environmental Analysis/Location

Figure 3a :Site & City Silhouette of Kuala Lumpur[6]

Figure 3b : Site plan for new tower[6]

Figure 3c : Location of tall structures in the city [5]

[5] Retrieved from http://www.straitstimes.com/asia/se-asia/malaysian-pm-najib-to-build-tower-to-rival-mahathirs-twin-towers
[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference speech

Figure 4 : Tower options presented to prime minister[6]

"When someone mentions an iconic tower, what exactly does it mean? What is it makes a tower iconic? The design? The shape? The story or history that lies behind the development? Perhaps, in this case, it may be all of those things. But it is also the aspiration, the desire for excellence and the determination to build something memorable and lasting, something that can define a new Malaysia" *Prime Minister Dato's Sri Mohd Najib bin Tun Abdul Razak* [2]

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference speech

Figure 5: Selected tower and urban contents [6]

[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference speech

Site Plan

Figure 6a: Site Plan [6]

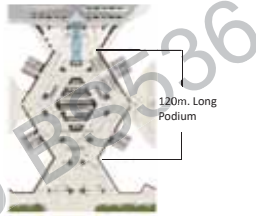

Figure 6b : Ground Floor Plan [6]

The tower is designed as a crystalline form, fashioned in glass from the diamond motif derived from a traditional Malay songket pattern outline employed in both plan and elevation. [6]

[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference speech

Typical Floor Plans

Level 107
Typical Hotel Floor

Figure 7a[2]

Level 10
Typical Office Floor

Figure 7b[2]

Level 75
Typical Sky Lobby

Figure 7c[2]

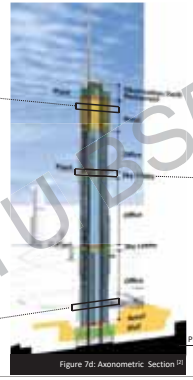

Figure 7d: Axonometric Section [2]

118 Floors Above Ground[2]
-83 Office Floors
-17 Hotel Floors
-18 Mechanic, Electric, Sky lobby Floor
5 Floors Below Ground
Typical Floor Height : 3.6 m.
Numbers of Elevators: 87

Dimensions in plans are in cm.
Plans are drawn by **Damlanur İlipinar**

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City

Figure 8a[2]: **Level 107-Typical Hotel Floor**

2.0m x 1.0m R/C Column
2.8m x 2.4m R/C Column
50cm x 50cm steel box perimeter columns
R/C Core: 30m x 19m
Core Outer Wall Thickness: 50cm

Figure 8b[2]: **Level 10-Typical Office Floor**

3.8m x 3.8m R/C Column
4.5m x 3.2m R/C Column
50cm x 50cm steel box perimeter columns
R/C Core: 34m x 44m
Core Outer Wall Thickness: 150cm

Detailed Dimensions

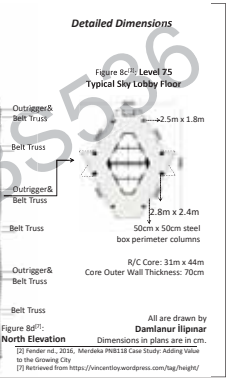

Figure 8d[7]: **North Elevation**

Figure 8c[2]: **Level 75 Typical Sky Lobby Floor**

2.5m x 1.8m
2.8m x 2.4m
50cm x 50cm steel box perimeter columns
R/C Core: 31m x 44m
Core Outer Wall Thickness: 70cm

All are drawn by **Damlanur İlipinar**
Dimensions in plans are in cm.

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[7] Retrieved from https://vincentloy.wordpress.com/tag/height/

Structural Openings

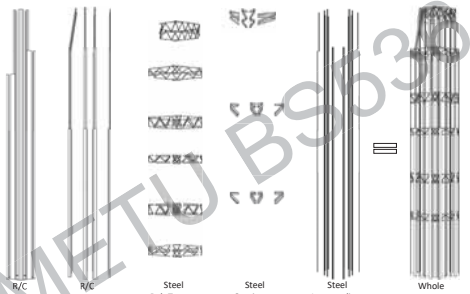

Figure 9 [2] : Structural Elements of Tower, drawn by **Damlanur İlipinar**

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City

Structural Axonometry

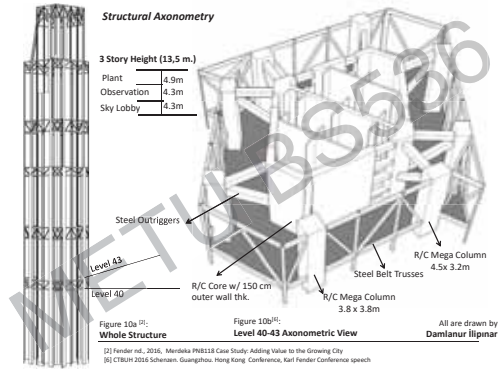

Figure 10a [2]: **Whole Structure**

Figure 10b[6]: **Level 40-43 Axonometric View**

All are drawn by **Damlanur İlipinar**

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference speech

Outriggers in Three Levels

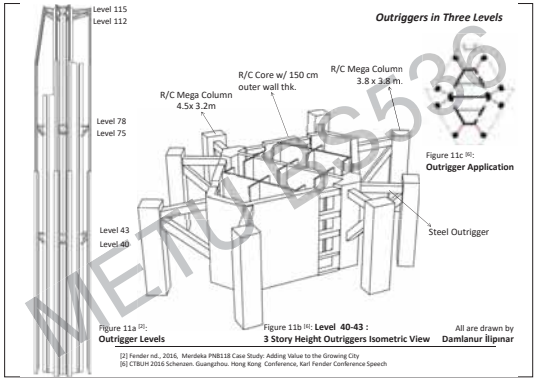

Figure 11a [2]: **Outrigger Levels**

Figure 11b [6]: **Level 40-43 : 3 Story Height Outriggers Isometric View**

Figure 11c [6]: **Outrigger Application**

All are drawn by **Damlanur İlipinar**

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference Speech

Belt Trusses in Six Levels

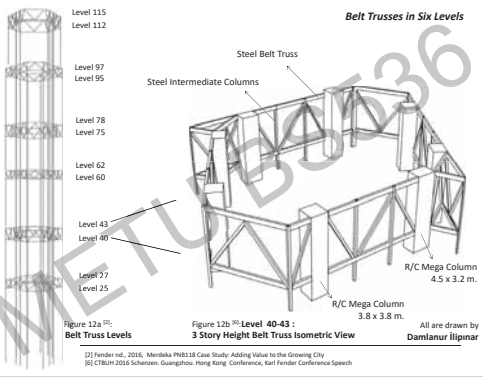

Figure 12a [2]: **Belt Truss Levels**

Figure 12b [6]: **Level 40-43 : 3 Story Height Belt Truss Isometric View**

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[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[6] CTBUH 2016 Schenaen. Guangzhou. Hong Kong Conference, Karl Fender Conference Speech

3D Section View

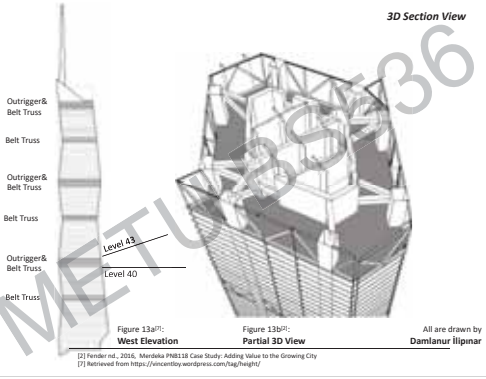

Figure 13a[7]: **West Elevation**

Figure 13b[2]: **Partial 3D View**

All are drawn by **Damlanur İlipinar**

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[7] Retrieved from https://vincentloy.wordpress.com/tag/height/

Lettable Area

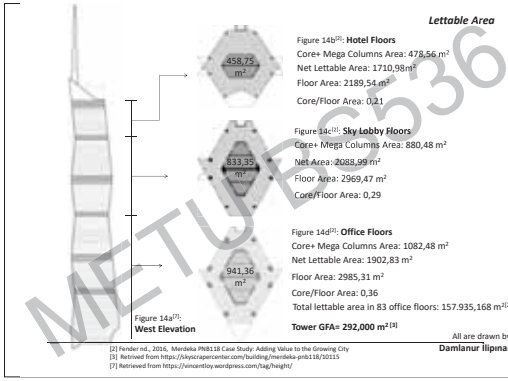

Figure 14a[2]: **West Elevation**

Figure 14b[2]: **Hotel Floors**
Core+ Mega Columns Area: 478,56 m²
Net Lettable Area: 1710,98m²
Floor Area: 2189,54 m²
Core/Floor Area: 0,21

Figure 14c[2]: **Sky Lobby Floors**
Core+ Mega Columns Area: 880,48 m²
Net Area: 2088,99 m²
Floor Area: 2969,47 m²
Core/Floor Area: 0,29

Figure 14d[2]: **Office Floors**
Core+ Mega Columns Area: 1082,48 m²
Net Lettable Area: 1902,83 m²
Floor Area: 2985,31 m²
Core/Floor Area: 0,36
Total lettable area in 83 office floors: 157.935,168 m²[2]

Tower GFA= 292,000 m² [3]

All are drawn by **Damlanur İlipinar**

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[3] Retrived from https://skyscrapercenter.com/building/merdeka-pnb118/10115
[7] Retrieved from https://vincentloy.wordpress.com/tag/height/

Construction Photo

Figure 15 [8] : **Core Reinforcement**

[8] Retrieved from http://www.skyscrapercity.com/showthread.php?t=956606&page=199

Construction Photo

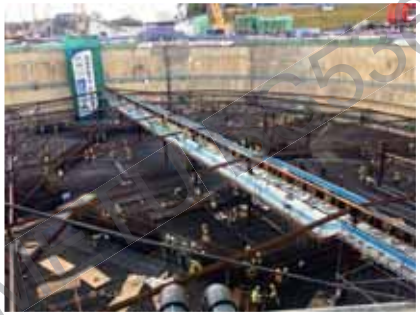

Figure 16 [8] : **Core Reinforcement**

[8] Retrieved from http://www.skyscrapercity.com/showthread.php?t=956606&page=199

Construction Photo

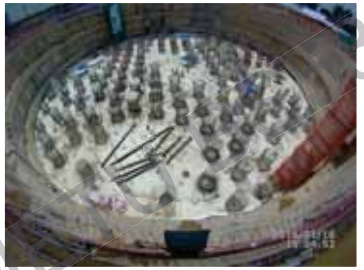

Figure 17[8]: **Raft Foundation**

The superstructure is supported by by a four-meter-thick raft foundation slab and 137 cast-in-place board piles, each 2.2 meters in diameter and extending 60 meters in length. [2]

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City
[8] Retrieved from http://www.skyscrapercity.com/showthread.php?t=956606&page=199

Figure 18a [2]: Night View

Figure 18b [2]: Day View

[2] Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City

Reference List

1- https://assets.nst.com.my/images/articles/PNB118.transformed.jpg

2- Fender nd., 2016, Merdeka PNB118 Case Study: Adding Value to the Growing City

3- https://skyscrapercenter.com/building/merdeka-pnb118/10115

4- Günel H.& Ilgin E.(2014), Tall Buildings: Structural Systems and Aerodynamics Form, Routledge – Taylor and Francis Book Company

5- http://www.straitstimes.com/asia/se-asia/malaysian-pm-najib-to-build-tower-to-rival-mahathirs-twin-towers

6- CTBUH 2016 Schenzen. Guangzhou. Hong Kong Conference, Karl Fender Conference speech

7- https://vincentloy.wordpress.com/tag/height/

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