César Pelli

Petrona Towers

1998
Architect

César Pelli, born October 12, 1926 in San Miguel de Tucumán, Argentina.

His many awards include the 1995 AIA Gold Medal.

Pelli completed his studies at the School of Architecture, at the University of Illinois at Urbana-Champaign.

He emigrated to the United States in 1952 and became a naturalized U.S. citizen in 1964.

Pelli served as dean of the School of Architecture at Yale University from 1977 to 1984.

Perhaps his most famous work: Petronas Twin Towers.
Other Projects

Wells Fargo Center (formerly Norwest Center), Minneapolis
Key Tower, Cleveland, Ohio, USA
Other Projects

100 North Main Street (formerly Wachovia Center), Winston-Salem, North Carolina
Other Projects

Cheung Kong Center
Other Projects

Cheung Kong Center
Other Projects

Zurich Tower
Other Projects

Goldman Sachs Tower, Jersey City, New Jersey
Other Projects

Torre de Cristal, Madrid, Spain
Petronas

COMPANIES INVOVLED

Architect: César Pelli, Djay Cerico

Structural engineer: Thornton Tomasetti

Contractor (PM Dr. Mahathir Mohamad idea of having two separate contractors to create competition)

Tower1: Hazama Corporation
Tower2: Samsung Engineering & Construction

Developer/Owner: KLCC Holdings
Petronas  an introduction

Location: Jalan Ampang, Kuala Lumpur, Malaysia


Floor count: 88

Floor area: 395,000 m² (4,252,000 sq ft)

Elevators: 78

Cost: US$1.6 billion

Were the world's tallest buildings from 1998 to 2004, when their height was surpassed by Taipei 101

From 2001, the towers remain the tallest twin buildings in the world

Previous record set by Willis Towers (formerly known as Sears Towers) as its antennas (a non-architectural feature) are not included in recording total height, though its numbers of floors (110) and floor area is much higher
Petronas

- Petronas Towers 1 & 2: 1,483 feet
- Sears Tower: 1,450 feet
- Empire State Building: 1,250 feet
- Taipei 101: 1,667 feet
Brief

functional requirements were

- **218,000 square metres** of floor space **for office** in each of the towers
- **concert hall**
- **a six-storey shopping and entertainment complex** to include two department stores, shops, restaurants, cinemas, an art gallery, a specialized library
- **four-storey underground car park for 5,400 cars**
Brief

Malaysia, one of the major south-east economy wanted it to put itself on map by breaking US monopoly on mega-structures.

“To create pair of joint skyscrapers, to house office of Petronas, short form of Petroliam Nasional Berhad, Malaysian-owned oil and gas company”

Then, prime minister Dr. Mahathir Mohamad wanted an iconic structure to depict countries dominance.

“Tall yet Malaysian”

(Islamic influence)

(60.4% Islamic, 19.2% Buddhist, 9.1% Hindu)
Kuala Lumpur, Race Curse
Site
Kuala Lumpur City Centre  37 + 63 acres

1. Petronas Towers I & II
2. Concert Hall
3. Suria KLCC Retail Complex
4. Office Tower (Menara Maxis, Menara Esso)
5. Mandarin Oriental Hotel
6. Future Buildings
Site
Kuala Lumpur City Centre  37 + 63 acres
Malaysian =

Islamic =

Geometric Shapes

Challenge:

to *translate* all this into a skyscraper
Initial iDEA

2 skyscrapers with **skywalk** at mid height

Depiction of an “**Islamic Gateway**”

PM believed that the idea **wasn’t Malaysian enough** to satisfy the brief
PM’s Input

Floor plan based on two interlocking squares

This represents order and harmony
Pelli’s Modifications

Floor plate designed by PM wasn't giving the desired floor area.

Cesar Pelli, embellished the floor plan with semi-circular scallops.

The finalising of design took 8 months.
Pelli’s Modifications
My Interpretation

Success in making skyscraper Islamic

1\textsuperscript{st} impact: Pelli’s initial idea of having a skywalk in between two giant towers to give an appeal of an **ISLAMIC GATEWAY**

2\textsuperscript{nd} impact: floor plates derived from Islamic geometric patterns

3\textsuperscript{rd} impact: line of symmetry
Challenges in CONSTRUCTION

Detailed site study showed that structure proposed was standing on the edge of depression in sub surface.

The towers were shifted 60 m towards the depression and enormous piles were laid on the hard bed bedrock (120 m deep).
Challenges in CONSTRUCTION

building of Foundation Slab

The whole concreting of the slab had to be done in one go which meant

- **52 hrs** of concreting w/o a break
- Truck load every **2 ½ minute**

**Monsoon strike** in between
Challenges in CONSTRUCTION replacing Steel with reinforced concrete

- Malaysia has a shortage of steel and importing it would have blown the budget out of proportion.
- Concrete required to serve this purpose was of grade 140 Mpa

16 CONCRETE PILLARS
Along the curvature supporting by ring of beams
Vertical Circulation

**DOUBLE ELEVATOR**
The floor area was too small to accommodate too many space for shafts, so **double elevators were employed**. Passengers that want to go

- **Odd** level stay at lobby
- **Even** level climb one level up using escalators

Each shaft had 2 double elevators, 56 in total

**EXPRESS ELEVATOR**
This goes half way up, called the sky lobby
Vertical Circulation

Section showing vertical circulation
Layout & Design

Concept and structure

Support Beam
Perimeter Column
Core
Bustle

Mast
Rig Ball
Perimeter Supporting Columns
Elevator Shafts
Foundation Mat
Piles

Section
Plan

The core:

23 X 23 meters and occupies approximately 23% of the floor space.

The core contains lifts, staircase, MEP shafts and toilets.

Cesar Pelli considered it to be a very good ratio for tall buildings.

WTC had 15% of the floor area as core.
Plan

Level 76 plan
Facts

The cost per square meter in Petronas is estimated to be about 195 USD/ sq. m

The maintenance cost is 1.5 USD/ sq. m

Air conditioning required in towers is 30,000 TR

Cesar Pelli was asked to adjust the orientation of the towers so that they are directed towards the Mecca. The toilets were located so that they oriented away from Mecca
The two towers are connected by a skybridge at the sky lobby levels on the 41st and 42nd floors for inter-tower communication and circulation.
A shopping and entertainment galleria connects the office towers at the base, integrating the entire complex.
Entrance
Lobby

Geometric design on the floor that features a radial swirl of stainless steel embedded in black granite
Users and Response

Reason for coming to Petronas Towers:

- Business: 11%
- Shopping: 28%
- Visiting: 6%
- Cultural: 32%
- Recreation: 6%
- Eating and drinking: 17%

Why do you like the Petronas Towers Complex?

- The tallest building in Kuala Lumpur: 25%
- Islamic character: 12%
- Uses advanced technology: 21%
- Creates the Kuala Lumpur City Centre: 12%
- Combines several functions: 24%
- International / modern style skyscraper: 6%

Favourable elements of the complex

- Towers: 20%
- Shopping mall: 23%
- Concert hall: 27%
- Art gallery: 7%
- Front plaza / garden: 10%
- Ground-floor interior design: 3%
- Top of the towers: 10%
Thank You