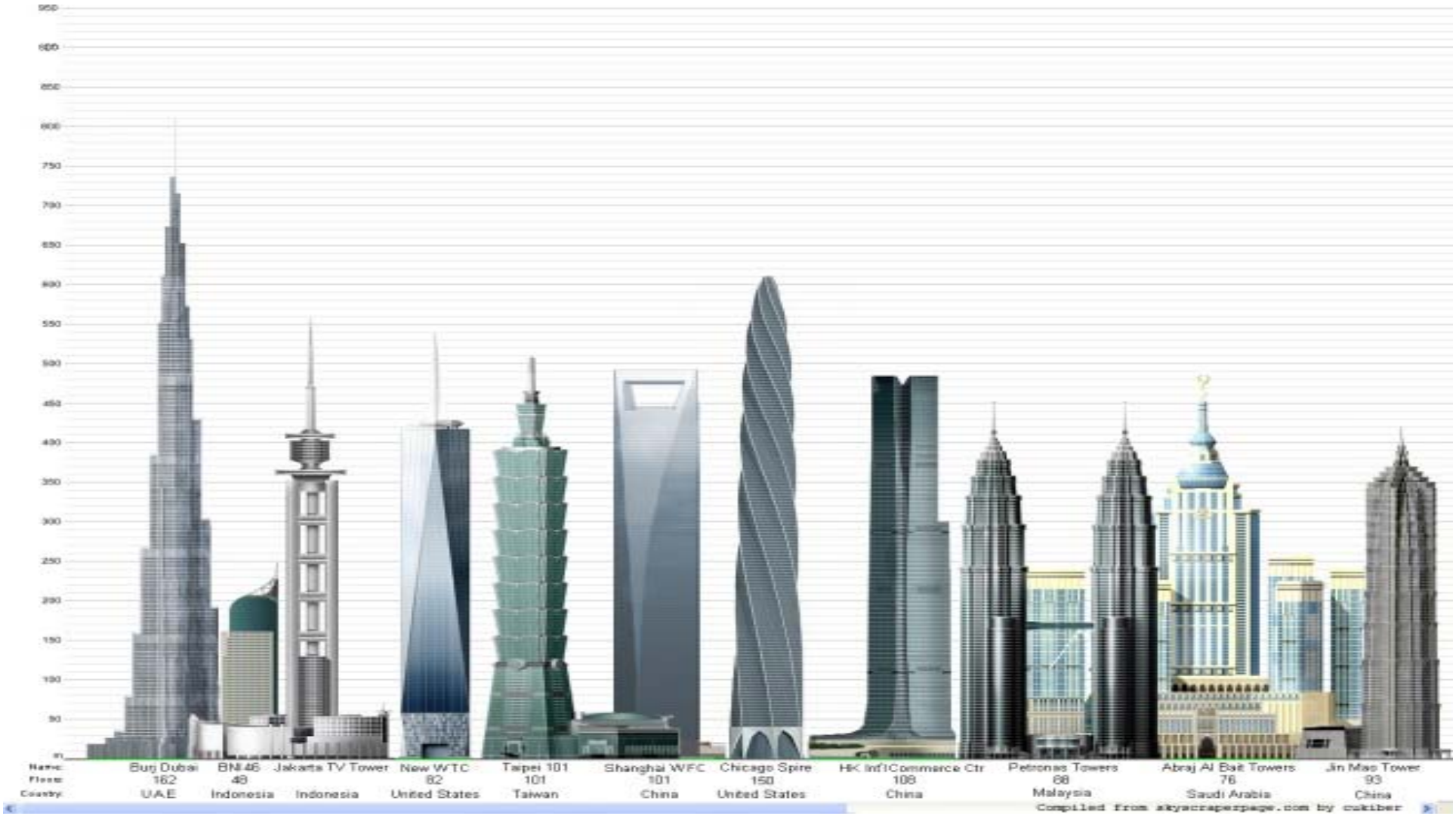
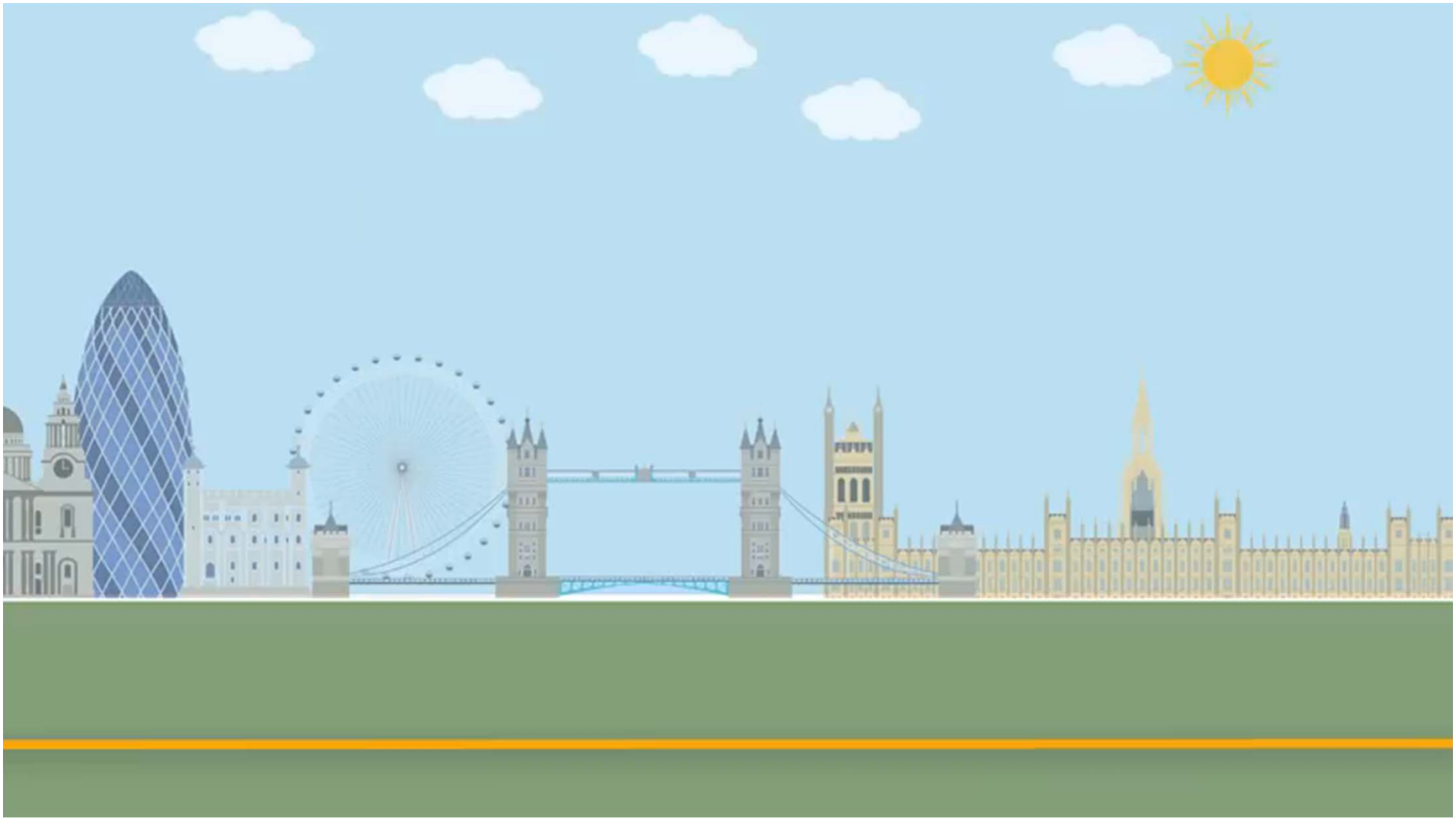
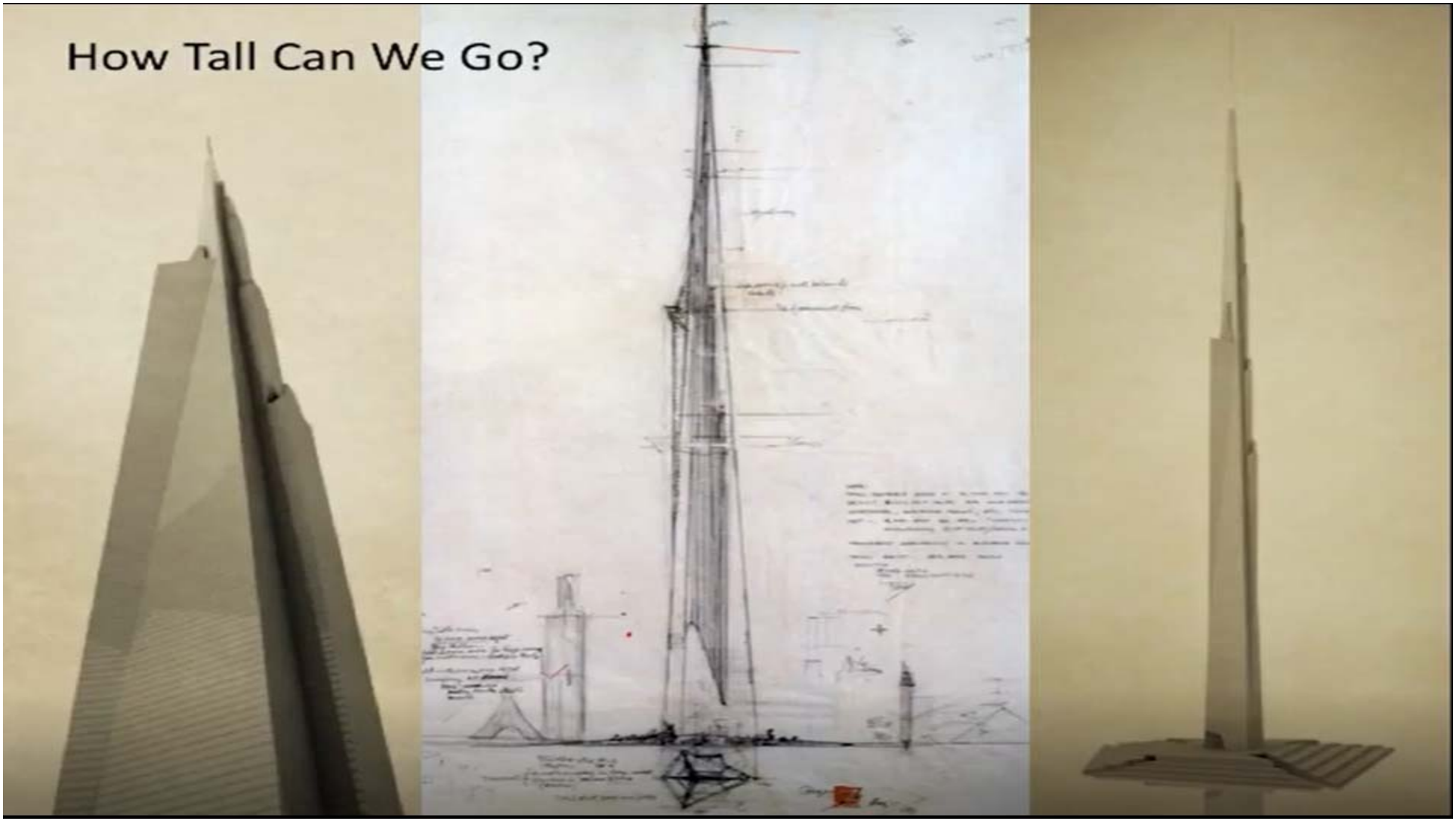
PENGANTAR
BANGUNAN BERTINGKAT TINGGI

Baju Arie Wibawa, S.T., M.T.
MK. Struktur Bangunan Bertingkat Tinggi

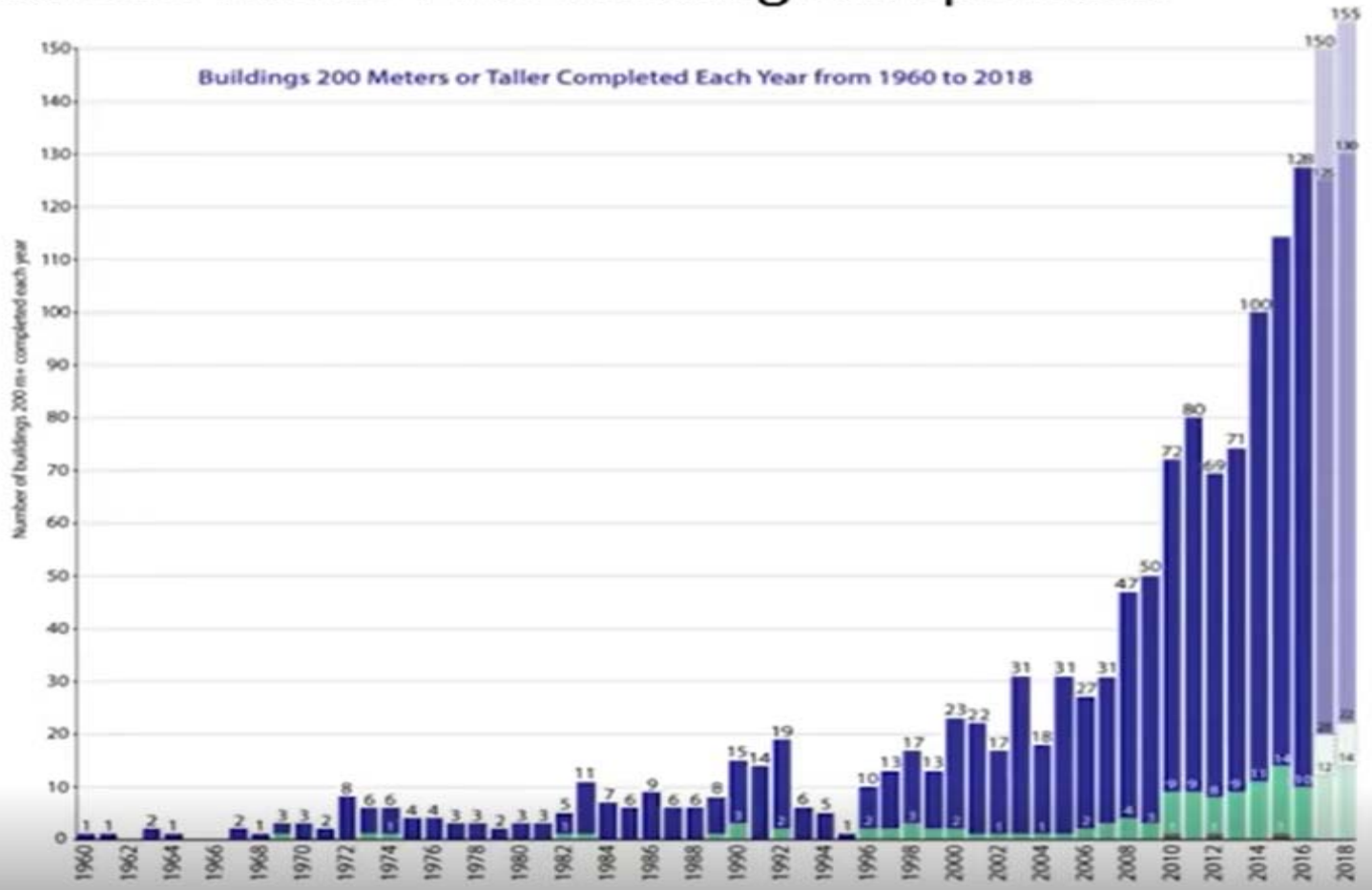

950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
Name: Burj Dubai | BNI 46 | Jakarta TV Tower | New WTC | Taipei 101 | Shanghai WFC | Chicago Spire | HK Int'l Commerce Ctr | Petronas Towers | Abraj Al Bait Towers | Jin Mao Tower
Floors: 162 | 46 | | 82 | 101 | 101 | 150 | 108 | 88 | 76 | 93
Country: UAE | Indonesia | Indonesia | United States | Taiwan | China | United States | China | Malaysia | Saudi Arabia | China
Compiled from skyscraperpage.com by cukiber



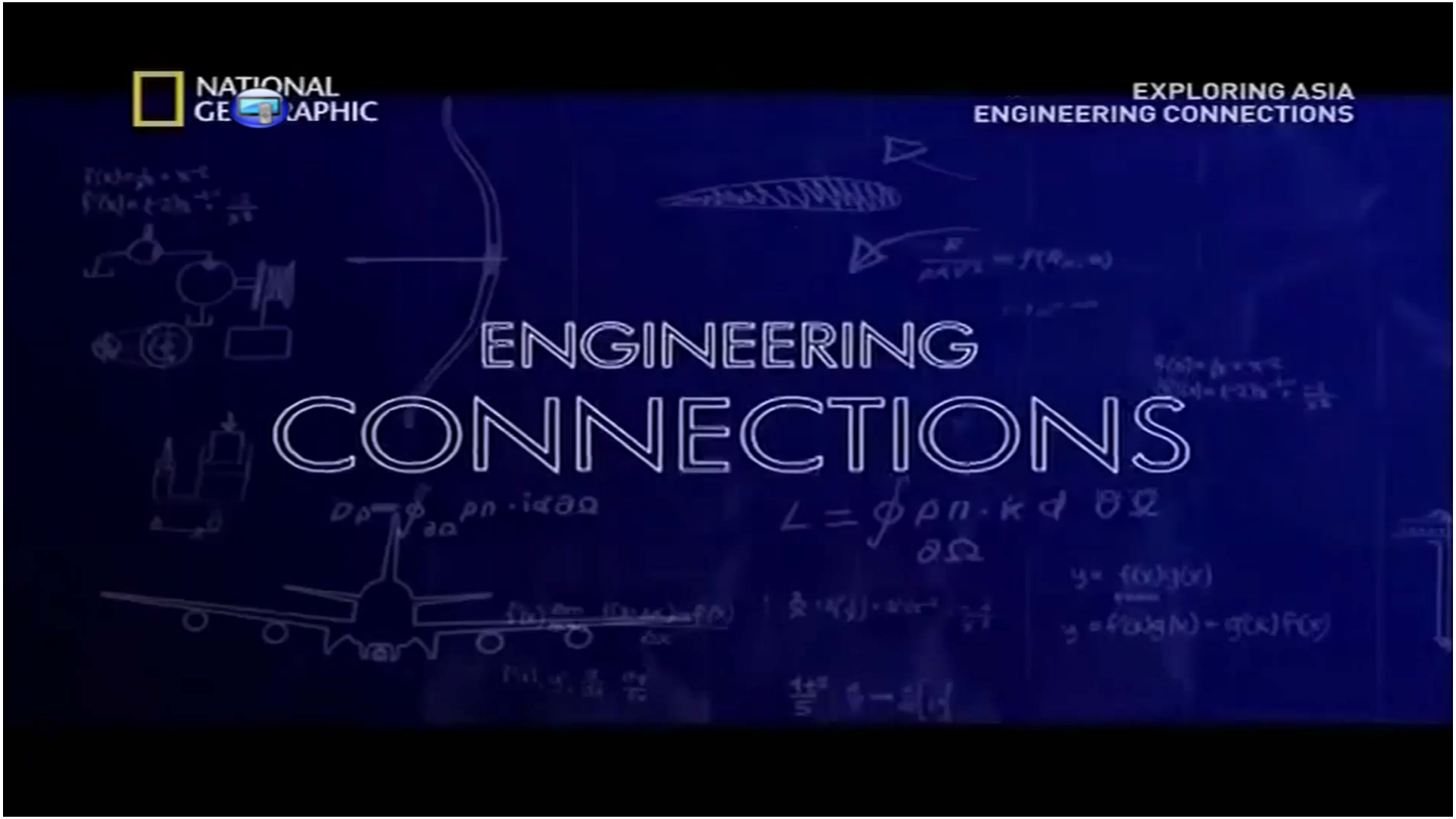
How Tall Can We Go?



Annual 200-Meter-Plus Building Completions

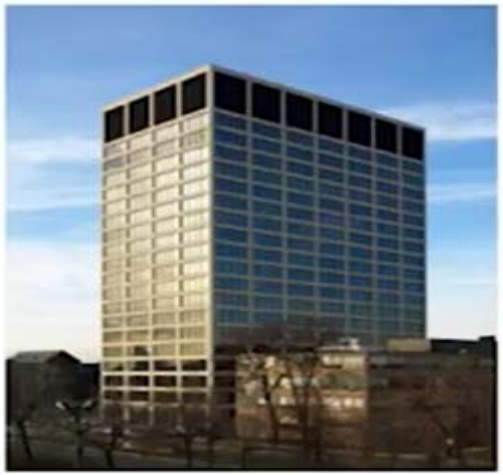



What is a Tall Building?

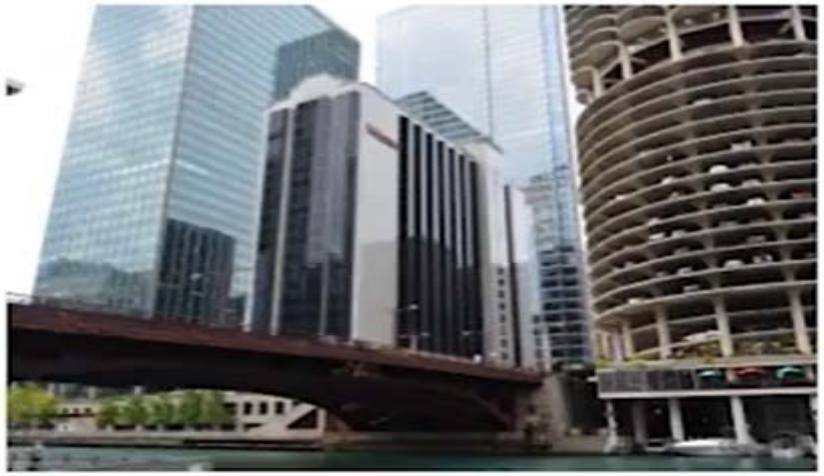

NATIONAL GEOGRAPHIC
EXPLORING ASIA
ENGINEERING CONNECTIONS
ENGINEERING
CONNECTIONS

What’s highrise building

1. Height Relative to Context

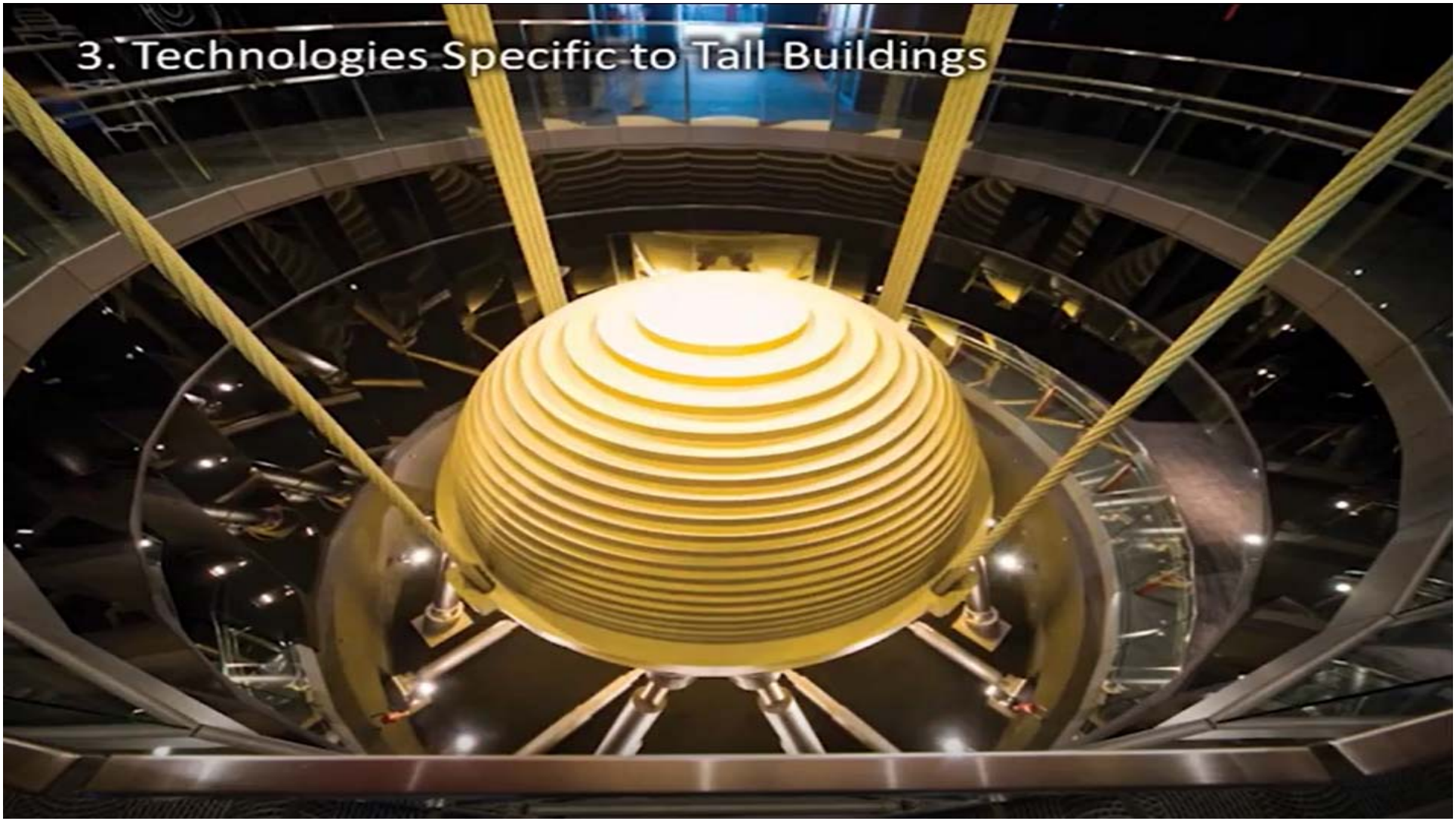


VS.

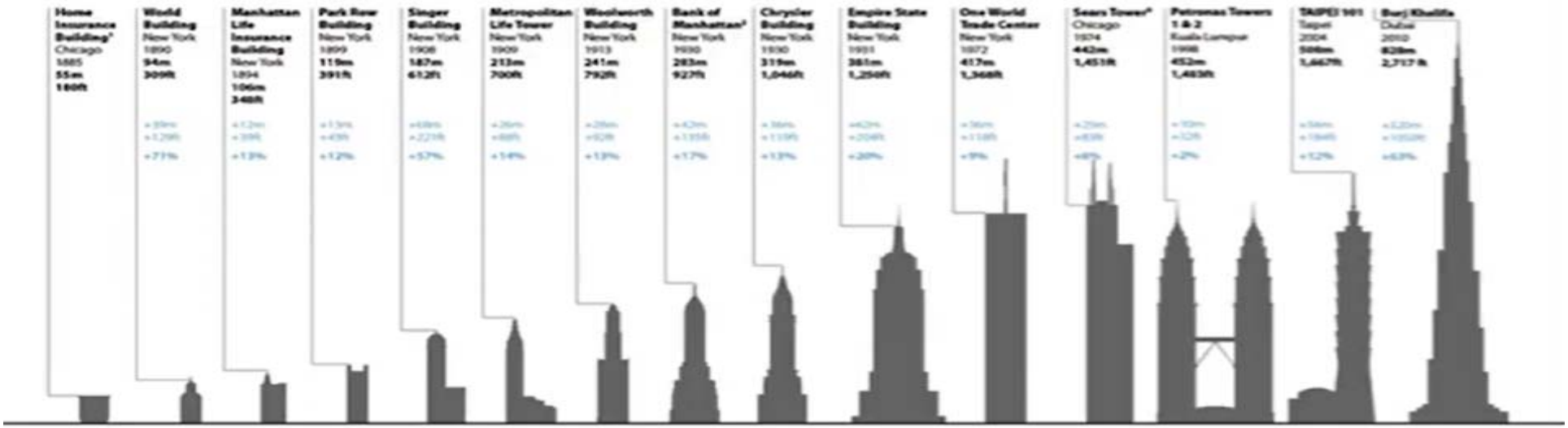


2. Proportion

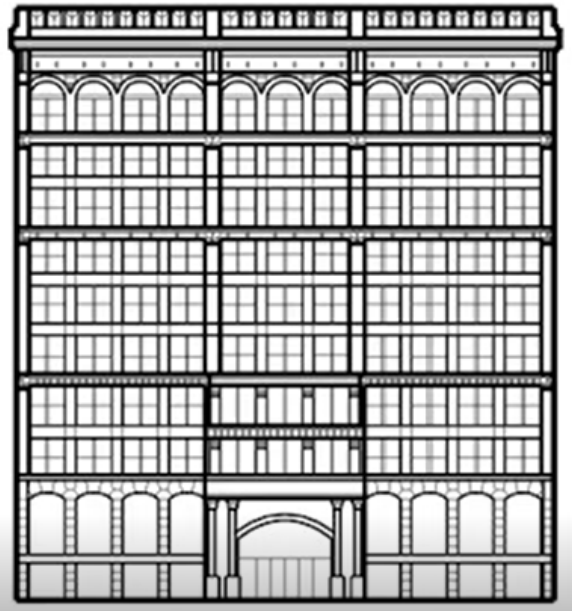
VS.


3. Technologies Specific to Tall Buildings

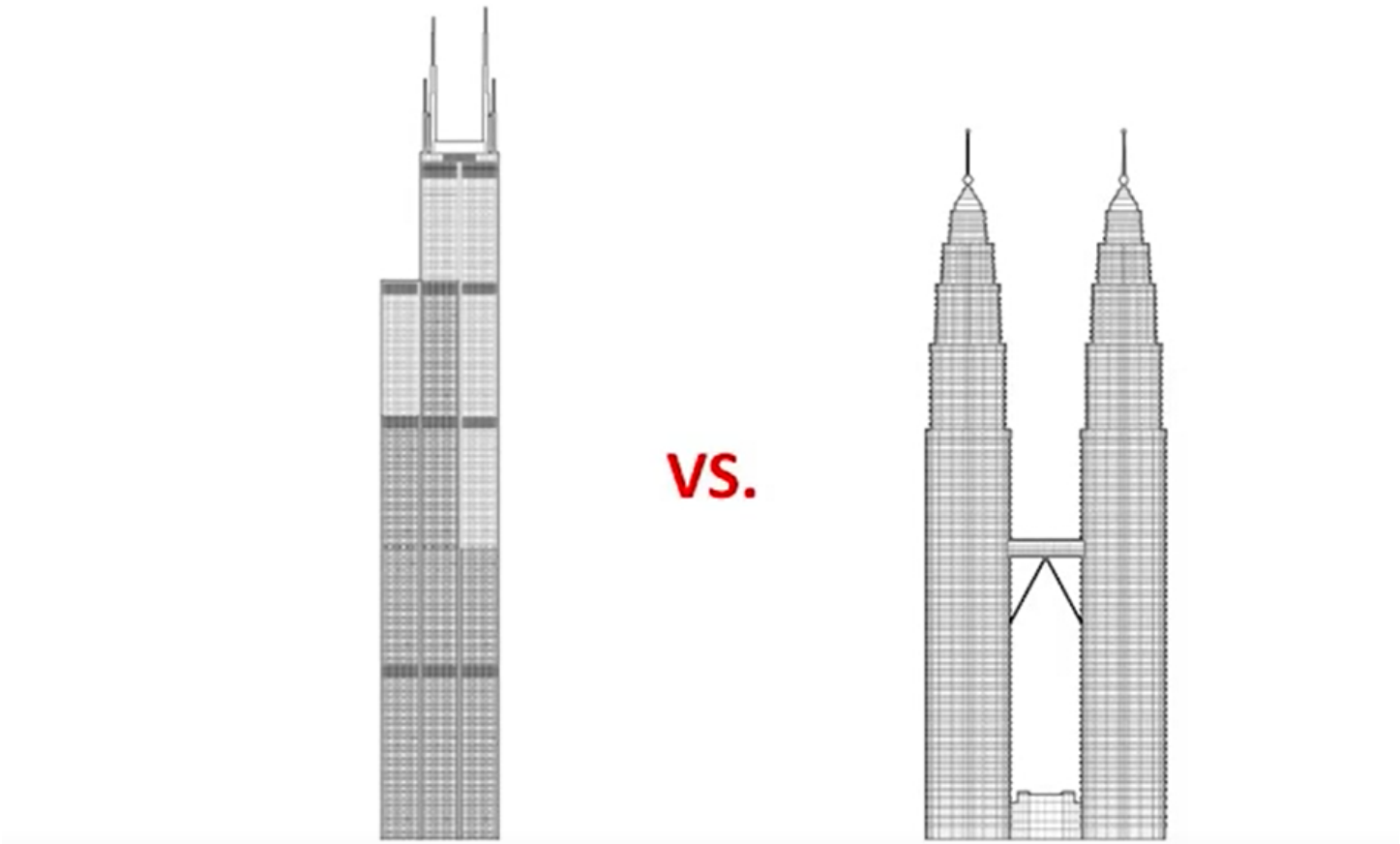
History of the “World’s Tallest Building”



The First Tall Building
1885. Home Insurance Building, Chicago
42 meters




Current World's Tallest Building
2010. Burj Khalifa, Dubai
828 meters


VS.
Willis Tower (then Sears)
Petronas Towers

Spires

Chrysler Building,
New York

Petronas Towers,
Kuala Lumpur

Burj Khalifa,
Dubai

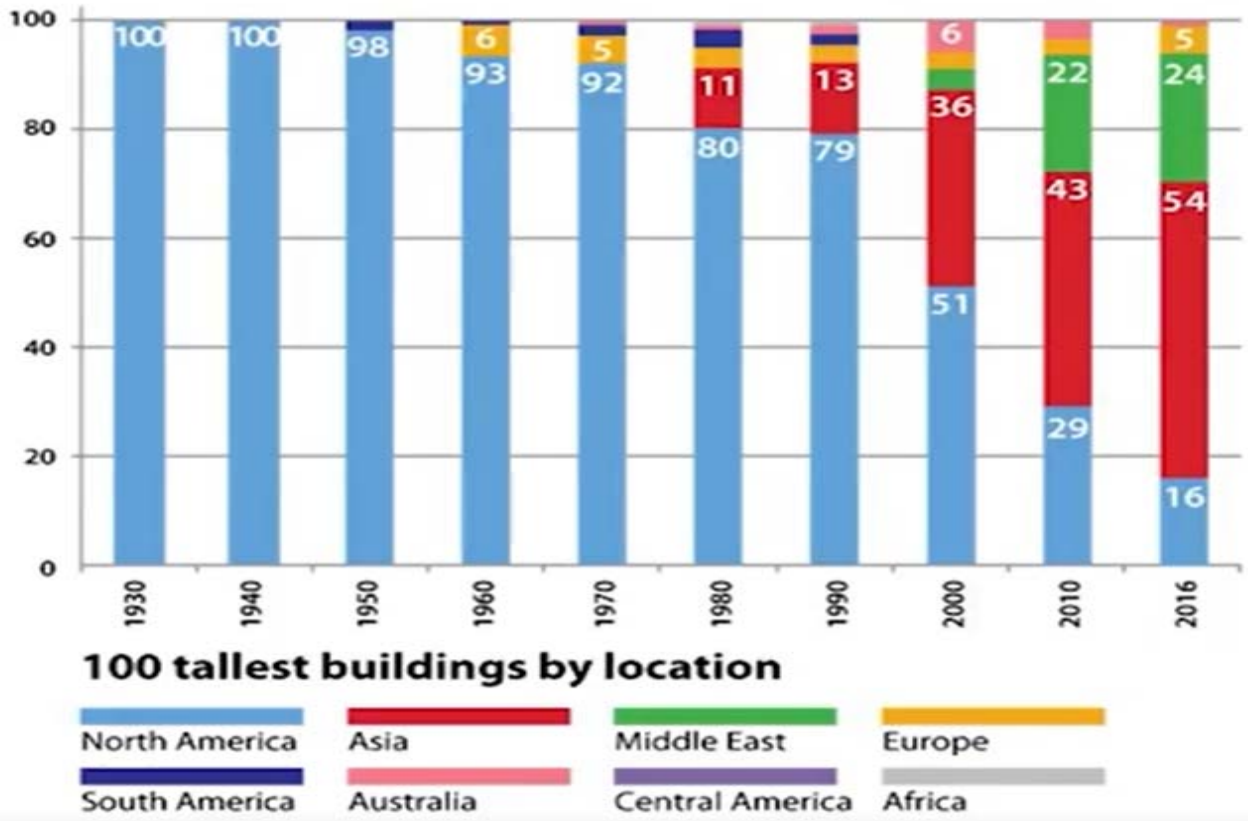
Antennae

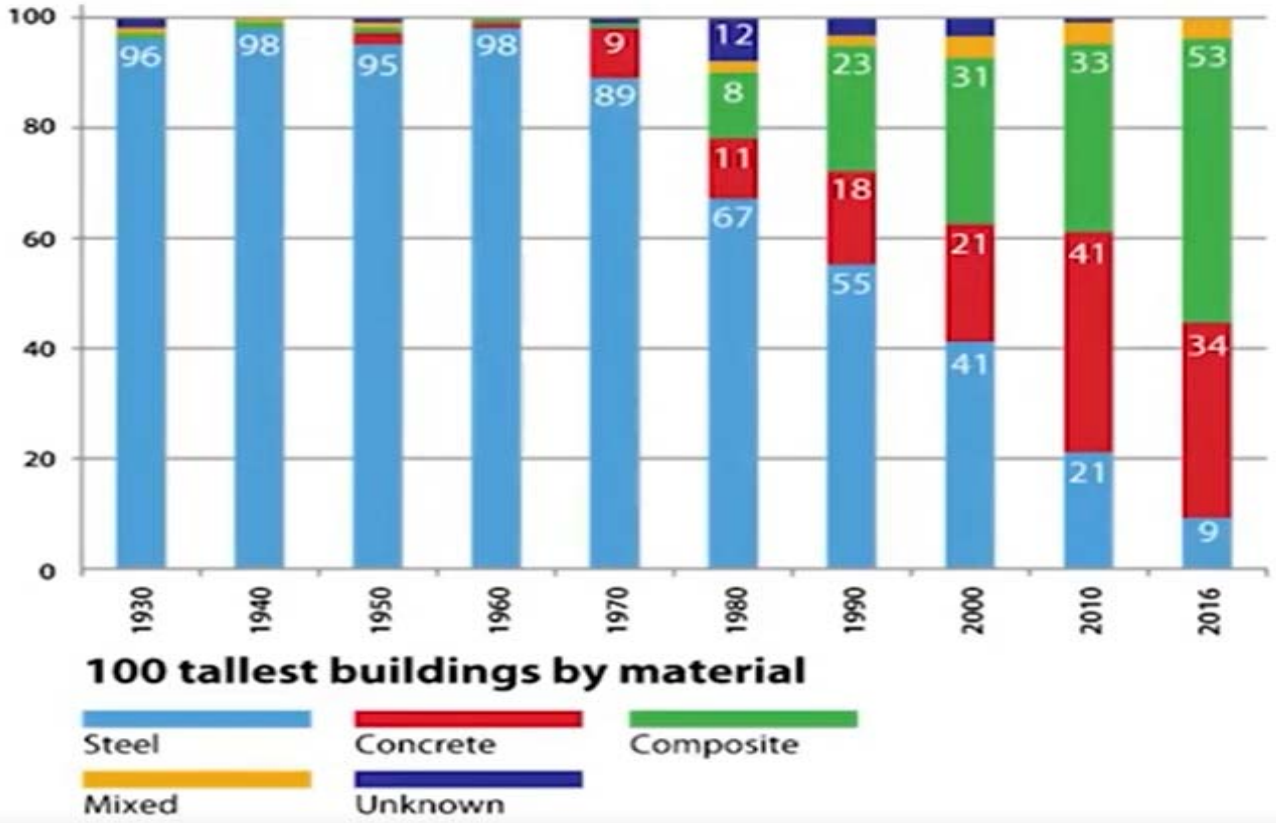
John Hancock Center, Chicago

Original World Trade Center, New York

Willis Tower, Chicago

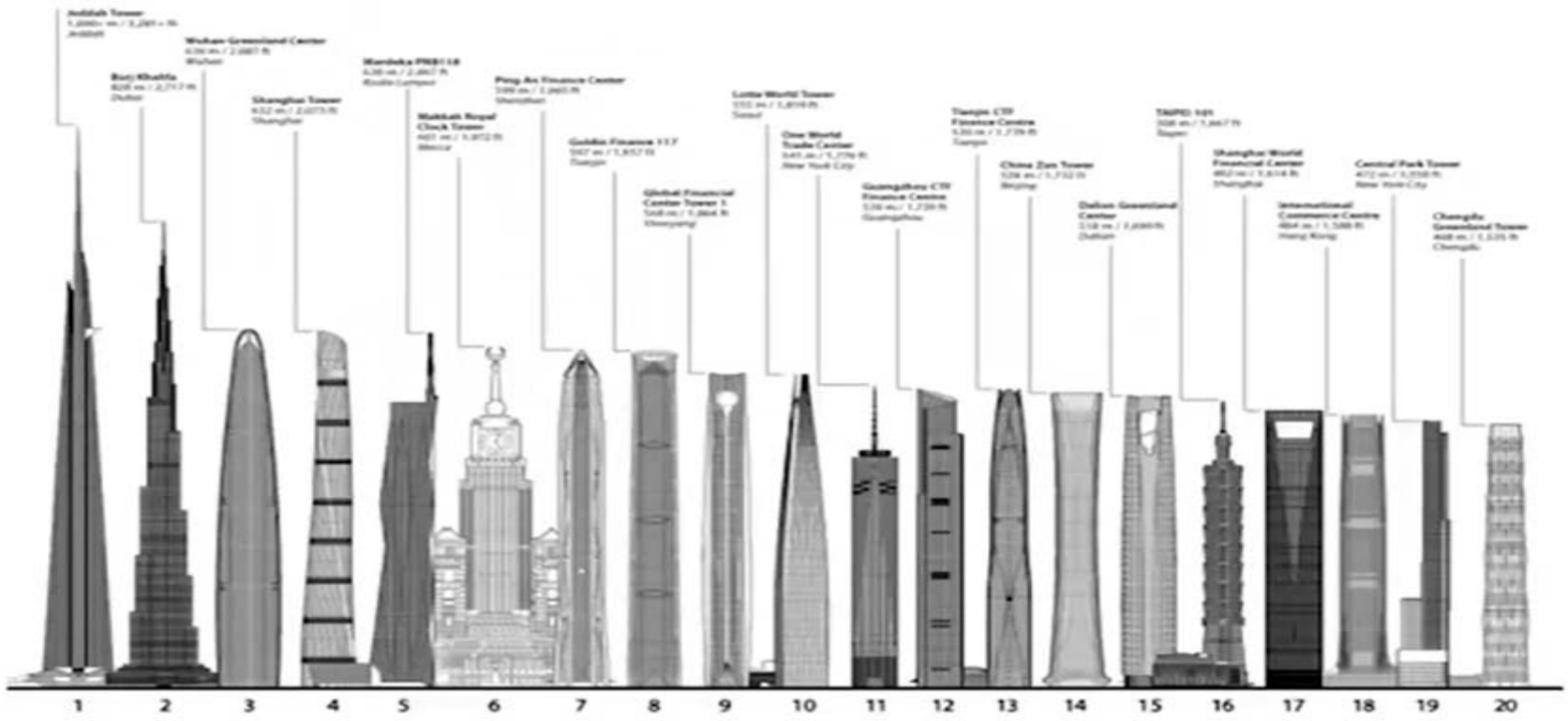

Willis Tower (then Sears)
VS.
One World Trade Center





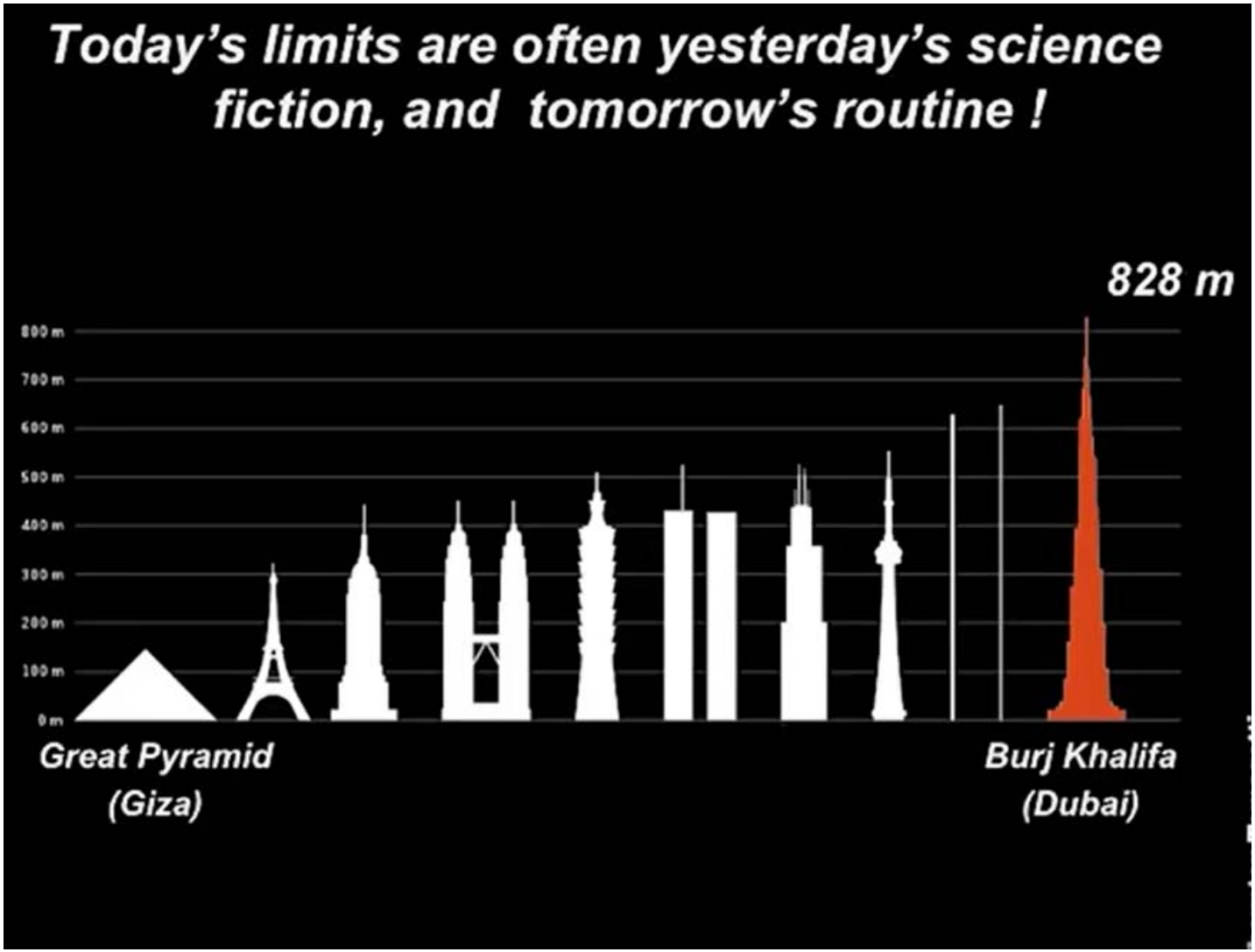
WHERE THE NEXT BUILDING TALLER 

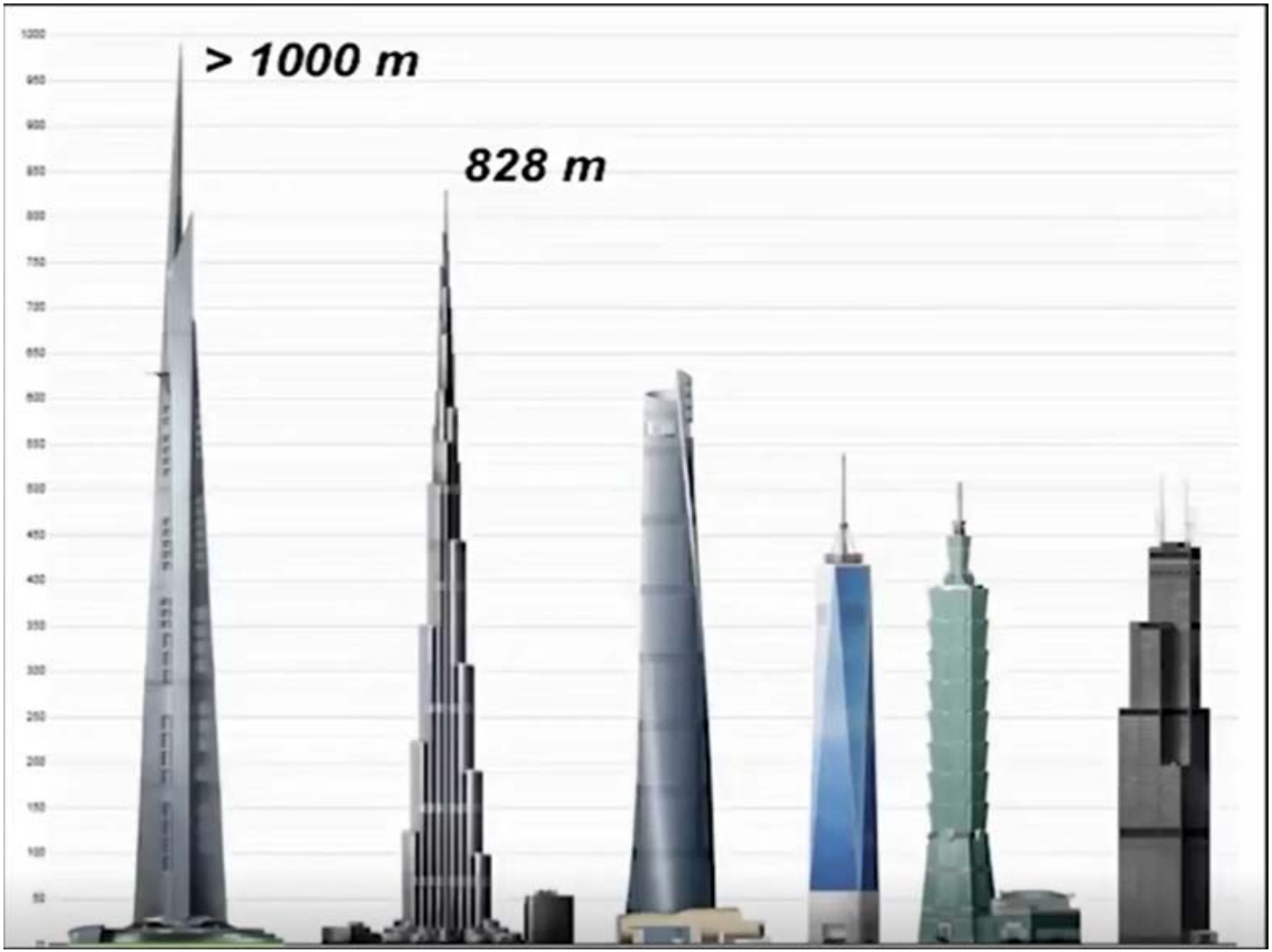
Tallest 20 Buildings in 2020




Jeddah
Tower

HOW MANY TALL OF BUILDING CAN CREATE 

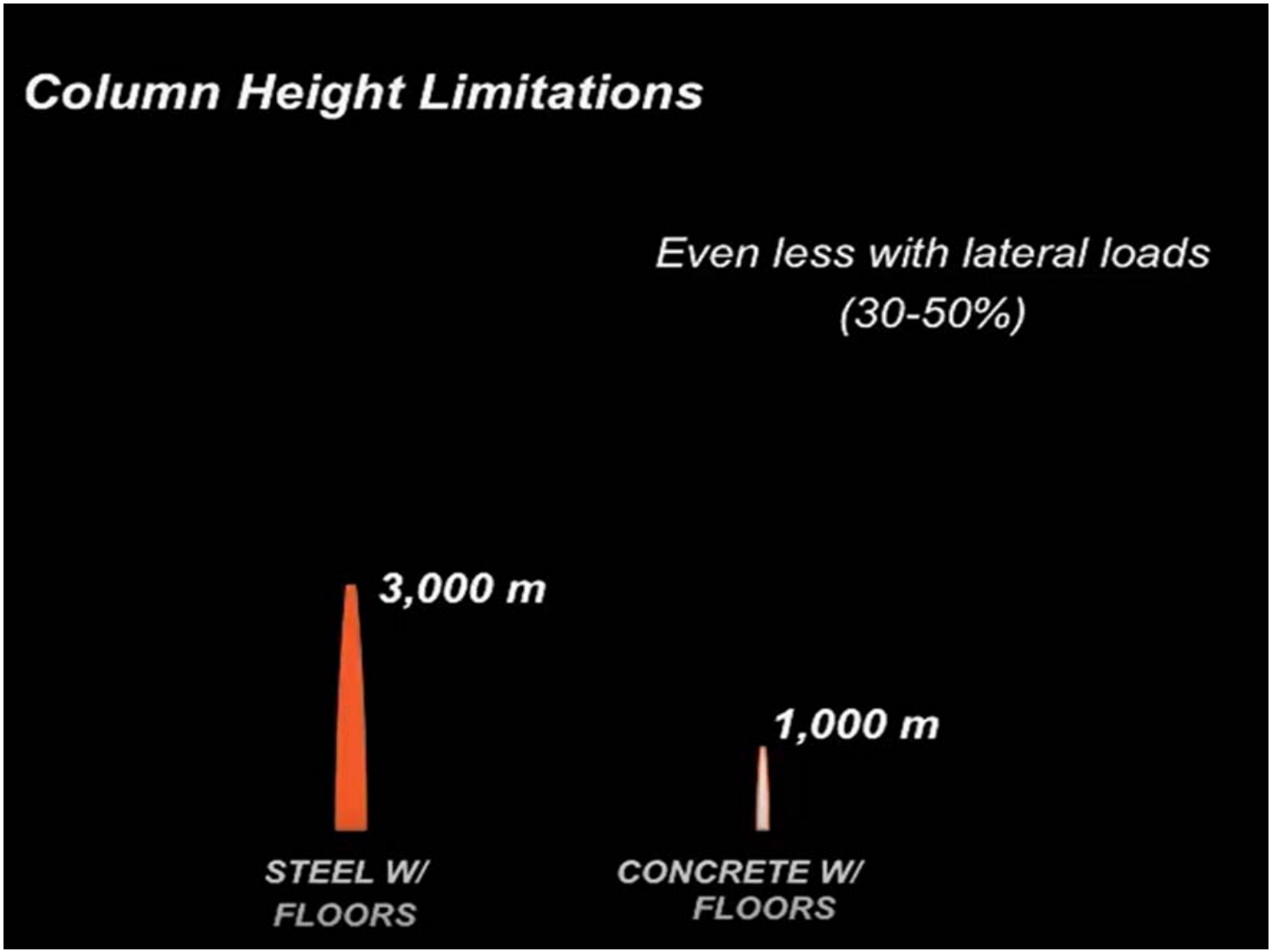

Today's limits are often yesterday's science fiction, and tomorrow's routine !
828 m
800 m
700 m
600 m
500 m
400 m
300 m
200 m
100 m
0 m
Great Pyramid
(Giza)
Burj Khalifa
(Dubai)


> 1000 m
828 m


Column Height Limitations
14,000 m
8,000 m
60 ksi STEEL
12 ksi CONCRETE

Column Height Limitations

Even less with lateral loads (30-50%)



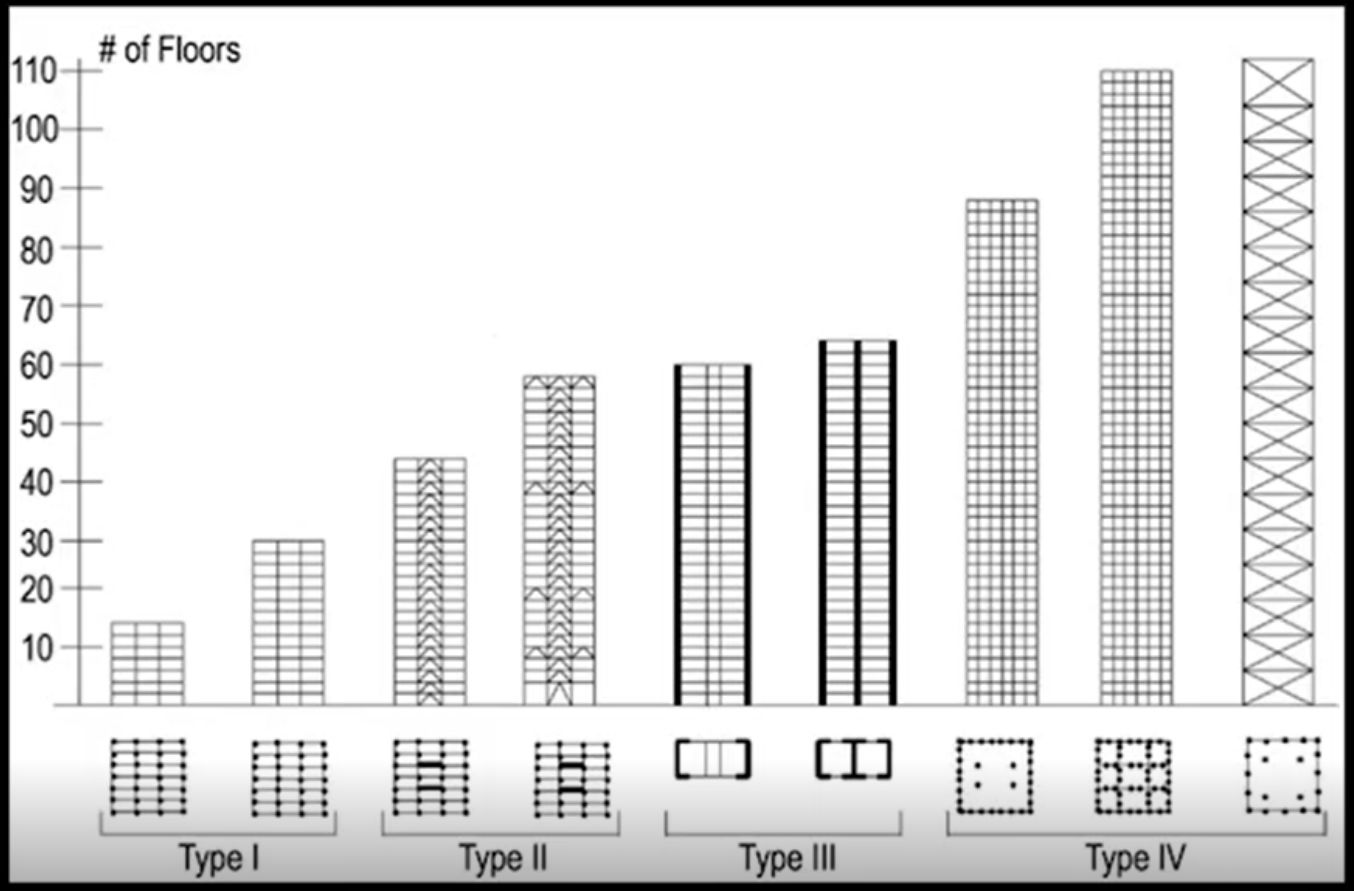
Tapered Structures

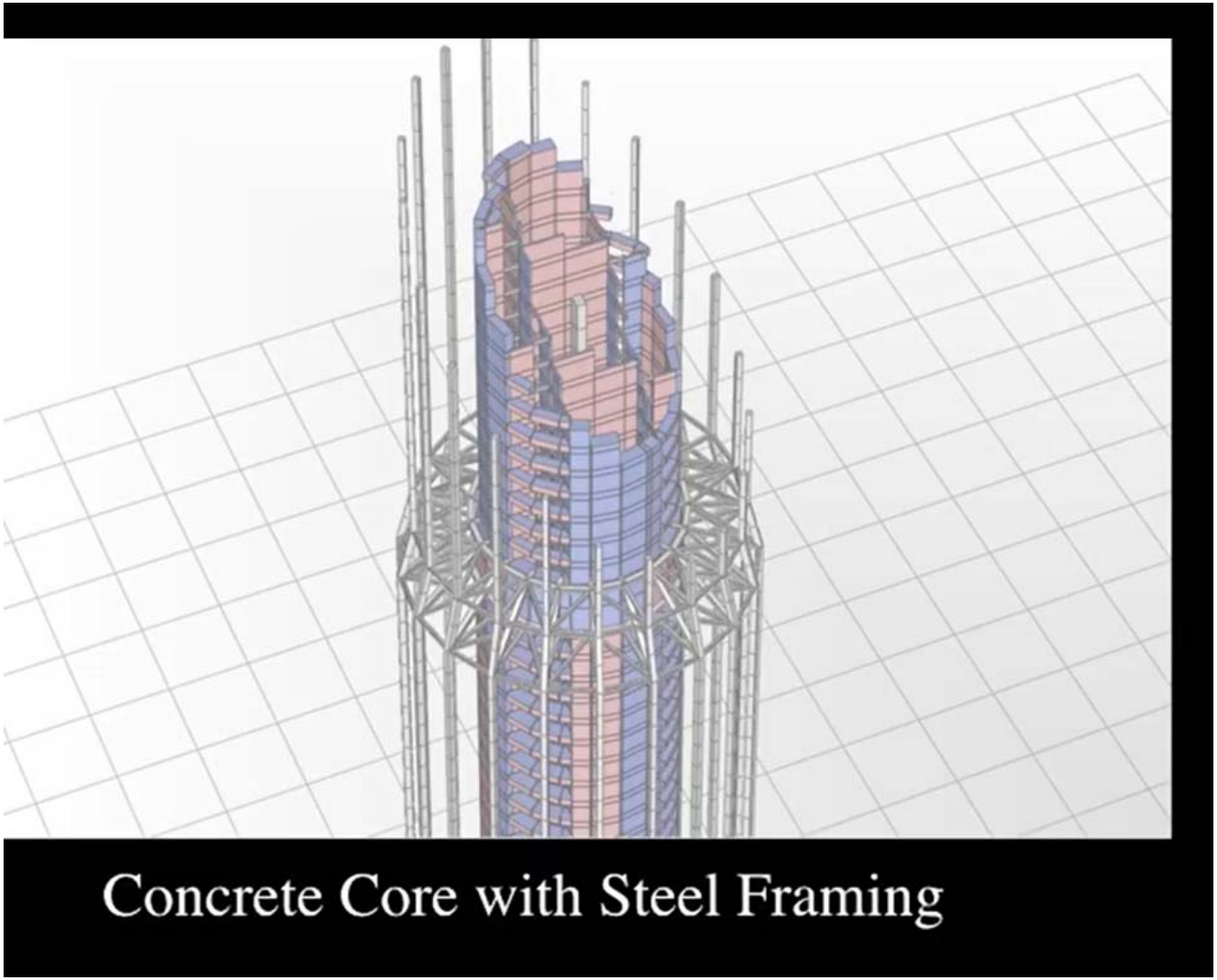
Eiffel Tower

Burj Khalifa, SOM

Lateral Load Resisting Systems

Fazlur Kahn, CTUBH 1980

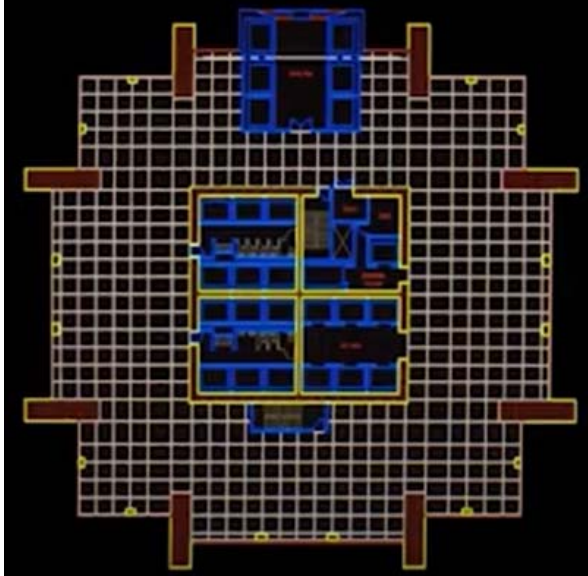


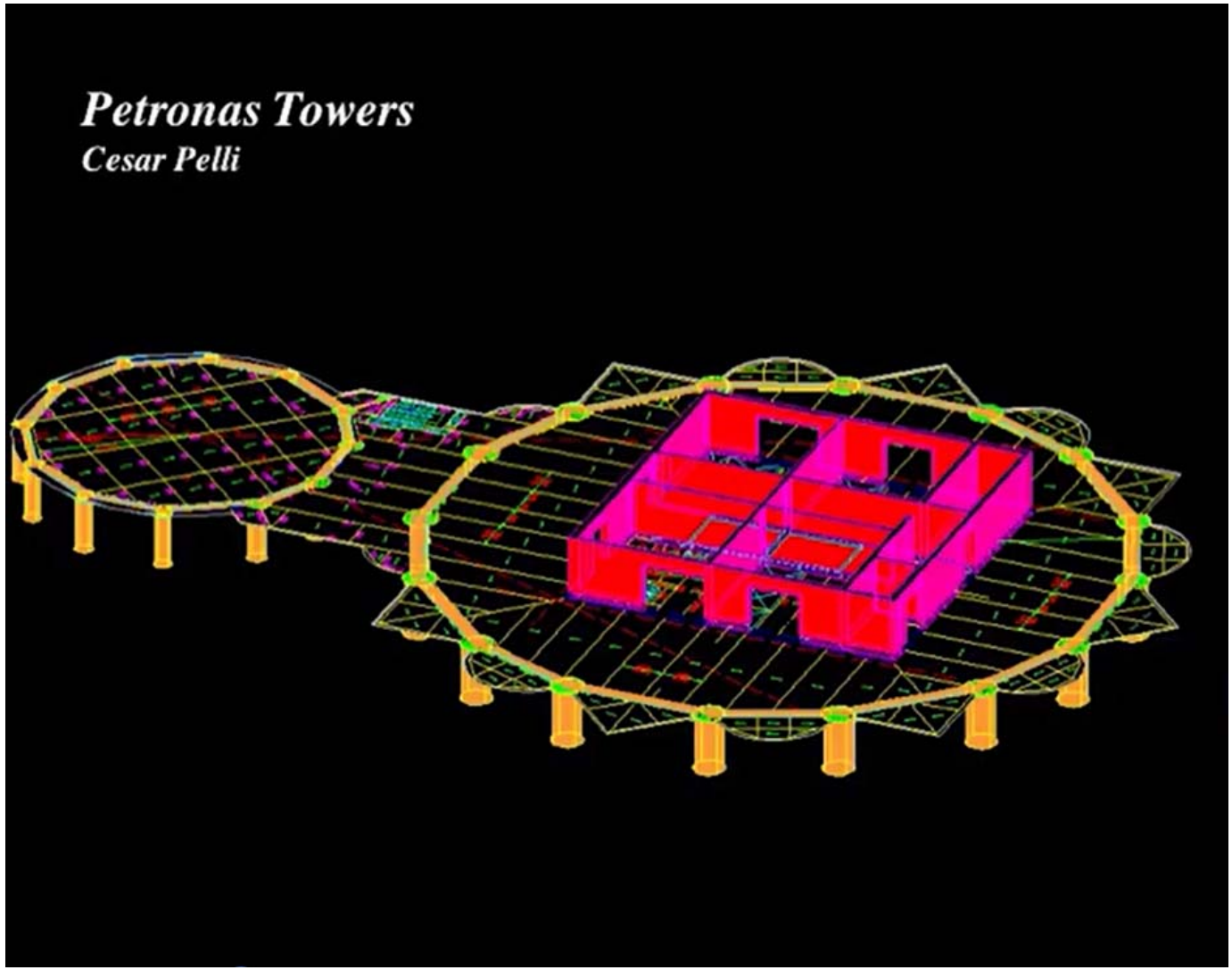


Concrete Core with Steel Framing

Miglin Beitler Tower

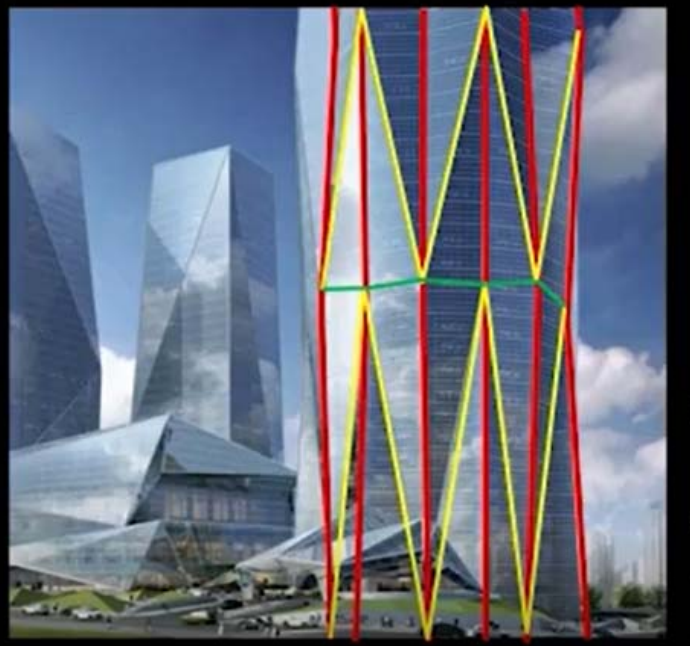
Cesar Pelli




Petronas Towers
Cesar Pelli

Exoskeleton

Greenland Project, Chengdu, Chin
Adrian Smith + Gordon Gill



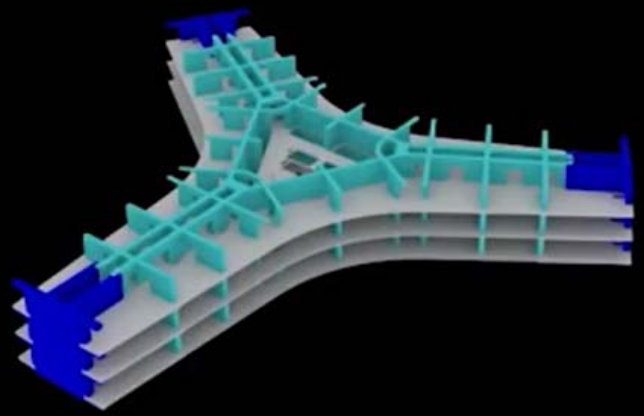
Exoskeleton

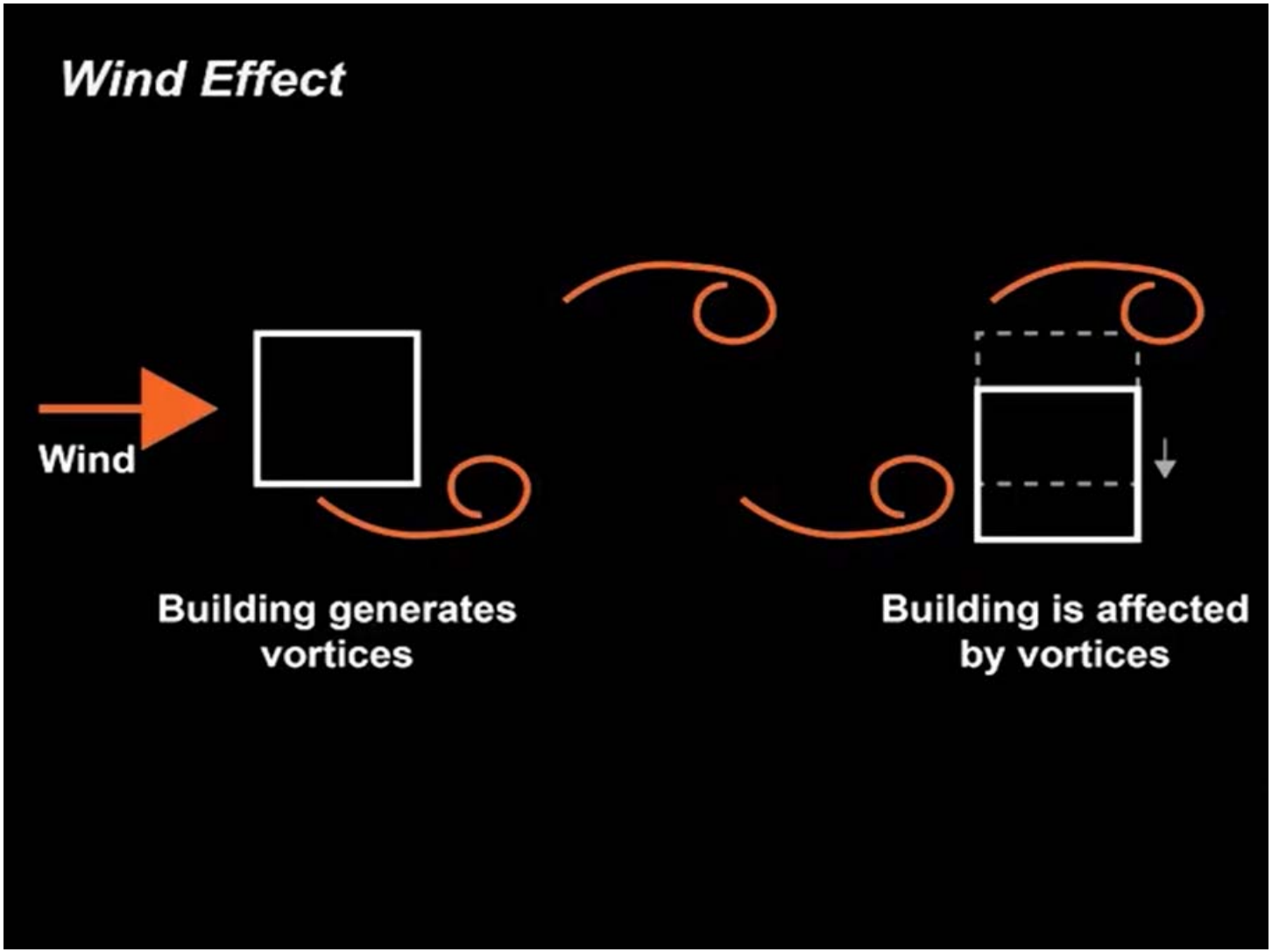
Greenland Project, Chengdu, China
Adrian Smith + Gordon Gill

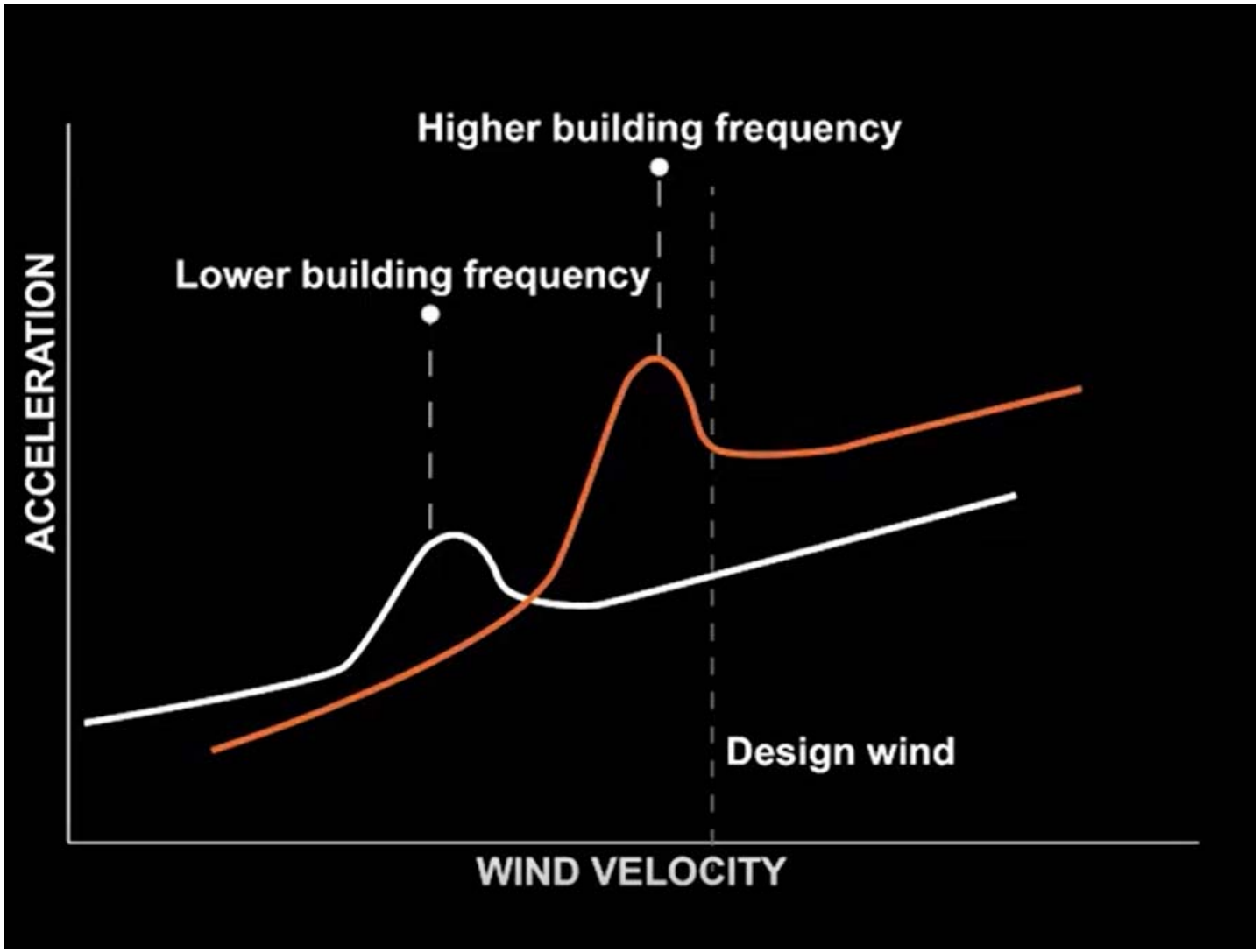
Thornton Tomasetti

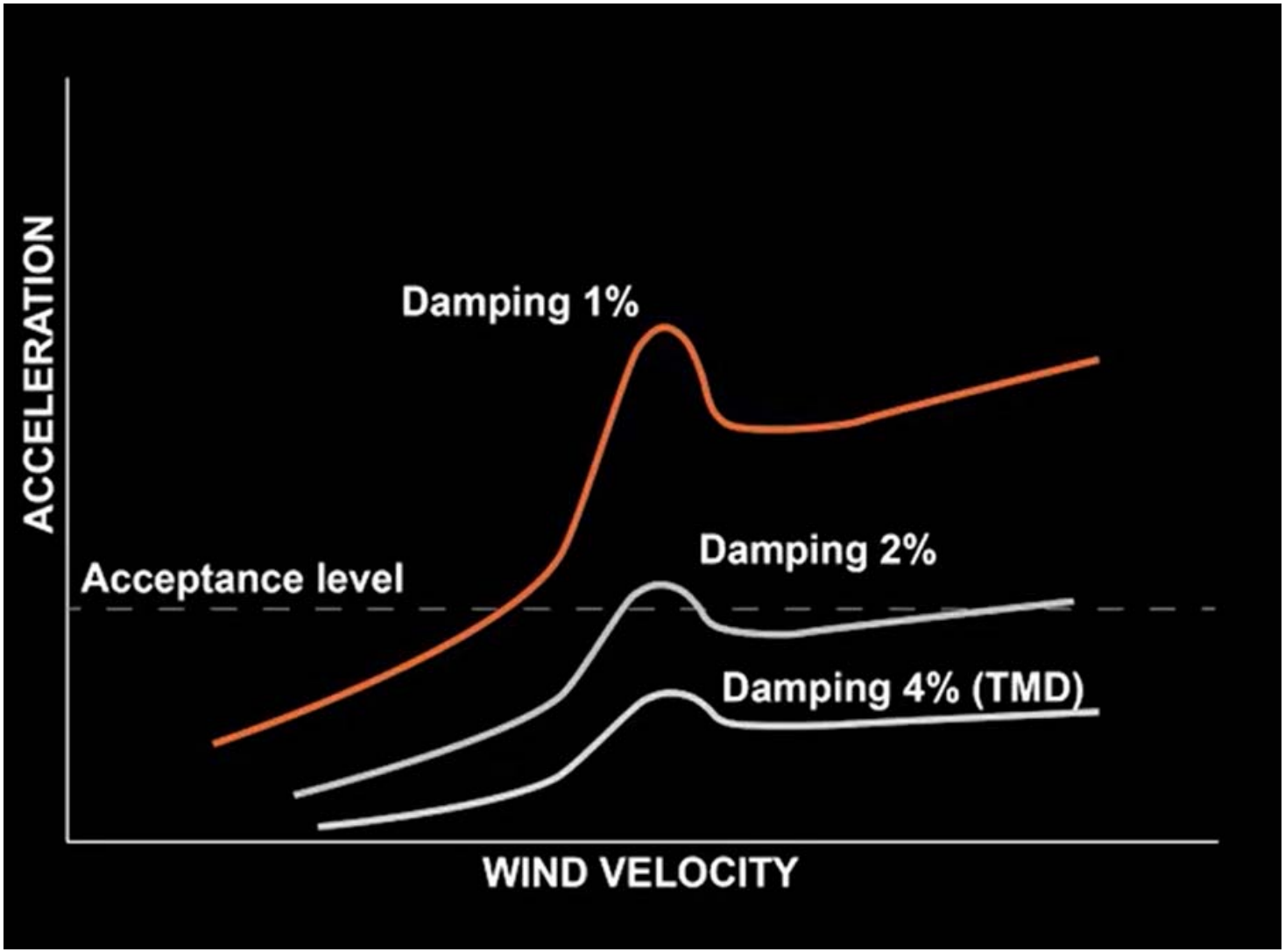
Jeddah Tower

Adrian Smith + Gordon Gill



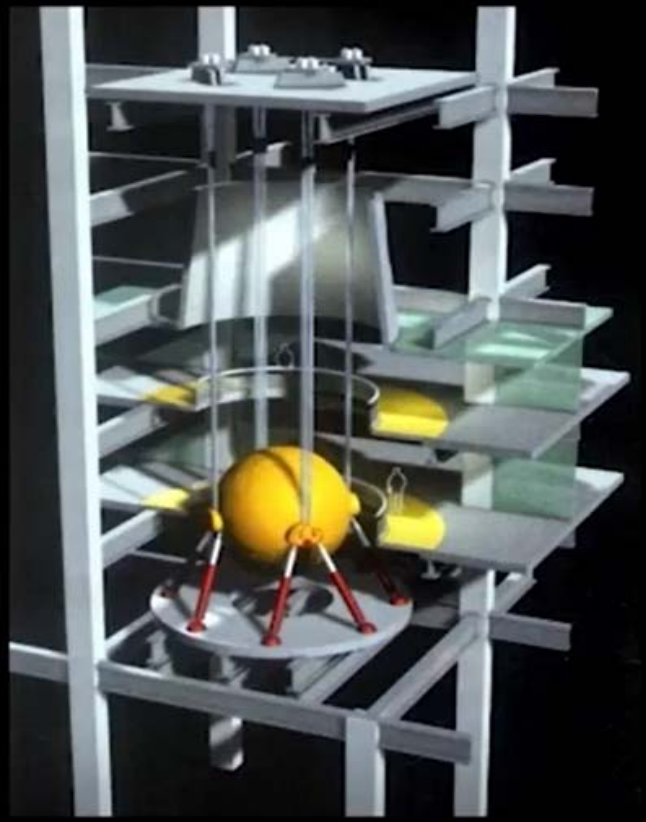

Wind Effect
Wind
Building generates vortices
Building is affected by vortices


Higher building frequency
Lower building frequency
ACCELERATION
Design wind
WIND VELOCITY

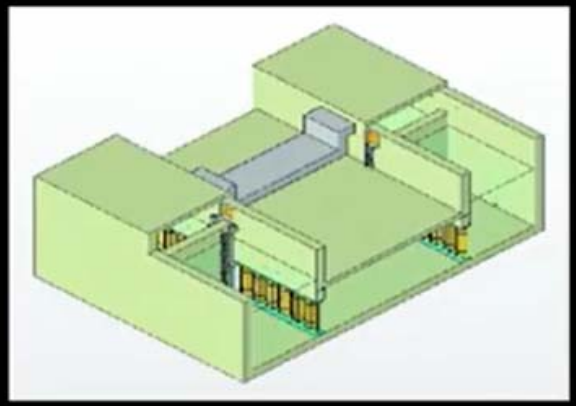

ACCELERATION
Damping 1%
Acceptance level
Damping 2%
Damping 4% (TMD)
WIND VELOCITY

Variety of Damping Devices

Tuned Mass Damper



Tuned Liquid Column Damper



Tuned Sloshing Damper

Integration of Architecture & Engineering

Sagrada Família
Antoni Gaudi

Petronas Tower
Cesar Pelli

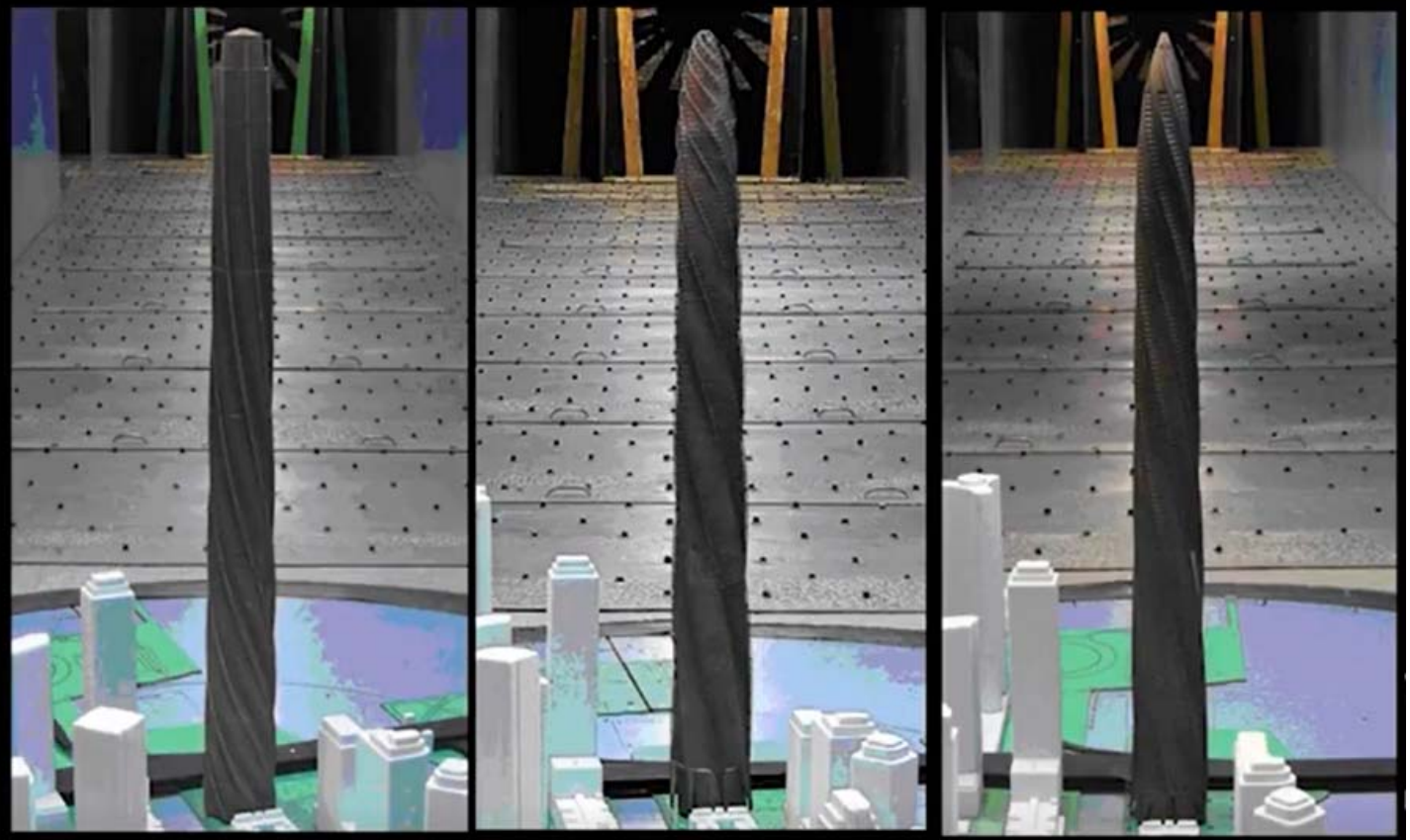
Jeddah Tower
AS + GG

Mitigating Vortex Shedding Effects

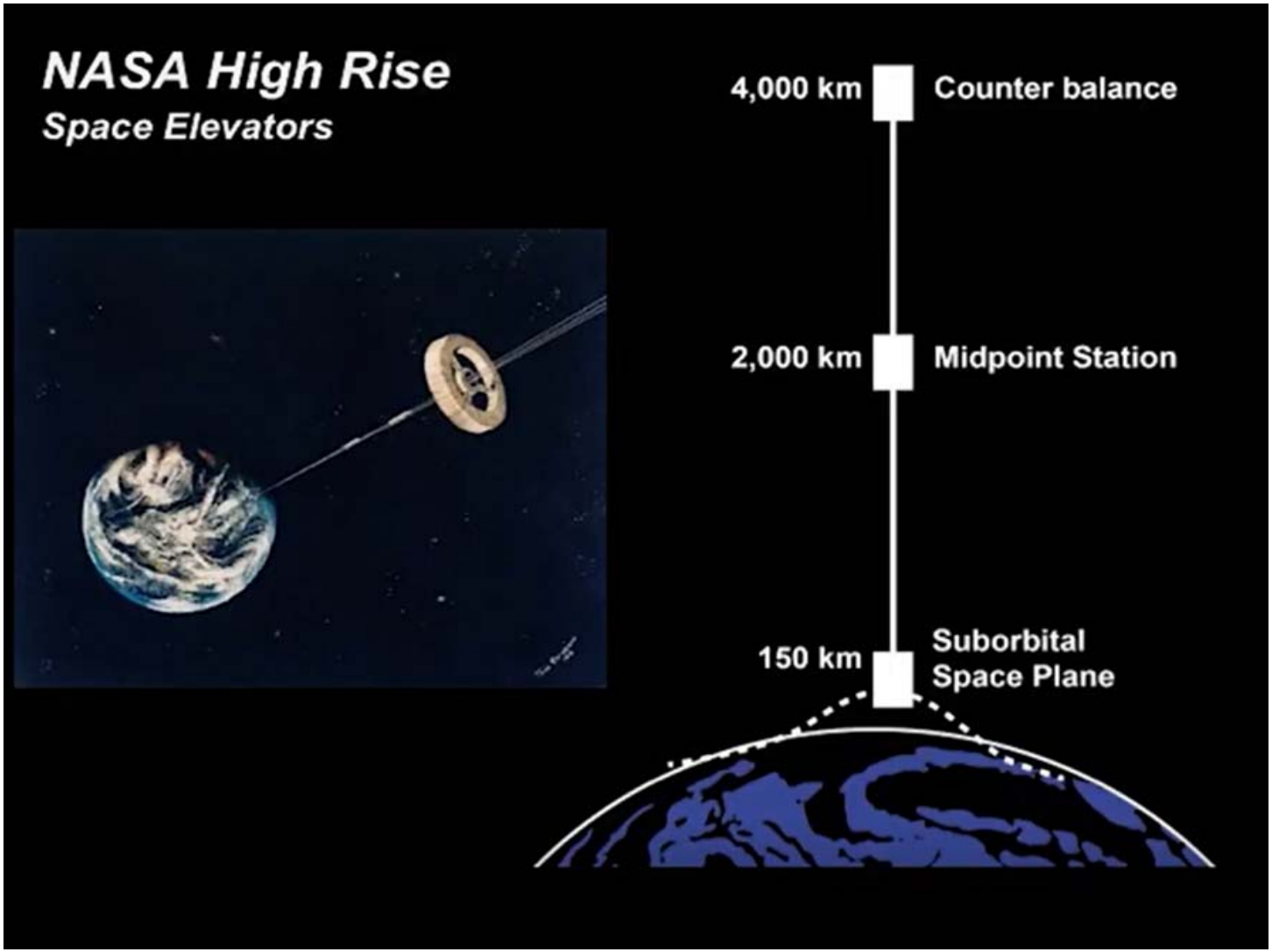
Shanghai Tower, Gensler
Building Twist

Taipei 101, C.Y Lee
Rough Corners

Wind Tunnel Models



RWDI


NASA High Rise
Space Elevators
4,000 km
Counter balance
2,000 km
Midpoint Station
150 km
Suborbital
Space Plane

What Else?

- Slenderness
- Creep and Shrinkage
- Construction Technology
- Cost Effectiveness
- Elevator & MEP Technology
- Sociological and environmental issues

Chicago Spire
Santiago Calatrava

Plaza 66
Kohn Pedersen Fox

SHOULD WE BE GOING HIGHER 

WHAT'S FOR 

Thank You

Baju Arie Wibawa, ST, MT.
Kaprodri Arsitektur Universitas PGRI Semarang
E-mail: ***bayu.ariwibawa@gmail.com***