A nighttime photograph of the Chicago skyline, featuring several illuminated skyscrapers. The lights from the buildings are reflected in the dark water in the foreground. The sky is dark, and the overall scene is a classic cityscape at night.

Khan and the (Chicago) Skyscraper

Themes:

Tension between architectural and structural expression in buildings

Fazlur Khan and expression of structure in buildings

Stiffness in skyscrapers

photo credit: Richard Seaman





Chicago 1930-1970

“The depression that began in the 1930’s and was ended ten years later only by a massive program of military procurement was a disaster for the nation as a whole but an absolute and unmitigated calamity for Chicago. It was not only the collapse of the public and private economy; it was the Sophoclean reversal of fortune, from the expansive force of the twenties ... to the impotence and hopelessness of the thirties.”

“It was 12 years after WWII ended before a new building would be built in the Chicago CBD.”

Chicago 1930-1970, *Carl Condit*



Map of Miami, Fla.
© 1935
W. H. H. Co.

LEGEND	
1	Stadium
2	City Hall
3	Post Office
4	Police Station
5	Fire Station
6	Public Library
7	Public Bath
8	Public Garage
9	Public Market
10	Public Park
11	Public School
12	Public Hospital
13	Public Jail
14	Public Prison
15	Public Cemetery
16	Public Office
17	Public Warehouse
18	Public Dock
19	Public Pier
20	Public Quay
21	Public Wharf
22	Public Jetty
23	Public Breakwater
24	Public Pierhead
25	Public Landing
26	Public Wharves
27	Public Docks
28	Public Piers
29	Public Quays
30	Public Wharves
31	Public Docks
32	Public Piers
33	Public Quays
34	Public Wharves
35	Public Docks
36	Public Piers
37	Public Quays
38	Public Wharves
39	Public Docks
40	Public Piers
41	Public Quays
42	Public Wharves
43	Public Docks
44	Public Piers
45	Public Quays
46	Public Wharves
47	Public Docks
48	Public Piers
49	Public Quays
50	Public Wharves

1940s

SEE HOW THE CABLES ARE SUPPORTED



1940s

OFFICIAL VIEW BOOK

A CENTURY OF PROGRESS EXPOSITION

CHICAGO - 1933

NO. 1A
POSTAGE
1¹/₂
WITHOUT
MESSAGE







*Ludwig Mies
van der Rohe*



cityofchicago.org

2nd Chicago School
(now more Arch.)



www.greatbuildings.com



Seagram Building, New York.

Photo by Jean Alejandro di Bergerac Stephenson Davilus

www.structurae.de



Seagram Building, New York.

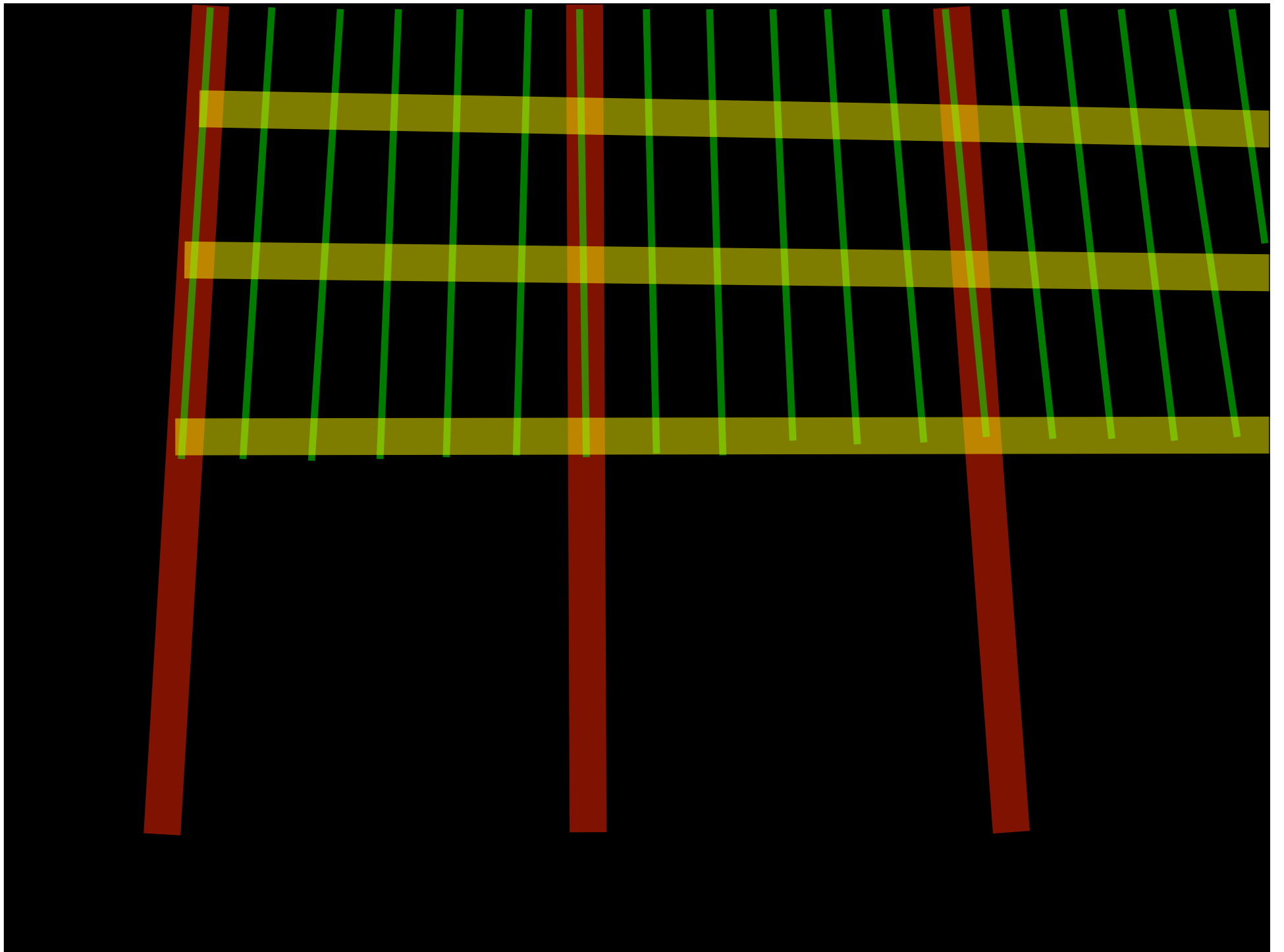
Photo by Jean Alejandro di Bergerac Stephenson Davilus

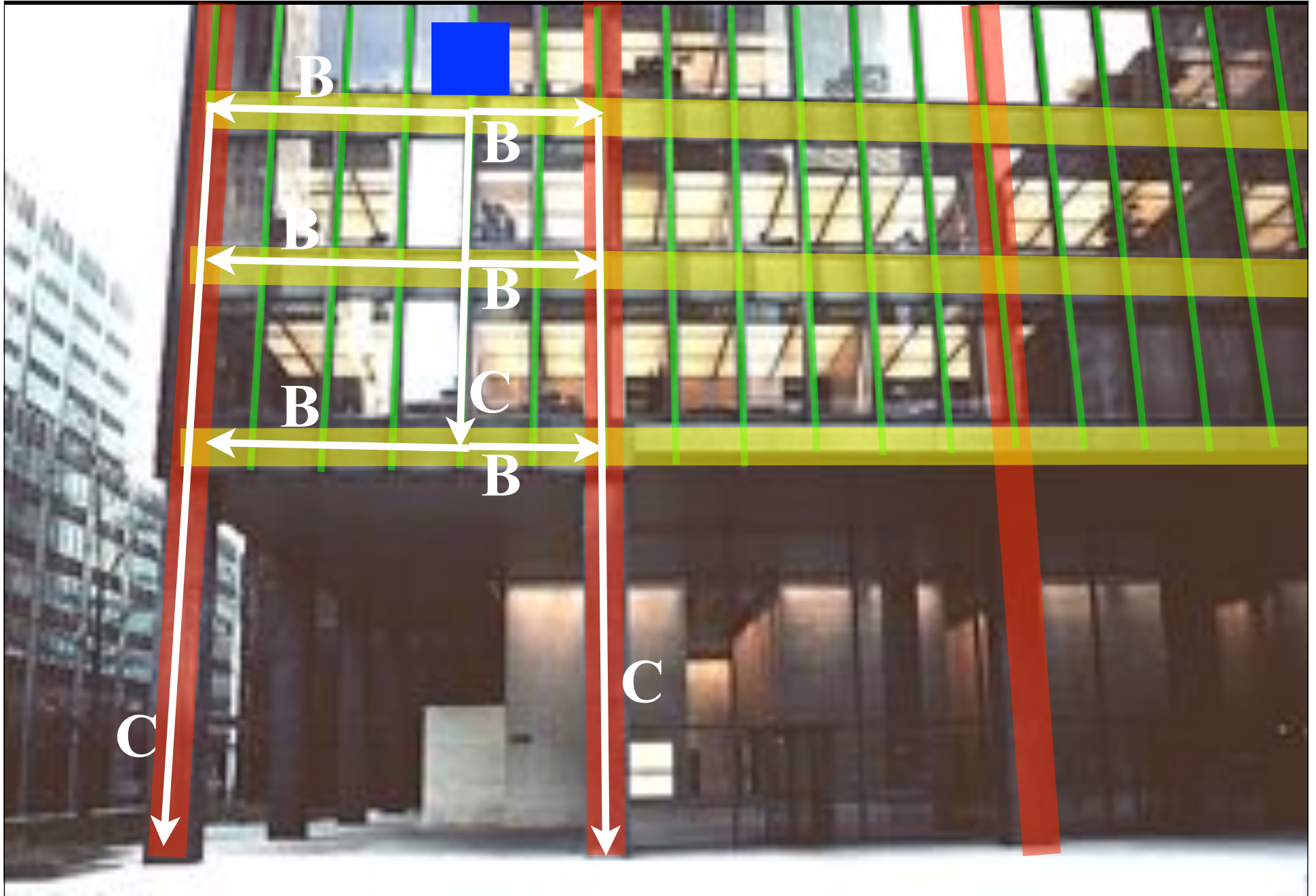
www.structurae.de

Structural Columns

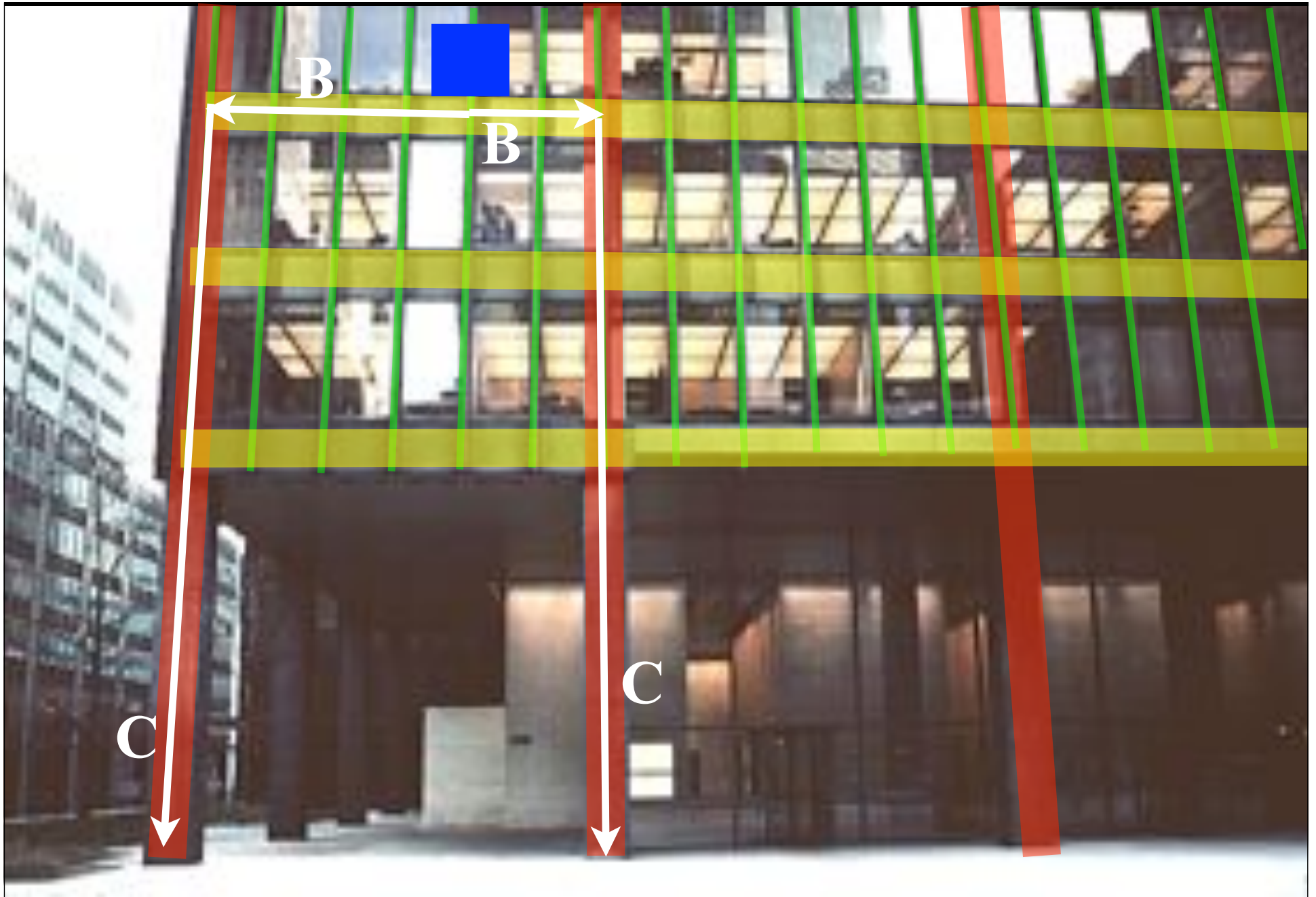
Structural Beams

Architectural Mullions





Load Path?



Load Path?



Marina
city













Chicago Civic Center – now the Daley center



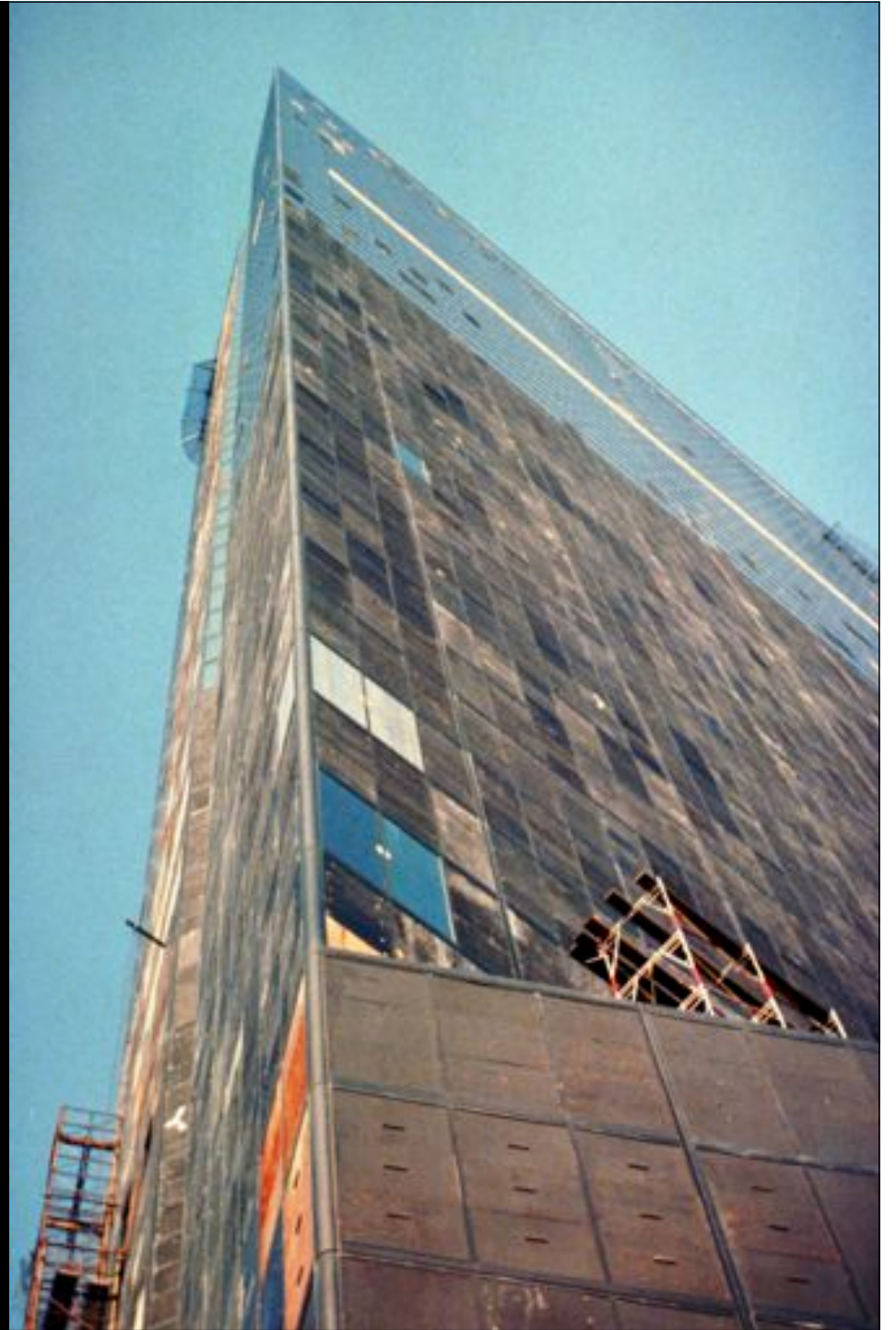




John
Hancock
Building







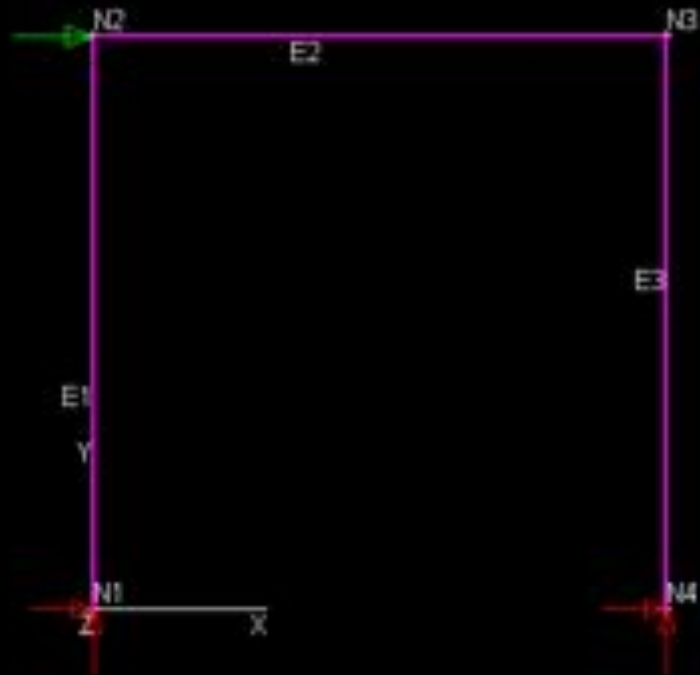




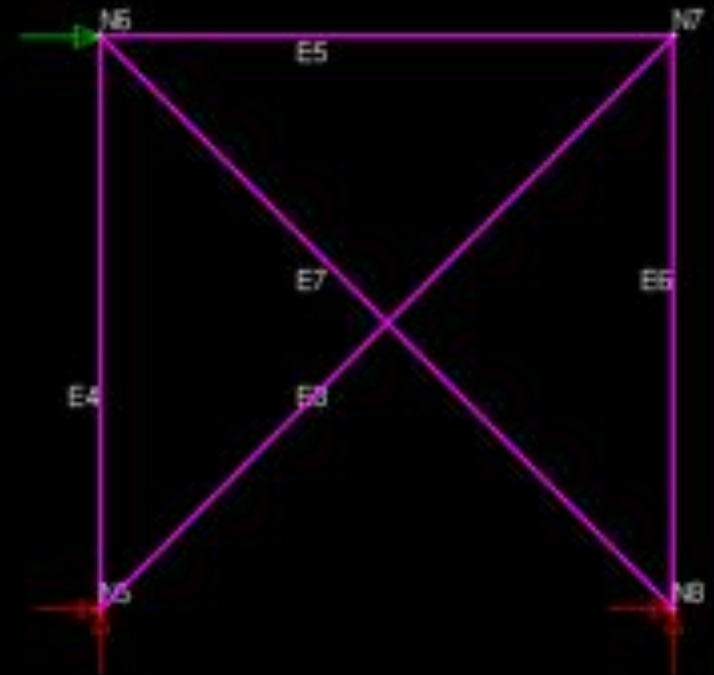


Lateral load on building frame

Frame

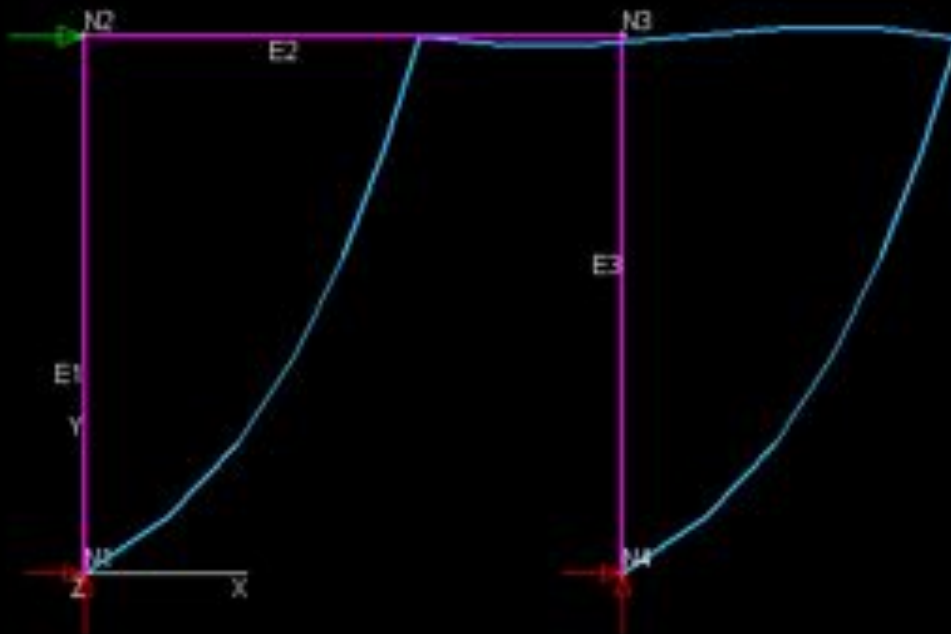


Braced frame

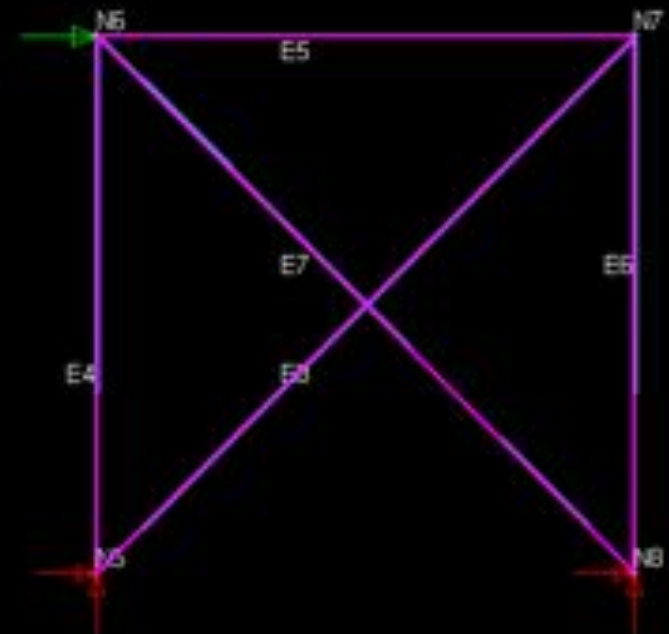


Deflected Shape

Frame



Braced frame



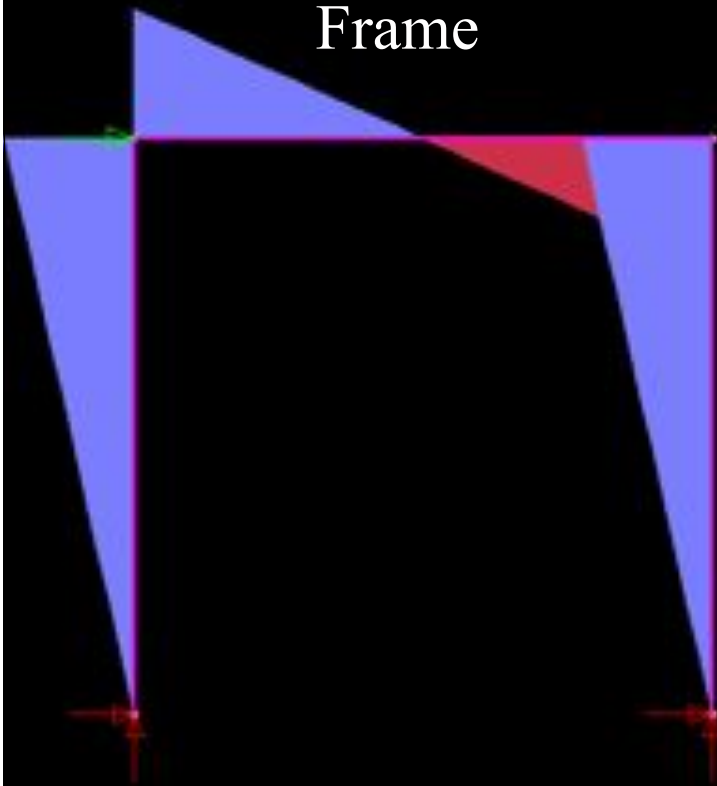
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S Def Line Type D Scale: n 4 # of pts: 4 < 1 > Apply Cancel

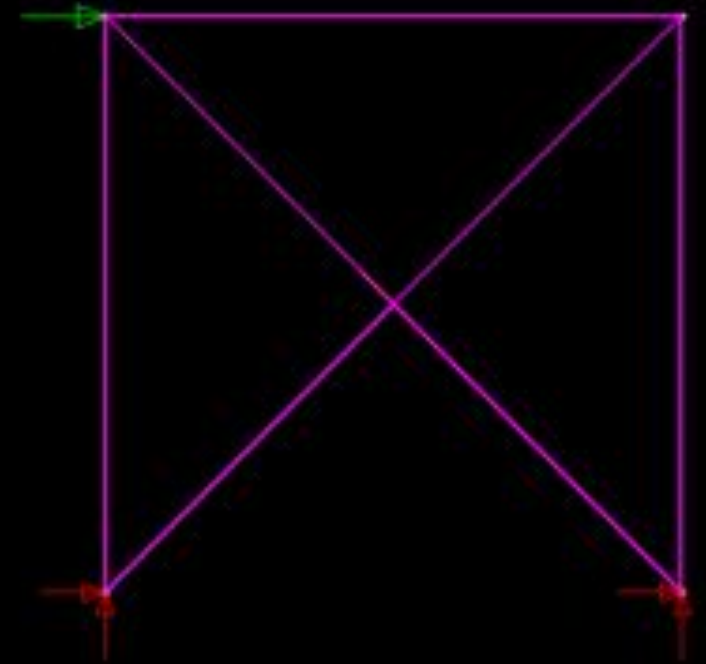
Bending Moment Diagram

Moment Z: 1st-Order Elastic, Incr #1, Applied Load Ratio = 1

Frame



Braced frame



Define element(s) and parameters

Element(s):

All

All

Ctrl

Status:

Success: Max Mz = 6.002e+004

C

Moment Z Side

T

Scale

27

of pts

10

Fill

<

1

>

Apply

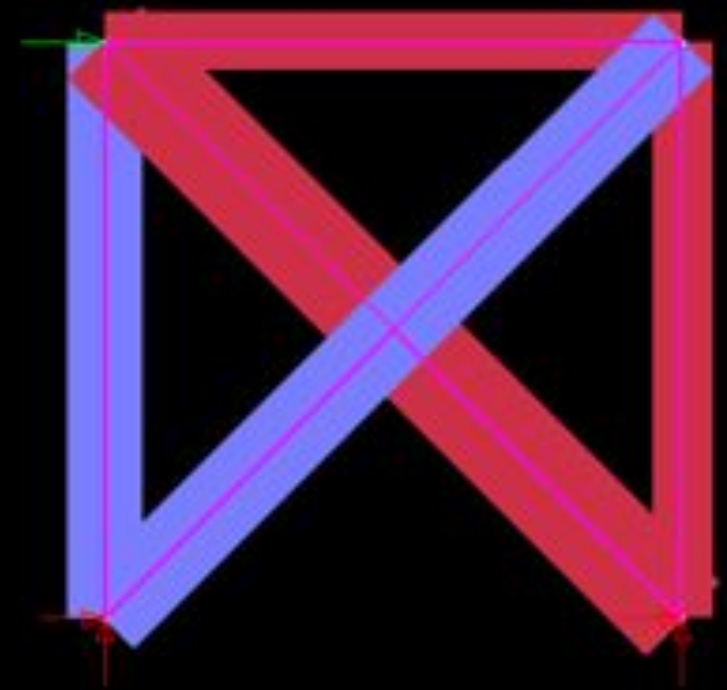
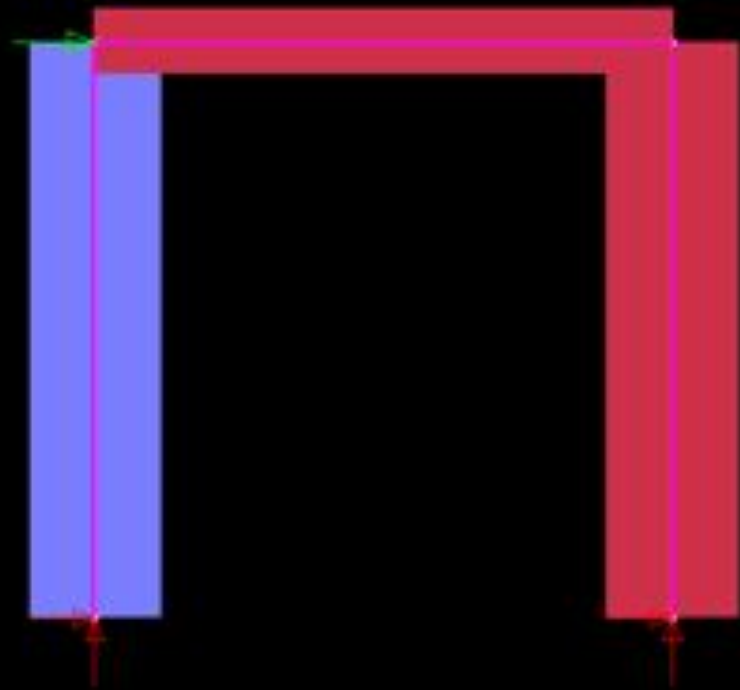
Cancel

Axial Force Diagram

Axial Force: 1st-Order Elastic, Incr # 1, Applied Load Ratio = 1

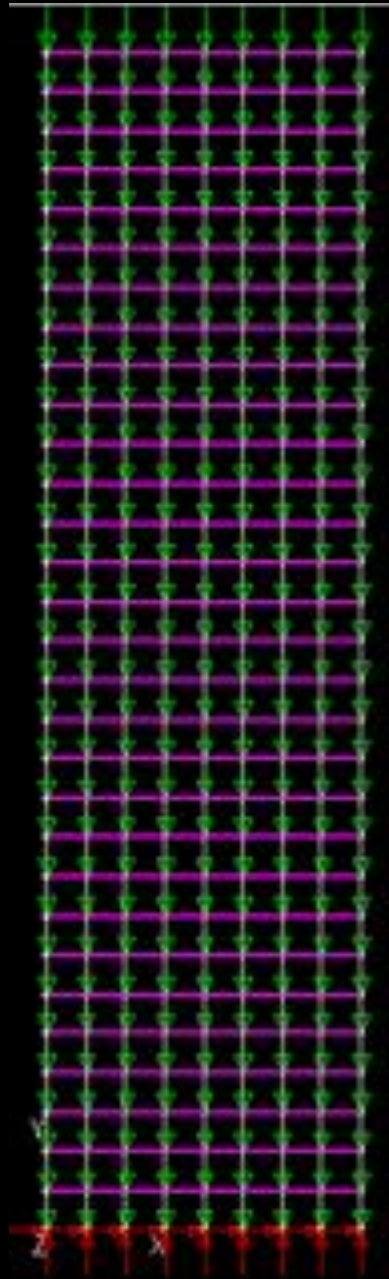
Frame

Braced frame

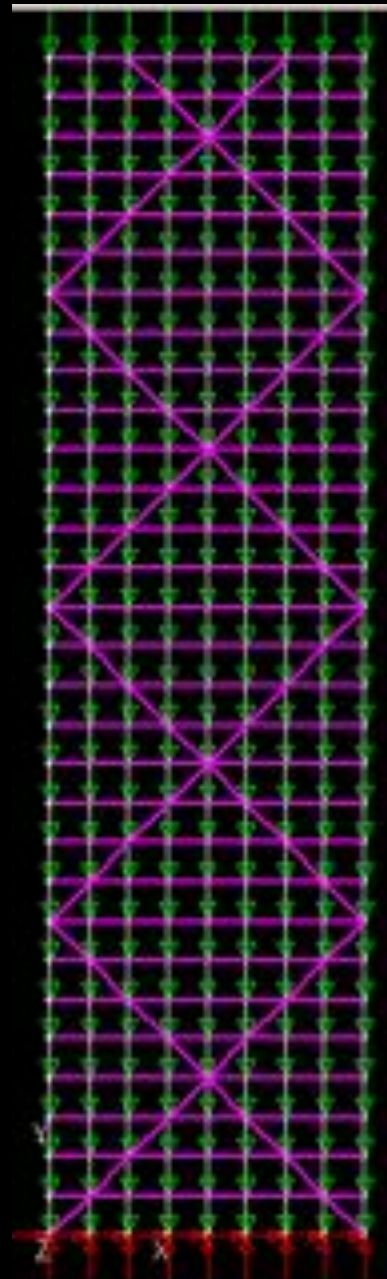


Define element(s) and parameters	Element(s):	All	All	Ctrl	Status:	Success: Max P = -1000						
<input checked="" type="checkbox"/> Pos	Tension Sign	<input type="checkbox"/> Neg	Scale	27	# of pts	1	<input checked="" type="checkbox"/> Fill	<	1	>	Apply	Cancel

Frame



Braced frame

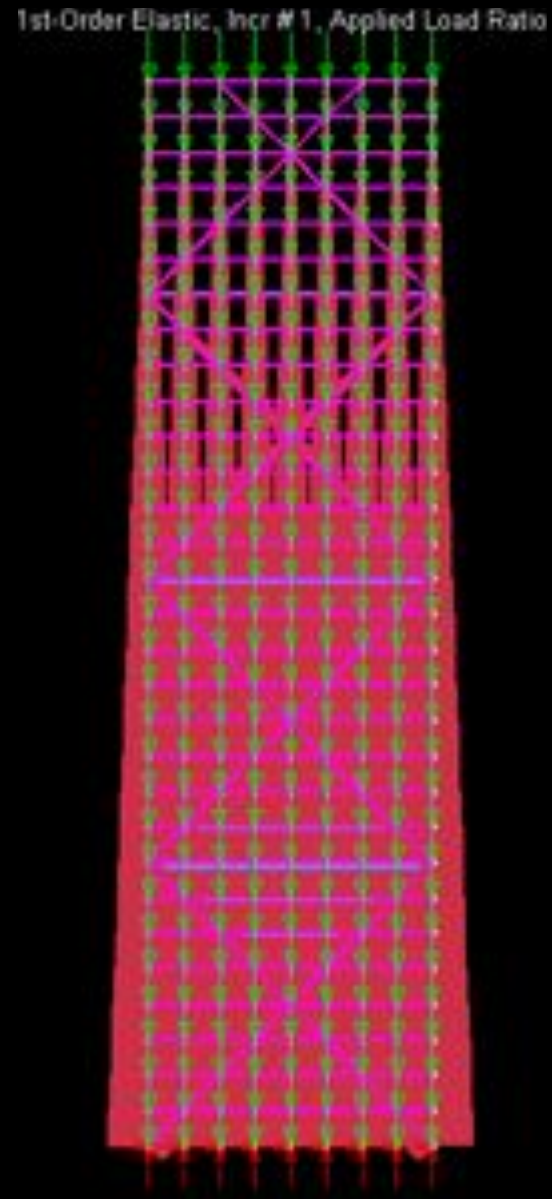


Gravity load

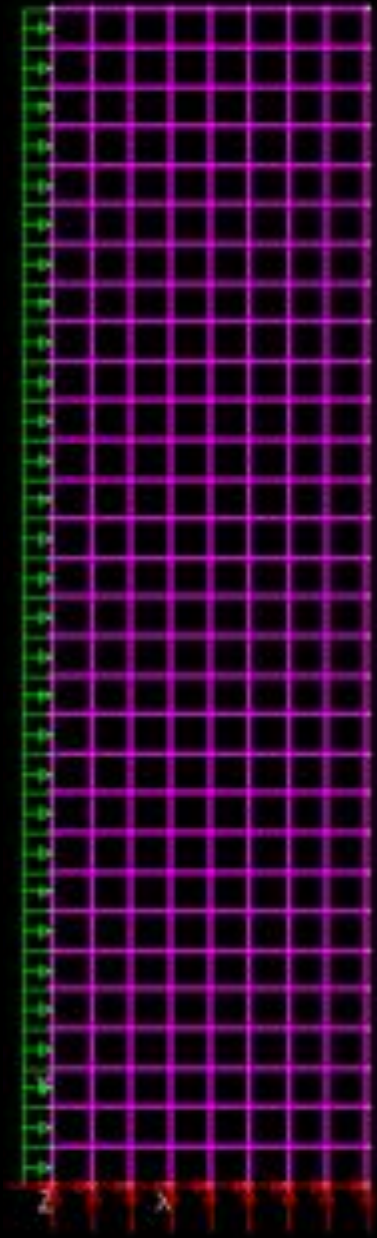
Frame



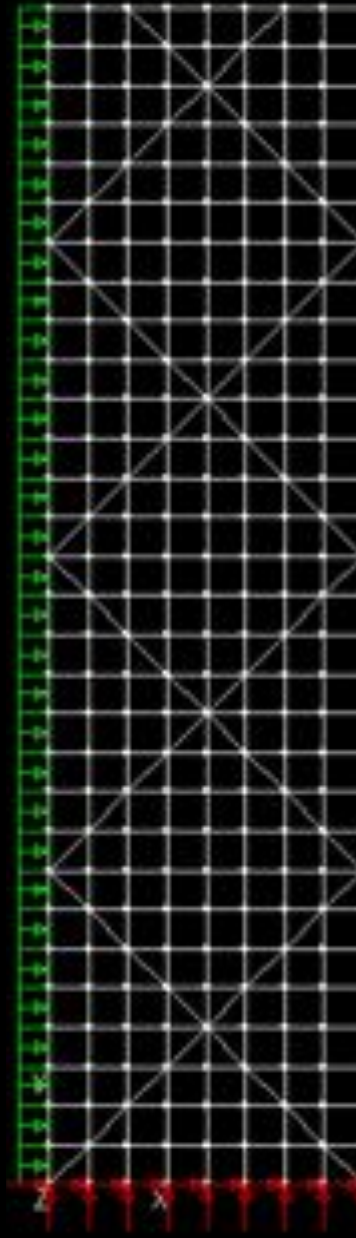
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Frame

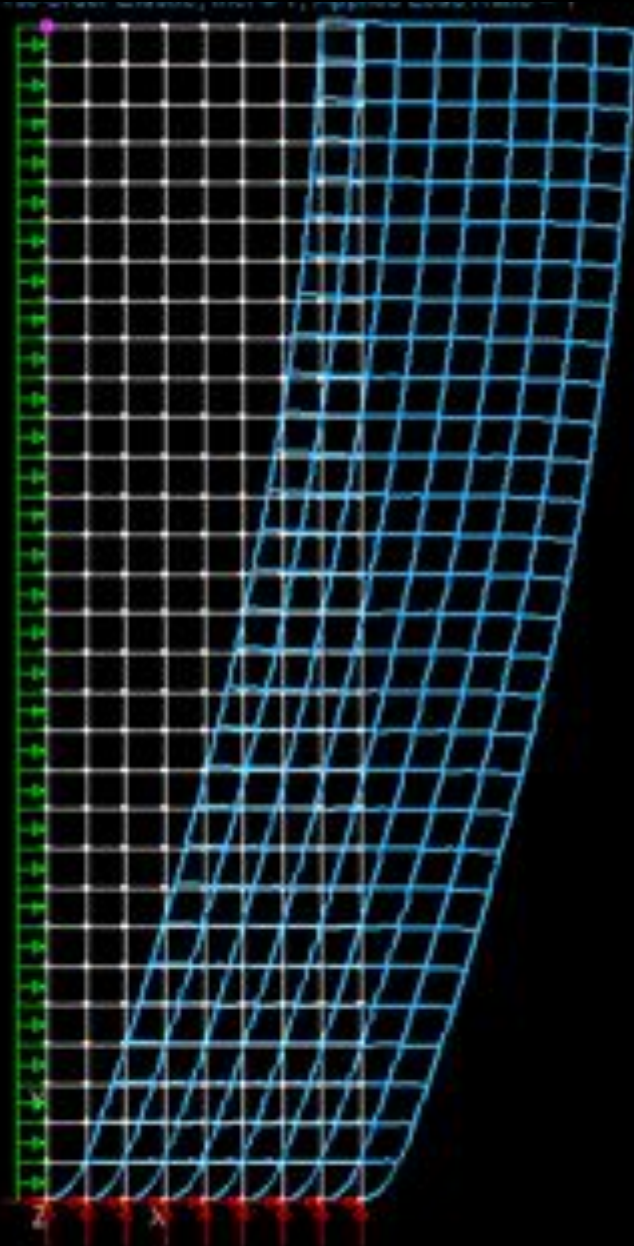


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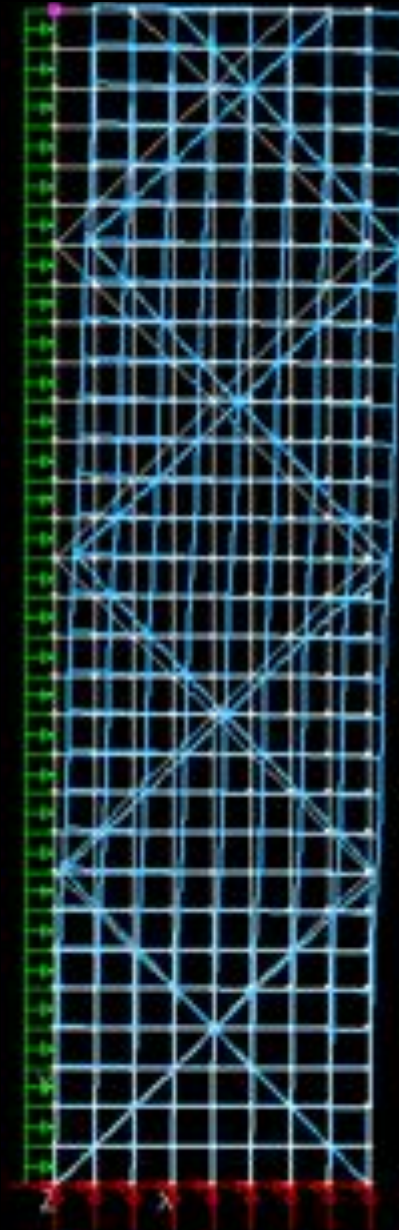


Wind load

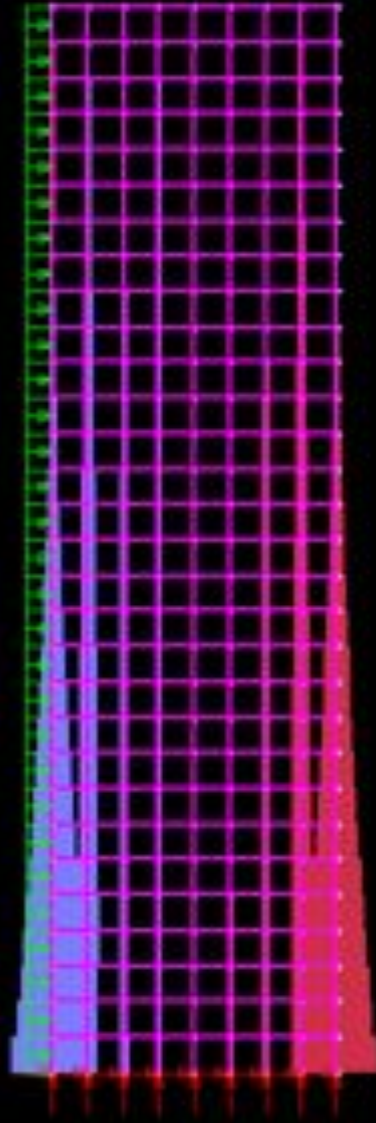
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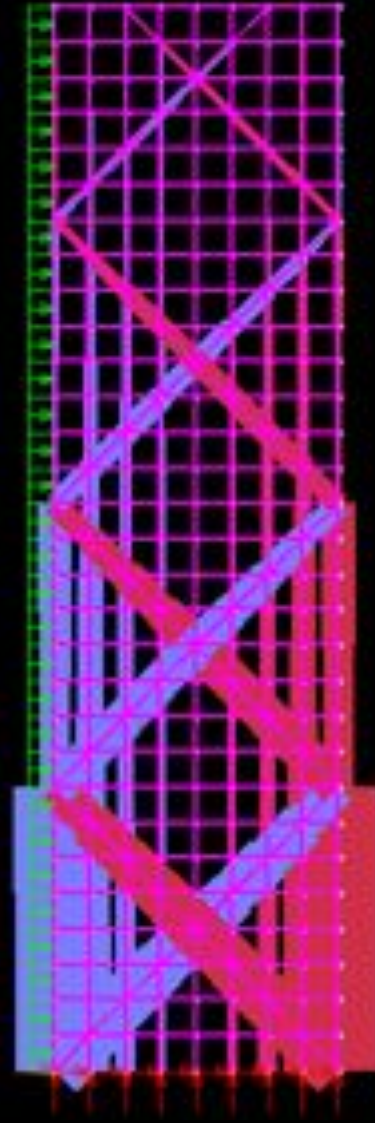
Braced frame



Frame



Braced frame





Khan

1929-1982







1965

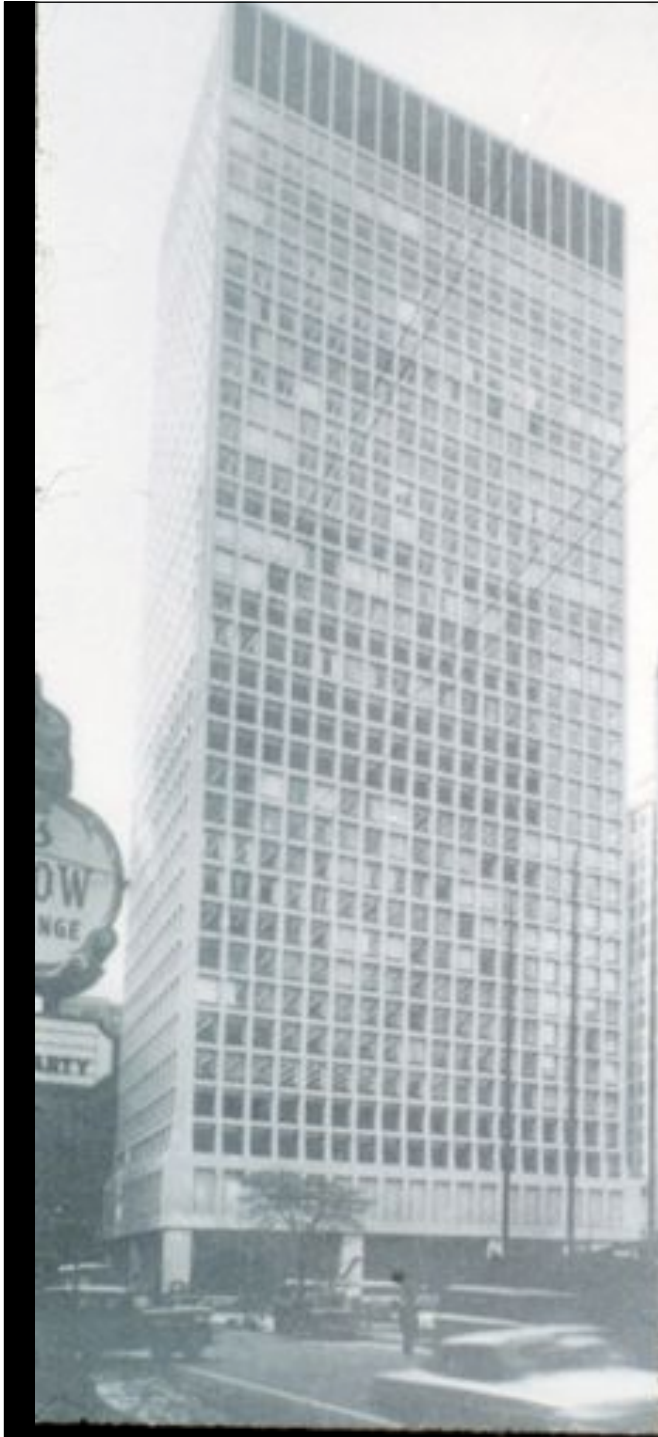
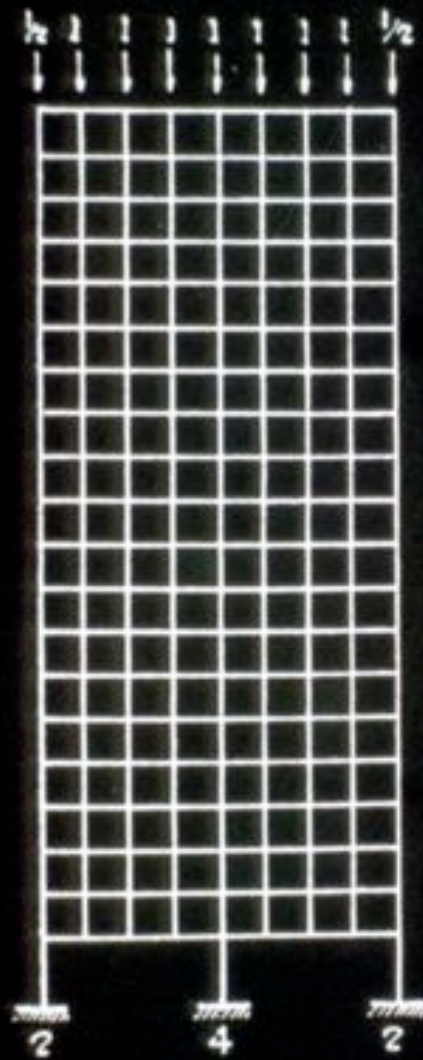
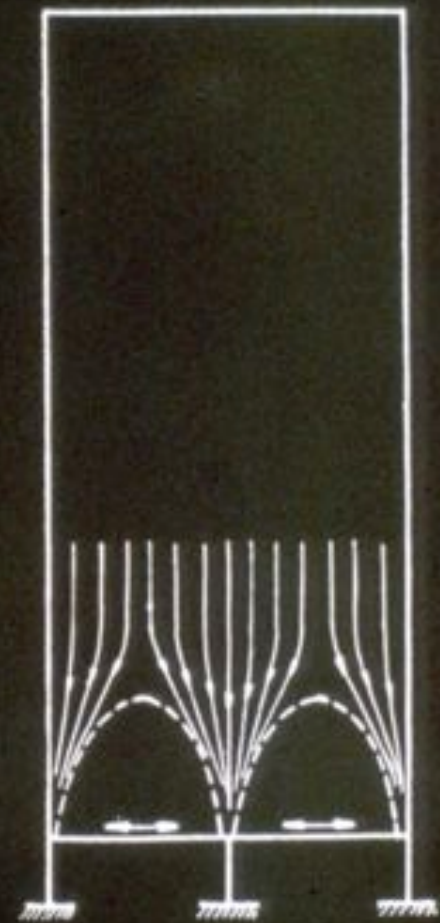


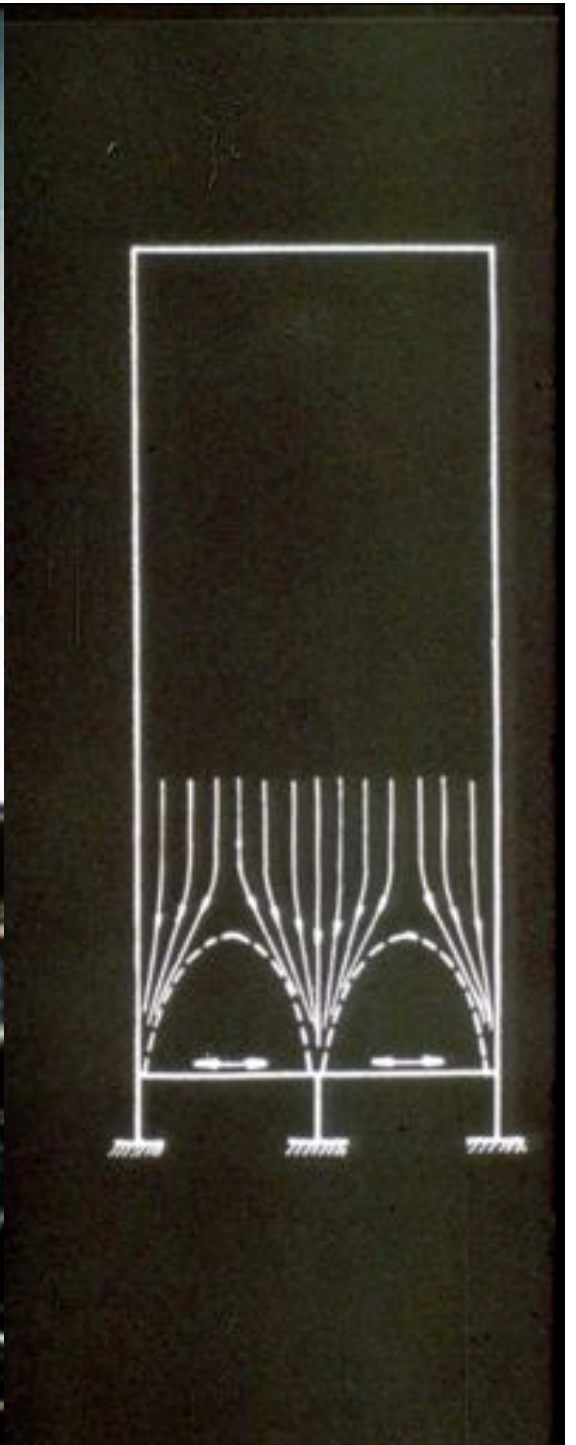
image for academic use only
<http://www.emporis.com/en/il/lv/?id=203434>

1965



=







marine
midland
bank

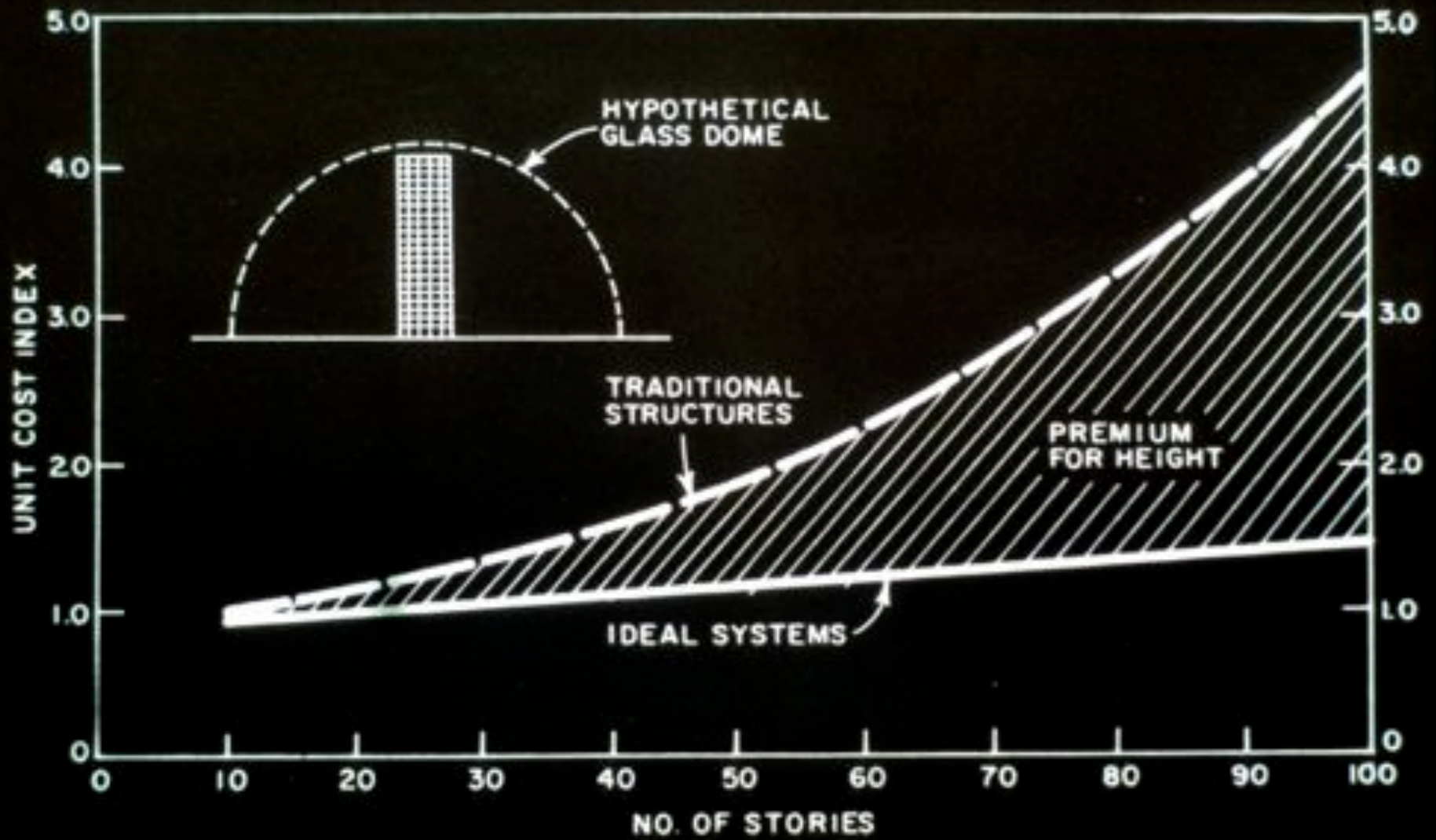


2 Shell
Plaza

1 Shell
Plaza







3 Premium for height is largely due to wind loads.

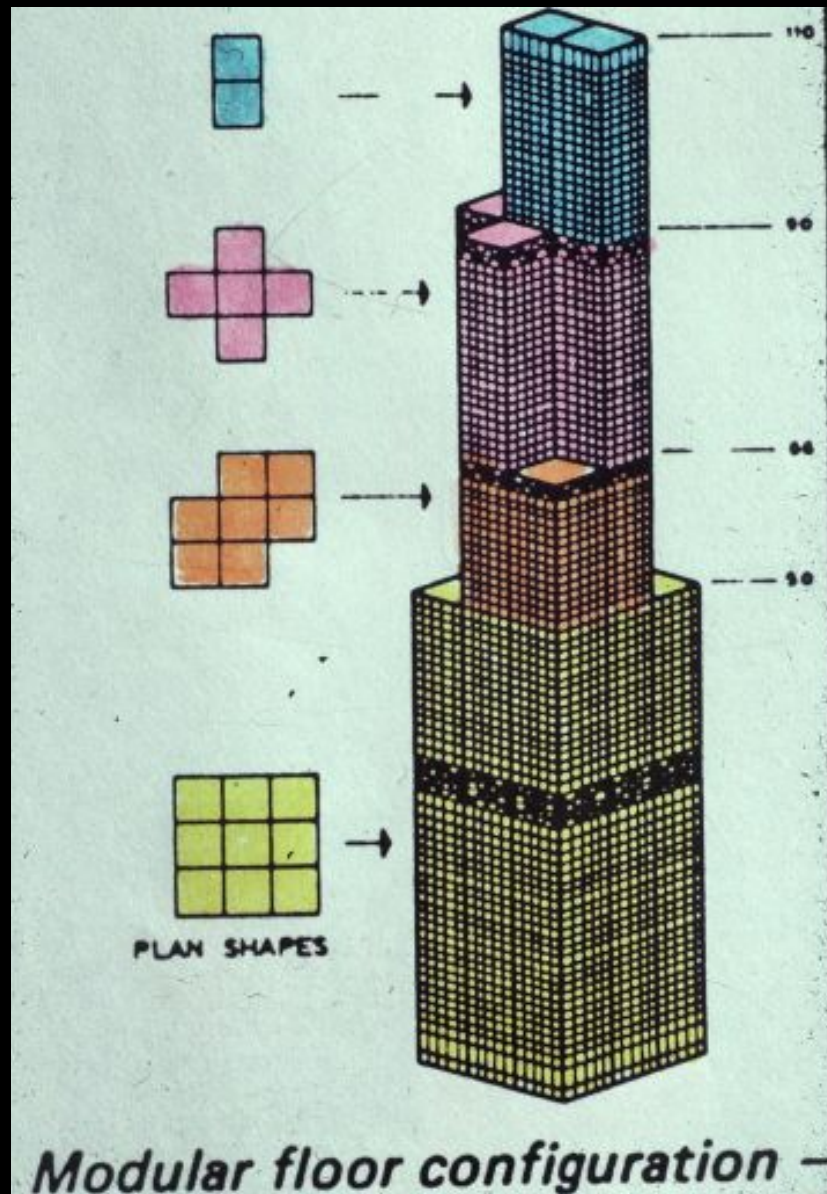


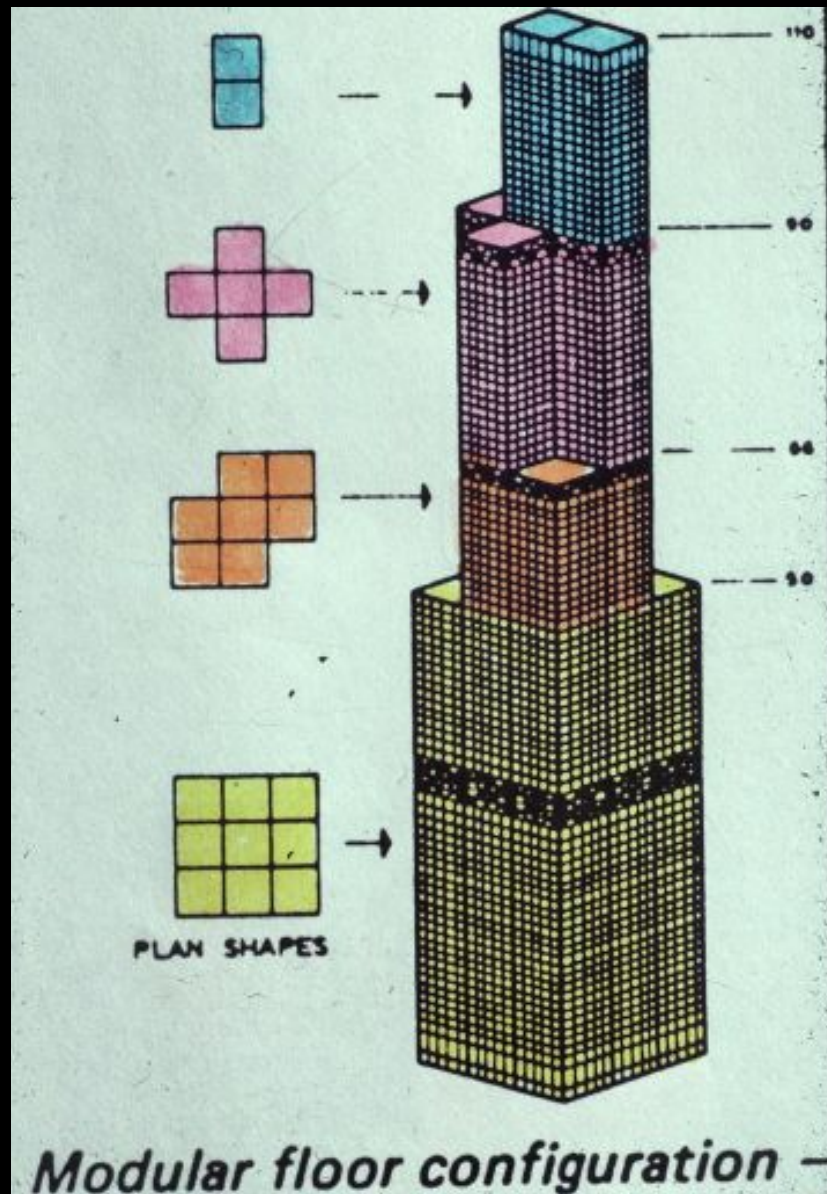




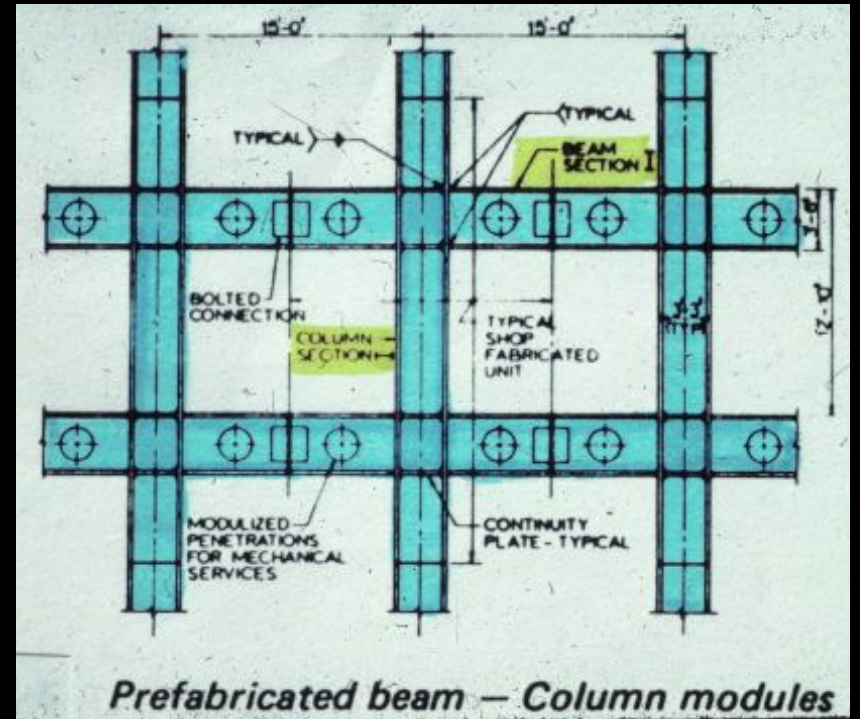


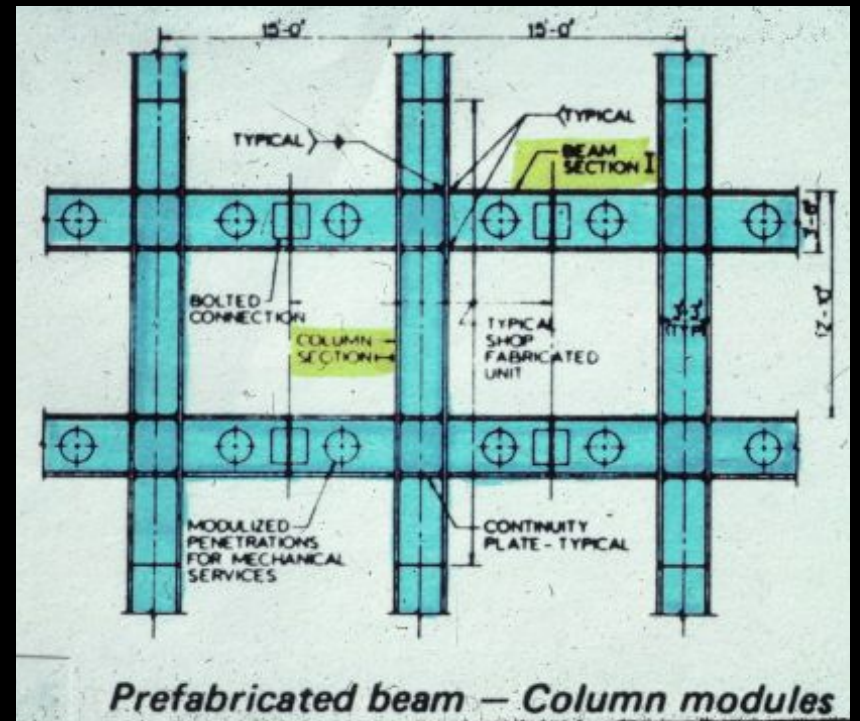
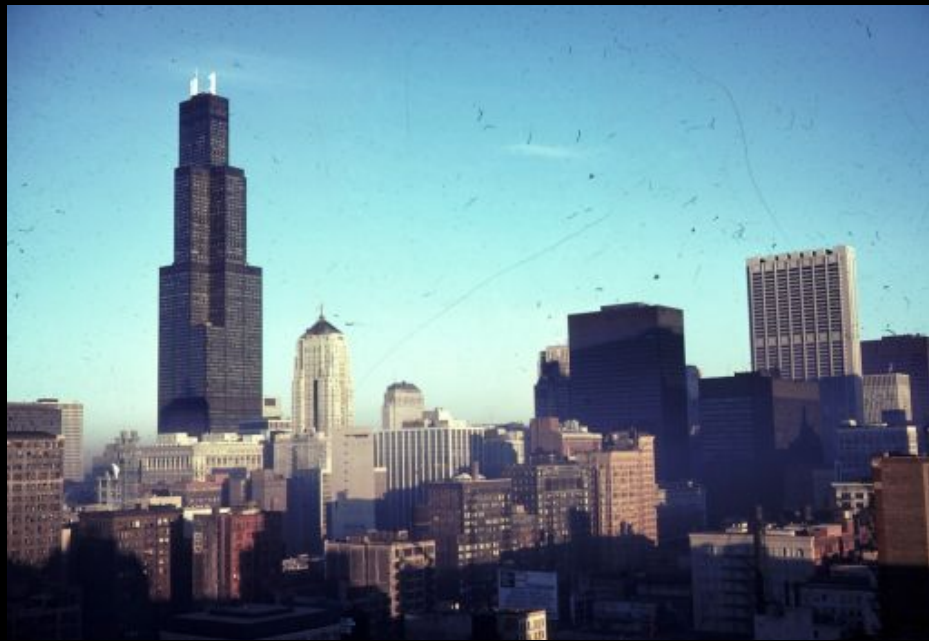






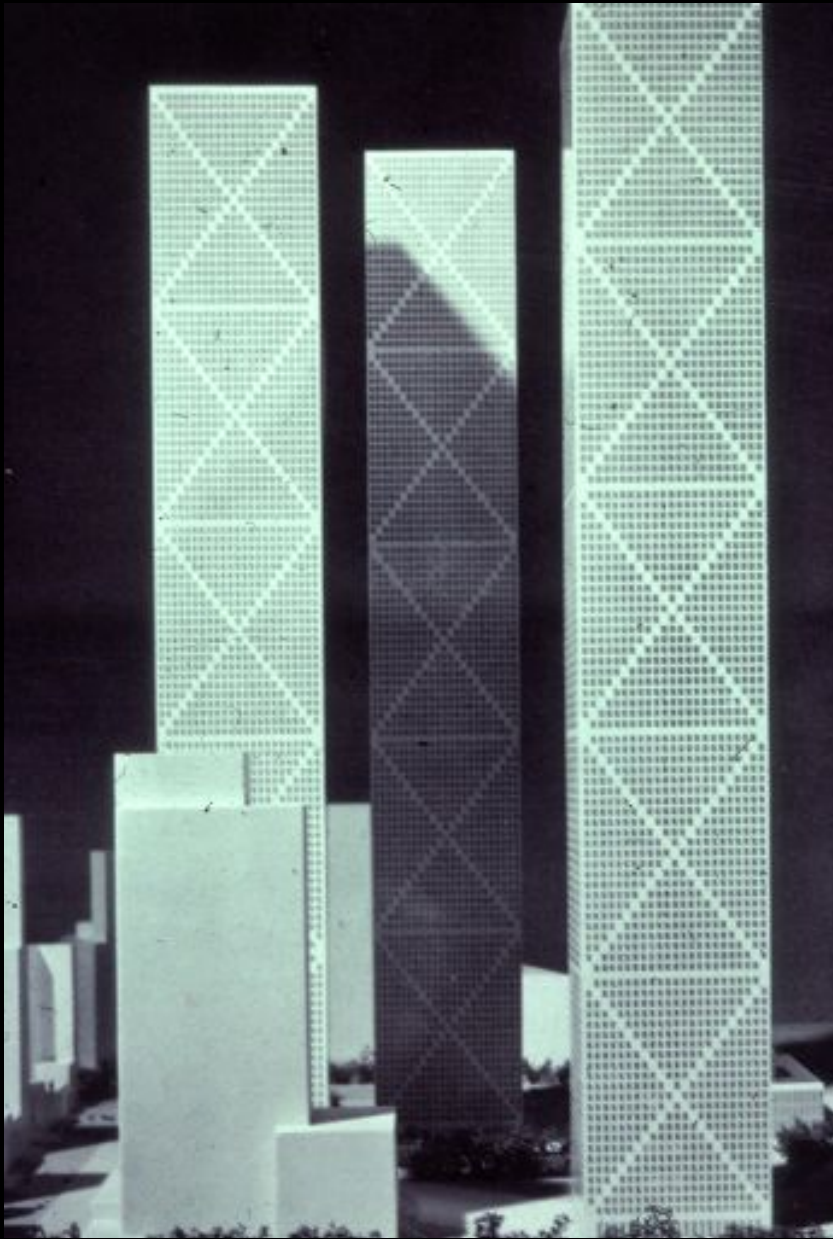


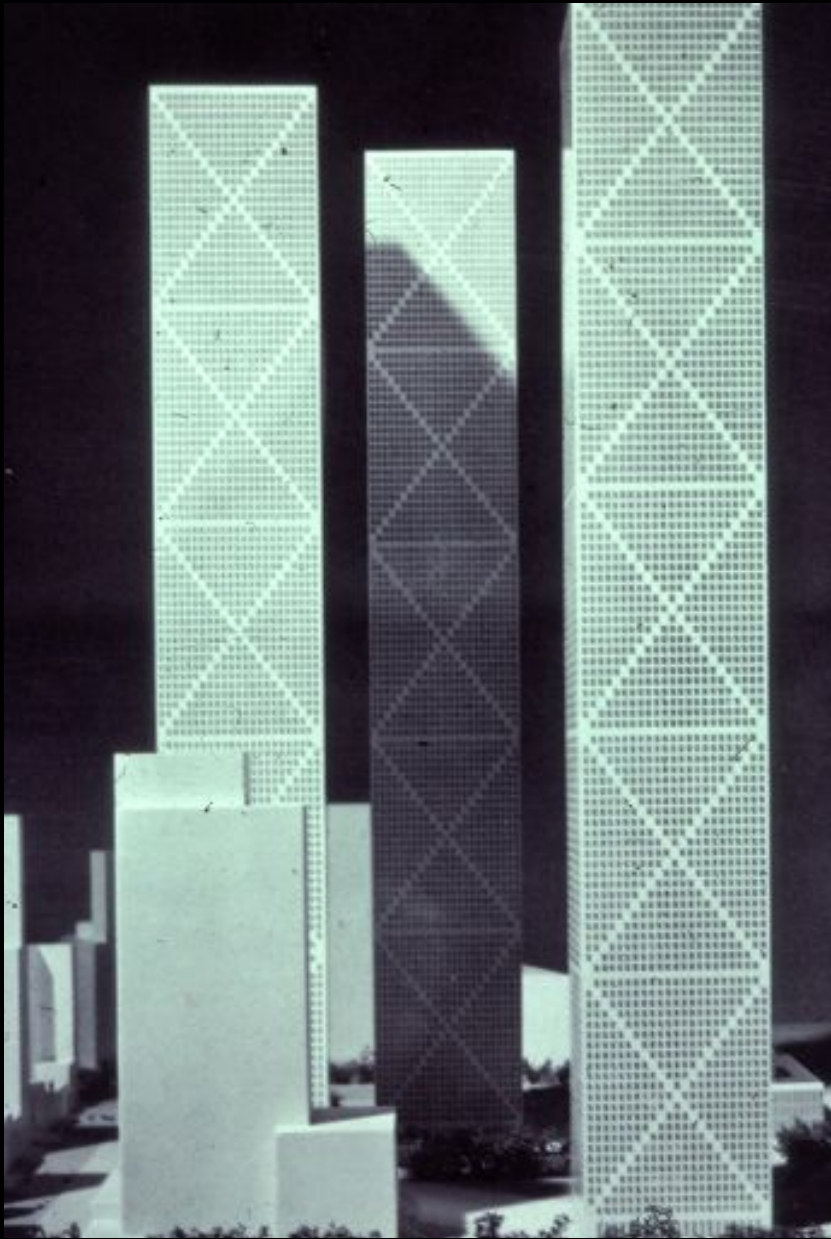












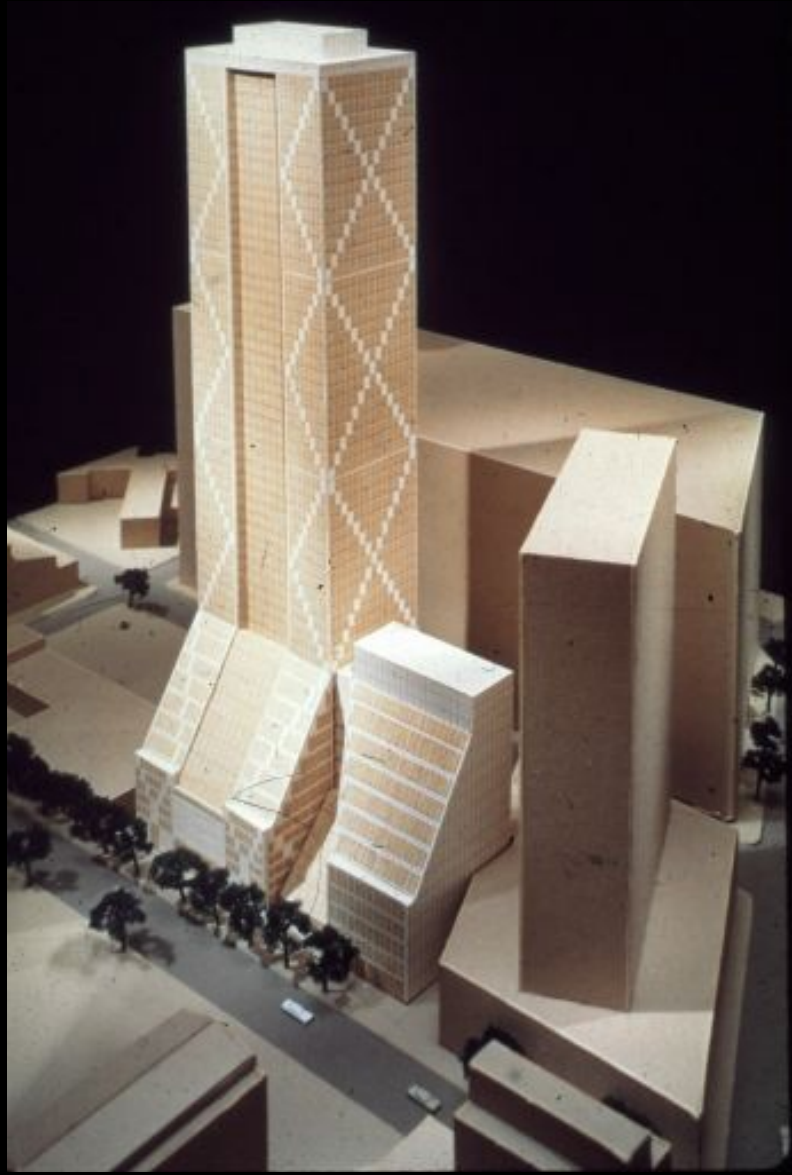
780 Third Avenue



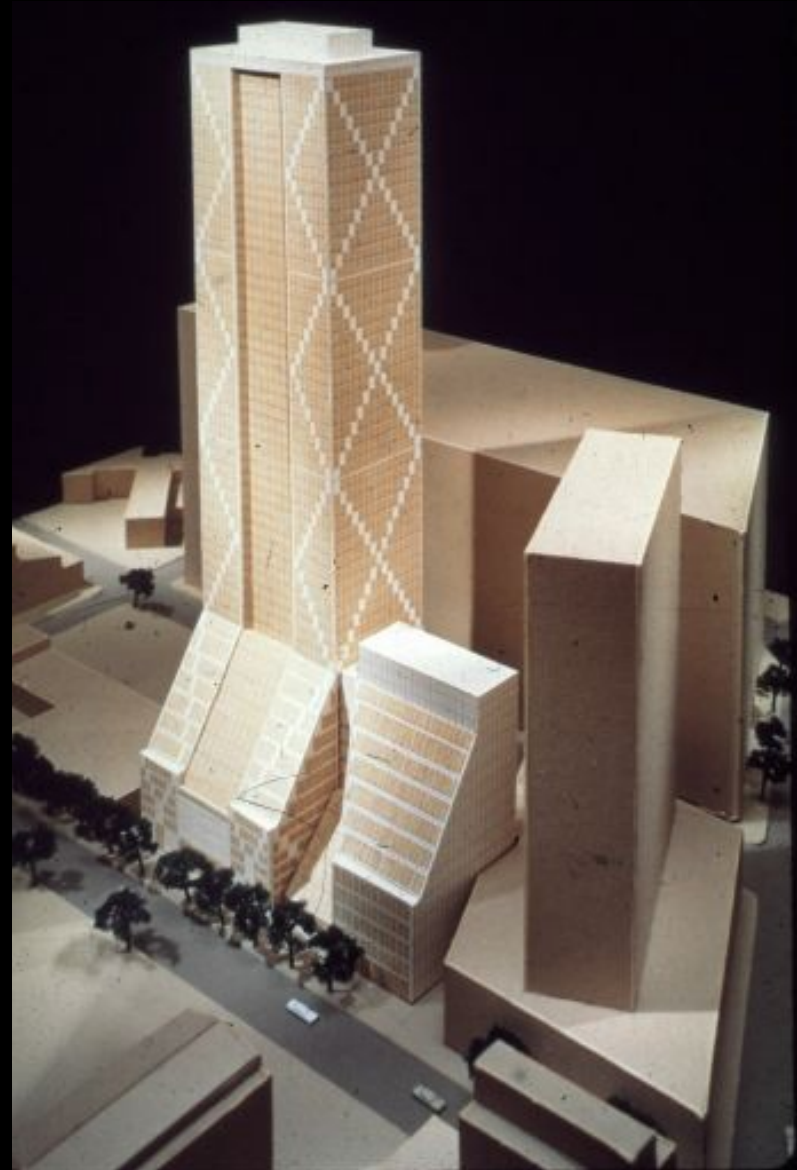
780 Third Avenue



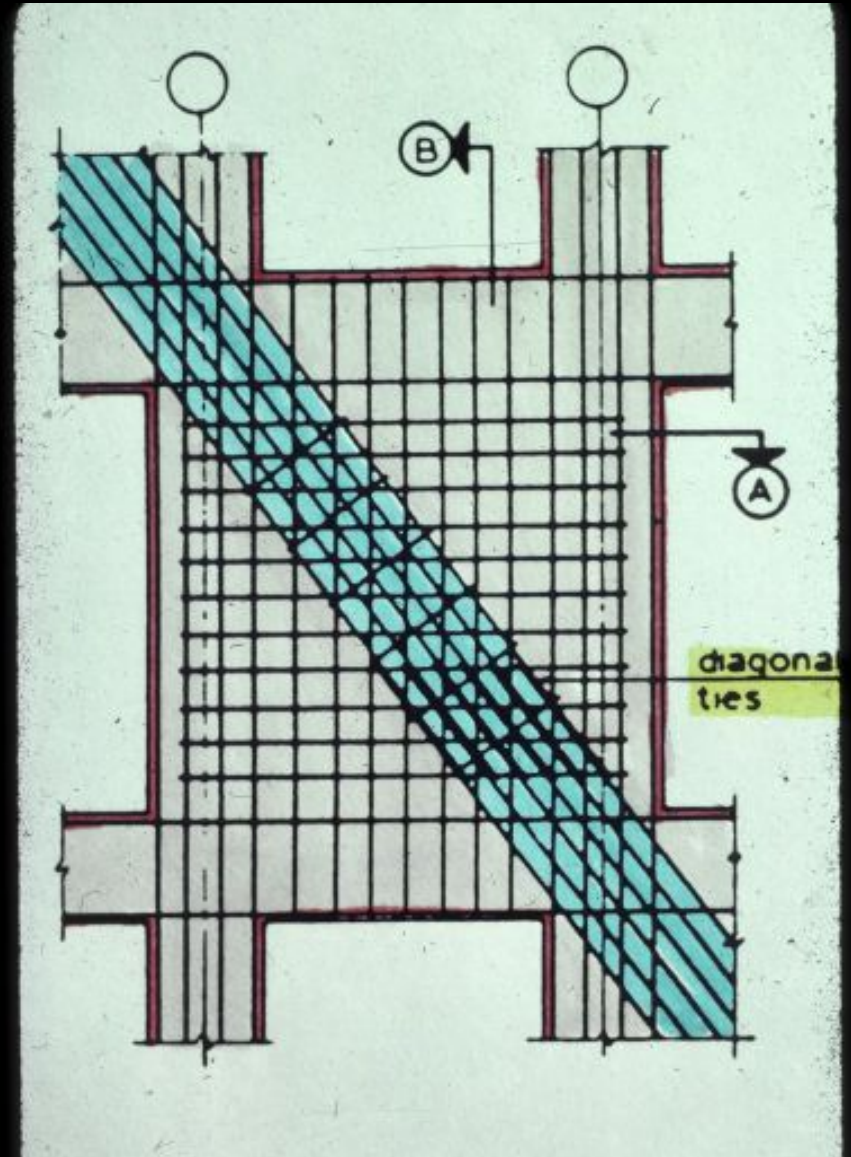


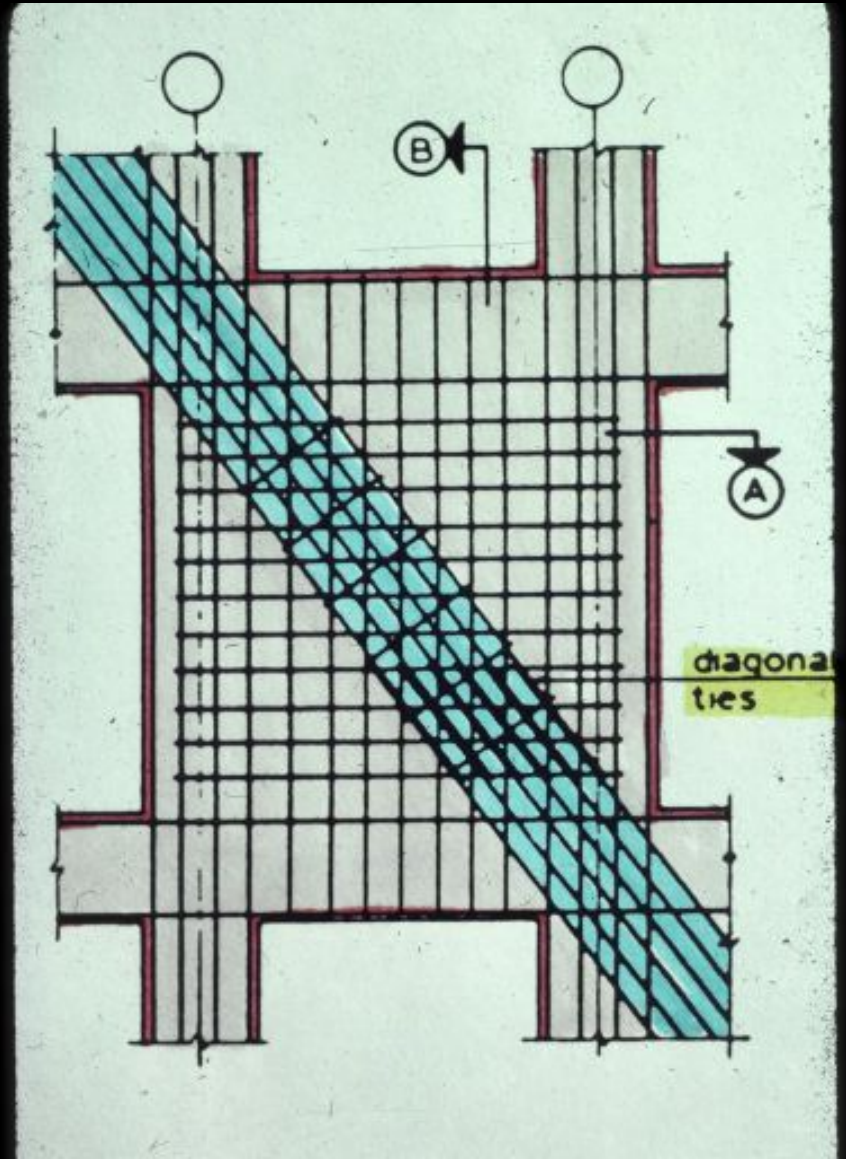


Onterie Building

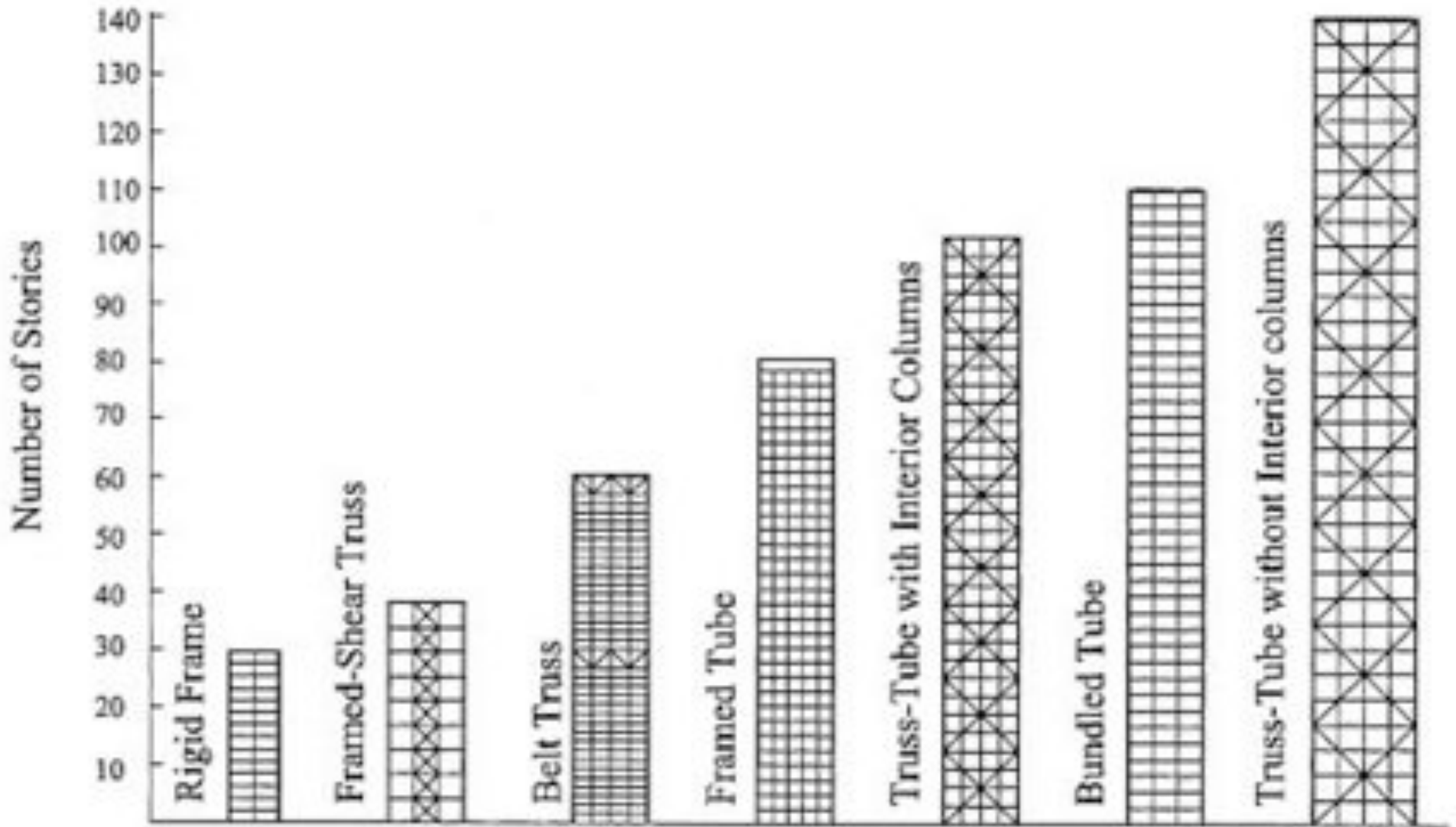


Onterie Building









Classification of tall building structural systems by Khan

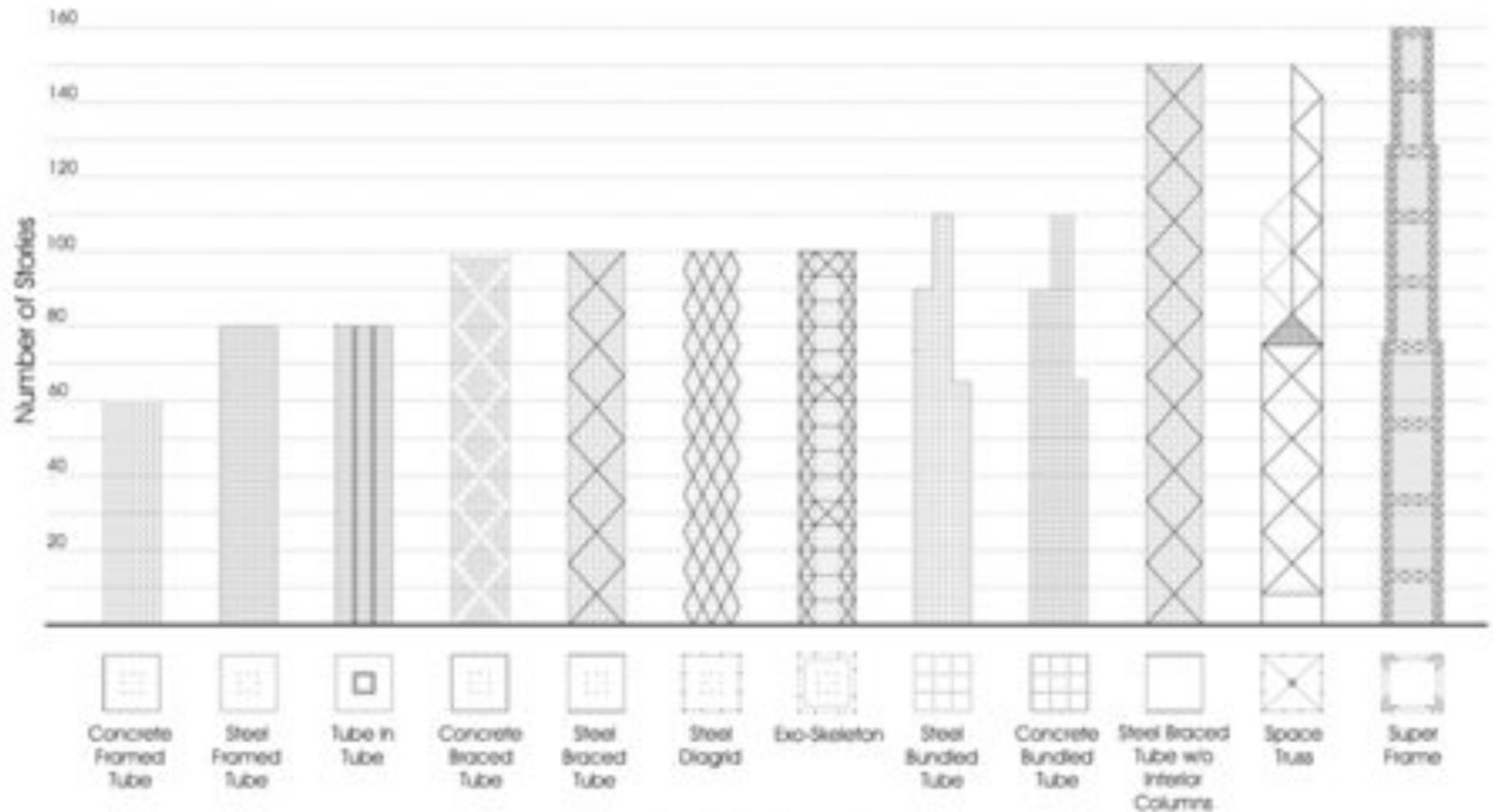


Figure 4-2: Exterior structures.

Updated by Ali and Moon in 2007 paper, focusing on tall building forms with exterior stiffening structures

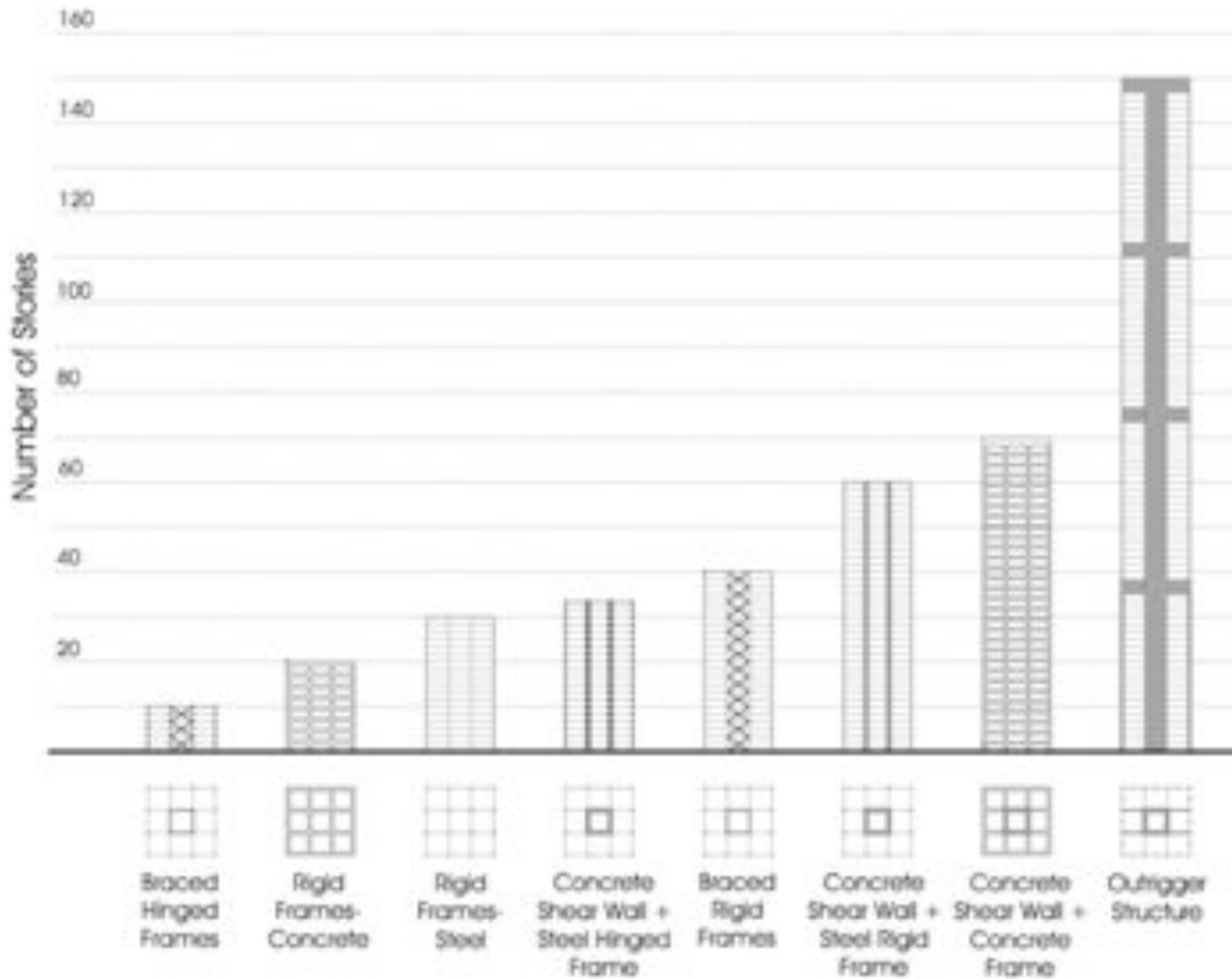


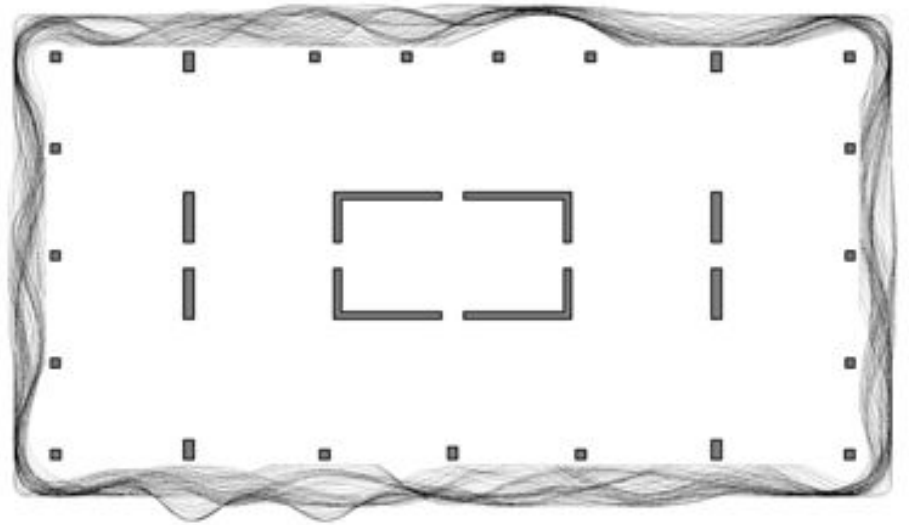
Figure 4-1: Interior structures.

Updated by Ali and Moon in 2007 paper, focusing on tall building forms with interior stiffening structures



















Mike Gustafon