MAGNUSSON
KLEMENCIC
ASSOCIATES

# You Can See the FUTURE

Ron Klemencic, P.E., S.E., Hon. AIA
Chairman and CEO

# You Can See the FUTURE Standing on Top of a Tall Building!

Ron Klemencic, P.E., S.E., Hon. AIA
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# You Can See the FUTURE Standing on Top of a Tall Building!

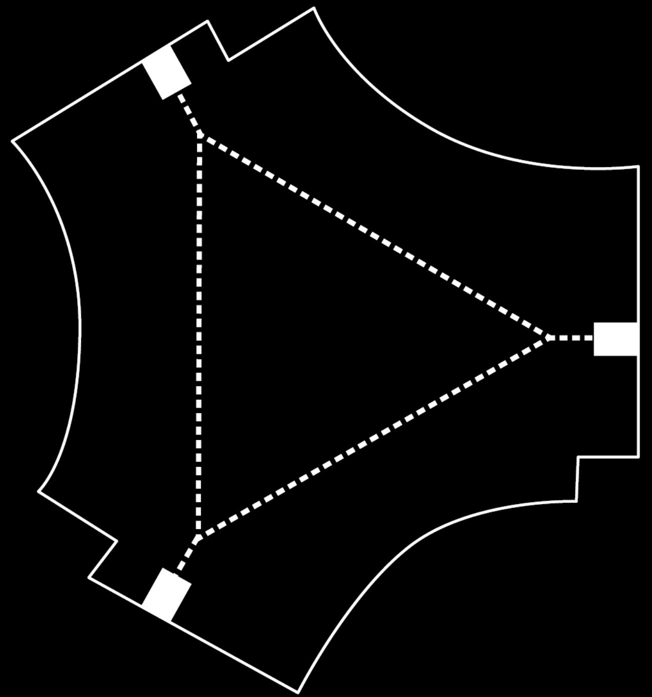
(WELL ALMOST)

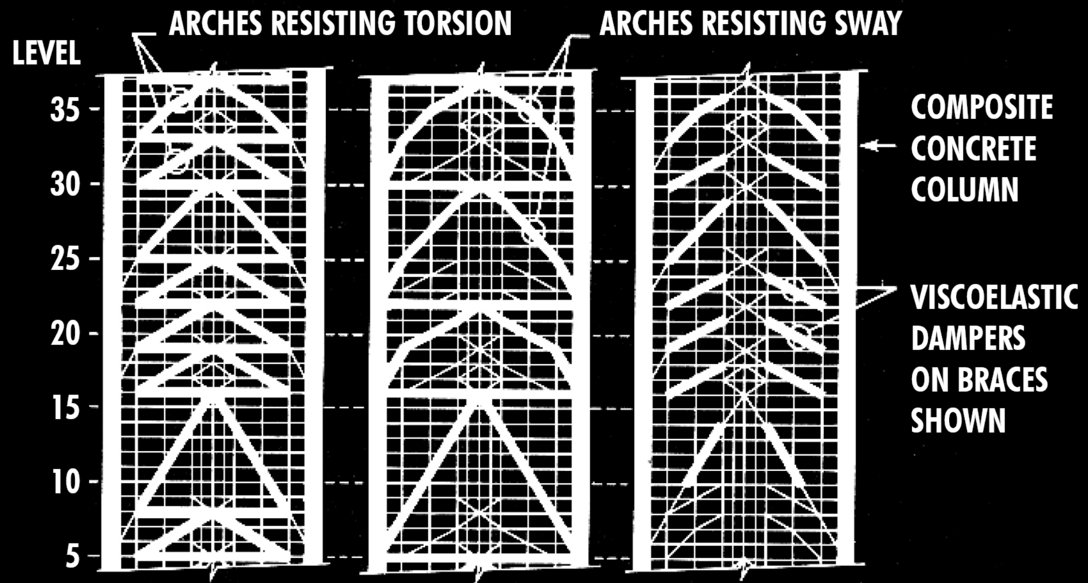
Ron Klemencic, P.E., S.E., Hon. AIA
Chairman and CEO

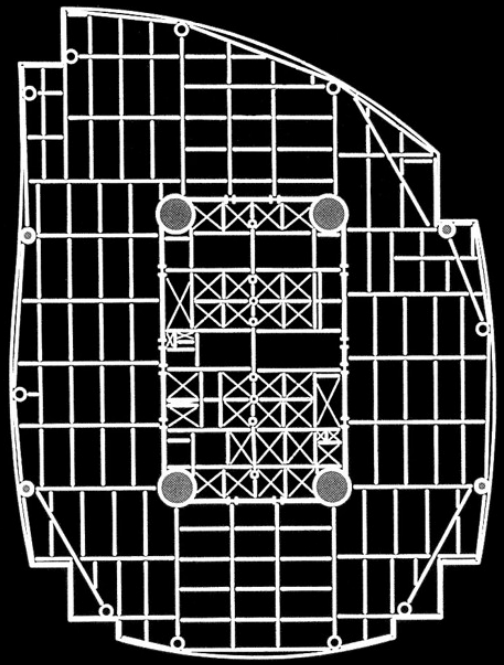

PAST
PRESENT
FUTURE
?


Budget


COLUMBIA CENTER
ONE WAY
701
FIFTH AVENUE
safeway




ARCHES RESISTING TORSION
ARCHES RESISTING SWAY
LEVEL
35
30
25
20
15
10
5
COMPOSITE CONCRETE COLUMN
VISCOELASTIC DAMPERS ON BRACES SHOWN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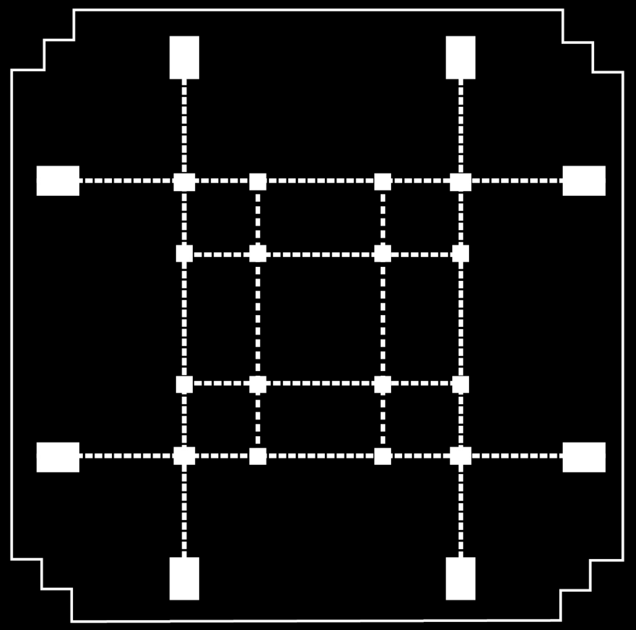
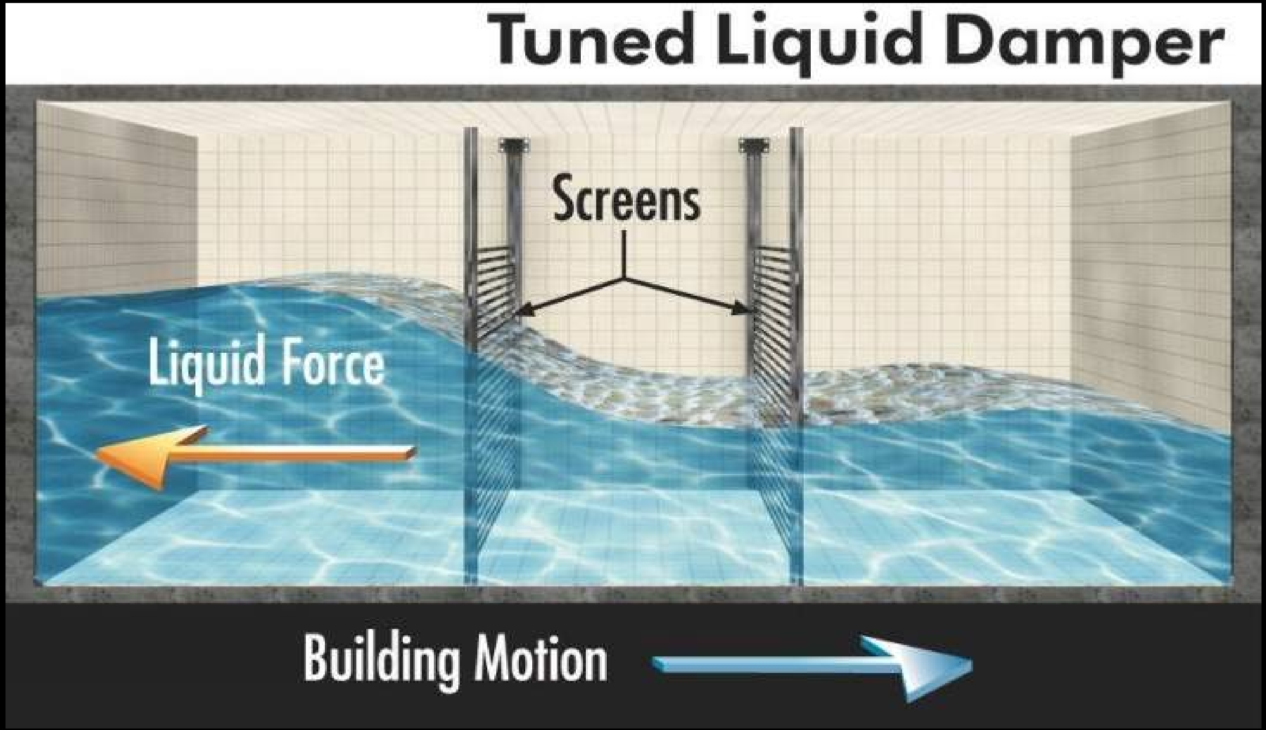
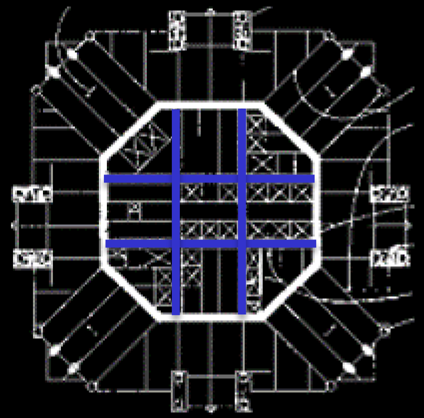
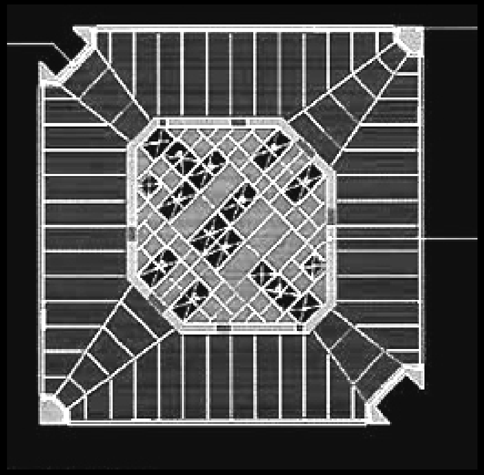
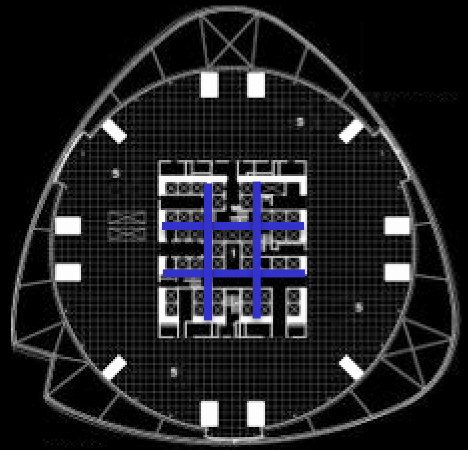
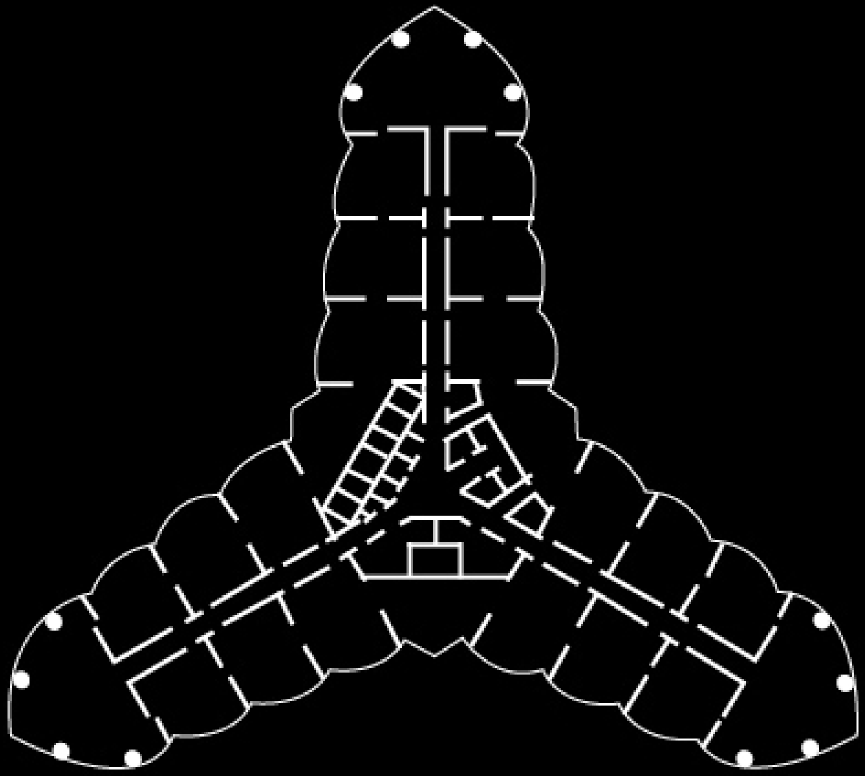


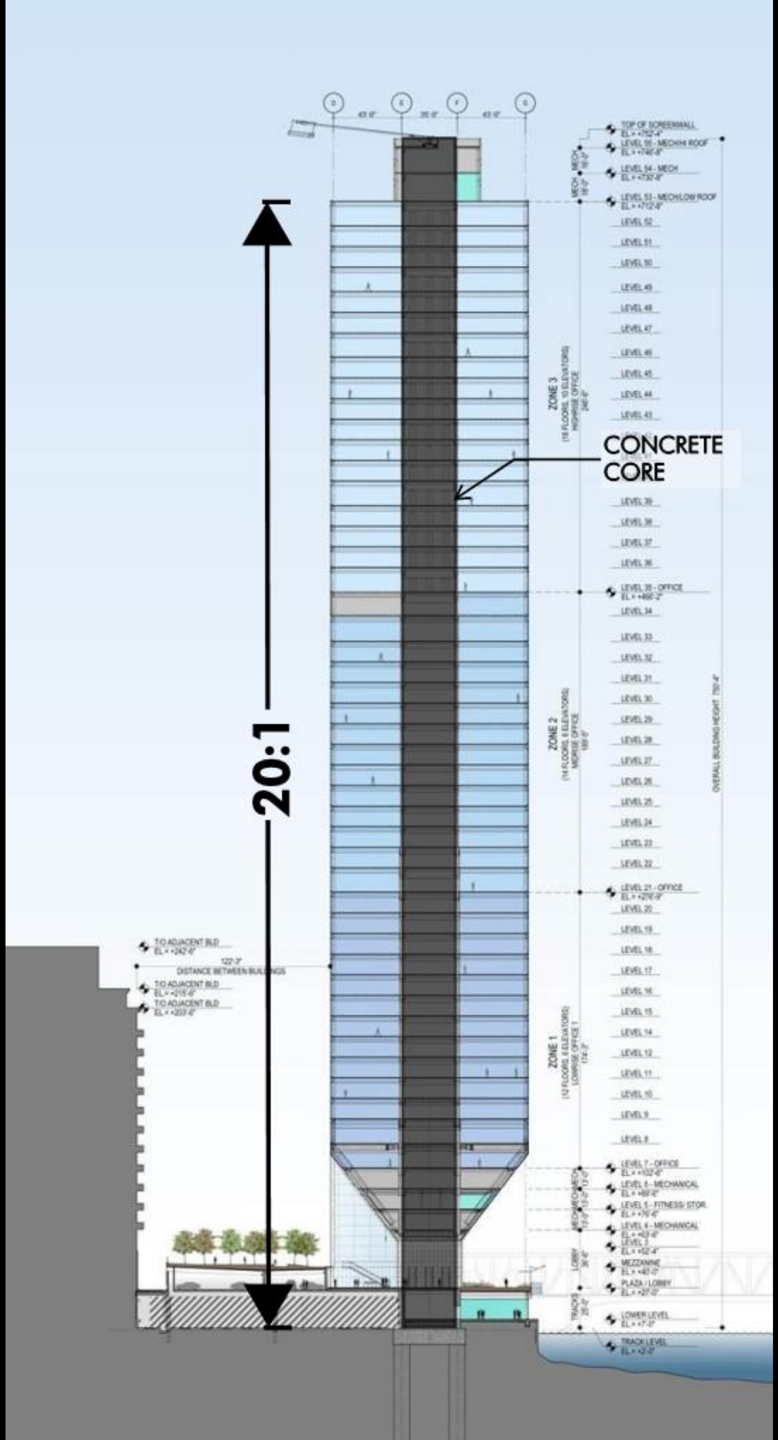


Tuned Liquid Damper
Screens
Liquid Force
Building Motion

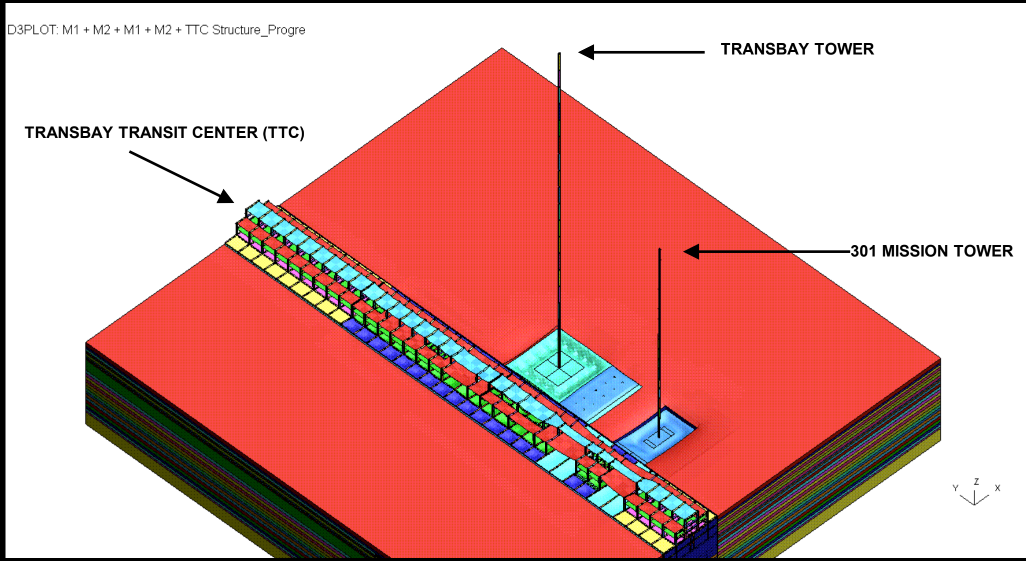


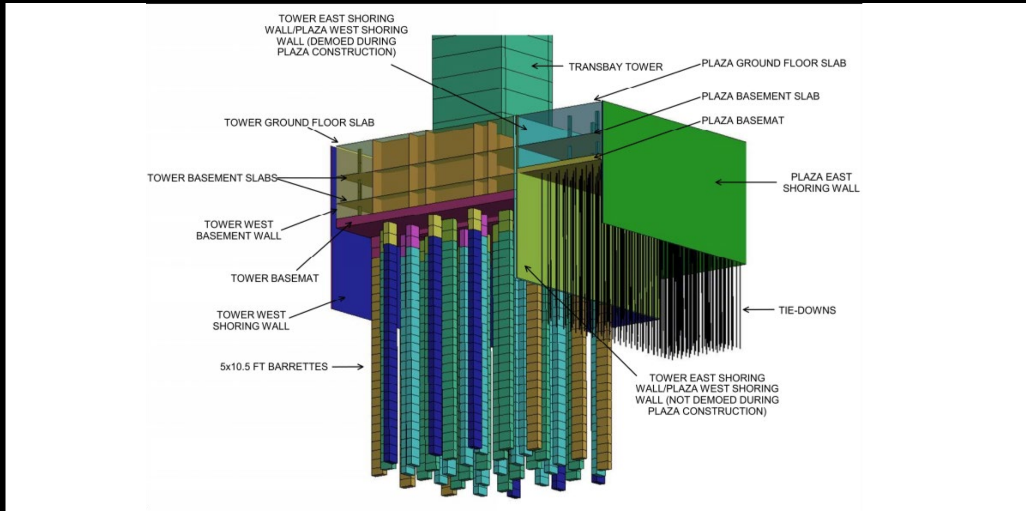




20:1
CONCRETE CORE

# Performance-Based Seismic Design




Deformations magnified x50



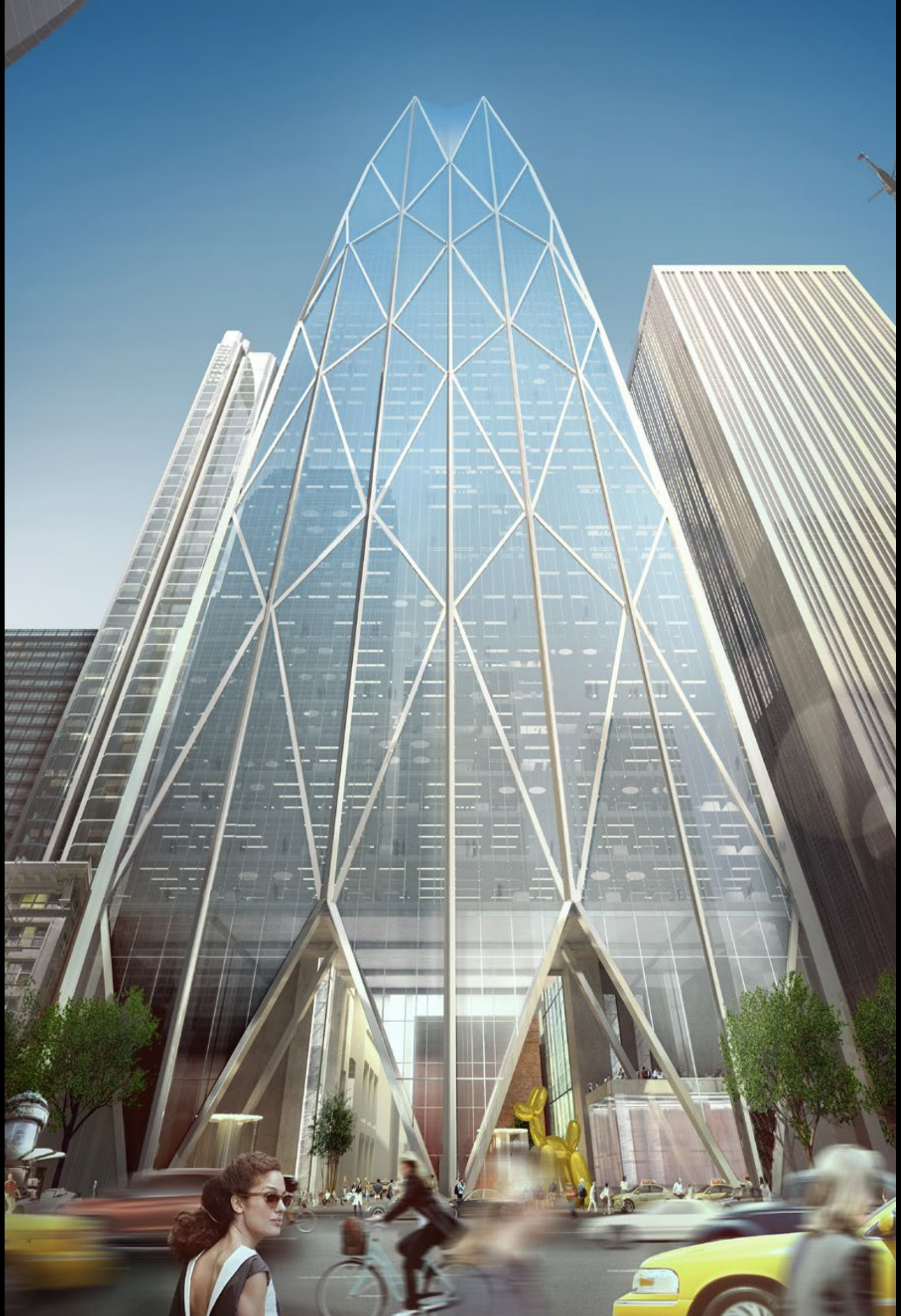
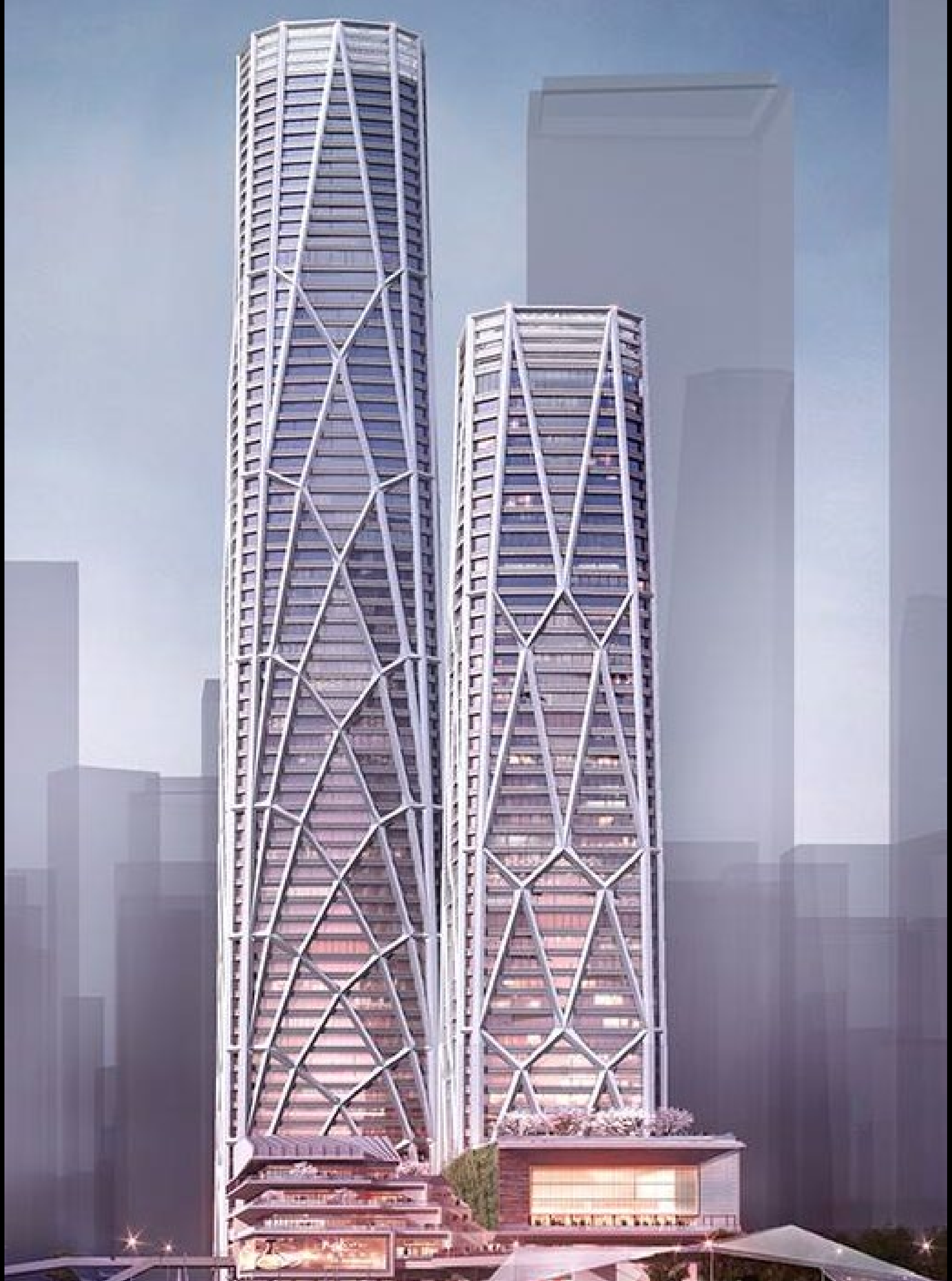
R

# ASCE/SEI 7-16 Target Reliability

**Table 1.3-1 Target Reliability (Annual Probability of Failure, $P_F$) and Associated Reliability Indices ($\beta$)[1] for Load Conditions That Do Not Include Earthquake, Tsunami, or Extraordinary Events[2]**

| | Risk Category | | | |
|---|---|---|---|---|
| **Basis** | **I** | **II** | **III** | **IV** |
| Failure that is not sudden and does not lead to widespread progression of damage | $P_F = 1.25 \times 10^{-4}$/yr<br>$\beta = 2.5$ | $P_F = 3.0 \times 10^{-5}$/yr<br>$\beta = 3.0$ | $P_F = 1.25 \times 10^{-5}$/yr<br>$\beta = 3.25$ | $P_F = 5.0 \times 10^{-6}$/yr<br>$\beta = 3.5$ |
| Failure that is either sudden or leads to widespread progression of damage | $P_F = 3.0 \times 10^{-5}$/yr<br>$\beta = 3.0$ | $P_F = 5.0 \times 10^{-6}$/yr<br>$\beta = 3.5$ | $P_F = 2.0 \times 10^{-6}$/yr<br>$\beta = 3.75$ | $P_F = 7.0 \times 10^{-7}$/yr<br>$\beta = 4.0$ |
| Failure that is sudden and results in widespread progression of damage | $P_F = 5.0 \times 10^{-6}$/yr<br>$\beta = 3.5$ | $P_F = 7.0 \times 10^{-7}$/yr<br>$\beta = 4.0$ | $P_F = 2.5 \times 10^{-7}$/yr<br>$\beta = 4.25$ | $P_F = 1.0 \times 10^{-7}$/yr<br>$\beta = 4.5$ |

[1]The target reliability indices are provided for a 50-year reference period, and the probabilities of failure have been annualized. The equations presented in Section 2.3.6 are based on reliability indices for 50 years because the load combination requirements in Section 2.3.2 are based on the maximum loads for the 50-year reference period.
[2]Commentary to Section 2.5 includes references to publications that describe the historic development of these target reliabilities.

# Performance-Based Wind

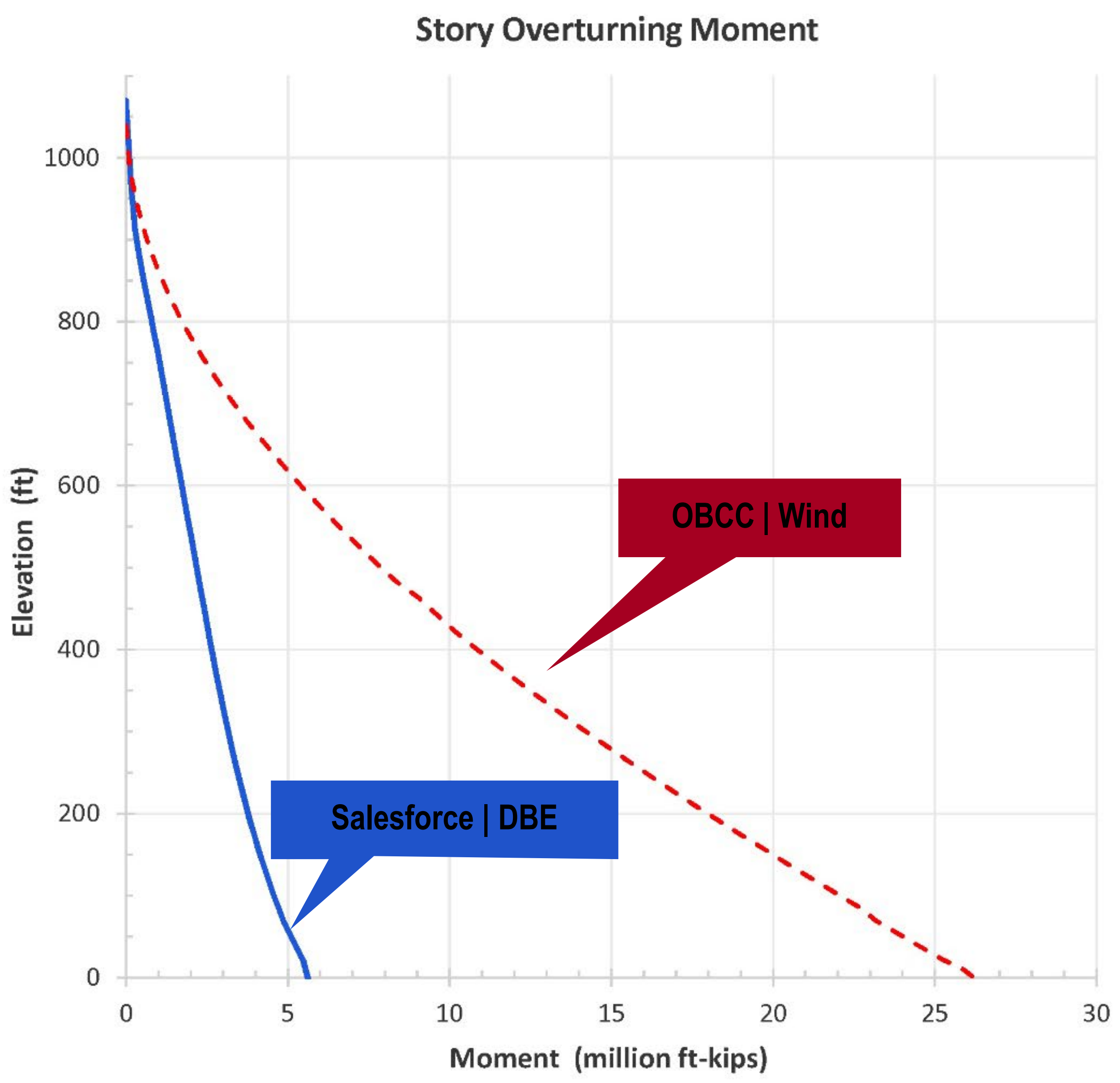
# Prestandard for Performance-Based **Wind** Design

**American Society of Civil Engineers**

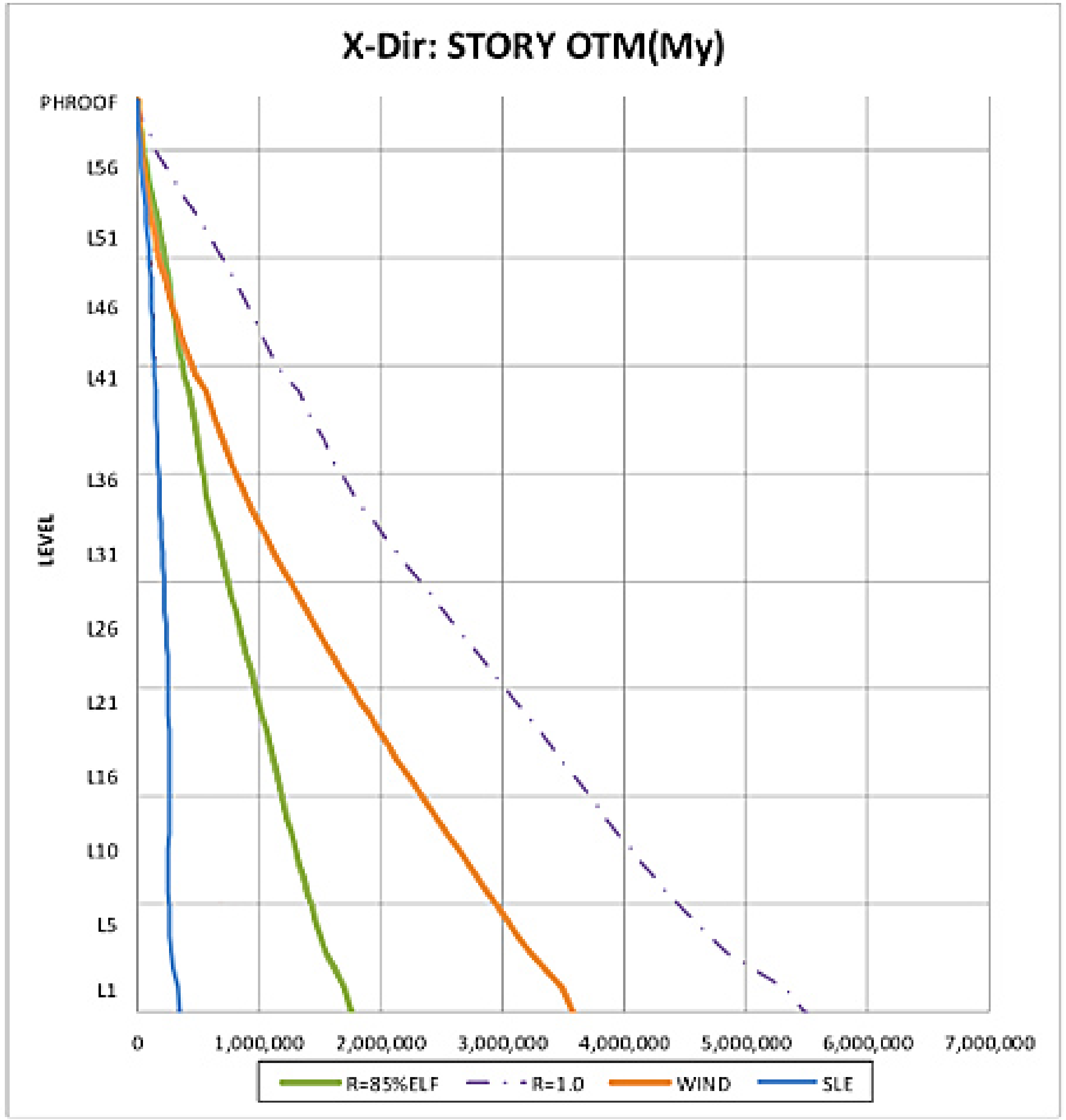
ASCE

CHARLES PANKOW FOUNDATION

SEI STRUCTURAL ENGINEERING INSTITUTE



Story Overturning Moment
Elevation (ft)
Moment (million ft-kips)
0
200
400
600
800
1000
0
5
10
15
20
25
30
OBCC | Wind
Salesforce | DBE

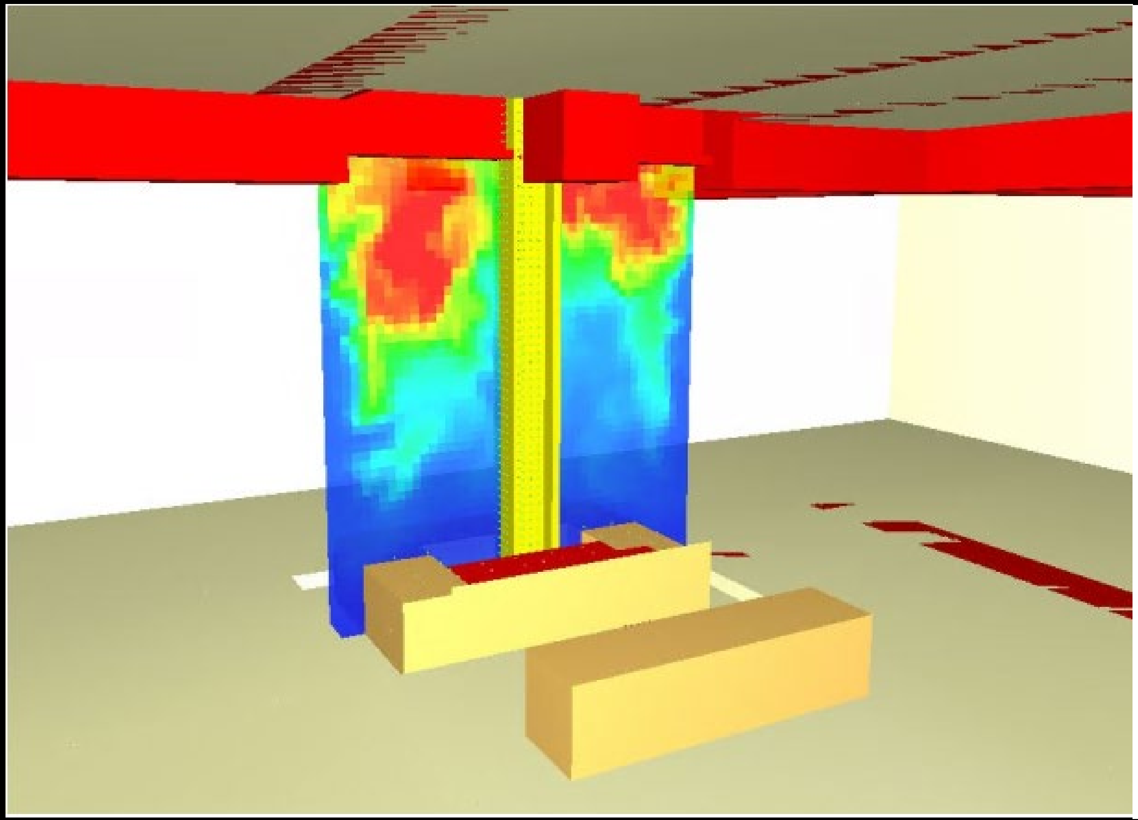


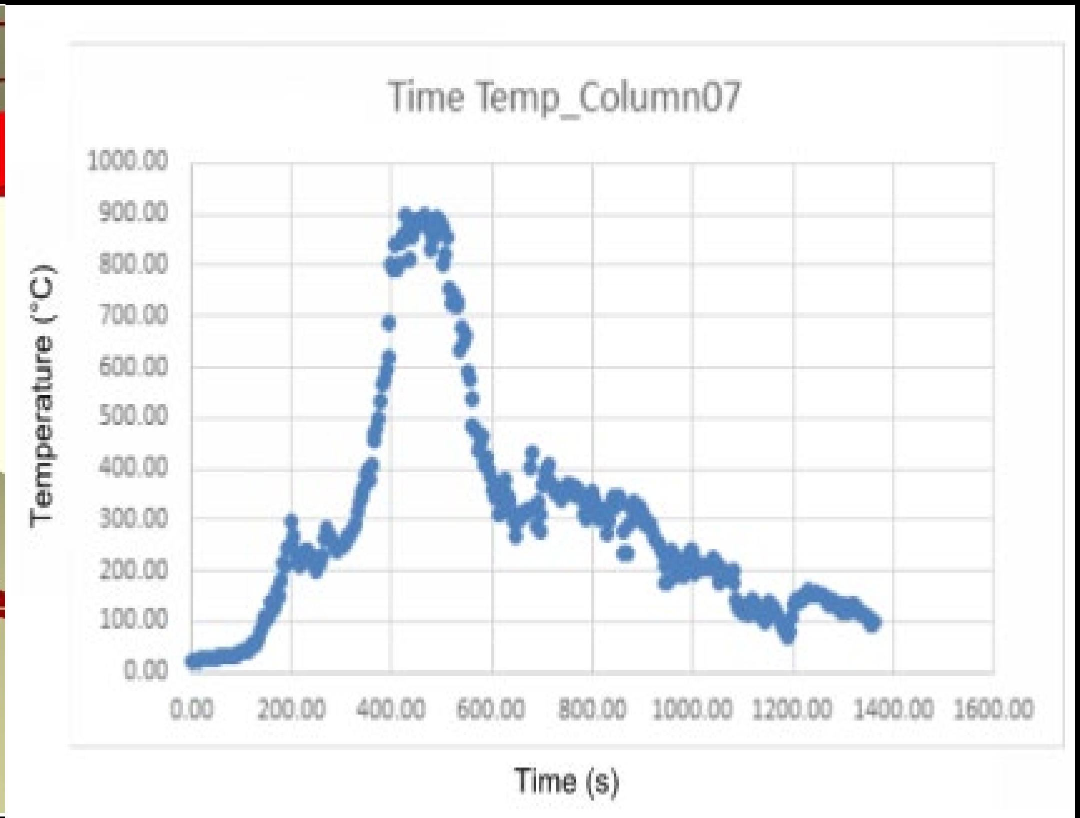
X-Dir: STORY OTM(My)
PHROOF
L56
L51
L46
L41
L36
L31
L26
L21
L16
L10
L5
L1
LEVEL
0
1,000,000
2,000,000
3,000,000
4,000,000
5,000,000
6,000,000
7,000,000
R=85%ELF
R=1.0
WIND
SLE

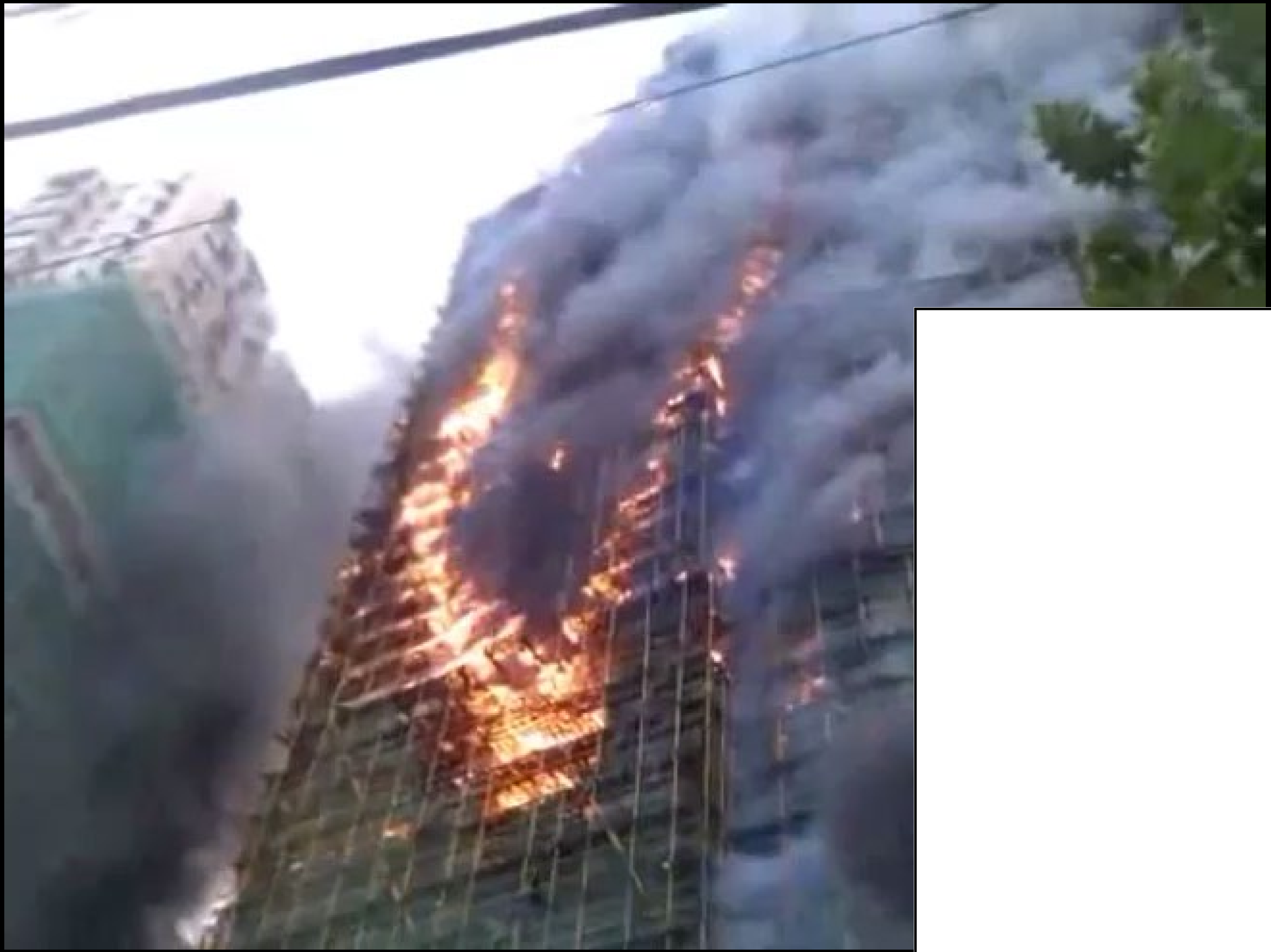

/121/T48/12/P556

# Lower Carbon Hybrid Systems

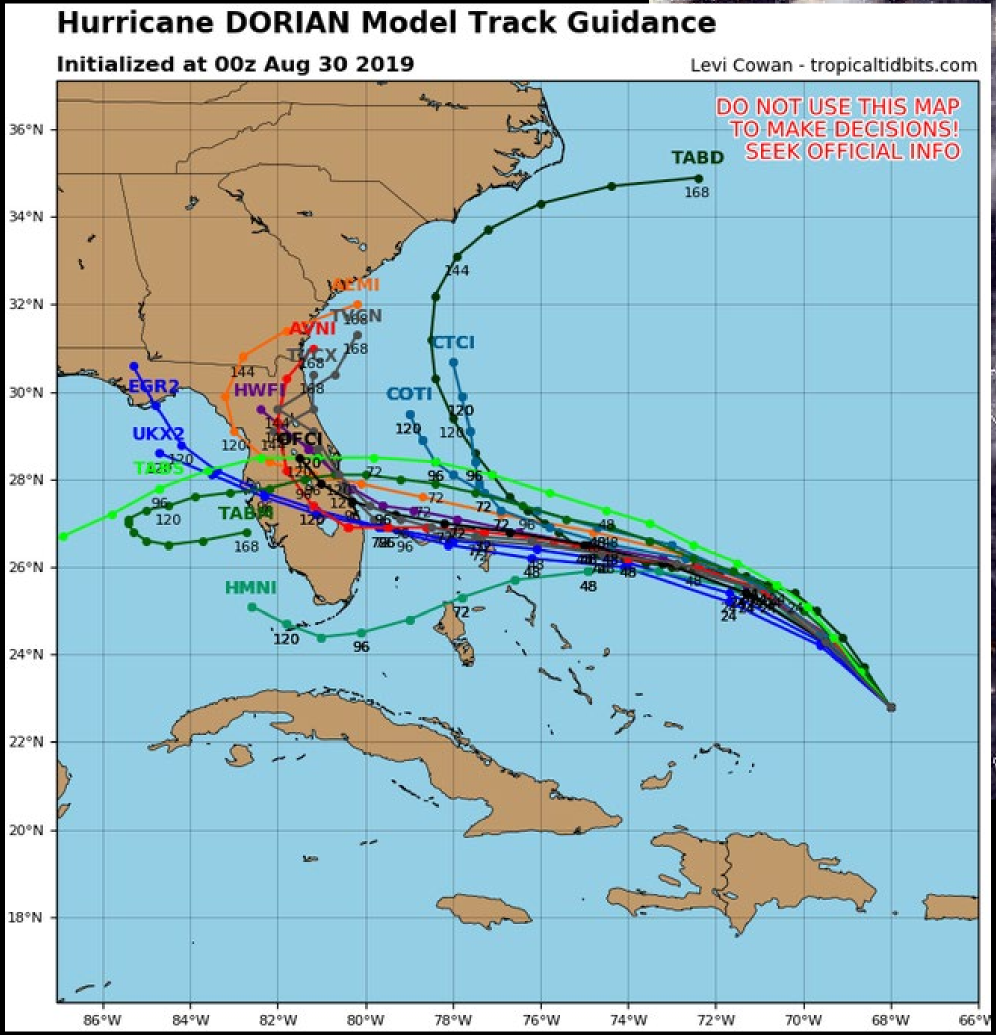
# Performance-Based Fire

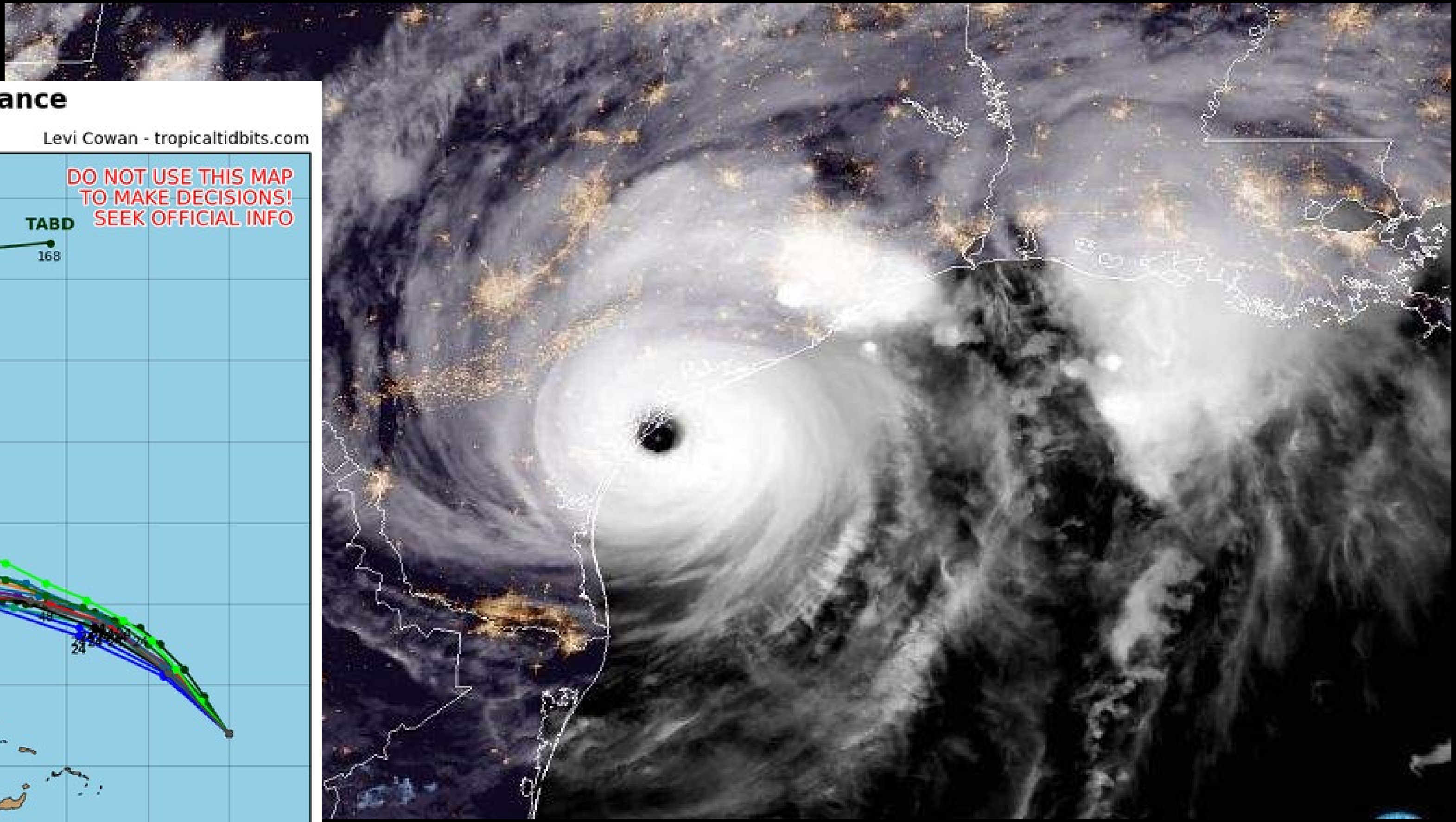




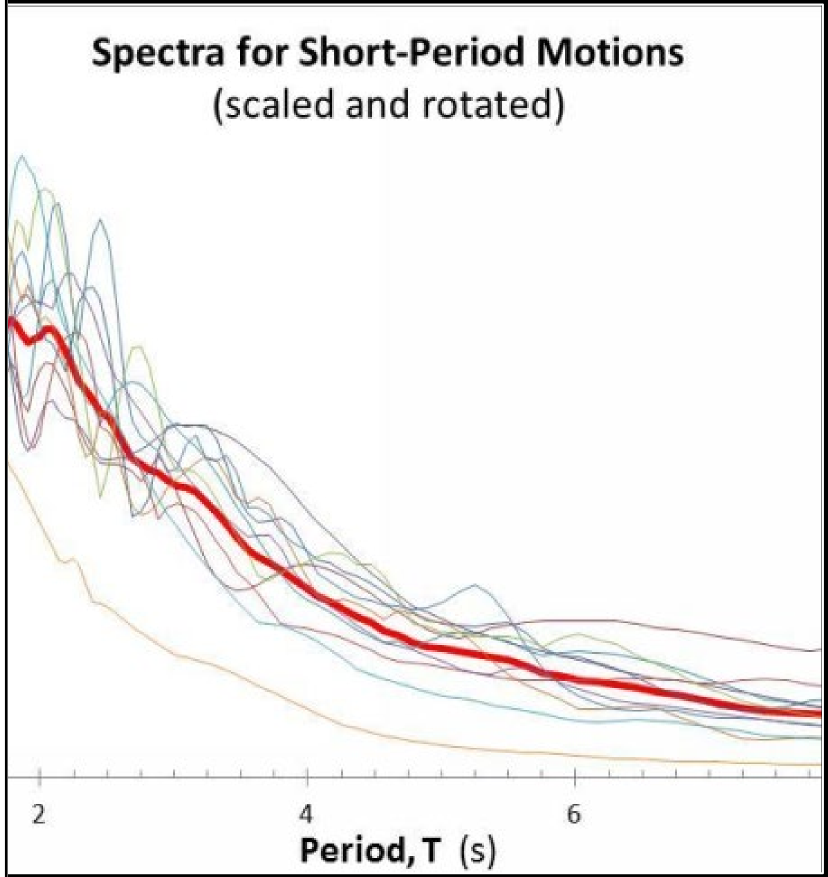


# AI — More Accurate Modeling of Weather



# AI – Help Solve What Isn’t Fully Understood

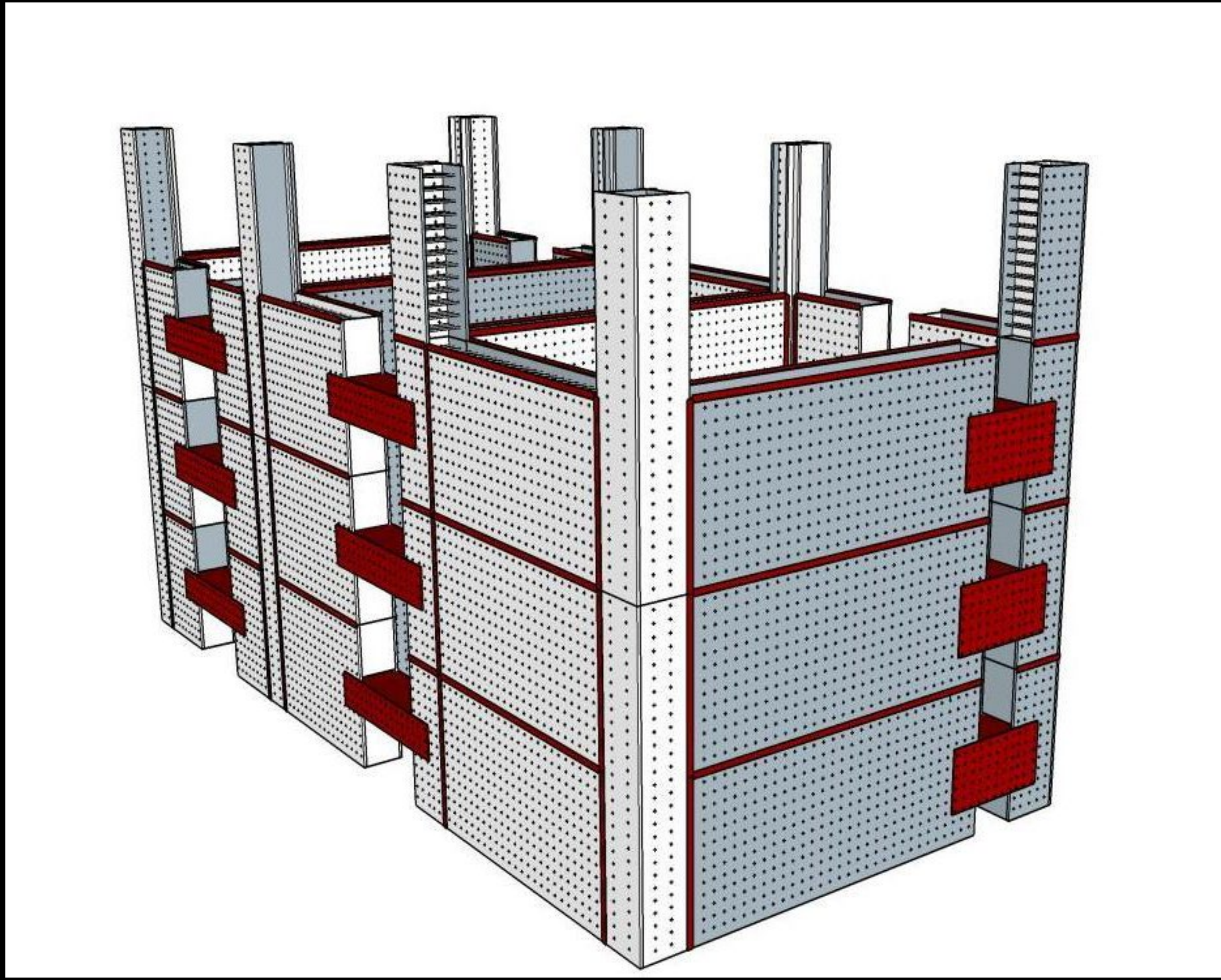


# Virtual / Augmented Reality

# Virtual / Augmented Reality


HEWDEN

# “Component” Modular



# Research

# Testing Validation





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