Rebecca Bires | Scott Brown | Scott Eckert | Jordan Huey | Helen Leenhouts | Andrew Levy | Jeffrey Loeb | Patrick Vogel

350 Mission

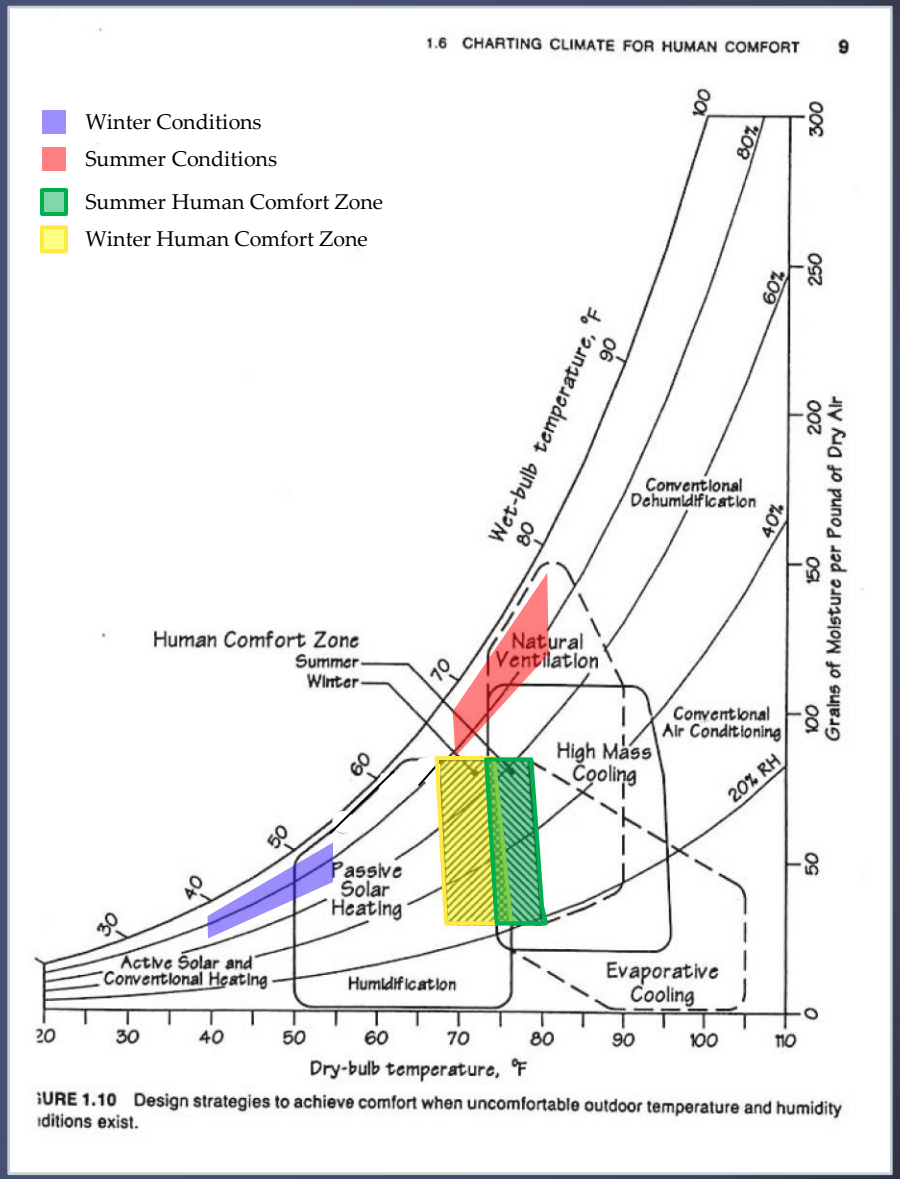
Energy

Structure

Performance

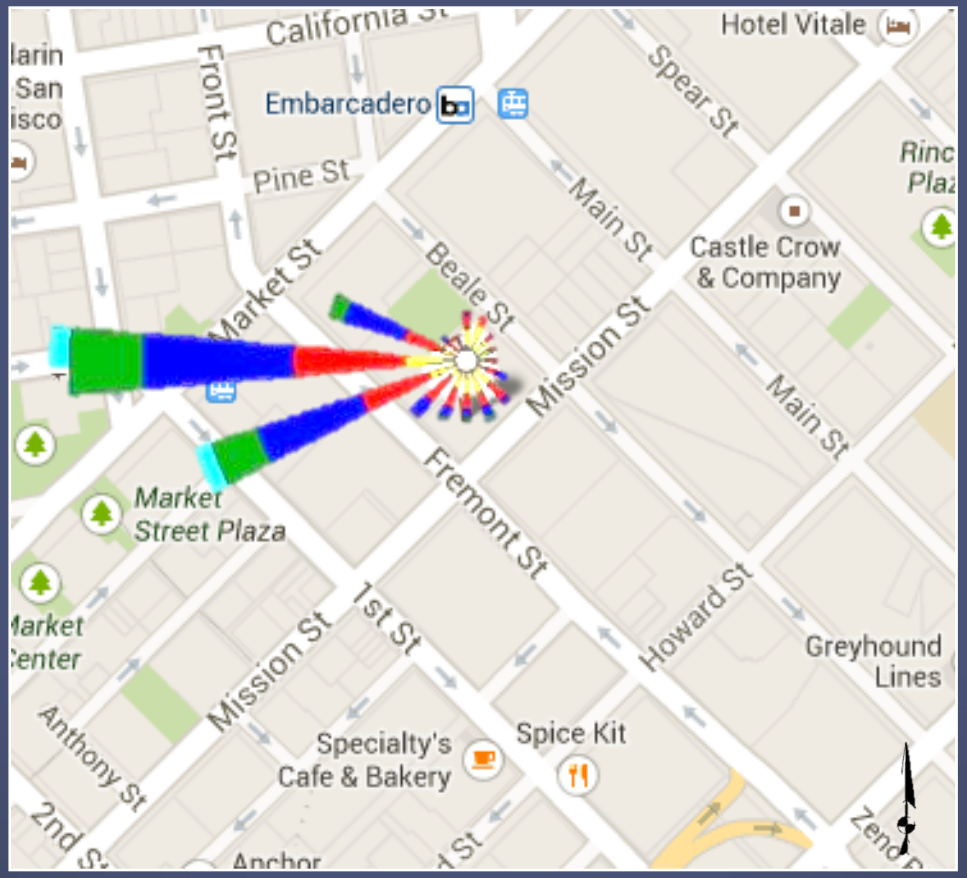
Site Weather Conditions

- Weather
  - Heating DB (99%) - 40.8 °F
  - Cooling DB (1%) - 78.3 °F
  - HDD – 2708
  - CDD – 142
- Design Challenge
  - Humidity



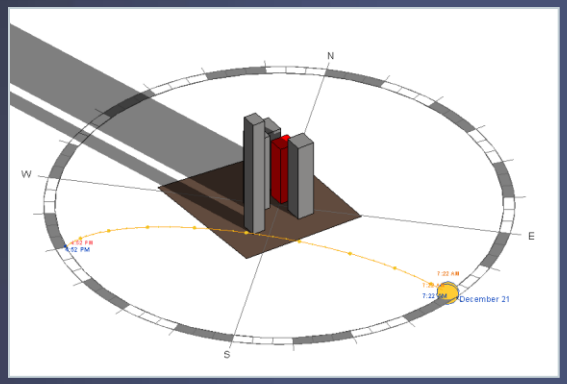
Site

- Wind
  - Prevailing direction: West to East



Site Solar Study

Winter Solstice



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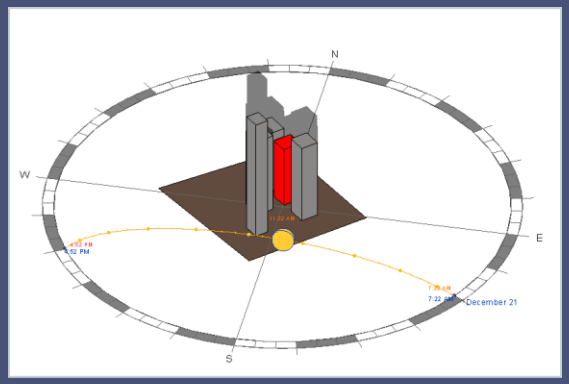

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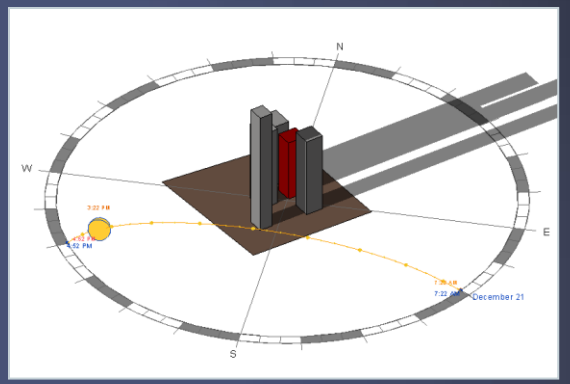

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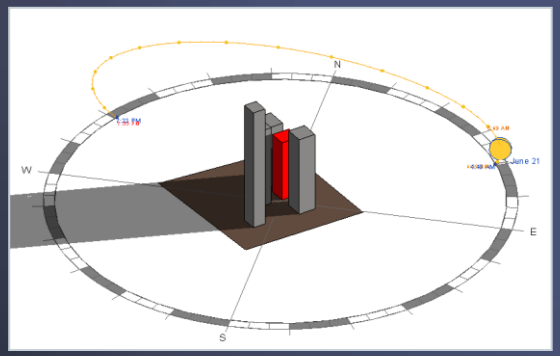
Summer Solstice



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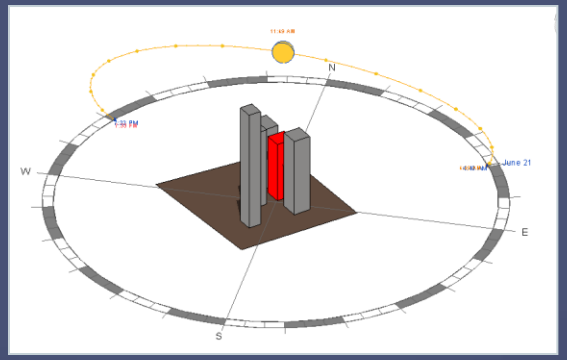

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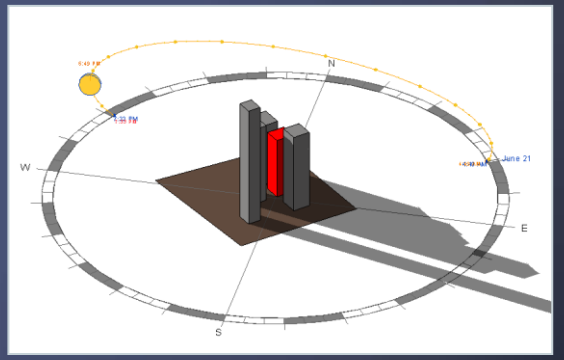

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Mechanical

- Chapter 4: Ventilation Air Supply
  - Natural and Mechanical Ventilation
  - Underground Parking
    - Exhaust Requirements
    - Carbon Monoxide Sensing
- Chapter 5: Exhaust Systems
  - General Requirements – Installation & Termination
- Chapter 6: Duct Systems
  - Design & Installation Requirements
- Chapter 10: Steam and Hot Water Boilers
  - Access & Maintenance
- Chapter 11: Refrigeration
  - Design Guidelines
  - ASHRAE 15
- Chapter 12-14: Piping
  - Piping Design Guidelines

Energy Challenges

Small footprint; big building

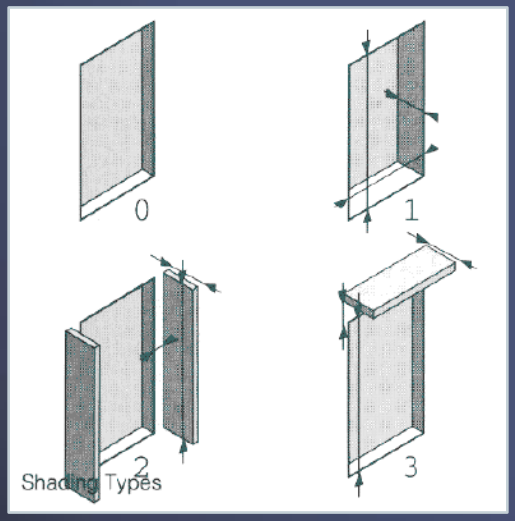
Photovoltaic Arrays: 70-140M kwh

Open Air Entrance

Net- Zero Construction

Energy Use Reduction

- LPD and Illuminance performance goals
- Shading devices
- Lighting and Electrical loads on occupancy sensors
- Descriptive controls narrative



CALIFORNIA BUILDING CODE 2010

California Code of Regulations
Title 24, Part 2, Volume 2 of 2

California Building Standards Commission
Based on the 2009 International Building Code®
2010 California Historical Building Code, Title 24,
2010 California Existing Building Code, Title 24,

Title 24: Energy Code

- Section 112: Mandatory Req's for Space-Conditioning Equipment
- Section 116: Mandatory Req's for Fenestration Products and Exterior Doors
- Section 118: Mandatory Req's for Insulation and Roofing Products
- Section 121: Req's for Ventilation
- Section 140: Choice of Performance and Prescriptive Approaches

Structural Provisions

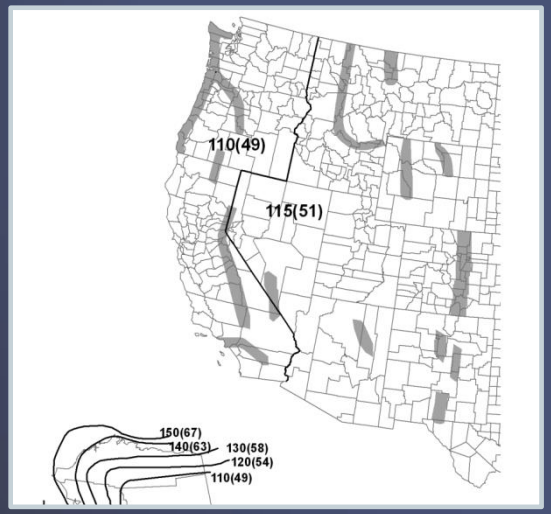
- San Francisco governed by 2010 California Building Code
  - Code provisions for design in LFRD, ASD, empirical design, and conventional construction methods.
  - Restricts stiffness to limit deflections of lateral drift
    - Governed by ASCE 7
  - Deflection of concrete structural members
    - Governed by ACI 318
  - Strength design of structural steel members
    - Governed by AISC steel manual
  - Seismic load provisions
    - Governed by ASCE 7
  - Wind load and story drift provisions
    - Governed by ASCE 7
  - Contains various modifications to both ASCE 7 and ASTM standards

ASCE 7 Seismic Provisions

- Structural System Selection
  - Limitations for both single and dual systems in both directions
- Seismic Load Effects
  - Horizontal and Vertical seismic load effects
  - Seismic load combinations and overstrength factor effects
- Structural Modeling Criteria
  - Support conditions for various scenarios
  - Stiffness and deformation limitations
- Drift and Deformation Limitations
  - Story drift limited by risk category and story height
- Foundation Design
  - Foundation requirements based on seismic design categories

ASCE 7 Wind Provisions

- Main Wind-Force Resisting System (MWFRS)
  - Limited to either Directional Procedure for buildings of all heights or the Wind Tunnel Procedure for all buildings.
- Wind Speeds
  - Procedure uses wind speed based on a three-second gust at 33 ft above ground.
  - Taken from wind speed maps based on risk category.
  - Contains provisions for wind gusts and takes into account the approximate natural frequency of the building.



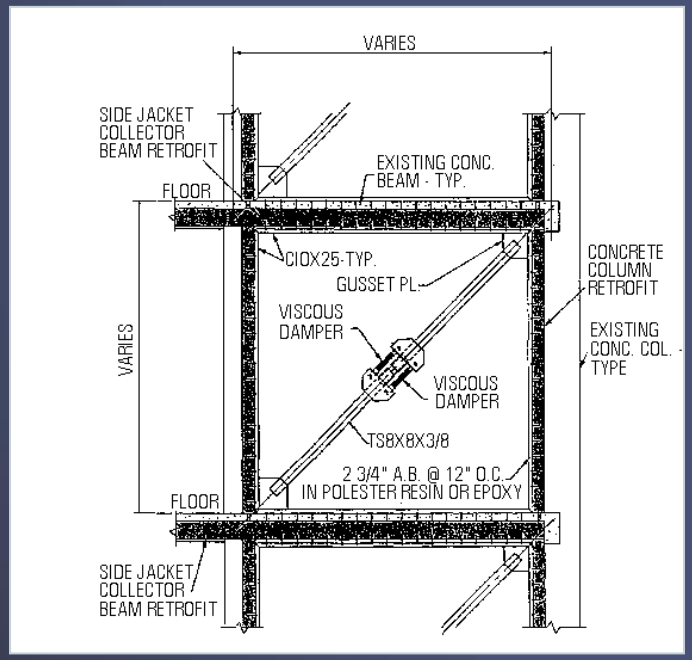
Latitude: 37.7909
Longitude: -122.3967

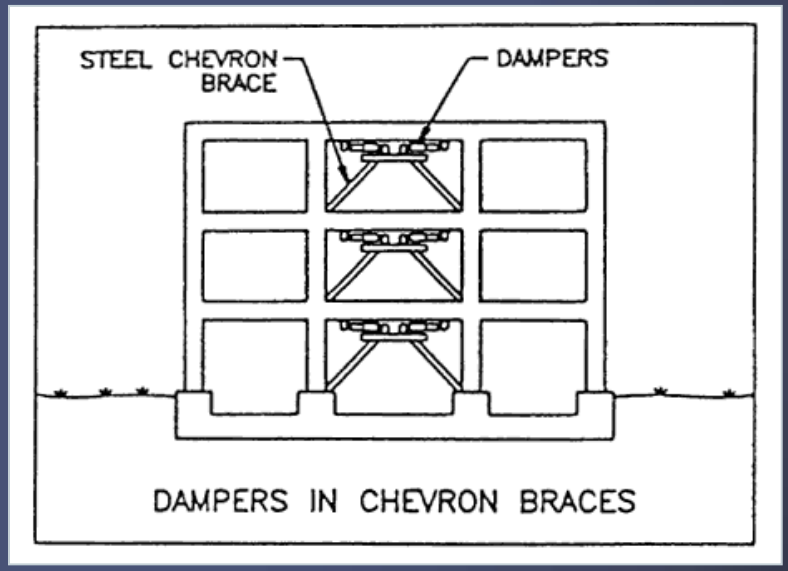
ASCE 7-10 Wind Speeds
(3-sec peak gust MPH*):

Risk Category I: 100
Risk Category II: 110
Risk Category III-IV: 115

Potential Design components

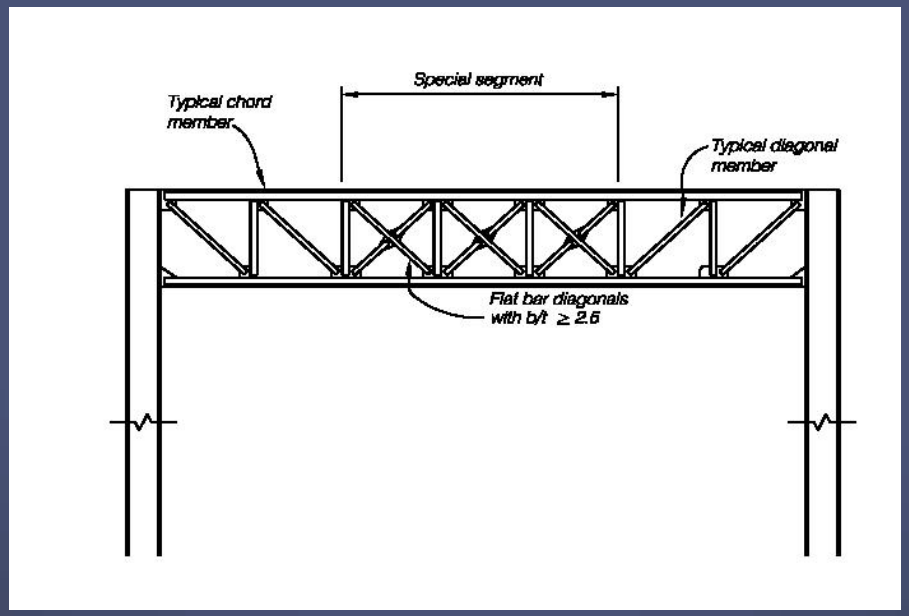
- Fluid Viscous Dampers
  - Up to 50% decrease in floor acceleration and lateral deformation
  - Different types of brace configurations
  - High lifetime cost savings, LEED Points
  - Can be modeled in ETABS or SAP





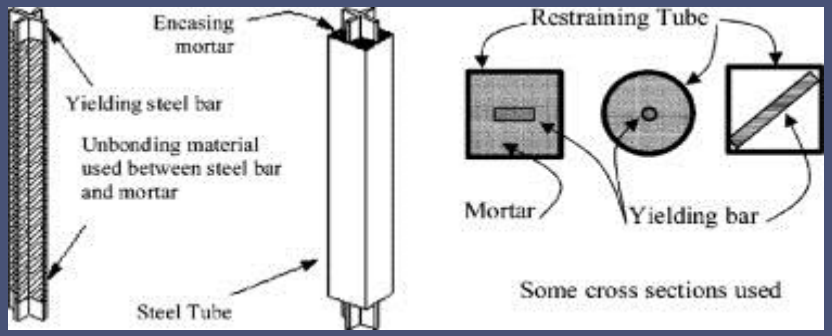
Potential Design components

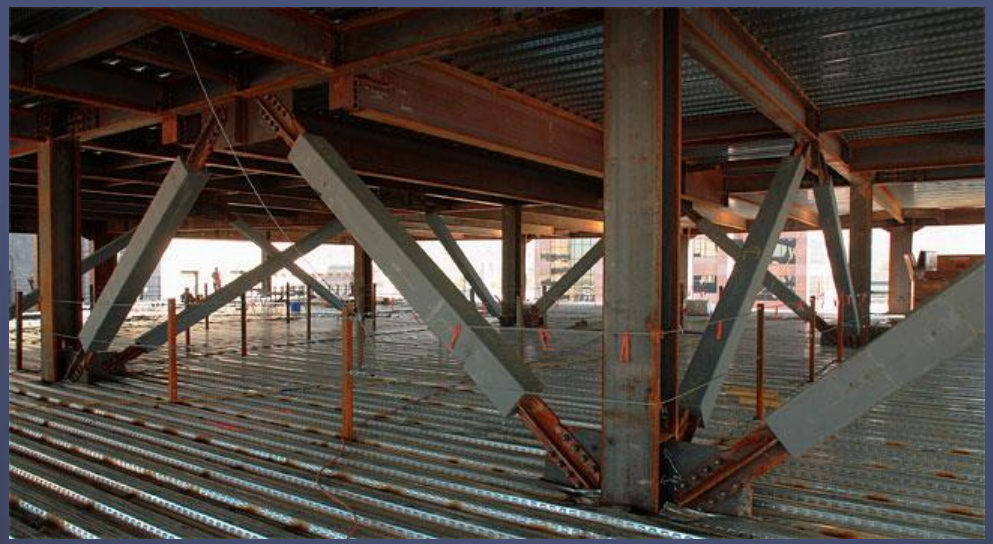
- Base Isolation Techniques
  - Isolate superstructure and foundation with elastomeric pads
- Special Truss Moment Frames
  - Special part designed to dissipate energy and isolate yielding
  - Yielded part can be easily replaced without major disruption
  - Field labor savings, reduced welding



Potential Design components

- Buckling-Restrained Braced Frames
  - Takes both axial tension and compression without buckling
  - Capacities in tension and compression are similar





Labor

- 100% Labor Unions
- Well educated work force
- 7 ½ hour work days

Modularization

- Prefabrication is not common
- Locally produced
- Coordination with traffic hours

Collaboration

Programs

Technology

Trailers

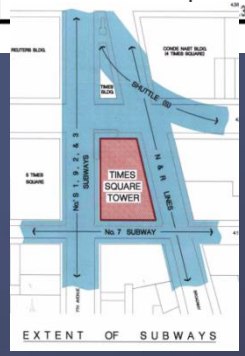
Comparison

The Tower At PNC Plaza
Pittsburgh, PA

Times Square Tower
New York, NY

PROJECT		1			5		
Bldg, floor height		9.67			12		
Building Length/Width		2.00			2.37		
Crane Model		Potain MR415			CO SN-169		
Boom Length (ft)		164			140		
Tower height (ft)		395.5			357.87		
Tower Section (ft)		10			6.5		
No of Collars		3			4		
Collar Spacing (ft)		120, 99, 96.5			82, 64, 69		
Tower height above last tie (ft)		79.5			74		
Tie:		#1	#2	#3		#3	#4
max load IN service (kips)	P1	88	84.17	71		47	39
	N2	86	61	52		25	21
	P2	62	16	14		43	35
max load OUT service (kips)	P1	136.19	152.79	112		114	81
	N2	135	111	81		47	34
	P2	110	41	30		111	79
Base Moment (ft.k)		7160			0		
Base Shear (k)		58.5			19		
Axial Load (k)		355			248		
Attached To		slab conc. 4000 psi			steel frame		
Floor Reinforcement		(C)EOR			(C)EOR		
Engineer Approval		(C)EOR			(C)EOR		
Notes					efore winds of 60 mph.		
				pre-hurricane.			
IN Service Wind (mph)		30	45	35	30		30
OUT of Service Wind (mph)		94	94		3		60, 75

Table 1. Crane and Tie Load Data



Questions?