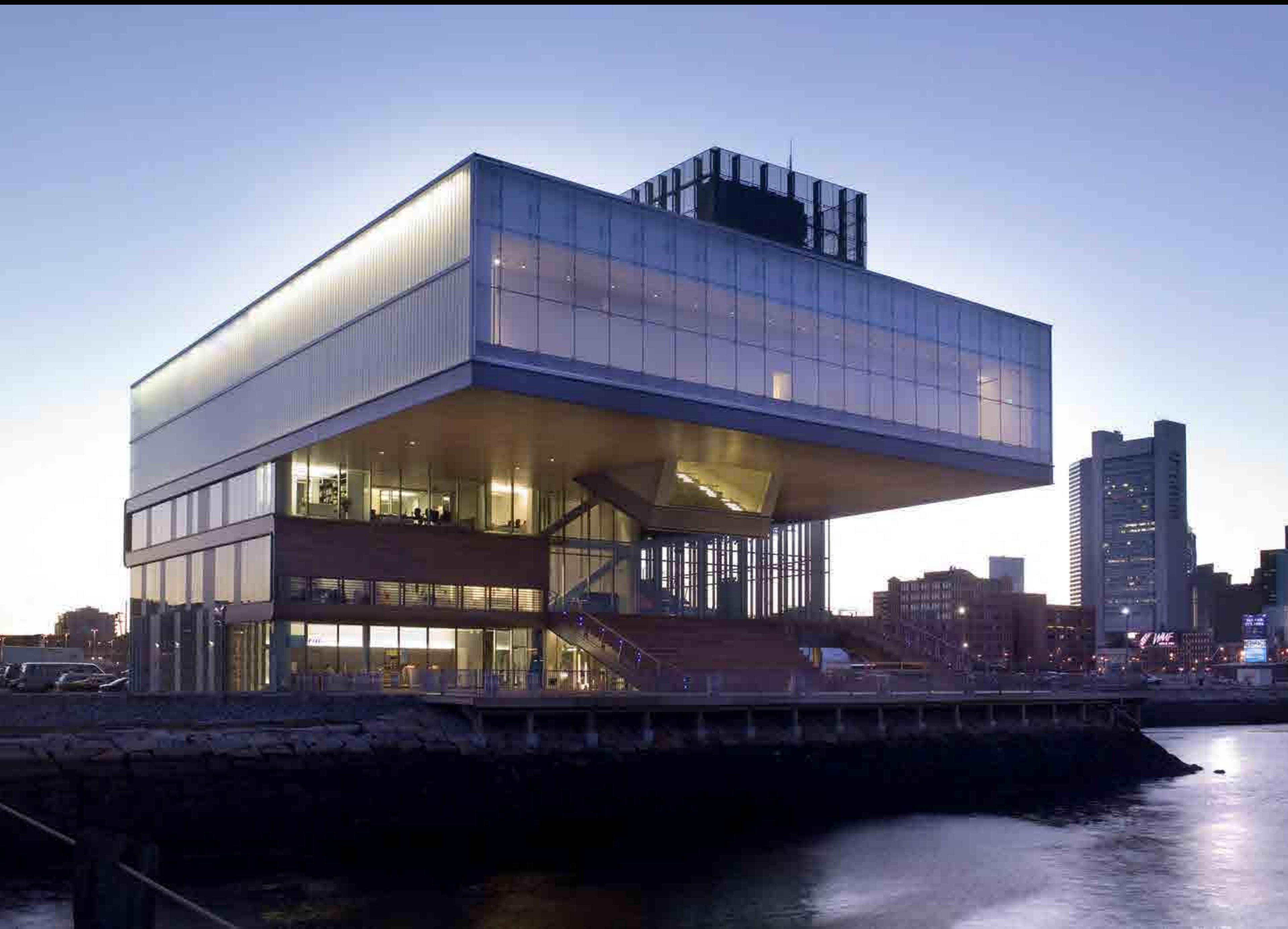


INSTITUTE OF CONTEMPORARY ART



nathan brandt + kendall clarke + cyndee moody + briana strickland

BACKGROUND

- typology: museum
- architect: diller scofidio + renfro (ds+r)
- structural engineer: new york city office of arup
- location: boston, massachusetts
- completion date: 2006
- area: 65,000 sf



THE ARCHITECTS

- elizabeth diller, ricardo scofidio, and charles renfro
- founded in 1979
- integrates architecture, the visual arts, and the performing arts
- perry dean rogers acted as associate architect



THE SITE

- located on harbor walk, a 47-mile long public walkway
- Pritzker family donated .75-acre site for civic use
- largest private development on south boston waterfront



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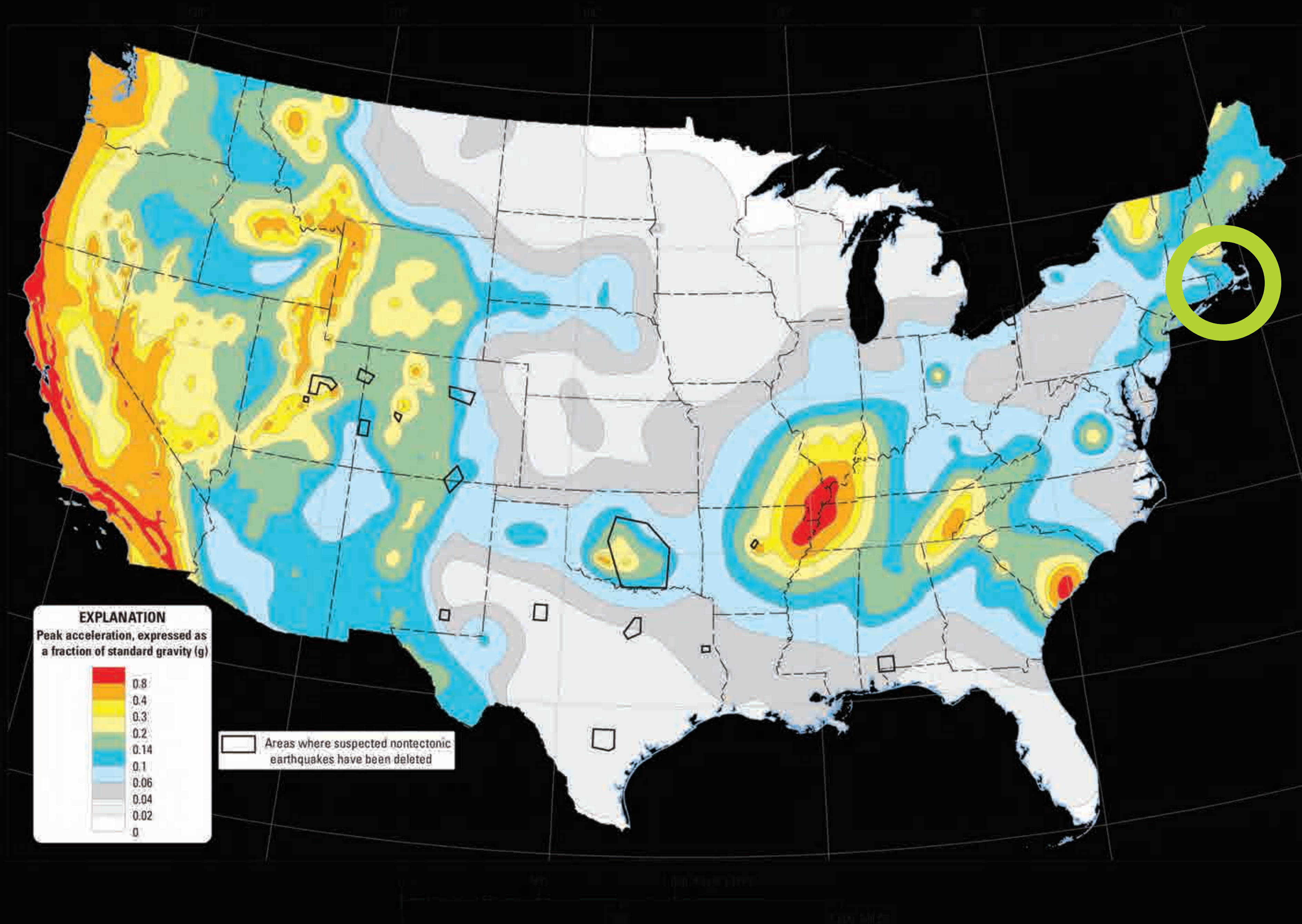


THE SITE



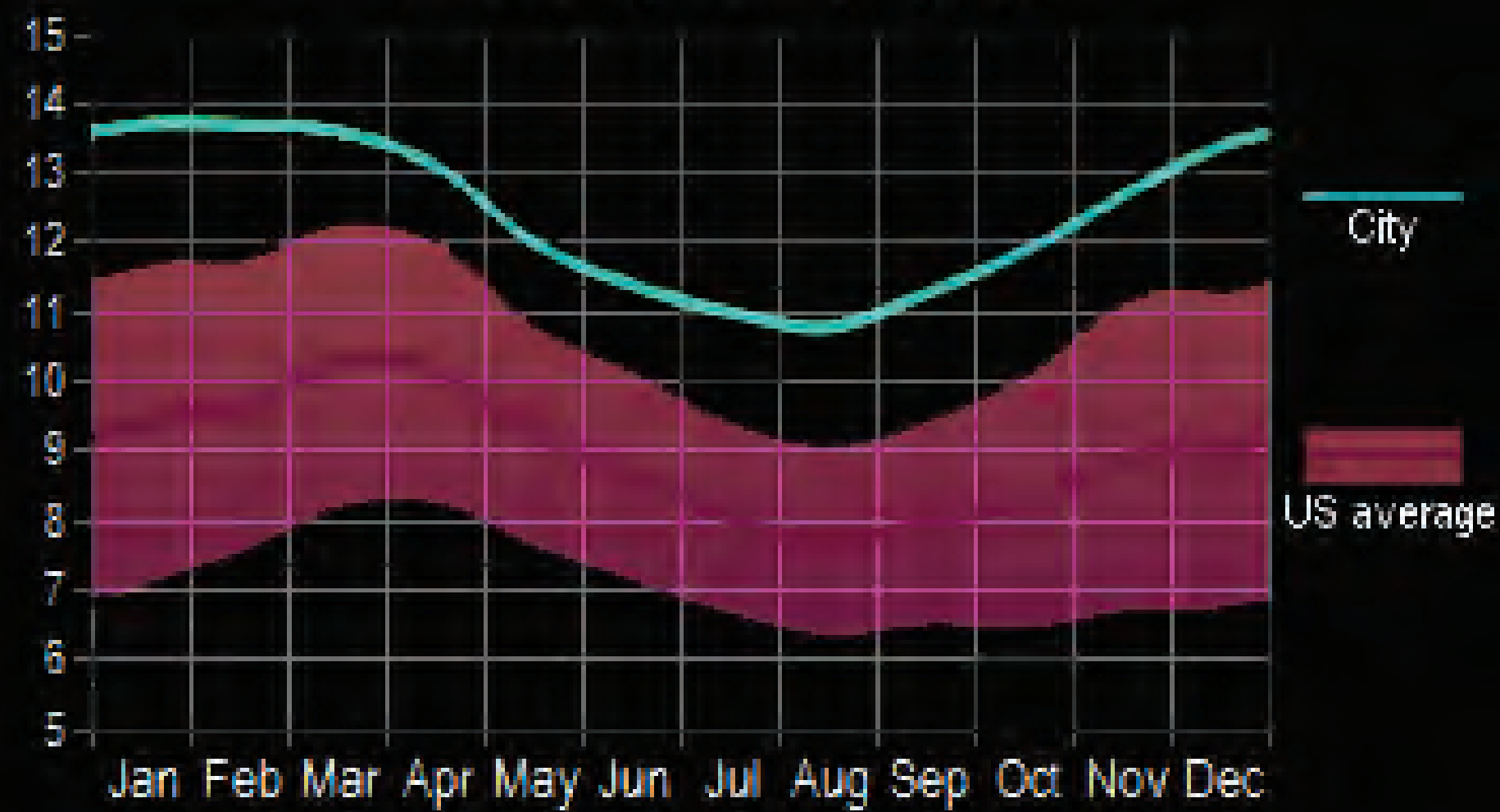
THE SITE

■ peak ground acceleration map - 2014

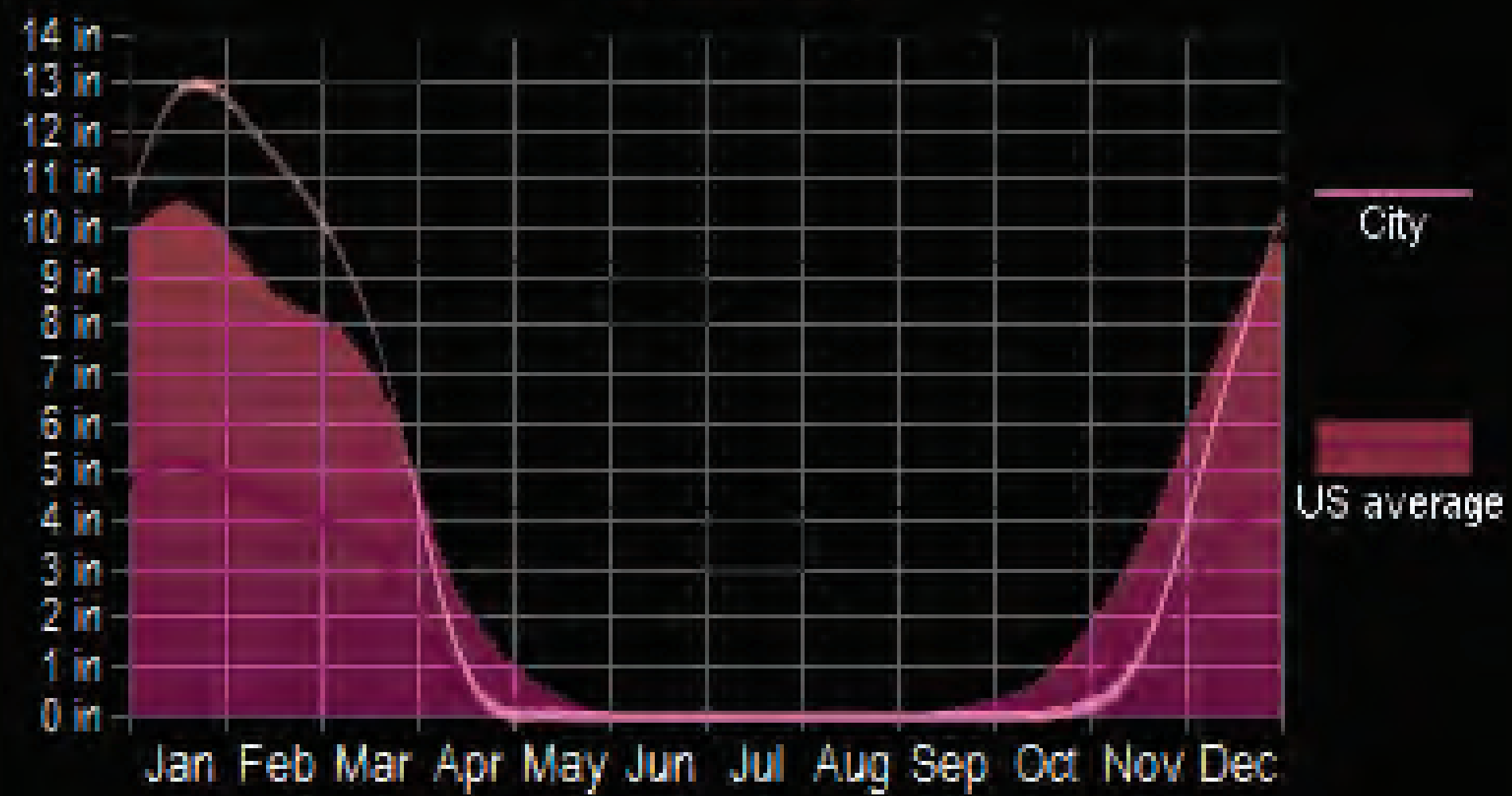


THE SITE

Wind Speed (mph)

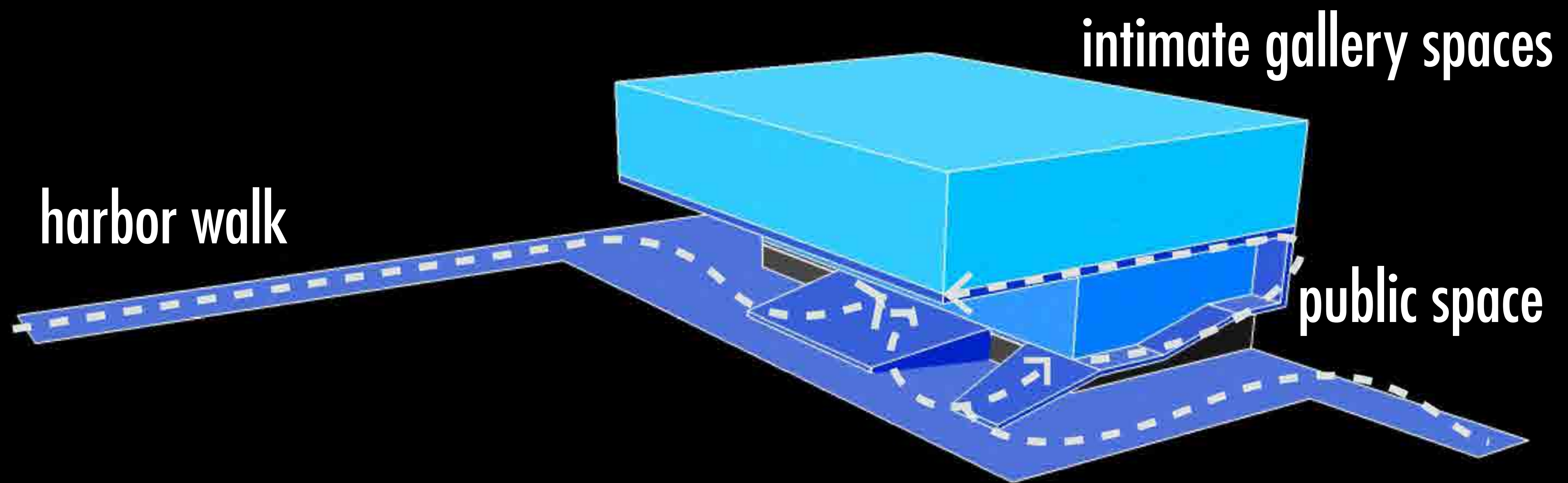


Snowfall

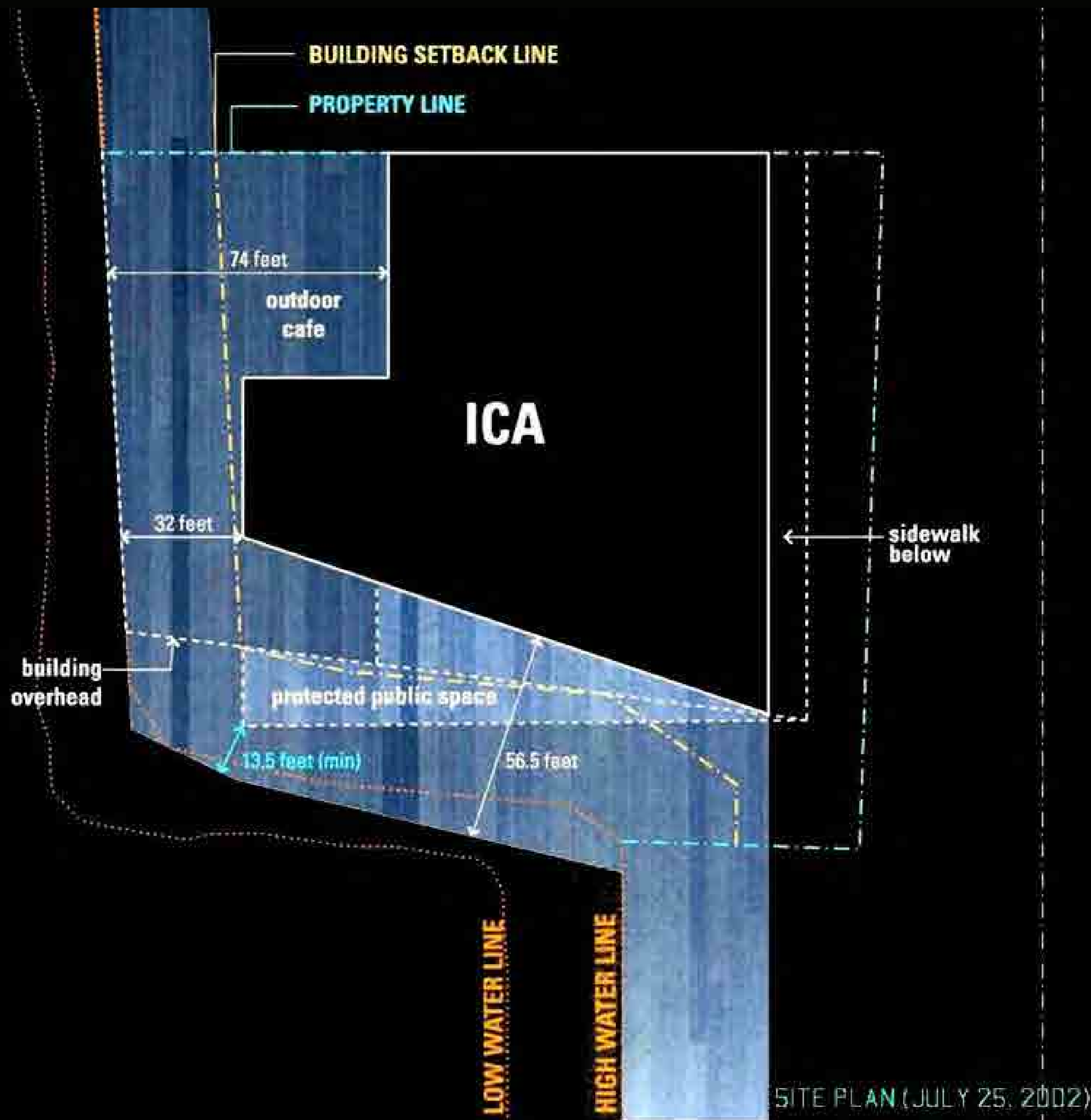


DESIGN CONCEPT

- harbor walk seen as civic surface
- extends up to form public space and wraps around the theater
- waterfront as asset and distraction

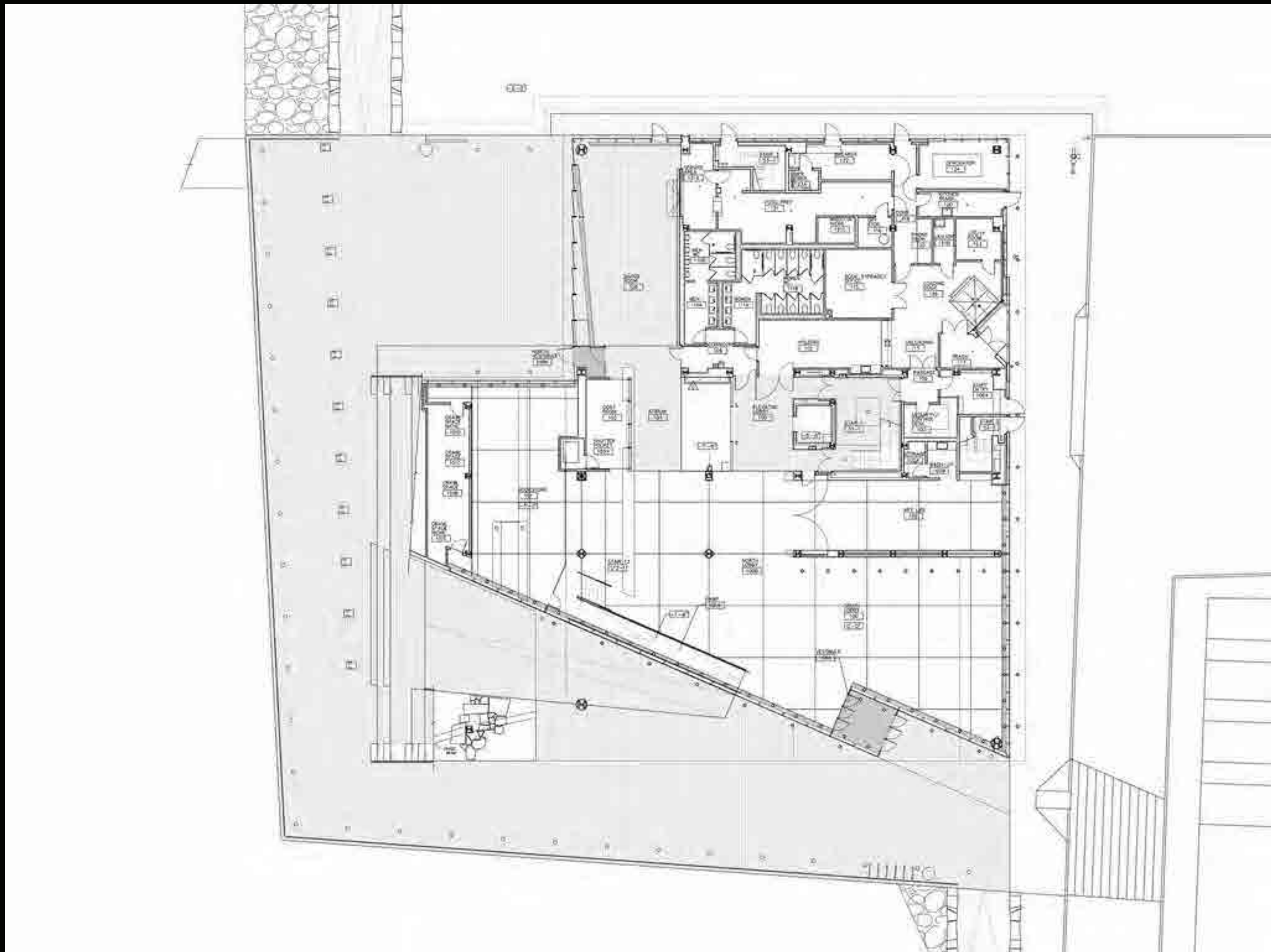


DESIGN CONCEPT



DESIGN CONCEPT

- ground level floor plan
- lobby, bookstore, dining, food prep, loading zone, art lab

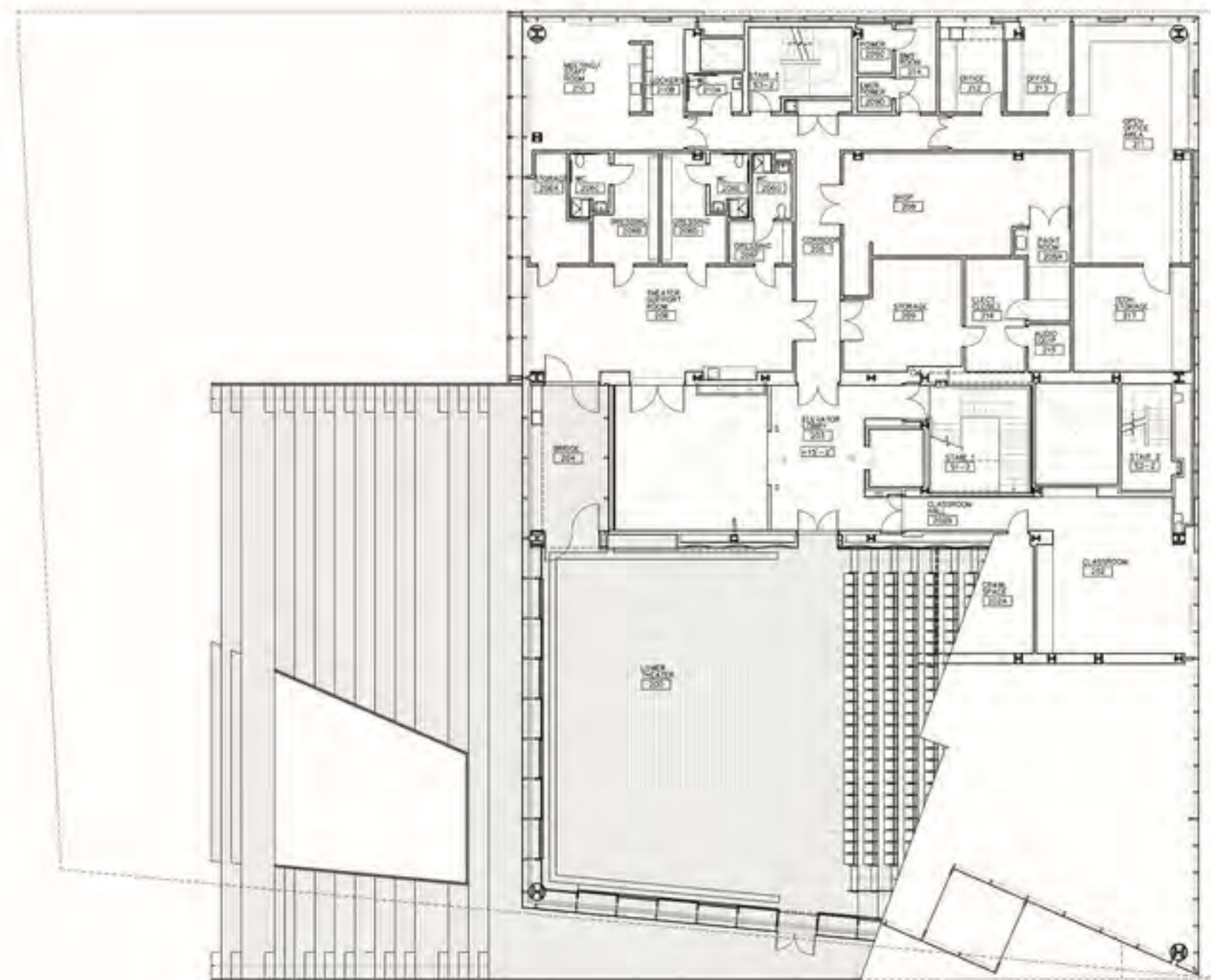


DESIGN CONCEPT



DESIGN CONCEPT

- second level floor plan
- theater, theater support, offices, classrooms

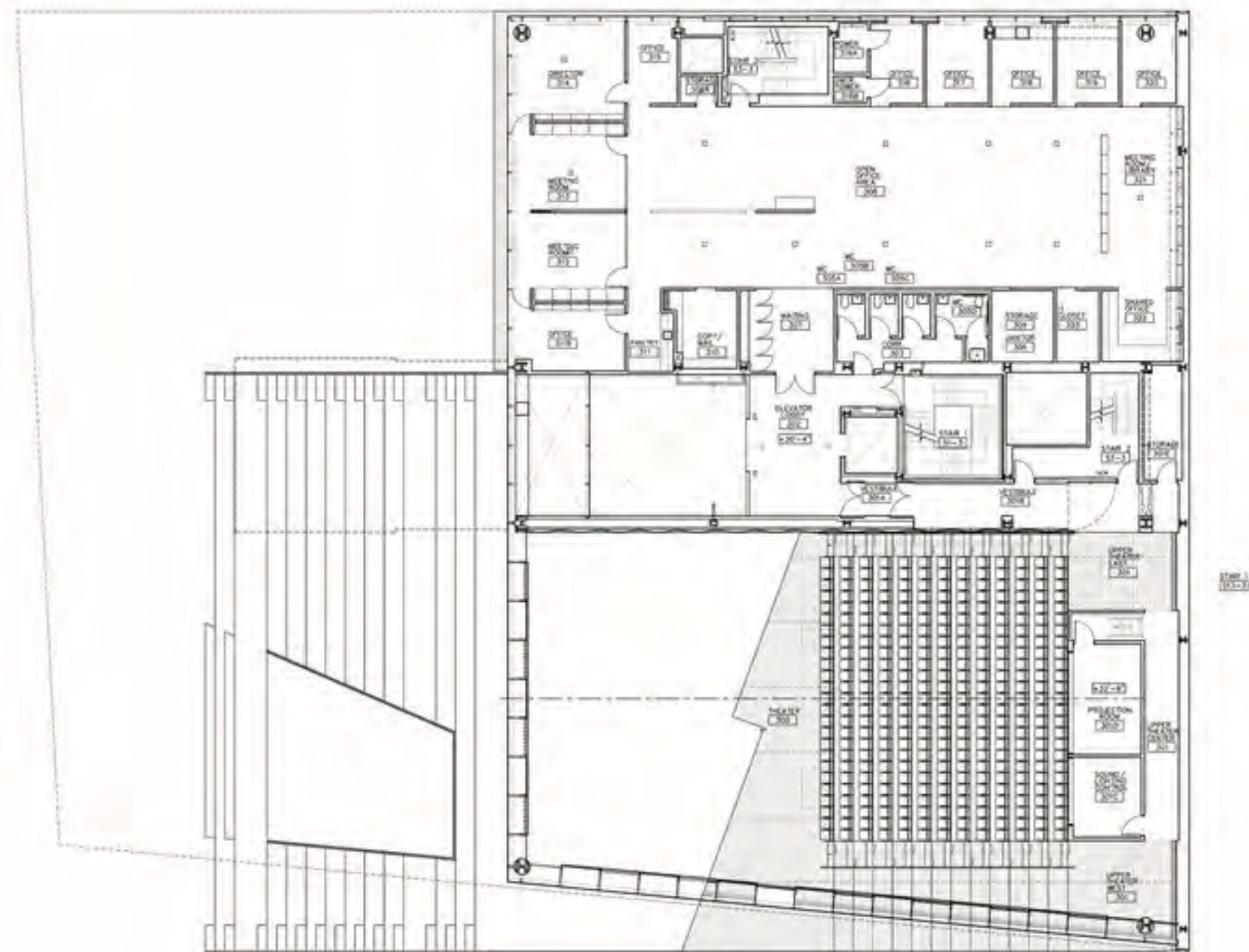


DESIGN CONCEPT



DESIGN CONCEPT

- third level floor plan
- theater, offices

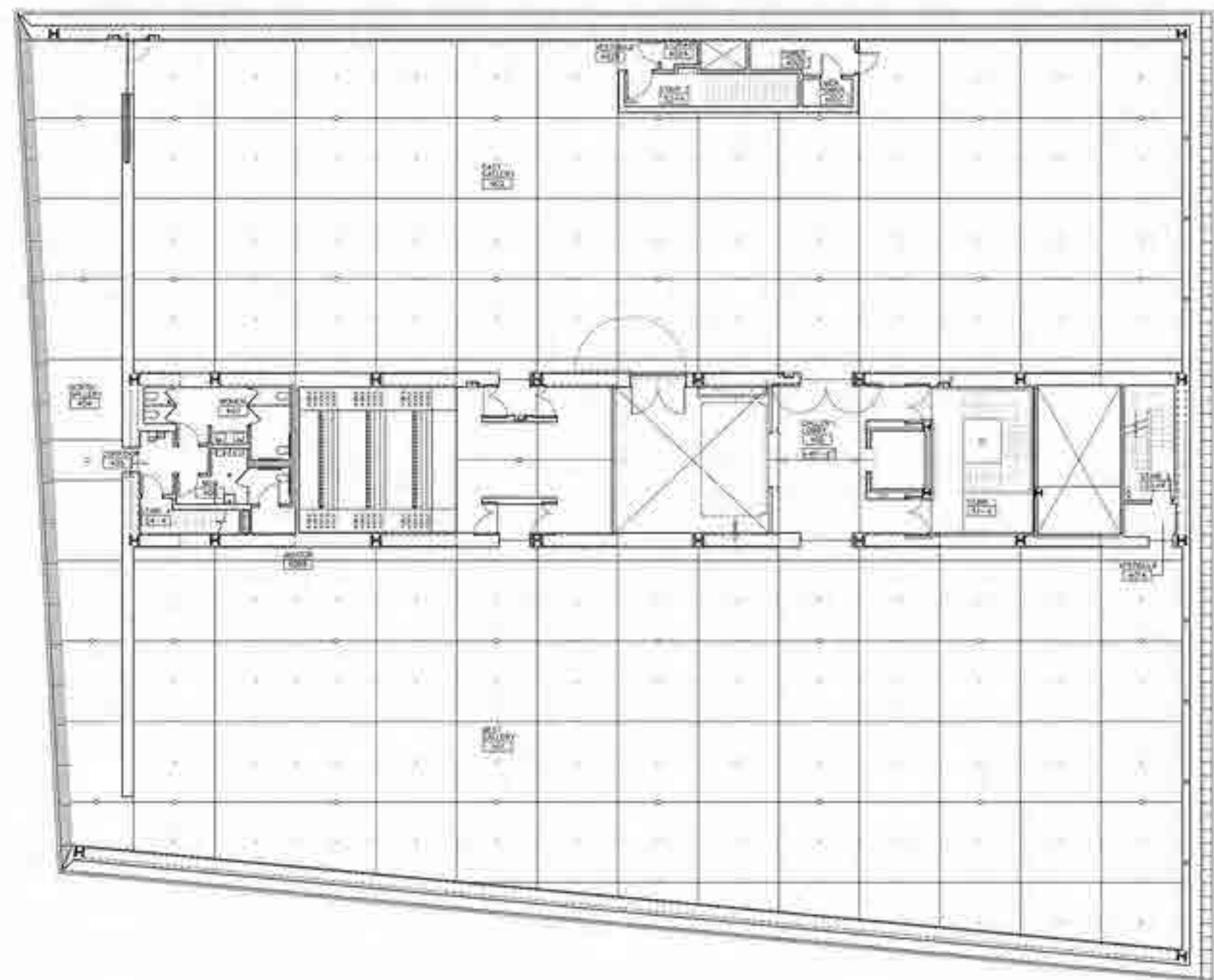


DESIGN CONCEPT



DESIGN CONCEPT

- fourth level floor plan
- galleries

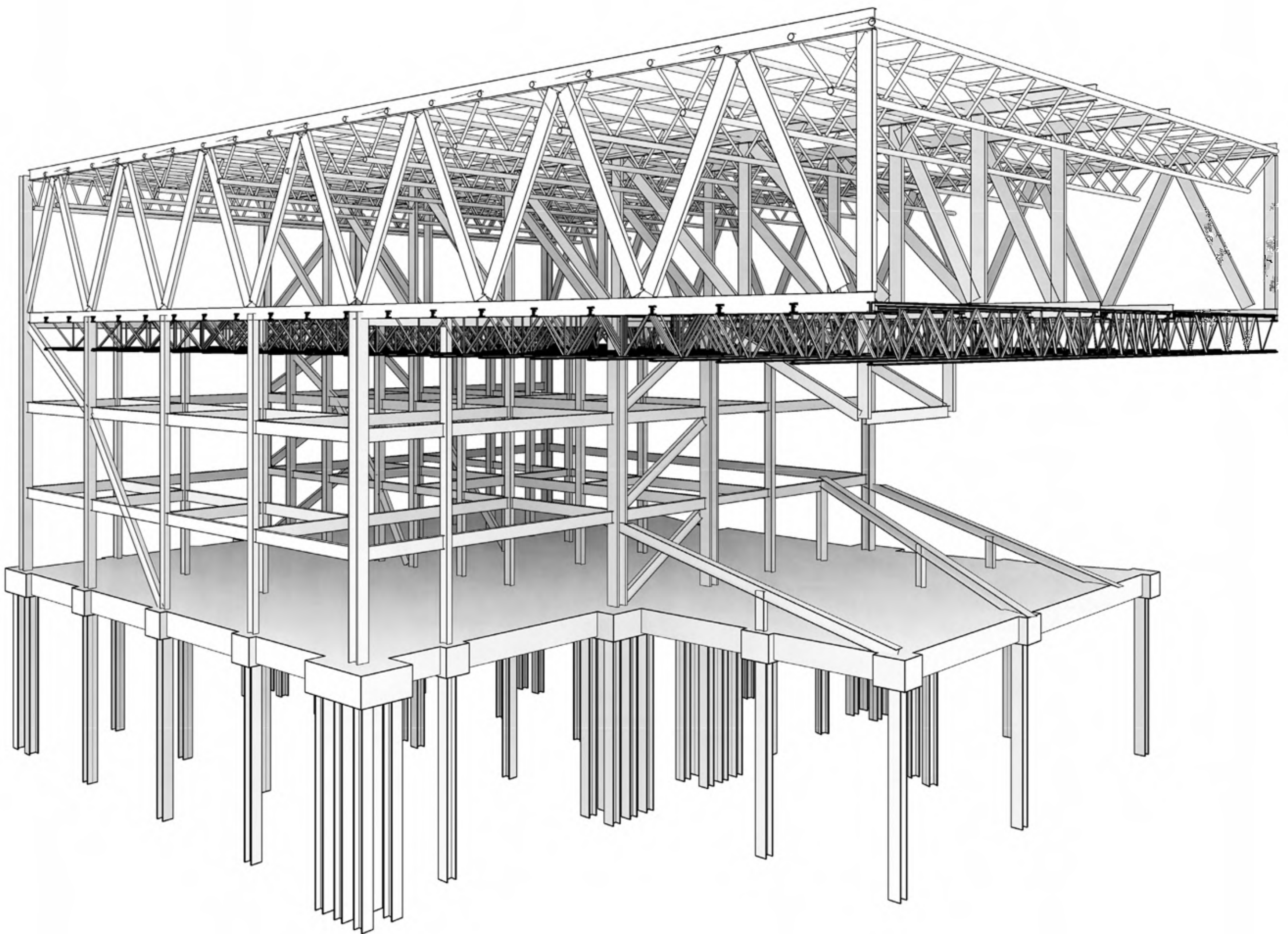


DESIGN CONCEPT



STRUCTURE structural system

- steel as structural system
- easy to transport and assemble; cantilever



STRUCTURE

inverted triangular
roof trusses

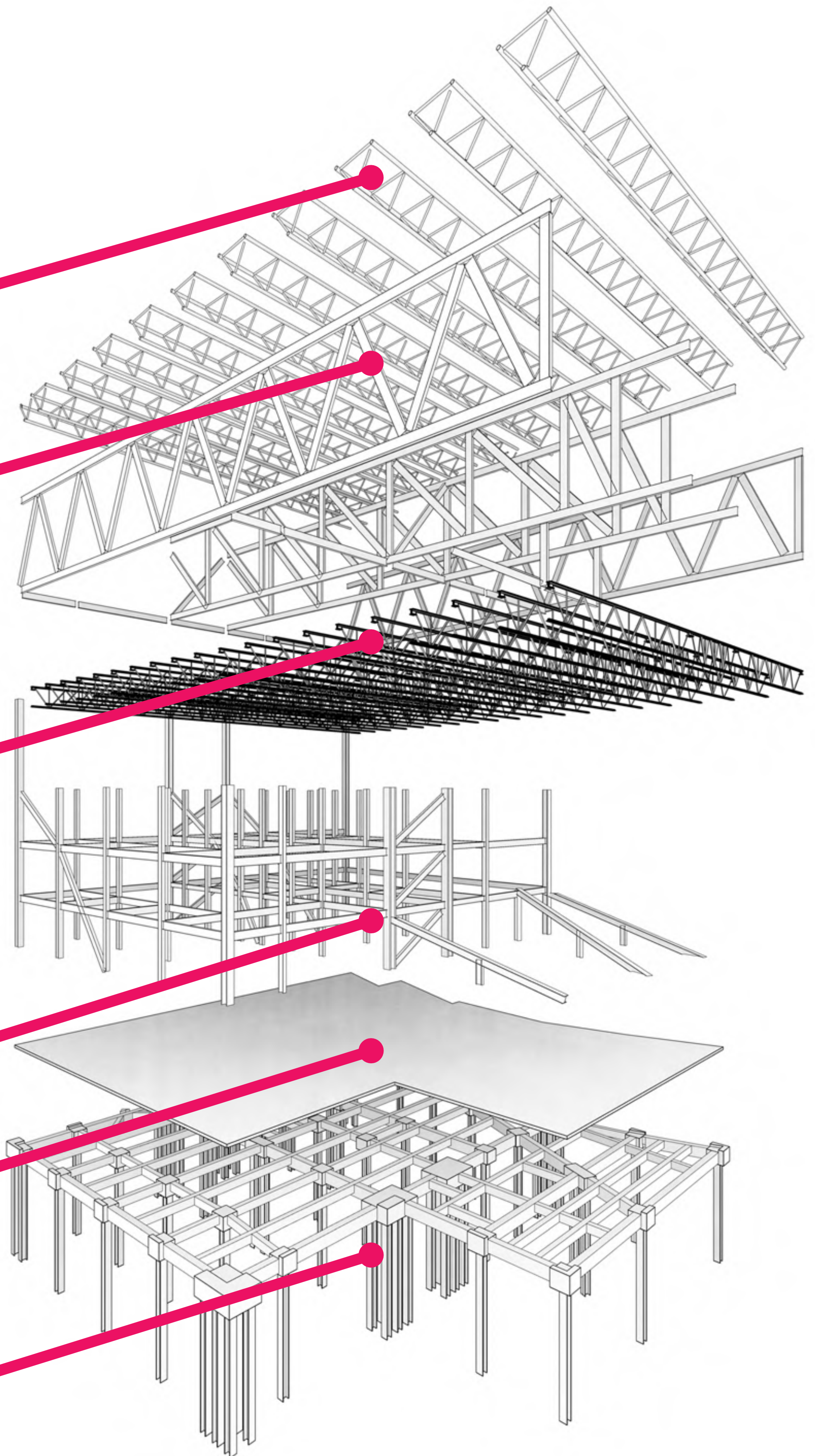
steel w section
megatrusses

gallery floor trusses;
w-tee chords, double
angle webs

steel w section beams
and columns with
lateral bracing

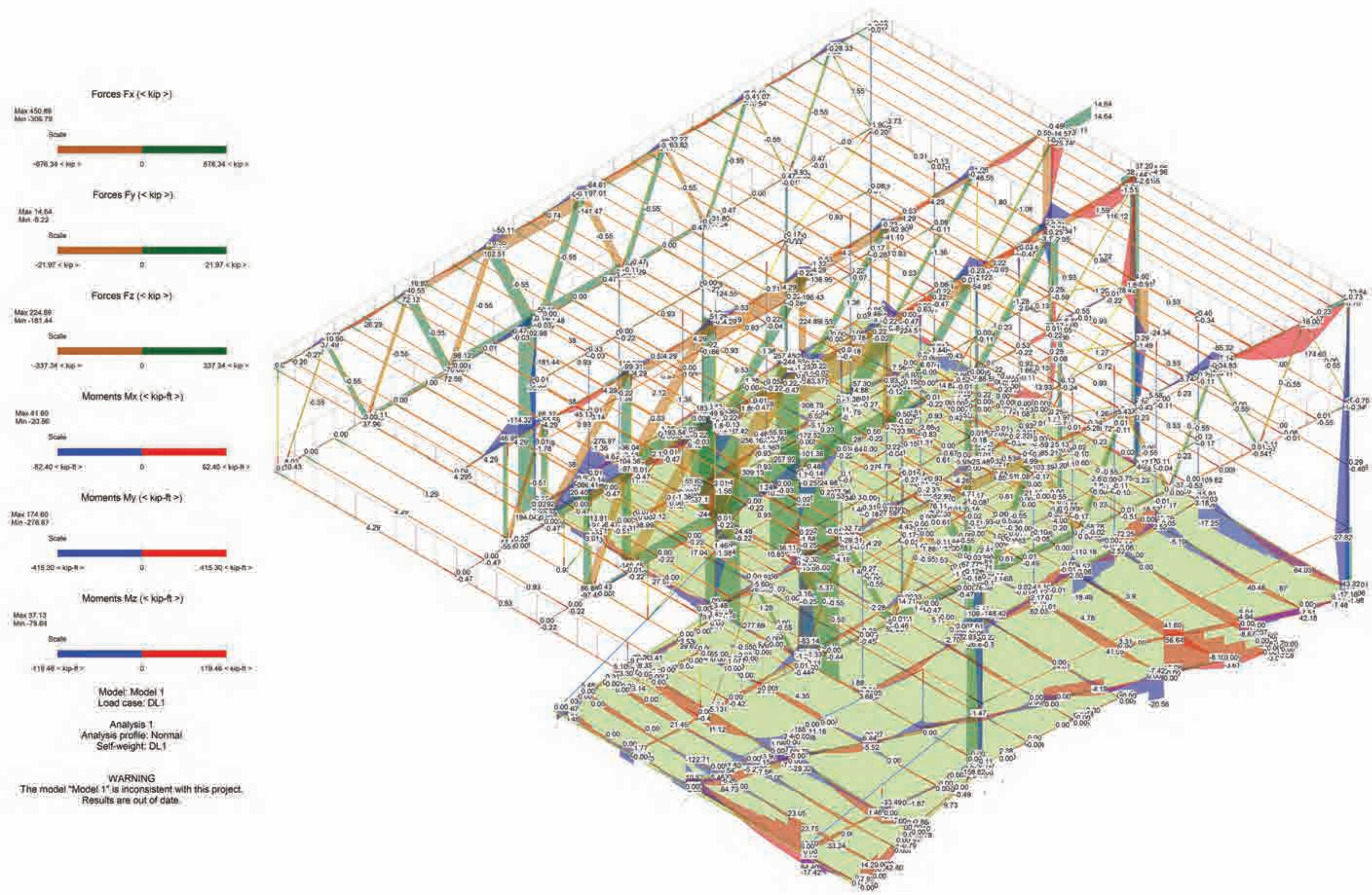
foundation slab

piles, pile caps, and
beam grillage

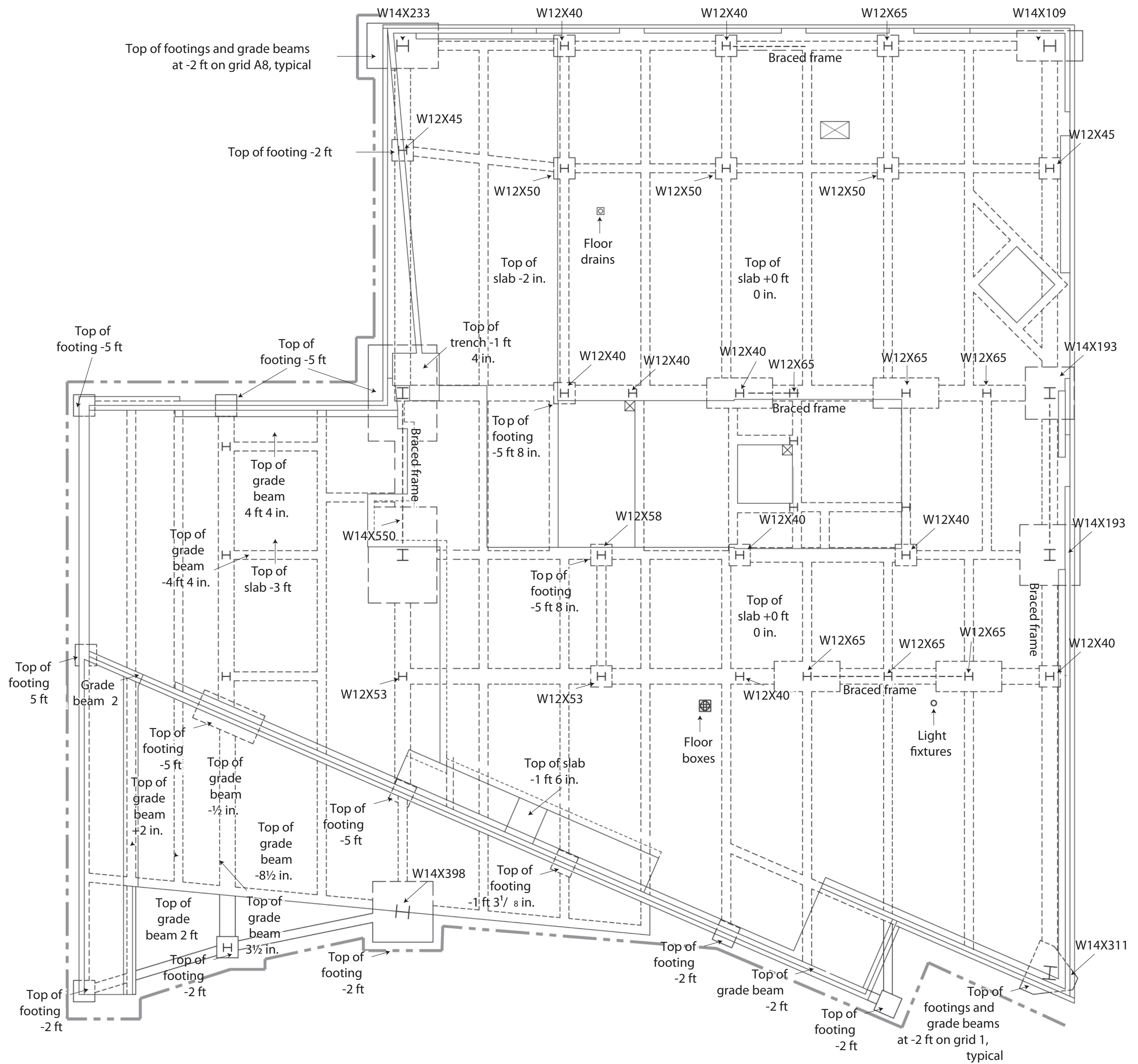


STRUCTURE revit analysis

- roof area load = 50 psf
- gallery floor area load = 100 psf
- member forces and moments

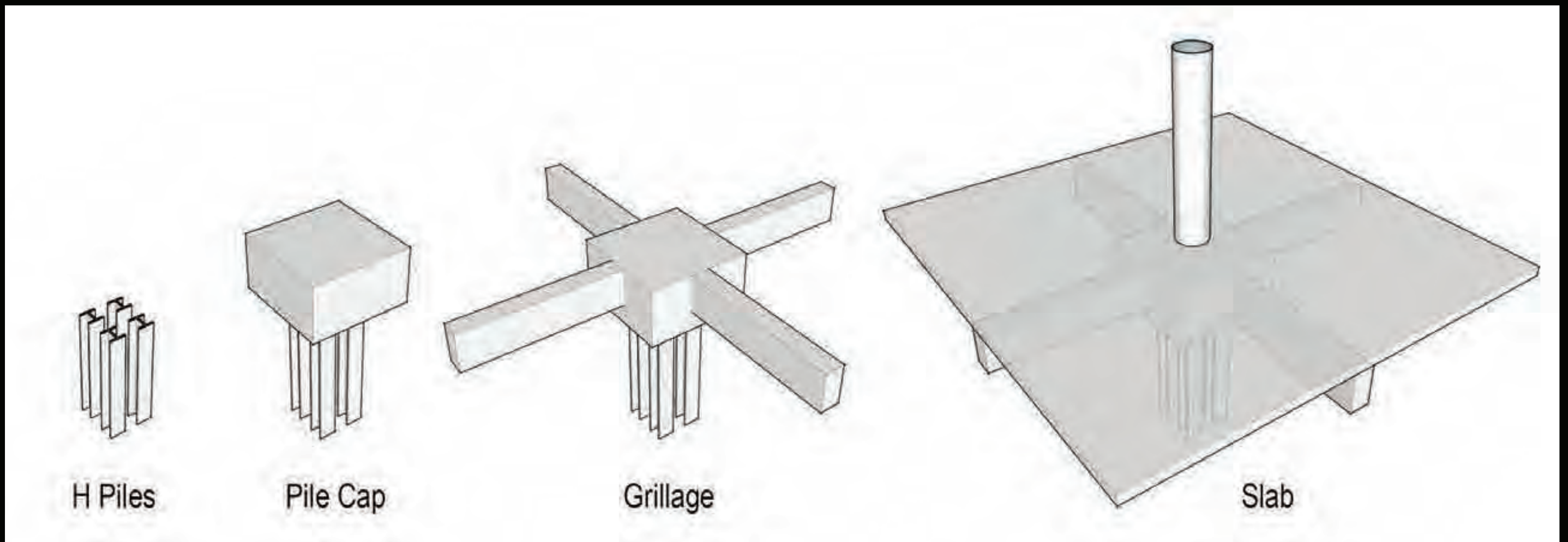


STRUCTURE foundation framing



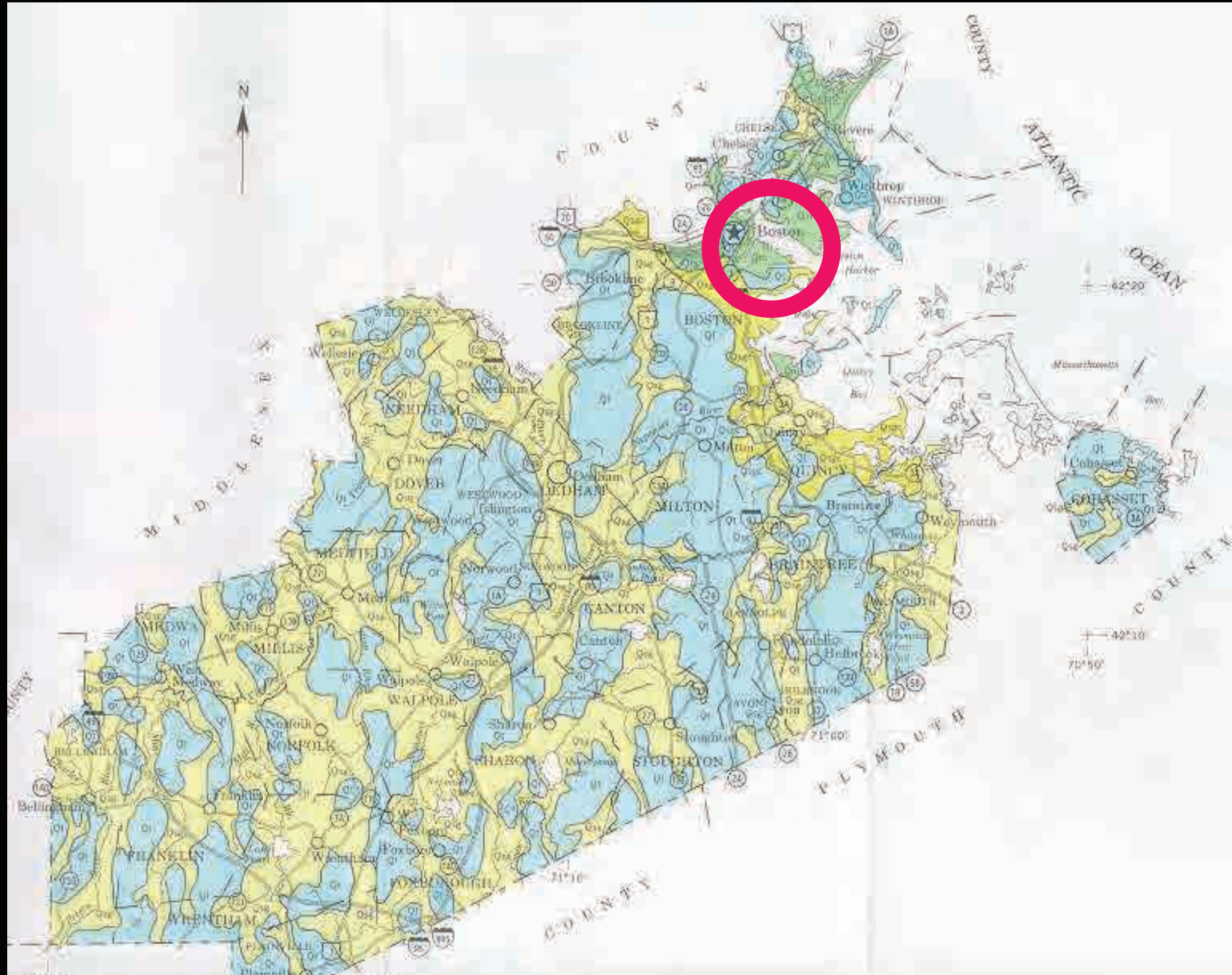
STRUCTURE foundation system

- steel H-Piles
 - H 14 x 117
 - 100 feet long
 - cathodic protection
- concrete pile caps and grillage



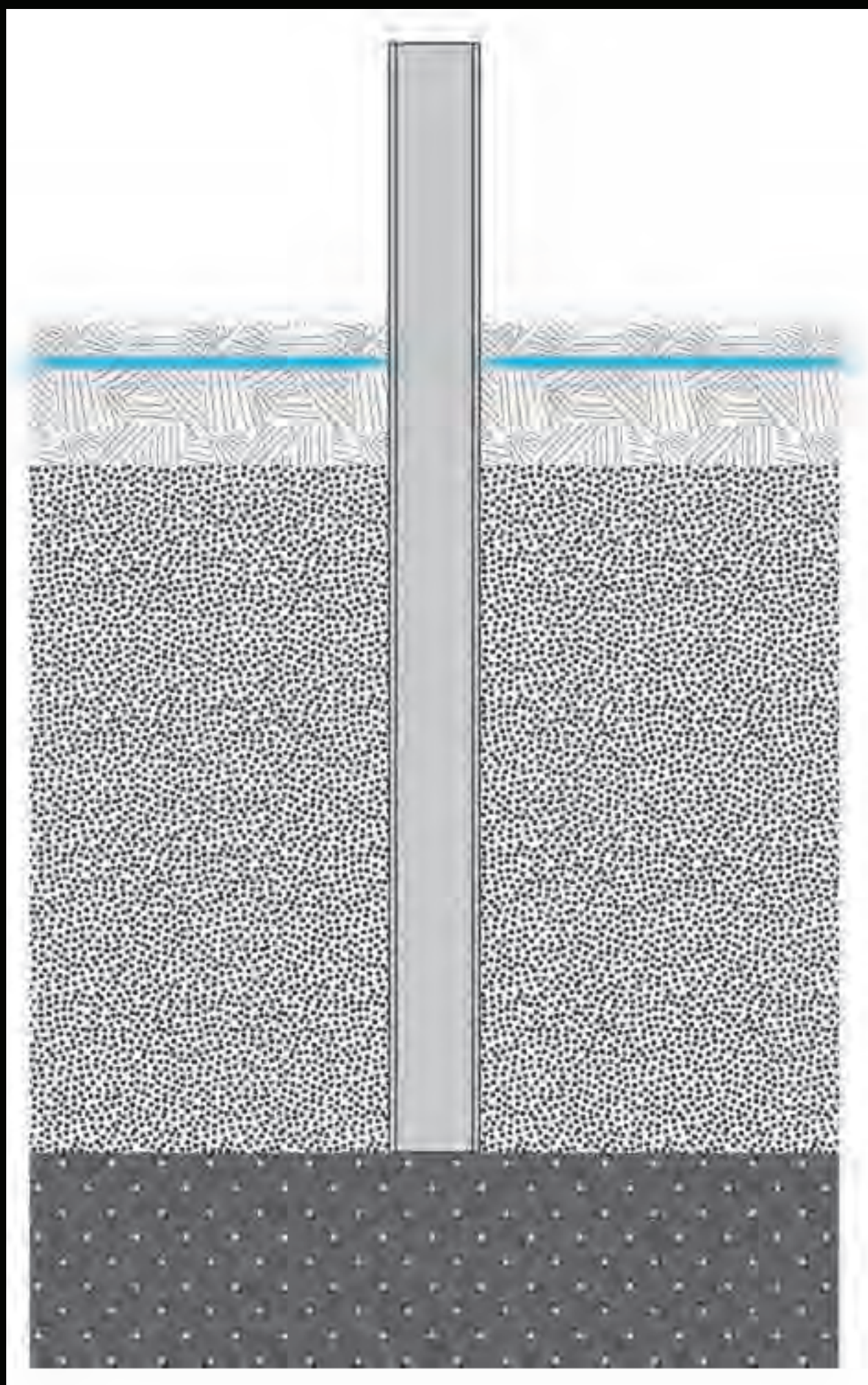
STRUCTURE soil type

- udorthents - urban land soil
 - 2-20 feet of artificial fill
 - loamy soil
 - ~10% clay
 - ~40% silt
 - ~50% sand



STRUCTURE soil type

- steel h-piles on bedrock for higher bearing capacity
- water table at 3-5 feet + frost condition
 - stability concern for design

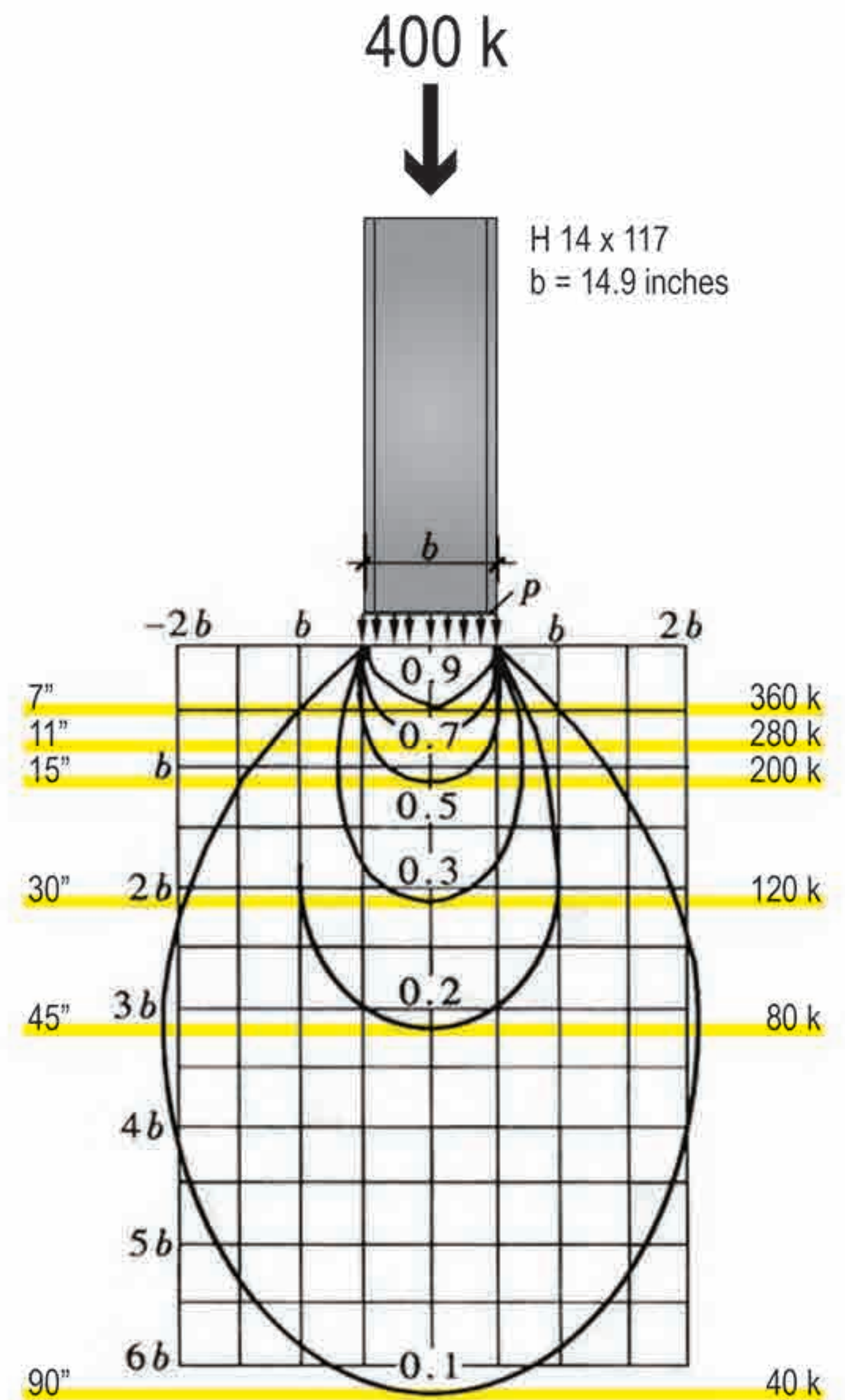
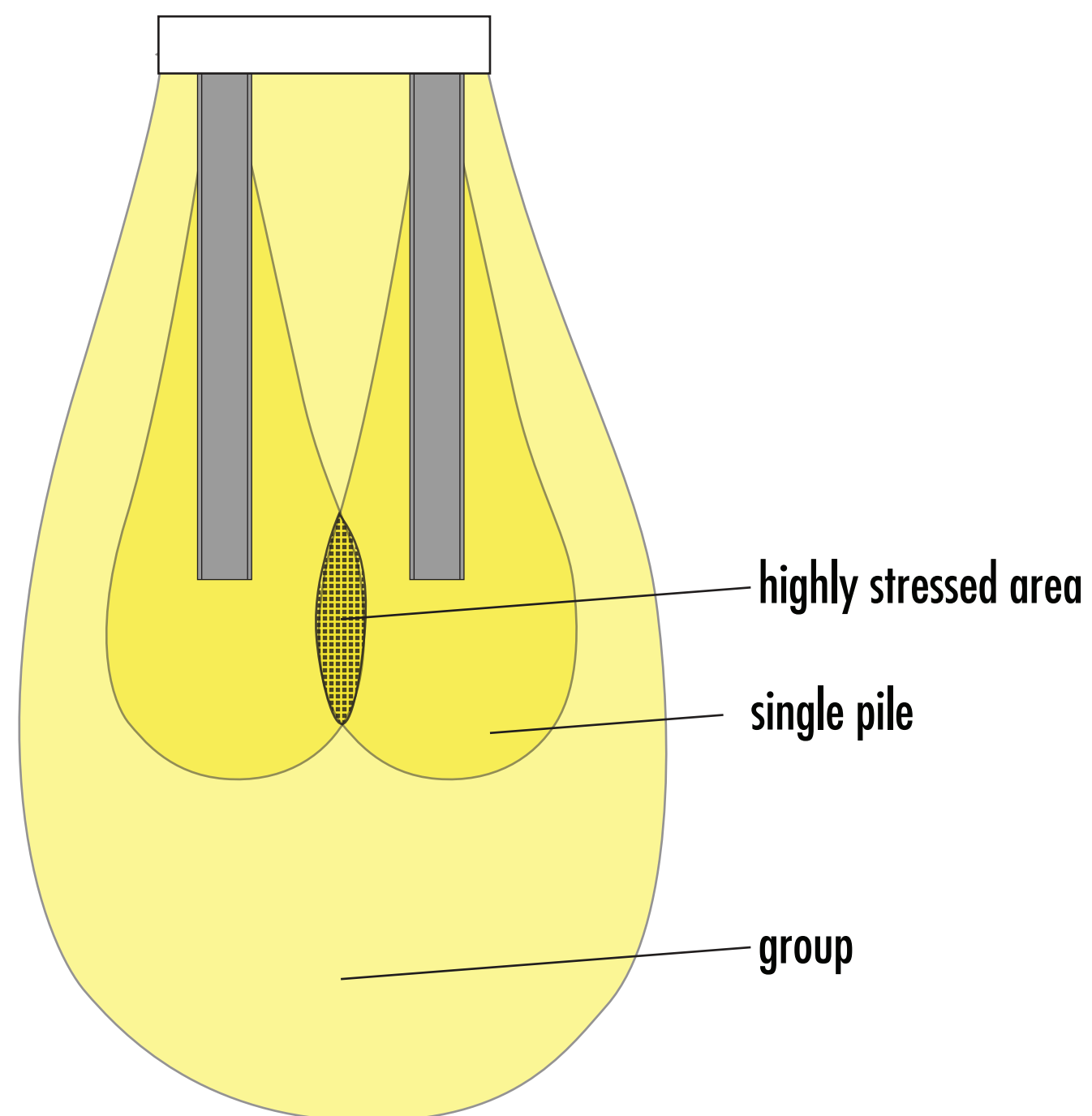


water table
artificial fill

clayey sand
vertical bearing capacity: 2,000 psf
lateral bearing pressure: 150 psf

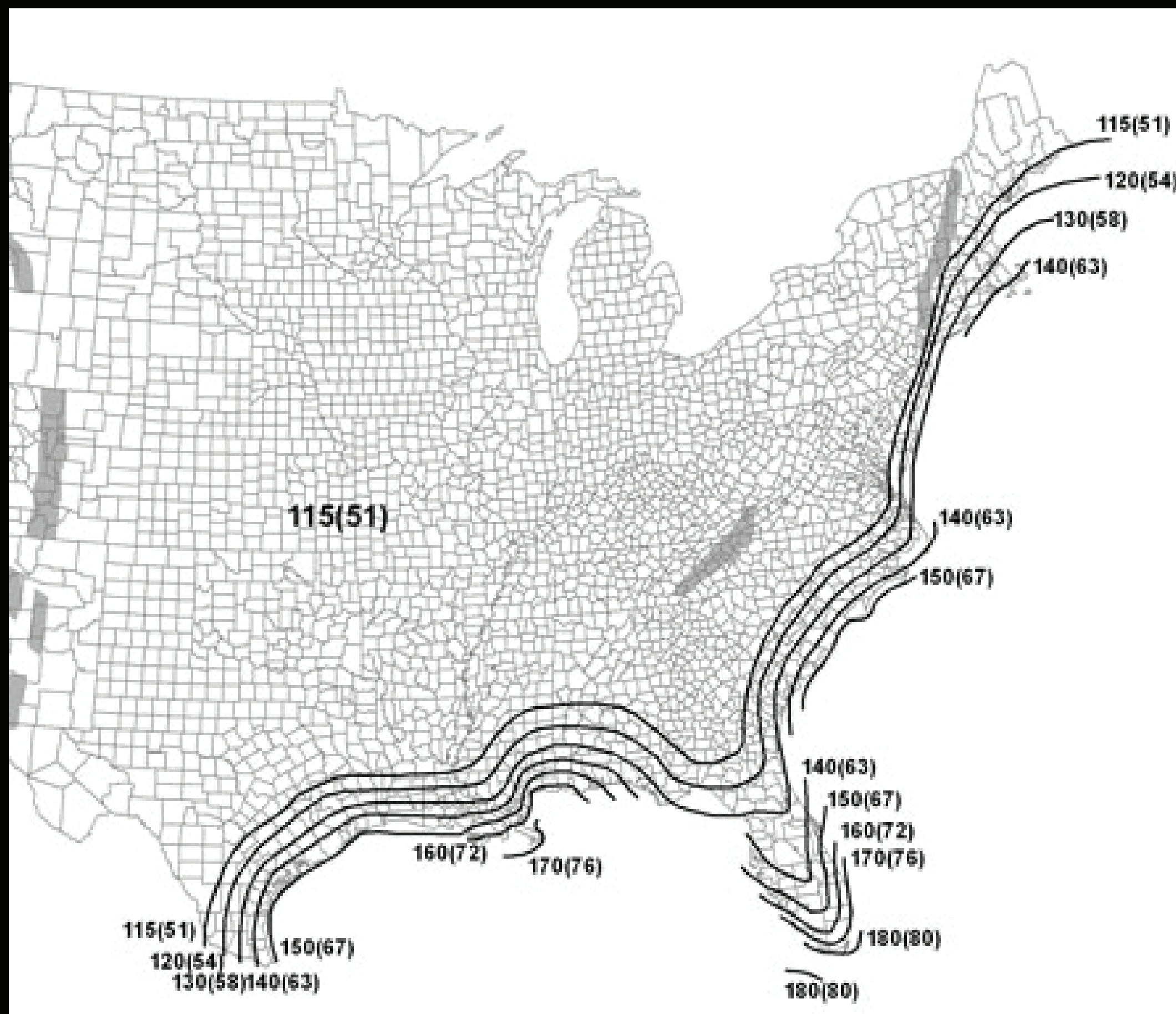
bedrock
vertical bearing capacity: 12,000 psf
lateral bearing pressure: 1,200 psf

STRUCTURE soil pressure



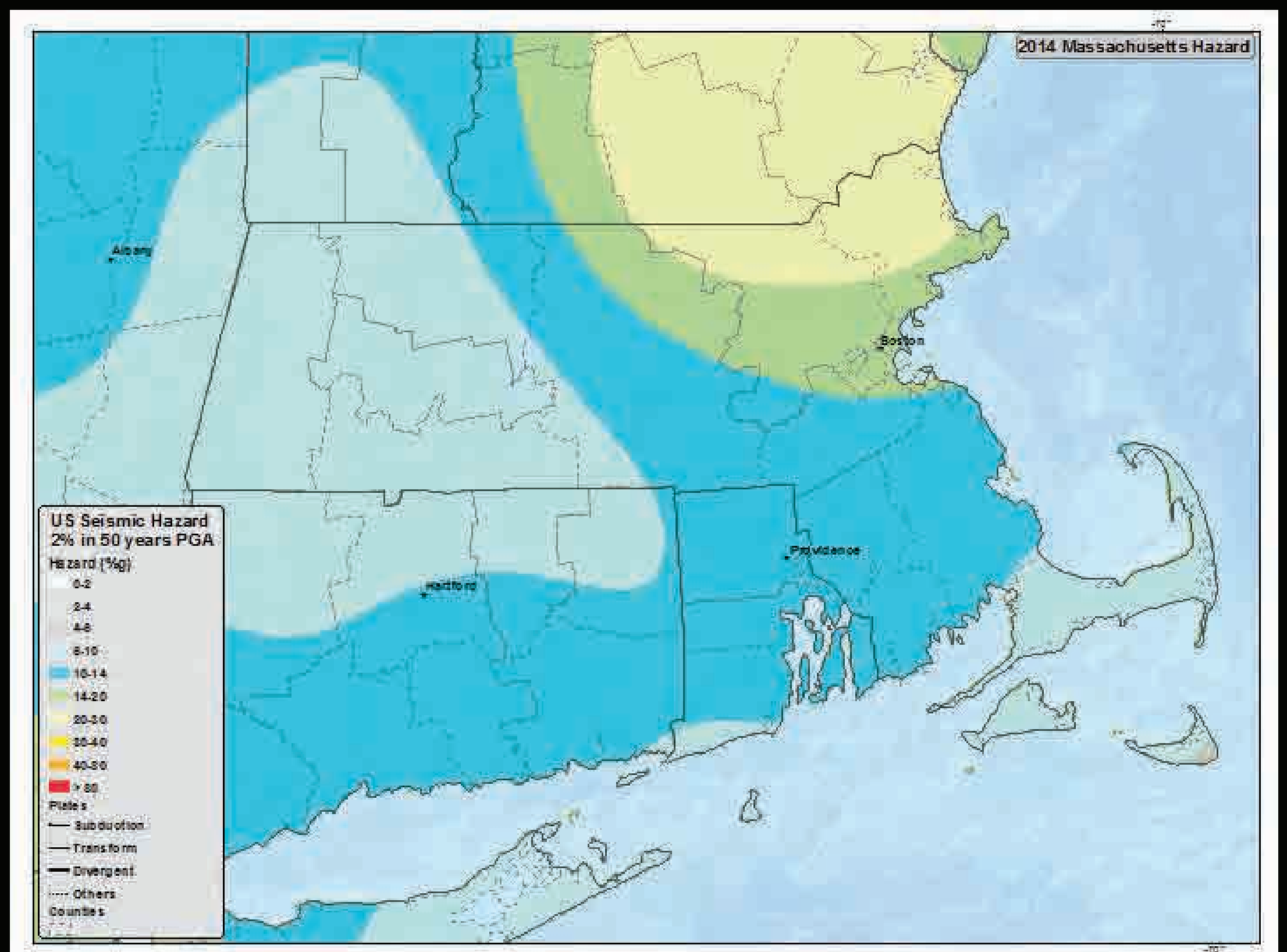
STRUCTURE wind load design

- 140 mph
 - horizontal load: 31.1 psf windward corner of building
 - vertical load: -37.3 psf windward corner of roof



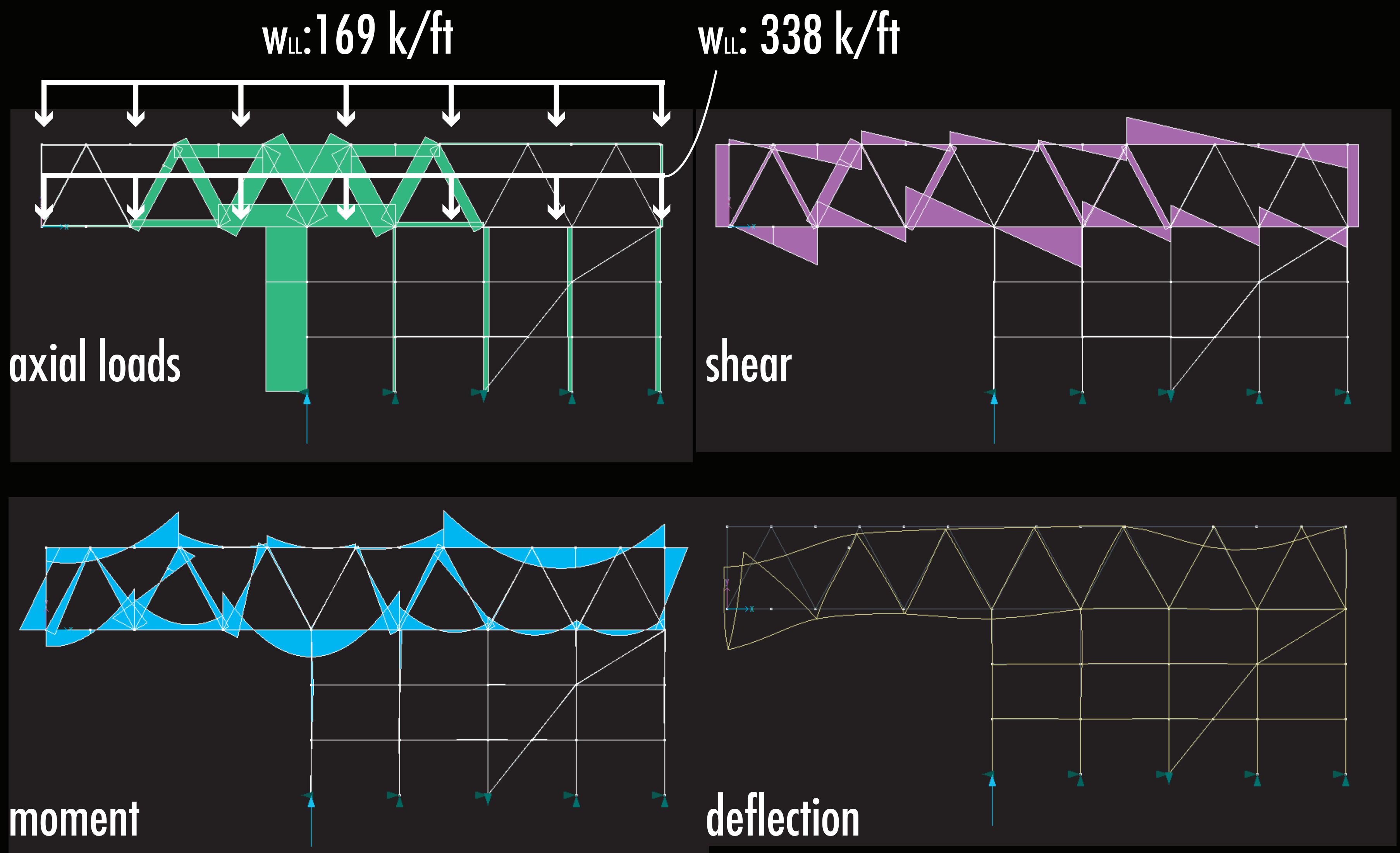
STRUCTURE seismic load design

- Zone 2A: 0.15
- Occupancy factor: 1.0
- Structure Response (R_w): 12 (moment resisting frame)



STRUCTURE multiframe analysis

- exterior bay
 - tributary area: 3,380 square feet
 - roof live load: 20 psf + roof snow load: 30 psf
 - floor live load: 100 psf

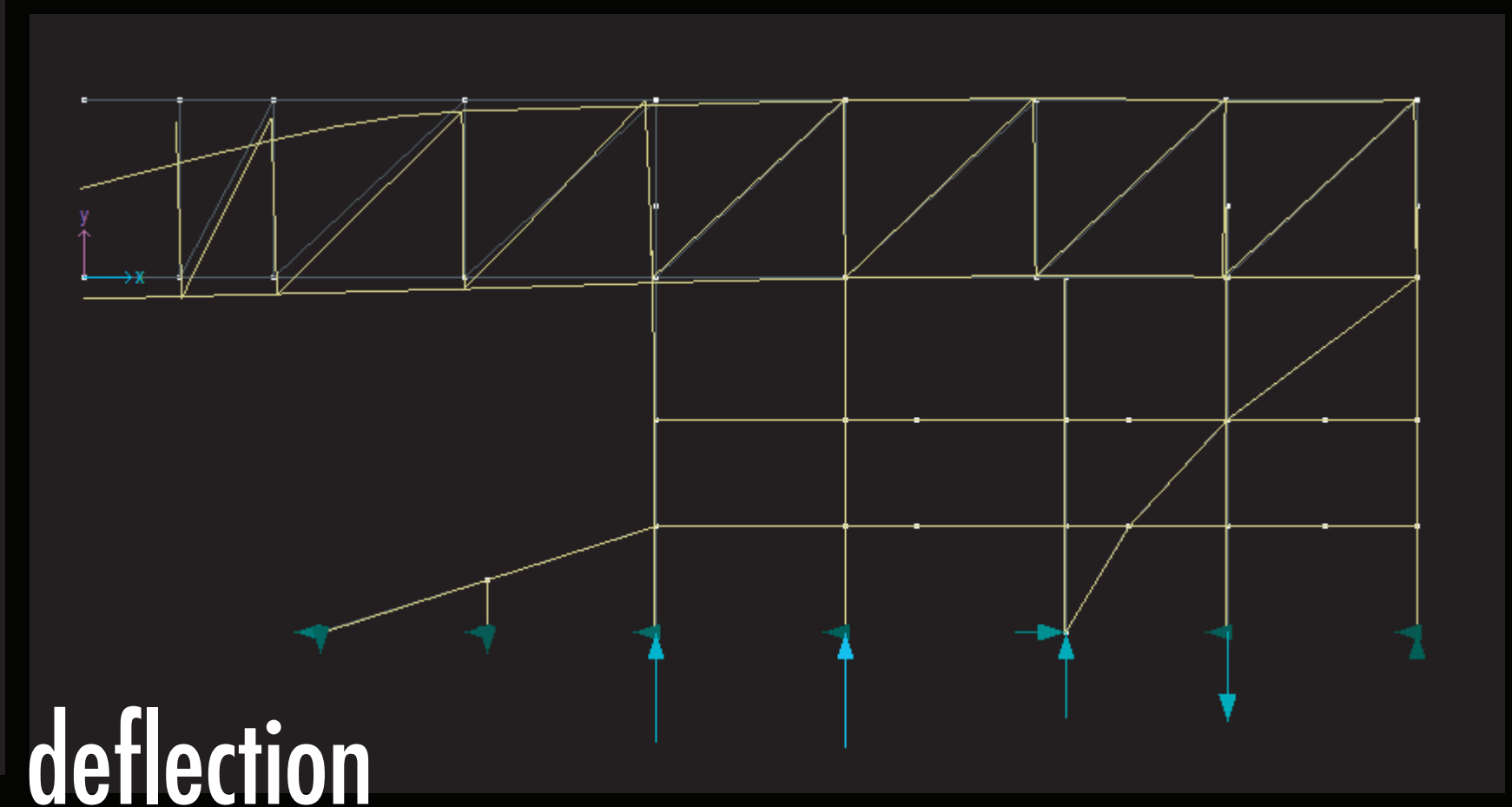
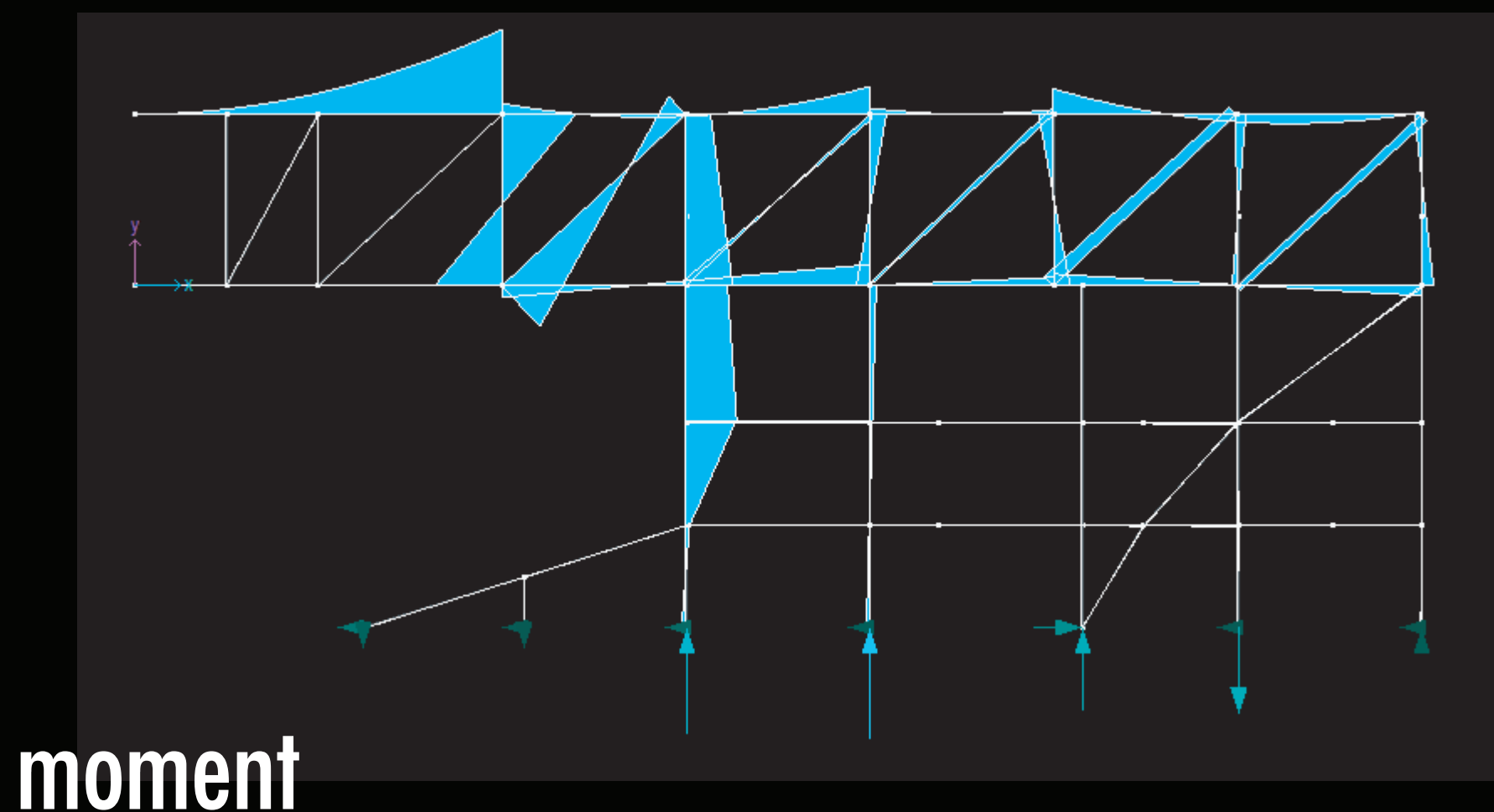
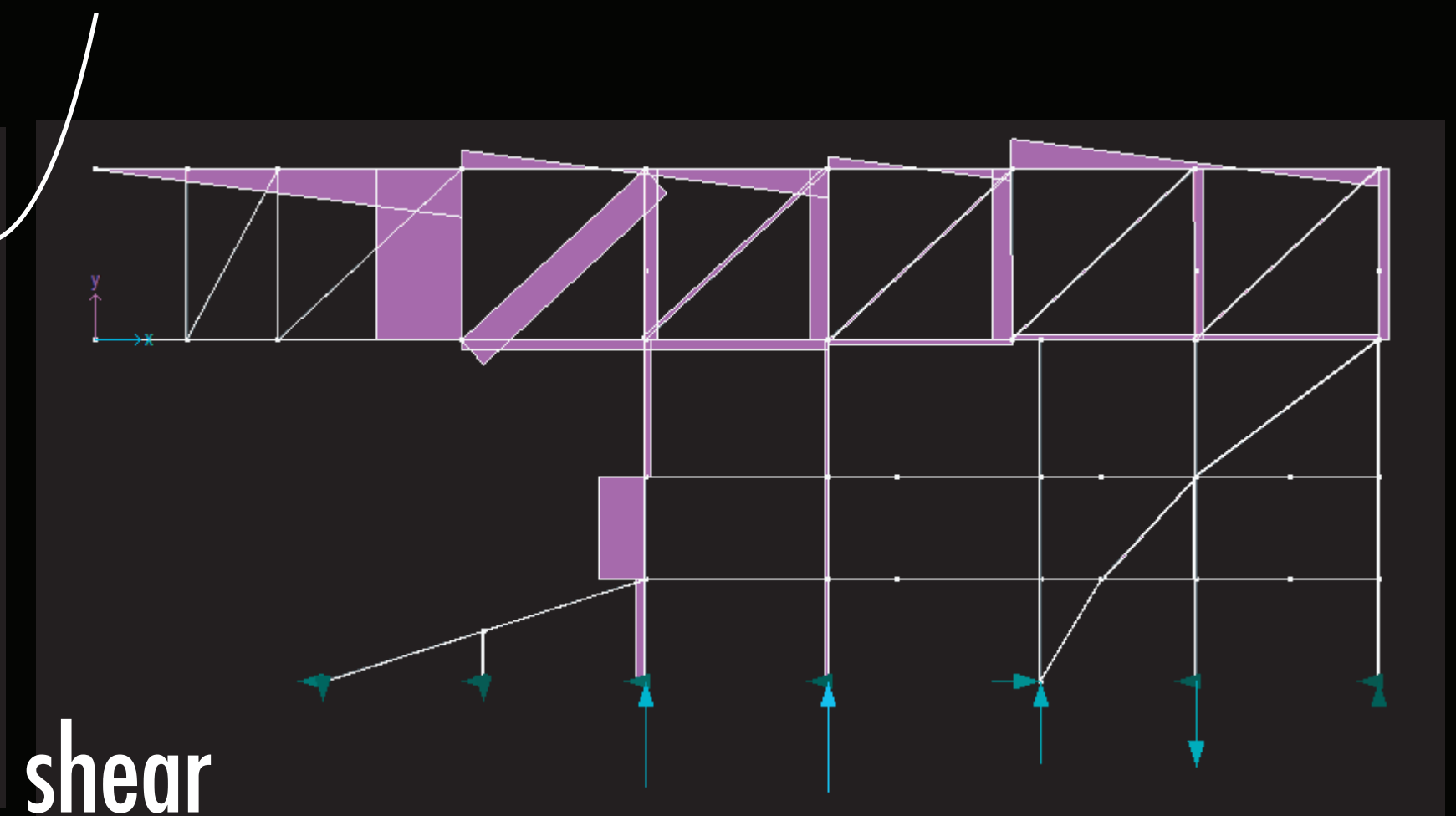
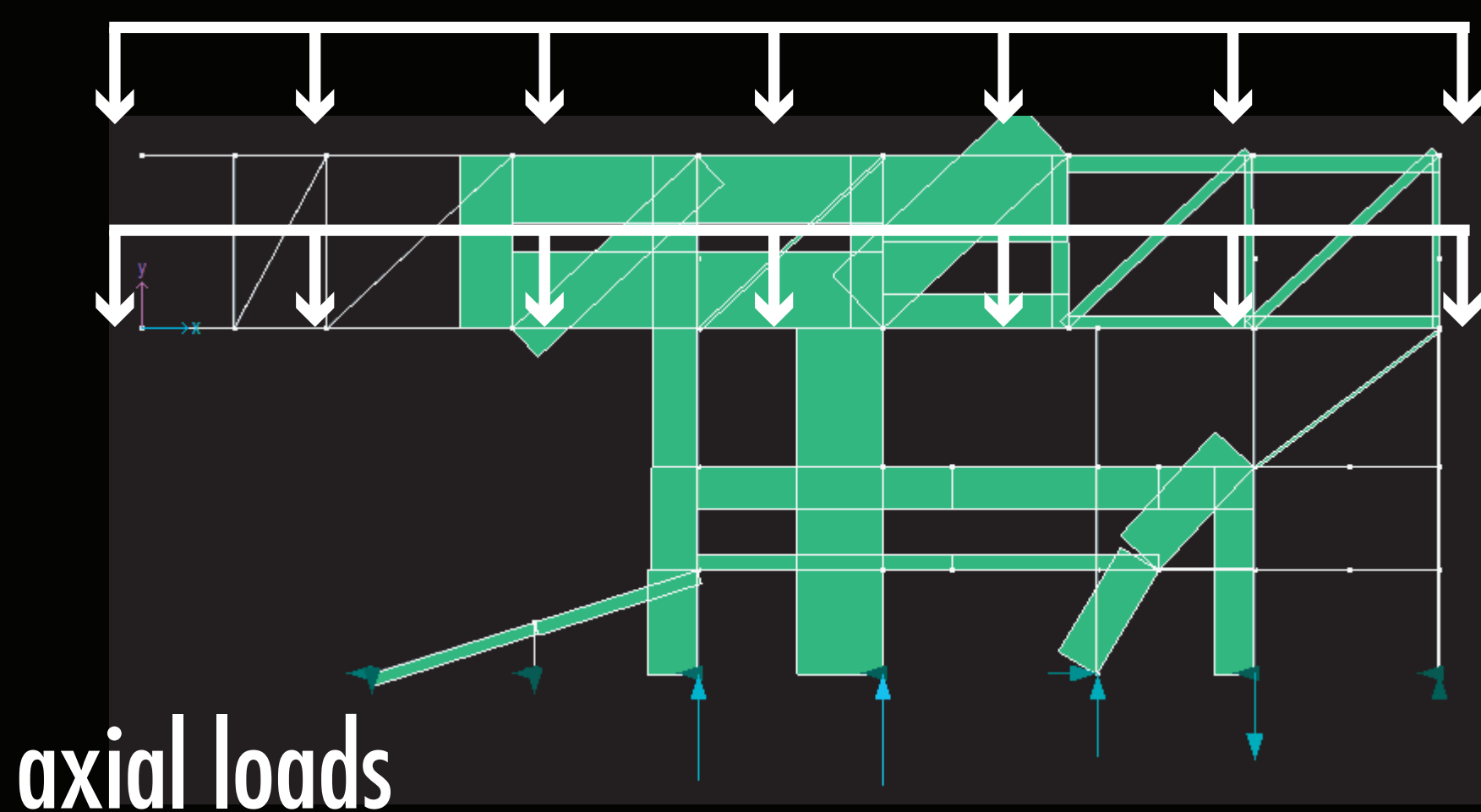


STRUCTURE multiframe analysis

- interior bay
 - tributary area: 3,380 square feet
 - roof live load: 20 psf + roof snow load: 30 psf
 - floor live load: 100 psf

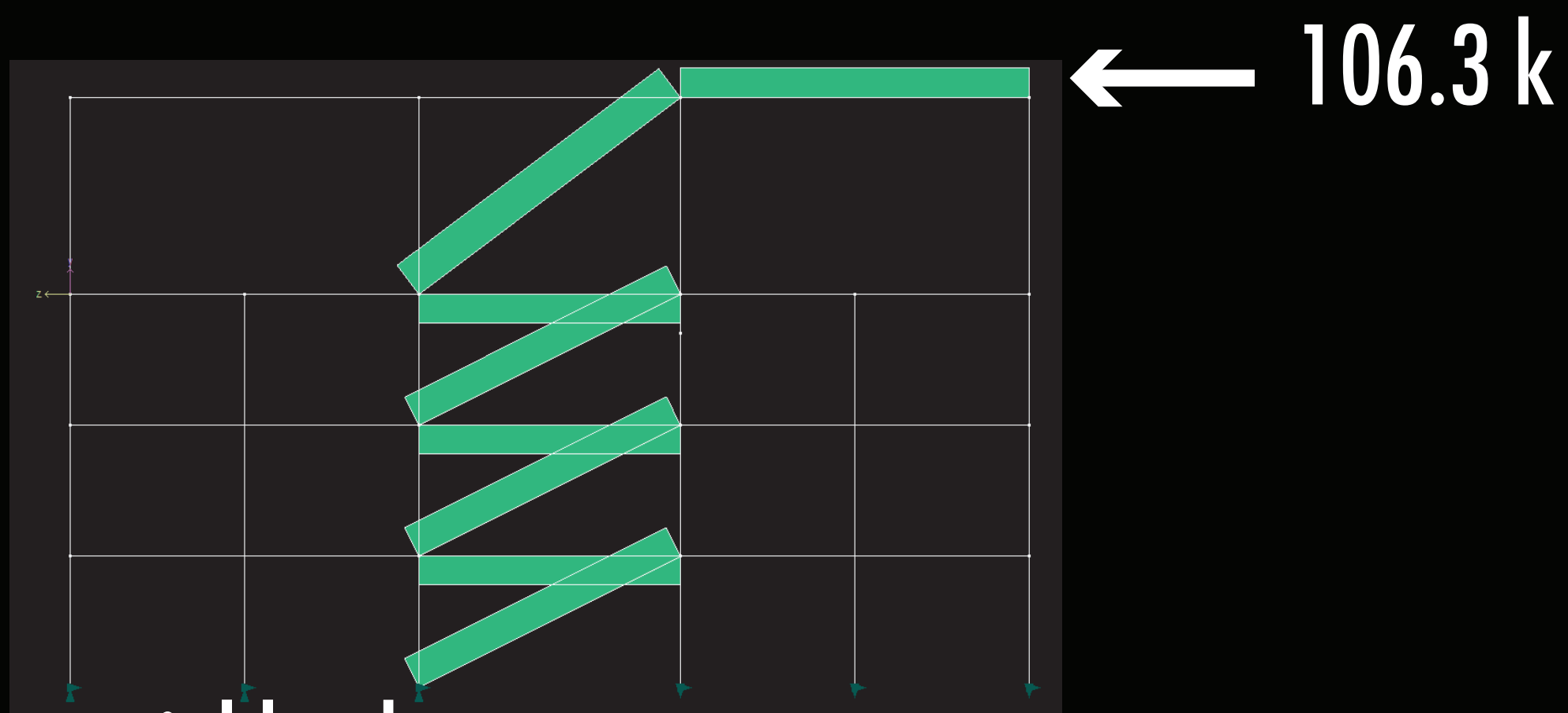
$w_{LL}: 295.75 \text{ k/ft}$

$w_{LL}: 581 \text{ k/ft}$

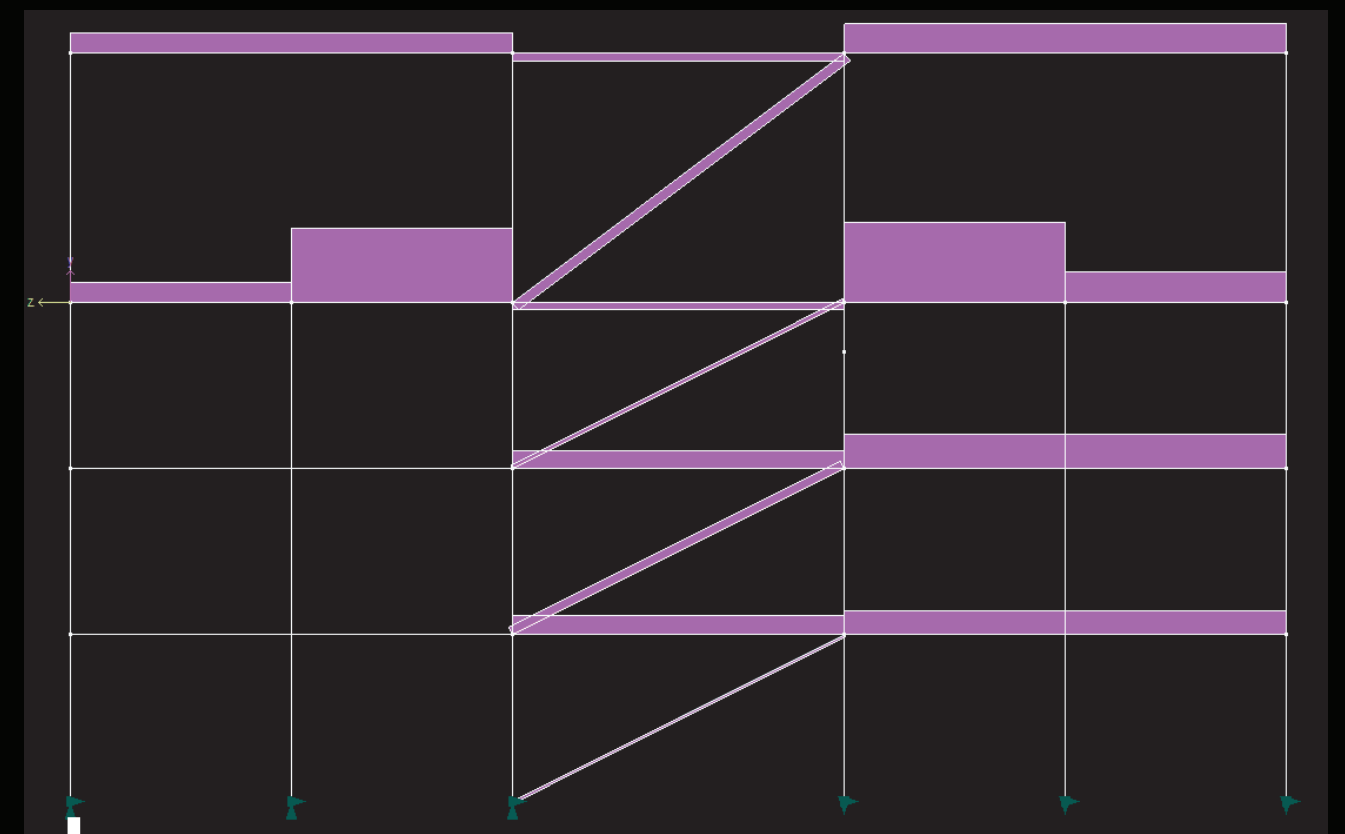


STRUCTURE multiframe analysis

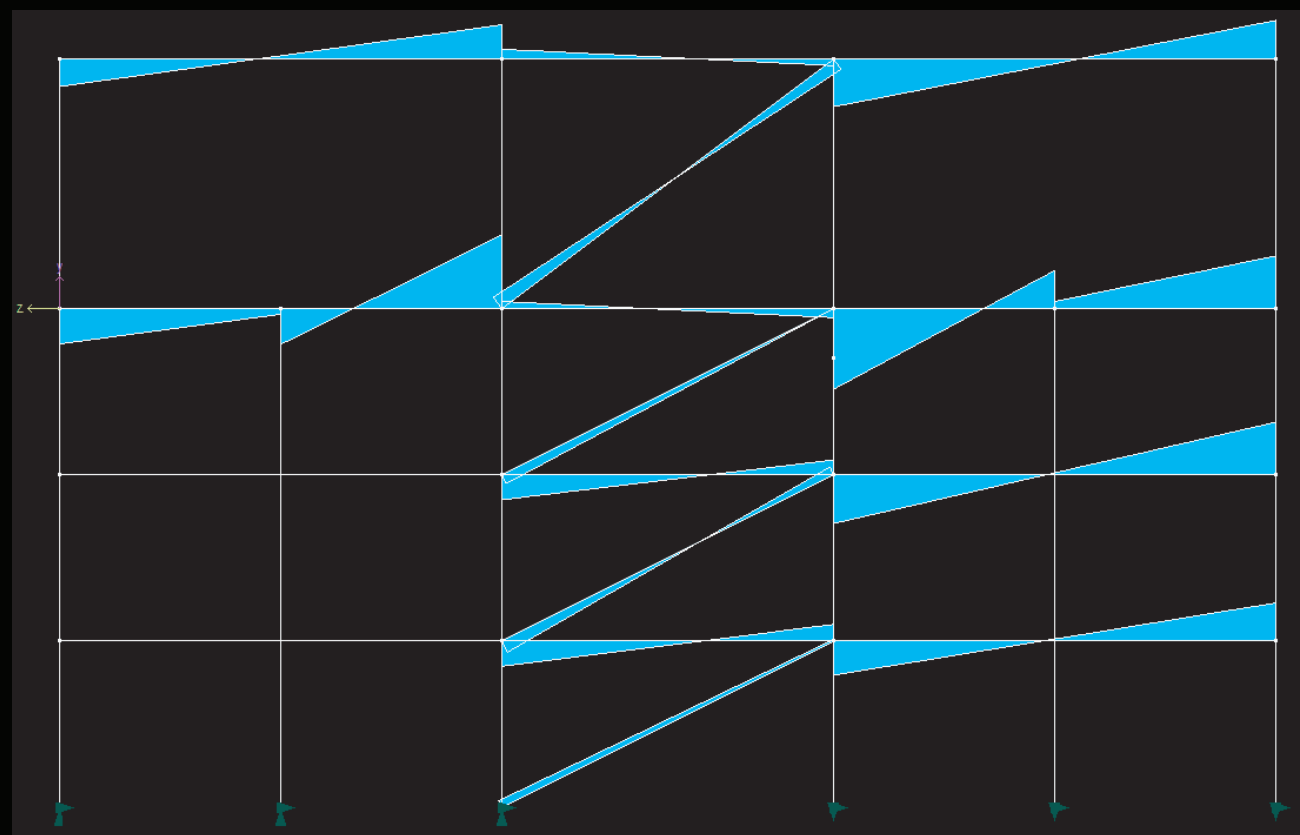
- south facade
 - wind load: 31.1 psf
 - east facade tributary area: 3,420 square feet



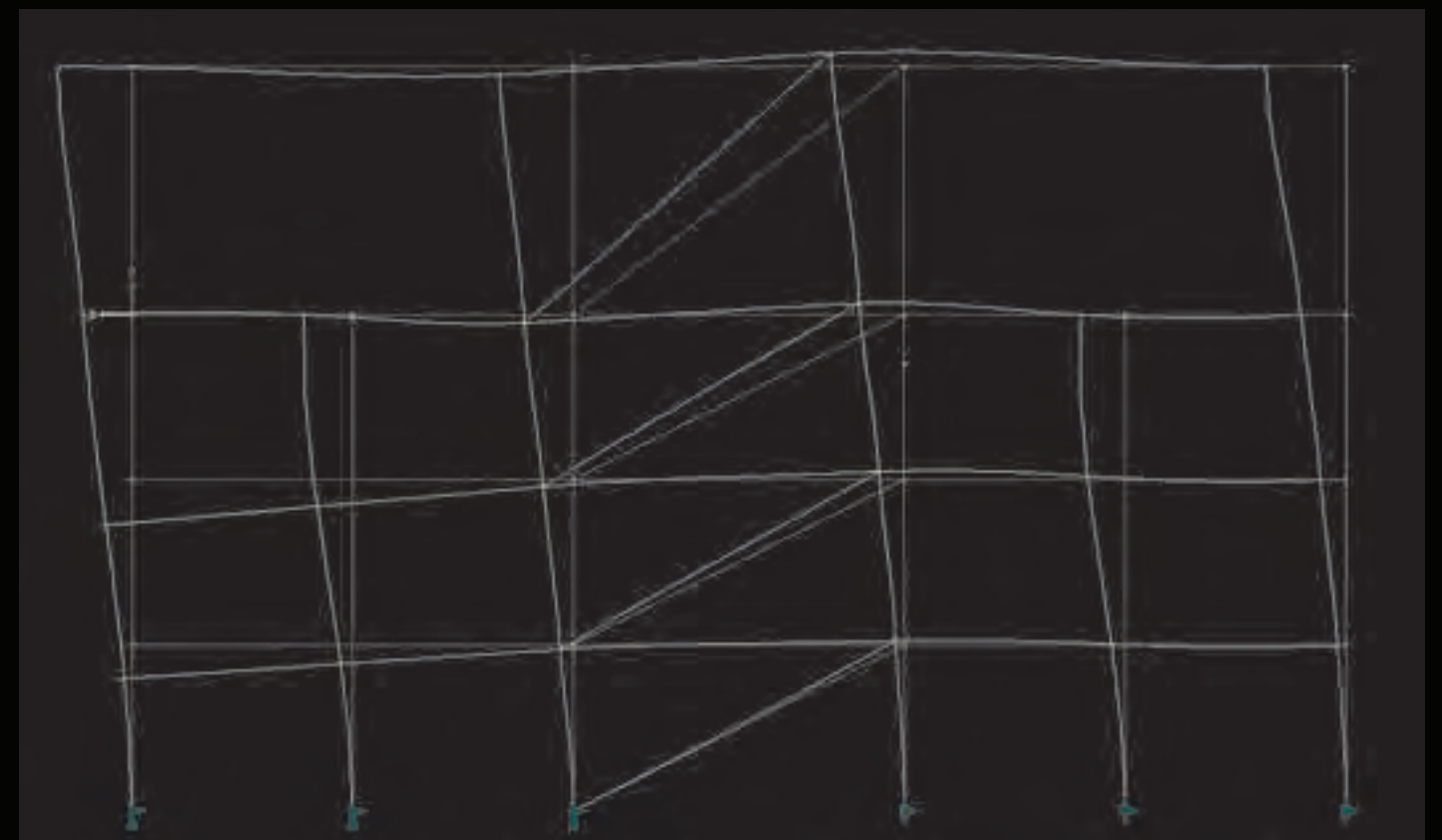
axial loads



shear



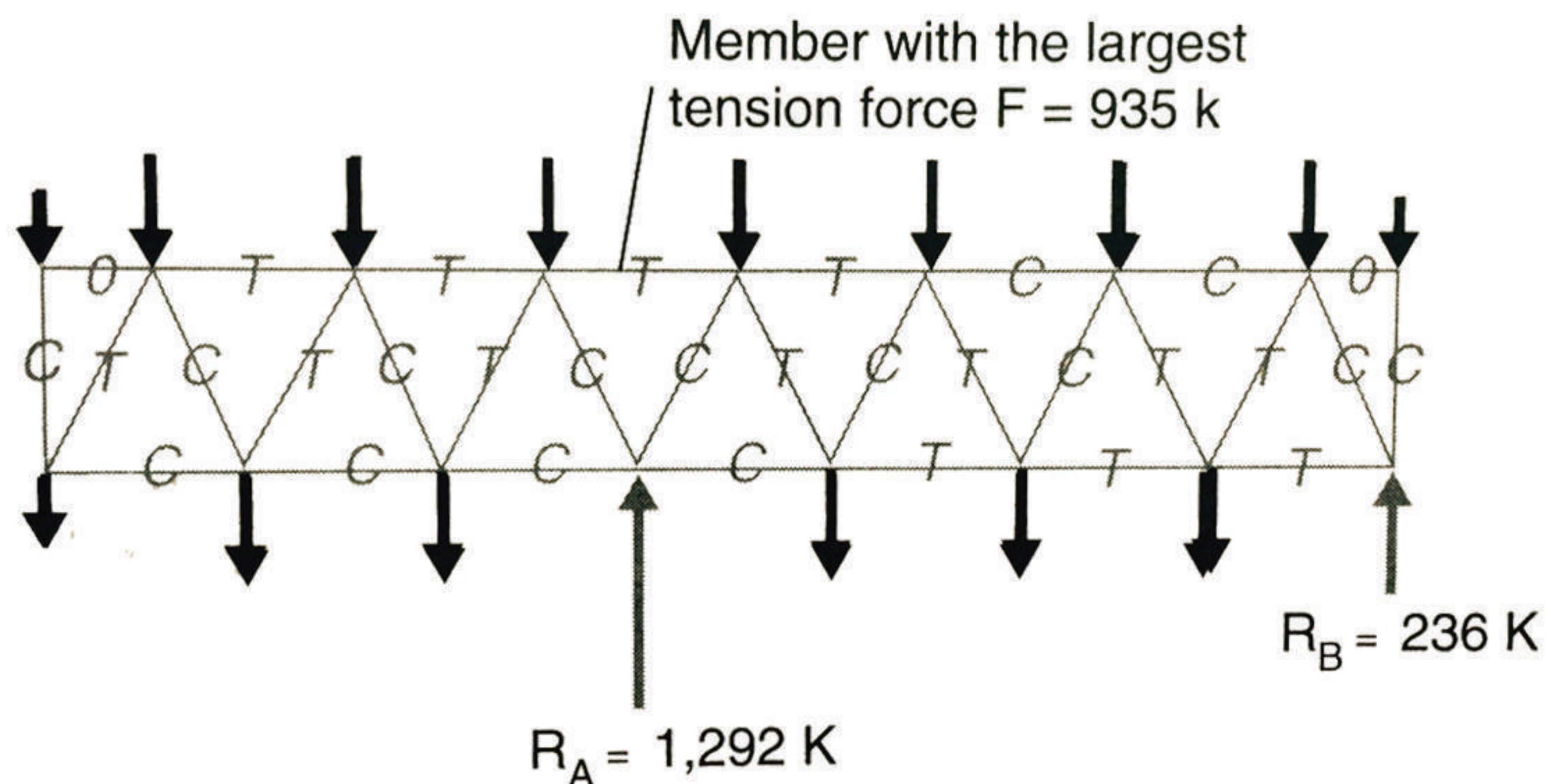
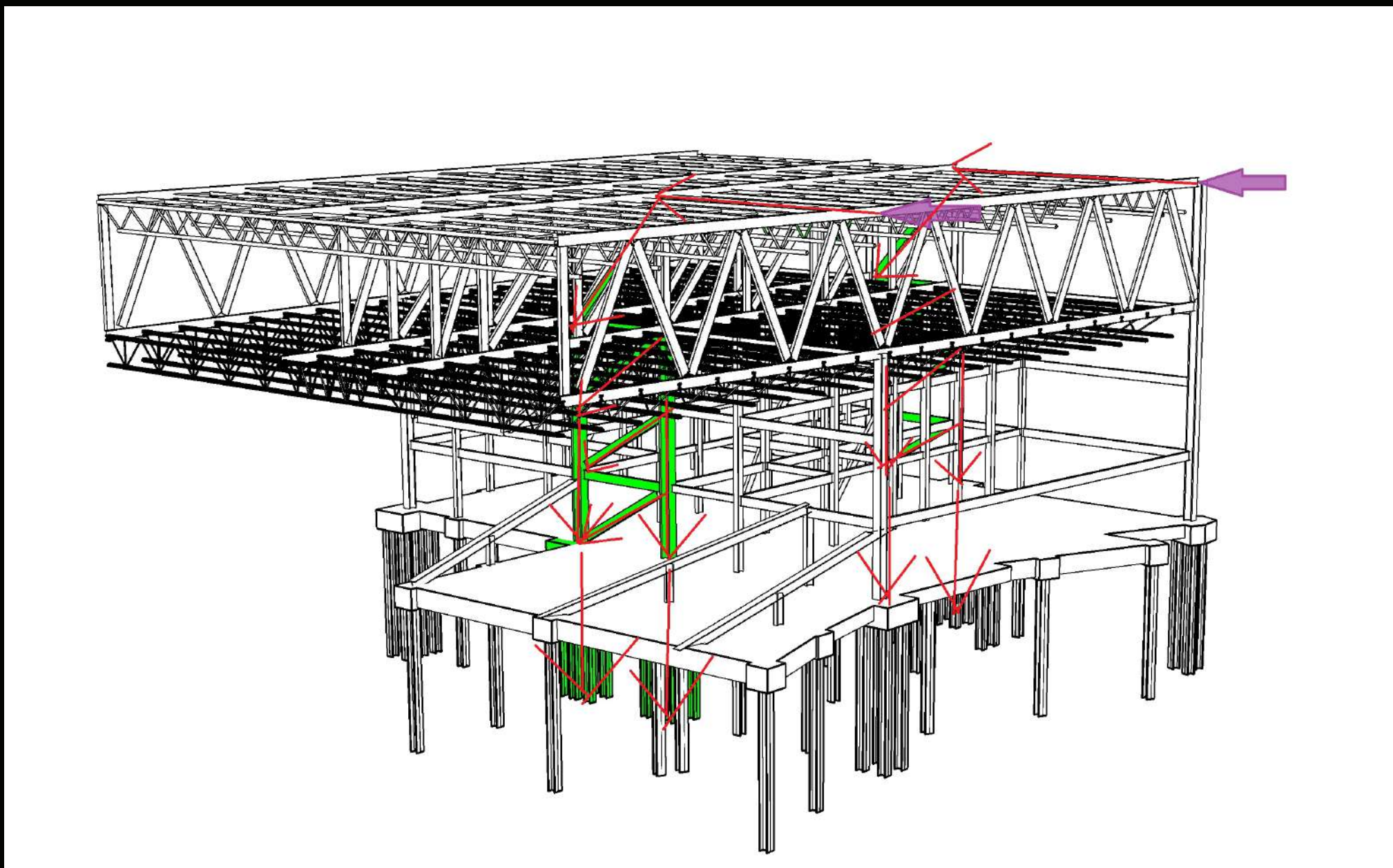
moment



deflection

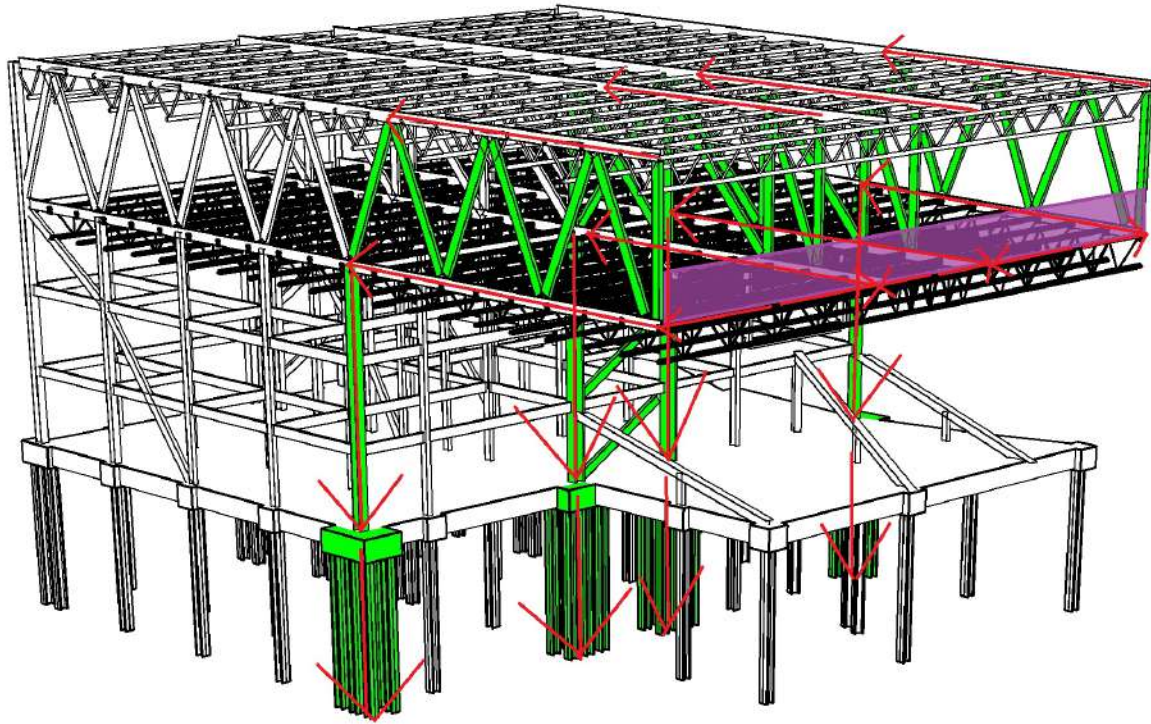
STRUCTURE load transfer

- lateral force on eastern side would transfer load to exterior megatruss

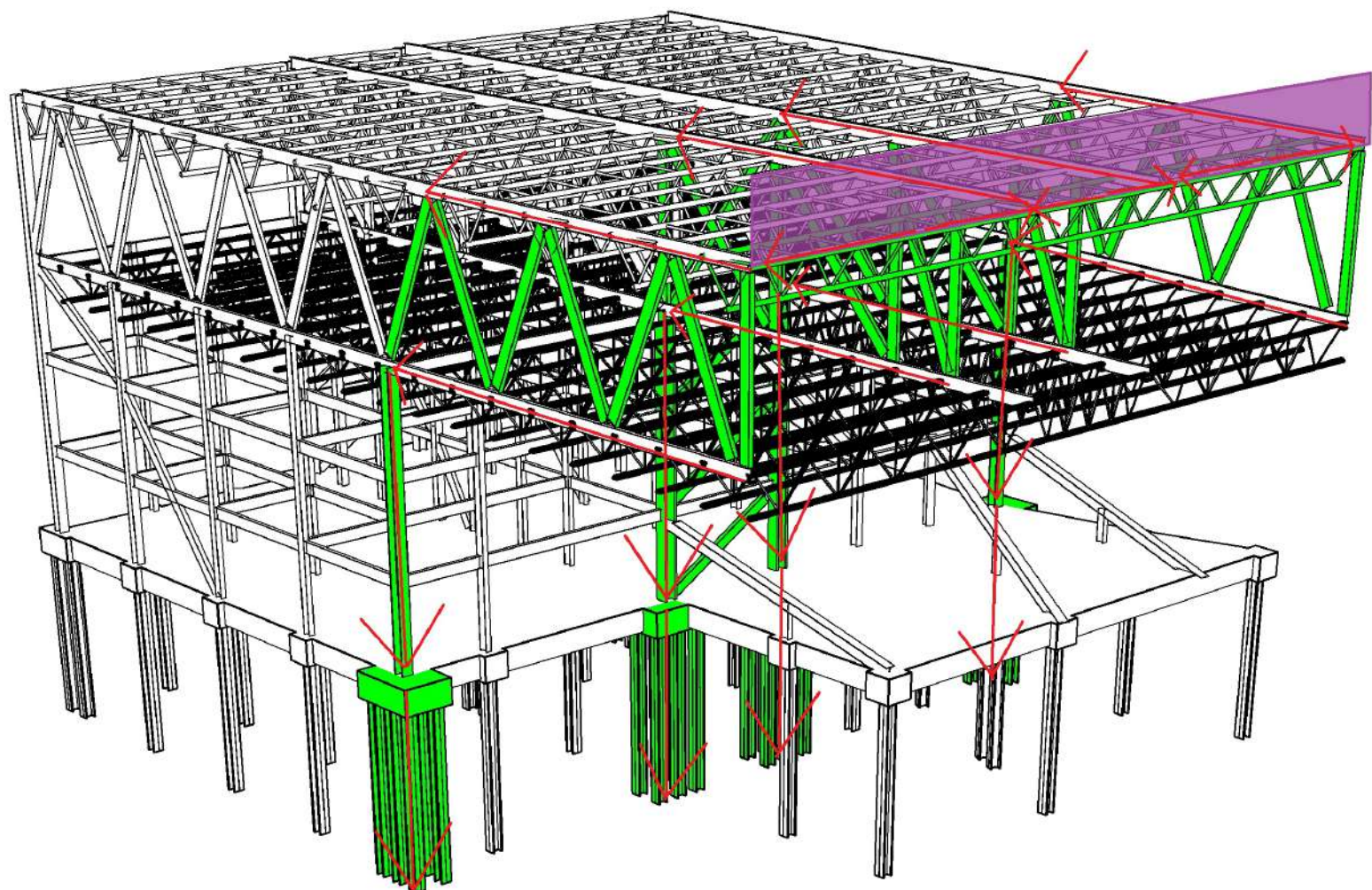


STRUCTURE load transfer

■ floor load transfer



■ roof load transfer



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