

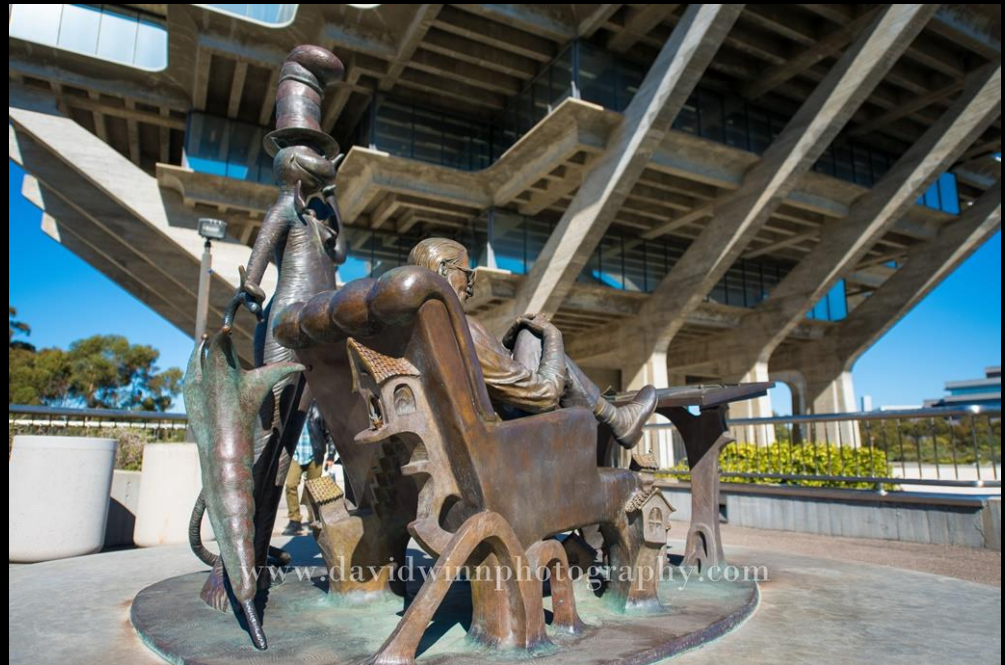
# Geisel Library



Gauri Nadkarni, Preston Scott, Kasi Svoboda, Shaghayegh Taheri,  
Julie Wright, Guang Yang

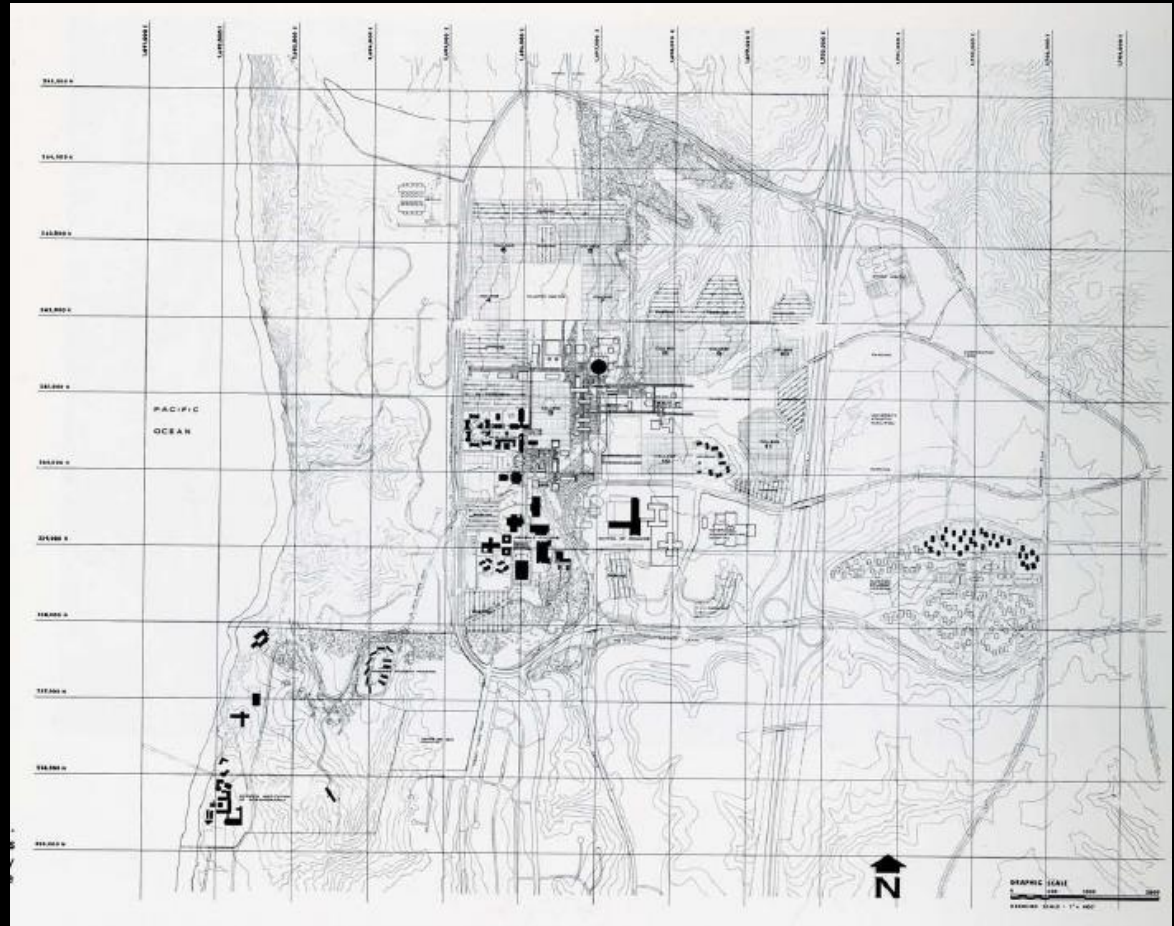
# Introduction

- ⌘ Typology: University Central Library
- ⌘ Architect: William L. Pereira
- ⌘ Location: University of California, San Diego (La Jolla, California)
- ⌘ Date: 1970
- ⌘ Area: 255,000 sqft
- ⌘ Dedicated to Audrey & Theodore Seuss Geisel (Dr. Seuss) in 1995



# Background

## Campus Master Plan





# The Architect:

## William L. Pereira

- ⌘ Born: April 25, 1909; Chicago, Illinois
- ⌘ Education: University of Illinois (1931)
- ⌘ Career:
  - ⌘ Started 3 architectural firms over his life lifetime
  - ⌘ Movie making business
  - ⌘ Professor of architecture at University of Southern California
- ⌘ Style:
  - ⌘ Brutalist
  - ⌘ Functionalist
  - ⌘ Pre-Cast Concrete

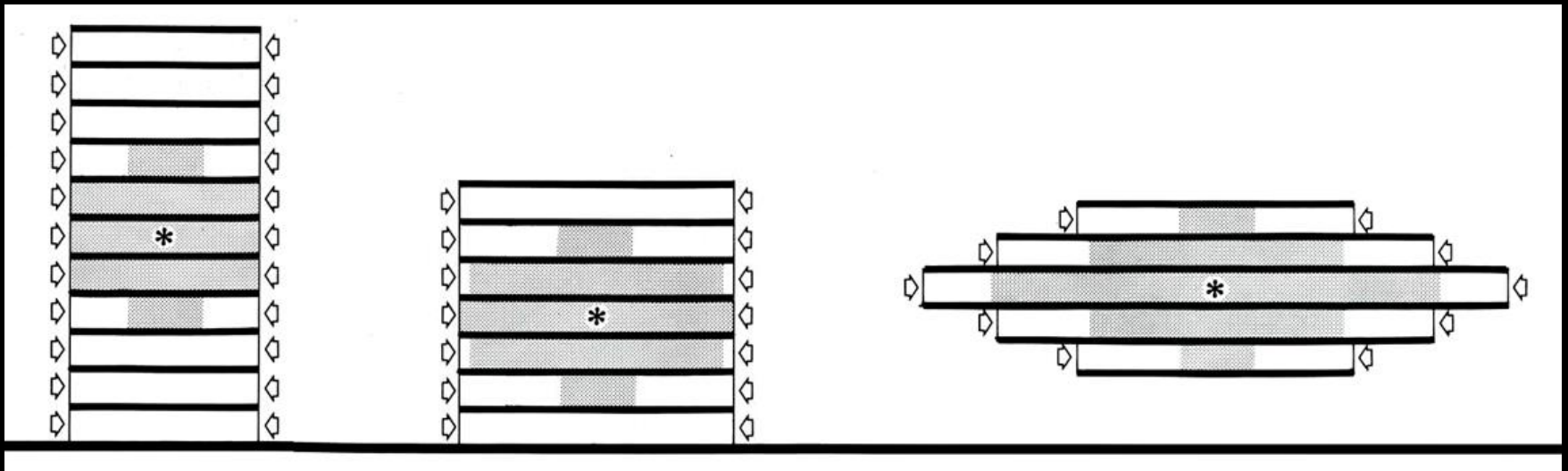


# Design Concept

Program:

≈ 3,000 readers

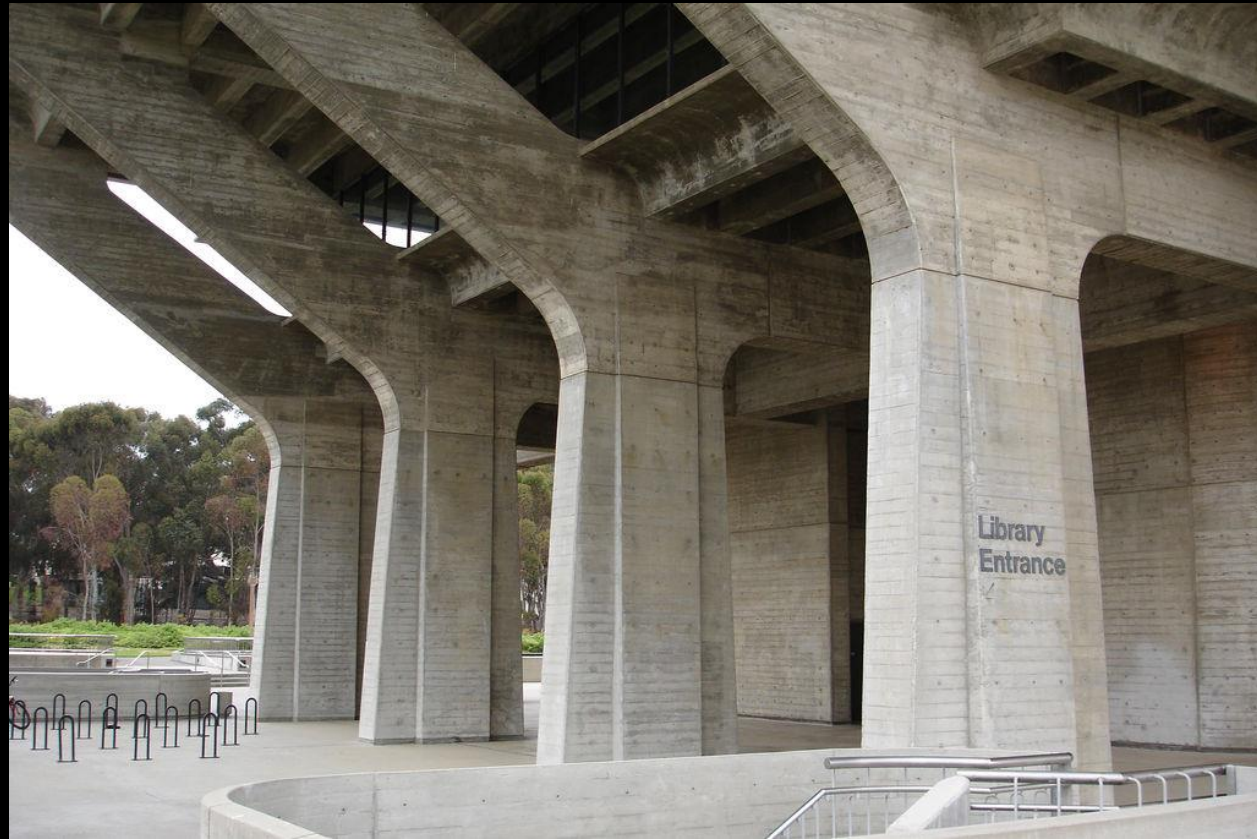
≈ 2,500,000 books



# Design Concept

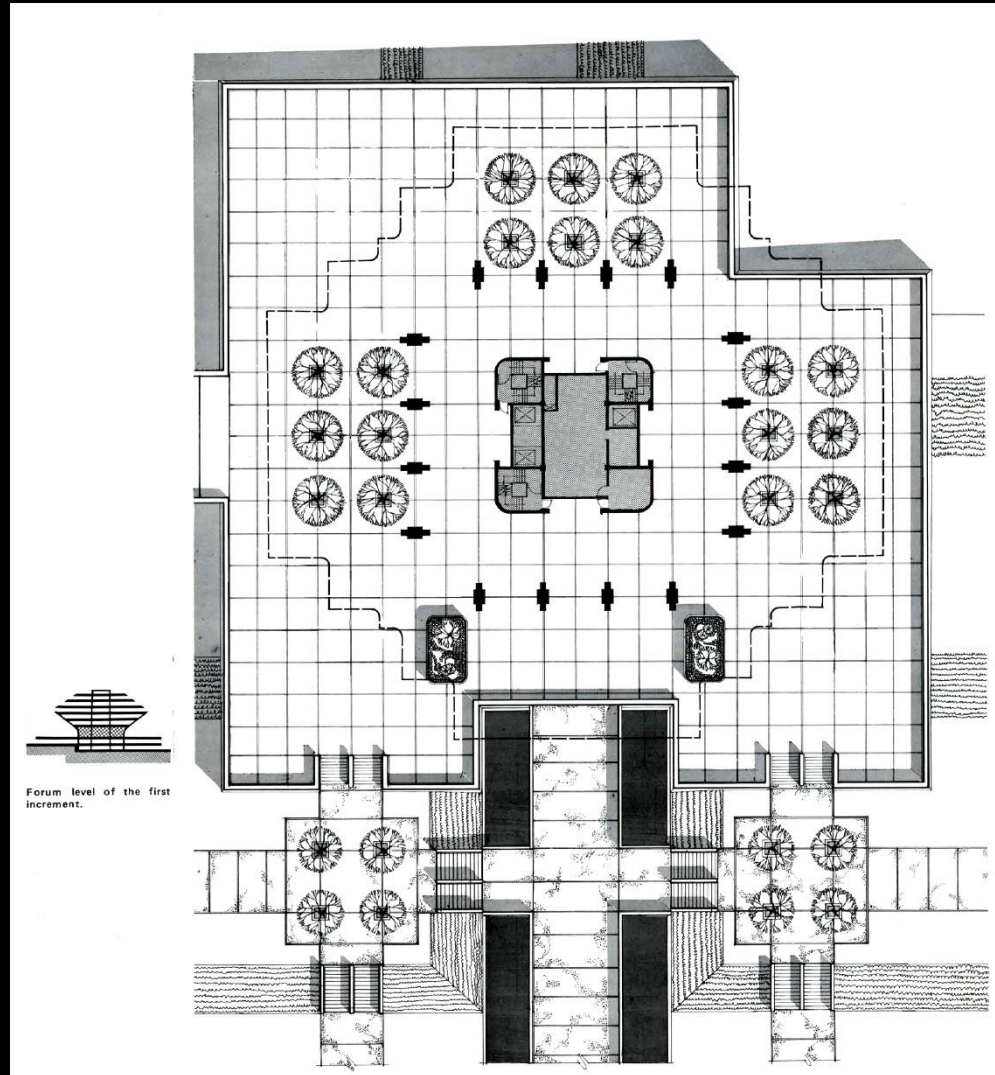
Forum

∅ 16 columns



# Design Concept

Forum





# Design Concept

## Below Forum

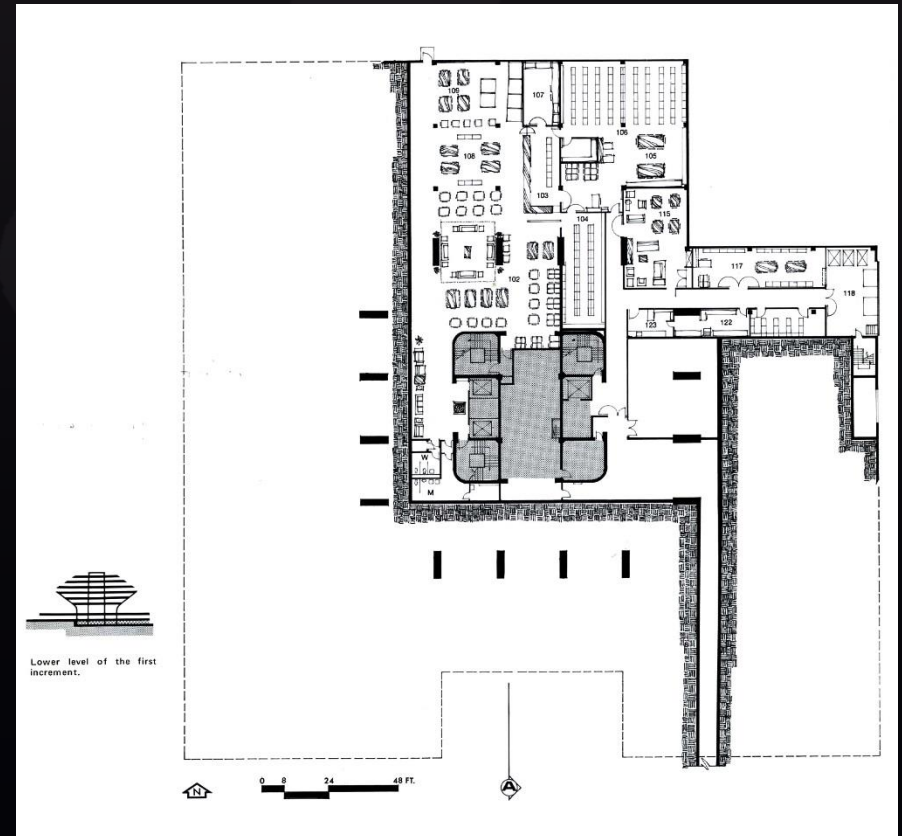
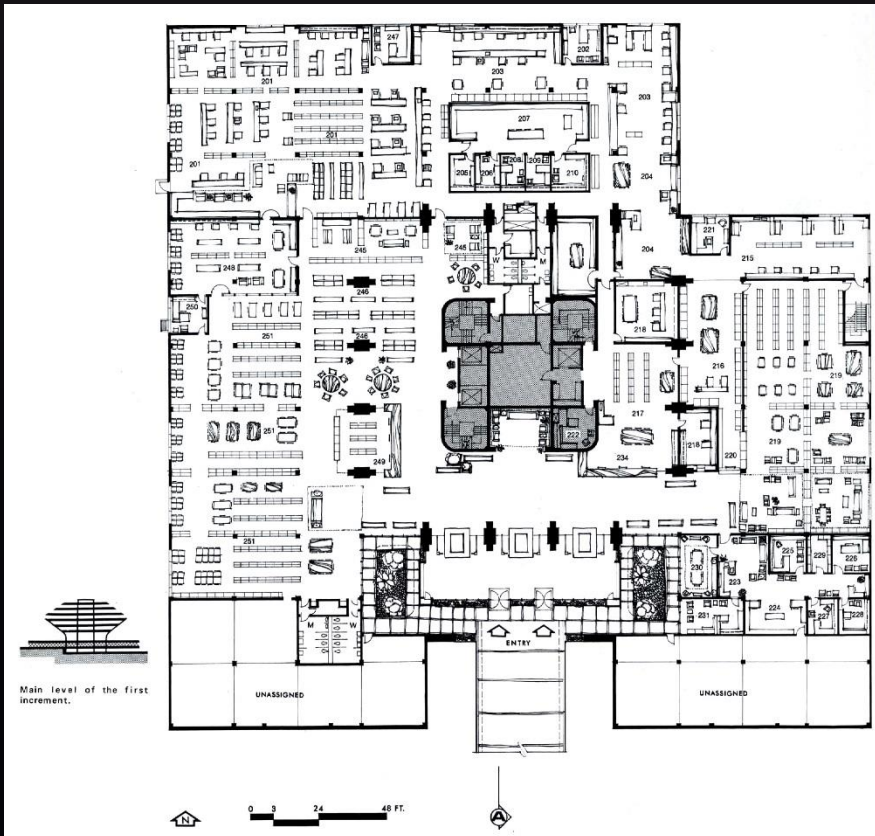
- ✧ Public Floor
  - ❏ Main entrance
  - ❏ Staff areas
  - ❏ Library Services
- ✧ Basement
  - ❏ Staff areas
  - ❏ Mechanical





# Design Concept

## Below Forum



# Design Concept

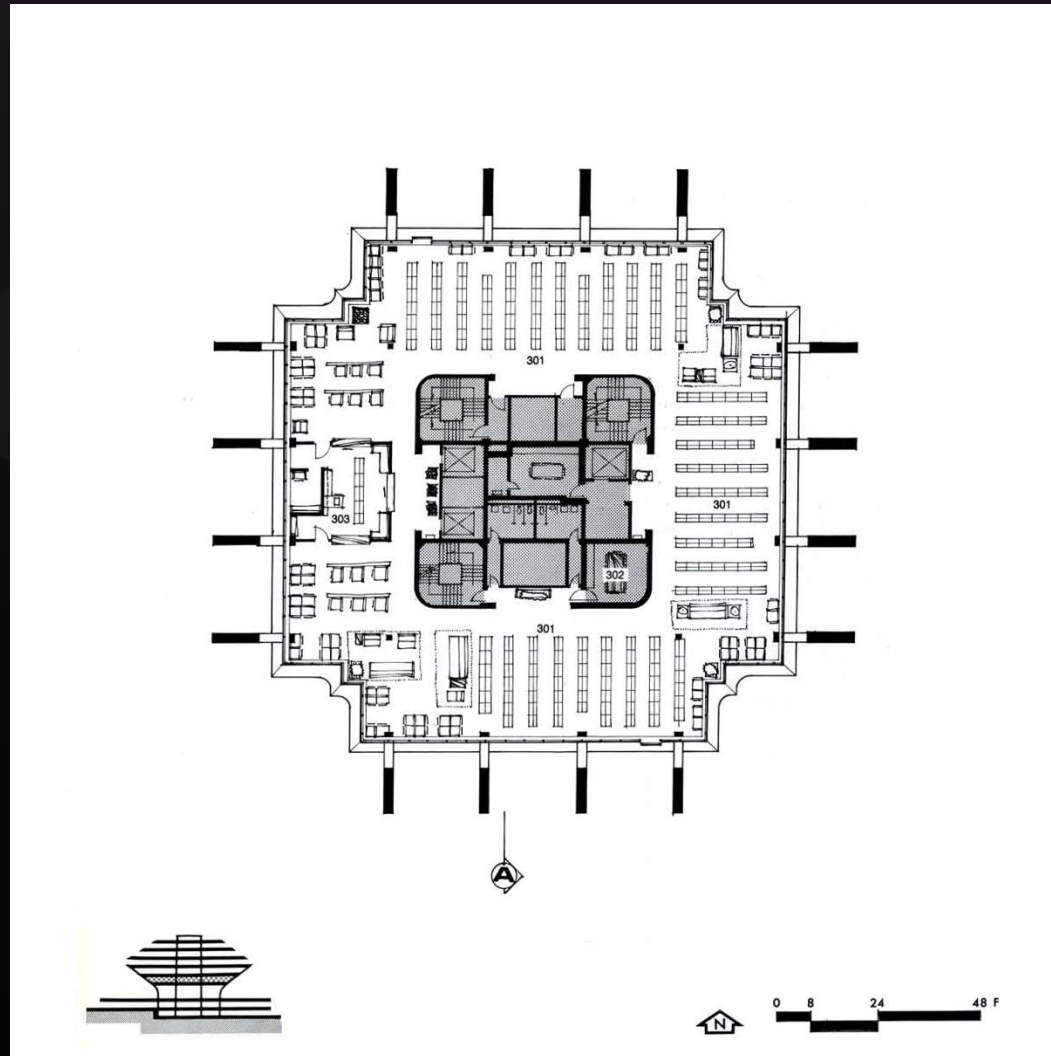
Above Forum

- ✧ 5 Floors
  - ✧ Book collection
  - ✧ Study areas
- ✧ Elliptical in Section
- ✧ “Circular” in Plan



# Design Concept

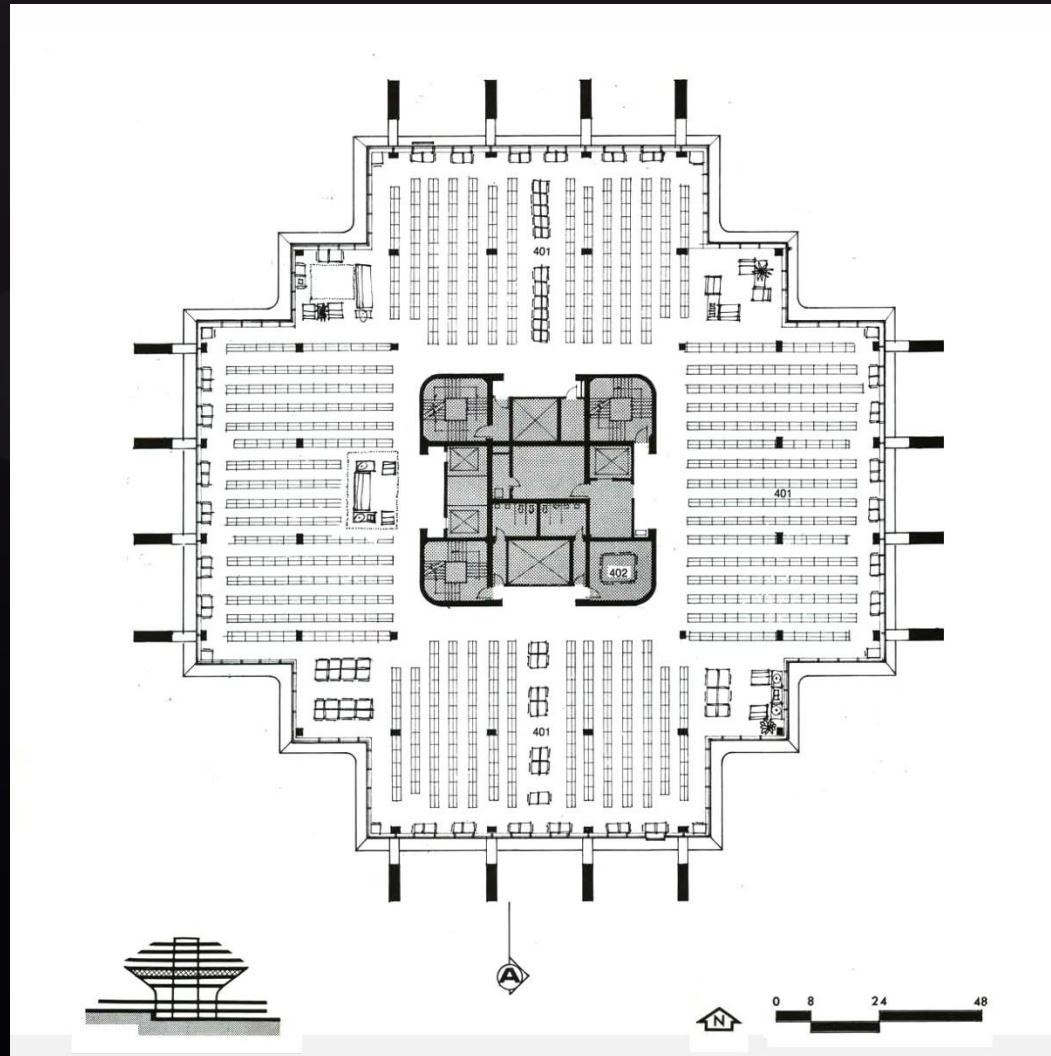
Above Forum:  
1<sup>st</sup> level of  
stacks





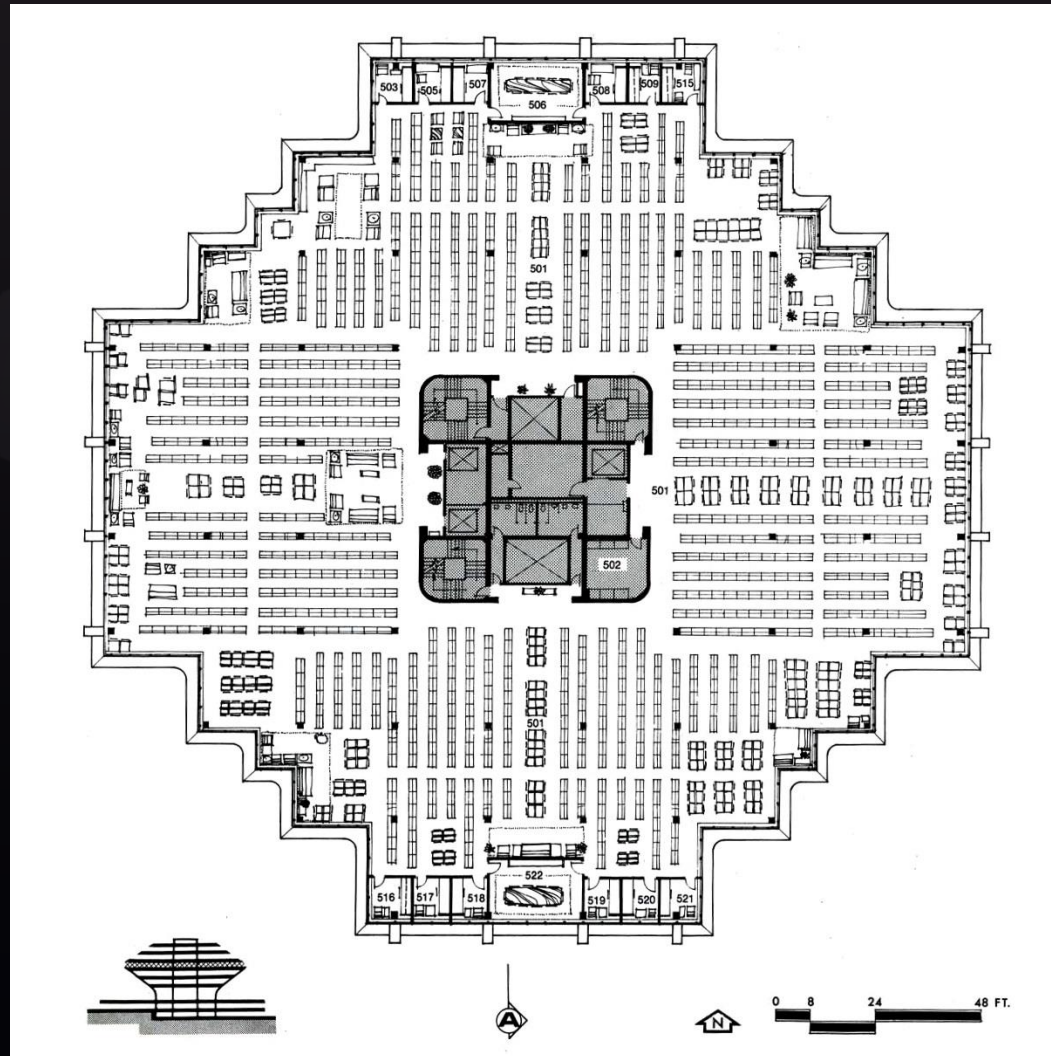
# Design Concept

Above Forum:  
2<sup>nd</sup> level of  
stacks



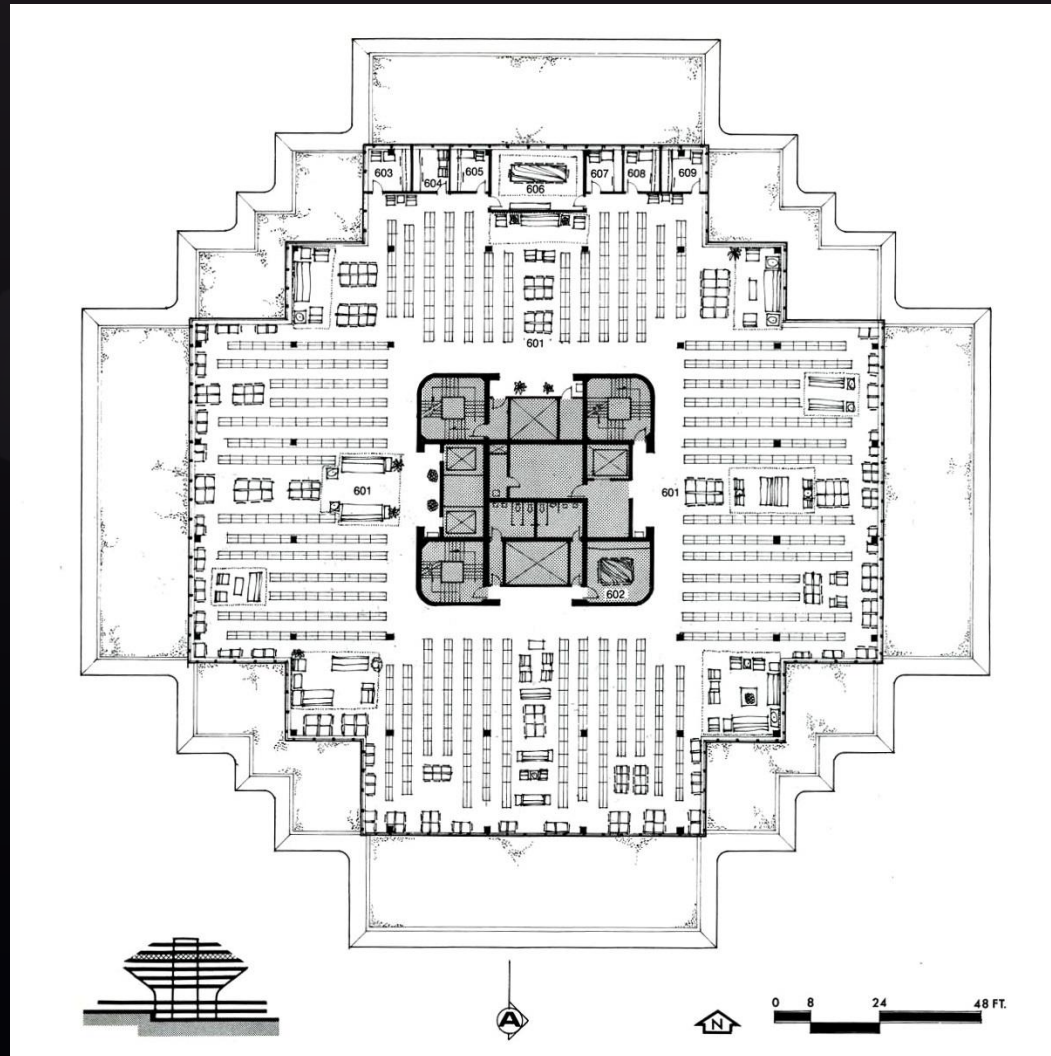
# Design Concept

Above Forum:  
3<sup>rd</sup> level of  
stacks



# Design Concept

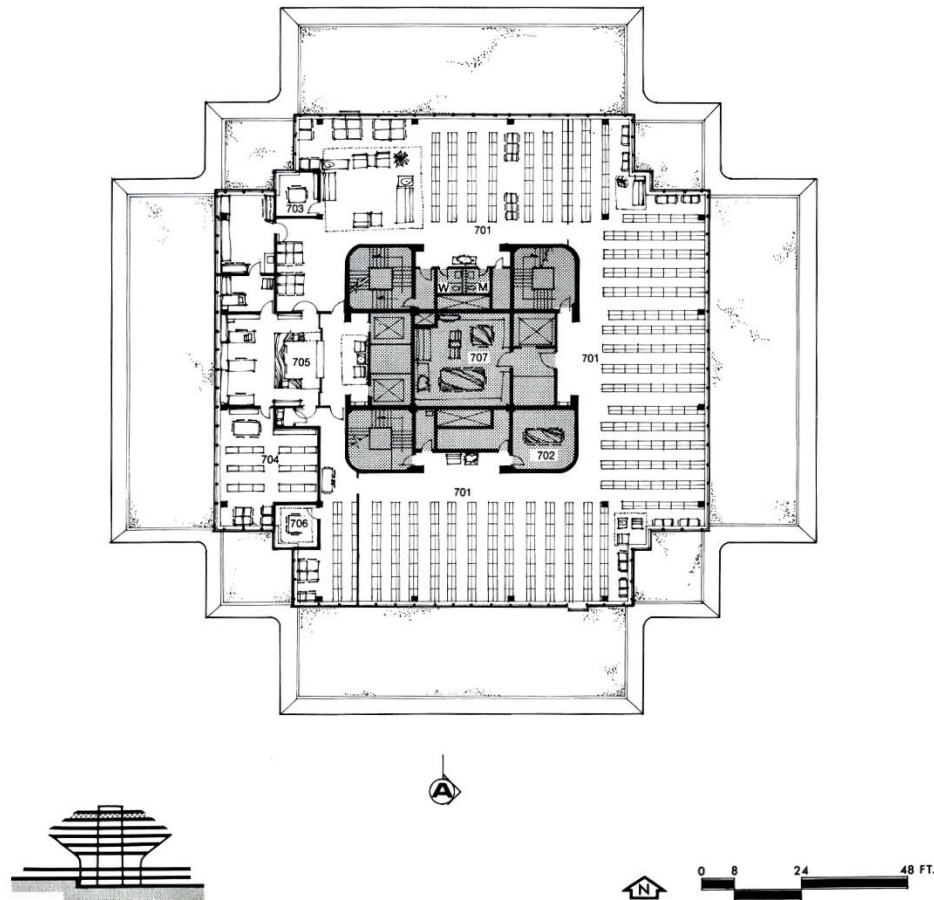
Above Forum:  
4<sup>th</sup> level of  
stacks





# Design Concept

Above Forum:  
5<sup>th</sup> level of  
stacks



# Choice of structural material

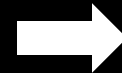
## Steel structure

with four large steel trusses supporting the third floor of spheroid, concealed in the second floor.



## Hybrid Steel-concrete structure

With concrete up to steel trusses



## Reinforced Concrete structure

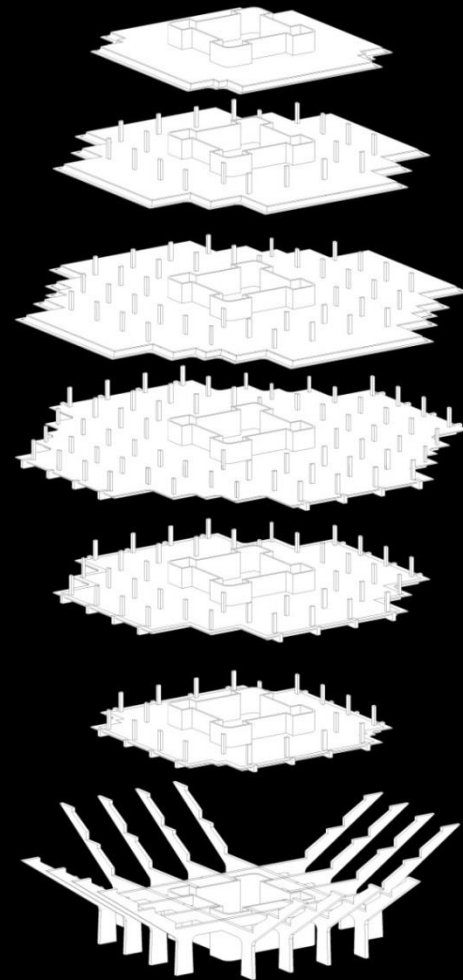
With external 16 sloped beam –column  
Laterally tied at lower three spheroid by post-tensioned beams.

### Factors influencing the choice of Reinforced Concrete construction

- Increasing rate of steel and extensive use of steel in the truss.
- Reduced flexibility of space at 2<sup>nd</sup> level of the spheroid.
- Additional cost of fireproofing the steel.
- High cost of connection at points of intersection of materials and load transfer

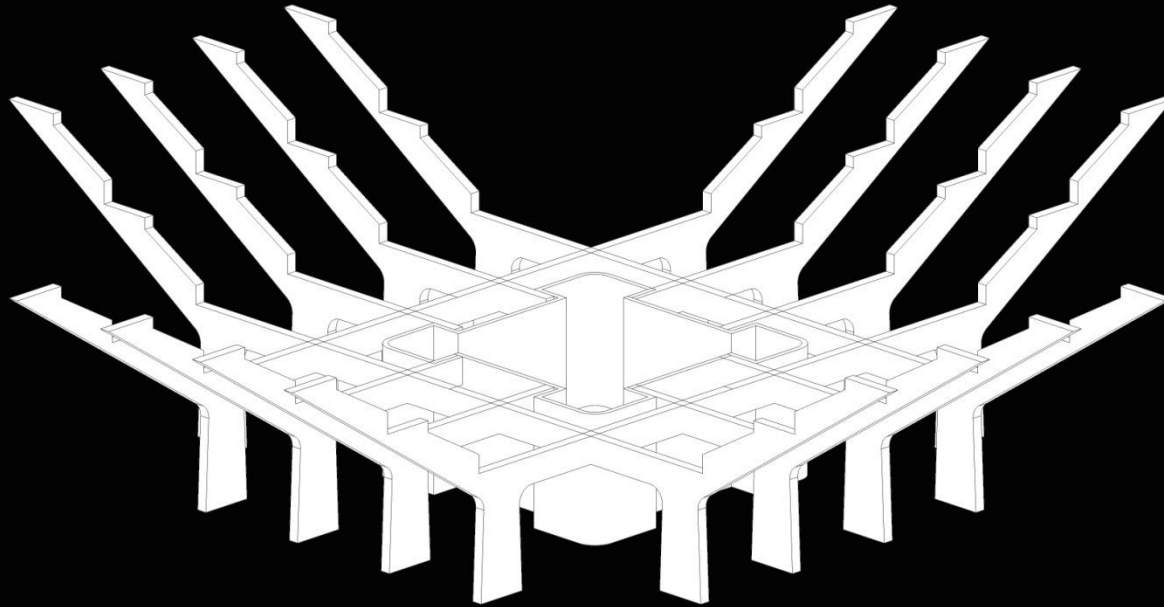
# Structure: structure configuration

- Main columns and sloped beam-columns: 3000 psi R.C.C with exposed rough form board finish
- Floor system up to third level of spheroid: Standard concrete Pan-joists
- Floor system above third floor: R.C.C slab and beam systems
- Stair and elevator core: Reinforced concrete stone aggregate
- Exterior walls: Poured in place R.C.C panels.
- The peripheral beams tying the bent columns: Post tensioned concrete 300 post-tensioning rods of 1/4-inch diameter high-tensile steel.

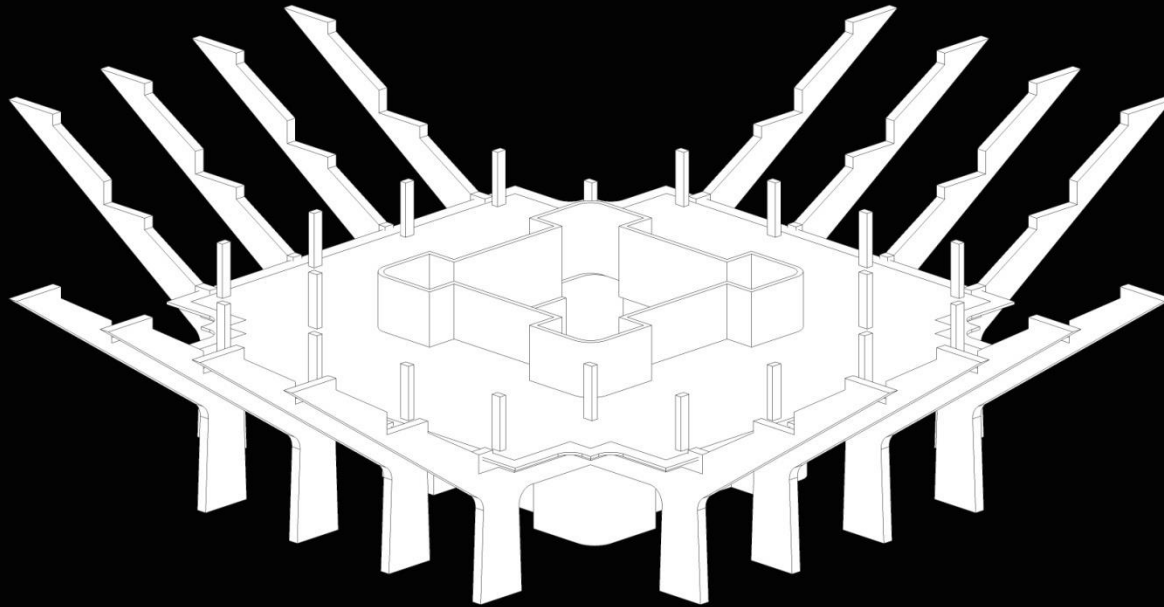




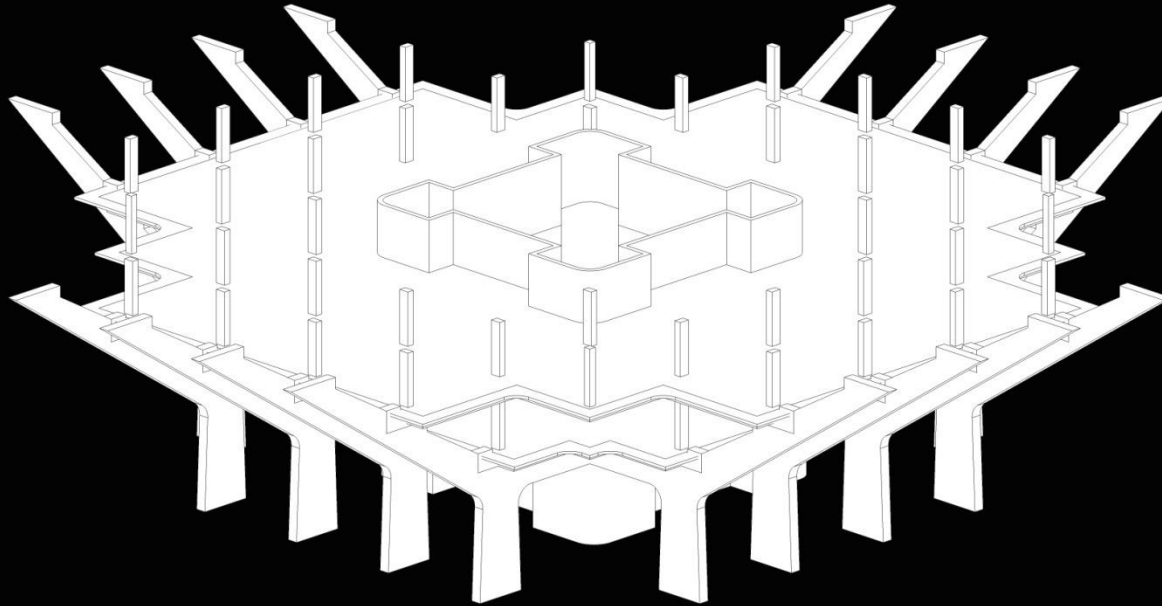
# Structure: structure configuration



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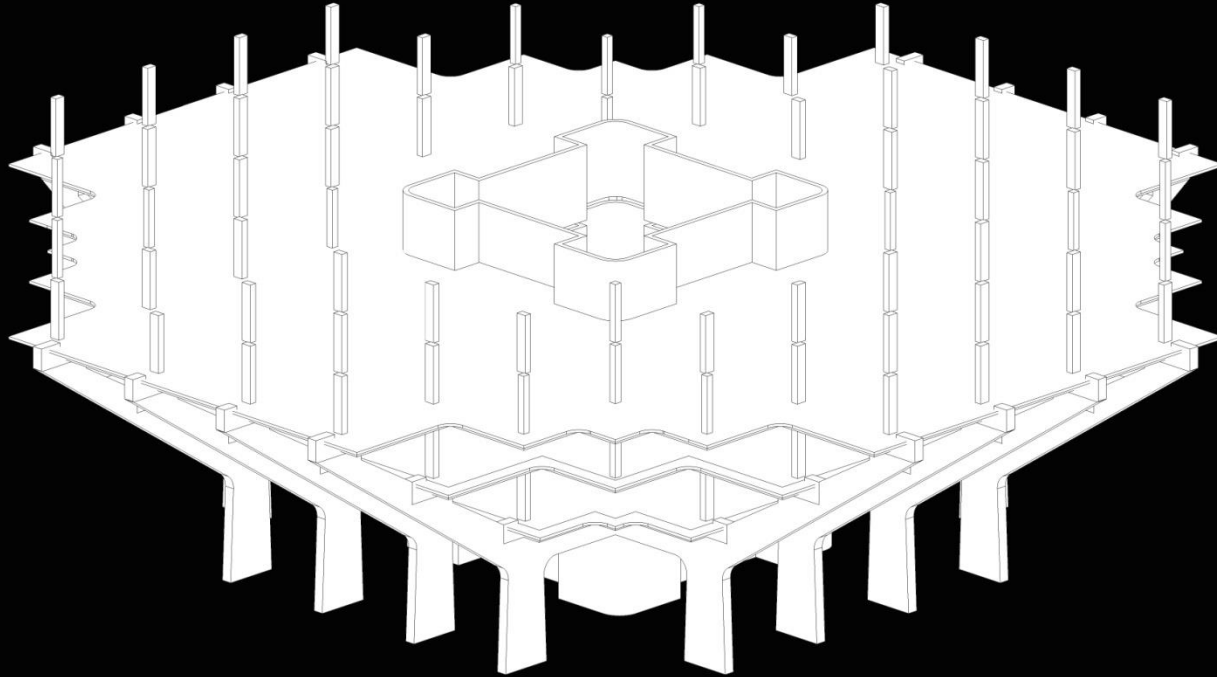


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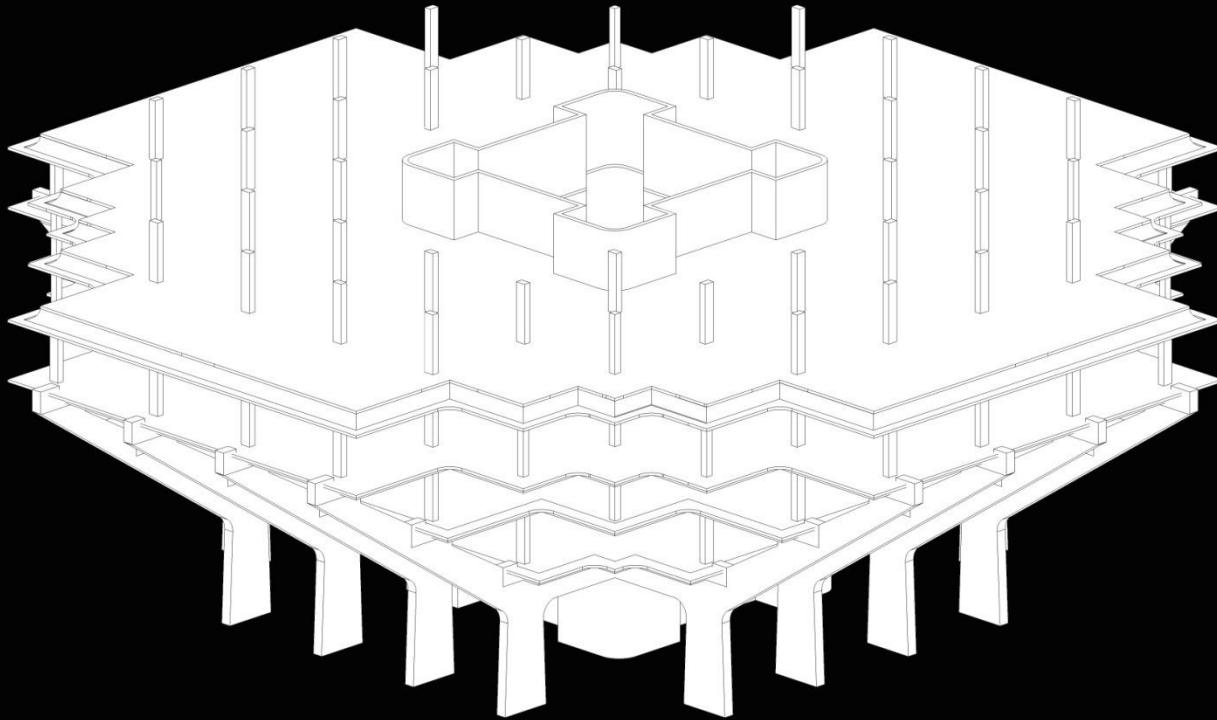




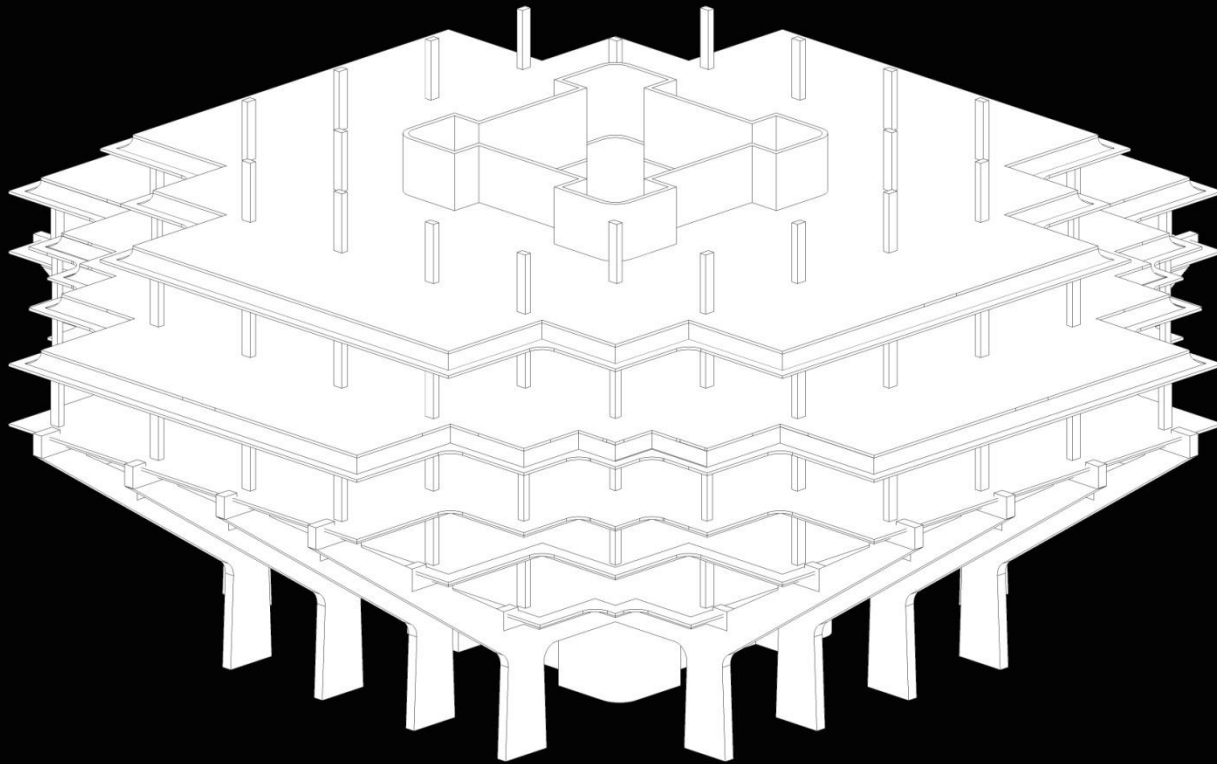
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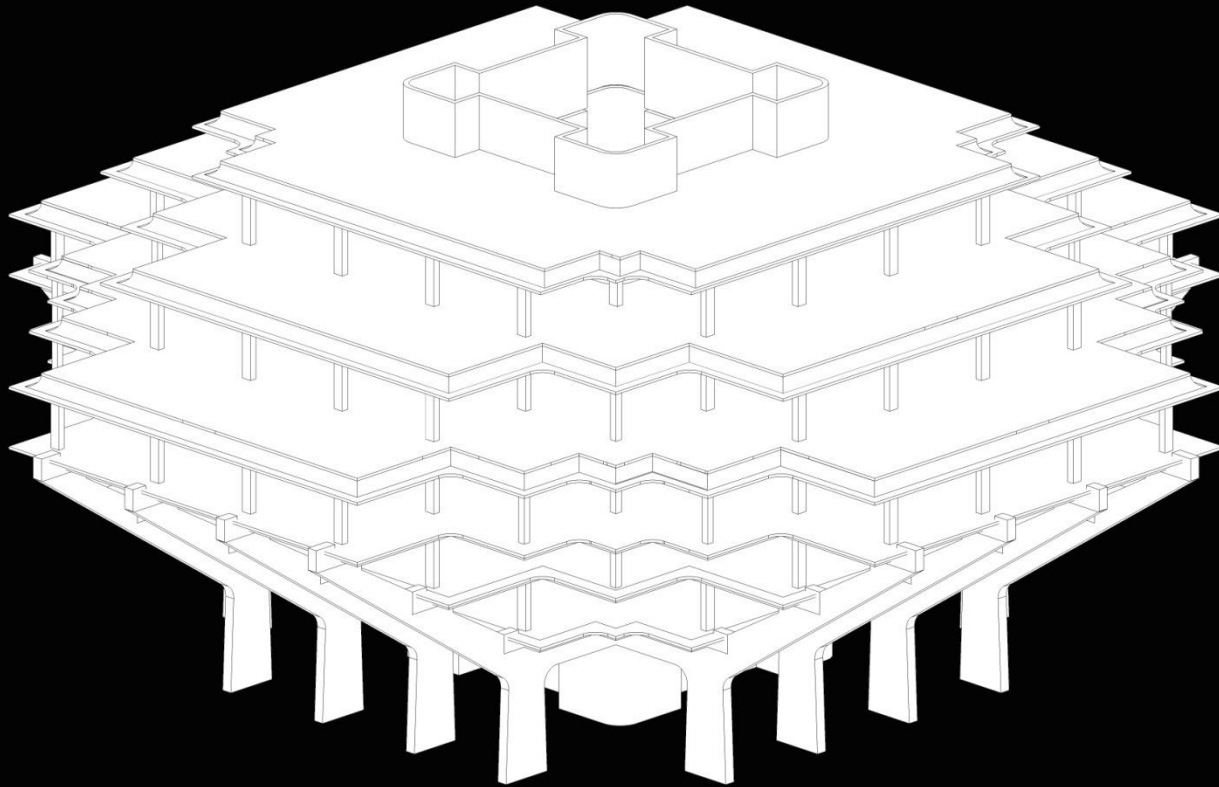
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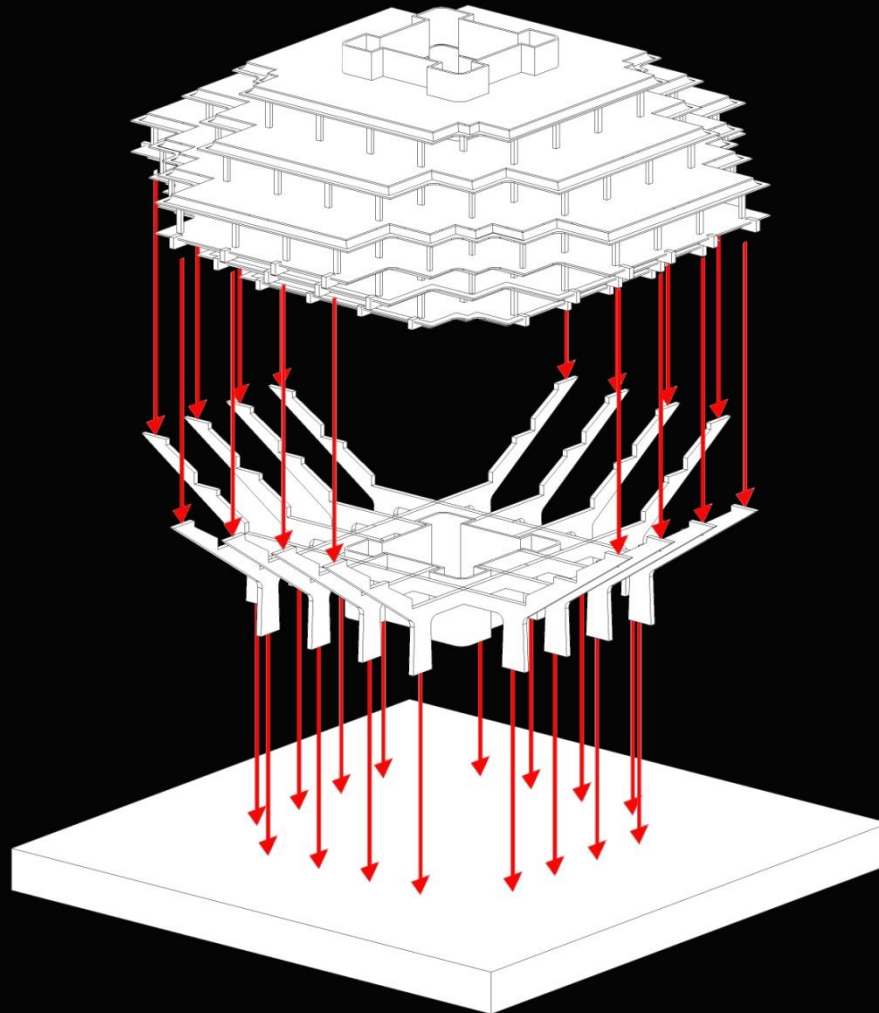
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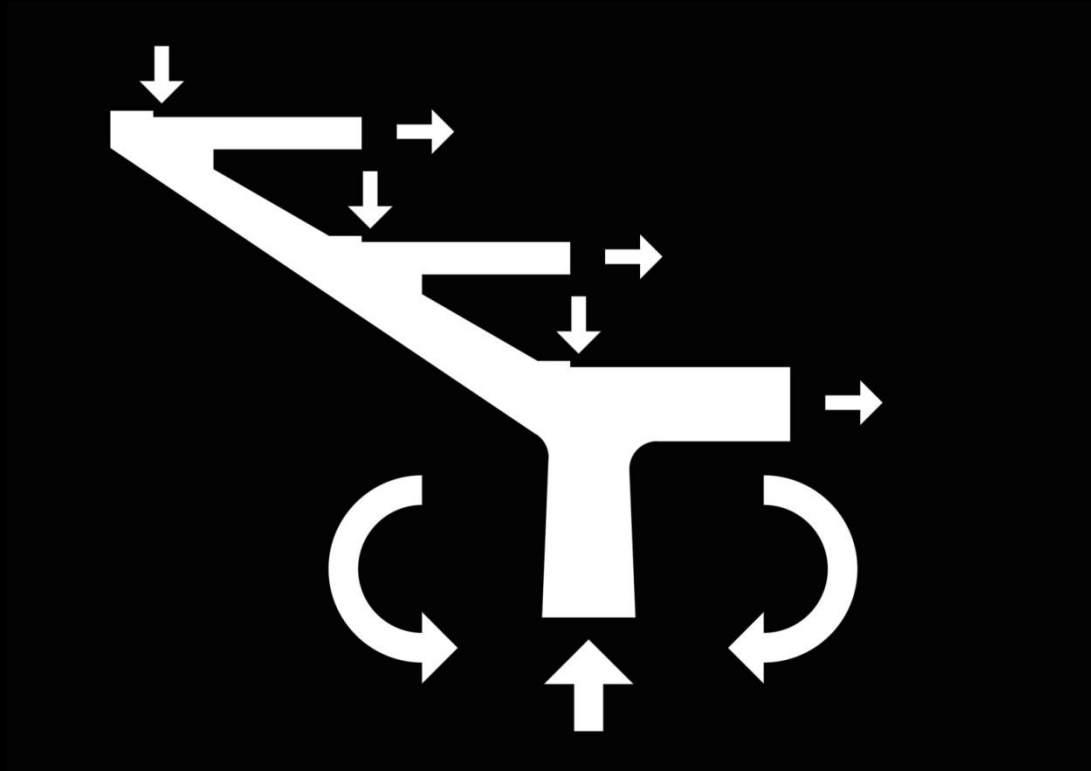


# Structure: structure configuration





# Structure: Columns

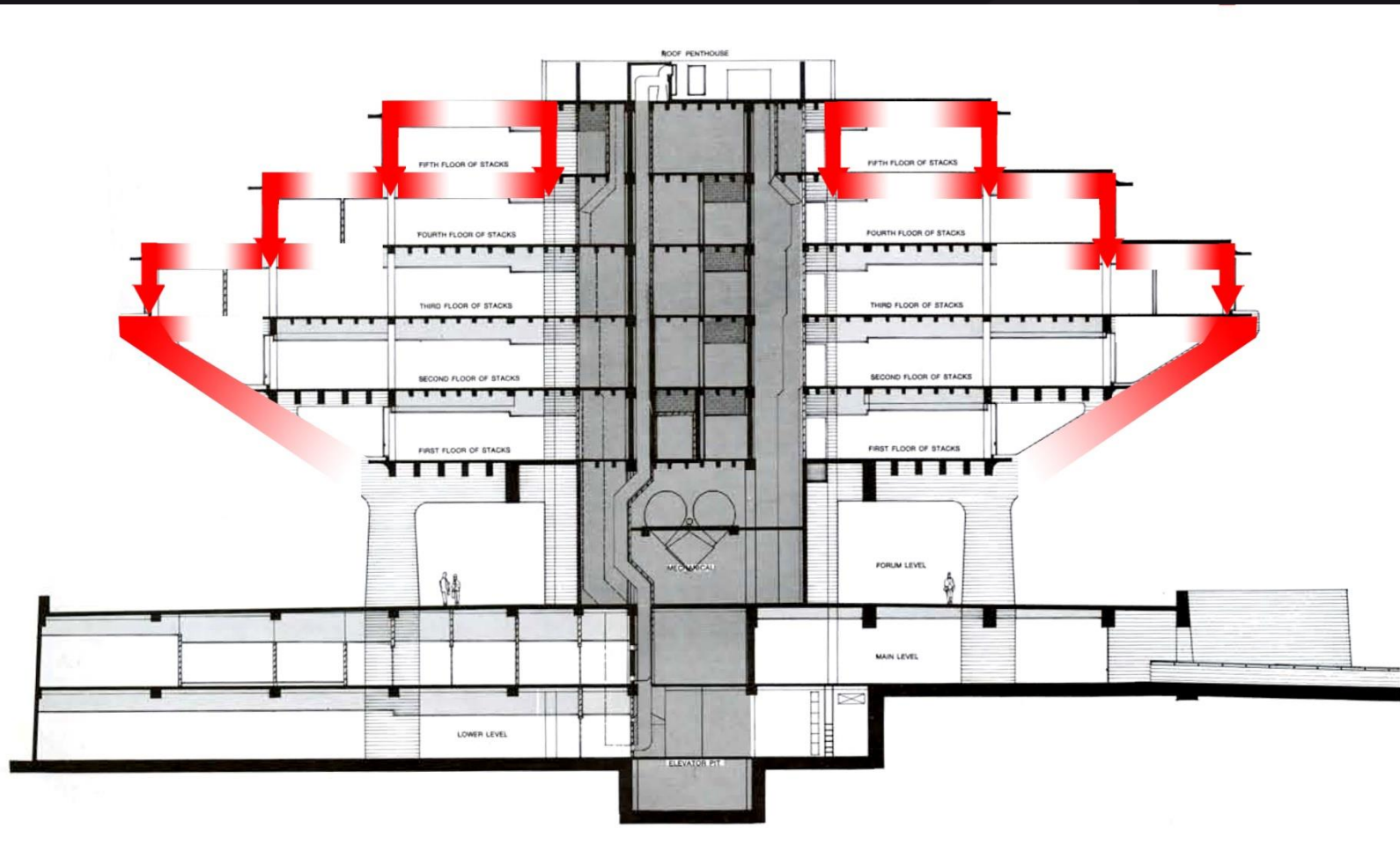


# Structure: Vertical loading

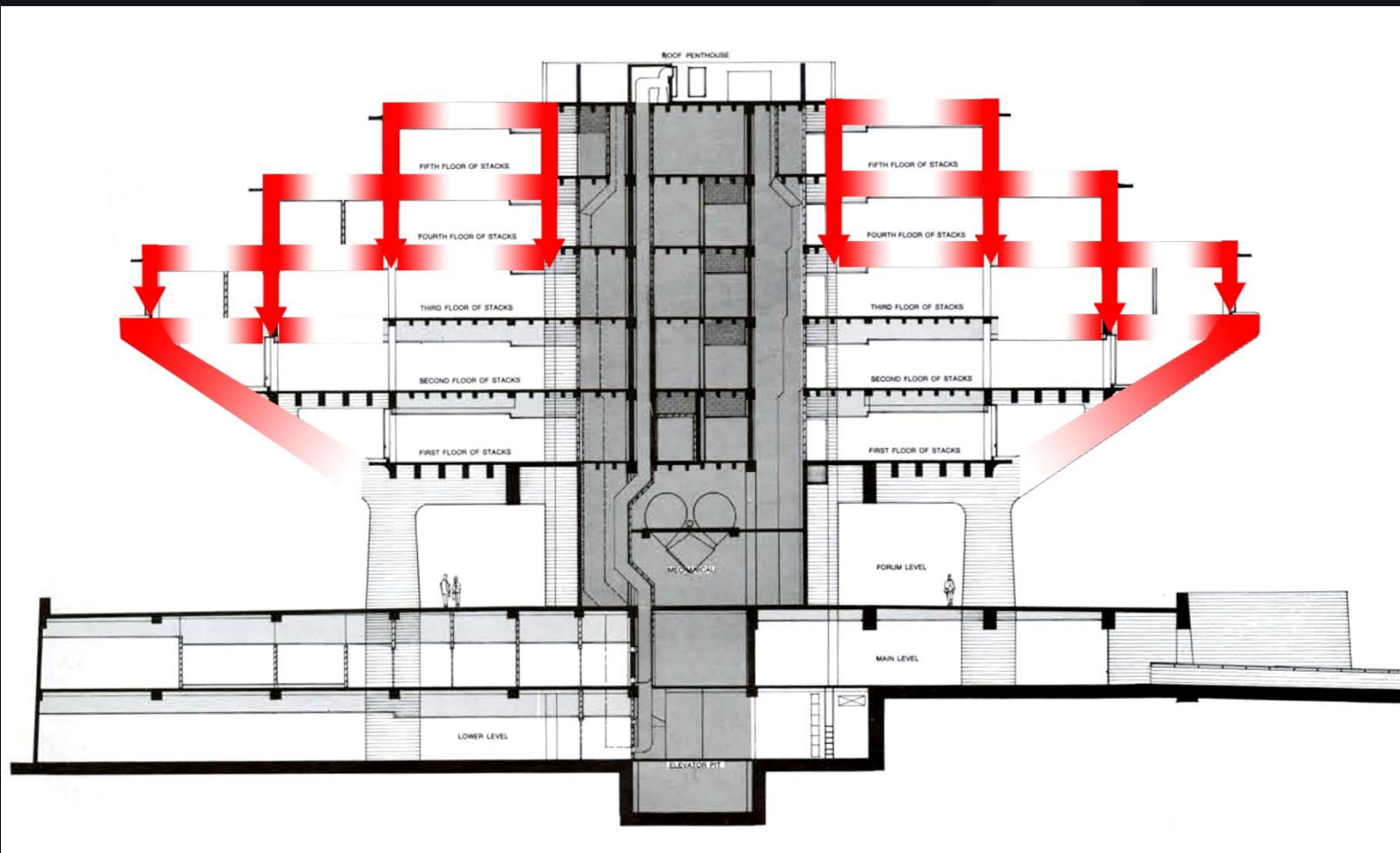
Exterior column loads in the tower 2400k-2475k

Interior column loads in tower 700k-800k

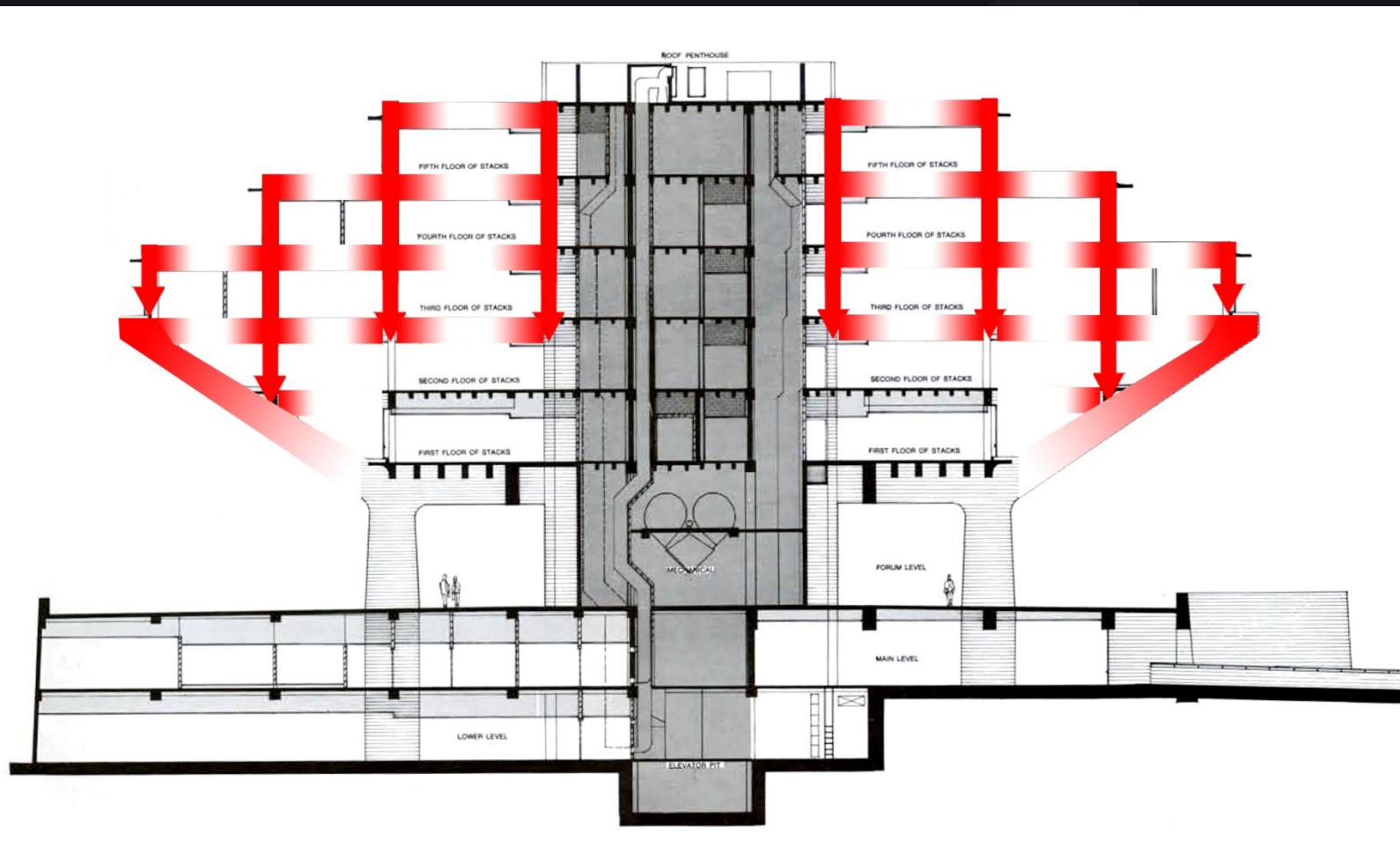
Column loads not in tower 150k-200k



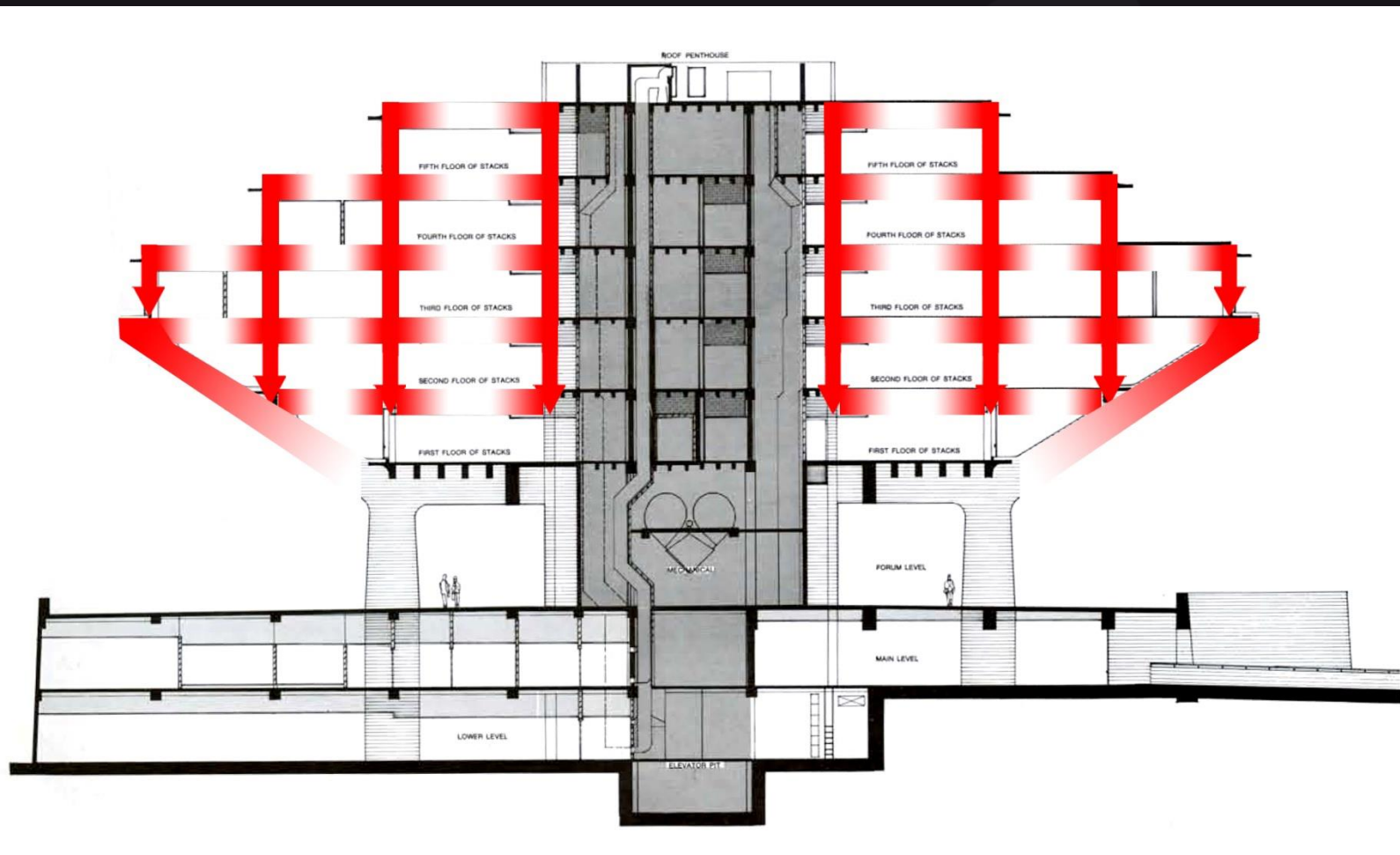
# Structure: Vertical loading



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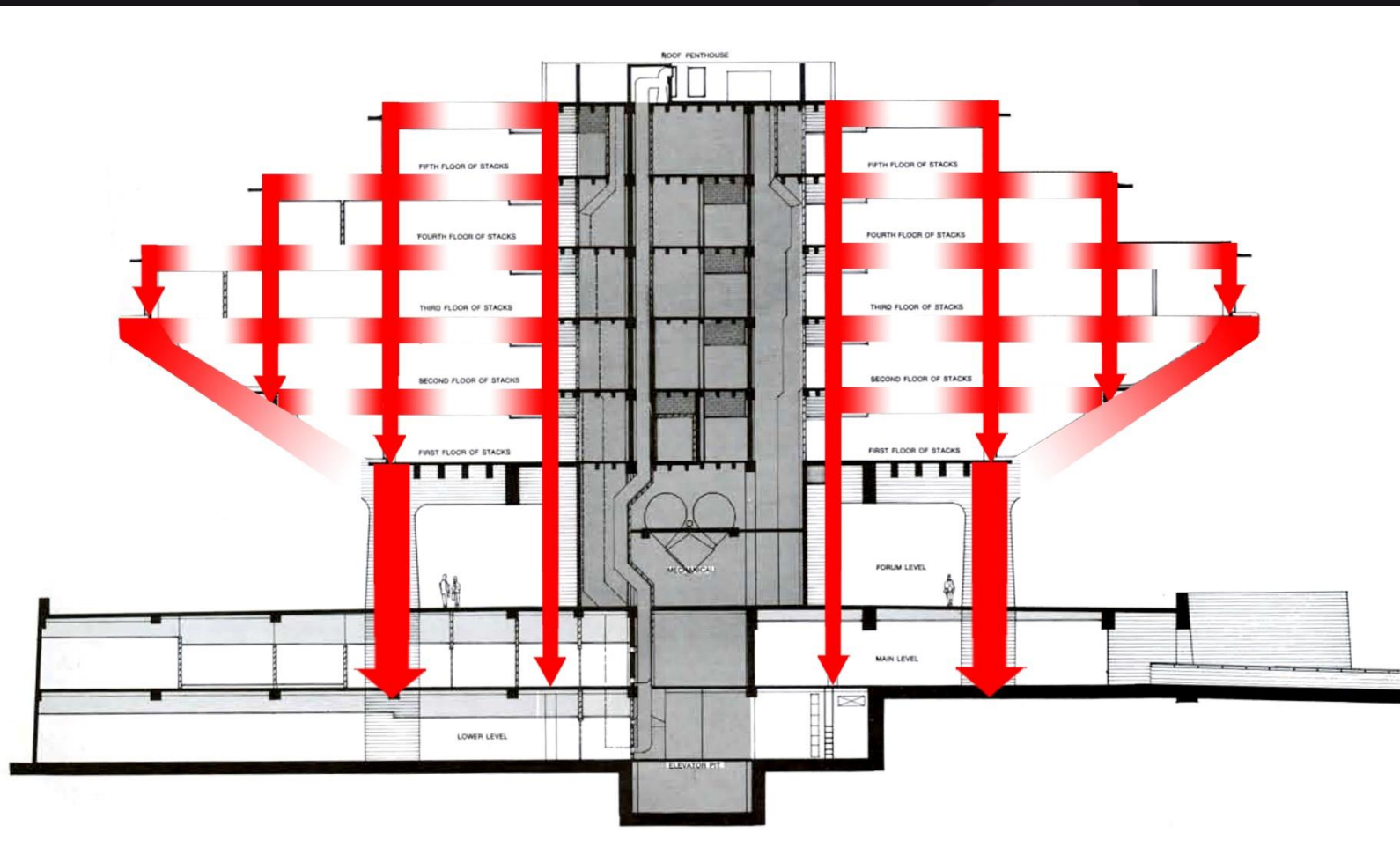


# Structure: Vertical loading

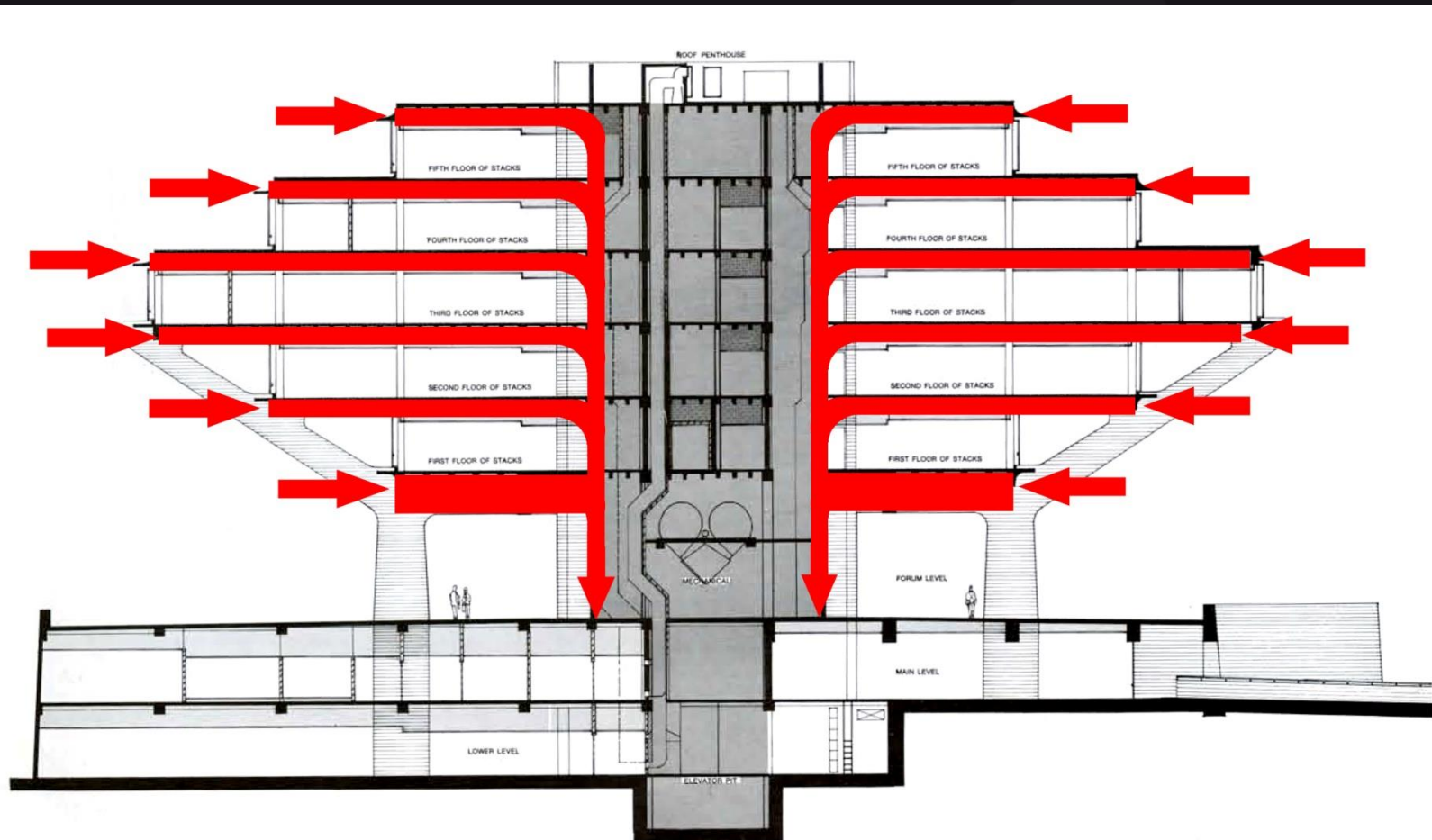




# Structure: Vertical loading

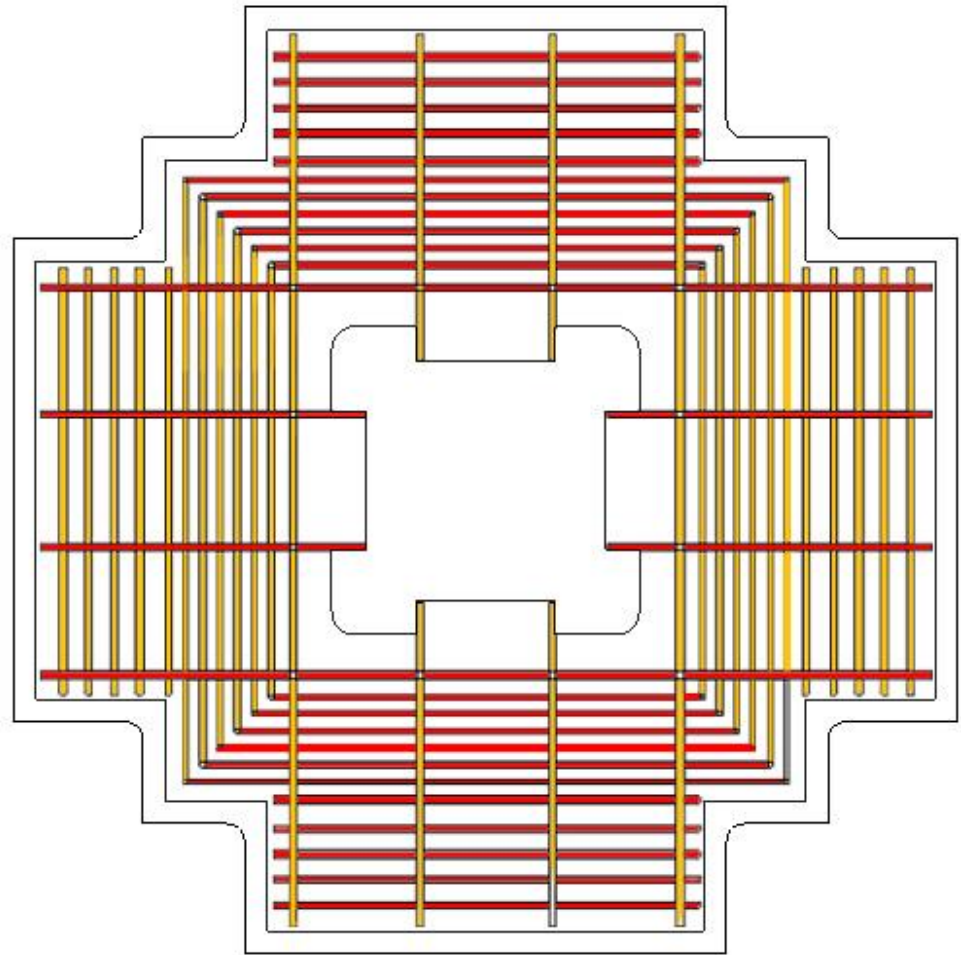


# Structure: Lateral loading



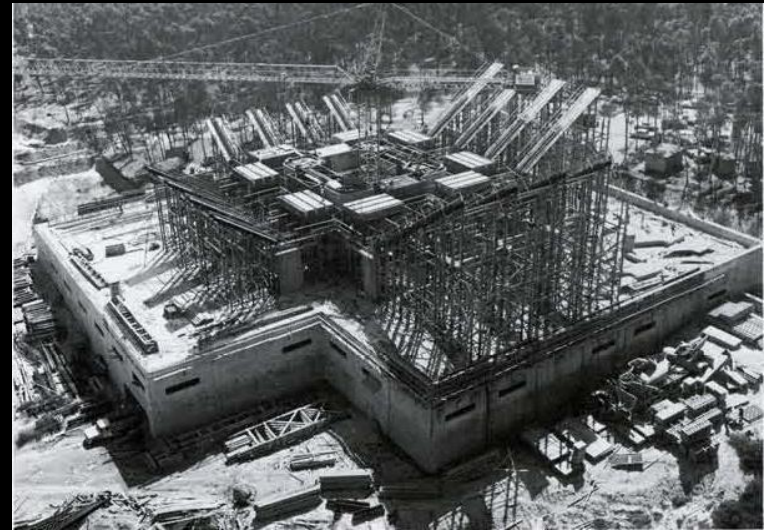
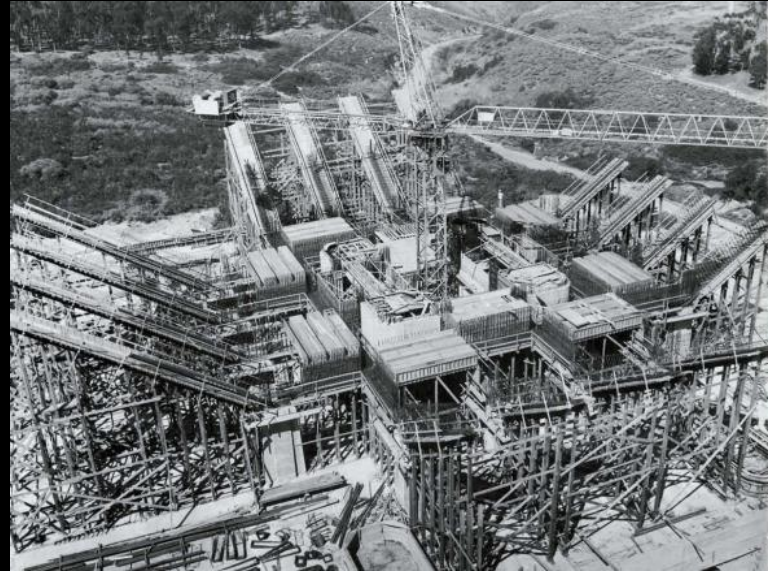
# Structure: Roof System

Two way floor system  
Diaphragm – cast in place



# Construction

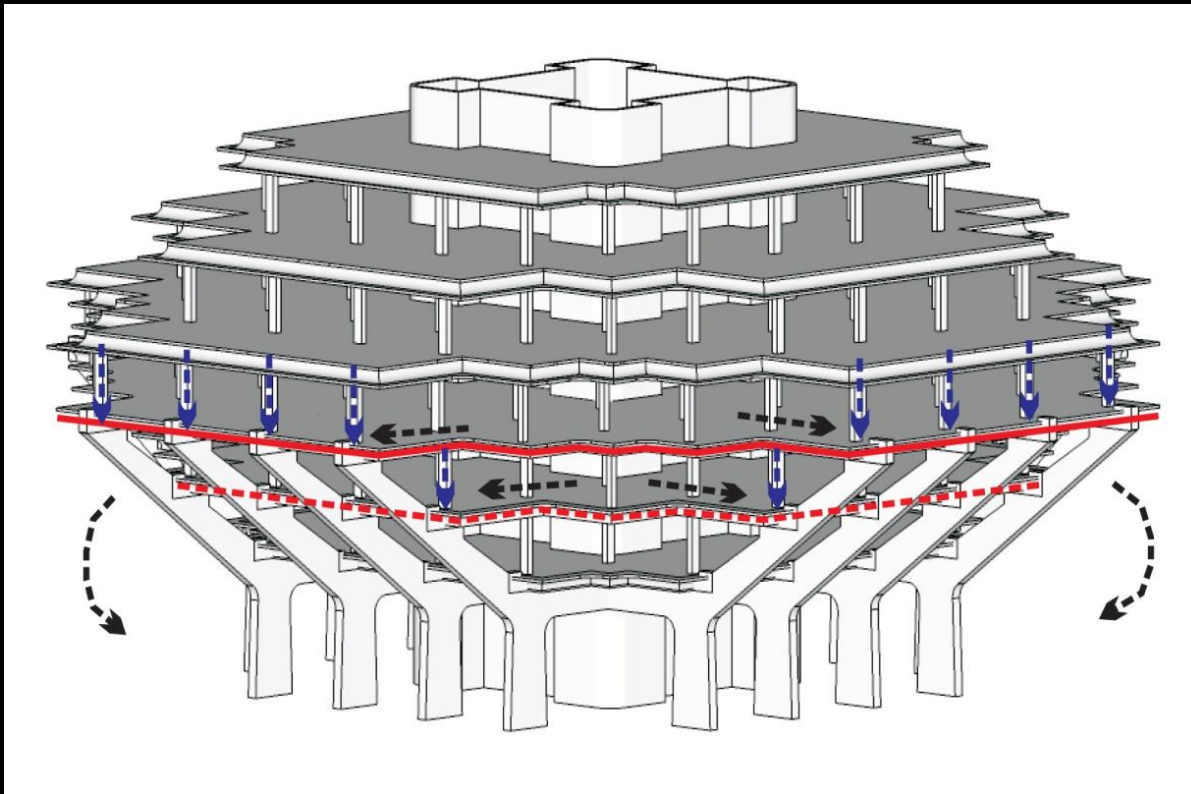
- .Construction began in 1968.
- .The center of the core was left open for placement of construction crane
- .The lower two levels were built first to act as a base for the scaffolding for formwork of the floors above .
- .The scaffolding was not removed until top floor was finished till 1969.
- .This was done since post-tensioning in the lower floors and peripheral beams at lower floors of the spheroid could not be executed correctly until the upper floors were constructed.
- .In 1970, Building was in full operation.





# Post-tensioning

- The nature of the loads causes the sloped beam columns to overturn outside. Hence, the peripheral beams tying these columns are post tensioned.
- Post-tensioning helps in designing an larger effective section in order to resist deflections. The ultimate strength of a post-tensioned beam is not overly superior to that of a similarly proportioned plain R.C.C beam. In a post-tensioned beam no tensile stresses are developed and hence no cracks develop.

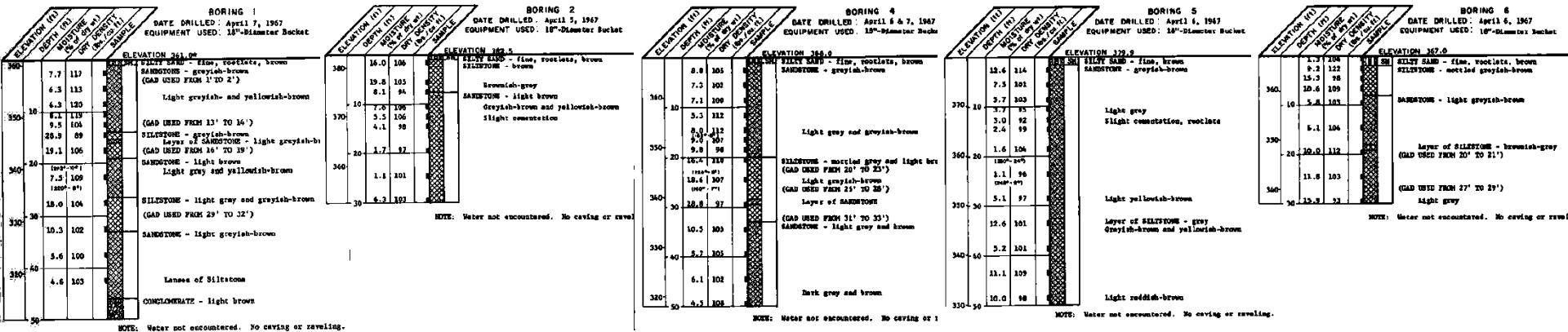


# Structure: soil & foundation

Shallow layer of sand/clay/silt over siltstone and sandstone

Concrete spread footings and caissons established in bedrock

Boring is much deeper where site is backfilled and where there is an existing fault line

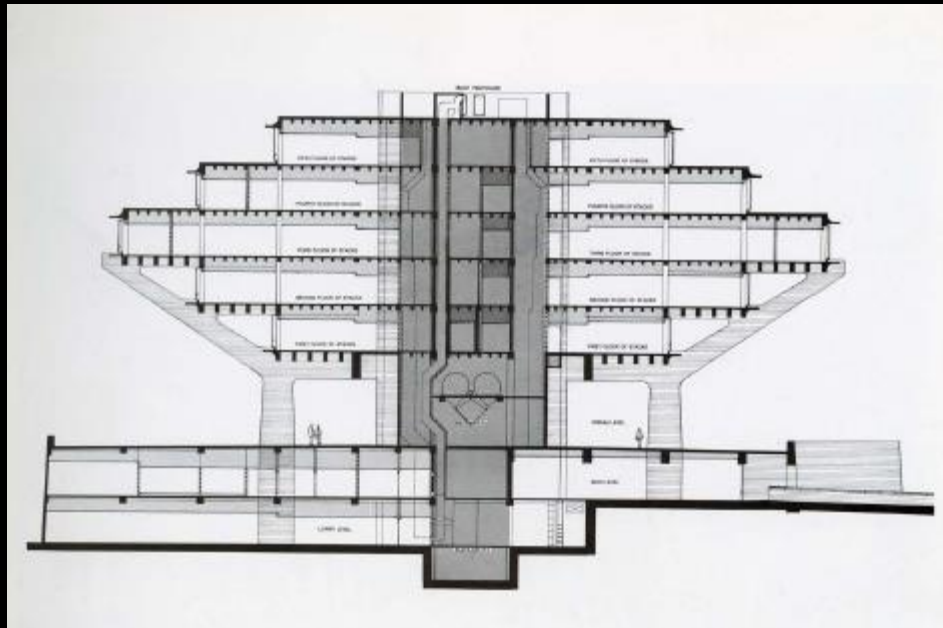




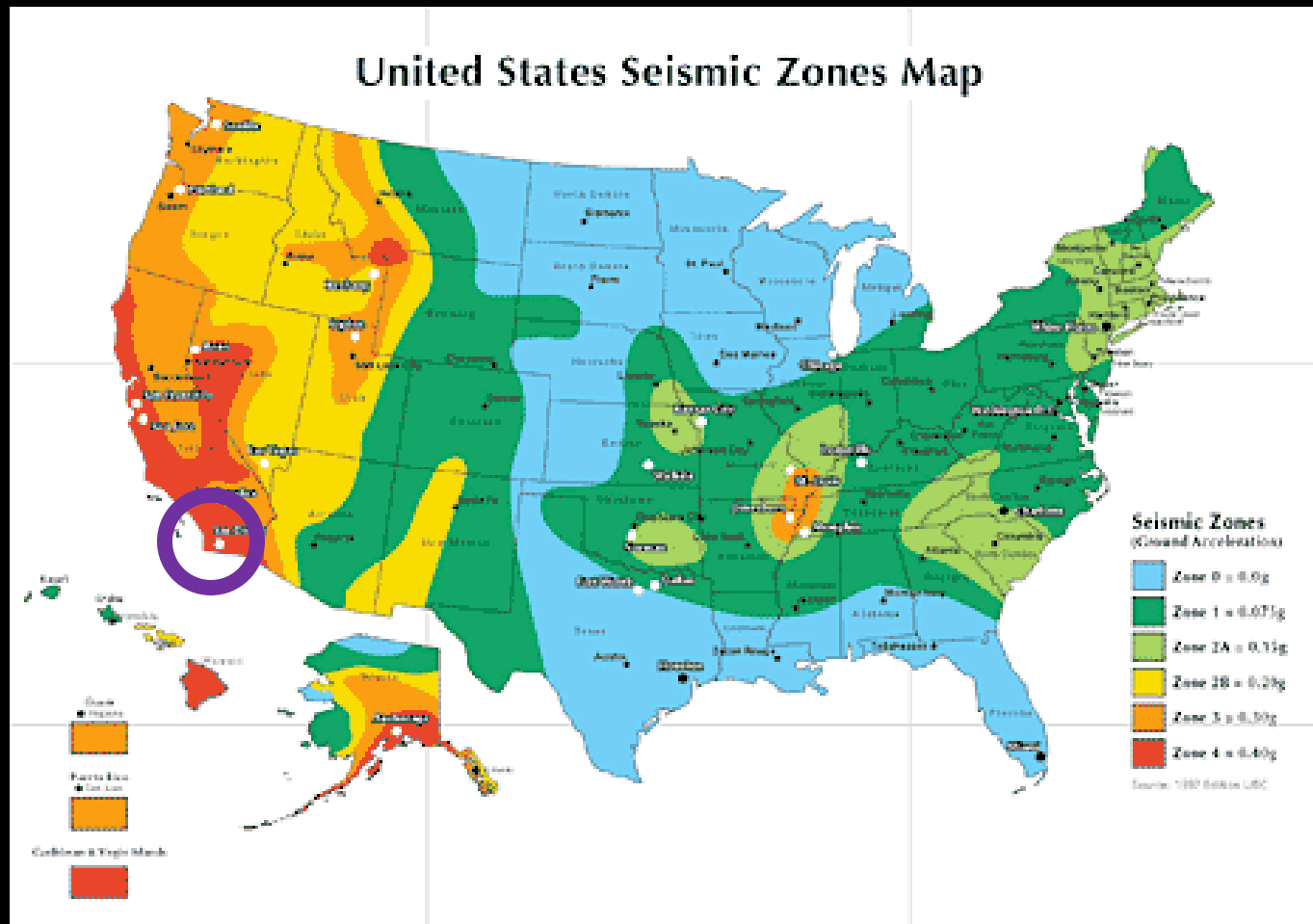
# Structure: soil & foundation

Variations in soil and boring depth cause differential settling

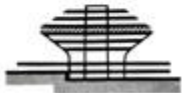
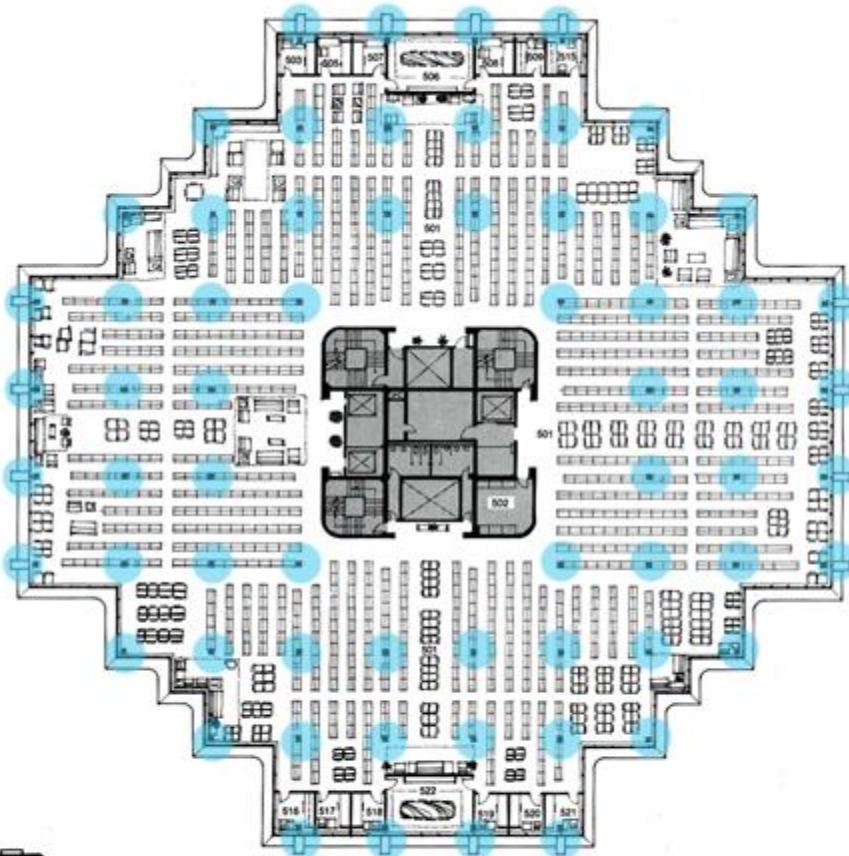
The structural tower was built before the non-tower portion was completed and prior to rigid connections to allow for pre-settling



# Structure: seismic loads



# Structure: seismic loads



0 8 24 48 FT.



Pereira planned for symmetrical dead and live loads to decrease the chance for destructive torsion

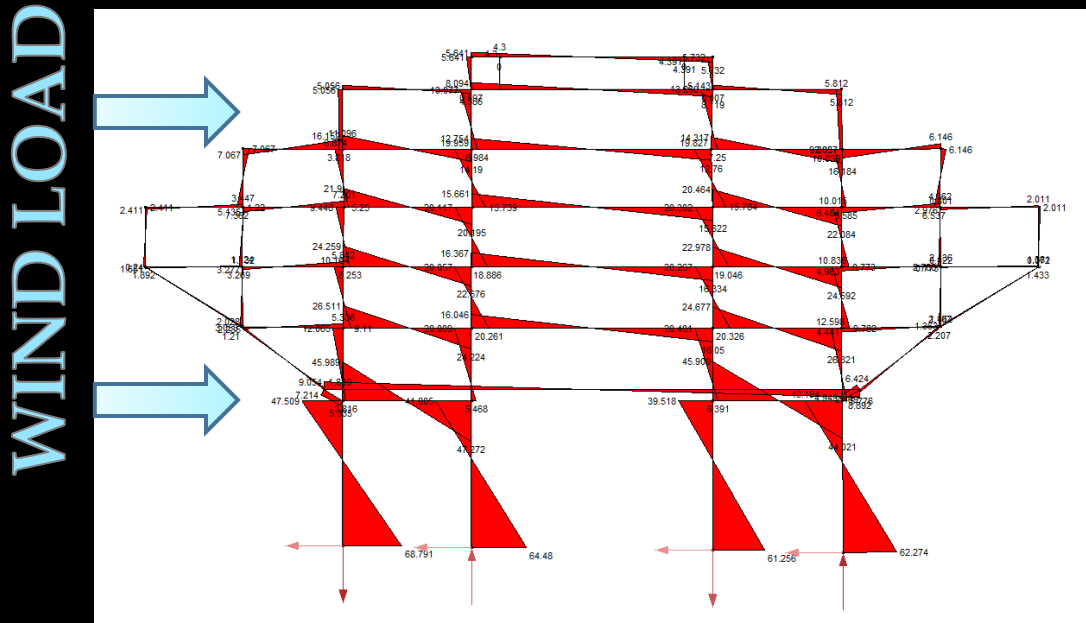
Expansion joints allow independent movement

Post-tensioned concrete tower and beam-columns designed to withstand 1/3 extra load

1000psf  
+ 3333psf  
4333psf

DL + LL  
wind & seismic

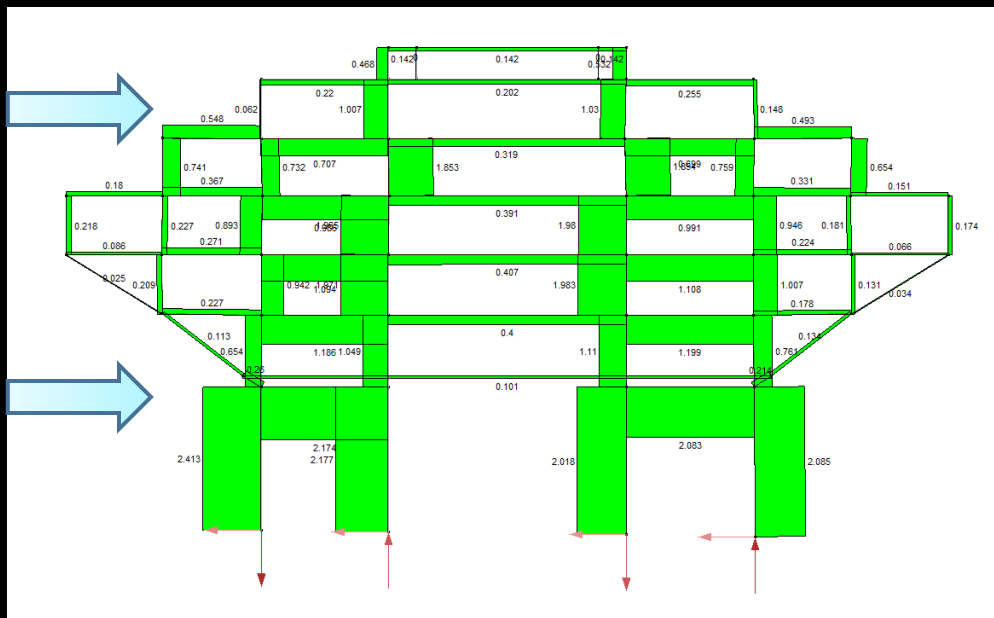
# Structure: Lateral Loading



Lateral loads from wind are worth noting, but not as significant as the gravity loads from a concrete structure. Because the mass is so large, Seismic loads are a large concern.

Tsunamis are also considered due to San Diego's geographical location.

# Structure: Lateral Loading



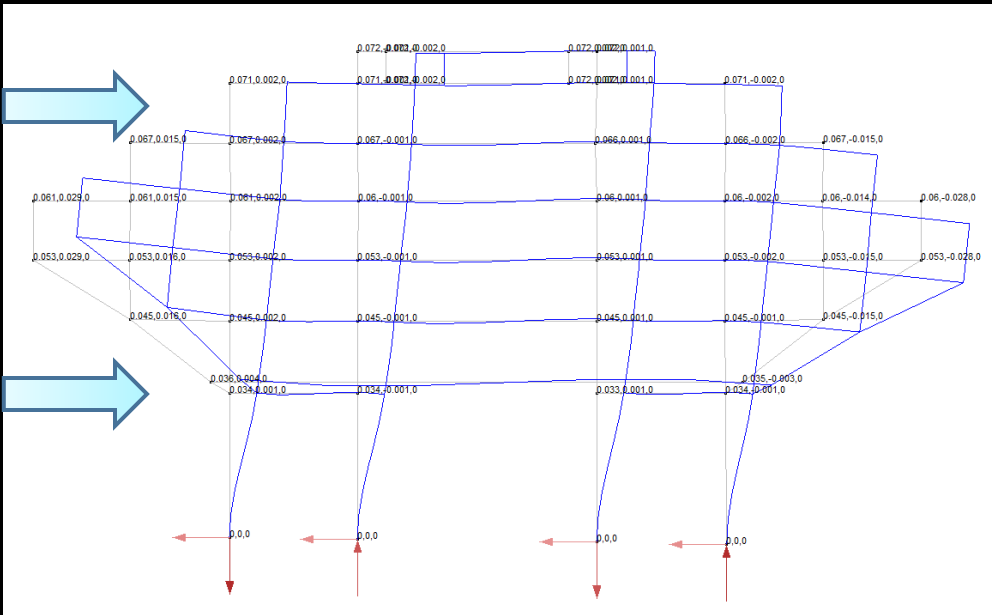
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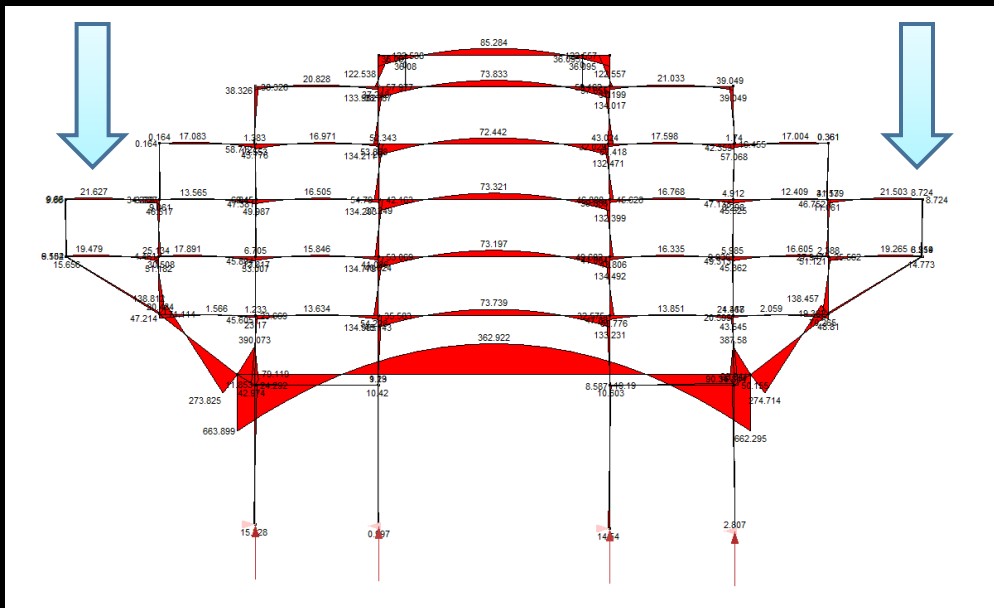
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# Structure: Lateral Loading

## GRAVITY LOAD

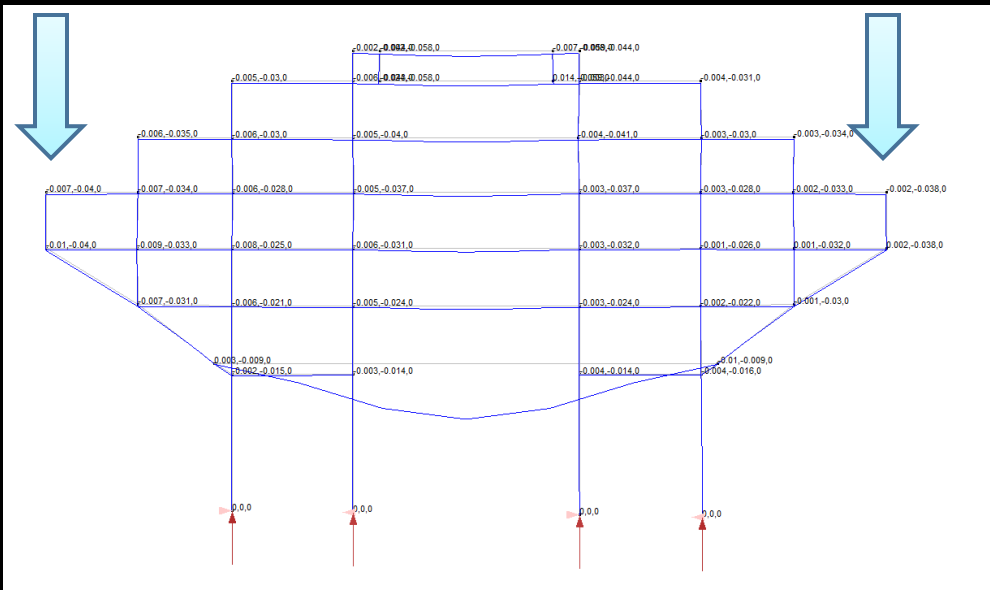


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# Structure: Lateral Loading

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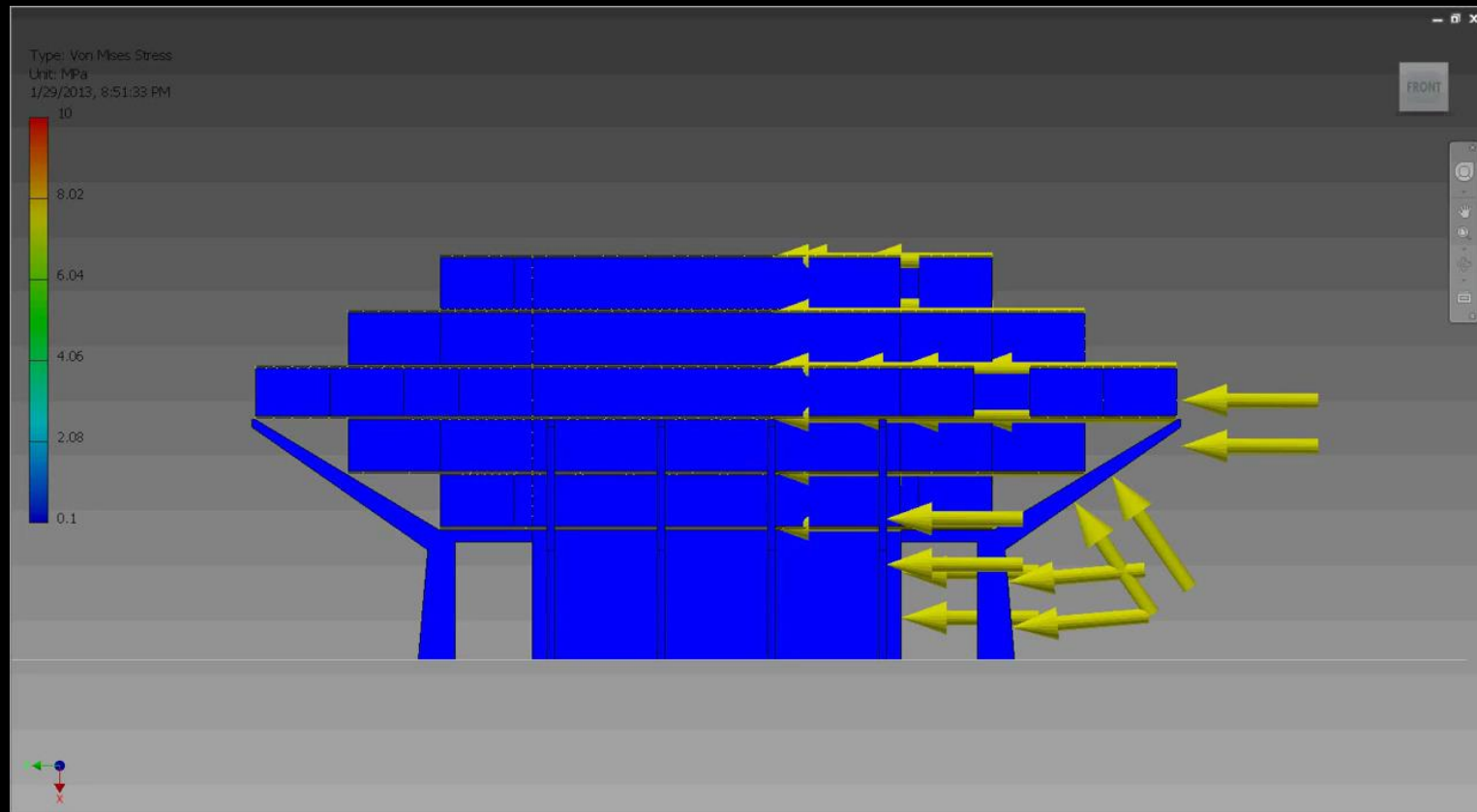


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# Structure: Lateral Loading

## Lateral Load from Tsunami



**conclusion**

# References

William L. Pereira & Associates, Planning & Architecture. *Central Library - University of California at San Diego*. Project Proposal. Corona Del Mar, CA: n.p., 1969. *Digital Archives*. University of California at San Diego Libraries. Web. 3 Nov. 2013.  
<[http://libraries.ucsd.edu/speccoll/DigitalArchives/z679\\_2u54w7\\_1969/z679\\_2\\_u54-w7-1969.pdf](http://libraries.ucsd.edu/speccoll/DigitalArchives/z679_2u54w7_1969/z679_2_u54-w7-1969.pdf)>.