Geisel Library

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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 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:
1st level of stacks
Design Concept

Above Forum:
2nd level of stacks
Design Concept

Above Forum: 3rd level of stacks
Design Concept

Above Forum: 4th level of stacks
Design Concept

Above Forum:
5th 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.

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**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\textsuperscript{nd} 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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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
Structure: Vertical loading
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
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

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
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.
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Structure: Lateral Loading
Lateral Load from Tsunami
conclusion
References