BACKGROUND

2004

OMA/LMN - Rem Koolhaas & Joshua Prince-Ramus

Magnusson Klemencic

362,987 sf.

$169.2 mil

Redefine Library

Form by Program
THE STRUCTURAL SYSTEM

Concrete base and shear walls
Beam-columns
Platforms and mega-trusses
Some traditional framing
CONNECTIONS

Diagrid

Non-vertical Faces

2 support connections per diamond

Setting blocks

Mullion system - screw-within-a-screw connect

Vertical Faces

Structural

No seismic steel

Deeper aluminum

Armatures

Threaded rod attachments
CONNECTIONS

Slanted Columns

- Pinned connection at bottom
- Welded connection to diagrid structure
- Afterthought - cut and welded on site
LATERAL COMPONENTS

Diagrid

Beam columns

Non-symmetrical - offset floors result in twisting
LOAD TRANSFER

Shear walls and lower column grid

on the northwest corner

transfer loads down to foundation
LOAD TRANSFER

Central loads
down elevator core and vertical columns

Other loads and thrust from beam columns
carried to platform edges, down mega trusses, out to diagrid
MULTIFRAME ANALYSIS

Gravity Loads

Loads Distribute

Axial Loads Diagram
MULTIFRAME ANALYSIS

Bending Moment Diagram

Shear Diagram
MULTIFRAME ANALYSIS

Wind Loads
Find the wind speed according to the ASCE -7-05 Chapter 6

Total lateral load from one side = 7.6 lb/ft^2 * 24145 ft^2 / 4 = 47775.5 lb

Distributed load along the edge = 47775.5 lb / 174 ft = 275 lb/ft
MULTIFRAME ANALYSIS

Wind Loads

Loads Distribute

Axial Loads Diagram
MULTIFRAME ANALYSIS

Bending Moment Diagram

Shear Diagram
FOUNDATION SYSTEM

Soil Type - Seismic Site Class C

Shallow Foundation System
Mat-slab Foundations
Spread Footing Foundations
Mat-slab Foundations

Dimension: 44 ft * 65 ft
Location: Under stairway cores

Northwest corner: Combined Footings
Spread Footings

Elevation Change Follow the slope of site
Soil Bearing Pressure

\[ q = \frac{P}{A} \]

Where  
- \( q \) = Soil bearing pressure  
- \( P \) = Load applied  
- \( A \) = Area of the footing
Spread Footings

Significant Factors:
- Structure Load
- Penetration
- Frost heave & Shrink-swell

Allowable Bearing Pressure: 10000 psf
The 30x30 footing has an area of 900 ft^2. The soil capacity for Class C is 1,500 lb/ft^2.

Using the equation $q = \frac{p}{a}$ we find $p$ to be 1.3 Million lbs. This 1.3 Million lbs represents the maximum column load per footing.

The allowable bearing pressure per footing over most of the site is 10,000 lb/ft^2.
QUESTIONS? COMMENTS? CONCERNS? REGRETS?

Thank You!
SOURCES


https://lmnarchitects.com/case-study/seattle-central-library-curtain-wall-design


https://meliskucuktunc.wordpress.com/2015/04/10/structural-analysis-seattle-public-library/

http://www.spl.org/locations/central-library/cen-building-facts

http://www.spl.org/prebuilt/cen_conceptbook/page2.htm


http://formativecomplexity.blogspot.com/2012/02/oma-seattle-public-library-globalized.html