Citicorp Center: New York, NY

A Structural Analysis

Architect: Hugh Stubbins

Structural Engineer: William LeMessurier
General Information

• Architect: Hugh Stubbins
• Structural engineer: William LeMessurier
• Site: Lexington Avenue & 54th Street
• Construction Date: 1974-1977

• Height: 915 ft (7th tallest structure in New York City)
• Height of atrium: 114 ft
• # of floors: 59, 46 of office space

• Total square footage:
  • Office Level: 24400 ft²
  • Plaza Area: 9000 ft²

• Building Use: office
• Building Cost: 195 Million
Unique Structural Considerations

• Existing buildings on the site
• Major subway station located underneath
• Air rights were sold to allow development overtop
Concourse Level
• Open to street level
• Connected to the subway
• Church located on Northwest corner
• Office/Retail on the Southeast corner

First, Second & Third Floor
• Connected to retail & restaurants

Typical Floor Plan
• Open office floor plan
• 4’-9’ building module throughout
• Centrally located elevator core
• Exterior columns with diagonal cross bracing
Materials

• Structural Steel Members
  • W21x44-45 for horizontal floor plates
  • W14x550 for diagonal bracing
  • W8x24-31-48 for vertical columns
  • W12x40-58-85 for interior columns
  • Columns were reinforced with steel to protect against terrorist attacks

• Concrete
  • Reinforced concrete throughout floor plates
  • Reinforced concrete columns
  • Steel reinforcement allows concrete spans and cantilever

• Aluminum
  • Exterior building cladding
  • Light weight and cheaper than steel

• Glass
  • Mirror finish
  • Aesthetic from mirror and aluminum finish
Aluminum & Glass Cladding

• Aluminum Material Properties
  • Light weight
  • Cost
  • Satin mirror finish reflects light
  • Hides interior structure
  • Post-Modern Period

• Mirror Glass Façade
  • Emphasizes Post-Modern
  • Allows natural light
  • 46% of exterior façade
  • Binary bands
Building Construction

• 6 - 8 Story modules
  • Each structural independent
  • One full chevron bracing per module
• Each corner cantilevers out 45 feet
• Sitting on four columns located at the center of each side with a central core
• Loads are transferred from the six modules through the chevron bracing to each of the columns
Tuned Mass Damper

- 400 ton concrete block
- Uses two hydraulic pumps to stabilize the block
- Located at the uppermost full floor plate
Multiframe – Shear Diagram

Multiframe – Moment Diagram
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southern ellis . kyle reader . matt miller . will paton . andrew pipkin
• The slender profile has a tendency to produce a periodic shedding of vortices

• A main design concern for the Citicorp Center was avoiding lock-in

• Flutter was alleviated by welded connections which limited torsional movements
References:

Braybrooke, Susan. ARCHITECTURE: The Design Experience. New York: John Wiley & Sons


Citigroup Center’s Secrets
http://www.youtube.com/watch?v=bXpyukjQoGw

Music:
“O Fortuna” – Carl Orff