Structural Requirements

(for the design Engineer of Record)

Presented by:

Lindsay Anderson

Consultant Structural Plan Examiner

and

Dixit Patel

Structural Plan Examiner

Structural Requirements

Overview

1. Department Clarification Memorandums
2. Building Permit Submittal Requirements
3. Building Code Structural Design Requirements

CITY OF CHICAGO
DEPARTMENT OF BUILDINGS

Structural Requirements

Clarification Memorandums

Clarification memos are posted on the DOB website. Search for "Chicago Building Code Clarifications & Memorandums"

1. Soil Improvement Systems - Geopiers or Stone Columns
2. Glass as a Structural Material in Guardrails and Handrails
3. Earth Retention Systems
4. Pile Deep Foundations
5. Use of Cold Formed Steel Framing for Bearing Walls in Residential Buildings of Type I Construction

Structural Requirements

Submittals

Submittal requirements apply to all projects, regardless of permit review process.

- Drawing Requirements
- Existing Building Requirements
- Professional of Record
- Floor Load Placards
- Structural Calculations

Provide Structural Drawings

- General Information
  - Provide gravity and wind design loads. Comply with CBC Tables. Include partition loads.
  - Provide roof loads including snow drift load diagrams.
  - Provide structural material specifications.
  - Provide appropriate general notes.

Structural Requirements

DRAWING REQUIREMENTS

- General Information
  - Limit allowable soil bearing pressure to 3,000 psf with a note indicating that a soil testing agency is to confirm this capacity prior to placing concrete for footings.

Earth Retention Systems

- ERS exceeding a depth of 12 feet require a Geotechnical Review

Foundations

- Provide a foundation plan and foundation details.
- Provide all dimensions including depth of footings.
- Provide concrete reinforcement as appropriate.
- Lot line foundations represent a special case.
- Foundations exceeding a depth of 12 feet require a Geotechnical Review

Foundations

- Foundations can not encroach upon the public way beyond that provided for in the CBC.

  What is the limitation of encroachment on the public way for deep foundations?

  Can structural information be provided on architectural drawings instead of submitting separate structural drawings?

Foundations

- Alternative Code Approval is required for steel pipe piles less than 10.75" in diameter and nominal wall thickness less than 0.25".
- Alternative Code Approval is required for steel helical piles.
- Alternative Code Approval is required for rock surface bearing of the caisson.
- Submit Alternative Code Approval Request (ACAR) to *altcodeapproval @cityofchicago.org*. Include approved ACAR signed by Department on plans.

Superstructure

- Provide a lateral load resisting system (shear walls, etc.).
- Provide floor and roof diaphragm connections to walls.
- Provide rooftop HVAC unit equipment load and location information.
- Provide typical & unique structural connections and member bearing details.
- Ensure that structural members are adequately braced.

Superstructure

- Provide anchorage of floor & roof structures to party walls
- Provide drawings for pre-engineered building components
- Provide load diagrams for pre-engineered trusses subject to non-uniform loads

Additions and Alterations

- Provide existing structure information whenever a change is to be made to the existing structure or the loads on that structure.
- Provide original permit drawings of existing structure or make on-site investigation.
- State the condition of the existing structure.
- Investigate the existing structure

Additions and Alterations

- Show pertinent portions of existing structure
- Original permitted drawings
- Investigate building
- Provide a report of existing conditions
- Submittals “For Reference Only”

Structural Requirements

Professional of Record

- Structural drawings and calculations must be prepared under the direct supervision of an Illinois-licensed Architect or Structural Engineer.
- Every structural sheet in the permit set must have a wet ink or electronic seal (including pre-engineered bldg. component drawings).

Structural Requirements

Professional of Record

- The Architect of Record (Architect or Structural Engineer) is allowed to prepare, and seal all sheets (ASMEP). Professional Engineers are only allowed to prepare and seal the MEP sheets.
- The certification statement on the cover sheet must be sealed and signed by the Architect of Record.
- Every other sheet must include the seal and signature of the Illinois licensed design professional responsible for preparing that sheet.

Structural calculations are required for a structural review

- One set of sealed and signed calculations is required.
- The calculations assist the structural examiner in understanding the structural design.
- The calculations are reviewed but not stamp approved by DOB.
- The calculations should be complete and legible.
- Transfer details from calculations to drawings.

Structural Requirements

FLOOR LOAD PLACARDS

Structural Floor Load Placards must be obtained for storage and file rooms as well as mercantile, industrial, and technology center uses.

- Submit a completed Floor Load Placard Data Sheet for each required location in the building.
- Submit structural calculations and building framing plans for a structural review.
- Obtain and prepare the actual Load Placard for each location. Include a key plan.
- Pay the placard fee.
- Obtain the approval stamp on placard from the structural examiner.
- Upload the Placard(s) to ProjectDox.

Structural Requirements

Structural Design

- Load Requirements
- Foundation Design
- Superstructure Design
- Lateral Load Resisting System
- Lateral Bracing of Structural Elements
- Materials
- Undermine Existing Structures

Chicago Building Code

- Group 16 Chapter 13-52 Minimum Design Loads

Resource Documents

- ASCE 7

Structural Requirements

Foundation Design

- Spread Footings
- Strip Footings
- Lot Line Footings
  - Unequal soil pressure
  - Continuity with foundation wall
- Lateral Earth Pressure
- Deep foundations
  - Caissons
  - Piles
  - Micro piles & Helical Piles
    - Load tests
    - ACAR required for piles not covered in CBC 13-132.

Structural Requirements

Superstructure Design

- Structural Steel Frame
  - Rolled shapes
  - Built-up sections
  - Trusses
  - Connections
- Pre-engineered Buildings
- Concrete Frame
  - One way system
  - Two-way slab
- Precast Concrete
  - Design
  - Connections

- Wood Frame
  - Manufactured wood products
  - Solid lumber
    - Availability
  - Connections
  - Continuity
- Masonry Bearing Walls
  - Support wood or steel floor and roof framing
  - Continuity

Source of Lateral Loads

- Wind
  - CBC wind loads
  - ASCE 7 wind loads & distribution
  - Photovoltaic panel
    - CBC ASCE 7-05
    - SEAOC PV2-2012
- General Stability

General Concepts

- Wind load impinges on walls (or lateral load impinges on structure)
- Walls transfer loads to floor and roof diaphragms
- Diaphragms transfer load to shear walls or frames
- Shear walls and frames transfer lateral loads to foundations
- Foundations transfer lateral load to soil within allowable pressures
- Continuous load path

Structural Requirements

Lateral Load Resisting System

- Structural Steel Frame
  - Braced frame
  - Moment frame
  - Concrete or masonry shear walls
- Concrete Frame
  - Braced frame
  - Moment frame
  - Shear walls
- Precast Concrete
  - Shear Walls

Structural Requirements

Lateral Load Resisting System

- Wood Frame
  - Braced frame
  - Wood shear walls
  - Concrete or masonry shear walls
- Masonry Bearing Walls
  - Simple span to resist wind loads
  - Shear walls
    - Reinforcement to fit cells
    - Continuity

Structural Requirements

Lateral Bracing of Structural Elements

- Columns
  - Floor framing must intersect column in both axes
- Beams
  - Lateral unbraced length must be considered in design
  - Lintels are not to be braced by the wall that they support
- Masonry Walls
  - Check thickness to height limitations for unreinforced walls as per ACI 530 for empirical design

Structural Requirements

Materials/ References

- Steel
  - AISC ASD 1989 or latest addition
- Steel Joists
  - SJI Standard Specification
- Metal Deck
- Cold Formed Light Gage Steel
  - AISI Manual
- Aluminum & Metal Alloys
  - ACAR is Required

Structural Requirements

Materials/ References

- Aluminum & Metal Alloys
  - Provide design drawings
- Concrete & Precast Concrete
  - ACI 318
  - ACI 301
  - ACI 315
- Masonry Design
  - ACI 530
- Wood
  - National Design Specification(NDS)
- Structural Glass Systems
  - ACAR or Standards & Tests

Structural Requirements

Existing Structures

- Change Use of Building
- Repairs
- Additional Loads
  - Additional floor/penthouse
  - Mechanical equipment
  - Wireless transmission equipment
  - Storage
- Revise Gravity Load Path
  - Create or remove openings
  - Move columns or foundations

Structural Requirements

Existing Structures

- Revise Lateral Load Resisting System
- Revise Exterior Enclosure
  - Add or remove openings
  - Revise/replace curtain wall
- Add to Structure
  - Remove exterior shear walls
  - Add to existing lateral load resisting system

Structural Requirements

Undermine Existing Structures

- Excavation Certification Form
- Bottom of New Building Foundation Below Adjacent Footings
- Knowledge of Soil Conditions
- Provide Lateral Support Both During Construction and After Completion
- A Geotechnical review is required for excavation >12 ft.

Structural Requirements

Contacts

Dixit Patel
Structural Examiner
312.744.7620

Jamaica McCarthy
Structural Examiner
312.744.6145

Man Leung
Structural Examiner
312.744.8081

QUESTIONS & ANSWERS