Design of a Large Scale Structure
Objective

- To design a sustainable modern and efficient residential building on Illinois Institute of Technology’s campus, replacing an outdated and unsightly graduate dorm.
- Use advanced design techniques to facilitate both the initial design and subsequent revisions.
Team Organization

- **Structural Design & Analysis**
  - Responsible for design of a complete structural system incorporating precast structural concrete.

- **Foundations**
  - Responsible for the analysis of existing soil conditions and design of a foundation system and basement structure for the proposed building.
  - Responsible for examining the existing site and utilities and creating a civil site plan.
Structural Design & Analysis

- Coordination with architects from IPRO 335
- Choose structural system
  - Using precast and cast-in-place concrete
  - Gravity load bearing system
  - Lateral load resisting system
    - Shear wall and moment frame dual system
- Lay out column grid & floor system (in progress)
  - Determine column locations and girder spans
  - Calculate column, girder, and beam loading
Structural Layout
Structural Model
Structural Design & Analysis

Looking forward:

- Sizing structural members
- Analyzing structural integrity and strength
- Follow current design codes (ACI 318 and CBC)
- Use computer-aided analysis programs to facilitate analysis
Research and analysis of existing conditions

- Obtained soil boring logs from MTCC construction defining the properties and depth of the soil strata.
- Acquired existing site plan and utilities map from IIT Facilities department
- Planned site visit to identify utilities and obstructions
Soil Boring Log

- **SAND (SP)**
- **SILT (ML)**
- **SILTY CLAY (CL)**
- **SILTY CLAY (CL)**
- **CLAYEY SILT (CL-ML)**
  (CHICAGO HARDPAN)
Selection of Foundation System

- Drilled reinforced concrete caissons extending to the hardpan layer
- Sheet pile retaining structure and dewatering system to allow construction below the ground water table
- Construction methods used to minimize site impact and disturbances to surrounding area.
Looking Forward

- Site visit to identify and locate utilities and obstructions to construction
- Calculate allowable bearing pressures for the existing soil
- Coordinate with the Structural Analysis team to determine the required foundation capacity
- Design foundation system to safely carry the weight of the structure and prevent large settlements of the structure, following ACI 318-05 and CBC.
What Lies Ahead

- Continued cooperation with IPRO 335
  - Design revisions, support on engineering issues
- Design and Analysis of Load Bearing Systems
  - Structural system
  - Foundation system
- Finalization of Site plan and Excavation Procedures
- Questions