Deliverable #1 – Conceptual Design – Structures

General

The Conceptual Design, as envisioned for this course, makes up the initial stage of the design process. Typically the owner, architect, and engineers are the only parties involved at this point. The concept behind this stage of design is to assemble all of the necessary information required to create a general framing baseline so that design iteration may take place, design constraints become apparent, and preliminary budgeting may occur. The structural documents should contain a general conceptual design that addresses the following:

- Structural types (steel, concrete, timber, masonry, or mixed types)
- The applicable codes, loads, and design constraints of the building
- General building layout, including rough plans for space utilization on each floor level and possible structural types
- A preliminary foundation design for the building

Resources

- The faculty associated with this course
- The industry mentors
- International Building Code (IBC) 2009 (or as required by the governing building department)
- ASCE 7-05 Minimum Design Loads for Buildings and Other Structures
- Local/Regional Building Codes/Amendments as applicable

Process

1. Find out what building code(s) will be applicable to your project.
2. Develop a list of applicable loads for your project.
3. Consider the placement of columns consistent with the general floor plans developed by the group as a whole, consider the structural floor system of your choice (note: a comprehensive floor system design is not required at this design stage – but considers spans versus the chosen material).
4. Based on the general floor plan and room usage/occupancy, research typical dead and live loads for your choice of structural system. Consider roof snow loads per the applicable code.
5. Develop a preliminary stairway design.
6. Develop a preliminary structure and foundation layout considering the following:
   a. Do all of the columns and walls start at the foundation? If a column or a wall does not start at the foundation, where do those loads go?
   b. Are there any large open spaces that cannot have columns in them?
   c. How do you deal with all of the different floor loads (in coordination with foundation issues)?
7. Decide on a foundation type based on the site specific constraints and the loads.
Deliverables (100 Total Points)

1. **Description.** A technical narrative describing the building (location, size, use, etc.) and the process of structural design thus far (placement of various occupancy types, and any design constraints that need special considerations).
   - Include a detailed section on why the structural system and structural materials you are using were selected.
   - Include descriptions of any structural system(s) and structural materials that you have considered during the process. If necessary, simple drawings can be included in this part.
   - Based on the lecture on Codes, provide a summary of the codes and standards that you need to account in your design.

   *(25 Possible Points)*

2. **Calculation.** A preliminary calculations section for various loads in the structure using the applicable building code(s) for dead and live load values that correspond with the selected materials and occupancy types (such as public use space, corridor use, exhibit area, office use, etc.), and lateral and snow loading design parameters.
   - Include documentation of the appropriate building codes and design parameters used in your calculation in the cover page of the drawings (see next section).
   - Include a preliminary “typical” foundation design for the building along with a design detail (“typical” being the governing case for the primary foundation system used).

   *(40 possible Points)*

3. **Drawings.** Preliminary drawings for the chosen structural option(s). These should include the major structural components such as columns, load bearing walls, and the layout of girders. They should not include structural floor system details or shear resisting elements at this point. Note that a lot of judgments and assumptions can be used in this phase.
   - Include a “General Notes” section on the cover page of the drawings indicating the material properties, applicable codes and the appropriate wind and snow loading design parameters that will be used in the design.

   *(35 Possible Points)*

*For the first meeting with mentors*

Show your work to mentors on Items 1, 2, 3, and 6 as described in Process. Preliminary drawings should be ready. The calculations can be completed after the meeting.