Structure and Systems Delivery for Urban Micro-housing Tower in NYC

Overview
The New York City housing stock census numbers showed that there is a need for 800,000 low cost single person apartments. To address this need, a housing solution must be developed for potential implementation at preselected sites along the East River in Brooklyn, NYC. This solution must be simple and easy to build, while maintaining structural stability and providing all necessary utilities.

Objectives
PSU Architecture I set out to design an apartment complex with the following goals:

- Creating a frame superstructure with removable “capsule” unit housing
- Designing a safe and effective capsule mounting method
- Laying out a streamlined and efficient utility delivery method
- Optimizing capsule floor space and livability
- Ensuring the final design is aesthetically pleasing

Approach
- Research previously created Japanese capsule unit housing and NYC building code standards
- Gather and rank customer needs using sponsor input and human living necessities
- Generate, design, and model 5 capsule unit apartment concepts
- Schedule a design review and proceed with a single concept based upon sponsor selection
- Improve upon the selected design with refined CAD drawings and a detailed utility delivery system
- Perform FEA on capsule unit frames to ensure structural stability
- Calculate necessary pipe diameters and water flow rates to ensure utility system feasibility
- Generate DXF files to create a scaled model of an individual capsule unit
- Gather all necessary materials for capsule creation and assembly
- Cut the major capsule components using the Learning Factory laser cutter
- Assemble the capsule model

Outcomes
- The apartment complex can hold up to 140 individual capsule units
- Capsules are aesthetically pleasing and maximize livability
- The capsule mounting method and utility connections are simple and effective
- The capsule frames meet NYC building code loading requirements with a factor of safety of 3
- The apartment complex utility system meets all NYC building code flow rate requirements