Green Towers Vertical Aquaponic Microfarm

Overview
The lack of available farm and gardening land in urban areas makes it difficult to obtain locally grown fruits and vegetables. Green Towers is attempting to solve this problem by building "urban gardens" inside of vertically placed, twenty-foot tall shipping containers. The gardens utilize aquaponic technology, which makes them sustainable and easy to maintain. The gardens house multiple grow beds full of plants and vegetables. These grow beds, as well as lights and other necessary equipment, will need to be organized and stored inside of the container via the shelving system.

Objectives
The objective of the project was to design a grow bed and shelving support structure for the vertical garden as well as conduct a structural analysis on the modular system and shipping container.

Approach
- Interviewed the customer to create a list of needs for the grow bed and shelving support structure
- Researched relevant patents and competing companies
- Generated multiple concept ideas for both the grow bed and support structure then used a scoring matrix to select the one to further develop
- Created both a physical prototype and a CAD model of the final design
- Conducted physical testing of grow bed prototypes and scaled down support structure
- Ran multiple loading situations through computer analyses to validate design
- The results from the physical testing and simulation show that the design will be effective

Outcomes
- New grow bed design
- New shelving support structure
- Size and orientation of guy wire supports for shipping container
- Size of flooring needed at second level
- Verification of structural integrity through computer analyses