

Executive Summary

This report details the structural system of our team's elementary school design for submission in the 2013 ASCE Charles Pankow Foundation Architectural Engineering Student Competition.

The team goals which were selected to align with the reading community, competition guidelines, and Charles Pankow Foundation mission focused on creating a better community through integrated building design while designing and implementing innovative strategies and structural systems that will push the project integration to new limits.

With the community and future advancements driving the structural design of this elementary school, the structural system was designed to allow easy modifications of floor plans, uninterrupted corridors for security, integration of community spaces, and a shelter in the event of a natural disaster. The structural system was selected and designed through an integrated approach which allowed design decisions to be addressed by the entire project team. Early analysis allowed collaboration with the Construction Management members to make the most beneficial decisions for our project

The Structural system can be summarized as follows:

- The substructure consists of grade beams, driven piles, and pile caps which account for the possibility of sinkholes created beneath the building during its lifetime
- The superstructure consists of steel framing which allows more open areas throughout the building in order to increase security measures. The building is separated by an expansion joint to account for the shelter which sees an increase in the load resistance needed per codes. Furthermore, the geotechnical report assumes the use of steel framing.
- X-braced frames are used to resist the lateral forces exerted on the building. These opposed to shear walls, maintain a continuous line of sight throughout various parts of the building which increases security measures.
- Long-span joist girders are used to support the roof of the multi-purpose room/shelter. These members are designed to resist the uplift due to high velocity wind occurrences. Since this area has the potential for high noise levels, acoustical roof decking was selected
- The multi-purpose room floor is supported by cellular beams since the pool is beneath it. The use of cellular beams allows a smaller finished floor to decking height since mechanical ducts pass through them, requiring less excavation.
- The building envelope and enclosure consists of a prefabricated panel system which uses structural window mullions to resist out of plane lateral forces. The panels consist of two wythes of concrete connected by carbon fiber shear trusses which creates a composite section. The void is then filled with insulation to assist with thermal loads. This was one of our areas of greater collaboration.