

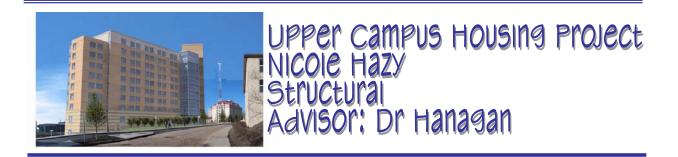
## UPPER Campus Housing Project Nicole Hazy Structural Advisor: Dr Hanagan

## Summary and Conclusions

The Upper Campus Housing Project could be designed as either a one-way hollow-core plank system or a two-way flat-plate system. Designing the structure as a one-way system will allow for easier construction and less cost. However, the two-way system will allow for the conversion of the structure to another use if needed by the University of Pittsburgh in the future. This conversion would be possible because of a more flexible floor plan and the ability to carry higher floor loads.

The existing conditions for this building consist of one-way hollow-core concrete plank (8" + 2  $V_2$ " topping), filled in solid where needed. This system has reinforced concrete masonry bearing and shear walls located at every exterior wall and most interior walls. These shear walls are of varying thicknesses and reinforcement. The hollow-core plank system, because of its nature, allows for considerably easy and quick construction. This system however, causes the structure to be defined only as a dormitory structure. Dormitory structures can only withstand a 40psf live load. Also, because the interior walls are also bearing and shear walls they cannot be moved to accommodate a new floor layout.

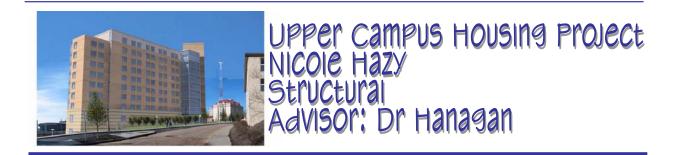
The proposed two-way flat-plate system consists of 10" slab with 26" x 26" reinforced columns. This system will have 10" reinforced concrete shear walls located at various places along the exterior of the building. The new system will also have a new building envelope consisting of light gauge metal stud walls with a brick façade. This system will allow for a flexible floor plan because all interior walls will only be partitions and can be moved if needed for future development of the structure.



This system also provides large bays (approximately 27' x 27') and higher floor loads (80psf).

Overall it is more important for developers to consider lower cost and not worry about the possible future development of the building. Therefore, the one-way hollowcore plank system is a better system overall for the structure of the Upper Campus Housing Project. This makes sense because it is unlikely that the professional engineers and developers would choose a system that was not the best choice. Below is a summary of the cost and duration of a typical bay for each system, proving that the oneway system is a better choice. However, the two-way system is a possibility for the structure and could be used in a similar design.

System	Cost/Typical Bay	Manhours/Typical Bay
Two-Way	\$22,113	353
One-Way	\$11,058	92



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## References

Design of Concrete Structures 13<sup>th</sup> Edition ACI3 18-02 AISC Manual of Steel Construction PCI Design Handbook CRSI Design Handbook