Prince Frederick Hall

Thesis Proposal

Construction, Sowers, 8 February 2014, PSU AE
University Park, Maryland

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Executive Summary

Prince Frederick Hall is a well-designed building. However it does things in a fairly traditional method. I would like to propose four analysis areas to seek to improve Prince Frederick Hall even more.

The first proposal is a study of alternative super-structural materials. Specifically the Infinity system and its potential impact on the construction schedule had it been implemented. Since the Infinity system is a blending of metal studs and concrete decking a structural breadth analysis would be performed in tandem to ensure this system could in fact service this building.

The next proposal is a research study on the Final Information transfer and distribution once a finished building is handed over from the contractor to the owner. This would ideally focus on the individuals who work in and maintain Prince Frederick Hall, seeking to provide them the precise information they need to maintain Prince Frederick Hall well.

The third proposal is a study of the possibility of implementing a grey water system to help the University of Maryland achieve a Platinum LEED rating on Prince Frederick Hall. Due to the massive water use of dormitory buildings, implementing some kind of grey water system will not only potentially lower water costs, it will also serve to help preserve the watershed. Due to the additional weight concerns of a grey water system a structural analysis would be performed in tandem to ensure that Prince Frederick Hall would be able to bear the load.

The final proposal is a study of the possibility of implementing a photovoltaic cell system on the south side of Prince Frederick Hall. Since a dormitory also has a massive electrical load this system would serve to help address some of that load and serve to help the University

achieve a Platinum LEED credit for Prince Frederick Hall. An electrical breadth analysis would be performed in tandem to ensure the electrical load generated by the photovoltaic cells can be successfully tied into the current electrical system.

Alternative Super-Structure materials

The Prince Frederick Hall Schedule is set to a fairly strict finish date due to the academic school year the University runs on. The schedule has already been speed up considerable through smart distribution of MEP labor. However, changing the material used on the super-structure of the building may accelerate the schedule further, ensuring the building will be finished on time.

The super-structure of Prince Frederick Hall is currently cast-in-place concrete. This alternative material investigation would require comparing schedule durations, cost options, local availability, logistics, and practical use of the alternative material and the original cast in place concrete. This investigation would gather data from original sources and current date on Prince Frederick Hall.

Figure 1: Current Superstructure

Originally it was suggested to investigate pre-cast concrete as an alternative. However, due to the general back log of work most pre-cast locations have, there was little chance of actually accelerating the schedule using such a method. Instead, I propose investigating the value of implementing an infinity structural system instead. An Infinity Structure is "a structural framing system specializing in the Epicore MSR composite Floor System on pre-panelized load-bearing metal stud walls." (http://www.infinitystructures.com/, 13 Dec) The vertical panels can be lifted into place via a crane while the floor slabs are poured on site. Hypothetically, this hybrid system will be able to shorten the duration of raising the super-structure.

End Result

At the end of the spring I expect to present schedules, cost and logistics data side by side for both cast-in-place and the Infinity System. From this I would conclude if the Infinity System would in fact save time in the schedule or if the cost of it outweighs any benefits.

Building Information Transfer Research

An interesting aspect of Prince Frederick Hall is the nature of the owner. The University of Maryland maintains hundreds of multi-use buildings on their main campus alone. Because of this some of the unique details of a certain building can be lost in the system.

I propose an investigation into the best method to help smooth the building handoff and to help prevent loss of efficiency for the unique systems within Prince Frederick Hall. This investigation would begin with a survey distributed to custodians and building maintainers at both Penn State and the University of Maryland. Once the survey is collected the results would be compared to the typical information distributed once the building is completed. Discrepancies would be noted and a proposed document or method for information transference suggested. A secondary set of interviews with OPP and Clark construction would investigate the building hand –off from the perspective of the construction managers. Then I would compare the two groups to seek our discrepancies and similarities.

From the above a document or checklist would be created to help ensure information about Prince Frederick Hall is successfully distributed. This building has complex systems serving a wide ownership including the University, the students, and the campus visitors. The day to day staff may need a document or diagram of some kind to ensure every staff change

still knows and understands the systems that make Prince Frederick Hall unique. This could also help to ensure the systems are maintained at or near peak efficiency while also ensuring Prince Frederick Hall meets the needs of the end users.

End Result

At the end of the spring I would present the gathered data, trends derived from it. The true end result would be a suggested information check list or standing document for this and future projects to ensure the right information at the right amount of content is being distributed to the users.

Grey Water System Investigation

Prince Frederick Hall has achieved a LEED Gold certification mostly through smart construction Tactics and efficient building systems. However the University has recently suggested seeing if it is possible to push to reach Platinum Certification. Nearly every construction LEED Point has been achieved at this point for Prince Frederick Hall. To achieve this Platinum rating, a greater focus would need to be turned to active systems over the life of the building to decrease the buildings energy usage.

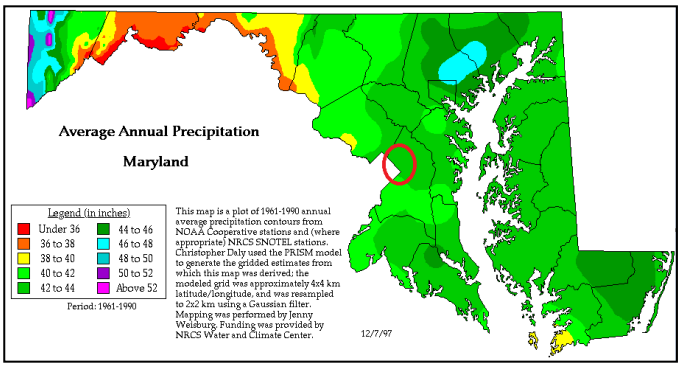

Figure 2: Precipitation Map

To achieve this I suggest investigating the possibilities of including a grey water system in Prince Frederick Hall. Initially the investigation would cast a wide net to explore

the different types of grey water systems readily available. Once a system is selected the investigation would switch to focusing on implementation, namely the cost of installation, architectural and structural adjustments, and potential water savings.

End Result

At the end of the semester I would present the reasoning behind the choice in grey water systems. I would also present the potential costs and savings. At the end I would present my suggestion on if this system meets the goals of the University.

Photovoltaic Cell Investigation

As stated above, the university has requested that Prince Frederick Hall achieves a LEED Platinum certification. While each system is unique with distinct benefits, no one system will help Prince Frederick Hall achieve LEED Platinum. There must be more than one.

Another system to investigate that may help to achieve a Platinum certification is Photovoltaic cells in the glass facades on the south side of the building. Since the south side of the dormitory faces out over a massive lawn then this is an ideal scenario to take advantage of solar power to help decrease the demand

Figure 3: South Side of the Building

load of the dormitory. This analysis would investigate the different solar cells available on the market and their ease of maintenance specifically. Once a cell was chosen I would then create a cost return analysis to demonstrate the value of this system.

End Results

At the end of the spring I would expect to present a chart of the various possible Photovoltaic cells comparing their price, ease of maintenance, ease of installation and architectural appearance. A lifetime cost analysis would also be performed to demonstrate savings and returns from the system over the lifetime of the building.

Conclusion

Each of these proposals stands to help Prince Frederick Hall reach a higher level of efficiency. To best serve the owner, all potentially improvements should be considered.

Appendix A

Structural Breadth

Due to the potential changes from the super-structure analysis and the grey water system the structure of Prince Frederick Hall may need to be reevaluated. I would like to propose a breadth analysis to study and ensure the structure in both the cast-in-place and the Infinity system can support its own load and the added grey water system weight.

Architectural Breadth

Both the photovoltaic cell and grey water systems have a potential impact on the visual appearance of Prince Frederick Hall. I propose a study on ensuring the desired architectural appearance in maintained while still taking full advantage of the sustainable systems. To this end I would study concealment methods for the water tank on the roof as well as potential means to expand the window area on the southern façade. Drawings, rendering and comparisons to other buildings on campus would all be included in the final report.

Appendix B – Proposed Grade Breakdown

Alternative Super-Structure Material	30%
Information Transfer Research	30%
Grey Water System Investigation	20%
Photovoltaic Cell Investigation	20%

This break down is estimated based on expected time demanded to achieve the desired result.

Appendix C – Spring Schedule

Spring Thesis Proposed Schedule as of 16 December 2013

	January			Febuary				March					April
	13-Jan	20-Jan	27-Jan	3-Feb	10-Feb	17-Feb	24-Feb	3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	7-Apr
Analysis 1:				1	2	3	4	Mile 2					
Analysis 2:	1	2,4	Mile 1					3, 4	5,6	Mile 3			Mile 5
Analysis 3:			1,2			3	4	Mile 2					
Analysis 4:										1,2	3,4	Mile 4	

Analysis 1:		Analysis 2:		Analysis 3:		Analysis 4:	
1	Gather Data on Infinity System	1	Write up Survey	1	Research Grey Water Systems	1	Research Photovoltaic Systems
2	Work on System differences	2	Distribute Survey	2	Evaluate Application	2	Evaluate Application
3	Do final Structural analyis	3	Gather Data on Survey	3	Do Final Structural Analysis	3	Do Electrical Analysis
4	Final Data	4	Discuss Building Transfer with Clark Cons.	4	Final Data	4	Final Data
		5	Evaluate Data				
		6	Crate Data Packet				

Milestones:	
1	Surveys Distributed
2	Structural Finished
3	Research Finished
4	Electricla Finished
5	Final Presentation Finished