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[TECHNICAL REPORT 3]

North Hall – American University
Washington, D.C.

Executive Summary

After American University's 2011 Campus Plan was approved the by District of Columbia Zoning Commission on March 8, 2012 Grunley Construction Company was awarded the construction contract on April 23, 2012 for American University's newest dormitory, North Hall. North Hall is an eight story, tracked for LEED Gold upon completion, dormitory building that is located on American University's Main Campus in downtown Washington, D.C. The 122,200 square foot building will house 358 undergraduate students in 94 suite style dorm rooms consisting of six bed, four bed and, RA units (1 bed). Grunley bid North Hall with a Guaranteed Maximum Price (GMP) of just under $ 29 Million. North Hall is scheduled to house students for the start of the Fall 2013 semester.

Using the LEED 2009 for New Construction and Major Renovations rating system North Hall will earn enough credits to achieve a LEED Gold rating. This an important achievement for American University as the begin their first step in a major building initiative with North Hall.

Schedule acceleration is critical to North Hall due to the very tight schedule and the need for the building to be complete for the start of the Fall 2013 semester. Most of the finish trades have had schedule acceleration bought into their contract by Grunley Construction to accelerate the schedule as much as possible.

The PACE Roundtable provide some key insight into the aspect of the supply chain in the construction industry. Specifically Integration Strategies and Technologies and, Modularization were the topics of discussion. The know and advice share by the industry professionals will be very valuable both now and in the future.

After analyzing problematic issues and discussing them with both the project team and industry professionals, distinct areas were identified. First, an upgrade to the original design of the solar panel array to include capabilities to heat domestic hot water with the addition of electrical generation. Secondly, the modularization of the bathroom units in each dorm suite to potentially accelerate the schedule. Finally, a barcode tracking system for material and equipment being installed in North Hall to improve deliveries and site logistics. This system can be rolled over to and operation and maintenance tool for American University after construction is complete.

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LEED Evaluation

Please See LEED 2009 for New Construction and Major Renovations Scorecard in Appendix A.

North Hall is tracking to achieve LEED Gold Certification under the LEED 2009 for New Construction and Major Renovation upon completion. In order for North Hall to achieve the LEED Gold Rating, at least 60 of the possible 110 credits must be earned in addition to the required prerequisites. Upon completion, North Hall will join the School of International Service, as American University's only other LEED certified building, which is also Gold Certified.

American University, the Design Team and, Grunley are all working together to complete the requirements for the LEED Gold rating for North Hall. Currently the team has identified 42 credits that are definitely being pursued as well as 34 credits that are being investigated to see if it will be feasible to obtain them. The project will need to get 18 of the 34 credits to reach the threshold for LEED Gold Certification. Figure 1 breaks down how many credits are being pursued, are possibly being pursued or not being pursued in the six LEED categories; Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources , Indoor Environmental Quality, Innovation and Design Process and, Regional Priority.

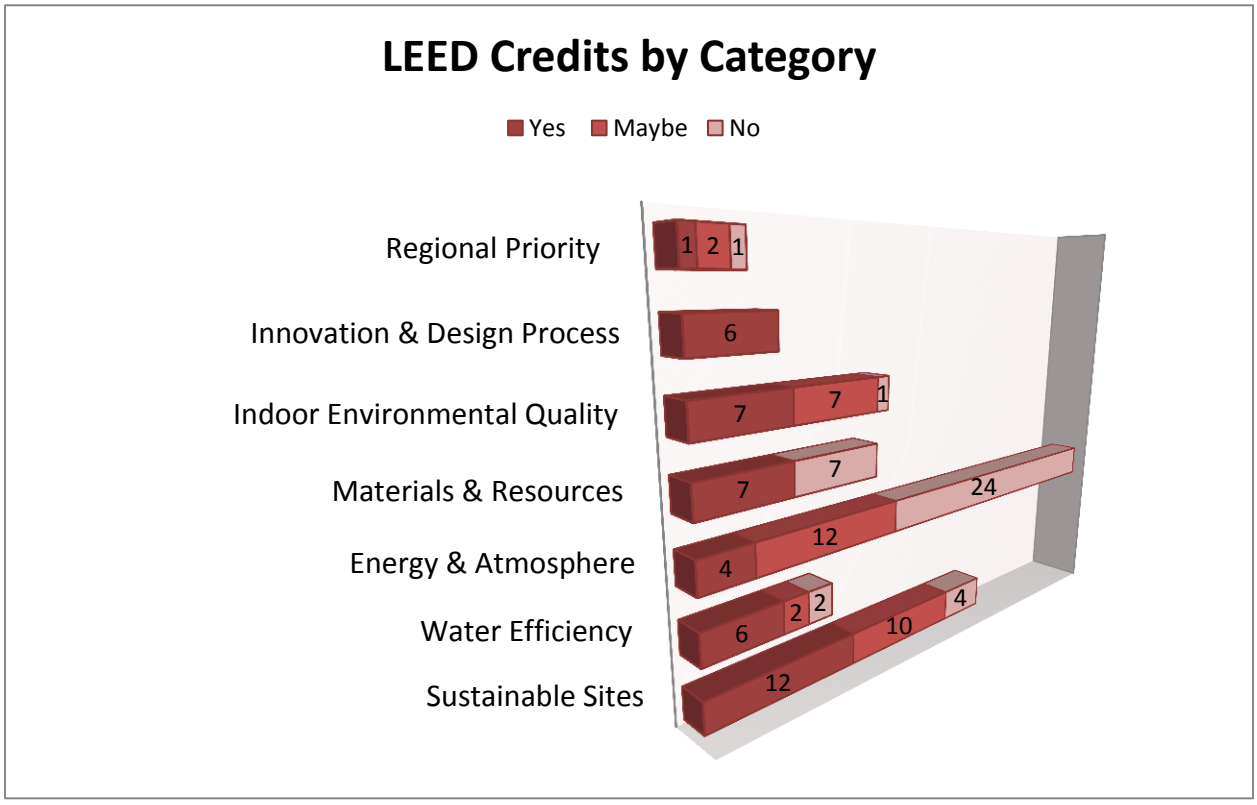

Figure 1: LEED Credits by Category

Sustainable Sites

Under the Sustainable Sites category the project team is aiming to get at least 12 credits and possibly get another 10 credits if they are deemed feasible. North Hall will benefit from its location near public transportation systems such as Washington, D.C.'s Metro and Bus systems as well as it urban location with 10 services within a half mile of the site. The proximity of the site to all these amenities will earn 9 credits for Alternative Transportation. With a light colored roof one credit for the Heat Island Effect-Roof. The 10 credits that are possibly going to be achieved include Site Selection, Development Density and Community Connectivity, Heat Island Effect- Non-roof as well as, Light Pollution Reduction.

Water Efficiency

North Hall is aiming to gain eight of the possible ten points available for Water Efficiency. North Hall will earn four credits by meeting the requirements of Water Efficient Landscaping – No Potable Water Use for Irrigation. North Hall will utilize a storm water re-use system to eliminate the need for potable water for irrigation purposes. Additionally, four credits will be earned with Water Use Reduction – Reduce by 40 %. This will be accomplished by using low flush fixtures.

Energy and Atmosphere

The one LEED category that North Hall is not earning nearly as many credits as it could possibly earn is the Energy and Atmosphere. With the information provided North Hall was on set to earn one out of a possible 19 points for Optimizing Energy Performance by improving the performance by 12%. This calculation was done before the energy model was complete. If the performance was improved by 48%, North Hall would receive 18 more credits which would easily propel North Hall to a LEED Platinum Rating. The mechanical engineer on North Hall, Vanderweil, has specified that North Hall will have Enhanced Refrigerant Management, earning two credits. Other possible credits include two credits for Enhanced Commissioning, three credits for Measuring and Verification, and two credits for Green Power.

Materials and Resources

Grunley Construction will be the driving force behind achieving credits in the Material and Resources category. They will be requiring the subcontractors to recycle their materials as well as use recycled materials in the construction. North Hall will should receive tow credits for each of the following; Construction Waste Management – 75% Recycled or Salvaged, Recycled Content – 20% of Content and, Regional Materials – 20 % of Materials. In addition, North Hall may also receive one credit for using Certified Wood.

Indoor Environmental Quality

The indoor quality will be monitored during the construction process. By doing this North Hall will receive a credit for Construction Indoor Air Quality (IAQ) Management Plan – During Construction. Materials that emit volatile organic compounds are bad of a good indoor environment. Consequently, LEED rewards a project for using low emitting materials. North Hal l will receive a credit each for using low emitting materials in the following; Adhesives and Sealants, Paints and Coatings, Flooring Systems, and Composite Wood and Agrifiber Products. Each room within North Hall is designed to have a thermostatic controlled damper which will earn a credit for Controllability of Systems – Thermal Comfort. North Hall will also receive a credit for Thermal Comfort – Design since the HVAC system and building envelope was designed to meet the requirements of ASHRAE 55 2004. Other credits that North Hall could possibly receive include Outdoor Air Delivery Monitoring, Construction Indoor Air Quality Management Plan – Before Occupancy, Indoor Chemical and Pollutant Source Control, Controllability of Systems – Lighting, Thermal Comfort- Verification, Daylight and Views – Daylight, and Daylight and Views – Views.

Innovation and Design Process

North Hall is aiming to earn all six of the possible credits in the Innovation and Design Process category. The project will earn five credits for Innovation in Design for the following: Materials and Resources Exemplary Performance, Educational Outreach, Green Cleaning, Low Mercury Lamping and, Intergraded Pest Management. The project team also contains at least one LEED Accredited Professional, which earns one credit.

Regional Priority

The project is tacking to earn one credit in the Regional Priority category. North Hall will earn a credit for Innovative Waste Water Technologies. The specifics of this technology are still in the works by the design team.

If the project team is able to fulfill all of the requirement for the credits that have been designated “yes” or “maybe” North Hall will earn 76 credits. If only four more credits would be pursued from the list of credits that are not currently being pursued, North Hall could receive a LEED Platinum Rating. North Hall would then become American University’s first LEED Platinum building. However, it is more likely that closer to only the 60 credits will be pursed to keep the costs down for the project.

Schedule Acceleration Scenarios

Critical Path

The concrete structure and hanging and finishing drywall walls dominate the critical path in North Hall's schedule. The first items on the critical path are the activities that prepare the site for the foundation system to be installed. Once the caissons are complete, the tower crane will be erected and the concrete structure of North Hall will begin. After the structure is nears completion the next items on the critical path are framing the stud walls on each floor. Flooring the framing of the walls is the hanging and finishing of the drywall walls.

Schedule Risks

Any delay to the project's schedule will potentially hinder North Hall form hitting the completion date of August 9, 2013. Any weather delays have to the potential to cause delays especially before the building is dried in and under roof. Over this past summer the Washington, D.C. area received a large amount of rain. This made the site very muddy slowing down the speed of excavation since the trucks where having a hard time getting on and off site in the mud. In addition, the place that all the excavated dirt was being taken would not accept dirt that was to moist, thus making it impossible to remove any dirt until the site dried out. The most recent weather delay was caused by Hurricane Sandy, due to the high winds, large rainfall and loss of power in the Washington, D.C. area. The site was shut down for approximately three days. These are three days' work will have to be made up in order to hit the completion date.

The process of contract buyout by Grunley Construction's Purchasing Department has potential to cause delays to the project's schedule. If a subcontractor is preforming work under a letter of intent before signing the contract the Grunley Project team has little to no leverage to enforce the completion date that is specified in the contract. This was a problem with the caisson subcontractor. The subcontractor took their time signing the contract making it has to push them to work extra days to hit the completion date when they were behind. Ultimately, this particular example caused about a week and half delay of starting the structure of North Hall

Another thing that has potential to slow down or delay the schedule is the slow owner and architect/engineer response times. American University has a representative that overseeing both of the projects that Grunley Construction has on American's campus, North Hall and Nebraska Hall. For most decisions he has to consult with the construction management office at American University. This can take a while for Grunley to get an answer that they need. In addition, the architect and engineers for North Hall have consistently taken their time answering Requests for Information (RFI's) and submittals. The slow response time has been a key concern for the Grunley project team.

Potential Acceleration Areas

After the building is dried in the finish trades can easily be accelerated. These trades will be shielded from the effects of the weather outside. The structure and activities that happen outside of the closed up building will be difficult to accelerate.

Cost and Techniques

Grunley has been very diligent in foreseeing any potential delays in the schedule and ways to minimize the effects of those delays. Grunley has bought schedule acceleration into almost all of the finish trade subcontractors. The finish trades will be able to work a night shift and Saturdays to help with the acceleration. As mentioned before the structure and outside activities will be hard to accelerate. The outdoor work is limited to 7AM to 7PM Monday through Saturday. Thus only working long days and Saturdays are an option for those trades. The finishes will be able to work during the night since they will be inside and not disturbing the neighbors or nearby students.

Value Engineering

Value Engineering is a process that reduces cost while either keeping or increasing the value on a particular. To keep the project cost of North Hall down as much possible without compromising the value of North Hall.

Value Engineered Components

North Hall has had two major Value Engineering items. A large portion of the lighting pack was value engineered to a more cost efficient type of lights. Along with the lighting change, the solar package was removed from the scope of the work. The original design of North Hall contained to different arrays of solar panels.

The original lighting design was of North Hall used 2869 total lighting fixtures and 37 different types of fixtures. Most of the rooms in North Hall have the same or very similar layouts making simplifying the lighting package to reduce the variation of light fixtures extremely feasible. The value engineering on the lighting package was able to save American University some money. (The exact savings was not provided.)

Solar panels were once destined to be located on North Hall's roof in two arrays. In a cost saving effort by American University the solar package was completely removed from the scope of work. According to one of the project superintendents, Justin Ingram, American will implement the solar package at a later date most likely one to two years after construction is complete. The roof structure will still be built as if the solar panels would be installed during construction. The removal of the solar package will be beneficial to the value of completing the project on or before the completion date.

Owner Goals

American University's goal is to provide new student housing to get as many of their students living on campus. American University has already started to give the suites to current students. These students are counting on having a place to live as well as American is counting on having the revenue that will be created with the room and board cost these students will be paying. The less money that is spent on the construction will ultimately help American University's bottom line.

With the two Value Engineered items North was will not be as intricate and elegant as originally was designed to be. However, both changes will help American University keep their new project on budget and get it finished quicker than expected.

Value Engineering Ideas Not Used

As of November 2, 2012, there have not been any value engineering ideas that were proposed which have not been used. This very well may change before North Hall is complete.

Critical Industry Issues

The 21st Annual Partnership for Achieving Construction Excellence (PACE) was held on November 5th and 6th, 2012 at the Penn Stater Conference Center at The Pennsylvania State University. This year's roundtable focused on "Improving Efficiency though Innovation," with brought sessions focusing on Supply Chain, Efficient Delivery of Services, and Operation and Maintenance. Due to the extremely tight site and compressed schedule of North Hall the Supply Chain will be very instrument in the success of the project. The Supply Chain topic had two breakout sessions that focused on Integration Strategies and Technologies as well as Modularization.

The first breakout session was titled, "Integration Strategies and Technologies." The discussion focused primarily on how to avoid potential problems in the supply chain and technologies to help manage it. Procurement of materials for construction can be a challenge when especially with item from overseas or long lead-time items. Since some materials have a very volatile market price that can change drastically from the beginning of the project to when it would be needed. Sometimes it would be more beneficial to buy the a particular material that a large quantity would be need over a multiyear multiphase project and then store the material until it is needed. Then the material would be delivered to site from the storage facility when it is needed on site.

Also discussed during this session was tracking material along the supply chain. Either a Quick Response (QR) Code tag, Radio Frequency Identification (RFID) tag, or a barcode can be placed on the material when it is manufactured. The material would have a unique ID that can track the material from the manufacturer, during transportation, arrival on site and, then when it was installed. The operations and maintenance staff to keep track of all the equipment in the building could then use the tags. The construction manager will benefit from this system for material tracking and site logistics. This is something that would be very helpful for North Hall since there is very little storage space on the site and deliveries are very frequent. The project team would be able to view all the data on a tablet computer such as an iPad that could be taken out into the field.

Modularization was the topic of the second breakout session at the 2012 PACE Roundtable. Modularization is when components of the project are assembled of site in modules and then are delivered to site and connected together to for the final product. The construction industry has been seeing so recent trends in modularization such as multiple trade modularization, new trades getting involved for example drywall and concrete and, projected being designed for modular construction. For modularization to be successful there needs to being early involvement for all parties involved, less customization, and time need to be allotted for proper planning. Some challenges for the project team related to modularization include; planning, site logistics, transportation, design "look," variations in design, laydown area, fabrication space, tolerances, module size, and weight of the module.

North Hall lends itself to modularization since it has very repetitive parts and which could be assembled in modules such as the bathrooms in each suite. These small modules of the bathroom would be then

assembled and to form the bathrooms. Modularization has the potential to reduce the labor costs, and the schedule for North Hall if properly planned and implemented.

All industry members in the Supply Chain breakout sessions have valuable knowledge on both discussion topics. Bill Moyer of Davis Construction and Kurt Maldovan of Balfour Beatty Construction provided much insight in to the "Integration Strategies and Technologies" breakout session. In the "Modularization" breakout session Jeff Angstadt of Foreman Program and Construction, John Bechtel of Penn State Office of the Physical Plant, Will Lazration of Clark Construction, Charles Tomasco of Truland and Raj Vora of Southland Industries all provided useful industry insight on Modularization.

Problem Identification and Technical Analysis Options

After spending the summer on site, speaking with the project team and industry members are the PACE Roundtable several areas of the project have been identified a potentially problematic and lend themselves to a technical analysis in future research.

Solar Panel Array Upgrade

North Hall will most likely receive the solar panels that were originally designed for the building within two years after construction is completed. They solar panels were recently value engineered out to keep the project on budget as well as keep it on schedule. The original design of the solar panel array only uses a system that heats domestic hot water.

Solar Panels have capability to not only heat water but also generate electricity. North Hall is located on a site in which the sun is unobstructed from any neighboring building or trees. The solar energy that will hit the roof and solar panels every can be captured an used to meet the part of the electrical load for North Hall. With an upgrade to the original design, American University has the potential to not only save on their electrical costs over time but also be an example of an environmental steward in Washington, D.C.

This analysis will require research into solar panel systems that can be used to heat hot water as well generate electricity. It is important to weight the costs versus the potential savings of the system over its lifecycle to determine its feasibility. The electrical load that the panels must be worked into the electrical design of the building. Due to the fact that the panel arrays may increase in size and weight the roof structure must be check to make sure the possible increase load will be supported properly

Modularization of Bathrooms

Anyway in which the construction of North Hall can be accelerated can be beneficial to the schedule and meeting the completion date for North Hall. North Hall has a very important completion date since the building must be ready for students to move in for the start of the Fall 2013 semester. Modularization of the bathrooms in the suites is a way that the construction can potentially be accelerated. The bathrooms are typical from suite to suite making the repetitiveness of them ideal for modularization,

These bathroom modules can be built off site and then brought to site, set in place and the modules connected together forming the bathrooms. These modules will reduce the field labor as well as giving the workers much better access to what they are working on when it was in a factory or warehouse facility that the modules are constructed in.

The site logistics of how the modules would be delivered to site and then moved to the correct place in the building will be important to study to determine if modularization is feasible for North Hall. The cost of modularizing the bathroom must be compared to the stick built cost to determine if the cost is also feasible. Finally, the process must be carefully analyzed for schedule savings.

MATERIAL TRACKING

Deliveries to site can be extremely problematic because of the single lane access to the site as well as the extremely tight site. Once a truck pulls onto site it is next to impossible for another truck to get in or out of the gate essentially shutting down the access road to until the truck is unloaded and leaves. North hall would benefit greatly from a material tracking system.

A system that uses either a Quick Response (QR) Code tag or a Radio Frequency Identification (RFID) tag barcode system would be ideal. The barcode would be scanned when the material is shipped and heading to site and the project team would receive a notification that the material coming so that they would be able to clear the entrance when needed. This barcode would also be able to be used for tracking materials for LEED credit purposes.

Another potential use of the barcodes attached to the material and equipment in North Hall is for operation and maintenance. The database of information would be turned over to American University's operation and maintenance people. They would be able to track their maintenance preformed on each piece of equipment.

This analysis will require research on the most cost efficient type of tagging system for materials and equipment. The project team as well as American University will need software to interface with the barcodes to display the information that is needed. An analysis of the type software currently on the market for this type of application will be performed. In addition, a study of what type of system for operation and maintenance will be best for American University will be performed.

Appendix A: LEED 2009 for New Construction and Major Renovations Scorecard

LEED 2009 for New Construction and Major Renovations

Project Checklist

North Hall - American University

12-Nov-12

Sustainable Sites — Possible Points: 26

Y	?	N	d/C			
Y			C	Prereq 1	Construction Activity Pollution Prevention	
	1		d	Credit 1	Site Selection	1
	5		d	Credit 2	Development Density and Community Connectivity	5
		1	d	Credit 3	Brownfield Redevelopment	1
6			d	Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			d	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
		3	d	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			d	Credit 4.4	Alternative Transportation—Parking Capacity	2
	1		C	Credit 5.1	Site Development—Protect or Restore Habitat	1
0	1		d	Credit 5.2	Site Development—Maximize Open Space	1
1			d	Credit 6.1	Stormwater Design—Quantity Control	1
1			d	Credit 6.2	Stormwater Design—Quality Control	1
	1		C	Credit 7.1	Heat Island Effect—Non-roof	1
1			d	Credit 7.2	Heat Island Effect—Roof	1
	1		d	Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y	?	N				
Y			d	Prereq 1	Water Use Reduction—20% Reduction	
4			d	Credit 1	Water Efficient Landscaping	2 to 4
					Reduce by 50%	2
				4	No Potable Water Use or Irrigation	4
		2	d	Credit 2	Innovative Wastewater Technologies	2
2	2		d	Credit 3	Water Use Reduction	2 to 4
					Reduce by 30%	2
					Reduce by 35%	3
				4	Reduce by 40%	4

Y	?	N			Energy and Atmosphere — Possible Points: 35	
Y			C	Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			d	Prereq 2	Minimum Energy Performance	
Y			d	Prereq 3	Fundamental Refrigerant Management	
1	4	14	d	Credit 1	Optimize Energy Performance	1 to 19
				1	Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
					Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
					Improve by 16% for New Buildings or 12% for Existing Building Renovations	3
					Improve by 18% for New Buildings or 14% for Existing Building Renovations	4
					Improve by 20% for New Buildings or 16% for Existing Building Renovations	5
					Improve by 22% for New Buildings or 18% for Existing Building Renovations	6
					Improve by 24% for New Buildings or 20% for Existing Building Renovations	7
					Improve by 26% for New Buildings or 22% for Existing Building Renovations	8
					Improve by 28% for New Buildings or 24% for Existing Building Renovations	9
					Improve by 30% for New Buildings or 26% for Existing Building Renovations	10
					Improve by 32% for New Buildings or 28% for Existing Building Renovations	11
					Improve by 34% for New Buildings or 30% for Existing Building Renovations	12
					Improve by 36% for New Buildings or 32% for Existing Building Renovations	13
					Improve by 38% for New Buildings or 34% for Existing Building Renovations	14
					Improve by 40% for New Buildings or 36% for Existing Building Renovations	15
					Improve by 42% for New Buildings or 38% for Existing Building Renovations	16
					Improve by 44% for New Buildings or 40% for Existing Building Renovations	17
					Improve by 46% for New Buildings or 42% for Existing Building Renovations	18
					Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19
1	1	5	d	Credit 2	On-Site Renewable Energy	1 to 7
					1% Renewable Energy	1
					3% Renewable Energy	2
					5% Renewable Energy	3
					7% Renewable Energy	4
					9% Renewable Energy	5
					11% Renewable Energy	6
					13% Renewable Energy	7
	2		C	Credit 3	Enhanced Commissioning	2
2			d	Credit 4	Enhanced Refrigerant Management	2
	3		C	Credit 5	Measurement and Verification	3
	2		C	Credit 6	Green Power	2

Y	?	N				
6	1	7		**Materials and Resources**	**Possible Points:**	**14**
Y			d	Prereq 1	Storage and Collection of Recyclables	
		3	C	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
					Reuse 55%	1
					Reuse 75%	2
					Reuse 95%	3
		1	C	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			C	Credit 2	Construction Waste Management	1 to 2
					50% Recycled or Salvaged	1
					75% Recycled or Salvaged	2
		2	C	Credit 3	Materials Reuse	1 to 2
					Reuse 5%	1
					Reuse 10%	2
2			C	Credit 4	Recycled Content	1 to 2
					10% of Content	1
					20% of Content	2
2			C	Credit 5	Regional Materials	1 to 2
					10% of Materials	1
					20% of Materials	2
		1	C	Credit 6	Rapidly Renewable Materials	1
	1		C	Credit 7	Certified Wood	1

Y	?	N				
7	7	1		**Indoor Environmental Quality**	**Possible Points:**	**15**
Y			d	Prereq 1	Minimum Indoor Air Quality Performance	
Y			d	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	1		d	Credit 1	Outdoor Air Delivery Monitoring	1
		1	d	Credit 2	Increased Ventilation	1
1			C	Credit 3.1	Construction IAQ Management Plan—During Construction	1
	1		C	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			C	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			C	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			C	Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			C	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
	1		d	Credit 5	Indoor Chemical and Pollutant Source Control	1
	1		d	Credit 6.1	Controllability of Systems—Lighting	1
1			d	Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			d	Credit 7.1	Thermal Comfort—Design	1
	1		d	Credit 7.2	Thermal Comfort—Verification	1
	1		d	Credit 8.1	Daylight and Views—Daylight	1
	1		d	Credit 8.2	Daylight and Views—Views	1

Y	?	N				
6	0	0		**Innovation and Design Process**	**Possible Points:**	**6**
1			d/C	Credit 1.1	Innovation in Design: Specific Title	1
1			d/C	Credit 1.2	Innovation in Design: Specific Title	1
1			d/C	Credit 1.3	Innovation in Design: Specific Title	1
1			d/C	Credit 1.4	Innovation in Design: Specific Title	1
1			d/C	Credit 1.5	Innovation in Design: Specific Title	1
1			d/C	Credit 2	LEED Accredited Professional	1

1	2	1	Regional Priority Credits	Possible Points: 4
Y	?	N		
	1		d/C Credit 1.1 Regional Priority: Specific Credit	1
1			d/C Credit 1.2 Regional Priority: Specific Credit	1
	1		d/C Credit 1.3 Regional Priority: Specific Credit	1
		1	d/C Credit 1.4 Regional Priority: Specific Credit	1

42	34	34	Total	Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Appendix B: PACE Roundtable Student Form

Student Name Brandon Tezak

Session #1

Topic: Integrating Strategies & Tech.

Research Ideas:

(1) Using QR Tags / RFID for Material Tracking & QC

(2) Procurement Strategies - Early Procurement & Storage of Material

Session #2

Topic: Modularization

Research Ideas:

(1) Multi-trade Modularization

(2) Miami Valley Hospital Approach to Modularization

Student Panel

Industry Panel: Differentiation in a Down Economy

Research Ideas:

(1) Stand up for what you believe in → Know How to hold your ground

(2) CM's have inherent responsibility to Drive the project

Student Form Pg. 1

Industry Member Discussion

Key Feedback:

Which research topic is most relevant to industry? What is the scope of the topic?

Modularization is becoming more popular

- Has good ~~one~~ potential uses for thesis building
- Make sure dimensions are accurate
  - can lead to problems

Suggested Resources:

What industry contacts are needed? Is the information available?

Jeffrey Angstadt ⇒ Foreman Program & Construction Manager
John Bet~~tel~~ -> OPP
Will Lazration -> Clark
Kurt Maldovan -> Balfour Beatty
Billy Moyer -> Davis Construction
Charles Tennessee -> Truland
Raj Vora -> South Land

Student Form

Pg. 2