Technical Report III

900 16th Street

Douglas W. Watson | 11 November 2015
Construction Management | Leicht

EXECUTIVE SUMMARY

The focus of Technical Report III is to analyze the project management services, value engineering topics, critical industry issues, BIM uses, and sustainability implementation on the 900 16th Street NW construction project. The following pages include an interview with the general contractor's project manager, Tyler Moyer, concerning project management and value engineering topics. In addition this report will include an evaluation of the critical industry issues discussed at the 24th annual PACE Roundtable as well as an evaluation of the implementation of BIM and sustainable design on the project.

This building is to serve as a trophy class office building. Because of this the owners are having finish materials being brought in from around the world. For instance the glass of the structural 3D curtain wall is from the United Arab Emirates, teak wood is being brought in from India, and the lobby stone is coming from quarries in Europe. Along with materials being brought from around the world the feature wall of the lobby is made from bronze, silver, and gold. All that being said the owners of this structure had made it very clear from the beginning that they did not want the contractors to utilize value engineering on the materials being installed. However the team was able to value engineer some of the MEP systems within the structure.

Building Information Modeling or BIM is a tool that is being used to some capacity on almost every jobsite. Implementing BIM on a project can complete change the dynamic on the project by creating schedule and cost savings. The 900 16th Street team did not implement a specific BIM plan on the project but they did put several BIM uses into place over the course of the project including: 3D coordination, 4D phase planning, design reviews, and site layout. The project could have benefited if the team had used BIM to conduct an in depth analysis of the existing conditions. By doing so a large schedule delay could have been avoided.

As the construction industry continually develops so do the critical industry issues involved with it. At this year's annual PACE Roundtable I was able to discuss a few leading topics in construction with several industry professionals from a wide variety of disciplines. The following pages of this report will include summaries of what was discussed at two of the sessions attended.

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PROJECT MANAGER INTERVIEW

Refer to Appendix A for a transcript of the interview conducted with the DAVIS Project Manager Tyler Moyer

Project Management Services:

For DAVIS, the 900 16th Street project featured a large majority of project management services that the company implements on almost all of their projects. Upon being given the contract they immediate went to work developing estimates to assist the owner. From the estimates DAVIS was able to begin creating the scopes of work for the various trades involved in the project. For the most part the subcontractors were all selected using the low bid process. In special circumstances DAVIS had convinced the owner to award contracts to certain subs who were not the low bid. These contractors included the MEP work and cast-in-place concrete structure. After completing an analysis of the systems and the project schedule DAVIS really saw the need to place the work in the hands of companies that were completely capable of completing the work. Throughout the project the general contractor was also in charge of creating and managing material procurement. They were also responsible for all shop drawing review, subcontractor management, and schedule management.

Value Engineering:

This project in particular provided a large amount of difficulty when it came to value engineering. For the most part the owner specifically told DAVIS that they did not want to use value engineering at all. This project is meant to be a showcase trophy class office building in the middle of downtown DC. The finishes and materials going into the building are of the upmost quality and the owner wanted it to remain that way. However, when it came to the mechanical equipment and rain water management system the team was able to convince the owner to go with systems that better align with the goals they are trying to achieve and save on overall project costs.

One way that the general contractor was able to use value engineering to create a significant cost and schedule savings actually stemmed from an issue that arose during construction. Poor knowledge of the existing conditions lead to the demolition of a party wall that the monitor building shared with a building neighboring it. Demolishing this wall created two issues. The first was that the fire rating of the wall was no longer up to the code requirements. The second was that the capstones at the roof were now not fully supported by the CMU that it currently rested on. Designers wanted to completely pull down the rest of the wall and replace it. While that is a possible solution, it is perhaps the most time consuming and expensive one. DAVIS was able to quickly come up with a plan so as to get the project back on track as soon as possible. It involved placing steel angle along the capstones to reestablish its structural integrity and applying a material called Monokote Z-156 to establish the proper fire rating of the wall system. Although the issue still ended up costing the job around three months in delays, the solution devised by DAVIS was still significantly faster than the initial plan of action.

CRITICAL INDUSTRY ISSUES - PACE

Post BIM – Challenges and Opportunities:

This breakout session was led by Dr. Robert Amor, the same person who had given the keynote presentation just before. Following his keynote presentation on the topic of *The BIM Revolution* an interest in what the industries thoughts towards BIM was sparked. BIM itself is a broad topic with an unquantifiable amount of definitions and interpretations. There were several main topics of discussion throughout the breakout session including owner education in what BIM is and can be used for. This conversation began with reference to how almost every Request for Proposal ever received from an owner simply states that a contractor is require to use BIM. It is rare for an owner to specify to what level they want BIM to be used. Most owners think of BIM as purely 3D coordination and clash detection. In fact it could be used as an irreplaceable facility management tool if the owner wants it to be. Industry professionals must take every opportunity possible to educate owners on the importance of BIM. Contractors can bring them along to various conferences about the subject so they can expand their knowledge together. In some circumstances a few industry members have given presentations to owners on BIM to improve their understanding.

The overall contract value is what will ultimately dictate what level of BIM integration a client wants. Every construction project has a different dollar value associated with it and while a BIM model is beneficial, is it really always cost effective. An example that was provided in the discussion was that a project with a contract value of $100 million might have a $1 million expense on BIM but a $10 million project might have a $250,000 BIM expense for similar services. It would become much easier to convince an owner to buy into full BIM integration on a project as the contract value is increased.

The underlying idea of cost was brought up again when a discussion was sparked about the ability of subcontractors to keep up with the technology. There has been a continual decrease in contractor fees so now even a general contractor or CM loses the want to go above and beyond on a project. The bottom line is that companies are not being paid enough to properly use BIM on a project. At the end of the day, the development of BIM in the industry falls on the shoulders of the owner and the technology we use to implement it. Owners and clients need to be willing to pay for extra services associated with BIM to provide them with vast schedule savings.

Driving Collaboration into the Field:

The second breakout session that I had attended was led by Dr. Leicht and focused on how companies can create a collaborative atmosphere. As a group we begun by defining a baseline of what is currently being done to drive collaboration. The industry uses mostly pull planning, colocation of contractors, jobsite computer boxes, foreman meetings, and weekly work plans. Several companies use a variety of the practices stated above in a number of capacities. One thing that was particularly interesting was that Southland sends out surveys to their project teams

and subcontractors so they can get a feel for what works on certain types of projects. Knowing what works and what is not as successful.

It is also important to understand the difference between coordination and collaboration. Coordination falls along the lines of a single entity telling all other what to do. Collaboration is completely different. It is when all parties drive towards a common goal as a single party. Even though at the end of the day it is the job of the GC or CM to coordinate other trades, it is equally if not more important to get input from them. While a GC or CM has an idea of the tasks of a trade, the trades themselves know exactly what needs to be done and how their work fits into the grand scheme.

The main challenge associated with driving collaboration is getting the contractors and more importantly the tradesmen to buy in. It was discussed that the key to getting this to happen is to first get the foreman to collaborate. This is possible by including them in weekly contractor meetings to discuss the work plan. The more that they feel a part of the planning process the more they will be willing to work with the other trades to complete the job. Once the foremen are on board with collaboration it is almost certain that the tradesmen under them will follow.

One idea I thought was really thought provoking was the practice of the "us vs them" mentality. As the managers of the site we fall into a mentality of we are the boss so everyone will do whatever we tell them to. However, this mentality is detrimental to the entire construction process. The first step to creating a collaborative atmosphere on a project and throughout the industry is to stop using this approach when on site.

| FEEDBACK FROM PACE INDUSTRY ROUNDTABLE |

Refer to Appendix B for the notes taken during the roundtable discussions

At the end of the 24th Annual PACE Roundtable event I had the opportunity to further discuss the topics from earlier in the day with an industry member of my choosing. I had taken this opportunity to sit down with Leaha Martynuska, a senior project manager with James G. Davis Construction. One of the breakout topics that we both found interesting was *Innovation in Safety*. Although I did not particularly attend this session, we discussed how a majority of industry professionals are all focused on decreasing the number of big picture injury causes, while it seems like the smaller causes are being overlooked. Interestingly enough it was suggested that we ban all cellphones from the jobsite, with the exception of the foreman and superintendents. Removing such a distracting device from site could help bring the eyes of individuals to various hazards that they would not pay attention to when walking around and looking at their phones. A second topic that was brought up throughout the conversation involved the submittal and RFI processing rate on a job. For this stemmed the idea that the number and rate at which they are processed and returned correlates with the amount of profit that a contractor will receive at the end of construction. Furthermore how does that all compare within a variety of contract types? Is there a contract type that yields both the best response time and the most profit or has that not

been seen yet? It would be interesting to use several projects of similar characteristics with different contract structures to determine the contract that yields the most profit.

LEADING INDUSTRY PRACTICE EVALUATION

Building Information Modeling Use Evaluation:

Refer to Appendix C for a Level 1 BIM process map that this project would have benefitted from

The 900 16th Street project team did not establish a BIM plan. The reason being was that while BIM is useful on many projects this project was not as intensive because they were only responsible for the core and shell construction. Even though the scope of work was didn't call for heavy BIM implementation the DAVIS team still took the time to use various BIM strategies to help with construction.

First and foremost the team completed in depth MEP clash detection throughout the project. 3D clash detection is becoming a normality on most construction projects at this point. This process involves comparing the models of all the trades in a clash detections software to find conflicts between them. In doing so many major issues can be solved before they become a problem in the field. Finding these issues before they become a problem is key because precious time and money will be saved during the actual construction process. If the conflicts are to remain until they are found during installation the project will experience continual stops and schedule loss while a solution is devised. Along with schedule savings using clash detection has the possibility of vastly reducing the number of RFI's created throughout the duration of the project.

In conjunction of the 3D clash detection, 4D Modeling was used to plan the excavation and support of excavation system. This process utilizes 3D modeling with an imported schedule to give the viewer a picture of the process before it happens. The 4D model allows the viewer to visually see the process and the spatial needs of the system components. Again the DAVIS team was only responsible for the core and shell construction, so the MEP fit out is not in depth enough for 4D phase planning to be used. As discussed in past reports the support of excavation for this site is extremely difficult. Three different systems are used and the site surrounding vary immensely so this more in depth modeling was a huge help in planning the construction of the systems. Because the project team was only tasked with completing the core and shell they saw it as unnecessary to use 4D modeling to help plan the rest of the construction sequences. If the team would have been granted the interior contract implementing a 4D model may have been useful.

Another way that the project used BIM was through Design Review. The curtain wall system that acts as the entrances to the church's entrance is extremely complex. This high level of complexity did not allow for the production of typical shop drawings because there was no way to understand what one was looking at to approve it. Because of this the design team allowed façade designers to submit a model for to be approved instead of a traditional set of shop

drawings. Once this model was approved it was given to the fabricators to assist them in creating this one of a kind curtain wall system.

The final way that the DAVIS team took advantage of BIM was by modeling the site layout. Their main purpose in doing so was to show how the site safety measures would interact with the surroundings. Modelled was everything from the safety netting on the side of the structure to the protected pedestrian sidewalks surrounding the site.

Although the team did use BIM in several ways, the entire construction process could have been helped by using several other features. The contract may only be for the core and shell work but a full 4D phase planning model could have helped with the coordination of cast-in-place, MEP, and facade much like it did with the SOE. One thing that the project team should have used throughout the design and construction process was an in depth evaluation of the existing conditions. While they had laser scanned the site following the demolition of the two existing buildings, they still took down a party wall that caused a significant delay. Had the team taken the time to model the existing conditions and conduct a more in depth analysis this issue could have been avoided all together.

If I were to develop a BIM Execution Plan for the 900 16th Street project it would include the following:

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING		DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
X	SITE ANALYSIS	X	DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
		X	3D COORDINATION	X	3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS		RECORD MODELING		RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABLITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)	X	PHASE PLANNING (4D MODELING)	X	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
X	EXISTING CONDITIONS MODELING	X	EXISTING CONDITIONS MODELING	X	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

Figure 1: BIM Uses (courtesy of bim.psu.edu)

Sustainability Implementation:

Reference Appendix D for the planned v3 scorecard and the predicted v4 scorecard

The construction of 900 16th Street is currently slated to achieve a LEED Gold rating on the v3 point system. In total the building has the possibility to receive 69 points on the old system. Based upon the USGBC's description of each point category, I have determined that the total point value on the new v4 system would be 51 points. According to the v4 point requirements the project would not be able to receive a rating of LEED Gold. USGBC has completely revamped the LEED system to push designers to break the envelope when creating a sustainable design. The number of questionable LEED points decreased from 29 to 24. This is due to the fact that the new report card only features a single category for questionable points. Also, the point requirements to attain point values have changed which would have made probable points from v3 become unattainable in the revamped v4. The number of unachievable points increased significant from 7 to 35. This is again due mostly in part to the fact that the requirements increased and the prescribed plan for 900 16th Street does not meet the new requirements for certain points to be achievable.

Penn State requires that all projects be, at minimum, LEED Certified. This requires that the project be granted at least 40 of the LEED points that it pursues. In addition to the LEED Certified requirement the Penn State OPP have a LEED Policy which dictates exactly which points must be pursued, what points should be attempted, and what points are not required. As stated above earlier, DAVIS and the design team are predicting that the project will be able to achieve LEED Gold (minimum of 60 points). This should mean that 900 16th Street far surpasses what is required by Penn State University. While the total point value is well passed what Penn State requires, after an in depth analysis of the OPP LEED Policy I discovered that the project does not chase all that are required. Penn State requires that the On-site renewable energy, enhanced commissioning, and green power credits be achieved. Although they were not sought after on 900 16th Street, the project team had plans to implement them if the owner wished to go after LEED Platinum. The water use reduction falls short of the required 30% reduction required by the Penn State LEED Policy. Some points that Penn State requires are an impossibility on this project because it is only a core and shell fit out. This issue arises with the points associated with the thermal comfort of the building.

Overall I believe that the design team and general contractor created a building and construction plan the fits within the needs of the owner. It is perfectly fitting for an office building in the trophy class to be LEED Gold. However, in my personal opinion I think that since this office building is to be a trophy class it should be nothing less than LEED Platinum. The owner wants this structure to stand out among the rest around it. To do so they have had the materials brought in materials from around the world. They have requested that the curtainwall glass be fabricated in the UAE, teak wood be brought from India, and the lobby stone be fabricated in Europe. If they are going through all the trouble and spending all the money to bring materials from various corners of the world they should be just as focused on creating sustainable building. The design

team planned LEED points that the building could easily pursue if LEED Platinum were to become the new goal. If the planning was set in place for such systems why stop there? While the GMP would have increased the overall quality of the project would have truly embodied the "trophy" class, not just the finishes within the project.

Appendix A:

Project Manager Interview Transcript

1. What are the main services that DAVIS is providing to the owner on this job? (i.e. schedule management, etc).

The general contractor, DAVIS, had provided the owner with a variety of project management services that can be seen on a vast majority of projects. During the preconstruction phase DAVIS assisted the owner in developing the project budget and estimation of various scopes of work. They also assisted in subcontractor procurement and development of scopes of work. A large majority of the subcontractors were attained by the process of low bid. However, we were able to convince the owners to pay an up charge for the concrete and MEP contractors. The main reason being that we as a company thought that they would best be able to complete the work based on the tight schedule. Throughout the construction process DAVIS provided much of the services that have become an industry norm such as subcontractor management, schedule management, shop drawing review, submittal review, LEED documentation, and project close out.

2. What are the biggest constraints for the client for this job? (i.e. financing, phasing, quality).

The nature of this project, a trophy class office building, helps to dictate what the owner expects. First and foremost the wanted the highest quality of materials to be included into the design. While they wanted to stay within the GMP money was not the main focus, rather creating a high class office building was. At first the owner had dictated what floors they wanted turned over according to which spaces they already had rented out. We convinced them to change their initial plan so that the turnover of floors would better fit the construction schedule and allow for faster overall completion.

3. What were the main value engineering principals used on this project?

This project was very difficult to apply value engineering to, not because the opportunity to do so was not present but rather the nature of the project. Like you know this building was designed to be a trophy class office building with extremely high end finishes. So right from the start the owner told us not to apply VE to any of the finishes. That being said the solid gold, silver, and bronze feature wall in the lobby could have certainly been exchanged for something less expensive. Also, a large majority of the other finishes are being fabricated and shipped in from overseas. Even though it was difficult to apply VE to this project we still helped to better the MEP system and make up water cistern by suggesting more efficient systems. The unexpected party wall that was torn down was initial planned to be fixed by tearing down the wall of the neighboring building and replacing it entirely. Instead DAVIS came up with a solution that used a material called Monokote Z-156, saving countless man hours and money.

4. Do they fit within the goals of the owner?

The VE that we were able to apply definitely fit within the goals of the owner. We helped to increase the efficiency of the MEP system slightly and were able to minimize the effect of a major issue that arose during construction. Again it was impossible to apply VE to the materials because of the need for all of the high end finishes.

5. What else could have been done to better help the project?

The one thing I could see really benefiting the project is completing a better examination of the existing conditions on site before and during demolition. This way could have avoided the three month delay that was caused by demolishing the party was between the monitor building and the neighboring building to the north.

Appendix B:

PACE Roundtable Notes

The 24th Annual PACE Roundtable

STUDENT FORM

Student Name Douglas Watson

Session 1: Topic: BIM

Research Ideas:

1) Contract change to IPD for better quality BIM models
   ↳ EARLY INVOLVEMENT = BETTER MODELS

2) STRUCTURAL COORDINATION OF EMBEDS/REBAR IN CONJUNCTION W/ FACADE TYPES
   ↳ Associated possible cost/schedule savings

Session 2: Topic: Driving Collaboration

Research Ideas:

1) Effectiveness of colocation based upon the contract value of a project

2) Effectiveness of Pull Planning
   ↳ Entire Project vs. trade specific (MEP, STRUCTURE, FACADE)

Session 3: Topic: Safety

Research Ideas:

1) Individual scorecards of sub employees to track hazards

2) - Banning of cell phones beside foreman to avoid careless injuries
   ↳ Part of a safety awarness program

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The 24th Annual PACE Roundtable

STUDENT FORM

Industry Member: LEAHA MARTYNUSKA

Key Feedback:

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

- What contract type yields the fastest submittal/RFI return time?
  - ↳ which recieves highest profit margin
  - ↳ Is there a correlation?
- How would the findings impact/influence the industry?
  - ↳ MORE FOCUS ON IPD OR A DIFFERENT DELIVERY TYPE/CONTRACT

Suggested Resources:

What industry contacts are needed? Is the information available?

- GENERAL CONTRACTOR -> HISTORY OF PAST PROJECTS
- VARIOUS GENERAL CONTRACTORS IN A SINGLE GEOGRAPHIC AREA -> NEEDED IF SINGLE CONTRACTOR DOES NOT HAVE A WIDE ENOUGH RANGE OF PROJECTS

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Appendix C:

BIM Use Process Map

LEVEL 1: BIM EXECUTION PLANNING PROCESS

Project Title

Developed with the BIM Project Execution Planning Procedure by the Penn State CIC Research Team

http://www.engr/psu.edu/ae/cic/bimex

BIM USES

Planning
Validate Program
Owner | Programming

Schematic Design
Author Schematic Design
Architect | Design Authoring

Schematic Design
Existing Conditions
Contractor | 3D Modeling

Schematic Design
Perform 3D Coordination
Architect | 3D Macro Coordination

Schematic Design
Design Review (curtain wall system)
Architect | Façade Model

Schematic Design
Create 4D Model
Contractor | 4D Modeling

Design Development
Author Design Development
Architect | Design Authoring

Design Development
Existing Conditions
Contractor | 3D Modeling

Design Development
Perform 3D Coordination
Architect | 3D Macro Coordination

Design Development
Design Review (curtain wall system)
Architect | Façade Model

Design Development
Create 4D Model
Contractor | 4D Modeling

Construction Documents
Author Construction Documents
Architect | Detailed Map

Construction Documents
Existing Conditions
Contractor | Detailed Map

Construction Documents
Perform 3D Coordination
Architect | 3D Macro Coordination

Construction Documents
Design Review (curtain wall system)
Architect | Façade Modeling

Construction Documents
Create 4D Model
Contractor | 4D Modeling

Operations
Compile Record Model
Contractor | Record Model

END PROCESS

INFO EXCHANGE

Program Model

Schematic Design
- Architectural Model
- MEP Model
- Structural Model
- Civil Model

Existing Conditions Modeling

Schematic Design 4D Model

Schematic Design 3D Macro Coordination Model

Schematic Design of Review of Façade Model

Design Development
- Architectural Model
- MEP Model
- Structural Model
- Civil Model

Design Development Existing Conditions Modeling

Design Development 4D Model

Design Development 3D Macro Coordination Model

Design Review of Facade Model

Construction Documents (WP)
- Architectural Model
- MEP Model
- Structural Model
- Civil Model

CD (MP) 3D Macro Coordination Model

CD (MP) 4D Model

CD (MP) Existing Conditions Modeling

CD (MP) 3DM Modeling

CD (MP) 3D Micro Coordination Model

Record Model

Appendix D:

LEED Evaluation Scorecards

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: 900 16th Street
Date: 11/11/2015

Y	?	N			
	1		Credit	Integrative Process	1

18	1	1	**Location and Transportation**		**20**
			Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
2		1	Credit	High Priority Site	3
6			Credit	Surrounding Density and Diverse Uses	6
6			Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
	1		Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

3	2	6	**Sustainable Sites**		**11**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
		2	Credit	Site Development - Protect or Restore Habitat	2
	1		Credit	Open Space	1
	1	2	Credit	Rainwater Management	3
1		1	Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1
1			Credit	Tenant Design and Construction Guidelines	1

3	2	6	**Water Efficiency**		**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
	2		Credit	Outdoor Water Use Reduction	2
		6	Credit	Indoor Water Use Reduction	6
2			Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

14	12	7	**Energy and Atmosphere**		**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
	6		Credit	Enhanced Commissioning	6
13		5	Credit	Optimize Energy Performance	18
	1		Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
	3		Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
	2		Credit	Green Power and Carbon Offsets	2

2	2	10	**Materials and Resources**		**14**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
		6	Credit	Building Life-Cycle Impact Reduction	6
	2		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
		2	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
		2	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

5	2	3	**Indoor Environmental Quality**		**10**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
		2	Credit	Enhanced Indoor Air Quality Strategies	2
3			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
	2	1	Credit	Daylight	3
1			Credit	Quality Views	1

4	2	0	**Innovation**		**6**
3	2		Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

2	0	2	**Regional Priority**		**4**
1			Credit	Regional Priority: Specific Credit	1
1			Credit	Regional Priority: Specific Credit	1
		1	Credit	Regional Priority: Specific Credit	1
		1	Credit	Regional Priority: Specific Credit	1

51	24	35	**TOTALS**	Possible Points:	**110**

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

900 16th Street Actual LEED Scorecard

Courtesy of DAVIS

LEED 2009 for Core & Shell
900 16th Street

Possible	Achievability hi	med	low	NP	
110	66	14	15	15	69 Projected Points

Certified 40 to 49 points **Silver** 50 to 59 points **Gold** 60 to 79 points **Platinum** 80 or more points
Achievability rating: **Hi** = 90%, **Med** = 60%, **Low** = 10%, **NP** = not possible.

Possible						Prerequisites	Standard	Comments	Responsible
Y	Y				SS Prereq 1	**Construction Activity Pollution Prevention**	Create and implement erosion control plan that meets the 2003 EPA Construction General Permit.	Must achieve	Davis, Wiles Mensch C
Y	Y				WE Prereq 1	**Water Use Reduction:** 20%	Reduce water use by 20% over the baseline specified in LEED.	Prerequisite must be pursued.	Atelier Ten
Y	Y				EA Prereq 1	**Fundamental Commissioning of Building Energy Systems**	Engage commissioning agent, and develop and execute a commissioning plan.	Must pursue prerequisite.	Team Member
Y	Y				EA Prereq 2	**Minimum Energy Performance**	Reduce energy cost by 10%, compared to ASHRAE 90.1-2007, Appendix G	Must pursue prerequisite.	A10 / Dewberry
Y	Y				EA Prereq 3	**Fundamental Refrigerant Management**	Eliminate CFCs in building HVAC&R.	Must pursue prerequisite.	A10 / Dewberry
Y	Y				MR Prereq 1	**Storage & Collection of Recyclables**	Provide space for the collection and storage of paper, cardboard, glass, plastic, and metals.	Must pursue prerequisite.	Team Member
Y	Y				IEQ Prereq 1	**Minimum IAQ Performance**	Meet sections 4 through 7 of ASHRAE 62.1-2007.	Must pursue prerequisite.	Team Member
Y	Y				IEQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Prohibit smoking inside building, and locate exterior smoking areas at least 25 feet away from building.	Must pursue prerequisite.	RAMSA

28	24	0	3	1		Sustainable Sites	Standard	Comments	
1	1				SS Credit 1	**Site Selection**	Do not develop sites that are prime farmland, floodplains or wetlands, parkland, or key habitat.	Site complies.	A10
5	5				SS Credit 2	**Development Density and Community Connectivity**	Locate project in dense areas or near key community services.	Site complies.	A10
1				1	SS Credit 3	**Brownfield Redevelopment**	Locate project on a remediated brownfield site.	Not applicable.	--
6	6				SS Credit 4.1	**Alternative Transportation:** Public Transportation Access	Locate project within 1/2 mile of a rail station or 1/4 mile of two bus lines.	Site complies	A10
2	2				SS Credit 4.2	**Alternative Transportation:** Bicycle Storage & Changing Rooms	Provide bicycle racks for 3% of builidng occupants and showers for 0.5% of FTE occupants.	Requires 27 bike racks and space within building for 2 showers	A10 / RAMSA
3	3				SS Credit 4.3	**Alternative Transportation:** Low-Emitting, Fuel-Efficient Vehicles	Provide preferred parking for hybrid vehicles for 5% of the project's parking capacity.	5 preferred parking spaces required	ICG
2			2		SS Credit 4.4	**Alternative Transportation:** Parking Capacity	Do not exceed zoning parking requirements; provide preferred carpool parking for 5% of parking capacity.	Client to verify parking compliant with DC zoning	ICG
1	1				SS Credit 5.1	**Site Development:** Protect or Restore Habitat	Restore 50% of site open space or 20% of the total site, whichever is greater, for native /adapted vegetation.	Combination of green roof and streetside plantings should comply.	MVLA
1	1				SS Credit 5.2	**Site Development:** Maximize Open Space	Exceed zoning open space requirements by 25%.	Should be achievable given green roof area.	MVLA
1	1				SS Credit 6.1	**Stormwater Design:** Quantity Control	No net increase site runoff, OR, reduce over existing conditions by 25%.	With a green roof we can expect to get this credit. (according to Mary Ramsey of WMC)	Wiles Mensch Corp
1	1				SS Credit 6.2	**Stormwater Design:** Quality Control	Develop stormwater plan that meets local best management practice, and removes 80% TSS.	The green roof would have to cover nearly the full extents of the roof in order to get this credit. (according to Mary Ramsey of WMC)	Wiles Mensch Corp
1	1				SS Credit 7.1	**Heat Island Effect:** Non-Roof	Use open-grid paving, light-colored paving, or provide shade on 50% of all hardscape.	Landscape and sidewalk design will achieve this.	MVLA
1	1				SS Credit 7.2	**Heat Island Effect:** Roof	Use light-colored membrane for 75% of roof or vegetated roof for 50% of roof.	Roof complies with Option 2 (>50% green roof)	Wiles Mench Corp.
1			1		SS Credit 8	**Light Pollution Reduction**	No nighttime light trespass from building AND meet exterior lighting requirements of ASHRAE 90.1-2007.	May be difficult to achieve given site boundary - but will be tracked.	A10
1	1				SS Credit 9	**Tenant Design and Construction Guidelines**	Provide tenants with design and construction guidelines.	ICG typically uses tenant guidelines, A10 has templates available.	ICG

10	5	3	2	0		Water Efficiency	Standard	Comments	
2	2				WE Credit 1	**Water Efficient Landscaping:** 50% Reduction	Reduce potable water used for irrigation by 50%	MVLA indicated that this credit is likely to be achieved.	MVLA
2		2			WE Credit 1	**Water Efficient Landscaping:** No Potable Water	No potable water use for irrigation.	Irrigation will be provided during a 2 year establishment period only.	MVLA
2			2		WE Credit 2	**Innovative Wastewater Technologies**	Reduce water used for sewage conveyance by 50%.	In order to achieve Platinum certification, this credit may need to be pursued.	TBD
4	3	1			WE Credit 3	**Water Use Reduction:** 30% / 35% / 40%	Reduce water use by 30%/35%/40% over the baseline specified in LEED.	Difficult to achieve- current calculations show 25% reduction	0

37	14	8	7	8		Energy & Atmosphere	Standard	Comments	
5	5				EA Credit 1	**Optimize Energy Performance:** 12% / 14% / 16%	Reduce building energy cost by 12%/ 14%/ 16% compared to ASHRAE 90.1-2007, Appendix G.	30% modeled savings	A10 / Dewberry
3	3				EA Credit 1	**Optimize Energy Performance:** 18% / 20% / 22%	Reduce building energy cost by 18%/ 20%/ 22% compared to ASHRAE 90.1-2007, Appendix G.	30% modeled savings	A10 / Dewberry
3	3				EA Credit 1	**Optimize Energy Performance:** 24% / 26% / 28%	Reduce building energy cost by 24%/ 26%/ 28% compared to ASHRAE 90.1-2007, Appendix G.	30% modeled savings	A10 / Dewberry
3		1	2		EA Credit 1	**Optimize Energy Performance:** 30% / 32% / 34%	Reduce building energy cost by 30%/ 32%/ 34% compared to ASHRAE 90.1-2007, Appendix G.	30% modeled savings	A10 / Dewberry
3		3			EA Credit 1	**Optimize Energy Performance:** 36% / 38% / 40%	Reduce building energy cost by 36%/ 38%/ 40% compared to ASHRAE 90.1-2007, Appendix G.	30% modeled savings	A10 / Dewberry
4				4	EA Credit 1	**Optimize Energy Performance:** 42% / 44% / 46% /48%	Reduce building energy cost by 42%/ 44%/ 46%/ 48% compared to ASHRAE 90.1-2007, Appendix G.	30% modeled savings	A10 / Dewberry
4				4	EA Credit 2	**On-Site Renewable Energy:** 1%	Produce renewable energy on-site for 1% of building energy consumption, calculated by cost.	Renewables not currently included in design - pursue for Platinum.	A10 / Dewberry
2		2			EA Credit 3	**Enhanced Commissioning**	Design review, post occupancy review, recommissioning manual.	Pursue for Platinum certification.	TBD
2	2				EA Credit 4	**Enhanced Refrigerant Management**	Select refrigerants with low global warming potential and ozone depletion potential.	To be pursued.	Dewberry
3	1		2		EA Credit 5.1	**Measurement & Verification:** Base Building	Develop and implement an M&V plan that meets IPMVP, Options B or D.	Pursue for Platinum certification.	Dewberry
3			3		EA Credit 5.2	**Measurement & Verification:** Tenant Submetering	Provide a centrally monitored electronic metering and develop a tenant M&V Plan.	Pursue for Platinum certification.	Dewberry
2		2			EA Credit 6	**Green Power**	Purchase Green-e certified electricity supply for 2 years, for 35% of building's electricity demand.	Pursue for Platinum certification or if needed at end of construction.	JBG

13	7	0	1	5		Materials & Resources	Standard	Comments	
5				5	MR Credit 1	**Building Reuse:** Maintain Existing Walls, Floors, & Roof, 25%-75%	Maintain existing structure and envelope for 25% / 33% / 42% / 50% / 75% of the existing building.	Not applicable.	N/A
2	2				MR Credit 2	**Construction Waste Management:** 50% / 75%	Create a construction waste management plan and recycle and/or salvage construction waste.	Will pursue 75% threshold - typical for DC.	Davis
1			1		MR Credit 3	**Materials Reuse:** 5%	Use salvaged, refurbished, or reused materials for 5% of construction materials, calculated by cost.	Not applicable.	N/A
2	2				MR Credit 4	**Recycled Content:** 10% / 20% (post-consumer + 1/2 pre-consumer)	Use materials or products with recycled content for 10% / 20% of construction materials, calculated by cost.	Will pursue 20% threshold - commonly achieved.	Davis
2	2				MR Credit 5	**Regional Materials:** 10% / 20%	Use materials extracted and manufactured within 500 miles for 10%/20% of construction materials.	Will pursue 20% threshold - commonly achieved.	Davis
1	1				MR Credit 6	**Certified Wood**	Use FSC-certified wood for 50% of wood-based materials, calculated by cost.	Will pursue, pending sufficient wood quantities in design.	Davis

900 16th Street Actual LEED Scorecard
Courtesy of DAVIS

12	10	1	0	1	Indoor Environmental Quality		Standard	Comments	
1	1				IEQ Credit 1	**Outdoor Air Delivery Monitoring**	Install monitoring of outdoor air on ventilation systems and monitor CO2 concentrations.	Dewberry to confirm that design will comply.	Dewberry
1	1				IEQ Credit 2	**Increased Ventilation**	Increase ventilation rates by 30% above ASHRAE 62.1-2007.	Dewberry to confirm whether this credit can be pursued.	Dewberry
1	1				IEQ Credit 3	**Construction IAQ Management Plan:** During Construction	Develop an IAQ plan that meets SMACNA IAQ Guidelines for Occupied Buildings Under Construction.	Plan will be included in specs.	Davis
1	1				IEQ Credit 4.1	**Low-Emitting Materials:** Adhesives & Sealants	Use adhesives and sealants that comply with the SCAQMD Rule #1168	Include in specifications.	Davis
1	1				IEQ Credit 4.2	**Low-Emitting Materials:** Paints & Coatings	Use products with VOC levels specified in Green Seal Standard GS-11 and GC-03, and SCAQMD Rule 1113.	Include in specifications.	Davis
1	1				IEQ Credit 4.3	**Low-Emitting Materials**: Flooring Systems	Use carpet that meets the CRI Green Label requirements and FloorScore compliant hard surface flooring.	Include in specifications.	Davis
1	1				IEQ Credit 4.4	**Low-Emitting Materials:** Composite Wood & Agrifiber Products	Use materials with no added urea-formaldehyde resins or adhesives.	Include in specifications.	Davis
1	1				IEQ Credit 5	**Indoor Chemical & Pollutant Source Control**	Floor grates at doors, MERV 13 filters, and exhausts and hazardous liquid container in chemical use areas.	Separate ventilation for chemical use spaces, 10 ft. walk-off matts.	Dewberry
1				1	IEQ Credit 6	**Controllability of Systems:** Thermal Comfort	Provide comfort controls or operable windows for 50% of individuals AND 100% of group spaces.	Not really possible given mechanical system design type and core and shell design.	Dewberry
1	1				IEQ Credit 7	**Thermal Comfort:** Design	Meet ASHRAE 55-2004, Thermal Comfort Conditions for Human Occupancy.	Planning to pursue - pending Dewberry agreement.	Dewberry
1		1			IEQ Credit 8.1	**Daylight & Views:** Daylight	Meet prescriptive requirements, or achieve 25 footcandles, in 75% of regularly occupied spaces.	Preliminary calculations indicate credit is potentially achievable.	Atelier Ten / RAMSA
1	1				IEQ Credit 8.2	**Daylight & Views:** Views	Provide direct views to the outside in 90% of regularly occupied spaces.	Views credit is likely to be achievable.	Atelier Ten / RAMSA

6	4	2	0	0	Innovation in Design		Standard	Comments	
1	1				ID Credit 1.1	**Innovation in Design**	Pending USGBC judgment.	SSc4.1 - could get credit for exemplary public transport access.	A10
1	1				ID Credit 1.2	**Innovation in Design**	Pending USGBC judgment	Education - develop a green building education program?	ICG Properties/JBG Co
1	1				ID Credit 1.3	**Innovation in Design**	Pending USGBC judgment	Low mercury lamps that have cumulative mercury contact below 90 picograms/lumen hour.	Team Member
1		1			ID Credit 1.4	**Innovation in Design**	Pending USGBC judgment	New option - Polypropylene heat fusion piping.	Davis Construction
1		1			ID Credit 1.5	**Innovation in Design**	Pending USGBC judgment	Could potentially reach 30% recycled content or regional content threshold.	Davis
1	1				ID Credit 2	**LEED™ Accredited Professional**	LEED accredited professional on design team.	A10 team members comply.	Atelier Ten

4	2	0	2	0	Regional Priority		Standard	Comments	
1	1				RP Credit 1.1	**Regional Priority**, SSc5.1	Pending USGBC judgment.	Achieved by the current design.	MVLA
1	1				RP Credit 1.2	**Regional Priority**, SSc6.1	Pending USGBC judgment	Achieved by the current design.	Wiles Mensch Corp
1			1		RP Credit 2	**Regional Priority**, EAc2	Pending USGBC judgment.	May achieve if platinum is pursued.	A10 / Dewberry
1			1		RP Credit 2	**Regional Priority**, WEc2	Pending USGBC judgment.	May achieve if platinum is pursued.	N/A