2. Analysis of Key Construction Features

2.1. Executive Summary

This particular assignment gave me a better understanding of the features of the projects that affect the project execution. This was understood by analyzing and preparing key features of Wilsdorf Hall, including: a schedule, an estimate, contracts, staffing plan, and design coordination.

Analysis and development of the construction schedule aided me in seeing the different phases of construction. Wilsdorf Hall is located on the University of Virginia therefore sitework and preparation took a considerable amount of time. Traffic needed to be rerouted, new emergency exits needed to be determined and site utilities was also a huge issue. Some key features of the project schedule are the underpinning process and also the relocation of the existing chilled waterlines.

The type of contract entered was typical for the University of Virginia and most contractors were selected by lowest price and also past relations. All contractors were required to obtain their own insurance and also obtain bid, performance, and payment bonds. It is also interesting to note that it is required by contract to publish the status of the project every week in local newspapers.

The last part of Tech. 2 discusses key findings from the Partnership for Achieving Construction Excellence (PACE) Roundtable Event. I choose to attend sessions on the Emerging Healthcare and Lab Industry, the Role of Technology in the Industry and also Developing a Learning Culture in the Industry. I was particularly interested in what industry professionals had to say about the construction of healthcare facilities and labs because it is directly related to Wilsdorf Hall.

2.2. Detailed Project Schedule

Please see attached Appendices:

Appendix A – Full Construction Schedule

Appendix B – Detail Excavation & Foundation Construction Schedule

2.3. Assemblies Estimate

Structural Totals:

Structural Type	Cost		
	Material	Installation	Total
Concrete Columns	$12,158.00	$28,180.00	$40,698.00
Slab on Grade	$42,292.22	$26,648.97	$68,941.19
Concrete Flooring	$101,529.60	$30,062.28	$131,591.88
Concerete Walls	$154,255.30	$220,394.25	$374,649.57
Total	$608,312.24	$305,285.50	**$615,880.64**

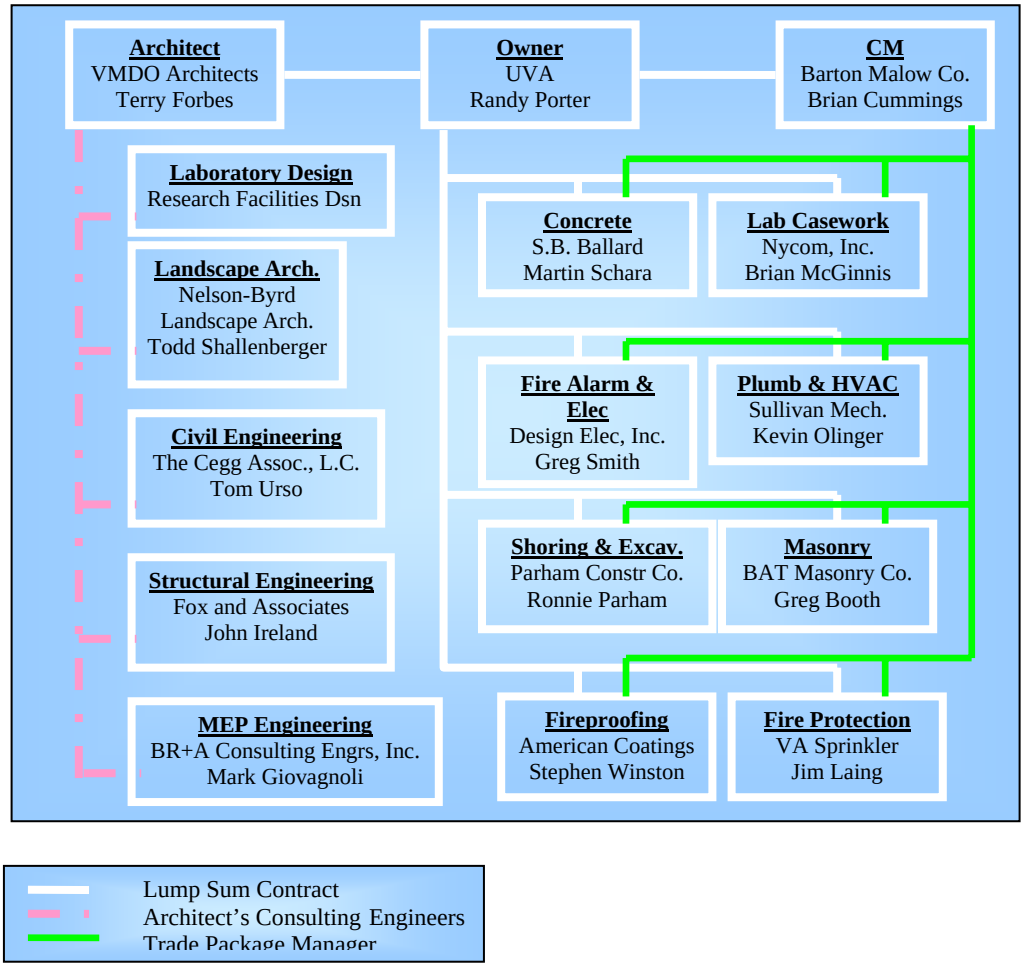
Appendix C – Means Assemblies Unit Cost Pricing

Appendix D – Means Assemblies Actual Costs

Assumptions:

- Assume vibration sensitive slab on grade is the same price as regular slab on grade.
- Beams are listed as precast concrete with precast planks in Means. Assume cast in place is the same price (changed wording from precast to cast-in-place).

2.4. Contracts



Owner – Architect

VMDO Architects holds a lump sum contract with the University of Virginia. If there is a change in design, VMDO must update the appropriate drawings, submit new pricing, and also charge a fee for the changes. After changes to the drawings are updated, they are to be sent to each contractor to review.

Owner – CM (Barton Malow)

Barton Malow is acting as a CM Agent on the project and holds a lump sum contract with the University of Virginia. This means that they represent the Owner in all relations to the Owners contractors.

Owner – Contractors

The University of Virginia holds all contracts (lump sum) with the contractors. All relations between the two parties are managed by the construction manager.

CM (Barton Malow) – Contractors

Barton Malow bid out all the trade packages to the contractors and now manages them. They are to handle all information flow and work with the University of Virginia to solve issues and conflicts during construction.

Contractor Selection

The scope of work is written by the State of Virginia; it is low bid wins, and there can be no exclusions to the scope provided by the State. Therefore UVA writes the scope and the contractors submit a price. That being said, UVA had relationships with most of the contractors who bid.

Also, State procurement requires that all bids for construction projects over $100,000 be advertised publicly. Wilsdorf Hall is currently advertised in the Cville Daily Progress and the Richmond Times Dispatch on Sundays.

Required Bonds and Insurance

The state of Virginia requires that any bid in excess of $100,000 shall be accompanied by a 'Commonwealth of Virginia Standard Bid Bond' payable to the Owner. In addition a standard performance bond and a standard payment bond are required for the full value of the contract from each contractor awarded a bid.

All bonds must be issued by a company who is legally authorized in the state of Virginia.

Each contractor is required to take out Workers' Compensation and Employers' Liability Insurance for all of his or her employees. This must be completed prior to winning the contract and proof needs to be submitted to the owner. In addition each contractor is required to have automobile liability insurance to insure against claims of personal injury and property damage arising from operations under contract.

Each contractor is also required at his cost to obtain "all-risk" builder's risk insurance on the entire structure and all materials intended for use. The value of this insurance excludes the cost of excavation, backfill, foundation, under ground utilities, and sitework.

The renovation work of two connecting buildings does contain asbestos which requires the asbestos contractor to obtain additional insurance. They need to have liability insurance with asbestos coverage no less than $1,000,000. The existing buildings needing renovation work are covered by the Owner's insurance and will not require the "all risk" builder's insurance.

2.5. Staffing Plan

During the construction of Wilsdorf Hall there will be eight main Barton Malow project members involved:

Phil Kirby	-	Vice President
Carrier Shaeffer	-	Project Director
Brian Cummings	-	Project Manager
Don Taylor	-	Project Engineer
Matthew Day	-	Field Engineer
Tim Morris	-	Superintendent
Walt Riggins	-	Inspector
Dianne Pugh	-	Project Secretary
Jim Morse	-	Accountant

The number of CM employees is average for the size of the construction project. Brian Cummings is the project manager and the main contact for Barton Malow. As the PM, he deals with all relations to the owner therefore the field engineer, project engineer, and superintendent will report to him. Brian will then report to the owner, project director, and project executives. The sub contractors will report to the superintendent and all appropriate information will be transmitted directly to Brian.

Wilsdorf Hall is organized like a standard Barton Malow project with a project executive, or vice president who oversees the entire project. Phil Kirby will typically spend a few days each month on site to ensure everything is running smoothly. On this particular project there is also a project director, Carrie Shaeffer who is working along with Brian who is a newly appointed project manager to advise him and aid him if needed.

Staff	02	2003				2004				2005				2006			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Brian Cummings																	
Don Taylor																	
Matthew Day																	
Tim Morris																	
Walt Riggins																	
Dianne Pugh																	
Carrie Shaeffer																	
Jim Morse																	

All project members work a typical five day, eight hour day work week. The staffing plan has changed slightly from the first proposed; the durations have been extended a quarter due to a delay in the construction schedule (caused by the underpinning failure on the Chemistry Library). Currently the job is not under or over staffed, but another field person for 2005 has been worked into the budget.

2.6. Design Coordination

Coordination of the mechanical, electrical, and plumbing systems is required by contract. This process is especially important because most of the ceilings are exposed, so coordination is required to ensure proper fit and compliance with the mechanical code, in addition the ceiling needs to be architecturally pleasing to the eye. There are mandatory bi-weekly meetings for specialty contractors, including the plumbing, HVAC piping, electrical, sheet metal, and fire protection contractor to attend.

The mechanical contractor is the leader of the coordination process and is responsible for the finished CAD drawings to be distributed to each specialty trade subcontractor, the Owner, the CM, and the Architect. Fabrication of materials can not start until the coordination drawings are complete and have been distributed to all specialty contractors. There is a very detailed process to the coordination of work:

- Each contractor must compare his drawings and specification to other trades and report any discrepancies between them to the architect.
- Locations of piping, ductwork, conduits, and equipment must be adjusted to accommodate possible interferences with accurate measurements and dimensions.
- Lines with pitch have the right-of-way over those without.
- Offsets, transitions, and changes of direction in systems must be made to maintain proper headroom and pitch of sloping lines.
- Work must be installed to permit removal or maintenance of coils, filters, controls, fan shafts and wheels, belt guards, sheaves, etc…
- Work must be accurately laid out with other trades to avoid conflicts and to obtain an organized installation plan.

There are also detailed requirements to the coordination drawings that must be followed:

- Each specialty contractor must prepare their own coordination drawings for floors showing the size and location of equipment and lines before materials are purchased or fabricated.
- A complete set of AutoCAD drawings are required from each contractor at a scale of ¼" = 1'0" showing the basic layout for the structure and any other information necessary for the preparation of the coordination drawings.
- All fire rated partition must be highlighted
- Main paths for the installation and removal of equipment from the mechanical and electrical rooms are required.

In addition to these requirements mechanical coordination must be reviewed by the Architect/Engineer to make sure the system and equipment arrangements allow maintenance access as follows:

- Group valves and instrumentation together in accessible locations
- Valves on pipes 6" or larger in a height above 8'0" must have chain operated valve wheels and cannot be located where chains will interfere with access to other mechanical systems.
- The location of control panels must be shown on the mechanical room coordination drawings.

The biggest challenge in design coordination is the ceiling height. There are two floors with restricted ceiling space because of the tie-in to the adjacent buildings which have open heights of 12'6". The typical floor is 14'6" clear for the new building, but one floor is 12'6" and the other is 12'10". There are also issues with shafts and maintaining fire separation between floors. There shafts are so full there is hardly enough room to infill the spaces between them with a fire rated structure.

The nanotechnology labs do not provide any specific coordination challenges besides being MEP intensive labs. The floor thickness and steel

required for vibration control has required accurate planning of the location of sleeves and penetrations to avoid core drilling a thicker slab.

The future nanotechnology lab users were involved in the original design of their individual spaces. Now that the Wilsdorf Hall is under construction there is one University representative and he has no authority to change anything unless he provides additional funding to compensate the change. Before this could even happen, the change request must first be approved by the University of Virginia Facilities Management.

2.7 Critical Industry Issues

- **Emerging and Rebounding Markets: I**

  Healthcare and Labs

  This particular session was very exciting, there were many topics covered and much information shared. Issues that were interesting to me included:

  - Coordination: The timing of specialty trades is critical for the AE & GC. All schedules need to be worked out in the beginning to avoid future conflicts and delays. Having the owner understand the importance of coordination with the MEP equipment manufacturer is also a huge issue.
  - Inhibition of Early Development: The most common are the state contracts that are required; the quick advancement in technology; the gaining of the owners trust; and the need to explain why the cheapest option isn't the most effective choice.
  - West v. East Region of the Country: In order to build a new healthcare facility in a different region companies will need to treat project players accordingly, learn new labor rules, and adjust to the region. As of now, most hospitals in California need to be rebuilt by 2012 to meet new earthquake standards.

  I believe that attending this information session was beneficial in my thesis research because I learned a lot about the effect of a particular region on the construction of a laboratory. I also gained an understanding of the importance of trust issues with the owner.

  Key Contacts:

  - Victor Sanvido
  - Southland Industries
  - Katie Lynaham
  - Barton Malow

- **Integrated Design and Construction: II**

  The Role of Technology

  This session didn't seem as appealing to the industry professionals as it did to the students. Issues that were interesting to me included:

  - Trade Coordination: 3D CAD aids in the start of the construction project because everyone can view and use it at their convenience. Although, this could present a problem to those without formal training.
  - 3D CAD: It was discussed that the primary focus of 3D CAD should be in ship (mechanical) design because of the limited space, curves, and complicated systems.
  - 4D CAD: It is not just a marketing tool; the program actually looks ahead and detects possible errors. It shows most scheduling flaws which can then be fixed before it's too late.

  I was very interested in this session also because I briefly researched the topic and gave a presentation on it this past summer. Part of my internship program requirement was to complete a research paper & presentation on an emerging construction management trend and I choose to investigate 3D and 4D CAD.

  Key Contacts:

  - Dan Liscinsky
    John J. Kirlin, Inc.

- **Creating a Learning Culture**

This session was focused on discussing ideas to further educate industry professionals. Topics of particular interest to me were:

- Mentoring Programs: Companies are beginning to have mentor programs in which a higher personal will assist and support someone who isn't as experienced. For this to happen, the mentor needs to be accessible, inspire, and act as an overall leader. The mentored will then be given the opportunity to take the next step in their job or to take on new responsibilities.
- Continual Learning: Some of the best ways to keep employees learning to have them be challenged, and to give them the opportunity to take the next step. A few more ideas that were discussed were classes, rotation within the company, and flexible positions.

It was very interesting in this session to see what ideas industry professionals had to increase learning and experiences within their own companies. Having already experienced a very structured internship program I could relate to the idea of having a mentor, supervision, and "buddy." I believe that this session was very beneficial for those company representatives that didn't have a learning culture. It gave them many ideas for growth and success.

Key Contacts:

- Bill Moyer
  James G. Davis Construction Corporation