Technical Assignment 1

Construction Project Management
September 29, 2008

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Construction Management
Dr. Riley

Integrated Science Center
College of William & Mary
Williamsburg, Virginia

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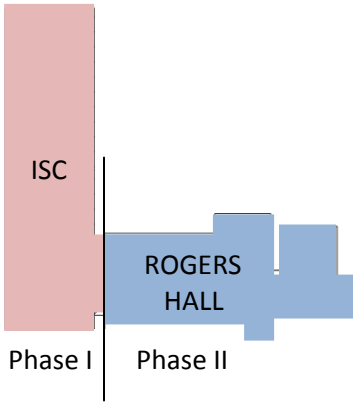
I. EXECUTIVE SUMMARY

The College of William and Mary is interested in upgrading its out-of-date chemistry, biology, and psychology departments by replacing buildings over 30 years old with top-of-the-line facilities. This joint project includes the addition of a new, high tech laboratory building as well as the renovation of the existing Rogers and Millington Halls. The entire addition/renovation project is broken into five phases. Phases I and II were bid on together and awarded to Gilbane Construction Company. The remaining three phases (Phases III-V) are still in the schematic design stage. This technical assignment describes the construction management methods executed by Gilbane for Phases I & II of this project. It will summarize the project schedule, budget, building systems, and site logistics, as well as present an overview of the project delivery system and staffing plan.

Phase I includes the addition of the 3 story, 116,500 SF Integrated Science Center. This building has a mechanical penthouse located on the 4th floor and an animal holding area in the basement. Once the new addition is complete, Gilbane will work with the college to transition people and equipment out of the existing building into their new home. Once vacant, the existing buildings will be gutted and renovated. Phase II includes the renovation of the exiting, 2 story, 42,500 SF Rogers Hall only. Careful attention is required to move expensive equipment and hazardous materials, and hit certain academic dates.



II. CLIENT INFORMATION

The College of William and Mary is a public university located in Williamsburg, Virginia. It is the United States second oldest institution of higher education and is one of the eight Public Ivies. To keep its reputation as being a cutting-edge research university, the college has decided to upgrade the outdated departments of Chemistry, Biology, and Psychology. Replacing facilities that are over 30 years old, the addition of the Integrated Science Center and the newly renovated Rogers Hall will include up to date mechanical systems, improved technological capacity and capability, upgraded electrical capacity, and modernization of laboratory spaces and equipment. William and Mary's intent is to become a national leader in research and teaching facilities in these departments.

Owner Expectations and Keys to Success:

- **Cost** – Some of the funding for this project is provided by the Virginia College Building Authority and the rest is paid for by sponsors and the college. William and Mary would not like to pay more than they have to without sacrificing the end product.

  Keys to Success: No one likes to pay more if they don't have to. Both the contractor and owner are better off if construction is within budget. It is the contractors' responsibility to keep up with the expenditures and budget. This should be updated regularly and the owner should be informed.

- **Quality** – The owner is looking for a high quality product. By providing appealing facilities, the college will be able to attract the best faculty and students in these departments.

  Keys to Success: It is necessary to stress the importance of quality to workers when they first get on the project. If poor work is let go, workers may look to take the easy out for the rest of the job and quality could be sacrificed. Gilbane checks daily to make sure the work performed is sufficient.

- **Schedule** – The college has requested certain dates to be met so not to interrupt their academic schedule.

  Keys to Success: The academic calendar was taken into consideration when developing the project schedule. To keep the owner happy, it is necessary to hit as many benchmarks as possible. Gilbane has developed 2-week look-ahead schedules for its contractors so they are fully aware what needs to be done and by when.

- **Safety** – It is crucial for W&M to keep their students and faculty unharmed.

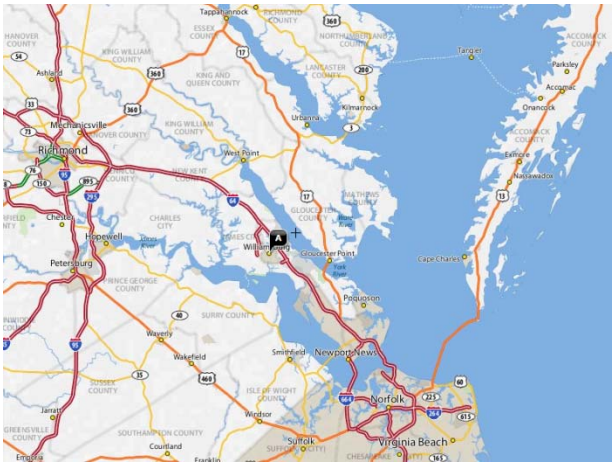
  Keys to Success: It is inevitable that construction will take place during the school year. Gilbane intends to keep everyone injury and accident free by providing overhead protection where necessary, additional lighting and signs, full and easy access around the site, and fencing for security.

No project is perfect, however; you can keep the client satisfied by considering the expectations they stress and actively working to achieve them.

III. LOCAL CONDITIONS

Williamsburg, Virginia

The project is located on the campus of the College of William and Mary in Williamsburg, Virginia. The following is information regarding the city of Williamsburg and its surrounding area.



- **Location** – Williamsburg is located on the I-64 corridor on the Virginia Peninsula, 45 miles southeast of Richmond and 37 miles northwest of Norfolk.

- **Williamsburg's Claim to Fame** – The city is well-known for Colonial Williamsburg, the restored Historic Area of the city, and for the adjacent College of William and Mary. Williamsburg is also part of the Historic Triangle of Virginia, along with Jamestown and Yorktown, which is one of the most popular tourist destinations in the world.
- **Preferred Methods of Construction** – To match the Colonial and Historic Williamsburg areas, most structures are masonry, cast-in-place concrete and light steel.
- **Construction Recycling** – Services are available locally for most materials.
- **Tipping Fee** – In 2008, the tipping fee was $49.95/ton but is expected to rise to $53.95 in 2009 (Solid Waste Management Program Overview)
- **Regional Soil Types** – The regional geology is very complex and generally consists of interbedded layers of varying mixtures of sands, silts, and clays.

Project Site

The subsurface exploration program and geotechnical engineering analyses for this project were performed by Froehling & Robertson Inc. The subsurface exploration program consisted of the installation of one 20-foot deep piezometer and 13 Standard Penetration Test borings that were performed January 31, 2005 through February 3, 2005. The following information regards the existing site conditions.

- **General Boundaries** - The site is generally bounded by Landrum Drive to the north, Jamestown Road to the south, Rogers Hall to the east and Millington Hall to the west.
- **Surface Conditions** – The project site was sparsely wooded and contains pedestrian walkways. An existing ravine is present along the north side of the site.

- **Site Soil Types** – The borings showed layers of varying mixtures of sands, silts, and clays.
- **Subsurface Conditions** – Groundwater level was below the bottom of the piezometer at the time of the study. This level was therefore evaluated by visually judging the moisture content of the spilt-spoon samples and determined to be at a depth of 14 feet to 23 feet below existing ground surface. The contractor was prepared to possibly encounter subsurface water if construction extended below the planned basement subgrade elevation.
- **Construction Parking** – Parking near the site was rather limited. Landrum Drive was restricted to W&M students and staff parking only. It was agreed on to close a portion of Landrum road (see figure above) for convenient parking. This closed the current Landrum Drive loop but did not prevent access to any part of campus.

IV. PROJECT DELEVERY SYSTEM

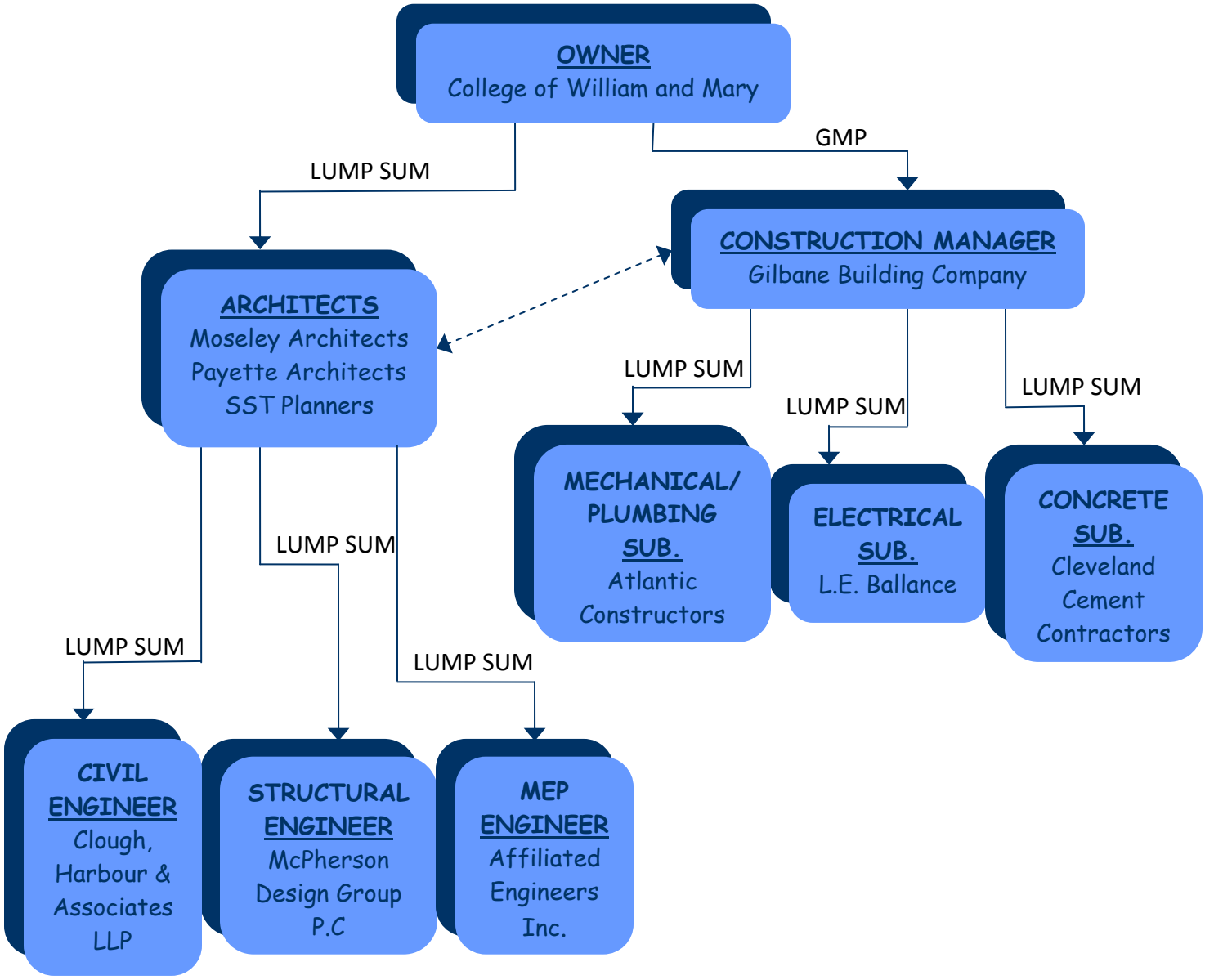
Gilbane Building Company was selected by the College of William and Mary to provide pre-construction and construction management services for their Chemistry/Biology/Psychology project on their campus. Gilbane serves as a construction manager at risk for this project. This was chosen by the owner to get the construction manager involved on the project early and to help alleviate some of the responsibilities and decisions from the W&M project staff. A guaranteed maximum price (GMP) contract was proposed by Gilbane, which is a typical contact type for them, and agreed to by the college. This way the construction manager will be acting in the owner's interest. The contract between the College of William and Mary and Gilbane was a GMP of nearly $42 million and schedule duration of 3.5 years.

The lump sum contracts that Gilbane holds with the subcontractors were developed for the individual parties. These contracts specified the list of contract documents, scope of work, work inclusions and exclusions, bid breakdown, unit rates, construction milestones, termination conditions, change order process, bonds and insurance, payment conditions, etc.

Gilbane was awarded this job through a design-bid-build process and was chosen over a select number of other qualified firms. Although this was the first project for Gilbane at the College of William and Mary campus, the original project manager for the job had a prior relationship with one of the W&M team members.

The builder's risk insurance was held by the owner. Gilbane carried general liability, automobile, and worker's compensation insurance. Each subcontractor was to provide general and excess liability insurances, automobile insurance, and worker's compensation insurance. Gilbane also required each subcontractor to have a performance and payment bond.

PROJECT ORGANIZATIONAL CHART



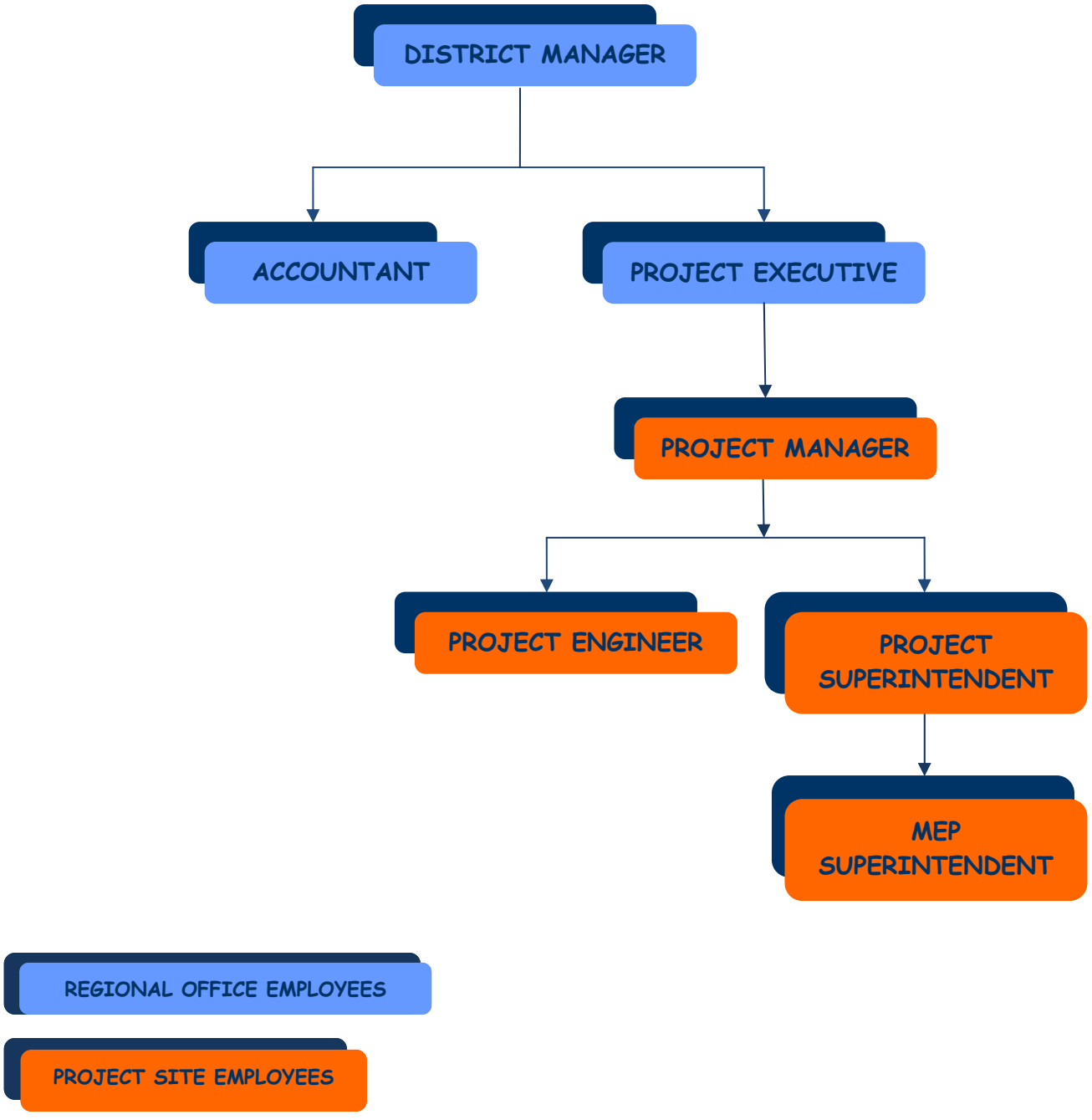
V. STAFFING PLAN

Gilbane Building Company was brought onto early in the project to act as a consultant to the owner in the development and design phases. Gilbane's preconstruction department provided estimating, purchasing, and budget control services. The preconstruction team consisted of the Richmond district manager, the accountant, and the project executive.

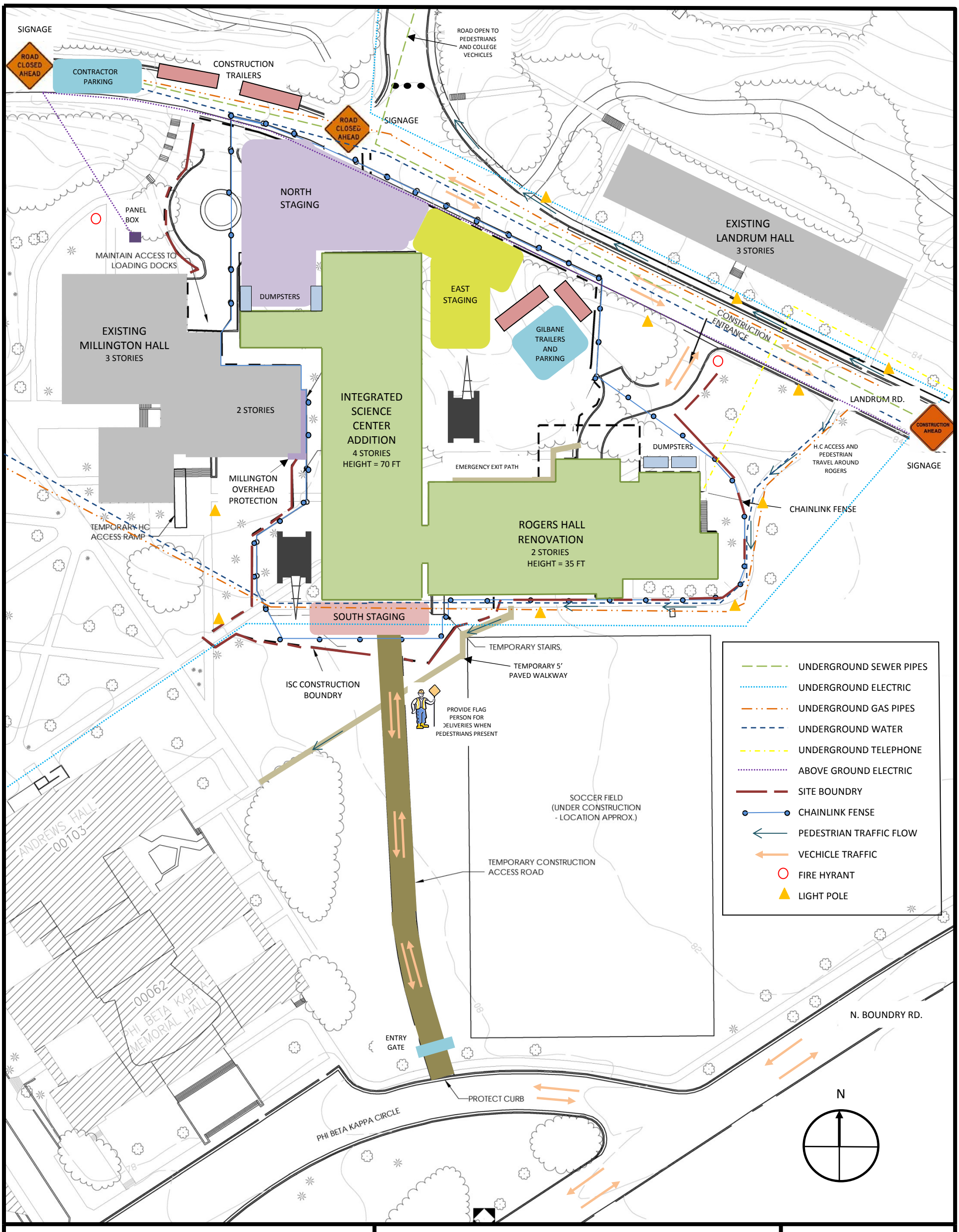
Once the project reached the construction phase, the project executive was head of the construction team. The ISC project executive oversees the construction progress mainly from the Richmond office and reports to the site once every two weeks. The project manager is in charge onsite. This position is mainly responsible for the cost reports, owner correspondence, and schedule updating. The project executive and project manager work together with the accountant (in the Richmond office) for cost reporting. There is no assistant project manager on this job so the project engineer stepped up to help the project manager in his responsibilities. The project engineer is also involved with any resource and engineering related activities relating to the project. There are two superintendents who shared duties in the field. They supervise the workers, inspect construction, oversee the MEP coordination, and enforce safety. The full time Integrated Science Center employees include the project manager, project engineer, and the two superintendents.

Gilbane has gone through numerous staffing changes on this project but the organization has remained the same. Not one member of today's team has been on the job since the beginning. At times this poses a challenge but Gilbane has managed to keep the project under control.

GILBANE ORGANIZATIONAL CHART



VI. SITE PLAN OF EXISTING CONDITIONS



MEGHAN GRABER THE PENNSYLVANIA STATE UNIVERSITY TECHNICAL ASSIGNMENT 1 SEPTEMBER 29, 2008	THE COLLEGE OF WILLIAM AND MARY **INTEGRATED SCIENCE CENTER** WILLIAMSBURG, VIRGINIA	EXISTING CONDITIONS SITE PLAN C.00

VII. BUILDING SYSTEMS SUMMARY

Yes	No	Work Scope
X		Demolition
X		Structural Steel Frame
X		Cast-In-Place Concrete
	X	Precast Concrete
X		Mechanical System
X		Electrical System
X		Masonry
	X	Curtain Wall
X		Support of Excavation

Demolition

- This project includes the demolition of interior partitions, ceiling assemblies, casework, and flooring materials in the existing Roger's Hall (except in the auditorium area).
- Coordination between demolition work and new work is required for the structural, plumbing, mechanical, and electrical systems
- Demolition and removal of partitions, columns, and exterior walls are necessary without jeopardizing the structural integrity of the building.
- Asbestos was detected in samples of vinyl floor tile, black duct mastic, panels of a laboratory fume hood, white pipe mastic, and corrugated cementitious panel from the rooftop HVAC cooling tower.
- Abatement is required before commencing work.
- Lead paint was not detected in the building.

Structural Steel Frame

- No bracing is used in this structure. The interior steel frame is simply supported by load bearing masonry and columns.
- The supported floor system consists of a 5" lightweight concrete slab on a 1-1/2" 22 gauge composite deck.
- Currently in the process of receiving crawler crane size and information. See site plan for crane locations.

Cast-In-Place Concrete

- Cast in place concrete was used for building footings, foundation walls, slabs-on-grade, suspended slabs, and concrete toppings.
- All the above used normal weight concrete except for the suspended slabs which used structural lightweight concrete
- The formwork (all horizontal for this project) was done on site using typical wood framing. Undamaged formwork was reused once cleaned and surfaces repaired.
- A pump truck was used for all major pours.

Mechanical System

- A mechanical penthouse is located on the fourth floor of the ISC addition. It contains five (5) AHUs with a max of 40,700 cfm.
- The existing Roger's Hall has its own mechanical room located on the 1st floor of the east end of the building. The original room was gutted, reconstructed, and new equipment was installed. It contains two (2) AHUs with a max of 29,900 cfm.
- The constant volume AHUs distribute through galvanized sheet metal duct and supplied to rooms through registers and grilles.
- Two 480 V boilers are located in the boiler room (ground floor of ISC building) along with an expansion tank and various heat pumps.
- Specialized laboratory features include a lab waste neutralization system, compressed air system, vacuum piping system and lab/acid waste piping.
- Standard Orifice quick response sprinklers will be installed throughout the entire building (Phases I and II).
- Basket guards will be provided on all exposed on all exposed sprinklers in equipment rooms, electrical rooms, and telecom rooms.

Electrical System

- A 2000 kVA transformer (35KV/480V/277V) is located on the ground floor of the ISC building.
- There are ten (10) dry type transformers (25kVA-300kVA) throughout the building and they are NEMA TP-1 rated. The three phase transformers are 60 Hz, 480 V delta primary and 208Y/120 V secondary.
- One switchboard rated to withstand fault current of 100,000 amperes symmetrical at rated voltage. Nominal system voltage rating of switchboard is 480Y/277V.
- The demand load estimate equals 4,253.9 kVA
- Redundancy is provided by emergency power generation. Emergency/standby power will be supplied by a 1250 kW diesel engine generator.

Masonry

- This building has brick veneer/metal stud exterior walls.
- The brick for the Phase I addition is a Flemish Bond pattern to match the adjacent dorm construction.
- The brick for the Phase II renovation is also a Flemish Bond pattern to match the existing Roger's Hall.
- Masonry ties at 1'-4" O.C. secure the brick veneer to the backup system.
- Galvanized steel shelf angles transfers the weight of the masonry back to the structural frame.
- Ground floor vivarium contains 6" CMU interior partitions.

Support of Excavation

- Permanent steel sheet piles and tie-back anchors were installed at the interface with the existing structures to facilitate the required excavation of the new addition. This system would potentially eliminate any surcharge loads from the existing building foundations on the basement walls of the new structure.
- Although the basement elevations are above the current ground levels, it is likely that some soils may transport water during wet seasonal conditions. The basement walls were waterproofed and a geocomposite drainage medium was applied to the outside of the walls. The wall drainage material is connected to a storm sewer system.

VIII. PROJECT COST ANALYSIS

Actual Cost

SYSTEMS COST	SITEWORK	PHASE I	COST/ 116,426 SF	PHASE II	COST/ 42,340 SF	TOTAL
Foundations	$0	$807,917	$6.94	$4,464	$0.11	$812,381
Slab-On-Grade	$0	$209,454	$1.80	$9,924	$0.23	$219,378
Structural Frame	$0	$1,590,469	$13.66	$40,292	$0.95	$1,630,761
Supported Floor	$0	$975,186	$8.38	$37,058	$0.88	$1,012,244
Roof Structure	$0	$189,270	$1.63	$99,916	$2.36	$289,186
Roof Coverings	$0	$529,957	$4.55	$56,332	$1.33	$586,289
Stairs	$0	$139,457	$1.20	$18,756	$0.44	$158,213
Conveying Systems	$0	$261,026	$2.24	$0	$0.00	$261,026
Exterior Walls	$0	$2,607,681	$22.40	$40,672	$0.96	$2,648,353
Interior Walls	$0	$1,496,407	$12.85	$509,149	$12.03	$2,005,556
Interior Finishes	$0	$1,226,871	$10.54	$496,170	$11.72	$1,723,041
Doors & Hardware	$0	$483,607	$4.15	$151,334	$3.57	$634,941
Windows & Glazed Walls	$0	$666,800	$5.73	$122,053	$2.88	$788,853
Specialties	$0	$167,331	$1.44	$56,023	$1.32	$223,354
Plumbing	$0	$2,366,361	$20.33	$538,495	$12.72	$2,904,856
HVAC System	$0	$8,092,726	$69.51	$2,379,154	$56.19	$10,471,880
Fire Protection	$0	$430,364	$3.70	$150,776	$3.56	$581,140
Power	$0	$2,245,369	$19.29	$621,904	$14.69	$2,867,273
Lighting	$0	$928,037	$7.97	$364,333	$8.60	$1,292,370
Special Electrical	$0	$333,594	$2.87	$130,995	$3.09	$464,589
Special Systems	$0	$491,951	$4.23	$165,157	$3.90	$657,108
Interior Demolition	$0	$135,756	$1.17	$262,910	$6.21	$398,666
Area Lighting	$30,461	$0	$0.00	$0	$0.00	$30,461
Exterior Mechanical Distribution	$11,184	$0	$0.00	$0	$0.00	$11,184
Water Distribution System	$64,831	$0	$0.00	$0	$0.00	$64,831
Sanitary Sewer	$142,388	$0	$0.00	$0	$0.00	$142,388
Storm Drainage	$150,596	$0	$0.00	$0	$0.00	$150,596
Roads	$42,084	$0	$0.00	$0	$0.00	$42,084
Earthwork	$538,851	$0	$0.00	$0	$0.00	$538,851
Landscaping	$98,782	$0	$0.00	$0	$0.00	$98,782
Site Improvements	$122,031	$0	$0.00	$0	$0.00	$122,031
Fencing	$11,400	$0	$0.00	$0	$0.00	$11,400
Special Building Foundations	$0	$572,300	$4.92	$0	$0.00	$572,300
Site Demolition	$69,790	$0	$0.00	$0	$0.00	$69,790
TOTAL	**$1,282,398**	**$26,947,891**	**$231.46**	**$6,255,867**	**$147.75**	**$34,486,156**

TOTAL COST	**$34,486,156**	$1,282,398	$26,947,891		$6,255,867		
CONSTRUCTION COST	**$33,203,758**		$26,947,891		$6,255,867		
COST/SF - PHASE I	**$231.46**			$231.46			
COST/SF - PHASE II	**$147.75**					$147.75	

The actual cost estimate on the previous page does not include jobsite overhead, contingency, or contractor fees. If these were factored in, the total project cost is almost $42 million.

RS Means 2008 Cost Estimate

The reference page from RS Means 2008 can be found in Appendix 1.

The following RS Means estimate was performed using the information for a Commercial/Residential/Institutional college laboratory. If the square footage of the Integrated Science Center and Rogers Hall were combined, the floor area would go beyond the RS Means chart. Therefore, I chose to split the estimate into Phase I, the ISC building, and Phase II, Rogers Hall. The exterior wall system was assumed to be face brick with concrete block back-up. The common wall where the two buildings are connected was excluded from the building perimeters. Common additives were included for a more accurate estimate.

ISC Building – Phase I

- Floor area = 71,970 SF
- Perimeter = 695 feet
- Story Height = 11 feet

Rogers Hall – Phase II

- Floor Area = 40,520 SF
- Perimeter = 905 feet
- Story Height = 11 feet

The next two pages show the calculations and additions I used to develop a square foot estimate.

SQUARE FOOTAGE ESTIMATE – Phase I

RS Means Source Year 2008 **Model #** M.150

Pages(s) 108-109 **Ext. Wall Type** Face Brick with Concrete Brick Back-up

Area 71,970 SF **Frame** Steel Frame

The Area falls between: 68,000 SF and 80,000 SF

*Base cost per Square Foot is: 152.41

Cost Adjustment Type: (11-12) x 0.733* Per SF Adjustment -0.733
(Story Height)

Cost Adjustment Type: (695-1151.15*)/100 x 1.6* Per SF Adjustment -7.30
(Perimeter)

Adjusted Base Cost per Square Foot: 144.38

Base Building Cost	144.38	x	71,9870	=	10,391,028.60
Basement Cost	28.60	x	23,320	=	666,952.00

Total Cost 11,057,980.60

RS Means Additions:

Addition:	(1) 3,500 lb hydraulic elevator at 150 fpm	Amount:	59,975.00
Addition:	(1) 4,500 lb hydraulic elevator at 150 fpm	Amount:	63,100.00
Addition:	(121) Fume Hood, included ductwork	Amount:	595,925.00
Addition:	(21) Safety Equipment, eye wash, hand held	Amount:	9,345.00
Addition:	(10) Deluge Showers	Amount:	8,050.00

Multiplier Type Location Value: 0.87

Multiplier Type Time Value: -

Total SF Estimate for Building **$10,261,107.00**

*** After interpolation**

SQUARE FOOTAGE ESTIMATE – Phase II

RS Means Source Year 2008 **Model #** M.150

Pages(s) 108-109 **Ext. Wall Type** Face Brick with Concrete Brick Back-up

Area 40,520 SF **Frame** Steel Frame

The Area falls between: 37,000 SF and 45,000 SF

*Base cost per Square Foot is: 168.99

Cost Adjustment Type: (11-12) x 0.928* Per SF Adjustment -0.928
(Story Height)

Cost Adjustment Type: (905-840.08*)/100 x 2.858* Per SF Adjustment -3.86
(Perimeter)

Adjusted Base Cost per Square Foot: 164.20

Base Building Cost	164.20	x	40,520	=	6,653,465.04
Basement Cost		x		=	-

Total Cost 11,057,980.60

RS Means Additions:

Addition:	(9) Fume Hood, included ductwork	Amount:	44,325.00
Addition:	(4) Safety Equipment, eye wash, hand held	Amount:	1,780.00
Addition:	(2) Deluge Showers	Amount:	1,610.00

Multiplier Type	Location	Value:	0.87
Multiplier Type	Time	Value:	-

Total SF Estimate for Building **$9,661,956.00**

*** After interpolation**

D4 Cost 2002 Estimate

The D4Cost estimate can be found in Appendix 2

Due to the fact that the ISC building and Rogers Hall are different in terms of size and number of floors, I again broke the building into the two construction phases to estimate the cost of this project. For Phase I, the Integrated Science Center, I selected the following four buildings to use in the D4Cost2002 averaging analysis.

Project Name	Size (SF)	Use	Floors	Cost
College Science Center	127,700	Educational	4	$27,133,551
Ezra Taft Benson Science Building	191,310	Educational	4	$24,388,293
Engineering Building VA State University	108,288	Educational	4	$11,769,200
Science & Technology Hall	73,406	Educational	3	$10,640,503

For Phase II, Rogers Hall, I selected the following two buildings for the averaging estimate.

Project Name	Size (SF)	Use	Floors	Cost
Biopsychological Sciences Building Addition	30,000	Educational	2	$7,660,300
Science Lecture/Lab Building	25,563	Educational	2	$2,746,552

These were relatively easy to pick out from the rest because they are all higher education buildings and fell within about the same square footage and number of floors as the ISC and Rogers Hall buildings. I also chose these based on the building descriptions. I looked for facilities that contained office, class, and laboratory spaces as well as ones that used structural steel and brick masonry.

For each phase, the True Averaging function was used to compare the selected buildings with a target information date (project start date) of June 2006. D4 produced an estimate of **$25,088,412** for Phase I and **$10,589,177** for Phase II.

Cost Comparison

	Phase I		Phase II		Total Cost (Phase 1+II)
	Cost	***Cost/SF***	***Cost***	***Cost/SF***	
Actual Cost	$26,947,891	$231.46	$6,255,867	$141.75	**$34,486,156**
RS Means 2008	$10,261,107	$144.38	$9,661,956	$168.99	**$19,923,063**
D4Cost2002	$25,088,412	$215.49	$10,589,177	$250.10	**$35,677,589**

The RS Means estimate turned out extremely low compared to the actual project cost. This is because the 4th floor penthouse and the general conditions were excluded. The ground floor of the ISC is much more sophisticated than just a basement. This could have also contributed to such a low estimate. The additives helped bring the estimate closer, but not significantly. Cabinets, hardware, and countertops were excluded from the estimate because they were not part of the actual cost. These were paid for and installed separately by the owner. The square foot estimate was higher than the actual cost for Phase II. This is because RS Means does not take into consideration that Roger's Hall is a renovation project, not a new building.

The D4 estimate was surprisingly close to the actual cost, just slightly higher. Despite the fact that the software has a limited database, I was able to find a few buildings of similar area, purpose, and structure. Again the Phase II cost was higher than the actual because the program treated Rogers Hall as a newly constructed building as opposed to a renovation.

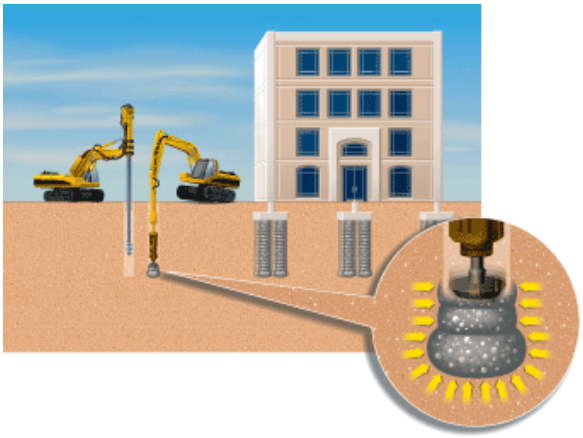
IX. PROJECT SCHEDULE SUMMARY

The one page summary schedule can be found in Appendix 3.

Key Element Sequences

Foundation

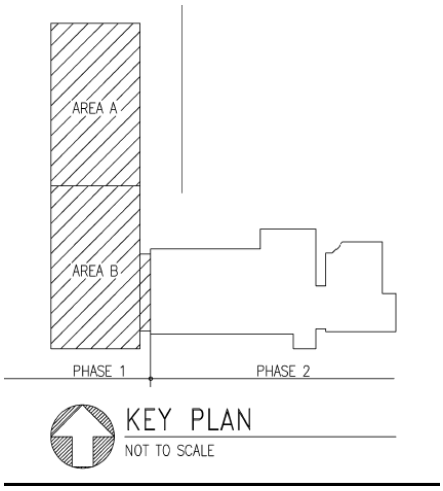
The ISC addition is supposed by a shallow foundation system (spread footings) in conjunction with ground reinforcement measures. The Geopier Intermediate Foundations System is used to reinforce the foundation soils on this site. This process first involves drilling a cavity. Layers of aggregate are then placed into the drilled cavity in thin lifts of one-foot compacted thickness. A patented beveled tamper rams each layer of aggregate using vertical impact ramming energy. The tamper forces aggregate laterally into the cavity sidewalls resulting in exceptional union with surrounding soils. Following installation, this system can support the designed spread footings. The figure shown on the right depicts this process. The Geopier elements provide bearing support, settlement control, significantly higher resistance to sliding and uplift.



The construction of the foundation system started in the basement from the south end of the building to the north end. The basement walls are reinforced cast-in-place concrete.

Structural

For the steel erection of the Integrated Science Center, the building was broken into two areas. The north end of the building is considered Area A and the south end is considered Area B. Floors one through four were erected in Area B, followed by floors one through four in Area A. Construction again moved from south to north foundation just as the foundation system had.

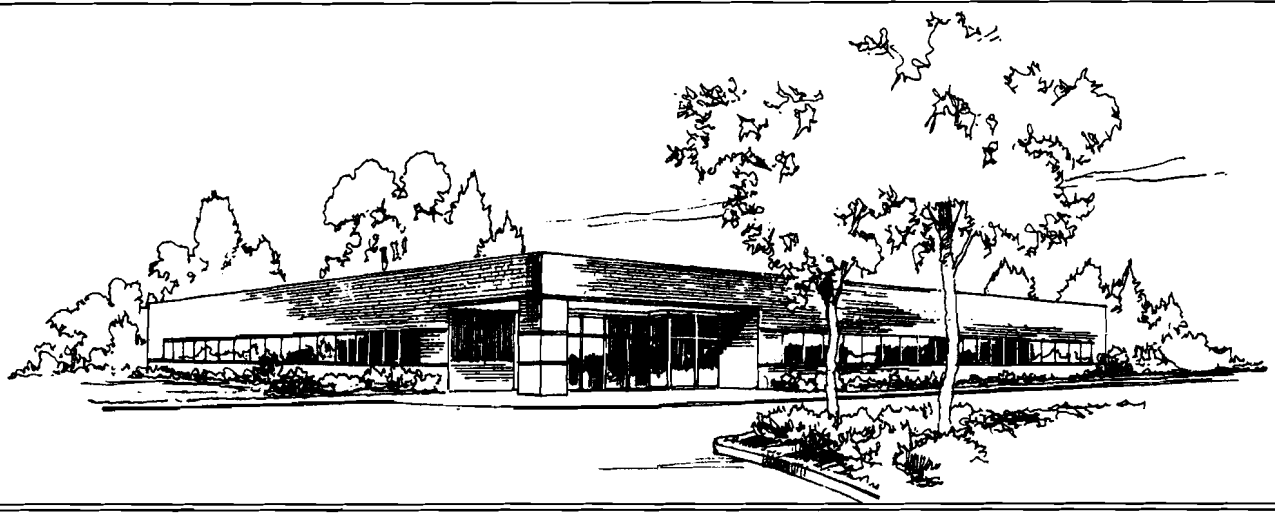


Finishes

Team meeting were held weekly to help with MEP coordination. Once all the major systems were in, the finishes began. The finishes are sequenced by floor in the same south to north fashion as the foundation system. The contractors will **complete** their trade in the following order:

- Metal Studs
- MEP Rough-In
- Gypsum Board
- Ceiling Grid and Tiles
- Floor Finishes (Carpet, VCT, Ceramic Tile, Epoxy, and Terrazzo)
- Painting
- Lighting Fixtures
- Furniture

APPENDIX



Costs per square foot of floor area

Exterior Wall	S.F. Area	12000	20000	28000	36000	44000	52000	60000	68000	76000
	L.F. Perimeter	470	600	690	790	900	1000	1100	1200	1300
Face Brick with Concrete Brick Back-up	Steel Frame	249.75	205.20	184.80	171.85	165.35	158.95	153.75	149.70	147.25
	Bearing Walls	245.20	200.65	180.20	167.30	160.75	154.40	149.15	145.15	142.65
Decorative Concrete Block	Steel Frame	242.95	200.05	180.45	168.10	161.85	155.70	150.85	147.05	144.70
	Bearing Walls	238.60	195.65	176.10	163.80	157.55	151.40	146.50	142.70	140.40
Stucco on Concrete Block	Steel Frame	241.45	198.90	179.50	167.35	161.10	155.05	150.25	146.55	144.20
	Bearing Walls	237.10	194.55	175.15	162.95	156.75	150.70	145.90	142.15	139.85
Perimeter Adj., Add or Deduct	Per 100 L.F.	9.60	5.75	4.10	3.10	2.55	2.10	1.70	1.40	1.25
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.75	1.40	1.15	0.95	0.90	0.90	0.75	0.70	0.65
For Basement, add $28.60 per square foot of basement area										

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from $138.90 to $259.45 per S.F.

Common additives

Description	Unit	$ Cost
Cabinets, Base, door units, metal	L.F.	243
Drawer units	L.F.	480
Tall storage cabinets, open	L.F.	455
With doors	L.F.	690
Wall, metal 12-1/2" deep, open	L.F.	180
With doors	L.F.	325
Carrels Hardwood	Each	655 - 1200
Countertops, not incl. base cabinets, acid proof	S.F.	43.50 - 56
Stainless steel	S.F.	112
Fume Hood, Not incl. ductwork	L.F.	745 - 2550
Ductwork	Hood	4925 - 8100
Glassware Washer, Distilled water rinse	Each	6475 - 13,100
Seating		
Auditorium chair, all veneer	Each	218
Veneer back, padded seat	Each	264
Upholstered, spring seat	Each	264
Classroom, movable chair & desk	Set	65 - 120
Lecture hall, pedestal type	Each	208 - 620

Description	Unit	$ Cost
Safety Equipment, Eye wash, hand held	Each	445
Deluge shower	Each	805
Sink, One piece plastic		
Flask wash, freestanding	Each	2250
Tables, acid resist. top, drawers	L.F.	188
Titration Unit, Four 2000 ml reservoirs	Each	6050

Important: See the Reference Section for Location Factors

Statement of Probable Cost

W&M ISC - Jun 2006 - VA - Other

Prepared By:	**Meghan Graber**	Prepared For:	**Technical Assignment I**
	Fax:		Fax:
Building Sq. Size:	**116426**	Site Sq. Size:	**80205**
Bid Date:		Building use:	**Educational**
No. of floors:	**3**	Foundation:	**CON**
No. of buildings:	**1**	Exterior Walls:	**CUR**
Project Height:	**57**	Interior Walls:	**DRY**
1st Floor Height:	**11**	Roof Type:	**OTH**
1st Floor Size:	**24300**	Floor Type:	**VCT**
		Project Type:	**NEW**

Division		Percent	Sq. Cost	Amount
01	**General Requirements**	**4.96**	**10.69**	**1,244,036**
	General Requirements	4.96	10.69	1,244,036
02	**Site Work**	**5.35**	**11.53**	**1,342,292**
	Site Work	5.35	11.53	1,342,292
03	**Concrete**	**11.60**	**25.00**	**2,911,151**
	Concrete	11.60	25.00	2,911,151
04	**Masonry**	**5.19**	**11.19**	**1,303,322**
	Masonry	5.19	11.19	1,303,322
05	**Metals**	**4.07**	**8.76**	**1,020,071**
	Metals	4.07	8.76	1,020,071
06	**Wood & Plastics**	**1.24**	**2.66**	**309,965**
	Wood & Plastics	1.24	2.66	309,965
07	**Thermal & Moisture Protection**	**2.87**	**6.18**	**719,981**
	Thermal & Moisture Protection	2.87	6.18	719,981
08	**Doors & Windows**	**5.97**	**12.87**	**1,498,826**
	Doors & Windows	5.97	12.87	1,498,826
09	**Finishes**	**6.81**	**14.67**	**1,707,606**
	Finishes	6.81	14.67	1,707,606
10	**Specialties**	**0.76**	**1.63**	**190,142**
	Specialties	0.76	1.63	190,142
11	**Equipment**	**7.97**	**17.17**	**1,999,377**
	Equipment	7.97	17.17	1,999,377
12	**Furnishings**	**1.58**	**3.40**	**396,065**
	Furnishings	1.58	3.40	396,065
13	**Special Construction**	**0.80**	**1.72**	**199,935**
	Special Construction	0.80	1.72	199,935
14	**Conveying Systems**	**0.93**	**2.01**	**234,250**
	Conveying Systems	0.93	2.01	234,250
15	**Mechanical**	**25.58**	**55.13**	**6,418,592**
	Mechanical	25.58	55.13	6,418,592
16	**Electrical**	**8.83**	**19.03**	**2,215,585**
	Electrical	8.83	19.03	2,215,585
21	**Fire Suppression**	**0.13**	**0.29**	**33,464**
	Fire Suppression	0.13	0.29	33,464
22	**Plumbing**	**0.54**	**1.16**	**134,487**
	Plumbing	0.54	1.16	134,487

23	**HVAC**	**2.53**	**5.46**	**635,903**
	HVAC	2.53	5.46	635,903
26	**Electrical**	**1.24**	**2.67**	**310,422**
	Electrical	1.24	2.67	310,422
27	**Communications**	**0.10**	**0.21**	**23,916**
	Communications	0.10	0.21	23,916
28	**Electronic Safety and Security**	**0.06**	**0.13**	**15,456**
	Electronic Safety and Security	0.06	0.13	15,456
31	**Earthwork**	**0.43**	**0.94**	**109,035**
	Earthwork	0.43	0.94	109,035
32	**Exterior Improvements**	**0.18**	**0.39**	**44,845**
	Exterior Improvements	0.18	0.39	44,845
33	**Utilities**	**0.28**	**0.60**	**69,689**
	Utilities	0.28	0.60	69,689
Total Building Costs		**100.00**	**215.49**	**25,088,412**
Total Non-Building Costs		**100.00**	**0.00**	**0**
Total Project Costs		**--**	**--**	**25,088,412**

Statement of Probable Cost

W&M Rogers Hall - Jun 2006 - VA - Other

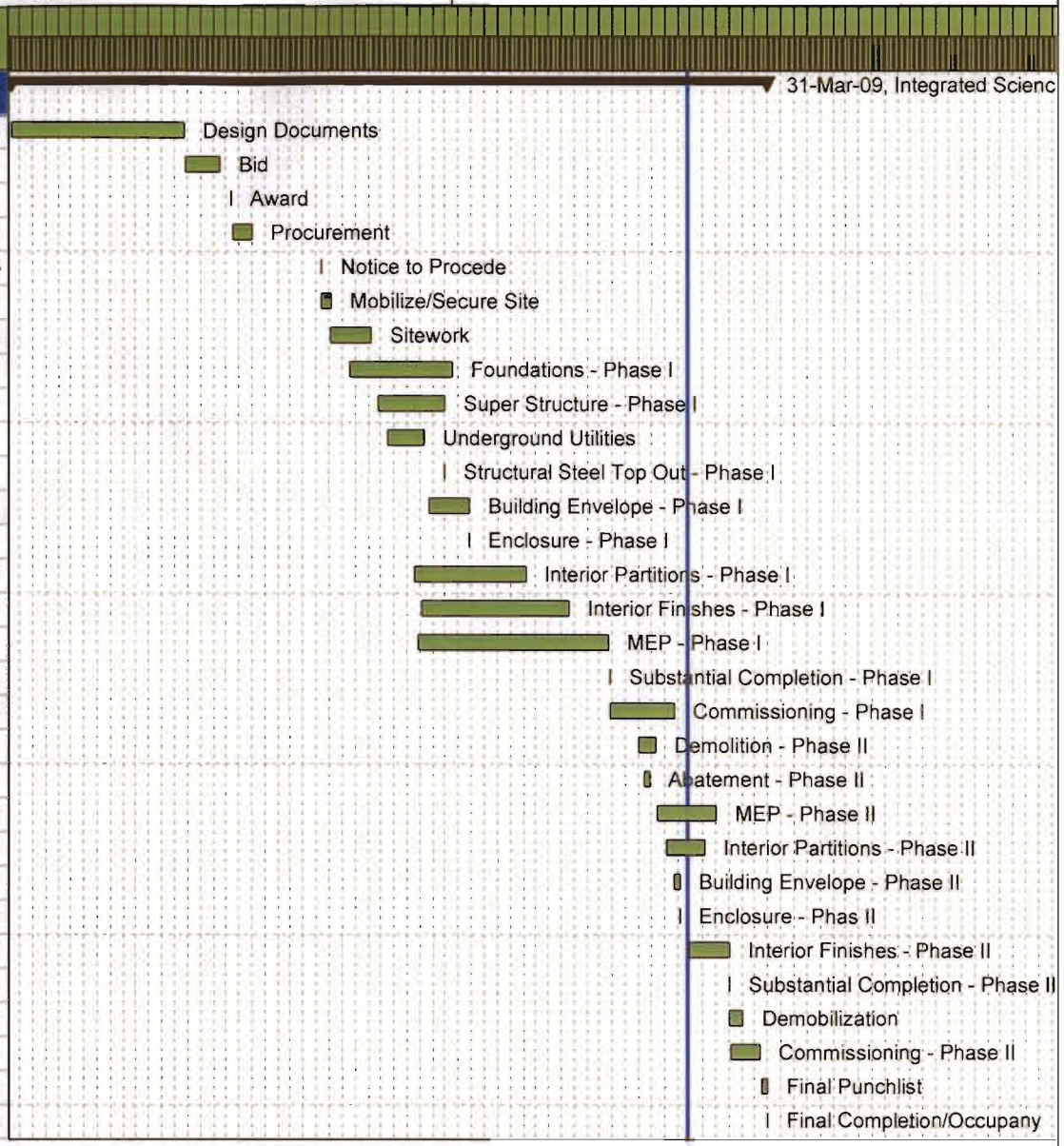
Prepared By:	**Meghan Graber**	Prepared For:	**Technical Assignment I**
,		,	
Fax:		Fax:	
Building Sq. Size:	**42340**	Site Sq. Size:	**25402**
Bid Date:		Building use:	**Educational**
No. of floors:	**2**	Foundation:	**CON**
No. of buildings:	**1**	Exterior Walls:	**CUR**
Project Height:	**30**	Interior Walls:	**DRY**
1st Floor Height:	**11**	Roof Type:	**OTH**
1st Floor Size:	**22000**	Floor Type:	**VCT**
		Project Type:	**REN**

Division		Percent	Sq. Cost	Amount
01	**General Requirements**	**4.94**	**12.36**	**523,277**
	General Requirements	4.94	12.36	523,277
02	**Site Work**	**3.97**	**9.94**	**420,656**
	Site Work	3.97	9.94	420,656
03	**Concrete**	**10.55**	**26.39**	**1,117,251**
	Concrete	10.55	26.39	1,117,251
04	**Masonry**	**11.54**	**28.87**	**1,222,255**
	Masonry	11.54	28.87	1,222,255
05	**Metals**	**2.74**	**6.85**	**290,237**
	Metals	2.74	6.85	290,237
06	**Wood & Plastics**	**2.29**	**5.73**	**242,810**
	Wood & Plastics	2.29	5.73	242,810
07	**Thermal & Moisture Protection**	**7.62**	**19.06**	**807,050**
	Thermal & Moisture Protection	7.62	19.06	807,050
08	**Doors & Windows**	**2.54**	**6.35**	**268,858**
	Doors & Windows	2.54	6.35	268,858
09	**Finishes**	**7.94**	**19.85**	**840,533**
	Finishes	7.94	19.85	840,533
10	**Specialties**	**0.33**	**0.83**	**35,253**
	Specialties	0.33	0.83	35,253
11	**Equipment**	**2.41**	**6.03**	**255,517**
	Equipment	2.41	6.03	255,517
12	**Furnishings**	**2.18**	**5.45**	**230,865**
	Furnishings	2.18	5.45	230,865
13	**Special Construction**	**1.06**	**2.65**	**112,181**
	Special Construction	1.06	2.65	112,181
14	**Conveying Systems**	**1.17**	**2.92**	**123,443**
	Conveying Systems	1.17	2.92	123,443
15	**Mechanical**	**28.20**	**70.53**	**2,986,106**
	Mechanical	28.20	70.53	2,986,106
16	**Electrical**	**10.51**	**26.28**	**1,112,886**
	Electrical	10.51	26.28	1,112,886
Total Building Costs		**100.00**	**250.10**	**10,589,177**
Total Non-Building Costs		**100.00**	**0.00**	**0**

Total Project Costs	–	–	**10,589,177**

College of William & Mary - Integrated Science Center Phases | Classic WBS Layout | 26-Sep-08 18:31

Activity ID	Activity Name	Original Duration	Start	Finish
Integrated Science Cent...		1254	12-May-04	31-Mar-09
01	Design Documents	284	12-May-04	23-Jun-05
02	Bid	58	27-Jun-05	16-Sep-05
03	Award	1	14-Oct-05	14-Oct-05
04	Procurement	33	17-Oct-05	02-Dec-05
05	Notice to Procede	1	12-May-06	12-May-06
06	Mobilize/Secure Site	15	15-May-06	05-Jun-06
07	Sitework	66	05-Jun-06	06-Sep-06
08	Foundations - Phase I	168	19-Jul-06	16-Mar-07
09	Super Structure - Phase I	108	25-Sep-06	27-Feb-07
10	Underground Utilities	60	16-Oct-06	11-Jan-07
11	Structural Steel Top Out - Phas...	1	27-Feb-07	27-Feb-07
12	Building Envelope - Phase I	65	25-Jan-07	25-Apr-07
13	Enclosure - Phase I	1	25-Apr-07	25-Apr-07
14	Interior Partitions - Phase I	186	18-Dec-06	05-Sep-07
15	Interior Finishes - Phase I	248	05-Jan-07	18-Dec-07
16	MEP - Phase I	321	26-Dec-06	19-Mar-08
17	Substantial Completion - Phase I	1	25-Mar-08	25-Mar-08
18	Commissioning - Phase I	108	26-Mar-08	22-Aug-08
19	Demolition - Phase II	30	02-Jun-08	11-Jul-08
20	Abatement - Phase II	10	16-Jun-08	27-Jun-08
21	MEP - Phase II	98	16-Jul-08	28-Nov-08
22	Interior Partitions - Phase II	64	08-Aug-08	05-Nov-08
23	Building Envelope - Phase II	10	25-Aug-08	05-Sep-08
24	Enclosure - Phas II	1	05-Sep-08	05-Sep-08
25	Interior Finishes - Phase II	68	29-Sep-08	31-Dec-08
26	Substantial Completion - Phase II	1	01-Jan-09	01-Jan-09
27	Demobilization	22	01-Jan-09	30-Jan-09
28	Commissioning - Phase II	49	05-Jan-09	12-Mar-09
29	Final Punchlist	12	16-Mar-09	31-Mar-09
30	Final Completion/Occupany	1	31-Mar-09	31-Mar-09



Actual Work | Critical Remaining ...
Remaining Work | Milestone

Meghan Graber

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