Lafayette Tower
Washington, DC

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Construction Management

Tech Assignment 1 | Dr. David Riley | 29 September 2008

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Executive Summary

This technical assignment takes an in-depth look at the construction management methods employed by Clark Construction and the existing construction conditions of 801 17th Street NW, Washington DC, the site of Lafayette Tower. Throughout the report there will be discussions on the projects schedule, building systems, project costs, project site, client information, project delivery system and the staffing plan.

Lafayette Tower is an 11 story core & shell office building in downtown Washington, DC owned by Louis Dreyfus Property Group. The design team consists of design architect, Kevin Roche John Dinkeloo & Associates, LLC, structural engineer, Tadjer Cohen Edelson & Associates, Inc. and MEP engineers, TOLK, Inc.

The project includes demolition of the Existing building that housed the FDIC Headquarters. Demolition began in August 2006 under an early start agreement and was completed in August 2007. The existing foundations and foundation walls were salvaged and support three tiers of rakers and tiebacks during demolition. The project team utilized a 3D scale model to plan the exact placement of the rakers and corner bracing to minimize the number of conflicts in the demolition of the existing and construction of the new structure. Construction of the new building started in August 2007 and will be completed in December 2008.

Lafayette Tower is designed to LEED Gold standard and will comprise 327,688 square feet of mixed use space, with eh ground floor dedicated to retail. The combination of column-free perimeter and floor-to-floor glass curtain wall skin will offer spectacular views of the city specifically The White House and The Washington Monument. Lastly, the penthouse level will have a green roof terrace and there will be three levels of underground parking available for tenant use.

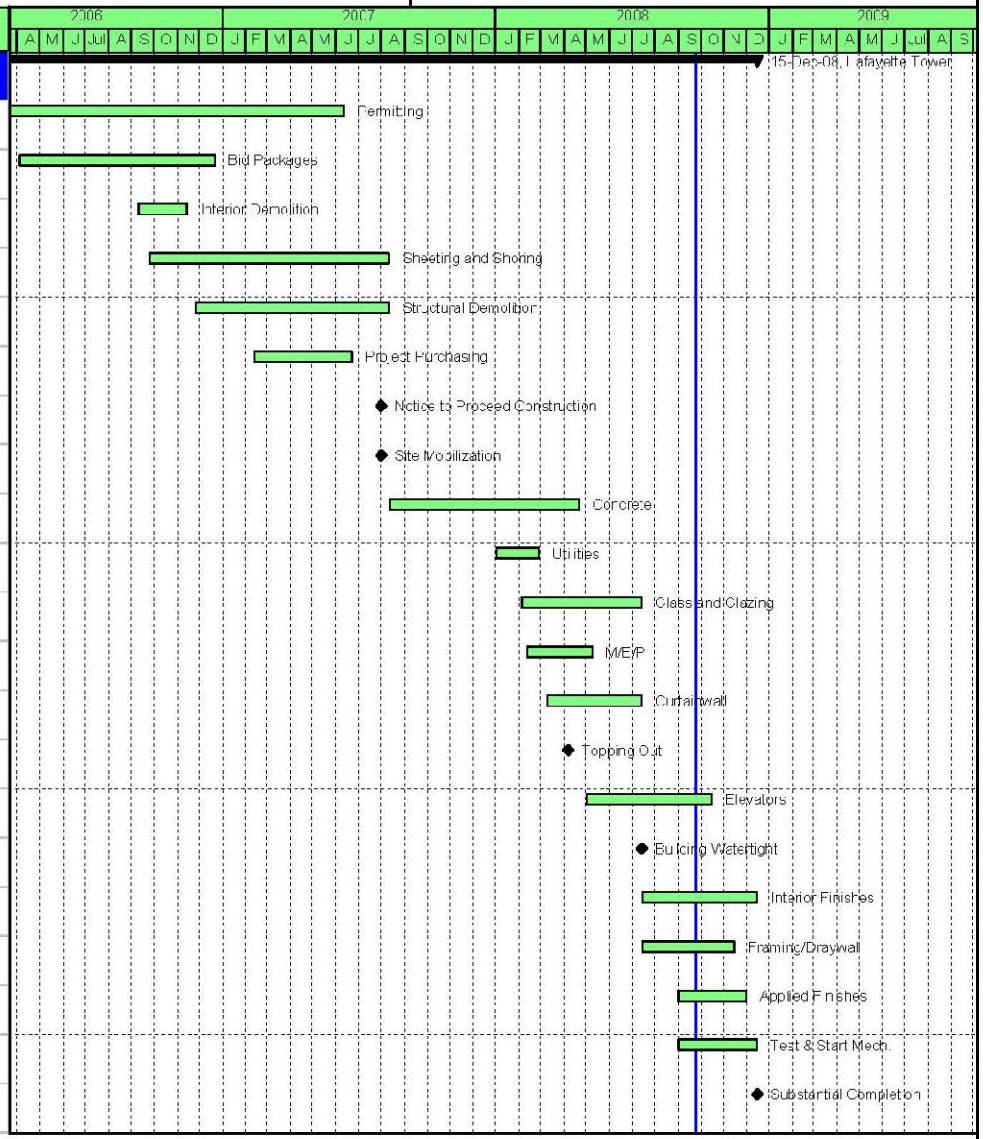
Project Schedule Summary

Louis Dreyfus already had the design well underway when they came to the Clark to try to rekindle a prior relationship with the company after spending a few years apart and trying some different construction companies in the area. Because the design was so far along, Clark started right away on permitting and working out a bid package. After the contract was negotiated, the critical path of the project fell completely on the demolition of the existing structure starting with the guts of the building then moving to the structural elements. Once the demo got below grade, three tiers of rakers and tie-backs were used to help support the existing exterior walls that would be used for the new building.

After the old building was completely demolished and removed, except for the foundation and foundation walls, the critical path moved to the concrete as it came out of the hole and continued up until it topped out. Then it preceded to the curtain wall and getting the building water tight and finally fell onto the mechanical equipment installation and commissioning.

Lafayette Tower | Classic WBS Layout | 24-Sep-08 01:54

Activity ID	Activity Name	Original Duration	Start	Finish
Lafayette Tower		735	09-Feb-06	15-Dec-08
A1000	Permitting	341	09-Feb-06	11-Jun-07
A1010	Bid Packages	184	03-Apr-06	21-Dec-06
A1020	Interior Demolition	47	11-Sep-06	14-Nov-06
A1040	Sheeting and Shoring	223	25-Sep-06	10-Aug-07
A1030	Structural Demolition	183	27-Nov-06	10-Aug-07
A1140	Project Purchasing	95	12-Feb-07	22-Jun-07
A1130	Notice to Proceed Construction	0	01-Aug-07	
A1150	Site Mobilization	0	01-Aug-07	
A1050	Concrete	181	13-Aug-07	21-Apr-08
A1160	Utilities	43	01-Jan-08	28-Feb-08
A1070	Glass and Glazing	113	04-Feb-08	14-Jul-08
A1080	M/E/P	63	12-Feb-08	08-May-08
A1170	Curtainwall	91	10-Mar-08	14-Jul-08
A1200	Topping Out	0		07 Apr 08
A1090	Elevators	120	01-May-08	15-Oct-08
A1190	Building Watertight	0		14-Jul-08
A1060	Interior Finishes	110	15-Jul-08	15-Dec-08
A1100	Framing/Drywall	89	15-Jul-08	14-Nov-08
A1110	Applied Finishes	65	01-Sep-08	01-Dec-08
A1120	Test & Start Mech.	73	01-Sep-08	15-Dec-08
A1180	Substantial Completion	0		15-Dec-08



Actual Work | Critical Remaining Work | Summary
Remaining Work | Milestone

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Construction Management

Building Systems Summary

Yes	No	Work Scope
✓		Demolition Required?
	✓	Structural Steel Frame?
✓		Cast-in-Place Concrete?
	✓	Precast Concrete?
✓		Mechanical System?
✓		Electrical System?
✓		Masonry?
✓		Curtain Wall?
	✓	Support of Excavation?

Demolition

Before September 2006, the site was home to the Federal Deposit Insurance Corporation or the FDIC who has now moved to 550 17th Street NW. Demolition began September 11th 2006. Clark started by completely gutting the interior of the building, removing anything that wasn't linked to the structural system. That was completed November 14th of the same year and which time they started the structural demolition.

To take down the structural system, they started by using skid steer with a hydraulic demolition hammer attachment to deconstruct the upper floors. The process they followed was to crush up the decks of the floor that they had the skid steer on then move down to the next floor to knock out the columns. This repeated until they could get in reach of the excavators with hydraulic shears.

Once in reach of the excavators, the demolition process sped up significantly. The sequencing went from basically going floor by floor to taking out sections of the building from top to bottom.

Figure 1- Excavators w/ hydraulic shears

After the demolition got below grade, tiebacks and rakers were used to help support the existing foundation walls until the walls were thickened with 14" of additional concrete for extra support.

Structural Steel Frame

Other than the rebar in the concrete, there was no steel used for any structural reasons.

Cast-in-Place Concrete

The structure of the building is made up entirely of cast-in-place concrete.
All of the slabs below grade are 8 ½" or 10 ½" thick where as all of the slabs above grade are 10" or 12" thick and also utilize post tensioning to allow for larger spans between columns and provide support for the cantilevered slabs that extend out past the exterior row of columns. The concrete for the slabs was put in place by a pump truck.

The columns were put in place by using vertical formwork and the crane and bucket method. The sizes of columns range from 24x40 to 24x12. Slanted columns were used 13 cases all below grade on either the P1 or Concourse level. Slanted columns allow you to stray from typical bays throughout your entire build but still transfer the load down from above.

Precast Concrete

No precast concrete was used in this project.

Mechanical System

Although there are small mechanical rooms on each of the above ground floors (each floor has its own AHU because each floor will host a different tenant), the main mechanical room is located on the P2 Parking level. The key system components that it houses are (2) water chilling units, (2) condenser water pumps, (1) chilled water pump, (1) heat exchanger. The only other major pieces of equipment in the building are (2) cooling towers that are located on the roof.

For fire suppression, both wet and dry systems are used. Wet is the primary system but a dry system is used in the spaces that aren't heated such as the parking levels and parts of the concourse level. Quick response heads are used throughout the building.

Electrical System

Lafayette Tower's electrical service is supplied by Pepco, a regulated electric utility that provides transmission and distribution services. The main feed is brought into the building and stepped down to 3Φ, 3000A, 265/460V before it goes into either of the 2 main switchboards that provide power for the rest of the building.

An emergency generator is located just north of the loading dock on the first floor. It is a 500KW/625KVA diesel generator with a 250 gallon tank. This generator would not be able to support the building running at full capacity for more than a couple of hours without being refueled during the outage.

Masonry

All of the masonry used on this job is non load bearing. It is mainly used in the stair wells and the exterior walls for the first two floors on parts of alley and the alley is the only place where scaffolding was used. It is also used as partitions for parts of the first floor and all the below grade levels.

The brick used in the alley is tied back into the building after every two layers by masonry wall ties. There is also a curtain wall stack joint with continuous masonry cap flashing that ties the bricks into the curtain wall coming down from above.

Curtain Wall

An elaborate curtain wall system is used for almost the entirety of the building. There are many box-ins and outs to make the building appear that it is made of glass Legos. There are two main materials used for construction which are aluminum and glass. The assemble involves two layers of glass with an air gap in-between with a coating on the inside of the outer piece of glass to

promote heat transfer and it is held together with the aluminum. The design and assembly is the responsibility of Trainor Glass Company.

The individual piece of curtain wall are manufactured in Trainor's shop where they are then packaged up and shipped to site ready to be installed as soon as they arrive. This process is called unitized glazing which allows for the glass to be set faster and cheaper. To get the glass into place, Trainor uses a crane to lift the panels to the floor above where the panel will actually be set then they use a mobile floor crane to lower them into place and attach them to the rest of the system.

The major benefits of this system is that it not only lowers energy costs and looks cool architecturally but it also does not impose loads on the structural system of the building and it is flexible so that it can move with the wind or expansion from heat.

Support of Excavation

There was no additional excavation other than the demolition of the existing building which had to be supported and is discussed in the demolition section above.

Project Cost Evaluation

The owner has requested that the specific cost information of this project not be revealed. For the purpose of this thesis, the final cost of the building with everything included is $47 million.

Total Project Cost: $47 million
Square Footage: 327,688 SF
Cost/SF: $143.43

D4Cost 2002 Estimate

To estimate the cost of Lafayette Tower, four buildings of similar function, characteristics or cost/SF were selected from the D4 Cost Estimating Program. It was challenging to relate buildings from D4 to Lafayette Tower because there are very few tall office buildings in the program, especially buildings with underground parking, a curtain wall system and LEED certified. The following four buildings were selected to use in the cost analysis:

Project Name	Size (SF)	Use	Floors	Cost	Similarities to Lafayette Tower
National Starch & Chemical Co.	71,145	Office	3	$9,817,688.00	• Curtain wall system used • Similar cost/SF • Same function
Twin Oaks | Office Tower	89,860	Office	4	$5,070,859.00	• 2 Floor lobby w/ marble floors • Sustainable design • Same function
NYS DOT Region One Headquarters	125,000	Office	4	$18,371,556.00	• LEED certified • High end finishes • Same function
Lewis & Clark State Office Bldg.	120,000	Office	4	$17,169,000.00	• LEED certified • Green roof • Same function

The True Averaging function was used to compare the four selected buildings with a target information date of August 2006 which is the actual project start date. The building estimate produced by D4 was **$53,634,140**, which is about $6.5 million high. Some reasons that this number is so high might be that Lafayette Tower has a smaller footprint the some of the other buildings or that D4 is overcompensating for time and location factors being that the program is 6 years old and hasn't been updated. Along with that, these buildings really aren't that similar to Lafayette Tower but they are they were the best choices given what was available.

D4 Cost Estimate of Lafayette Tower

Lafayette Tower - Aug 2006 - District of Columbia

Prepared By:		Prepared For:	
,		,	
	Fax:		Fax:
Building Sq. Size:	327688	Site Sq. Size:	147704
Bid Date:	8/1/2006	Building use:	Office
No. of floors:	11	Foundation:	EXT
No. of buildings:	1	Exterior Walls:	CUR
Project Height:	132	Interior Walls:	MAS
1st Floor Height:	12	Roof Type:	MEM
1st Floor Size:	29790	Floor Type:	CON
		Project Type:	NEW

Division		Percent	Sq. Cost	Amount
		0.00	0.00	0
00	Procurement and Contracting Require	4.43	7.24	2,373,442
01	General Requirements	7.37	12.06	3,953,409
02	Existing Conditions	4.72	7.72	2,530,115
03	Concrete	13.01	21.29	6,977,134
04	Masonry	6.03	9.87	3,232,929
05	Metals	10.61	17.37	5,692,877
06	Wood, Plastics, and Composites	3.66	5.99	1,963,103
07	Thermal and Moisture Protection	3.67	6.00	1,967,715
08	Openings	5.69	9.32	3,053,152
09	Finishes	12.62	20.66	6,770,482
10	Specialties	2.17	3.55	1,161,969
11	Equipment	0.04	0.06	21,016
12	Furnishings	1.05	1.72	562,875
13	Special Construction	0.29	0.47	154,856
14	Conveying Systems	1.35	2.21	722,926
15	Mechanical	11.46	18.75	6,144,774
16	Electrical	11.84	19.38	6,351,366
Total Building Costs		100.00	163.67	53,634,140

Figure 2 - D4 Cost Estimate

R.S. Means 2008 Cost Estimate

The reference pages from R.S. Means can be found in the Appendix

The following estimate was performed using information for a Commercial/Industrial/Institutional, Office, and 11-20 Story building. The exterior wall and structural systems used where double glazed heat absorbing tinted plate glass panels and reinforced concrete frame respectively. All the floors below grade were negated from the SF Area and later included as SF Area, Basement in an attempt to make the estimate more accurate. The only common additive included was the elevators.

Office, 11 stories, 11' story height
SF Area: 234,707
LF Perimeter: 617.09
SF Area, Basement: 96,359

Through interpolation, Unit Cost = $131.13/SF

Adjustment for additional perimeter = +$3.99/SF
Adjustment for story height = +$1.88/SF
Adjustment for below grade levels = +$3,228,026.50
Location Factor, D.C., Commercial = *0.99
Adjustment for elevators = +$2,339,625.00

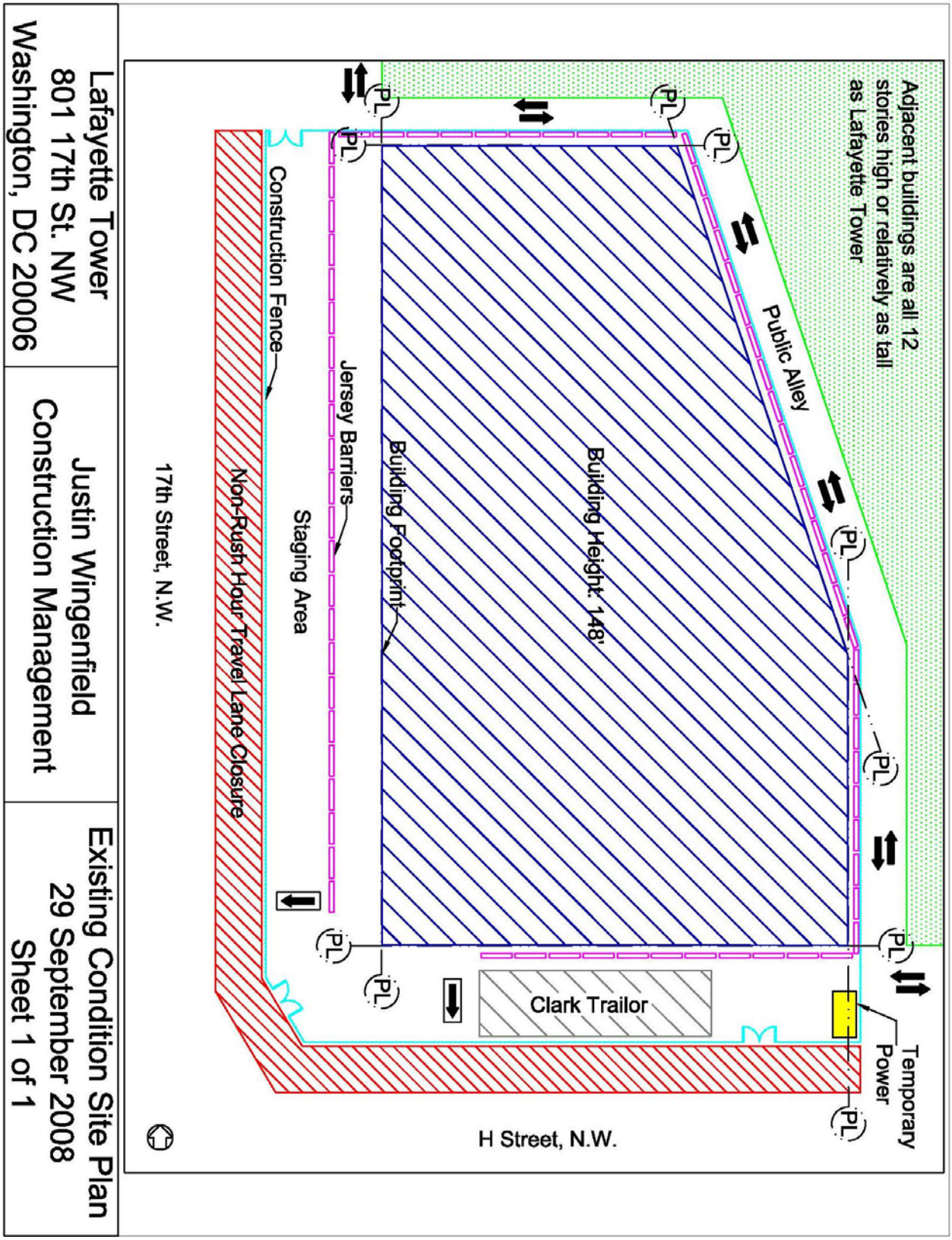
Adjusted Cost = **$37,722,510.50**

This number is significantly lower than the actual project cost. The main reason that this number differs so much is that it does not include fees and general conditions. The breakdown below, which is taken from R.S. Means, takes them into account and is much more accurate.

Lafayette Tower				
Total S.F.				**327,688**
Construction Cost				**$37,345,285.40**
		% of Sub-Total	Cost	Cost/S.F.
Substructure		4.6	$1,717,883.13	$5.24
Shell		36.6	$13,668,374.46	$41.71
	Superstructure	23.5	$8,776,142.07	$26.78
	Exterior Enclosure	12.8	$4,780,196.53	$14.59
	Roofing	0.3	$112,035.86	$0.34
Interiors		17.0	$6,348,698.52	$19.37
Services		41.8	$15,610,329.30	$47.64
	Conveying	4.7	$1,755,228.41	$5.36
	Plumbing	1.3	$485,488.71	$1.48
	HVAC	15.7	$5,863,209.81	$17.89
	Fire Protection	4.1	$1,531,156.70	$4.67
	Electrical	16.0	$5,975,245.66	$18.23
Equipment & Furnishings		0.0	$0.00	$0.00
Special Construction		0.0	$0.00	$0.00
	Sub-Total	100.0	$37,345,285.40	$113.97
Contractor Fees		25	$9,336,321.35	$28.49
Architect Fees		6	$2,240,717.12	$6.84
Total Building Cost			**$48,922,323.87**	**$149.30**

Figure 3 - R.S. Means data

Site Plan of Existing Conditions



Local Conditions

Lafayette Tower is located at 801 17th Street N.W. which is a mere 3 blocks from The White House.

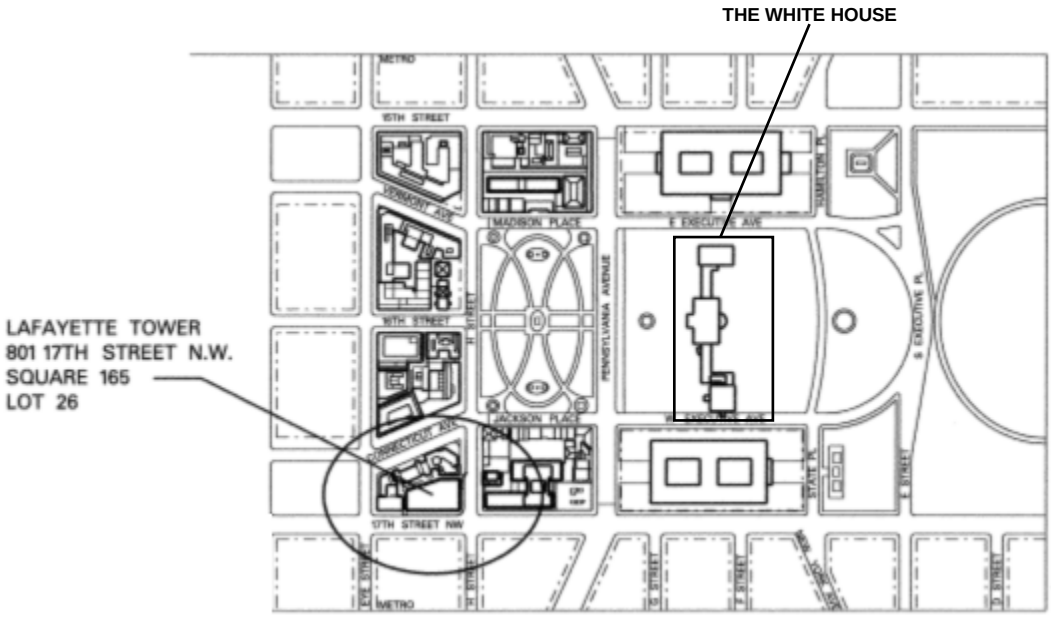


Figure 4 - Local Map

The District of Columbia, there is height restriction that prohibits buildings from being taller than the capital building. This being said, the primary type of construction used is cast-in-place to maximize the floor to ceiling heights and sometimes sneak an extra floor in that you wouldn't be able to have if you used steel. Post-tensioning is also often utilized so that thinner slabs or larger spans between columns can be used.

Parking for your workers is always a concern while working in downtown D.C. There are two public lots located on the site's block but they are not cheap. Fortunate for many of the workers, the site is located a block from the Farragut West metro stop. After the parking levels were finished, there was some on-site parking available but it was very limited and only foreman were allowed to park there.

For recycling and trash removal, Clark has its own trucks and dumpsters that their yard organizes and maintains so there were no extra fees for either of those.

I have not been able to procure a geotechnical report as of this time but I am still trying to and will update this document with the soil and subsurface water conditions when I do.

Client Information

Principal activities of the Louis Dreyfus Group consist of worldwide processing, trading and merchandising of various agricultural and energy commodities. The Group is also significantly involved in the ownership and management of ocean vessels; in the development and operation of telecommunications infrastructures; and in real estate development, management and ownership.

Since it was organized in 1971, Louis Dreyfus Property Group has acquired and developed over eight million square feet of office space in North America and Europe. Current office buildings and development sites in the portfolio, some of which are held in joint ventures with other parties, are located in Washington, DC; suburban New York; Portland (Oregon); and Paris. Louis Dreyfus is also building and developing for ownership a number of hotels in partnership with Four Seasons Hotels and Resorts, including the Four Seasons Resort in Jackson Hole, Wyoming, and the Four Seasons Hotel Silicon Valley.

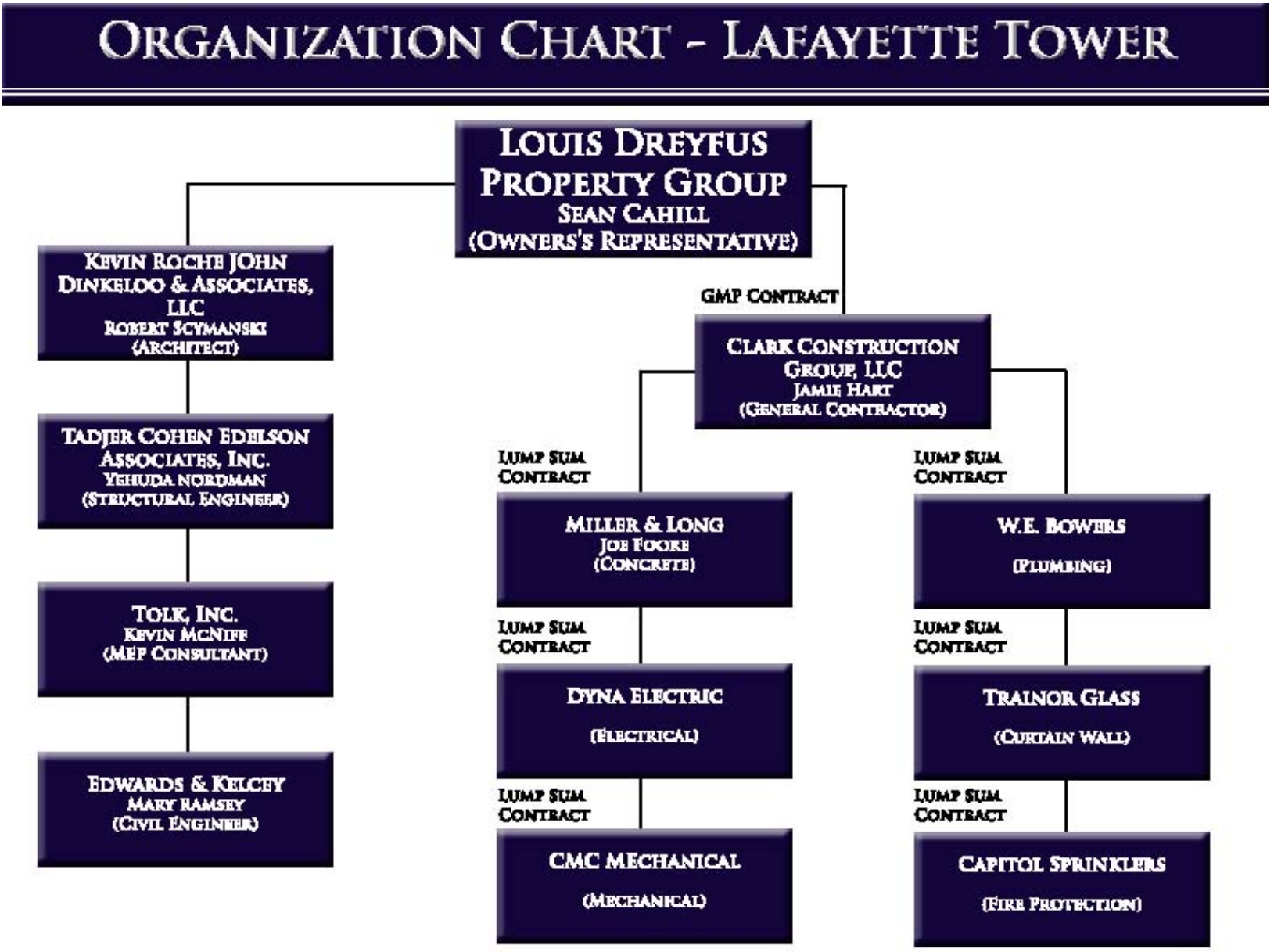
The main goal of this project for Louis Dreyfus was simply to make money. They expected this property to be a cash cow for a couple of reasons and the foremost of those being its close proximity and views of The White House and The Washington Monument.

As far as their cost, quality, schedule and safety expectations for this project, as of right now the only one that is not being stressed is schedule due to the fact that they have only been able to procure one tenant (John Deere) for a project that is supposed to be finished in around three months. Safety is always the number one concern in any type of construction matter due to how dangerous it is compared to other professions. Both Louis Dreyfus and Clark always make it their highest priority to send workers home the same way they came.

The only sequencing concerns of L.D. is that critical path items don't get delayed and the project keeps moving forward. There are no dual or phase occupancy requirements for the project. And the keys to completing the project to the owner's satisfaction would be that the project comes in on or under budget and it is of excellent quality.

After the building is completed, Louis Dreyfus will use it as its new headquarters until the building becomes entirely leased or they complete a new project that would suite them better.

Project Delivery System



Clark Construction is acting as the general contractor for Lafayette Tower. A GMP contract was used between Clark and Louis Dreyfus because upon the negotiation of the contract, the drawings were well underway but not yet complete and a GMP would make it easy to changes things later.

All of the contracts held between Clark and the subcontractors are lump sum. This is a typical contract agreement and allows for change orders later on. Clark also has a CCIP with most of the

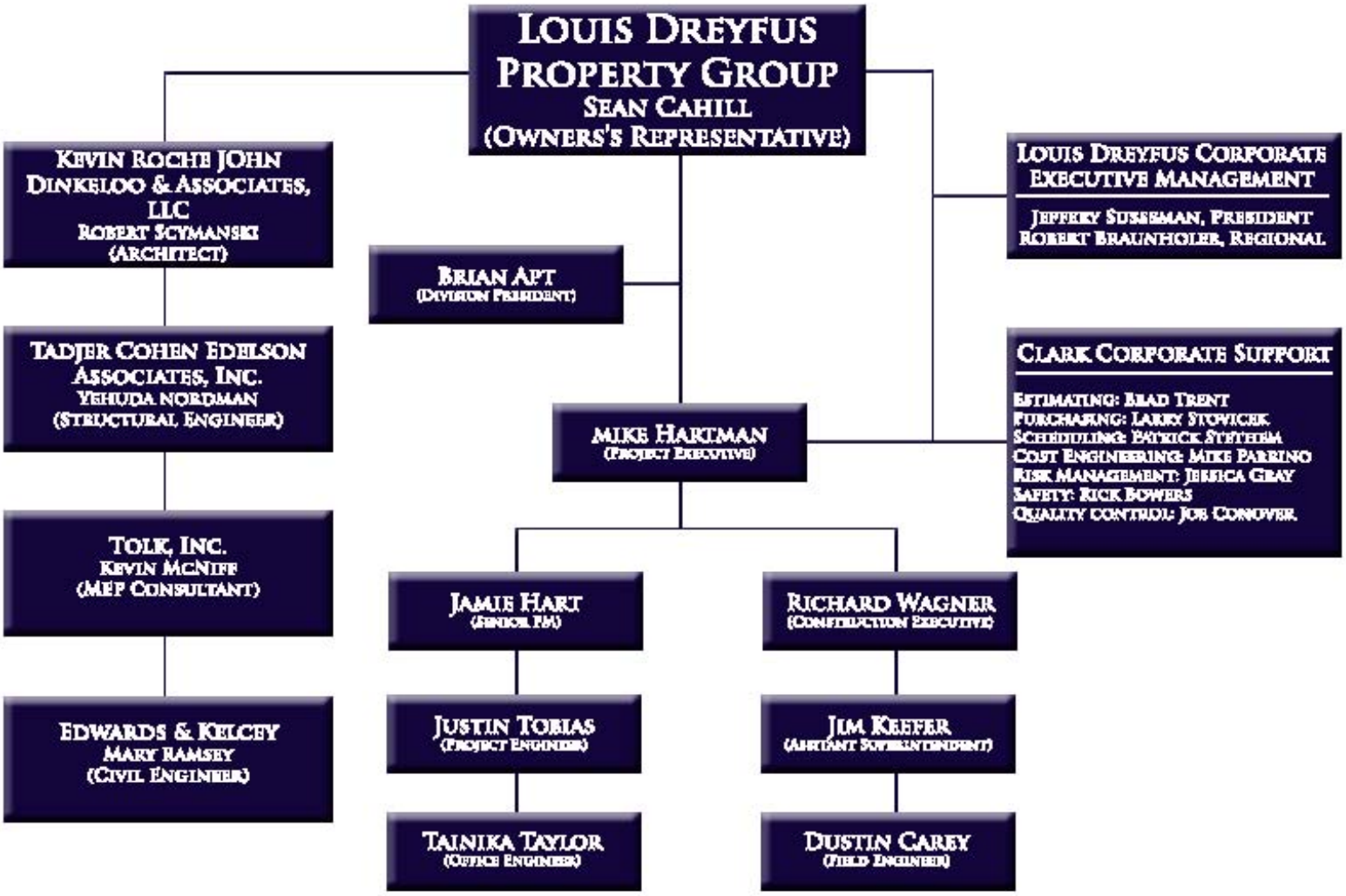
subcontractors which includes worker's compensation and general liability insurance. Payment and performance bonds are also covered in the CCIP. So minor subcontractors, the insulator for example, don't hold contracts directly with Clark but through larger subcontractors in which the 1st sub is responsible for the 2nd tier sub's bonding and insurance.

The owner would not disclose the types of contracts held between themselves and their hired consultants.

Staffing Plan

The project management and field supervision staff work hand-in-hand on this project and even share a site trailer. Therefore the project manager and the superintendent were considered equals in the construction hierarchy. Below the project manager, there is a project engineer, office engineer and an intern. Recently another project engineer was added to help with the dilemmas the curtain wall causing the job. The field side consisted of the superintendent, an assistant superintendent and a party chief engineer (one of the different levels Clark has for field engineers. Both sides also had a college intern and there were also two labor foreman on the field side.

STAFFING PLAN - LAFAYETTE TOWER



Appendix

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL | **M.480** | **Office, 11-20 Story**

Costs per square foot of floor area

Exterior Wall	S.F. Area	120000	145000	170000	200000	230000	260000	400000	600000	800000
	L.F. Perimeter	420	450	470	490	510	530	600	730	820
Double Glazed Heat Absorbing Tinted Plate Glass Panels	Steel Frame	151.50	146.15	141.70	137.80	134.85	132.55	125.95	122.35	120.10
	R/Conc. Frame	151.40	144.85	139.65	135.05	131.55	128.90	121.20	116.95	114.40
Face Brick with Concrete Block Back-up	Steel Frame	154.40	148.30	143.35	139.10	135.90	133.35	126.25	122.25	119.85
	R/Conc. Frame	146.45	140.50	135.70	131.55	128.35	125.90	118.95	115.05	112.75
Precast Concrete Panel With Exposed Aggregate	Steel Frame	156.30	149.95	144.85	140.45	137.05	134.45	127.00	122.90	120.45
	R/Conc. Frame	147.90	141.80	136.90	132.60	129.35	126.90	119.70	115.70	113.35
Perimeter Adj., Add or Deduct	Per 100 L.F.	7.55	6.20	5.35	4.50	3.90	3.50	2.30	1.50	1.10
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	3.00	2.65	2.40	2.10	1.90	1.75	1.25	1.05	0.90

***For Basement**, add $33.50 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 $86.10 to $210.00 per S.F.

Common additives

Description	Unit	$ Cost
Clock System		
20 room	Each	15,400
50 room	Each	37,400
Directory Boards, Plastic, glass covered		
30" x 20"	Each	580
36" x 48"	Each	1450
Aluminum, 24" x 18"	Each	570
36" x 24"	Each	635
48" x 32"	Each	925
48" x 60"	Each	1950
Elevators, Electric passenger, 10 stops		
3000# capacity	Each	278,500
4000# capacity	Each	281,000
5000# capacity	Each	286,000
Additional stop, add	Each	7875
Emergency Lighting, 25 watt, battery operated		
Lead battery	Each	278
Nickel cadmium	Each	800

Description	Unit	$ Cost
Escalators, Metal		
32" wide, 10' story height	Each	115,900
20' story height	Each	136,000
48" wide, 10' story height	Each	121,900
20' story height	Each	141,500
Glass		
32" wide, 10' story height	Each	113,900
20' story height	Each	136,000
48" wide, 10' story height	Each	121,900
20' story height	Each	141,500
Smoke Detectors		
Ceiling type	Each	174
Duct type	Each	445
Sound System		
Amplifier, 250 watts	Each	2225
Speaker, ceiling or wall	Each	181
Trumpet	Each	345
TV Antenna, Master system, 12 oulet	Outlet	299
30 oulet	Outlet	192
100 outlet	Outlet	179

180

Important: See the Reference Section for Location Factors

odel costs calculated for a 16 story building
th 10′ story height and 260,000 square feet
floor area

Office, 11-20 Story

				Unit	Unit Cost	Cost Per S.F.	% Of Sub-Total
A SUBSTRUCTURE							
A10	Standard Foundations	CIP concrete pile caps		S.F. Ground	9.12	.57	4.6%
A20	Special Foundations	Steel H-piles, concrete grade beams		S.F. Ground	54	3.36	
A30	Slab on Grade	4" reinforced concrete with vapor barrier and granular base		S.F. Slab	4.63	.29	
A10	Basement Excavation	Site preparation for slab, piles and grade beams		S.F. Ground	.25	.02	
A20	Basement Walls	4′ foundation wall		L.F. Wall	70	.34	
B SHELL							
B10 Superstructure							
B10	Floor Construction	Concrete slab, metal deck, beams		S.F. Floor	24.62	23.08	23.5%
B20	Roof Construction	Metal deck, open web steel joists, beams, columns		S.F. Roof	7.20	.45	
B20 Exterior Enclosure							
B10	Exterior Walls	N/A		—	—	—	12.8 %
B20	Exterior Windows	Double glazed heat absorbing, tinted plate glass wall panels	*100% of wall*	Each	37.45	12.22	
B30	Exterior Doors	Double aluminum & glass doors		Each	5236	.56	
B30 Roofing							
B10	Roof Coverings	Single ply membrane, fully adhered; perlite/EPS composite insulation		S.F. Roof	5.28	.33	0.3%
B20	Roof Openings	N/A		—	—	—	
C INTERIORS							
C10	Partitions	Gypsum board on metal studs	*30 S.F. Floor/L.F. Partition*	S.F. Partition	9.45	2.52	17.0%
C20	Interior Doors	Single leaf hollow metal	*400 S.F. Floor/Door*	Each	842	2.11	
C10	Fittings	Toilet partitions		S.F. Floor	.41	.41	
C20	Stair Construction	Concrete filled metal pan		Flight	14,500	1.95	
C30	Wall Finishes	60% vinyl wall covering, 40% paint		S.F. Surface	1.28	.68	
C30	Floor Finishes	60% carpet tile, 30% vinyl composition tile, 10% ceramic tile		S.F. Floor	4.59	4.59	
C30	Ceiling Finishes	Mineral fiber tile on concealed zee bars		S.F. Ceiling	4.74	4.74	
D SERVICES							
D10 Conveying							
D10	Elevators & Lifts	Four geared passenger elevators		Each	305,500	4.70	4.7%
D10	Escalators & Moving Walks	N/A		—	—	—	
D20 Plumbing							
D30	Plumbing Fixtures	Toilet and service fixtures, supply and drainage	*1 Fixture/1345 S.F. Floor*	Each	1358	1.01	1.3%
D30	Domestic Water Distribution	Oil fired water heater		S.F. Floor	.27	.27	
D30	Rain Water Drainage	Roof drains		S.F. Roof	1.12	.07	
D30 HVAC							
D30	Energy Supply	Oil fired hot water		S.F. Floor	3.96	3.96	15.7%
D30	Heat Generating Systems	N/A		—	—	—	
D30	Cooling Generating Systems	Chilled water, fan coil units		S.F. Floor	11.70	11.70	
D30	Terminal & Package Units	N/A		—	—	—	
D30	Other HVAC Sys. & Equipment	N/A		—	—	—	
D40 Fire Protection							
D40	Sprinklers	Sprinkler system, light hazard		S.F. Floor	3.76	3.76	4.1%
D40	Standpipes	Standpipes and hose systems		S.F. Floor	.37	.37	
D50 Electrical							
D50	Electrical Service/Distribution	2400 ampere service, panel board and feeders		S.F. Floor	1	1	16.0%
D50	Lighting & Branch Wiring	Fluorescent fixtures, receptacles, switches, A.C. and misc. power		S.F. Floor	10.26	10.26	
D50	Communications & Security	Alarm systems, internet and phone wiring, emergency lighting		S.F. Floor	4.23	4.23	
D50	Other Electrical Systems	Emergency generator, 200 kW, uninterruptible power supply		S.F. Floor	.50	.50	
E EQUIPMENT & FURNISHINGS							
E10	Commercial Equipment	N/A		—	—	—	0.0 %
E20	Institutional Equipment	N/A		—	—	—	
E10	Vehicular Equipment	N/A		—	—	—	
E10	Other Equipment	N/A		—	—	—	
F SPECIAL CONSTRUCTION							
F10	Integrated Construction	N/A		—	—	—	0.0 %
F10	Special Facilities	N/A		—	—	—	
G BUILDING SITEWORK		N/A					
					Sub-Total	100.05	**100%**
	CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)				*25%*	25	
	ARCHITECT FEES				*6%*	7.50	
					Total Building Cost	**132.55**	

Location Factors

Costs shown in *RSMeans Square Foot Costs* are based on National Averages for materials and installation. To adjust these costs to a specific location, simply multiply the base cost by the factor for that city. The data is arranged alphabetically by state and postal zip code numbers. For a city not listed, use the factor for a nearby city with similar economic characteristics.

STATE/ZIP	CITY	Residential	Commercial
ALABAMA			
350-352	Birmingham	.88	.88
354	Tuscaloosa	.79	.81
355	Jasper	.73	.79
356	Decatur	.79	.81
357-358	Huntsville	.85	.86
359	Gadsden	.76	.81
360-361	Montgomery	.78	.81
362	Anniston	.74	.78
363	Dothan	.77	.78
364	Evergreen	.75	.80
365-366	Mobile	.83	.84
367	Selma	.75	.79
368	Phenix City	.76	.81
369	Butler	.76	.79
ALASKA			
995-996	Anchorage	1.27	1.24
997	Fairbanks	1.29	1.24
998	Juneau	1.26	1.22
999	Ketchikan	1.30	1.29
ARIZONA			
850,853	Phoenix	.86	.89
852	Mesa/Tempe	.83	.86
855	Globe	.79	.85
856-857	Tucson	.85	.87
859	Show Low	.81	.86
860	Flagstaff	.86	.89
863	Prescott	.80	.84
864	Kingman	.83	.86
865	Chambers	.80	.84
ARKANSAS			
716	Pine Bluff	.81	.84
717	Camden	.69	.73
718	Texarkana	.74	.76
719	Hot Springs	.69	.74
720-722	Little Rock	.85	.85
723	West Memphis	.79	.81
724	Jonesboro	.78	.82
725	Batesville	.75	.77
726	Harrison	.76	.79
727	Fayetteville	.71	.77
728	Russellville	.76	.78
729	Fort Smith	.78	.81
CALIFORNIA			
900-902	Los Angeles	1.08	1.08
903-905	Inglewood	1.04	1.04
906-908	Long Beach	1.03	1.05
910-912	Pasadena	1.04	1.04
913-916	Van Nuys	1.07	1.06
917-918	Alhambra	1.08	1.05
919-921	San Diego	1.06	1.05
922	Palm Springs	1.04	1.04
923-924	San Bernardino	1.04	1.02
925	Riverside	1.08	1.07
926-927	Santa Ana	1.05	1.04
928	Anaheim	1.08	1.07
930	Oxnard	1.09	1.07
931	Santa Barbara	1.08	1.07
932-933	Bakersfield	1.06	1.06
934	San Luis Obispo	1.07	1.05
935	Mojave	1.05	1.03
936-938	Fresno	1.09	1.08
939	Salinas	1.10	1.09
940-941	San Francisco	1.25	1.23
942,956-958	Sacramento	1.11	1.09
943	Palo Alto	1.18	1.14
944	San Mateo	1.23	1.17
945	Vallejo	1.16	1.13
946	Oakland	1.22	1.18
947	Berkeley	1.24	1.16
948	Richmond	1.25	1.16
949	San Rafael	1.23	1.17
950	Santa Cruz	1.14	1.12
951	San Jose	1.21	1.17
952	Stockton	1.08	1.08
953	Modesto	1.08	1.07
CALIFORNIA (CONT'D)			
954	Santa Rosa	1.17	1.14
955	Eureka	1.11	1.07
959	Marysville	1.09	1.07
960	Redding	1.09	1.08
961	Susanville	1.09	1.07
COLORADO			
800-802	Denver	.93	.94
803	Boulder	.93	.92
804	Golden	.91	.93
805	Fort Collins	.89	.92
806	Greeley	.79	.86
807	Fort Morgan	.92	.92
808-809	Colorado Springs	.90	.93
810	Pueblo	.91	.93
811	Alamosa	.88	.92
812	Salida	.90	.92
813	Durango	.91	.92
814	Montrose	.87	.91
815	Grand Junction	.91	.92
816	Glenwood Springs	.90	.93
CONNECTICUT			
060	New Britain	1.11	1.09
061	Hartford	1.11	1.09
062	Willimantic	1.11	1.09
063	New London	1.10	1.07
064	Meriden	1.11	1.08
065	New Haven	1.11	1.10
066	Bridgeport	1.12	1.10
067	Waterbury	1.11	1.09
068	Norwalk	1.11	1.09
069	Stamford	1.12	1.11
D.C.			
200-205	Washington	.96	.99
DELAWARE			
197	Newark	1.04	1.04
198	Wilmington	1.05	1.04
199	Dover	1.03	1.05
FLORIDA			
320,322	Jacksonville	.82	.84
321	Daytona Beach	.90	.89
323	Tallahassee	.78	.79
324	Panama City	.75	.78
325	Pensacola	.82	.85
326,344	Gainesville	.81	.86
327-328,347	Orlando	.90	.89
329	Melbourne	.91	.92
330-332,340	Miami	.87	.89
333	Fort Lauderdale	.85	.88
334,349	West Palm Beach	.85	.85
335-336,346	Tampa	.92	.91
337	St. Petersburg	.79	.83
338	Lakeland	.89	.91
339,341	Fort Myers	.87	.87
342	Sarasota	.90	.88
GEORGIA			
300-303,399	Atlanta	.89	.90
304	Statesboro	.71	.77
305	Gainesville	.79	.83
306	Athens	.79	.84
307	Dalton	.75	.79
308-309	Augusta	.80	.83
310-312	Macon	.81	.83
313-314	Savannah	.82	.82
315	Waycross	.75	.80
316	Valdosta	.73	.77
317,398	Albany	.78	.82
318-319	Columbus	.83	.84
HAWAII			
967	Hilo	1.22	1.19
968	Honolulu	1.25	1.21