

# Technical Assignment #1

Marriott Hotel at Penn Square and  
Lancaster County Convention Center



**Trevor J. Sullivan**

Construction Management  
AE Faculty Consultant: Dr. Horman  
October 5, 2007

**Table of Contents**

Executive Summary .....	1
Project Schedule .....	2
Schedule Narrative .....	4
Building System Summary .....	5
Project Cost Evaluation .....	10
Site Plan of Existing Conditions .....	14
Local Conditions .....	16
Client Information .....	17
Project Delivery System .....	19
Project Delivery Organizational Chart .....	21
Project Delivery Organizational Chart Description .....	22
Staffing Plan .....	24
Staffing Plan Description .....	26
Appendices .....	27

Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

## **Executive Summary**

The Marriott Hotel at Penn Square and Lancaster County Convention Center is a new 412,000 SF facility being constructed where the former Watt & Shand department store was located. The 109 year old façade is being restored and incorporated into the new 19 story building. The hotel will consist of; 300 rooms, a 4,785 SF full service bar, a 9,621 SF ballroom which can also double as six meeting rooms highlighted by majestic two-tiered windows from the Watt & Shand façade, and 7,541 SF of amenities which include an exercise room, indoor pool and whirlpool spa. While the state-of-the-art convention center will consist of a 47,842 SF exhibit hall along with lobby areas, prefunction areas, a large ballroom, three boardrooms, and meeting rooms. The \$170 million dollar project is scheduled to be constructed from May 2006 to Dec. 31<sup>st</sup> 2008.

This report encompasses an initial study of the scheduling, budgeting, planning and delivery methods for the Hotel and Convention Center project along with the main building systems. The project is being delivered on a tight schedule from May 2006 to a substantial completion date of Dec. 31<sup>st</sup> 2008. It has been broken down into two phases to allow for an earlier start of work for several trades. A CM Agency is helping the Owner deliver the project with 17 multiple prime contracts. The project is located at the square of downtown Lancaster, which restricts the construction to a small area requiring a well thought out and carried out site logistics plan. Lastly, the construction cost for the project total \$105 million dollars, while initial SF estimates with RS Means and D4Cost 2002 put the construction cost at approximately \$58 million.

Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

### **Project Schedule**

See the following sheet for the project schedule.

ID	Task Name	Duration	Start	Finish	2002	2003	2004	2005	2006	2007	2008	2009
1	Conceptual Design	241 days	Wed 7/24/02	Wed 6/25/03								
2	Schematic Design	68 days	Mon 6/9/03	Wed 9/10/03								
3	Design Development	46 days	Mon 9/15/03	Mon 11/17/03								
4	Construction Documents	127 days	Fri 10/17/03	Mon 4/12/04								
5	Permits and Approvals	454 days	Wed 7/31/02	Mon 4/26/04								
6	Procurement of Construction Services	502 days	Wed 7/31/02	Thu 7/1/04								
7	Abatement and Demolition	245 days	Mon 10/24/05	Fri 9/29/06								
8	Façade Stabilization	90 days	Mon 5/1/06	Fri 9/1/06								
9	Site Work	545 days	Mon 10/2/06	Fri 10/31/08								
10	Area A Museum Level Shell	277 days	Wed 11/15/06	Thu 12/6/07								
11	Area A Museum Level Finishes	211 days	Fri 11/16/07	Fri 9/5/08								
12	Area B Convention Entry Shell	268 days	Wed 3/14/07	Fri 3/21/08								
13	Area B Convention Entry Finishes	176 days	Fri 1/4/08	Fri 9/5/08								
14	Area D Exhibit Hall Shell	306 days	Tue 3/20/07	Tue 5/20/08								
15	Area D Exhibit Hall Finishes	250 days	Fri 12/28/07	Thu 12/11/08								
16	Area C Exhibit Hall "B" Level Shell	399 days	Fri 12/22/06	Wed 7/2/08								
17	Area C Exhibit Hall "B" Level Finishes	207 days	Fri 1/4/08	Mon 10/20/08								
18	Area E Mech. Room and Laundry Area Shell	327 days	Wed 4/25/07	Thu 7/24/08								
19	Area E Mech. Room and Laundry Area Finishes	170 days	Tue 2/5/08	Mon 9/29/08								
20	Area F Hotel Lobby Area Shell	191 days	Thu 9/6/07	Thu 5/29/08								
21	Area F Hotel Lobby Area Finishes	233 days	Mon 12/24/07	Wed 11/12/08								
22	Area G Ballroom "A" and "B" Shell	193 days	Tue 10/16/07	Thu 7/10/08								
23	Area G Ballroom "A" and "B" Shell	193 days	Thu 3/13/08	Mon 12/8/08								
24	Area I Meeting and Admin Area Shell	152 days	Wed 12/19/07	Thu 7/17/08								
25	Area I Meeting and Admin Area Finishes	191 days	Wed 4/9/08	Wed 12/31/08								
26	Area J Health Club Level Shell	114 days	Tue 1/8/08	Fri 6/13/08								
27	Area J Health Club Level Finishes	201 days	Wed 3/26/08	Wed 12/31/08								
28	Hotel Tower Level 6-19 Shell	198 days	Thu 1/31/08	Mon 11/3/08								
29	Hotel Tower Level 6-19 Finishes	164 days	Fri 5/2/08	Wed 12/17/08								
30	Project Substantial Completion	0 days	Wed 12/31/08	Wed 12/31/08								

**Marriott Hotel at Penn Square and  
Lancaster County Convention Center**  
Lancaster, PA

Task		Project Summary	
Split		External Tasks	
Progress		External Milestone	
Milestone		Deadline	
Summary			

### Schedule Narrative

The design process for this project started in July of 2002, and continued to the middle of April 2004. It was at this point the project faced difficulties in obtaining financing to fund the public/private project. Many believed the project was not ever going to make it past the design phase, though in October 2005 the Owners proceeded to demolish the Watt & Shand building. The Owners also continued to begin construction activities immediately after the demolition phase even before the permanent financing was in place for the project. This was done to show the public that the project will be constructed and to gain support for the project during what was a controversial time.

After the year and half of dormancy the project faced, it is now into the construction phase and like any Owner, they want the building to be usable and open as soon as possible to begin making money on their investment. As seen on the schedule, the project is broken down into several different areas, areas A-J. These areas are located in the Convention Center and in the podium/shared space. The schedule shows a "Shell" and "Finishes" activity for each area. The "Shell" term is used to encompass any excavation work, forming, placing, reshoring, mechanical rough-ins, exterior walls, roof and any work to provide a structure that is "dried-in". The "Finishes" term is used to encompass any drywall, painting, ceiling, sprinkler heads, light fixtures, wall coverings, fixtures, hardware, etc... work to provide a usable building that provides the ability to use the room for its intended function. Once the project meets the Hotel tower the schedule is broken down into floors. The schedule again shows a "Finishes" and "Shell" activities. Due to the size and time constraints for construction, the finishes activities will follow the shell construction up the tower. Two separate companies have been contracted by the general trades contractor to complete the finish work; this is to meet the schedule requirements for the project by working multiple crews in different areas at the same time as can be seen on the schedule. The substantial completion date for the project is December 31, 2008.

## Building Systems Summary

### **Demolition Work:**

The abandoned Watt & Shand department store became an eyesore to Lancaster City after its years of nonuse. As part of the Redevelopment Authority revitalization plan of Lancaster City they decided to use this city block located at the square of center city Lancaster as the site for the new Hotel and Convention Center. The demolition of the Watt & Shand building and the façade stabilization was completed under phase 1 (May 2006 – Oct. 2006) of the project. The old Watt & Shand building consisted of a steel frame structure with concrete on metal deck. Asbestos was present in the 109 year old building, and was removed by an Asbestos Contractor hired by the Owner. The interior non-friable asbestos materials were removed from the building prior to demolition.

### **Structural Steel Frame:**

Once at the lobby level of the project, the Convention Center transitions from cast-in-place concrete to structural steel. The steel frame is a braced frame utilizing diagonal HSS shapes for the bracing and varying W shapes used for columns. The floor beams are also W-shapes, varying in size depending on loading conditions with nelson studs welded to them to create a composite floor slab. The roof over the loading dock area is made up of W shape beams varying in size depending on the weight of the mechanical equipment in that area. The entrance roofs are comprised of HSS shapes, again varying in size. The main roof over the Convention Center is made up of 153' long bow string metal trusses comprised of WT, HSS, and L shapes. The trusses are to be prefabricated at Greiner Industries and delivered to site in three pieces. Once on site they will be field erected and then lifted into place.

The Hotel is a cast-in-place concrete structure, though the roof of the podium (Health Club Level) consists of W-shape beams and bar joist. The three main joist sizes used are 24" K series to span 26', 28" K series to span 32' and 60" deep DLH series to span 85'.

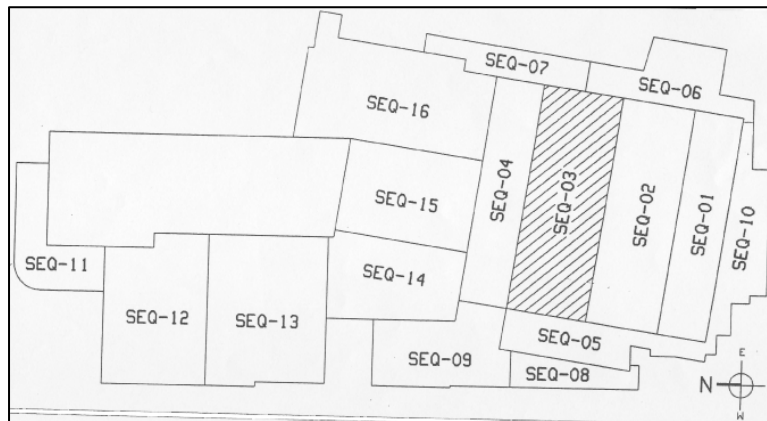


Figure 1. Steel Erection Sequence

To erect the steel for the project the steel contractor will use a 240 Ton crane. The erection will require multiple mobilizations due to the project configuration. The first mobilization will be to erect sequences 01 thru 10 (see Figure 1). The erection will require multiple mobilizations due to the project configuration. The first series of mobilizations will be

to erect sequences 01 thru 10 (see Figure 1 below). The crane will mobilize at sequence 02 to erect sequence 01 and 02, then remobilize where sequence 03 is located to erect sequences 03 and 04, then the crane will move out of the building footprint to finish erecting sequences 05 thru 10, remobilizing as necessary. The second series of crane mobilizations will be required to erect the steel for the roof of the podium, sequences 11-13 and the Convention Center roof that is sloped away from the tower, sequences 14, 15, 16 and 17. Sequence 17 is located above the north-east corner of sequence 16. Additional crane mobilizations will be required to erect the steel for the roof of the podium, and the rest of the Convention Center roof (sequences 14-17). Below, Figure 2 shows the different elevations of the roofs for the building. The podium roof steel is sequences 11, 12 and 13, and the Convention Center roof that is sloped away from the tower is sequences 14, 15, 16 and 17. Sequence 17 is located above the north-east corner of sequence 16.



Figure 2. Elevation of Project

### **Cast-in-Place Concrete:**

The superstructure is mainly cast-in-place concrete. The concrete columns in the hotel are spaced at 27' (N-S) along the length of the tower and the spacing varies along the width from 8' – 17'. The floor slabs are 12-14" thick and are post-tensioned concrete. At the base of the tower, 7' thick transfer girders are used to span the hotel lobby. The Convention Center also utilizes the cast-in-place concrete until it reaches the exhibit floors, where it switches to structural steel. The concrete structure is formed entirely by stick framing (except for a few retaining walls in the lower level of the convention center). The concrete is placed by means of a boom style pump truck when applicable and then when the truck can no longer reach the heights required for the tower a concrete standpipe will be used to get the concrete up the structure.

### **Precast Concrete/Curtain Wall:**

The façade of the Hotel Tower is comprised of three different architectural panels; architectural precast panels, architectural carbon cast panels and architectural spandrel precast panels. The architectural precast panels comprise most of the façade, and vary in size. The most common size of the panel is 31'-7 3/8" x 8'-11 1/4".

These precast panels will be cast by High Concrete Structures, Inc. located in Lancaster, PA. The tower crane will be used to lift the panels into place on a second shift basis, so that the tower crane can be used for other construction activities throughout first shift and accelerate the schedule. The connection for the panel is a welded connection to steel angles incorporated into the concrete superstructure.



### **Mechanical System:**

The mechanical system starts with 8 Boilers in a row in the main mechanical room (1658MBH/each) that are natural gas fired. Providing the cold water for the mechanical systems are the 2 (750 Ton) water cooled chillers coupled with 2 cooling towers that handle 2250GPM and produce 11,250 MBH of heat rejection. The hot and cold water is used in hydronic AHU's to provide heating and cooling to the public spaces of the hotel. Each hotel room is equipped with an energy recover unit, while the corridors are cooled with 100% outdoor air from roof top units. The Convention Center utilizes three D/X roof top units w/eru wheel each providing 1461 MBH total cooling and 1700 MBH of total heating to the main exhibit halls. Additionally, the hot water for the building is provided by 8 large gas-fired water heaters and storage tanks. The water heaters range in size from 500,000-1,700,000 BTU.

### **Electrical System:**

The electric for the project is provided by 2 main service points, each 4000 AMP 480Y/277 Volts, 3PH., 4W. The lighting system uses mainly 277V fluorescent lamps for the public areas and 120V fluorescent lamps for the hotel rooms. The electrical system steps down to 208Y/120 on each of the floors in the building for the receptacles. The back up system for the project is a 2000HP generator with a 2000 gallon diesel storage tank and a 75 gallon day tank.

### **Masonry:**

The majority of the masonry for the project is used as infill for the structural steel frame of the convention center. It is non-load bearing and provides backup for the different exterior finishes on the convention center including EIFS, brick and split face block.

### **Support of Excavation:**

Given the nature of the site several different types of excavation support systems are needed for this project. The project is situated in between five existing structures and surrounded by four roads. The types of shoring and bracing systems used for this project include; soldier piles, timber lagging, steel sheet piles, underpinning, soil nailing, and trench boxes.

The Gearhart building, the existing structure adjacent to the hotel, requires shot-crete and underpinning, as the bottom of the new hotel is lower than the existing neighboring structure. Also the entire Watt & Shand façade requires underpinning support as the hotel basement is lower than the existing façade. Along the site parallel to East Vine St. soil-nailing and shot-crete is called for to resist any movement of the soil underneath the roadway. Additionally, steel sheet piles and trench boxes are both to be used as needed during the excavation process of the construction process.

### Project Cost Evaluation

**Project Size:**

Total Square Footage: 412,079 SF  
Convention Center: 183,917 SF  
Hotel: 161,417 SF  
Shared Space: 66,745 SF

**Construction Cost:**

Construction Cost: \$105,580,685  
Construction Cost/SF: \$256/SF

**Total Project Cost:**

Total Project Cost: \$169.7 million  
Total Project Cost/SF: \$412/SF

**Building System Costs:**

	Bid Pacakage	Original Contract Amount	Cost/SF
1	Demolition	1,588,734	3.86
2	Façade Stabilization	3,063,000	7.43
3	Caissons	1,085,000	2.63
4	General Trades	37,100,000	90.03
5	Site & Utilites	2,909,000	7.06
6	Concrete	16,200,000	39.31
7	Precast Concrete	2,554,500	6.20
9	Steel	7,986,000	19.38
10	Roofing	2,055,885	4.99
14	Laundry Equipment	393,675	0.96
16	Conveying system	2,427,142	5.89
17	Plumbing	4,444,444	10.79
18	Fire Protection	1,197,800	2.91
19	HVAC	10,969,000	26.62
20	Electrical	8,757,000	21.25
21	Telecommunication/AV	1,488,000	3.61

**R.S. Means SF Estimate:**

**R.S. Means Estimate**

**Hotel**

Area = 192,079 SF

P = 580 LF

Exterior Wall	Area (SF)	140,000	192,079*	243,000
	Perimeter (LF)	403	496**	5.87
Face Brick Veneer On Steel Studs	R/Conc. Frame	132.65	129.42**	126.25

Story Height Adjustment	Per 1 ft.		:Not Needed:	
Perimeter Adjustment	Per 100 LF	1.85	1.66	1.60

Adjusted Cost / SF	129.42+1.66 (500-496) / 100 = 129.49			
--------------------	--------------------------------------	--	--	--

**Convention Center**

Area = 220,000 SF

P = 1532 LF

Exterior Wall	Area (SF)	16,000	20,000	220,000*
	Perimeter (LF)	560	600	2600**
Face Brick with Concrete Block Backup	Steel Frame	118.00	114.60	(55.4)**

Story Height Adjustment	Per 1 ft.	4.75	3.85	(41.14)**
Perimeter Adjustment	Per 100 LF	1.30	1.15	(6.35)**

Adjusted Cost / SF	Due to the large extrapolation from the given data to the required data, the resulting data is unusable.			
\$150 / SF will be assumed to complete the estimate.				

\* Target Value

\*\* Interpolated/Extrapolated Value

**Total Project Estimate**

**Hotel**                    192,079 SF x \$129.49 / SF = \$ 24,872,309.71

**Convention Center**    220,000 SF x \$150 / SF = \$ 33,000,000

**Total**                    **\$57,872,309.71**

Note: See Appendices for backup of R.S. Means Data.

Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

**D4Cost 2002 Estimate:**

See the following sheets for the D4 estimate of probable cost.

# Estimate of Probable Cost

LCCC - Oct 2006 - PA - Lancaster

Prepared By: **Trevor Sullivan**

Prepared For:

Building Sq. Size: **412079**  
 Bid Date:  
 No. of floors: **19**  
 No. of buildings: **1**  
 Project Height: **210**  
 1st Floor Height:  
 1st Floor Size:

Site Sq. Size: **94387**  
 Building use:  
 Foundation:  
 Exterior Walls:  
 Interior Walls:  
 Roof Type:  
 Floor Type:  
 Project Type:

Division		Percent	Sq. Cost	Amount
<b>00</b>	<b>Procurement and Contracting Require</b>	<b>7.76</b>	<b>10.77</b>	<b>4,436,705</b>
	Procurement and Contracting Require	7.76	10.77	4,436,705
<b>01</b>	<b>General Requirements</b>	<b>0.81</b>	<b>1.12</b>	<b>460,986</b>
	General Requirements	0.81	1.12	460,986
<b>02</b>	<b>Existing Conditions</b>	<b>2.82</b>	<b>3.92</b>	<b>1,614,843</b>
	Existing Conditions	2.82	3.92	1,614,843
<b>03</b>	<b>Concrete</b>	<b>10.63</b>	<b>14.76</b>	<b>6,082,143</b>
	Concrete	10.63	14.76	6,082,143
<b>04</b>	<b>Masonry</b>	<b>1.63</b>	<b>2.26</b>	<b>931,735</b>
	Masonry	1.63	2.26	931,735
<b>05</b>	<b>Metals</b>	<b>7.07</b>	<b>9.81</b>	<b>4,043,429</b>
	Metals	7.07	9.81	4,043,429
<b>06</b>	<b>Wood, Plastics, and Composites</b>	<b>3.54</b>	<b>4.91</b>	<b>2,024,685</b>
	Wood, Plastics, and Composites	3.54	4.91	2,024,685
<b>07</b>	<b>Thermal and Moisture Protection</b>	<b>4.38</b>	<b>6.08</b>	<b>2,506,429</b>
	Thermal and Moisture Protection	4.38	6.08	2,506,429
<b>08</b>	<b>Openings</b>	<b>7.04</b>	<b>9.77</b>	<b>4,024,332</b>
	Openings	7.04	9.77	4,024,332
<b>09</b>	<b>Finishes</b>	<b>13.78</b>	<b>19.13</b>	<b>7,883,834</b>
	Finishes	13.78	19.13	7,883,834
<b>10</b>	<b>Specialties</b>	<b>1.69</b>	<b>2.35</b>	<b>966,741</b>
	Specialties	1.69	2.35	966,741
<b>11</b>	<b>Equipment</b>	<b>0.75</b>	<b>1.04</b>	<b>430,383</b>
	Equipment	0.75	1.04	430,383
<b>12</b>	<b>Furnishings</b>	<b>0.68</b>	<b>0.94</b>	<b>388,945</b>
	Furnishings	0.68	0.94	388,945
<b>13</b>	<b>Special Construction</b>	<b>0.18</b>	<b>0.24</b>	<b>100,325</b>
	Special Construction	0.18	0.24	100,325
<b>14</b>	<b>Conveying Systems</b>	<b>2.32</b>	<b>3.22</b>	<b>1,326,374</b>
	Conveying Systems	2.32	3.22	1,326,374
<b>15</b>	<b>Mechanical</b>	<b>11.92</b>	<b>16.54</b>	<b>6,816,030</b>
	Mechanical	11.92	16.54	6,816,030
<b>16</b>	<b>Electrical</b>	<b>7.31</b>	<b>10.14</b>	<b>4,179,073</b>
	Electrical	7.31	10.14	4,179,073
<b>21</b>	<b>Fire Suppression</b>	<b>0.86</b>	<b>1.20</b>	<b>492,997</b>
	Fire Suppression	0.86	1.20	492,997

<b>22</b>	<b>Plumbing</b>	<b>4.47</b>	<b>6.20</b>	<b>2,554,083</b>
	Plumbing	4.47	6.20	2,554,083
<b>23</b>	<b>HVAC</b>	<b>4.78</b>	<b>6.63</b>	<b>2,732,275</b>
	HVAC	4.78	6.63	2,732,275
<b>26</b>	<b>Electrical</b>	<b>4.99</b>	<b>6.92</b>	<b>2,851,069</b>
	Electrical	4.99	6.92	2,851,069
<b>31</b>	<b>Earthwork</b>	<b>0.46</b>	<b>0.63</b>	<b>261,348</b>
	Earthwork	0.46	0.63	261,348
<b>32</b>	<b>Exterior Improvements</b>	<b>0.15</b>	<b>0.20</b>	<b>83,156</b>
	Exterior Improvements	0.15	0.20	83,156
<b>Total Building Costs</b>		<b>100.00</b>	<b>138.79</b>	<b>57,191,921</b>
<b>Total Non-Building Costs</b>		<b>100.00</b>	<b>0.00</b>	<b>0</b>
<b>Total Project Costs</b>		<b>--</b>	<b>--</b>	<b>57,191,921</b>

Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

**Estimate Summary:**

The parametric estimate using RS Means data is not very close to the actual construction cost, this may be due to the lack of building type choices in RS Means. The closest building type for a convention center is a community center. The community center data provided by RS Means is for considerably smaller projects than the 220,000 SF Convention Center. Being significantly different in size, the extrapolated data proved to be unusable as the cost/SF numbers were negative.

In preparing the estimate in D4Cost 2002 software the estimate was calculated to be \$57.2 million. The following are the projects that were used to come with the estimate:

To provide Convention Center type data:

Keystone Exhibit Hall – 47,820 SF - \$7 million

Blue Springs Conference Center – 27,000 SF - \$4.6 million

To provide Hotel type data:

Hampton Inn & Suites Hotel – 162,000 SF - \$13.8 million

AmeriSuites – 191,600 SF - \$16.5 million

Again, the projects used as a basis for the Convention Center estimate are a lot smaller in size; this may be a reason for the estimates being much lower than the actual construction cost.

It should be noted that the two methods of estimating the project provided two very similar estimates of \$57.8 million and \$57.2 million.

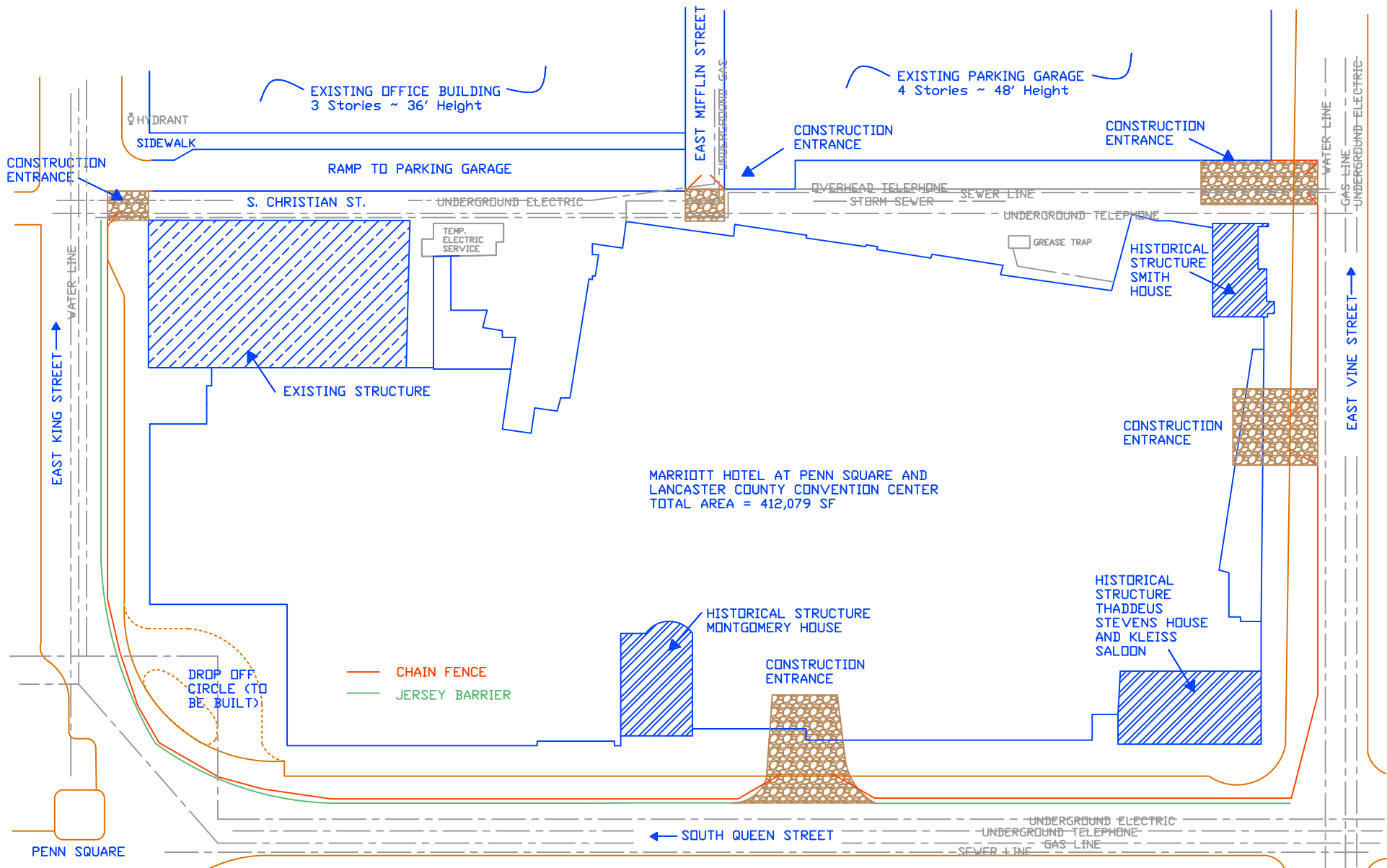
Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

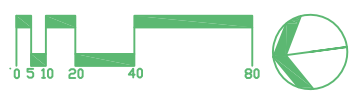
**Site Plan of Existing Conditions**

See the following sheet for the site plan of existing conditions.





SITE PLAN OF EXISTING CONDITIONS  
MARRIOTT HOTEL AT PENN SQUARE AND  
LANCASTER COUNTY CONVENTION CENTER



## **Local Conditions**

### **Preferred Methods of Construction in the Region:**

In Central Pennsylvania there are three common types of structures that are built in commercial construction. The two most readily used structural systems in the region are; 1. load bearing masonry walls with pre-cast concrete floor panels and 2. load bearing masonry walls with load bearing steel bar joist. Additionally, steel structures with steel bar joist and concrete slab on deck structural system is also used, though not as frequent. In residential and multi-family construction, wood framing with some engineered woods is common for the area.

### **Typical Parking for Construction in the Region:**

Central Pennsylvania is rich in farm lands and is thus a rural area. For most construction projects parking is not an issue, as construction workers typically park on-site or in nearby fields. This project is in a downtown location and parking is not as readily available. To accommodate for the limited parking on-site the majority of contractors meet at their home office location and transport workers to the site in a large van.

### **Locally Available Recycling and Tipping Fees:**

Lancaster County Solid Waste Management Authority is in charge of trash and recycling in Lancaster County. For construction projects in Lancaster County, LCSWMA Frey Farm Landfill, located in Manor Township, is typically used as they accept construction and demolition debris. The approximate tipping fee is \$55/ton for construction debris. Also, there are several other municipal waste landfill facilities in Lancaster and the surrounding counties.

### **Local Types of Soil:**

In the Lancaster region, cohesive SM, silty sand, and ML, silt/gravelly silt, soil types are common. Highly weathered/fractured limestone is also encountered frequently at deeper depths. The conditions for this project were similar to those described as common. On the “south” side of site, in the museum level, an underground ‘stream’ was encountered. A design for permanent dewatering was developed and implemented to meet the needs of this water source.

## Client Information

### **Reason for Construction:**

The Marriott Hotel at Penn Square and Lancaster County Convention Center is the most important regional economic development undertaking in decades, the project is expected to bring new hope, new jobs, and new financial strength to Lancaster City. The project is also designed to help increase Lancaster, PA popularity as one the most traveled tourist location on the East Coast. The Hotel and Convention project is just part of larger scaled revitalization to the city; other projects include the recently completed Clipper Magazine Stadium, the Lancaster Quilt Museum, the Pennsylvania Academy of music and the Pennsylvania College of Art & Design. Fittingly as part of the revitalization of the city, the project is incorporating the façade of the 109 year old Watt & Shand department store which has set vacant for several years in the heart of Lancaster City. To accommodate the Hotel and Convention Center, the city is building additional parking garages, renovating old parking garages and is cleaning up the city with new trash cans, street lights, street landscaping and much more.

In late 2000, the Lancaster County Convention Center Authority commissioned an independent study to evaluate and quantify the community benefits of the project. According to the analysis, the Hotel and Convention Center project will project several benefits to the city, they include:

- Create 520 to 590 construction jobs.
- Create 200 to 300 full-time jobs to staff the hotel and convention center.
- Increase Lancaster County tourism by an additional 114,000 to 147,500 visitors annually.
- Inject \$150 million into the local economy during construction: \$110 million in sales of Lancaster County-produced goods and services and \$40 million in personal income.
- Inject \$42 million per year into the local economy during operation: \$31 million per year in sales of Lancaster County-produced goods and services and \$11 million per year in personal income.
- Generate additional tax revenue for Lancaster City, Lancaster County, and the School District of Lancaster

### **The Owners of the Project:**

The Hotel and Convention Center has two Owners; the Redevelopment Authority of the City of Lancaster (RACL) is the Owner for the Hotel, and the Lancaster County Convention Center Authority (LCCCA) is the Owner for the Convention Center. Additionally, the Historic Preservation Trust (HPT) is paying for the preservation work to the historical structures that will be integrated into the project as museums. LCCCA was formed in 1999 with the goal to bring the best possible Convention Center to Lancaster. The authority is comprised of a seven member volunteer board (appointed by Lancaster County and City Officials) and an Executive Director. RACL is also a public board that is designed to revitalize downtown Lancaster. For the Hotel and Convention Center project, RACL has deferred their decision making in regards to the Hotel to Penn Square Partners (PSP). Penn Square Partners comprises general partner Penn Square Corporation, which is affiliated with High Industries, Inc.; Fulton Bank; and Lancaster Newspapers, Inc. Penn Square Partners were formed in 1998, and it was not until 2001 that the public-private partnership was formed between PSP and LCCCA.

In the projects early design stages it was proposed to be two separate buildings. It was not until later that the design incorporated the Hotel and Convention Center together as one large building to enhance the use of both functions. Overall, RACL's cost is 47% while LCCCA's cost is 53% of the total project cost. HPT pays for approximately \$3 million dollars worth of work incorporated into the cost of construction.

### **Cost, Quality and Schedule Expectations of the Owners:**

The cost of the project is \$169.7 million, including all the cost. The expectation to the Owners is to complete the project on budget, and not to exceed the contingency that is built into the total project cost during construction.

Time is of the essence during construction so that the Owners can open and use the building as soon as possible. The schedule calls for substantial completion to be Dec. 30<sup>th</sup>, 2008 and the Owners hope to have opening day in the middle of March, 2008. Achieving the opening day date is critical as marketing agents are currently making reservations and bookings for the Hotel and Convention Center. Achieving the scheduled opening day is so important that the Owners authorized the demolition of the Watt & Shand building to begin before the permanent financing was in place. Likewise all construction activities are to take place as expeditiously as possible, thus three temporary roofs are planned during construction to expedite interior work.

The quality of the project is also very important, which is why the Owners are constructing a Marriott Hotel. Even after the bids came in and the project was over budget, the following value engineering efforts were dedicated towards finding most cost effective means of construction while maintaining quality. For example, the Pre-cast panel façade has been kept for the Tower throughout the value engineering efforts and not revised to a cheaper dryvit system.

### **Keys to Complete the Project to the Owners Satisfaction:**

Much like any project, the keys to complete this project to the Owners satisfaction is to; complete the project on time, on budget, safely, while maintaining the quality that is intended for the Marriott name. While the construction of the building is critical to the success of the project as a whole, the marketing and advertising efforts are just as significant. Approximately 40 events are needed to be held in the Convention Center each year while filling roughly 66% of the rooms a night in the Hotel for the project to provide the financial return the Owners are expecting.

## Project Delivery System

### **Delivery Method:**

The project is being delivered as a Design-Bid-Build with an Agency Construction Manager and Multiple Prime Contracts with the Owners. Cooper Carry, Inc. was selected as the Architect for the project as they have experience with designing Marriott Hotels and Convention Centers in similar size and scope. Shortly after the Architect was selected, the construction managers were brought on. Initially as the project was being designed as two separate buildings, Reynolds Construction Management (RCM) was to be the CM on the Convention Center and High Construction to be the CM for the Hotel. As the design progressed the buildings were combined into one larger project, at this time it was agreed that RCM would be the CM for the entire project and High Construction would then be the general trades contractor for the entire project.

The project was divided into packages and phases of work during the design progress, in an effort to expedite the construction process by allowing the Owners to finalize the permanent financing while beginning demolition activities, and to allow for the unknown conditions under the existing building to be explored further. The project was split into two phases. 1. Façade Stabilization/Demolition, and 2. Construction. The façade stabilization/demolition was started as soon as possible, to begin work on demolishing the existing Watt & Shand department store. There were two prime contractors assigned to this phase of construction, a demolition contractor and a façade stabilization contractor. The construction phase was then ultimately split into 15 more prime contracts, bringing the total for the project to 17. There were two main reasons for having 17 multiple prime contractors to do the work for the project; the first being to get the right concrete specialty contractor to do the post-tensioning work as they like to be prime contractors on projects, along with the project was too large for any local general contractor to handle it as a single package. The developer for the project typically likes to use a design-build delivery method with a single general contractor as it can be a faster method of completing a project. Though for this project, the CM agency and multiple prime contracts was the best choice as it allowed the owners to begin demolition before permanent financing was in place and to attract larger specialty contractors from out of the area to provide competitive bids on a somewhat controversial project that local contractors didn't believe would actually get built.

### **Contractor Selection Process:**

The contractor selection process began with finding contractors that could meet the bonding requirements for the project as a prime contractor. In having bonding requirements, it prevents all the small contractors that may have not been able to handle the scope of work for the project. The most important prime contract, the concrete work, was selected by who had experience with post-tensioning work, this led to Miller, Long and Arnold a large concrete contractor from the Baltimore area. The largest prime contract being the general trades was given to High Construction as they agreed to do the work after the project was combined into one building. Obtaining the rest of the prime contractors was a matter of finding companies suitable to handle the work and who thought the project would actually be constructed. The majority of the prime contractors ended up being local, though some needed to be obtained from the Pittsburgh region, and New Jersey.

**Essence of the Contractual Agreements:**

Each prime contract is a lump sum agreement, along with some selective unit prices. Most of the unit prices come from the site being classified, so the caisson contractor and site work contractor each have unit prices that involve rock removal. There are no liquidated damages specified in the contract documents, thus there will be actual damages assessed at the end of the project if delivered late.

First and foremost of importance for all contracts is time is of the essence. The original contract called for 687 day duration though it was extended 136 days to the current Dec. 31<sup>st</sup> substantial completion date, through a no-cost change order, due to rock, water and permitting issues. The contracts use time only language for delays.

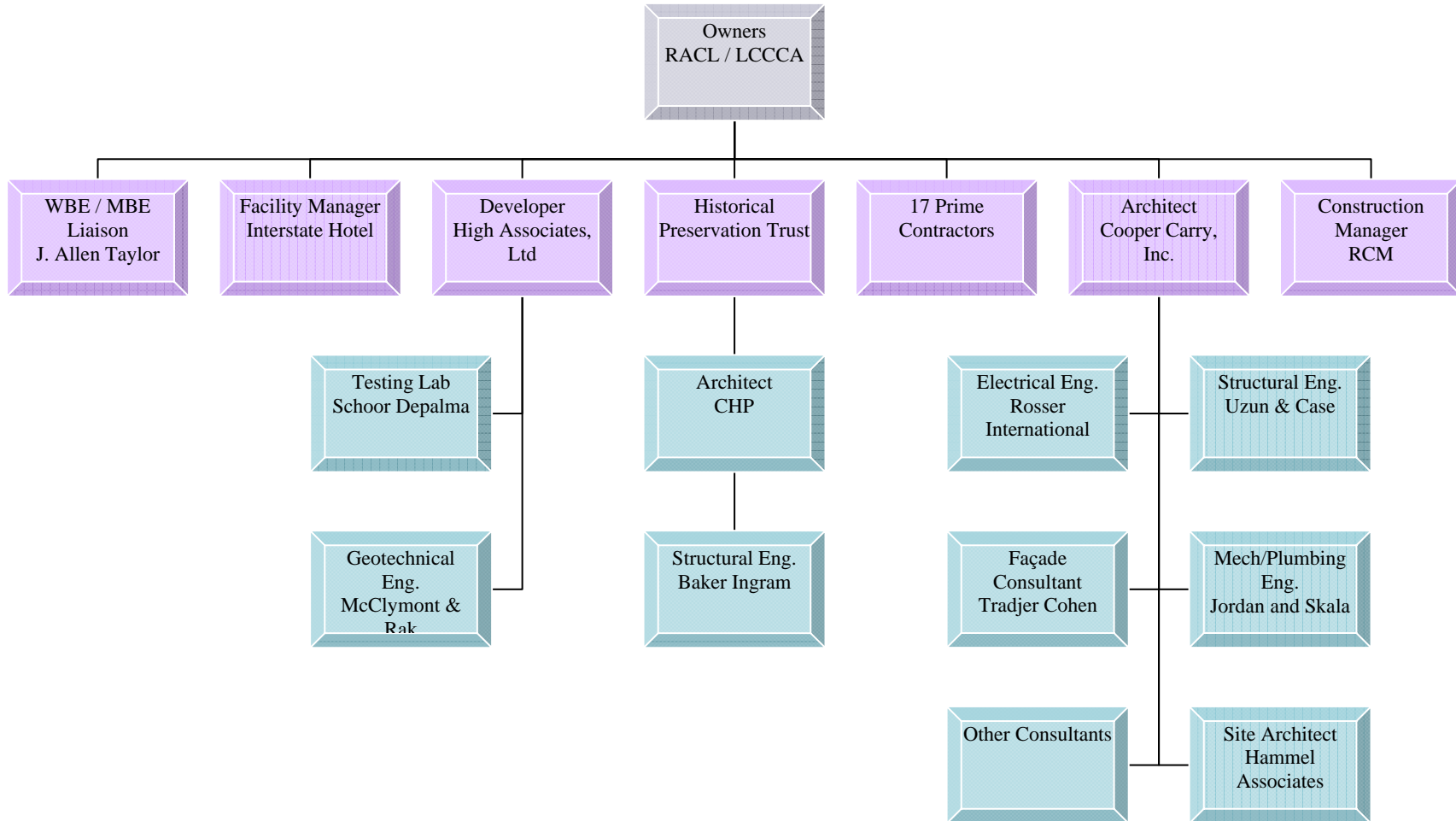
Payment is due to the contractors in 45 days, and the retainage of 10% is decreased to 5% at 50% completion. Also the contractors are allowed to bill for off-site stored materials at the Owners discretion. Alternate dispute resolution is solely at the discretion of the Owner, and litigation is in Lancaster County. There are also MBE/WBE goals for the project of 10% MBE and 5% WBE.

**Bonds and Insurance Requirements:**

The contract documents require all bidders for the project to provide written AIA document A312, Performance Bond and Payment bond. Both bonds are to be written in the amount of the Contract Sum. Also, since it is a public Owner the property may not be liened. The builders risk insurance is provided by the Owner, and the contractors are to provide insurance per the limits outlined in the contract.

**Project Delivery System Organizational Chart**

The organizational chart shows the relationship and contract ties between the Owners, Architects, Engineers, Construction Manager, and Contractors for the project. Attached is a detailed description of the organizational chart, including contract types, along with other information.



Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

### **Project Delivery System Organizational Chart Description**

#### **Contracts with Owner:**

Architect: Cooper Carry, Inc.

Contact: Bob Neal, and Lane Chapman

Contract: Percent Fee

Construction Manager: Reynolds Construction Management, Inc. (RCM)

Contact: David Angle

Contract: Fixed Fee with Owners

WBE / MBE Liaison: J. Allen Taylor Consulting

Contact: Al Taylor

Contract: Fee with LCCCA

Hotel and Convention Center (Facility) Manager: Interstate Hotel

Contract: Fee with Owners

Developer: High Associates, Ltd.

Contact: Thomas Smithgall

Contract: Percent Fee of Construction Cost with Owners

Historical Properties (Except Montgomery House): Historical Preservation Trust (HPT)

Contact: Gail Tomlinson

Contract: Agreement with Owners to preserve historical properties

Contract 01: Demolition: Empire Services

Contact: Steve Eurich

Contract 02: Façade Stabilization: Caldwell, Heckles & Egan, Inc.

Contact: Mark Strunk

Contract 03: Caissons: Shelly Drilling

Contact: Todd Andree

Contract 04: General Trades: High Construction

Contact: Sheila Snyder

Contract 05: Site & Utilities: Horst Excavating

Contact: Ralph Carruthers

Contract 06: Concrete: Miller, Long & Arnold

Contact: Roger Arnold

Contract 07: Precast Concrete: High Concrete Structures, Inc.

Contact: Bob Bisbing



Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

Contract 09: Steel : Steel Fab Enterprises, Inc.  
Contact: Steve Fisher

Contract 10: Roofing & Sheet Metal: Gooding, Simpson & Mackes, Inc.  
Contact: Derek Youndt

Contract 14: Laundry: PAC Industries  
Contact: Jon D'Amico

Contract 15: Food Service Equipment: Hmak, Inc.  
Contact: Nick Curry

Contract 16: Conveying Systems: Schindler Elevator Corp.  
Contact: Jeff Hotem

Contract 17: Plumbing: W.G. Tomko, Inc.  
Contact: Bill Tomko, III

Contract 18: Fire Protection: King's Fire Protection, Inc.  
Contact: Harry Smith

Contract 19: HVAC: Rado Enterprises, Inc.  
Contact: Craig Hosler

Contract 20: Electrical: The Farfield Company  
Contact: John Muscavage

Contract 21: Telecommunication/AV: Ray Angelini, Inc.  
Contact: Brian Meskill

**Note:** All Prime Contracts are Lump Sum  
Contracts 08, 11, 12, and 13 were added to contract 04 under an addendum.

**Contracts under HPT:**

Architect for Historical Properties (Except Mont. House): Community Heritage Partners (CHP)  
Contract: Fee with HPT

Structural Engineer for Historical Properties (Except Mont. House): Baker Ingram & Assoc.  
Contract: Fixed Fee with CHP

**Contracts with Developer:**

Testing: Schoor Depalma  
Contact: Mike Wright  
Contract: Rates for Services

Geotechnical Engineer: McClymont & Rak  
Contract: Rates for Services

Marriott Hotel at Penn Square  
and Lancaster County Convention Center  
Lancaster, PA

Trevor J. Sullivan  
Construction Management  
AE Faculty Consultant: Dr. Horman

**Contracts under Architect:**

Structural Engineer: Uzun & Case Engineers  
Contact: Byron Benson  
Contract: Fee with Cooper Carry, Inc.

Electrical Engineer: Rosser International  
Contact: Joe Broome  
Contract: Fee with Cooper Carry, Inc.

Mechanical / Plumbing Engineer: Jordan & Skala  
Contact (Mechanical): Tim Taylor  
Contact (Plumbing): Gary Creson  
Contract: Fee with Cooper Carry, Inc.

Façade Consultant: Tadjer Cohen Edelson Associates, Inc.  
Contact: Varinder Abrol  
Contract: Fee with Cooper Carry, Inc.

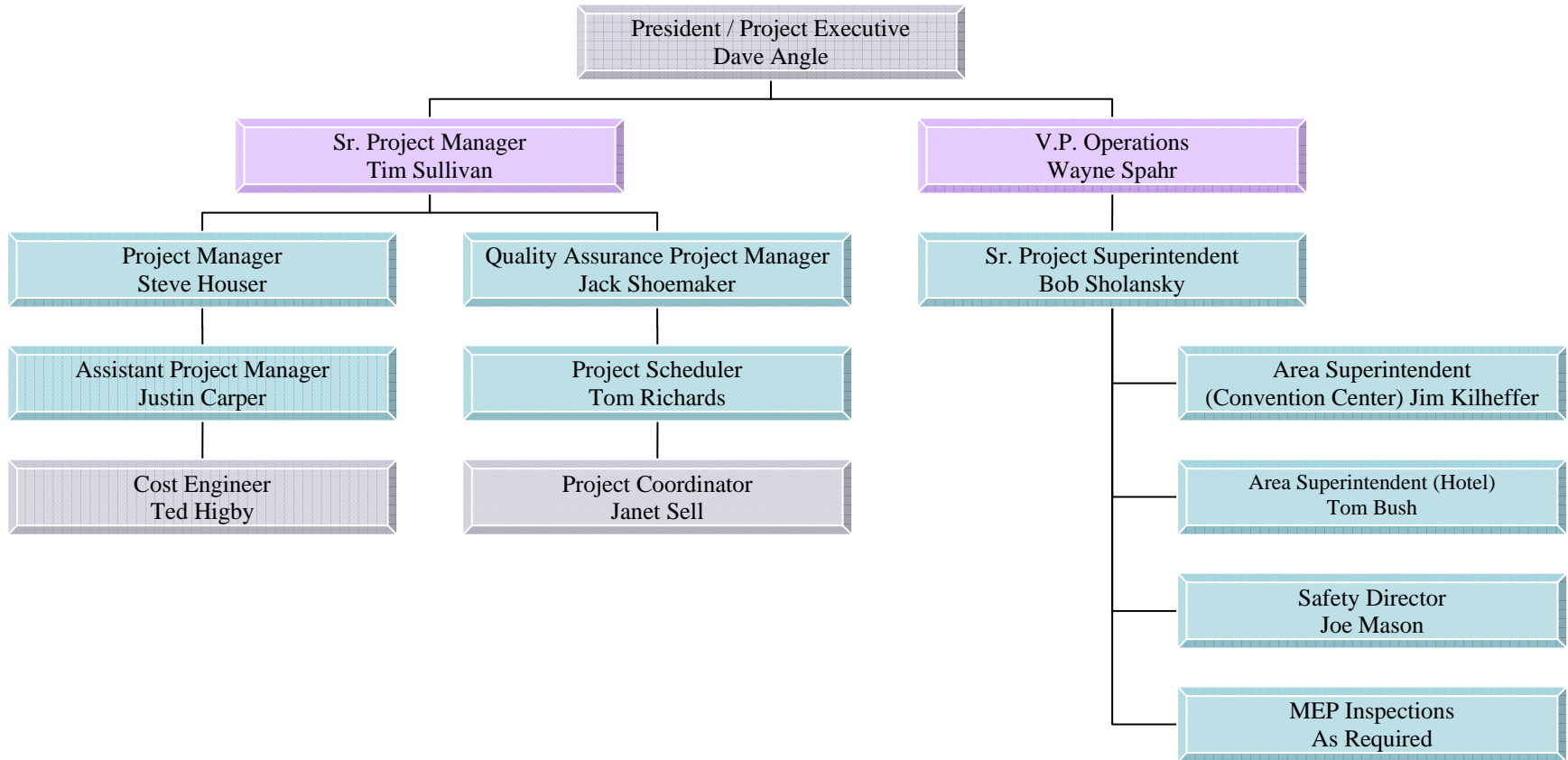
Local Architect (Montgomery House): Hammel Associates Architects, LLC  
Contact: Ted Vedock  
Contract: Fee with Cooper Carry, Inc.

**Other Consultants:**

Interior Design: Design Continuum  
Landscape Architecture: Derck & Edson, Associates  
Exterior Wall Review: Williamson & Associates  
Lighting: Moran Coventry Lighting & Assoc.  
Hardware: SBS Associates, Inc.  
Voice Data: Network Technologies  
Kitchen Equipment: McFarland Kistler & Associates  
Audio/Visual: Electro-Media Design, Ltd.  
Quality Control: Edward M. Hatch

**Staffing Plan**

Staffing Plan for Reynolds Construction Management, the CM Agent for the Project.



### **Staffing Plan Description**

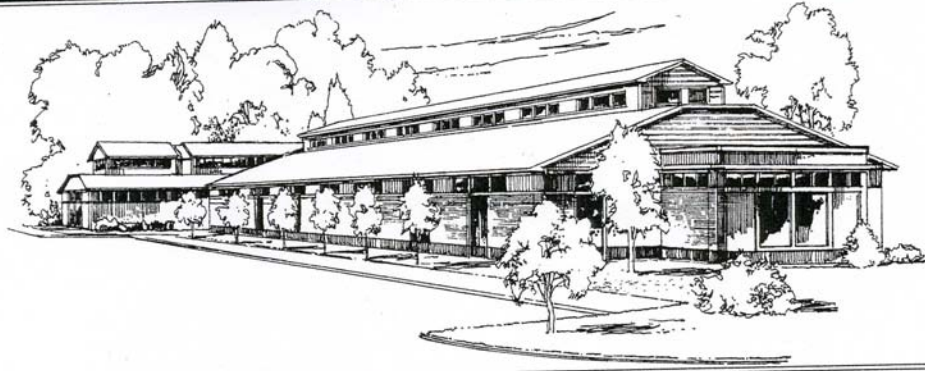
The President of Reynolds Construction Management (RCM) oversees the staff for the project. He gets involved with the schedule, progress meetings, Owner meetings and board meetings for the project.

The field supervision, located in a trailer on site, is headed with the Dir. of Field Operations who commits approx. three days a week on site at the project to oversee the staff and site progress. The Senior Superintendent is on site full time and oversees the entire project. Assisting him are two Superintendents, one specifically to oversee the Hotel construction and the other to oversee the Convention Center construction. RCM's safety director makes periodic visits to the site to check for any safety concerns. As the project progresses and MEP systems are being installed and ready for testing, RCM will provide MEP inspectors to provide quality assurance on these critical systems for the Owner.

On the operations side, RCM has rented an office down the street from the project to allow the staff direct access to the site on a daily basis. This office is headed by the Senior Project Manager who oversees the management side of the project. Working with him is the Project Manager who assists by heading up the change management issues and any technical issues. The Cost Engineer assists with the change management issues, as he reviews the proposed change orders for the quoted amount and makes any necessary adjustments before RCM makes recommendations to the Owner about the proposed change order. The Assistant Project Manager is responsible for the documentation control, processing the submittals, shop drawings, and RFI's, along with keeping track of addendums, bulletins and responses to the RFI's. Working with the Assistant PM and his documentation control, the Quality Assurance Manager performs constructability reviews of all the documents being released by the Architect. He meets weekly with the Architect to discuss issues and come up with solutions, trying to resolve issues on paper before workers come across the issues in the field during construction. Additionally, RCM employees a full time Project Scheduler, he meets bi weekly with the SPM to update the construction schedule.

**Appendices**

**COMMERCIAL/INDUSTRIAL/INSTITUTIONAL**      **M. 170**      **Community Center**



**Costs per square foot of floor area**

Exterior Wall	S.F. Area	4000	6000	8000	10000	12000	14000	16000	18000	20000
	L.F. Perimeter	260	340	420	453	460	510	560	610	600
Face Brick with Concrete Block Back-up	Bearing Walls	143.80	136.40	132.60	126.80	121.25	119.65	118.40	117.55	114.45
	Steel Frame	139.95	133.45	130.20	125.20	120.45	119.05	118.00	117.25	114.60
Decorative Concrete Block	Bearing Walls	126.75	120.85	117.85	113.40	109.10	107.85	106.85	106.10	103.75
	Steel Frame	128.60	123.60	121.05	117.30	113.80	112.70	111.85	111.30	109.35
Tilt Up Concrete Wall Panels	Bearing Walls	129.15	123.55	120.75	116.55	112.65	111.40	110.50	109.85	107.65
	Steel Frame	125.25	120.70	118.35	114.95	111.85	110.85	110.10	109.55	107.80
Perimeter Adj., Add or Deduct	Per 100 L.F.	19.05	12.65	9.50	7.60	6.40	5.40	4.75	4.20	3.85
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	2.40	2.05	1.95	1.65	1.40	1.30	1.30	1.20	1.15

*For Basement, add \$26.90 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 \$66.20 to \$209.15 per S.F.

**Common additives**

Description	Unit	\$ Cost	Description	Unit	\$ Cost
Bar, front bar	L.F.	345	Movie Equipment		
Back bar	L.F.	277	Projector, 35mm	Each	11,300 - 15,500
Booth, Upholstered, custom straight "L" or "U" shaped	L.F.	182 - 335	Screen, wall or ceiling hung	S.F.	7.80 - 11.90
Bowling Alleys, incl. alley, pinsetter	L.F.	188 - 320	Partitions, Folding leaf, wood		
Scorer, counter & misc. supplies, average	Lane	53,500	Acoustic type	S.F.	66 - 109
For automatic scorer, add	Lane	9675	Seating		
Emergency Lighting, 25 watt, battery operated	Each	265	Auditorium chair, all veneer	Each	212
Lead battery	Each	770	Veneer back, padded seat	Each	257
Nickel cadmium	Each		Upholstered, spring seat	Each	257
Kitchen Equipment			Classroom, movable chair & desk	Set	65 - 120
Broiler	Each	3375	Lecture hall, pedestal type	Each	202 - 605
Coffee urn, twin 6 gallon	Each	3175	Sound System		
Cooler, 6 ft. long	Each	4300	Amplifier, 250 watts	Each	2125
Dishwasher, 10-12 racks per hr.	Each	4275	Speaker, ceiling or wall	Each	174
Food warmer	Each	600	Trumper	Each	335
Freezer, #4 C.F., reach-in	Each	4325	Stage Curtains, Medium weight	S.F.	9.40 - 330
Ice cube maker, 50 lb. per day	Each	1525	Curtain Track, Light duty	L.F.	70
Range with 1 oven	Each	2225	Swimming Pools, Complete, gunite	S.F.	60 - 74

Model costs calculated for a 1 story building with 12' story height and 10,000 square feet of floor area			Community Center			
			Unit	Unit Cost	Cost Per S.F.	% Of Sub-Total
<b>A. SUBSTRUCTURE</b>						
1010	Standard Foundation:	Paired concrete; strip and spread footing:				
1030	Slab on Grade	4" reinforced concrete with vapor barrier and granular base	S.F. Ground	1.95	1.95	
2010	Basement Excavation	Site preparation for slab and trench for foundation wall and footing	S.F. Slab	4.45	4.45	
2020	Basement Walls	4' foundation wall	S.F. Ground	.24	.24	14.4%
			L.F. Wall	64	6.80	
<b>B. SHELL</b>						
<b>B10 Superstructure</b>						
1010	Floor Construction	N/A				
1020	Roof Construction	Metal deck on open web steel joists	S.F. Roof	5.81	5.81	6.2%
<b>B20 Exterior Enclosure</b>						
2010	Exterior Walls	Face brick with concrete block backup	S.F. Wall	26	11.63	
2020	Exterior Windows	Aluminum sliding	Each	535	1.82	15.3%
2030	Exterior Doors	Double aluminum and glass and hollow metal	Each	2043	.82	
<b>B30 Roofing</b>						
3010	Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation	S.F. Roof	5.81	5.81	
3020	Roof Openings	Roof hatches	S.F. Roof	.10	.10	6.4%
<b>C. INTERIORS</b>						
1010	Partitions	Gypsum board on metal studs	S.F. Partition	7.17	5.12	
1020	Interior Doors	Single leaf hollow metal	Each	815	5.83	
1030	Fittings	Toilet partitions, directory board, mailboxes	S.F. Floor	1.82	1.82	
2010	Stair Construction	N/A				
3010	Wall Finishes	Paint				27.3%
3020	Floor Finishes	50% carpet, 50% vinyl tile	S.F. Surface	1.53	2.18	
3030	Ceiling Finishes	Mineral fiber tile on concealed zee bars	S.F. Floor	5.74	5.74	
			S.F. Ceiling	4.71	4.71	
<b>D. SERVICES</b>						
<b>D10 Conveying</b>						
1010	Elevators & Lifts	N/A				
1020	Escalators & Moving Walks	N/A				0.0%
<b>D20 Plumbing</b>						
2010	Plumbing Fixtures	Kitchen, toilet and service fixtures, supply and drainage	Each	2284	2.51	
2020	Domestic Water Distribution	Electric water heater	S.F. Floor	5.85	5.85	9.4%
2040	Rain Water Drainage	Roof drains	S.F. Roof	.37	.37	
<b>D30 HVAC</b>						
3010	Energy Supply	N/A				
3020	Heat Generating Systems	Included in D3050				
3030	Cooling Generating Systems	N/A				
3050	Terminal & Package Units	Single zone rooftop unit, gas heating, electric cooling	S.F. Floor	9.11	9.11	9.8%
3090	Other HVAC Sys. & Equipment	N/A				
<b>D40 Fire Protection</b>						
4010	Sprinklers	Wet pipe sprinkler system	S.F. Floor	2.40	2.40	
4020	Standpipes	N/A				2.6%
<b>D50 Electrical</b>						
5010	Electrical Service/Distribution	200 ampere service, panel board and feeders	S.F. Floor	.92	.92	
5020	Lighting & Branch Wiring	Incandescent fixtures, receptacles, switches, A.C. and misc. power	S.F. Floor	4.45	4.45	
5030	Communications & Security	Alarm systems and emergency lighting	S.F. Floor	.34	.34	6.3%
5090	Other Electrical Systems	Emergency generator, 15 kW	S.F. Floor	.14	.14	
<b>E. EQUIPMENT &amp; FURNISHINGS</b>						
1010	Commercial Equipment	Freezer, chest type	S.F. Floor	.70	.70	
1020	Institutional Equipment	N/A				
1030	Vehicular Equipment	N/A				2.1%
1090	Other Equipment	Kitchen equipment, directory board, mailboxes, built-in coat racks	S.F. Floor	1.30	1.30	
<b>F. SPECIAL CONSTRUCTION</b>						
1020	Integrated Construction	N/A				
1040	Special Facilities	N/A				0.0%
<b>G. BUILDING SITEWORK</b>						
N/A						
				<b>Sub-Total</b>	93.05	100%
CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)				25%	23.28	
ARCHITECT FEES				9%	10.47	
<b>Total Building Cost</b>				<b>126.80</b>		

**COMMERCIAL/INDUSTRIAL/  
INSTITUTIONAL**

**M.360**

**Hotel, 8-24 Story**



**Costs per square foot of floor area**

Exterior Wall	S.F. Area	140000	243000	346000	450000	552000	655000	760000	860000	965000
	L.F. Perimeter	403	587	672	800	936	1073	1213	1195	1312
Face Brick with Concrete Block Back-up	Steel Frame	134.25	127.45	122.80	120.90	119.80	119.15	118.55	116.90	116.60
	R/Conc. Frame	134.50	127.70	123.05	121.10	120.05	119.35	118.75	117.10	116.80
Face Brick Veneer On Steel Studs	Steel Frame	132.00	125.60	121.30	119.50	118.55	117.85	117.30	115.85	115.55
	R/Conc. Frame	132.65	126.25	121.95	120.15	119.20	118.45	117.95	116.45	116.15
Glass and Metal Curtain Walls	Steel Frame	157.90	144.90	138.20	<b>135.00</b>	133.15	131.80	130.95	129.30	128.70
	R/Conc. Frame	158.55	145.50	138.90	135.65	133.80	132.50	131.55	129.95	129.35
Perimeter Adj., Add or Deduct	Per 100 L.F.	4.85	2.80	1.95	1.50	1.30	1.00	.90	.85	.70
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.85	1.60	1.25	1.10	1.20	1.00	1.10	.90	.85

*For Basement, add \$29.40 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 \$105.85 to \$185.10 per S.F.

**Common additives**

Description	Unit	\$ Cost	Description	Unit	\$ Cost
Bar, Front bar	L.F.	345	Laundry Equipment		
Back bar	L.F.	277	Folders, blankets & sheets, king size	Each	64,000
Booth, Upholstered, custom, straight	L.F.	182 - 335	Ironers, 110" single roll	Each	34,600
"1" or "U" shaped	L.F.	188 - 320	Combination washer & extractor 50#	Each	11,900
Closed Circuit Surveillance, One station			125#	Each	31,800
Camera and monitor	Each	1675	Sauna, Prefabricated, complete	Each	4950
For additional camera stations, add	Each	910	6' x 4'	Each	5925
Directory Boards, Plastic, glass covered			6' x 6'	Each	7300
30" x 20"	Each	570	6' x 9'	Each	8600
36" x 48"	Each	1375	8' x 8'	Each	11,900
Aluminum, 24" x 18"	Each	555	10' x 12'		
48" x 32"	Each	885	Smoke Detectors		
48" x 60"	Each	1850	Ceiling type	Each	171
Elevators, Electric passenger, 10 stops			Duct type	Each	440
1500# capacity	Each	270,500	Sound System		
3000# capacity	Each	278,000	Amplifier, 250 watts	Each	2125
Additional stop, add	Each	7675	Speaker, ceiling or wall	Each	174
Emergency Lighting, 25 watt, battery operated			Trumeter	Each	335
Lead battery	Each	265	TV Antenna, /Master system, 12 outlet	Outlet	288
Nickel cadmium	Each	770	30 outlet	Outlet	185
			100 outlet	Outlet	173

**Important: See the Reference Section for Location Factors**

Model costs calculated for a 15 story building with 10' story height and 450,000 square feet of floor area				Hotel, 8-24 Story			
				Unit	Unit Cost	Cost Per S.F.	% Of Sub-total
<b>A. SUBSTRUCTURE</b>							
1010	Standard Foundation:	Foured concrete; strip and spread footing.	S.F. Ground	16.05	1.07		
1030	Slab on Grade	4" reinforced concrete with vapor barrier and granular base	S.F. Slab	4.45	.30		
2010	Basement Excavation:	Site preparation for slab and trench for foundation wall and footing	S.F. Ground	.14	.01		1.5%
2020	Basement Walls	4' foundation wall	L.F. Wall	69	.15		
<b>B. SHELL</b>							
<b>B10 Superstructure</b>							
1010	Floor Construction	Open web steel joists, slab form, concrete, columns	S.F. Floor	17.63	16.45		16.6%
1020	Roof Construction	Metal deck, open web steel joists, beams, columns	S.F. Roof	7.50	.50		
<b>B20 Exterior Enclosure</b>							
2010	Exterior Walls	N/A	-	-	-		
2020	Exterior Windows	Glass and metal curtain walls	Each	20	5.55		5.6%
2030	Exterior Doors	Glass and metal doors and entrances	Each	2582	.19		
<b>B30 Roofing</b>							
3010	Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation	S.F. Roof	5.10	.34		
3020	Roof Openings	N/A	-	-	-		0.3%
<b>C. INTERIORS</b>							
1010	Partitions	Gypsum board and sound deadening board, steel studs	9 S.F. Floor/L.F. Partition	S.F. Partition	6.38	5.67	
1020	Interior Doors	Single leaf hollow metal	90 S.F. Floor/Door	Each	815	9.06	
1030	Fittings	N/A	-	-	-		
2010	Stair Construction	Concrete filled metal pan	Flight	11,550	2.34		27.8%
3010	Wall Finishes	20% paint, 75% vinyl cover, 5% ceramic tile	S.F. Surface	1.67	2.96		
3020	Floor Finishes	80% carpet tile, 10% vinyl composition tile, 10% ceramic tile	S.F. Floor	4.75	4.75		
3030	Ceiling Finishes	Gypsum board on resilient channel	S.F. Ceiling	3.54	3.54		
<b>D. SERVICES</b>							
<b>D10 Conveying</b>							
1010	Elevators & Lifts	One geared freight, six geared passenger elevators	Each	303,750	4.05		4.0%
1020	Escalators & Moving Walks	N/A	-	-	-		
<b>D20 Plumbing</b>							
2010	Plumbing Fixtures	Kitchen, toilet and service fixtures, supply and drainage	1 Fixture/165 S.F. Floor	Each	2301	13.95	
2020	Domestic Water Distribution	Electric water heater	S.F. Floor	4.07	4.07		17.8%
2040	Rain Water Drainage	Rain drains	S.F. Roof	1.50	.10		
<b>D30 HVAC</b>							
3010	Energy Supply	Oil fired hot water, wall fin radiation	S.F. Floor	2.00	2.00		
3020	Heat Generating Systems	N/A	-	-	-		
3030	Cooling Generating Systems	Chilled water, fan coil units	S.F. Floor	10.01	10.01		11.8%
3050	Terminal & Package Units	N/A	-	-	-		
3090	Other HVAC Sys. & Equipment	N/A	-	-	-		
<b>D40 Fire Protection</b>							
4010	Sprinklers	Sprinkler system, light hazard	S.F. Floor	2.89	2.89		
4020	Standpipes	Standpipes and hose systems	S.F. Floor	.31	.31		3.1%
<b>D50 Electrical</b>							
5010	Electrical Service/Distribution	6000 ampere service, panel board and feeders	S.F. Floor	1.37	1.37		
5020	Lighting & Branch Wiring	Fluorescent fixtures, receptacles, switches, A.C. and misc. power	S.F. Floor	7.40	7.40		
5030	Communications & Security	Alarm systems, internet wiring, communications systems and emergency lighting	S.F. Floor	2.53	2.53		11.4%
5090	Other Electrical Systems	Emergency generator, 500 kW	S.F. Floor	.32	.32		
<b>E. EQUIPMENT &amp; FURNISHINGS</b>							
1010	Commercial Equipment	N/A	-	-	-		
1020	Institutional Equipment	N/A	-	-	-		
1030	Vehicular Equipment	N/A	-	-	-		0.0%
1090	Other Equipment	N/A	-	-	-		
<b>F. SPECIAL CONSTRUCTION</b>							
1020	Integrated Construction	N/A	-	-	-		
1040	Special Facilities	N/A	-	-	-		0.0%
<b>G. BUILDING SITEWORK</b> N/A							
					<b>Sub-Total</b>	101.89	100%
CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)					25%	25.47	
ARCHITECT FEES					6%	7.64	
<b>Total Building Cost</b>					<b>135.00</b>		