Baltimore Washington Medical Center
Women's Center and Inpatient Tower *Glen Burnie, MD*

Technical Assignment #1

Megan Wortman | Construction Management | Consultant: John Messner

Table of Contents

Executive Summary

The Women's Center and Inpatient Tower is one of two new additions being built at the Baltimore Washington Medical Center in Glen Burnie, Maryland. The Baltimore Washington Medical Center, which is part of the University of Maryland Medical System, provides medical services for communities located between the Baltimore and Annapolis regions. With the addition of the Women's Center and Inpatient Tower, the Baltimore Washington Medical Center will become an extensive care center for all patients throughout the state of Maryland.

The patient tower project is a very intense project due to the complexity of the building. The project is designed using a number of complex systems including the structural system, the mechanical and electrical systems, and the glass curtainwall system. The combination of these systems creates a very detailed oriented project.

Technical Assignment 1 addresses with the construction project management for the Baltimore Washington Medical Center- Women's Center and Inpatient Tower. The assignment includes a project summary schedule, a building systems summary, a project cost evaluation, a site plan showing the existing conditions of the site, the local conditions for the area, a description of the owner, the project delivery schedule, and the staffing plan for the project. This technical report breaks down the components of the project in order to gain a better understanding of how the project is being managed.

Project Schedule Summary

***Please refer to the following page for the gantt bar chart schedule for the BWMC Women's Center and Inpatient Tower.

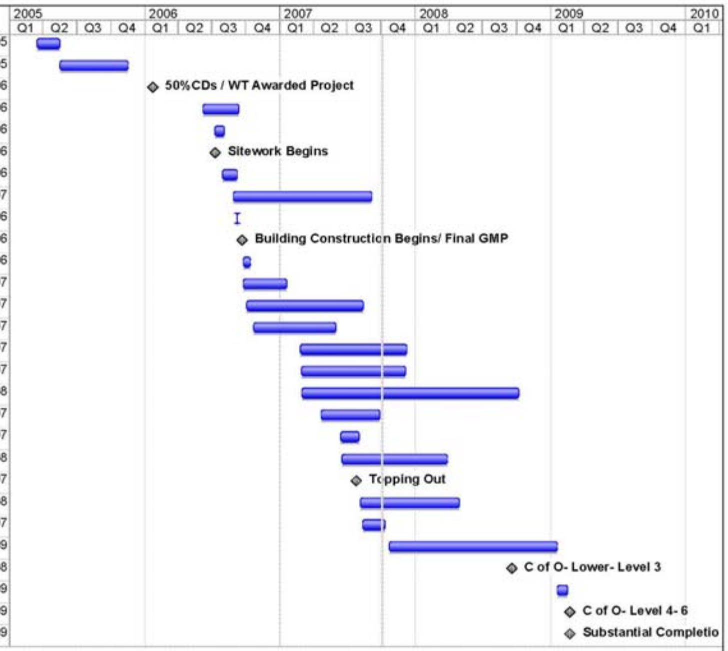
The design for the BWMC Women's Center and Inpatient Tower Project began in early 2005. Early in the design phase of the project, a construction manager was brought on the project to perform the preconstruction services for the project. This construction manager had a contract with the owner for the preconstruction services only. When the Construction Documents were 50% complete in January 2006, Whiting-Turner was awarded the contract for the construction phase of the project. Whiting-Turner moved onto site in May 2006 and began the subcontractor bidding phase in June 2006. The subcontractor's bids were awarded in mid September 2006, and the final GMP was executed on September 22, 2006. Because the new patient tower was designed to tie into the existing hospital, part of the existing hospital needed to be either demolished or gutted before construction for the new tower could begin.

The construction process for the new tower always moved from south to north. The building construction began with the drilling of helical piers below the existing structure and the start of the foundation system. The concrete structure was poured by floors with 4 phases per floor. The three phases for the Patient Tower began at the south end and moved to the north end. The fourth phase is the West Lobby Area, which is attached to the north-east end of the Patient Tower. The steel truss, which is located above the existing mechanical room, was erected in three sections. Each section was erected before the concrete structure was placed for those levels. The hollow-core precast planks were placed by level after the steel truss was erected. Once the concrete structure topped out, the penthouse structure was erected.

The MEP equipment was installed at various times depending on the location of the equipment. Once level three of the concrete structure was placed, the MEP rough-ins began on the lower level and worked up the levels as the concrete structure was still being placed. The MEP rough-in was sequenced in the following order: mechanical, plumbing, electrical, and sprinkler. The interior fit-out and finishes followed behind the MEP rough-ins. As the concrete structure was finishing, the exterior wall framing and sheathing was started on level 1. The Patient Tower is planned to be turned over in two phases. The first phase consists of the lower level through level two, and the second phase is levels three through six.

Project Schedule Summary

ID	Task Name	Duration	Start	Finish
1	Schematic Design	44 days	Thu 3/17/05	Tue 5/17/05
2	Design Development	132 days?	Wed 5/18/05	Thu 11/17/05
3	50%CDs / WT Awarded Project	0 days	Tue 1/24/06	Tue 1/24/06
5	Subcontractor Bid/Award	69 days?	Thu 6/8/06	Tue 9/12/06
7	Utilites Relocation	20 days?	Mon 7/10/06	Fri 8/4/06
6	Sitework Begins	0 days	Mon 7/10/06	Mon 7/10/06
8	Demolition / Excavation	30 days?	Mon 7/31/06	Fri 9/8/06
28	Upgrade Existing Utility Plant	268 days?	Tue 8/29/06	Thu 9/6/07
4	100% Construction Documents	1 day?	Fri 9/8/06	Fri 9/8/06
14	Building Construction Begins/ Final GMP	0 days	Fri 9/22/06	Fri 9/22/06
9	Drilling Helical Piers	15 days?	Mon 9/25/06	Fri 10/13/06
10	Foundations	85 days?	Mon 9/25/06	Fri 1/19/07
11	Concrete Structure	225 days?	Wed 10/4/06	Tue 8/14/07
12	Steel Truss Erection	160 days?	Mon 10/23/06	Fri 6/1/07
22	MEP Equipment Installation	206 days?	Mon 2/26/07	Mon 12/10/07
20	Roofing	201 days?	Thu 3/1/07	Thu 12/6/07
18	MEP Rough-ins	418 days?	Fri 3/2/07	Tue 10/7/08
16	North and South Bridge Structures	115 days?	Mon 4/23/07	Fri 9/28/07
15	Precast Concrete Erection	36 days?	Fri 6/15/07	Fri 8/3/07
23	Building Enclosure	205 days?	Mon 6/18/07	Fri 3/28/08
13	Topping Out	0 days	Fri 7/27/07	Fri 7/27/07
21	Elevator Installation / Re-certification	191 days?	Tue 8/7/07	Tue 4/29/08
17	Penthouse Structure and Fitout	45 days?	Mon 8/13/07	Fri 10/12/07
19	Interior Fitout and Finishes LL- L6	324 days	Wed 10/24/07	Mon 1/19/09
24	C of O- Lower- Level 3	0 days	Fri 9/19/08	Fri 9/19/08
26	Commissioning and Punch List	20 days?	Tue 1/20/09	Mon 2/16/09
25	C of O- Level 4- 6	0 days	Mon 2/23/09	Mon 2/23/09
27	Substantial Completion	0 days	Mon 2/23/09	Mon 2/23/09



Project: Project Summary Schedule
Date: Wed 10/3/07

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

Page 1

Building Systems Summary

Yes	No	Work Scope	If yes, address these questions / issues
X		Demolition Required?	Types of materials, lead paint, or asbestos?
X		Structural Steel Frame	Type of bracing, composite slab?, crane size/ type / location(s)
X		Cast in Place Concrete	Horiz. And Vert. Formwork types, concrete placement methods
X		Precast Concrete	Casting location, connection methods, crane size / type / location(s)
X		Mechanical System	Mech. room locations, system type, types of distribution systems, types of fire suppression
X		Electrical System	Size / capacity, redundancy
X		Masonry	Load bearing or veneer, connection details, scaffolding
X		Curtain Wall	Materials included, construction methods, design responsibility
X		Support of Excavation	Type of excavation support system, dewatering system, permanent vs. temporary

Building Systems Summary

Demolition

Before construction could begin for the new Women’s Center and Inpatient Tower, part of the existing hospital needed to be removed. The demolition involved completely removing a portion of the existing building including the exterior structure. This small portion of demolition that occurred allowed the existing hospital structure to tie into the new patient tower structure. During this demolition, a variety of materials were removed. Some of these materials were of particular importance due to the possibility that they could contain asbestos. In the existing cafeteria, the VCT flooring needed to be removed. The adhesive used to hold down the tile flooring was tested for asbestos. It was determined that the adhesive contained asbestos so Whiting-Turner hired an abatement contractor to remove the contaminated materials. Also, in the existing utility plant, the insulation around the boiler flue needed be removed. The insulation was tested for asbestos, and it was determined that the insulation did not contain asbestos. Another issue that was of importance during the demolition process was a louver located on the exterior of the existing mechanical room. This louver was used to intake outside air. While the demolition was in progress, this louver needed to be blocked so that no dust or debris would enter into the mechanical room.

Structural Steel Frame

Structural steel framing is used as the support system for the area above the existing mechanical room. The steel truss system is located at the northeast corner of the new Women’s Center and Inpatient Tower. The steel framed truss above the existing mechanical room supports levels three through eight and the penthouse level. The types of bracing used for this truss system are ASTM A-992 wide-flange beams and columns. On level three, ASTM A-36 hollow structural sections are also used. Structural steel framing is also used on the two bridges that connect the new patient tower to the existing hospital. The structural system used for the bridges consists of ASTM A-992 wide-flange beams and a composite 3 ¼” concrete slab on metal decking. The crane used to place the structural steel truss is a 150 Ton Hydraulic Truck Crane. The crane manufacturer is Liebherr. Some of the other structural steel for the connection bridges was placed using a Flat Top Tower Crane with a boom length of 246 feet and a capacity of 17,460 lbs. The crane manufacturer for this crane is Terex-PPM.

Building Systems Summary

Cast in Place Concrete

The primary framing system for the new tower is cast-in-place concrete slabs with 6 ½" drop panels at each column. The concrete was placed using a combination of concrete pumps and crane and bucket. The majority of concrete was placed using two concrete pumps that run up through the building. Concrete pump trucks were also used to place concrete along the north edge of the building and the West Lobby Area. The crane and bucket method was seldom used to place concrete. The horizontal formwork used for the slabs, beams, and drop panels was the conventional metal systems. This system consists of aluminum shores supporting aluminum stringers and joists with plywood sheathing. The vertical formwork used for the columns and stairwells was ganged forms. This system consists of panels that are joined together and supported with steel frames. The system used is the Doka Frami and Framex vertical formwork.

Precast Concrete

Precast hollow-core concrete planks are used as the floor system for the area above the existing mechanical room. These precast planks were formed at Conewago Enterprises located in Hanover, PA. The precast concrete planks are placed on the structural steel truss. The planks have embedded plates with two headed studs, which allow them to connect to the structural steel. The plates are welded to the steel truss using a 1/4" thick, 4" long fillet weld. The crane used to place the planks is a Flat Top Tower Crane with a boom length of 246 feet and a capacity of 17,460 lbs.

Mechanical System

The mechanical system used for the patient tower consists of 3 central air handling units, two of which are located in the penthouse and one that is located on the roof level of the West Lobby. The two units located in the penthouse each have a capacity of 102,000CFM. The third unit, which is located on the roof level of the West Lobby, has a capacity of 45,000CFM. These air handling units serve the individual variable air volume (VAV) supply air terminal units that are located throughout the building. The VAV units, which have hot water heating coils, serve as the distribution system for the building. The penthouse also contains two cooling towers, each with a capacity of 500 Tons. These two cooling towers serve one centrifugal chiller with a capacity of 1000 Tons, which is also located in the penthouse. The primary sprinkler system used for the building is a wet pipe system. The system is used throughout the patient tower excluding the generator and electrical rooms located on the lower level. A pre-action sprinkler system with heat and ionization detectors is used for the generator and electrical rooms.

Building Systems Summary

Electrical System

The primary service distributed to the building is 13.2KV. The primary service runs to the main switchgear. The main switchgear then supplies secondary service to the rest of the building. The secondary service is 480Y/ 277V, 3 Phase, 4 Wire. Most of the electrical system for the building is located in the central plant electrical room on the lower level. Some of the equipment is also located in the penthouse electrical room. The central plant electrical room houses the main service switchgear (13.2KV) substation with two 3000KVA transformers. Also located in the central plant, are two 1500KW, 480Y/277V Diesel Engine-Generators. The penthouse electrical room houses another main service switchgear (13.2KV) substation with two 2000KVA transformers and also switchgear for the emergency generators. The lower level and levels one through six each have an electrical room, which houses three to four 480 to 208/120V transformers and a series of panel boards for each level.

Masonry

Masonry is used primarily on the north and west facades and extends from the lower level to level two. The masonry used for the building is a brick veneer system. The brick veneer was designed to match style and colors of Baltimore Washington Medical Center's Tate Cancer Center, which is located in front of the new patient tower. The veneer system consists of tan face brick with 3" rigid insulation either on a cast-in-place concrete wall or an 8" CMU block wall. The brick is tied to the concrete wall using dovetail anchors which are screwed into the concrete wall. The brick is tied into the CMU block wall using adjustable brick wire ties. Because the brick veneer was mostly located on the lower level and levels one through two, scaffolding was seldom needed. The scaffolding that was needed in some areas is steel framed scaffolding with wood planks.

Curtain Wall

A glass curtain wall system is used as the façade for the majority of the West Lobby Area and also for Stair Tower #2, which is located on the northwest corner of the Patient Tower. The glass curtain wall is an aluminum framed system with a combination of ¼" Spandrel Glass and 1" Low E Tinted Insulated Glass. It is the responsibility of the curtain wall manufacturer to ensure a high quality curtain wall design. The curtain wall manufacturer has a team of engineers that design the curtain wall system and detail the shop drawings for the system.

Support of Excavation

Before the excavation phase of the project could begin, the existing hospital needed to be secured and supported. Helical piers were used to support the existing structure. These piers were drilled diagonally against the existing structure and were secured using heavy duty footing brackets. The dewatering system used during the excavation phase of the project was a combination of sump pumps and dirt bags that pumped into an outfall located at the northwest corner of the construction site.

Project Cost Evaluation

Building Construction Cost:

- Cost: $66,455,588
- Cost/SF: $191.39
    - Note: Building Construction Cost does not include land costs, sitework, permitting, etc.
    - Note: Building Construction Cost does not include the upgrade of the existing utility plant.

Total Project Cost:

- Cost: $75,460,380
- Cost/SF: $219.71
    - Note: The sitework for this project is considered to be a separate contract, which includes the sitework for both the new Patient Tower and also for the Emergency Department Expansion; the majority of the sitework is not calculated in this total project cost.

Building Systems Cost:

- See Chart Below for Building Systems Costs

Building Systems	Cost	Cost / Square Feet
General Conditions	**$1,386,061**	**$4.47**
Structural System	**$1,2698,671**	**$106.73**
Concrete	$10,329,977	$33.62
Structural Steel	$2,368,694	$73.11
Masonry	**$1,154,148**	**$3.72**
Mechanical System	**$20,486,507**	**$57.62**
Patient Tower	$17,879,997	$57.62
Existing Utility Plant Upgrade	$2,606,510	$0
Electrical System	**$11,151,517**	**$21.56**
Patient Tower	$6,688,641	$21.56
Existing Utility Plant Upgrade	$4,462,876	$0

Project Cost Evaluation

Parametric Estimate using *D4Cost 2002*

***Please see Appendix A for the print out of the *D4Cost 2002* Estimate.

Within the D4Cost Project Database, there was only one project similar in size and cost. This project is the Baylor Regional Medical Center. Please see the information below for the Baylor Regional Medical Center. This project had similar square footage, cost, and number of stories. I used this project as a basis and modified the target date and location to match my project. I used the true averaging tool with the target date as the start of construction (July 2006), and the location as Maryland-Other.

Baylor Regional Medical Center

- $63,916,839
- 342,956SF
- 8 Stories

The D4Cost Estimate for the Baltimore Washington Medical Center- Women's Center and Inpatient Tower is: **$85,188,683**

Project Cost Evaluation

R.S. Means Square Foot Estimate

***Please see Appendix B for the R.S. Means Square Foot Cost 2007 reference and calculations for the estimate.

The square foot estimate was completed using the R.S. Means reference listed above. The reference used for the square foot estimate was listed under the Commercial/ Industrial/ Institutional Section. The type of building is a 4-8 Story Hospital with the model number M.340. The Exterior Wall was a combination of the Face Brick with Concrete Block Back-up (Reinforced Concrete Frame) and the Precast Concrete Panels with Exposed Aggregate (Steel Frame). Because the S.F. Area of the new patient tower fell between two values, the cost/ square foot was found by interpolating between the S.F. Area values 225,000 SF and 250,000 SF. The building perimeter was also found by interpolating between the L.F. Perimeter values 950 LF and 1033 LF. The Face Brick System makes up about 30% of the Exterior Wall System, and the Precast Concrete System makes up about 70% of the Exterior Wall System. The cost needed to be adjusted for the perimeter, and the basement cost was also added into estimate. To develop a more accurate cost estimate, some of the common additives such as cabinets, closed circuit TVs, nurse call stations, sound system speakers, and sterilizers were included within the estimate.

Square Foot Building Estimate for the BWMC Women's Center and Inpatient Tower

Building Area (SF): 239,088 SF (excluding basement area)

Building Perimeter (LF): 1200 LF

Cost / Square Foot:

- Face Brick with Concrete Block Back-up (Reinforced Concrete Frame): $231.99 / square foot
- Precast Concrete Panels with Exposed Aggregate (Steel Frame): $224.07 / square foot

Base Cost / Square Foot:

- Face Brick: 30% of $231.99 / square foot
- Precast Concrete Panels: 70% of $224.07 / square foot
- Total Base Cost / Square Foot: $ 226.45 / square foot

Project Cost Evaluation

Cost Adjustment Type:

- Actual Perimeter: 1200 LF
- Interpolated Perimeter: 995 LF
- Adjusted Cost / Square Foot: + $2.05 / square foot
- Adjusted Base Cost / Square Foot: $228.50 / square foot

Building Cost:

- Base Building Cost: $54,631,608
- Basement Cost: $925,230
- Total Cost: $55,556,838

Additions:

- Nurse Call Station (Single Bedside): $42,624
- Nurse Call Station (Emergency Call Station): $49,350
- Nurse Call Station (Duty Station): $9,000
- Nurse Call Station (Master Control Station): $16,650
- Sound System (Speakers): $49,590
- Sterilizers (Single Door, Steam): $161,500
- Closed Circuit TV (station camera and monitor): $61,975
- Cabinets (Base, Door Units): $76,752
- Cabinets (Base, Drawer Units): $50,600
- Cabinets (Wall, Doors): $186,050
- Cabinets (Tall, Storage): $8,100
- Total Cost of Additions: $712,196

Total Cost with Additions: $56,269,029

Multiplier Type:

- Location Multiplier (Baltimore, MD-Commercial): .93

Total Square Foot Estimate for Building: $52,330,200

Project Cost Evaluation

Actual Estimate vs. Calculated Estimates (RS Means and D4Cost)

Actual Building Cost	**$66,455,588**
RS Means 2007	$52,330,200
D4Cost 2002	$85,188,683

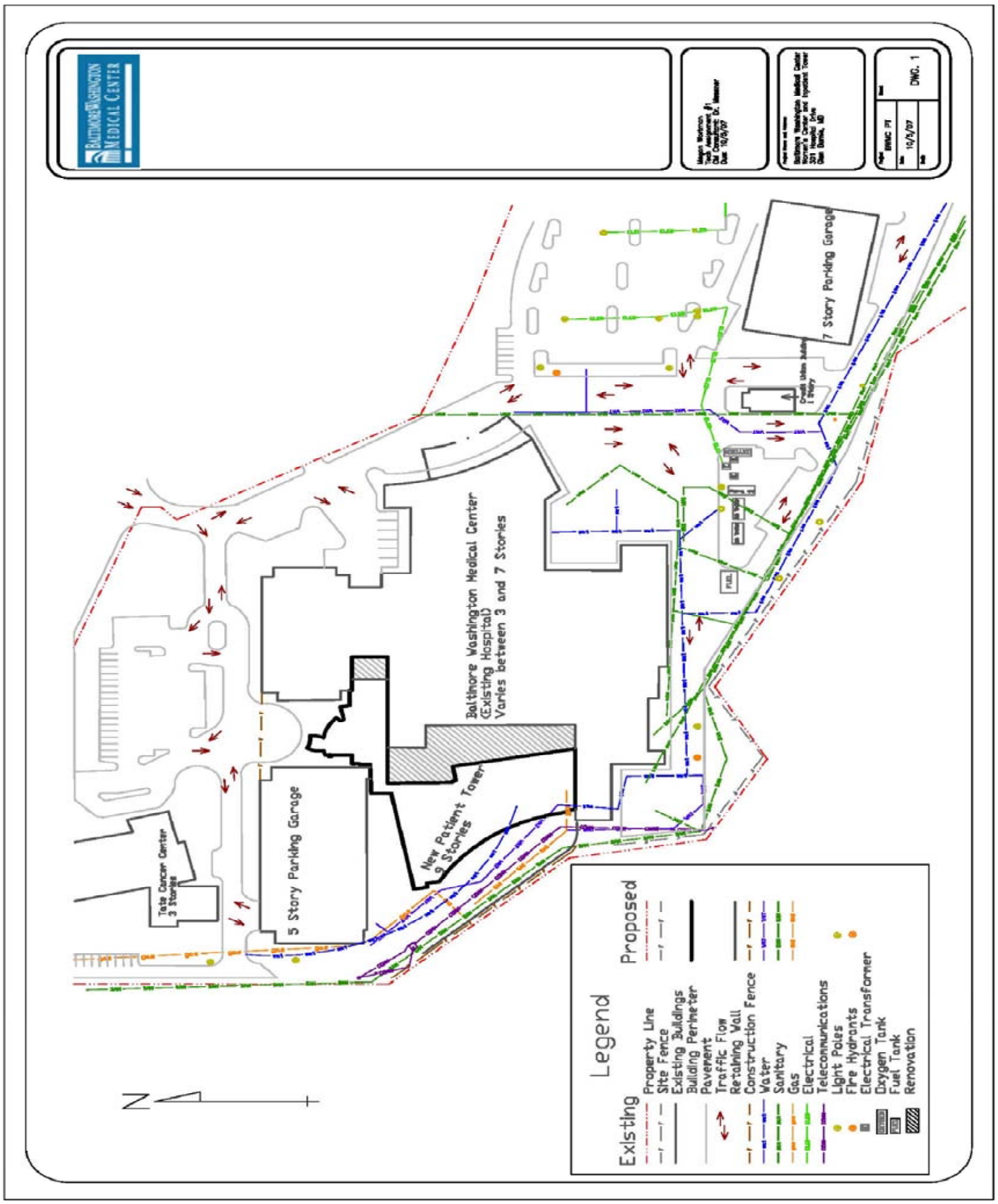
When comparing the calculated estimates to the actual project costs, there was a significant difference between the three costs. The actual building cost is around the average of the two calculated estimates. The D4Cost2002 program provided the highest estimate while the RS Means reference provided the lowest estimate.

The D4Cost estimate was based on one reference project that was somewhat close to the size and cost of the BWMC Women's Center and Inpatient Tower. Many of the projects in the D4Cost database were very different than the patient tower, which made it was difficult to average a number of projects; therefore, only one project was used to average the new patient tower. Many of the costs in the D4Cost estimate were significantly higher than the actual costs. Some of these costs included the General Requirements, Sitework, Finishes, and Equipment. For the Women's Center and Inpatient Tower project, the sitework is considered to be a separate contract from the rest of the project. A separate contract was created for t he sitework because the sitework takes into account the entire site of the hospital and not just the new patient tower. The cost for the entire sitework is approximately $3,400,000. By adding this value to the patient tower cost, the sitework in the D4Cost is somewhat comparable to the actual sitework cost. As stated above, the D4Cost estimate for the finishes was also very high when compared to the actual cost. The reason for this difference in finishing costs is partially due to the fact that the seventh and eighth floors of the new patient tower are considered to be shell and core floors; therefore, there are no finishes located on these floors. If the finishes for these levels could be deducted from the D4Cost estimate, the two finishing costs would be comparable. Even though many of the costs were higher in the D4Cost estimate, the D4Cost estimate was accurate in estimating the major mechanical and electrical systems for the building.

Project Cost Evaluation

Although the RS Means estimate was lower than the actual cost, it was somewhat closer compared to the D4Cost estimate. The RS Means estimate is lower than the actual cost for several reasons. One main reason for the difference is that the exterior wall systems for the model used in RS Means did not accurately match the actual exterior wall system for the patient tower. The RS Means reference did not include a glass curtainwall system as part of the exterior wall systems, which was used for a small portion of the building façade. The glass curtainwall façade is located along the north face of the West Lobby Area. Although the glass curtainwall is only a small percentage of the entire building façade, it has a cost impact to the project. The actual building cost also takes into account the upgrade of the existing utility plant. This upgrade was required in order to be able to serve the new patient tower. This utility plant is not located in the new building footprint and was therefore not included in the RS Means estimate.

Site Plan of Existing Conditions



Local Conditions

The Baltimore Washington Medical Center is located just south of Baltimore in Glen Burnie, Maryland. The Baltimore Washington Medical Center site consists of an existing hospital, formerly known as the North Arundel Hospital. It also includes the Tate Cancer Center, two parking garages, and a few parking lots. The new Patient Tower, which sits on top of what was an existing parking lot, is located adjacent to the existing six-story hospital and directly behind the main parking garage. The subsurface soils on-site are considered to be Coastal Plain Deposits also known as the Potomac Group. This profile consists of layered loamy sands and silts. This soil is considered to be unsuitable for infiltration of storm water management.

On the site, there are currently two new additions to the existing hospital. Along with the addition of the patient tower, the emergency department is also currently under construction. With the large amount of construction currently going on, there is a demand for worker's parking on-site. To accommodate for this demand, the hospital has allocated a section of the back parking garage for construction workers parking. The parking allotted for the workers is sufficient at this time; however, as more trades begin to start up on site, there will need to be more parking available for these extra workers to park. Due to the large volume of construction, there are also a lot of waste products that accumulate on site; therefore, a number of dumpsters have been placed around the entire Baltimore Washington Medical Center site. The tipping fee for the waste is currently $350/ dumpster. This fee accounts for a certain weight, and for anything that is overweight, there is an additional fee.

Client Information

The Baltimore Washington Medical Center (BWMC) - Women's Center and Inpatient Tower is owned by the University of Maryland Medical System (UMMS). UMMS recently purchased the existing hospital structure and changed the name from North Arundel Hospital to Baltimore Washington Medical Center. The hospital still remains under the same management; however, the hospital is now corporately owned. The construction for this project is being managed by an owner's representative.

The addition of the Women's Center and Inpatient Tower is being built to provide a more extensive care center for the surrounding community. The new tower will offer a variety of new services such as a women's healthcare center, intensive care centers, and surgical patient rooms. The growth of the Baltimore Washington Medical Center will allow the hospital to reach many of the surrounding areas between Baltimore and Annapolis.

The keys to completing the project to the owner's satisfaction include a high quality project that is on budget and on schedule. The owner holds each of these elements to a very high standard. From the beginning of the project, the owner has held a very stringent budget. In fact, the construction manager who performed the preconstruction services for the project was not awarded the construction phase of the project because they could not lower the budget to the owner's satisfaction. Whiting-Turner was able to present a budget that the owner was satisfied with, and therefore was awarded the construction phase of the project. To ensure that the quality of work is above standards, Whiting-Turner has an incentive program for completing quality control reports. Each employee is required to complete three quality control reports and two safety checklists each week. These quality control items vary each week depending on the activities occurring in the field. For each additional quality control report submitted, the employee receives a chance to win a gift that is awarded at the end of each quarter. The owner is always concerned with the schedule of the project. Owner meetings are held every other Tuesday to discuss whether or not the project is on schedule. For these meetings, the superintendents review the two-week look-ahead schedule to keep the owner up to date with the track of the project. Throughout the project, Whiting-Turner has managed to keep the project on schedule. Safety is always an important issue for the both the owner and Whiting-Turner. In fact, safety is one of Whiting-Turner's biggest priorities. For this project, Whiting-Turner joined in a partnership with MOSH (Maryland Occupational Safety and Health) to ensure a safe environment for all employees on-site.

Client Information

Because the new Patient Tower will tie into the existing hospital, there are a number of sequencing issues that are of interest to the owner. Whiting-Turner's scope of work includes both new construction and also renovation of the existing hospital. The areas to be renovated exist on the lower level and level three of the existing hospital. In order to renovate these areas, there must be a space within the new Patient Tower where employees can relocate. In order to provide spaces during the renovation, the patient tower has been split into two phases. The first phase consists of the lower level through level three; therefore, the sequencing of the project is concentrated mostly on these levels. Once this phase is completed and turned over, the renovation can begin in the existing hospital. Before the first phase can be turned over for occupancy, all life safety measures will need to be in place for the entire tower. These safety items include the elevators, fire alarm systems, and sprinkler systems.

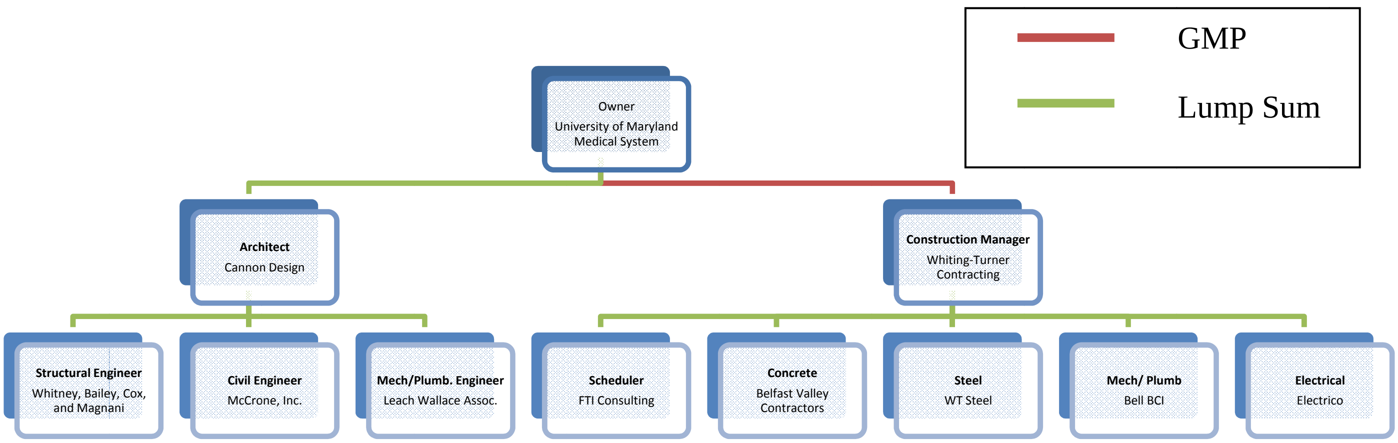
Project Delivery System

The Baltimore Washington Medical Center: Women's Center and Inpatient Tower is being delivered as a Construction Manager at Risk with a Guaranteed Maximum Price contract with the owner. Whiting-Turner was awarded the contract for the construction phase of this project based on the previous relationship held between the owner, University of Maryland Medical System, and Whiting-Turner. The contract for the preconstruction services was awarded to another construction manager at the beginning of the design phase for this project. Even though the contract was only for the preconstruction services, it was understood that if this construction manager could give the owner a reasonable budget at the end of the design, they would be awarded the construction phase of the project. However, at the end of the design, the previous construction manager was unable to lower their budget to the owner's satisfaction, and was not awarded the contract for the construction phase of the project. At this point, the owner turned to Whiting-Turner to complete the construction phase. In the past, Whiting-Turner had completed projects for this owner and was able to maintain a good relationship with them. Whiting-Turner was able to negotiate with the owner to lower the cost of the project, and was therefore given the contract. When the Construction Documents were 50% complete, the project was turned over to Whiting-Turner.

The process for selecting subcontractors for the project varied depending on the scopes of work for these trades. For many of the larger scopes of work such as MEP, concrete, and steel, Whiting-Turner negotiated with large, well-known subcontractors early on in the project. For some of the smaller scopes of work, the work was competitively bid. During this process, Whiting-Turner reviewed many of the lowest bids. To ensure that the lowest bid was actually the best bid, Whiting-Turner held meetings with the subcontractors to discuss the scopes of work and also to get familiar with each of the subcontractors. With this process, Whiting-Turner was able to select the best bid, which was not necessarily the lowest bid. The contract held between Whiting-Turner and each of the subcontractors is a Lump Sum Contract. For this project, the owner does not require Whiting-Turner to purchase any bonds. For subcontractors, Whiting-Turner does not require any bid bonds; however, any subcontractor performing over $100,000 of work is required to have payment and performance bonds.

Project Delivery System

Baltimore Washington Medical Center
Women's Center and Inpatient Tower
Organization Chart



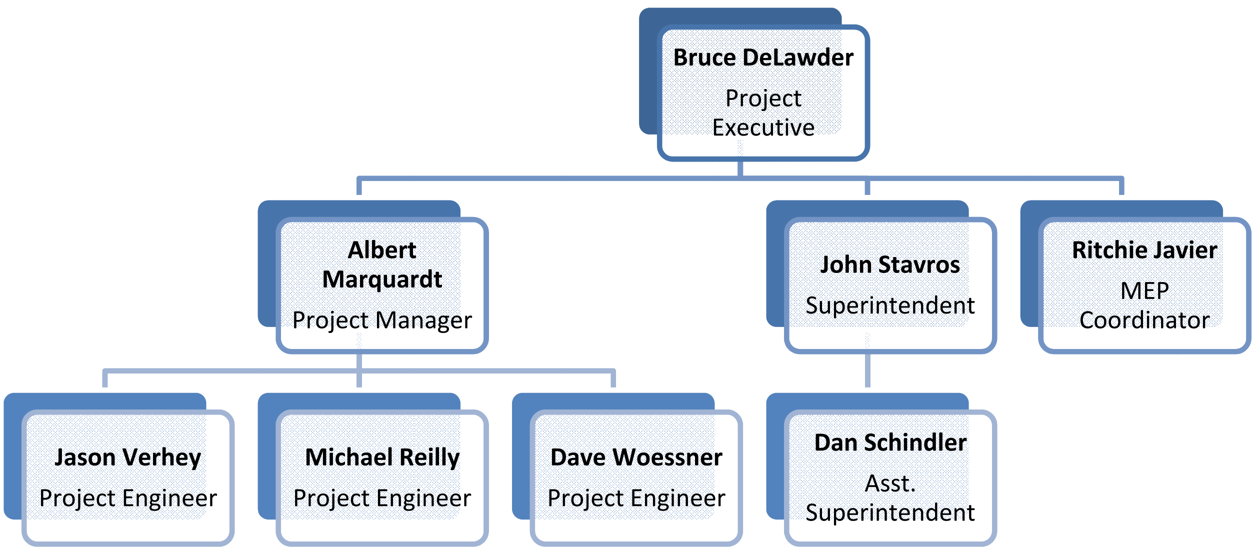
Staffing Plan

At the beginning of the project, Whiting-Turner had a rather large project team consisting of a project executive, a project manager, an assistant project manager, a superintendent, an assistant superintendent, a MEP coordinator, a MEP engineer, and four project engineers.

Bruce DeLawder is the Project Executive for the project. He oversees all of the operations for the project. Due to the young staff and the complexity of the project, Bruce spends the majority of his time in his trailer office located on-site. Albert Marquardt, who was originally the Assistant Project Manager, was recently promoted to Project Manager where he replaced the resigned project manager. Because Albert is new to the project management role, Bruce assists him with many of the management tasks. As the Project Manager, Albert is responsible for managing the project costs and owner invoices. He also tracks overall processes for RFI's, purchase orders, submittals, etc. Along with these tasks, Albert is responsible for a few of the subcontractors where he manages the submittal processes and RFI's for these trades. Below Albert, there are three project engineers: Jason Verhey, Michael Reilly, and Dave Woessner. These project engineers are responsible for a majority of the subcontractors. Each project engineer manages the submittal processes, RFI's, and supplements for their corresponding trades. Ritchie Javier is the MEP Coordinator. He oversees all of the MEP work for the project, and is also responsible for the MEP subcontractors where he manages the submittal process and RFI's for these trades. John Stavros is the Superintendent for this project. Below John, is the Assistant Superintendent, Dan Schindler. John and Dan oversee all work that takes place in the field.

Staffing Plan

Whiting-Turner's Staffing Plan



Appendix A

D4Cost 2002 Estimate

unday, September 23, 2007 Page

Estimate of Probable Cost

BWMC- Women's Center - Jul 2006 - MD - Other

Prepared By:

,
Fax:

Building Sq. Size: 310290
Bid Date:
No. of floors: 8
No. of buildings: 1
Project Height:
1st Floor Height: 12
1st Floor Size:

Prepared For:

,
Fax:

Site Sq. Size: 1280664
Building use: Medical
Foundation: CON
Exterior Walls: EIF
Interior Walls: GYP
Roof Type: EPD
Floor Type: CON
Project Type: NEW/ADD

Division		Percent	Sq. Cost	Amount
00	**Bidding Requirements**	**0.00**	**0.00**	**0**
	Bidding Requirements	0.00	0.00	0
01	**General Requirements**	**8.71**	**23.91**	**7,417,505**
	General Requirements	8.71	23.91	7,417,505
02	**Site Work**	**6.36**	**17.46**	**5,418,320**
	Site Work	6.36	17.46	5,418,320
03	**Concrete**	**18.37**	**50.42**	**15,645,468**
	Concrete	18.37	50.42	15,645,468
04	**Masonry**	**2.04**	**5.60**	**1,737,383**
	Masonry	2.04	5.60	1,737,383
05	**Metals**	**3.38**	**9.28**	**2,879,831**
	Metals	3.38	9.28	2,879,831
06	**Wood & Plastics**	**3.20**	**8.78**	**2,724,650**
	Wood & Plastics	3.20	8.78	2,724,650
07	**Thermal & Moisture Protection**	**3.35**	**9.20**	**2,855,210**
	Thermal & Moisture Protection	3.35	9.20	2,855,210
08	**Doors & Windows**	**5.60**	**15.37**	**4,768,326**
	Doors & Windows	5.60	15.37	4,768,326
09	**Finishes**	**9.44**	**25.91**	**8,039,216**
	Finishes	9.44	25.91	8,039,216
10	**Specialties**	**1.60**	**4.38**	**1,358,838**
	Specialties	1.60	4.38	1,358,838
11	**Equipment**	**0.84**	**2.31**	**716,992**
	Equipment	0.84	2.31	716,992
12	**Furnishings**	**0.34**	**0.93**	**288,512**
	Furnishings	0.34	0.93	288,512
13	**Special Construction**	**0.20**	**0.55**	**171,610**
	Special Construction	0.20	0.55	171,610
14	**Conveying Systems**	**2.08**	**5.72**	**1,774,661**
	Conveying Systems	2.08	5.72	1,774,661
15	**Mechanical**	**21.95**	**60.27**	**18,701,035**
	Mechanical	21.95	60.27	18,701,035
16	**Electrical**	**12.55**	**34.46**	**10,691,128**
	Electrical	12.55	34.46	10,691,128
Total Building Costs		**100.00**	**274.55**	**85,188,683**

Appendix A

D4Cost 2002 Estimate

Sunday, September 23, 2007 Page 2

Total Non-Building Costs	100.00	0.00	0
Total Project Costs	--	--	85,188,683

Appendix A

D4Cost 2002 Estimate

Sunday, September 23, 2007 — Page 3

Estimate of Probable Cost

Building Division Notes

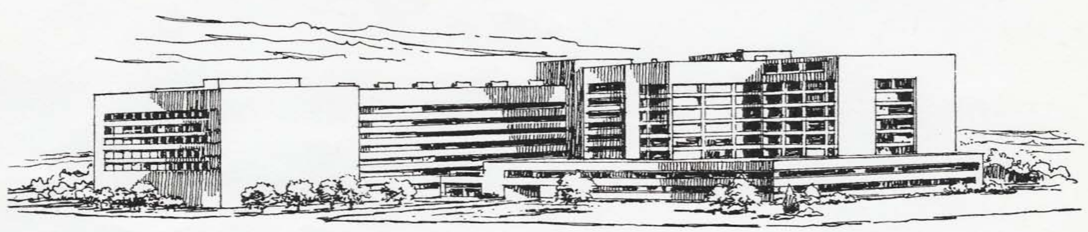
BWMC- Women's Center - Jul 2006 - MD - Other

Bidding Requirements	Averaged subdivision. Used in 1 of 1
General Requirements	Averaged subdivision. Used in 1 of 1
Site Work	Averaged subdivision. Used in 1 of 1
Concrete	Averaged subdivision. Used in 1 of 1
Masonry	Averaged subdivision. Used in 1 of 1
Metals	Averaged subdivision. Used in 1 of 1
Wood & Plastics	Averaged subdivision. Used in 1 of 1
Thermal & Moisture Protection	Averaged subdivision. Used in 1 of 1
Doors & Windows	Averaged subdivision. Used in 1 of 1
Finishes	Averaged subdivision. Used in 1 of 1
Specialties	Averaged subdivision. Used in 1 of 1
Equipment	Averaged subdivision. Used in 1 of 1
Furnishings	Averaged subdivision. Used in 1 of 1
Special Construction	Averaged subdivision. Used in 1 of 1
Conveying Systems	Averaged subdivision. Used in 1 of 1
Mechanical	Averaged subdivision. Used in 1 of 1
Electrical	Averaged subdivision. Used in 1 of 1

Appendix B

R.S. Means Square Foot Estimate

COMMERCIAL/INDUSTRIAL/ INSTITUTIONAL | **M.340** | **Hospital, 4-8 Story**



Costs per square foot of floor area

Exterior Wall	S.F. Area	100000	125000	150000	175000	200000	225000	250000	275000	300000
	L.F. Perimeter	594	705	816	783	866	950	1033	1116	1200
Face Brick with Structural Facing Tile	Steel Frame	246.65	240.70	236.65	230.60	228.30	226.50	225.10	223.90	223.00
	R/Conc. Frame	255.75	249.75	245.65	239.55	237.25	235.35	234.00	232.80	231.80
Face Brick with Concrete Block Back-up	Steel Frame	241.15	235.30	231.30	225.80	223.55	221.85	220.45	219.35	218.40
	R/Conc. Frame	252.00	246.15	242.15	236.70	234.45	232.75	231.35	230.20	229.35
Precast Concrete Panels With Exposed Aggregate	Steel Frame	244.55	238.65	234.65	228.85	226.55	224.80	223.45	222.25	221.30
	R/Conc. Frame	253.75	247.80	243.80	238.00	235.75	233.95	232.55	231.40	230.50
Perimeter Adj., Add or Deduct	Per 100 L.F.	3.95	3.10	2.65	2.25	1.95	1.75	1.60	1.45	1.25
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.75	1.65	1.55	1.25	1.25	1.25	1.20	1.20	1.15

For Basement, add $29.80 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 $144.60 to $352.60 per S.F.

Common additives

Description	Unit	$ Cost
Cabinets, Base, door units, metal	L.F.	234
Drawer units	L.F.	460
Tall storage cabinets, 7' high, open	L.F.	435
With doors	L.F.	540
Wall, metal 12-1/2" deep, open	L.F.	171
With doors	L.F.	305
Closed Circuit TV (Patient monitoring)		
One station camera & monitor	Each	1675
For additional camera add	Each	910
For automatic iris for low light add	Each	2325
Hubbard Tank, with accessories		
Stainless steel, 125 GPM 45 psi	Each	26,800
For electric hoist, add	Each	2925
Mortuary Refrigerator, End operated		
2 capacity	Each	12,500
6 capacity	Each	22,500

Description	Unit	$ Cost
Nurses Call Station		
Single bedside call station	Each	288
Ceiling speaker station	Each	130
Emergency call station	Each	175
Pillow speaker	Each	270
Double bedside call station	Each	340
Duty station	Each	300
Standard call button	Each	154
Master control station for 20 stations	Each	5550
Sound System		
Amplifier, 250 watts	Each	2125
Speaker, ceiling or wall	Each	174
Trumpet	Each	335
Station, Dietary with ice	Each	16,300
Sterilizers		
Single door, steam	Each	161,500
Double door, steam	Each	207,500
Portable, counter top, steam	Each	3875 - 6050
Gas	Each	40,000
Automatic washer/sterilizer	Each	55,500

Important: See the Reference Section for Location Factors

Appendix B

R.S. Means Square Foot Estimate

Model costs calculated for a 6 story building with 12′ story height and 200,000 square feet of floor area

Hospital, 4-8 Story

			Unit	Unit Cost	Cost Per S.F.	% Of Sub-Total
A. SUBSTRUCTURE						
1010	Standard Foundations	Poured concrete; strip and spread footings	S.F. Ground	13.14	2.19	2.2%
1030	Slab on Grade	4″ reinforced concrete with vapor barrier and granular base	S.F. Slab	6.76	1.12	
2010	Basement Excavation	Site preparation for slab and trench for foundation wall and footing	S.F. Ground	.14	.02	
2020	Basement Walls	4′ foundation wall	L.F. Wall	69	.29	
B. SHELL						
	B10 Superstructure					
1010	Floor Construction	Concrete slab with metal deck and beams, steel columns	S.F. Floor	18.12	15.10	9.8%
1020	Roof Construction	Metal deck, open web steel joists, beams, interior columns	S.F. Roof	7.50	1.25	
	B20 Exterior Enclosure					
2010	Exterior Walls	Face brick and structural facing tile *70% of wall*	S.F. Wall	36	7.86	7.0%
2020	Exterior Windows	Aluminum sliding *30% of wall*	Each	503	3.14	
2030	Exterior Doors	Double aluminum and glass and sliding doors	Each	4703	.66	
	B30 Roofing					
3010	Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation	S.F. Roof	6.66	1.11	0.7%
3020	Roof Openings	Roof hatches	S.F. Roof	.18	.03	
C. INTERIORS						
1010	Partitions	Gypsum board on metal studs with sound deadening board *9 S.F. Floor/L.F. Partition*	S.F. Partition	6.62	7.35	24.5%
1020	Interior Doors	Single leaf hollow metal *90 S.F. Floor/Door*	Each	840	9.34	
1030	Fittings	Hospital curtains	S.F. Floor	.88	.88	
2010	Stair Construction	Concrete filled metal pan	Flight	9250	1.20	
3010	Wall Finishes	40% vinyl wall covering, 35% ceramic tile, 25% epoxy coating	S.F. Surface	3.07	6.82	
3020	Floor Finishes	60% vinyl tile, 20% ceramic, 20% terrazzo	S.F. Floor	9.70	9.70	
3030	Ceiling Finishes	Plaster on suspended metal lath	S.F. Ceiling	5.70	5.70	
D. SERVICES						
	D10 Conveying					
1010	Elevators & Lifts	Six geared hospital elevators	Each	182,000	5.46	3.3%
1020	Escalators & Moving Walks	N/A	—	—	—	
	D20 Plumbing					
2010	Plumbing Fixtures	Kitchen, toilet and service fixtures, supply and drainage *1 Fixture/416S.F. Floor*	Each	2504	6.02	6.5%
2020	Domestic Water Distribution	Electric water heater	S.F. Floor	4.40	4.40	
2040	Rain Water Drainage	Roof drains	S.F. Floor	2.94	.49	
	D30 HVAC					
3010	Energy Supply	Oil fired hot water, wall fin radiation	S.F. Floor	3.51	3.51	19.0%
3020	Heat Generating Systems	Hot water boilers, steam boiler for services	Each	27,375	.34	
3030	Cooling Generating Systems	Chilled water units	S.F. Floor	2.40	2.40	
3050	Terminal & Package Units	N/A	—	—	—	
3090	Other HVAC Sys. & Equipment	Conditioned air with reheat, operating room air curtains	S.F. Floor	25	25.55	
	D40 Fire Protection					
4010	Sprinklers	Wet pipe sprinkler system	S.F. Floor	2.01	2.01	1.5%
4020	Standpipes	Standpipe	S.F. Floor	.44	.44	
	D50 Electrical					
5010	Electrical Service/Distribution	4000 ampere service, panel board and feeders	S.F. Floor	3.80	3.80	15.8%
5020	Lighting & Branch Wiring	Hospital grade light fixtures, receptacles, switches, A.C. and misc. power	S.F. Floor	16.90	16.90	
5030	Communications & Security	Alarm systems, internet wiring, communications system, emergency lighting	S.F. Floor	1.74	1.74	
5090	Other Electrical Systems	Emergency generator, 800 kW with fuel tank, uninterruptible power supply	S.F. Floor	4.00	4.00	
E. EQUIPMENT & FURNISHINGS						
1010	Commercial Equipment	N/A	—	—	—	10.0%
1020	Institutional Equipment	Medical gases, curtain partitions	S.F. Floor	13.08	13.08	
1030	Vehicular Equipment	N/A	—	—	—	
2020	Other Equipment	Patient wall systems	S.F. Floor	3.65	3.65	
F. SPECIAL CONSTRUCTION						
1020	Integrated Construction	N/A	—	—	—	0.0%
1040	Special Facilities	N/A	—	—	—	
G. BUILDING SITEWORK		**N/A**				
				Sub-Total	167.55	**100%**
	CONTRACTOR FEES (General Requirements: 10%, Overhead: 5%, Profit: 10%)			25%	41.90	
	ARCHITECT FEES			9%	18.85	
				Total Building Cost	**228.30**	

Appendix B

R.S. Means Square Foot Estimate

Location Factors

STATE/ZIP	CITY	Residential	Commercial
IDAHO			
832	Pocatello	.86	.90
833	Twin Falls	.74	.82
834	Idaho Falls	.75	.84
835	Lewiston	.96	.97
836-837	Boise	.87	.90
838	Coeur d'Alene	.94	.96
ILLINOIS			
600-603	North Suburban	1.10	1.08
604	Joliet	1.10	1.06
605	South Suburban	1.10	1.08
606-608	Chicago	1.16	1.13
609	Kankakee	1.00	1.01
610-611	Rockford	1.04	1.03
612	Rock Island	.96	.96
613	La Salle	1.02	.98
614	Galesburg	.99	.98
615-616	Peoria	.98	.98
617	Bloomington	.98	.99
618-619	Champaign	.99	1.00
620-622	East St. Louis	1.00	.99
623	Quincy	.98	.96
624	Effingham	.96	.95
625	Decatur	.97	.97
626-627	Springfield	.97	.97
628	Centralia	1.00	.97
629	Carbondale	.95	.94
INDIANA			
460	Anderson	.91	.89
461-462	Indianapolis	.95	.94
463-464	Gary	1.01	.98
465-466	South Bend	.91	.90
467-468	Fort Wayne	.91	.89
469	Kokomo	.92	.88
470	Lawrenceburg	.87	.87
471	New Albany	.86	.85
472	Columbus	.92	.89
473	Muncie	.91	.90
474	Bloomington	.94	.91
475	Washington	.91	.90
476-477	Evansville	.90	.92
478	Terre Haute	.90	.91
479	Lafayette	.91	.89
IOWA			
500-503,509	Des Moines	.91	.91
504	Mason City	.77	.82
505	Fort Dodge	.76	.81
506-507	Waterloo	.79	.82
508	Creston	.81	.83
510-511	Sioux City	.87	.87
512	Sibley	.73	.77
513	Spencer	.74	.77
514	Carroll	.74	.78
515	Council Bluffs	.81	.89
516	Shenandoah	.75	.77
520	Dubuque	.86	.90
521	Decorah	.76	.77
522-524	Cedar Rapids	.94	.93
525	Ottumwa	.84	.86
526	Burlington	.87	.87
527-528	Davenport	.97	.96
KANSAS			
660-662	Kansas City	.99	.98
664-666	Topeka	.80	.86
667	Fort Scott	.85	.86
668	Emporia	.72	.80
669	Belleville	.78	.83
670-672	Wichita	.80	.85
673	Independence	.85	.85
674	Salina	.76	.83
675	Hutchinson	.77	.79
676	Hays	.82	.84
677	Colby	.83	.84
678	Dodge City	.82	.86
679	Liberal	.79	.82
KENTUCKY			
400-402	Louisville	.92	.91
403-405	Lexington	.89	.89
406	Frankfort	.89	.91
407-409	Corbin	.78	.83
410	Covington	1.00	.99
411-412	Ashland	.98	.97
413-414	Campton	.79	.84
415-416	Pikeville	.86	.91
417-418	Hazard	.73	.79
420	Paducah	.90	.91
421-422	Bowling Green	.90	.91
423	Owensboro	.89	.91
424	Henderson	.91	.91
425-426	Somerset	.78	.84
427	Elizabethtown	.87	.89
LOUISIANA			
700-701	New Orleans	.86	.87
703	Thibodaux	.84	.85
704	Hammond	.79	.81
705	Lafayette	.82	.82
706	Lake Charles	.83	.83
707-708	Baton Rouge	.82	.82
710-711	Shreveport	.79	.80
712	Monroe	.74	.79
713-714	Alexandria	.74	.80
MAINE			
039	Kittery	.79	.84
040-041	Portland	.90	.90
042	Lewiston	.89	.89
043	Augusta	.82	.85
044	Bangor	.88	.88
045	Bath	.80	.85
046	Machias	.81	.84
047	Houlton	.85	.86
048	Rockland	.81	.84
049	Waterville	.80	.85
MARYLAND			
206	Waldorf	.85	.88
207-208	College Park	.87	.92
209	Silver Spring	.86	.90
210-212	Baltimore	.90	.93
214	Annapolis	.85	.90
215	Cumberland	.86	.89
216	Easton	.68	.74
217	Hagerstown	.86	.89
218	Salisbury	.75	.78
219	Elkton	.81	.82
MASSACHUSETTS			
010-011	Springfield	1.04	1.01
012	Pittsfield	1.01	1.00
013	Greenfield	1.00	.99
014	Fitchburg	1.12	1.06
015-016	Worcester	1.14	1.08
017	Framingham	1.12	1.08
018	Lowell	1.13	1.09
019	Lawrence	1.13	1.09
020-022, 024	Boston	1.19	1.15
023	Brockton	1.12	1.09
025	Buzzards Bay	1.10	1.05
026	Hyannis	1.09	1.07
027	New Bedford	1.12	1.08
MICHIGAN			
480,483	Royal Oak	1.03	1.00
481	Ann Arbor	1.05	1.02
482	Detroit	1.07	1.05
484-485	Flint	.97	.97
486	Saginaw	.94	.95
487	Bay City	.95	.95
488-489	Lansing	.97	.96
490	Battle Creek	.93	.93
491	Kalamazoo	.92	.93
492	Jackson	.95	.95
493,495	Grand Rapids	.82	.83
494	Muskegon	.89	.90
496	Traverse City	.80	.84
497	Gaylord	.83	.86
498-499	Iron Mountain	.90	.92
MINNESOTA			
550-551	Saint Paul	1.13	1.10
553-555	Minneapolis	1.17	1.12
556-558	Duluth	1.09	1.05
559	Rochester	1.05	1.03
560	Mankato	1.03	1.01
561	Windom	.83	.89
562	Willmar	.85	.91
563	St. Cloud	1.07	1.07
564	Brainerd	.98	1.00

454

Appendix B

R.S. Means Square Foot Estimate

<u>Building Area (SF):</u> 239,088 SF (excluding basement area)

<u>Building Perimeter (LF):</u> 1200 LF

<u>Cost / Square Foot:</u>

- Face Brick with Concrete Block Back-up (Reinforced Concrete Frame)

  Interpolate between SF Area 225,000SF and 250,000SF

SF Area	Cost/SF
225,000SF	$232.75
239,088SF	$231.99
250,000 SF	$231.55

- Precast Concrete Panels with Exposed Aggregate (Steel Frame)

  Interpolate between SF Area 225,000SF and 250,000SF

SF Area	Cost/SF
225,000SF	$224.80
239,088SF	$224.07
250,000 SF	$223.45

<u>Base Cost / Square Foot:</u>

- Face Brick: 30% of $231.99 / square foot
- Precast Concrete Panels: 70% of $224.07 / square foot
- Total Base Cost / Square Foot: (.30)($231.99) + (.70)($224.07)= $226.45

<u>Cost Adjustment Type:</u>

- Actual Perimeter: 1200 LF
- Interpolated Perimeter

SF Area	LF Perimeter
225,000SF	950LF
239,088SF	995LF
250,000 SF	1033LF

- Adjusted Perimeter: 1200LF-995LF= 205LF / 100LF= +$2.05 / SF
- Adjusted Base Cost / Square Foot: $226.45 + $2.05= $228.50 / square foot

Appendix B

R.S. Means Square Foot Estimate

Building Cost:

- Base Building Cost: $228.50 /SF x 239,088SF= $54,631,608
- Basement Cost: $29.80 /SF x 31,048SF= $925,230
- Total Cost: $54,631,608 + $925,230= $55,556,838

Additions:

- Nurse Call Station (Single Bedside): ($288/ each) x (148 stations)= $42,624
- Nurse Call Station (Emergency Call Station): ($175/ each) x (282 stations)= $49,350
- Nurse Call Station (Duty Station): ($300/ each) x (30 stations)=$9,000
- Nurse Call Station (Master Control Station): ($5500/ each) x (3 stations)=$16,650
- Sound System (Speakers): ($174/ each) x (285 speakers)=$49,590
- Sterilizers (Single Door, Steam): ($161,500/ each) x (1 sterilizer)=$161,500
- Closed Circuit TV (station camera and monitor): ($1675/ each) x (37 monitors)=$61,975
- Cabinets (Base, Door Units): ($234/ LF) x (328 LF)=$76,752
- Cabinets (Base, Drawer Units): ($460/ LF) x (110 LF)=$50,600
- Cabinets (Wall, Doors): ($305/ LF) x (610 LF)=$186,050
- Cabinets (Tall, Storage): ($540/ LF) x (15 LF)=$8,100
- Total Cost of Additions: $712,196

Total Cost with Additions: $55,556,838 + $712,196= $56,269,029

Multiplier Type:

- Location Multiplier (Baltimore, MD-Commercial): (.93) x ($56,269,029)= $52,330,200

Total Square Foot Estimate for Building: $52,330,200