

4.0 Project Schedule, Sequencing, and Budget Information

4.1 Detailed Project Schedule

The Washington County Regional Medical Center schedule, refer to Appendix C, is a detailed schedule that encompasses a wide, in depth range of tasks. The schedule includes many features comprising all the critical phases of construction progress such as the substructure, superstructure, MEP, and the detailed finishes required for hospital construction. The design process is also included with the schedule. As the schedule shows, a noticeable gap between the completion of the design and the release of the construction documents exists. This gap is attributed to the many phases of litigation the medical center project went through. The legal action was related to the location and zoning of the new hospital. It was a case being pursued by only a few members of the surrounding community. A Maryland Supreme Court judge eventually ruled in favor of the medical center allowing the work to begin in March of 2008. The medical center is scheduled for substantial completion in December of 2010.

4.1.1 Foundation Schedule Impacts

The medical center consists of three, five story bed towers. Supporting these bed towers are an array of one hundred fifty deep foundation caissons. These caissons are a crucial component of the sequencing because the bed towers lead each building construction sequence. The caissons must bear on rock with an allowable service load bearing pressure of 80,000 pounds per square foot. If finding adequate bearing rock, drilling and excavating each bore, and placing concrete for each caisson can maintain schedule, this will set a good precedence for the continuation of the sequences throughout the building. The other building foundation systems consist of the following:

- Spread and strip concrete footings
- Load bearing concrete foundation walls
- Concrete grade beams

Since the caissons and the other foundation elements are each part of their own package, the other concrete foundation systems can proceed simultaneously with the caissons. The only exceptions to this are that some of the grade beams are located on top of the caissons and therefore cannot be placed until the caissons are finished.

Another consideration to the foundation systems is cold weather. The schedule shows the foundation systems to end in February of 2009. This will mean cold weather concrete placement procedures will need to be practiced to ensure the quality of the foundations.

4.1.2 Structural Schedule Impacts

The structural system consists of steel beams and columns with composite concrete slab on metal decks. The steel will be set throughout the winter starting in early October and ending in early March. Although not as crucial as cold weather concrete, cold weather steel erection will need to be considered when it comes to planning the steel work. The sequencing will follow the caissons. This means the steel erection will start with the most critical parts of the building, the bed towers. Since the bed towers rise five stories, the steel columns at the base of these bed towers will be very large. Again, it is vital that the steel maintains a tight schedule because the architectural precast panels and building envelope will follow the same sequence. If the steel cannot maintain this schedule and the building envelope cannot start on time, the building enclosure milestone will not be met and as a result, will delay the interior work and push substantial completion back.

4.1.3 Finishing Schedule Sequence

The finishing sequencing will continue to follow the other sequences of the building. This means the bed towers will start with the finishing trades first. They will employ a top down method of finishing, starting on the fifth floor and working to the third floor of each tower. Below the third floor they will continue to move from the top down, however, they will finish more crucial departments within the hospital first because of the extensive owner furnished equipment in these areas. There are many constraints and intricate details when finishing a medical center. This attributes to a substantial time frame for the finishes that are vital for the completion and turn over of the building.

4.1.4 Schedule Assumptions

The schedule includes two extra sequences that have not been previously mentioned. These are sequences within one of the other sequences and were separated for some activities, such as the steel, and not separated for other activities. Therefore, I used the diagram to show general overall sequences and did not show the smaller "sub-"sequences.

Activity durations were carefully determined; however, with limited experience in developing schedules, some durations were educated, knowledge based assumptions. Also, being bound by activity limits, many activities were combined and may distort the actual duration of each detailed line item.

4.2 Sequencing

To be able to fully understand the medical center's schedule, the sequencing process needs to be examined. Appendix D shows a diagram of the building's footprint. It is labeled by each section of the building and a number that represents the sequence order. As this diagram shows, all the sequences start with the bed towers. These are the most crucial parts of the building, especially with respect to the substructure and superstructure. Table 4.1 is a summary of Appendix D and shows the order of sequencing.

Table 4.1: Building Sequencing Order

SEQUENCING ORDER	
#	Area
1	South Tower
2	West Tower
3	East Tower
4	Service Building
5	Admin (or Link) North
6	Admin (or Link) South
7	Admitting
8	Ambulatory
9	Emergency
10	Surgery

A top down method will be employed for the finishing sequences. However, this level of detail was not able to be captured in this schedule, but was considered when the schedule was being developed.

4.3 Cost Evaluation

4.3.1 Actual Building Construction Cost

The following is The Washington County Regional Medical Center's actual building construction cost based on figures released from the owner and construction manager:

Building Size: 500,000 sqft
 Cost per Sqft: \$300
 Total Cost: \$150 million

4.3.2 Total Project Costs

The following is The Washington County Regional Medical Center's total building cost based on figures released from the owner and construction manager. It includes land procurement, design fees, and other expenses to completely fund the entire project from start to finish:

Building Size: 500,000 sqft
 Cost per Sqft: \$564
 Total Cost: \$282 million

4.3.3 Major Building Systems Costs

Table 4.2: Major Building Systems Cost Summary

Building System	Total Cost	Size	Cost/SQ FT
Electrical	\$20,830,000	500,000 sq ft	\$41.66
Mechanical and Plumbing	\$48,376,500	500,000 sq ft	\$96.75
Fire Protection	\$1,557,500	500,000 sq ft	\$3.12
Structural ¹	\$18,657,524	500,000 sq ft	\$37.32

¹Figures include all concrete and steel packages

4.3.4 Parametric Estimate using D4 Cost

Table 4.3, shown below, is an estimate using D4 Cost software. The D4 Cost program predicts the cost of a building based on historical data. The four buildings were chosen because they all represented some aspect of the Washington County Regional Medical Center. Choosing the most similar projects should produce a more accurate cost prediction.

Table 4.3: Parametric Estimate

Project	Size	Cost/SQ FT	Total Cost
Lawrence J. Ellison Ambulatory Care Center	369,777 sqft	\$184.52	\$68,231,228.00
Baylor Regional Medical Center	354,400 sqft	\$261.54	\$92,689,693.00
Utah Valley Regional Medical Center	218,213 sqft	\$313.01	\$68,303,492.00
Florida Flagler Hospital	294,898 sqft	\$203.81	\$60,102,526.00
Average	309,322 sqft	\$240.72	\$72,331,734.75

4.3.5 Square Foot Estimate using 2008 R.S. Means

Appendix E shows an estimate utilizing RS Means square foot building data. The highlighted data is information that had to be extrapolated because the data was not explicit for the size and specifics of The Washington County Regional Medical Center. RS Means also allows the choice of an exterior wall system. Since the medical center is comprised of both face brick and architectural precast panels, the median value between the two was chosen.

4.3.6 Cost Comparison

Table 4.4: Cost Comparison

COST COMPARISON	
Method	Total Construction Costs
D4 Cost Software	\$72,331,735.00
RS Means Data	\$115,160,600.00
Actual Costs	\$150,000,000.00

An analysis of all three costs shows RS Means to be lower than the actual building cost and the D4 Cost estimate to be much lower.

A further examination of the D4 Cost data will show that the historical data for hospitals, though chosen with The Washington County Regional Medical Center in mind, cannot be used so easily. The range of systems, technology, and equitable projects varies tremendously. Historical data alone can not produce an accurate cost of such a diverse and constantly growing and changing market.

A look into the RS Means data produces one explanation for the lower figure. Technological advances in the medical field, also shown in the D4 Cost evaluation, can cause a tremendous amount of systems and equipment price fluctuations. RS Means can not control or account for these constant changes.

4.3.7 General Conditions Estimate

The general conditions estimate, refer to Appendix F, provides costs for the general items covered by the construction manager. The total length of the project used as the base of the calculations is thirty three months. Table 4.5 shows a summary of the three major categories from the general conditions estimate: field office, equipment, and expenses, project staffing, and temporary utilities. The table also includes the total general conditions estimate.

Table 4.5: General Conditions Estimate Summary

GENERAL CONDITIONS ESTIMATE SUMMARY	
Description	Total Costs
Field Office, Equipment, & Expenses	513,270
Temporary Utilities	249,150
Project staffing	5,192,480
Total General Conditions Estimate ¹	7,622,660

¹This is not just a sum of the three values above it. It includes all the items shown on the general conditions estimate

As Table 4.5 and Appendix F show, the majority of the estimate is made up of the project staffing costs. This leaves approximately \$2,400,000 for all the other items included in general conditions.