INTRODUCTION

Doctors Community Hospital (DCH) is located in Lanham, MD which is just outside of the Washington, DC, beltway in Prince George's County. Suburban Maryland is constantly growing and the hospital needs to improve its facility to continue to serve the area as a top-tier medical establishment.

The goal of the project is to provide a roughly 200,000 square foot expansion to an existing hospital and renovate about 70,000 square feet of existing space. All of the work will be completed while the hospital remains fully functional. Constructing a building that is attached to an existing, functional hospital, poses unique challenges for the project team, especially in terms of dust and debris control.

The expansion will consist of a 1st floor expansion to the existing Emergency Department, 2nd floor shell space (as of now, change order expected to fit-out space as administrative offices), and floors 3 through 5 will be patient rooms. Existing rooms on floors 3, 4 and 5 will be renovated as the last step in the project.

Gilbane Building Company is serving as the CM-at-risk for the DCH construction project. Design began in June of 2006 and the Notice to Proceed came forth on November 14, 2007. Three phased finish dates exist for the project: Emergency Department Expansion completed by February 2009, Patient Tower Expansion completed by June 2009, and Renovations finished by March 2010.

The original total cost for the project was $31,000,000 but the original scope did not include the 1st floor ED expansion. The total cost of the project as it currently stands is roughly $37,000,000.

PROJECT OVERVIEW

CLIENT INFORMATION

Doctors Community Hospital is a privately run, not-for-profit organization located in Prince Georges County, Maryland, which is adjacent to Washington, DC. Their goal is to serve the surrounding area of PG County and provide top notch medical service to those people in the region.

The expansion project was borne out of a need to create more space to adequately serve the needs of its patients. Currently, the hospital is very crowded, and many rooms that were originally designed to be private, individual rooms have been turned into semi-private, two person rooms. The vertical expansion is aimed to create enough new patient rooms that they can continue to serve the region, but offer private rooms for all individuals that require overnight stays at their facilities. Through this project, coupled with other construction underway on the campus as well, they also hope to expand their influence and reach into neighboring Anne Arundel County for patient care.

PROJECT DELIVERY METHOD

This project is being delivered with a Construction Manager at risk method. CR Goodman and Associates is serving as the architect for this project. As shown in Figure 1-Contractual Arrangements for the DCH Expansion**,** they are being compensated through a lump sum contract with the owner, DCH. CR Goodman has enlisted the services of consulting engineers for both structural and MEP work, and is using Lump Sum contracts for these arrangements. The majority of the design was completed before documents were sent out to bid.

Gilbane has been selected to perform the CM-at-risk responsibilities for the expansion and has entered into a Guaranteed Maximum Price contract with the owner. They have hired their subcontractors and entered into Lump Sum agreements for the major subs shown at right.

Traditional bonds are not required on this project by the owner or Gilbane, but instead, Contractors Default Insurance is being used to handle this risk. This insurance method is handled largely at the corporate level, not on the jobsite. The main advantage of this structure is that should a contractor go under, there is not an investigation by a bonding agency, therefore, the jobsite staff has better control over how to proceed, thus mitigating the impact on the project.

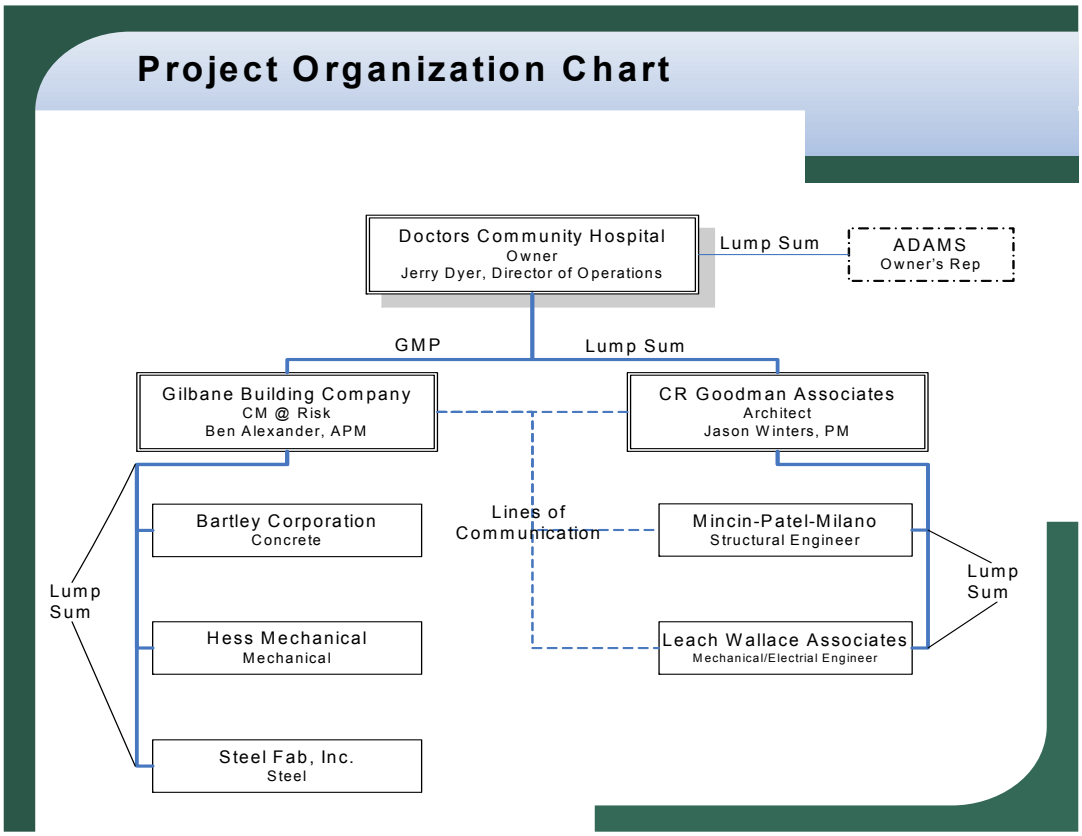


FIGURE 1-CONTRACTUAL ARRANGEMENTS FOR THE DCH EXPANSION

GILBANE PROJECT TEAM

Gilbane's staffing plan is relatively straight forward, without any complex relations or special positions and is laid out in Figure 2-Staffing Plan for Gilbane Building Company on DCH. The Project Executive oversees this project, along with a few other projects within the company. He is generally not on site, and makes appearances for roughly a day each week or less. Lisa Hancock, Project Manager, is the primary Gilbane employee in charge on site. She is supported in her management duties by her APM, Ben, and her project engineer, also named Ben. In the field, General Superintendent Ed is responsible for the construction activities and is supported by Tim.

It is curious to note that on such a MEP intensive project, systems which account for nearly half of the building cost, they do not employ at least a part time, if not full-time, MEP coordinator. Gilbane has specialized part of its company into Hospital construction, expansion, and renovations. Coordination is generally handled by the APM's and project engineers.

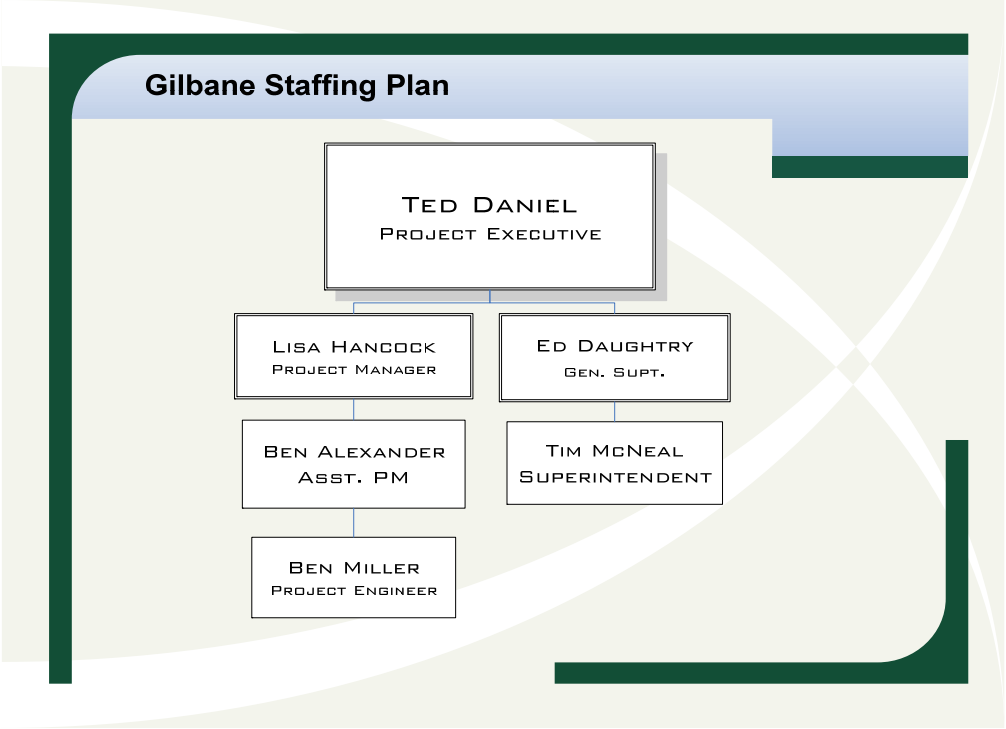
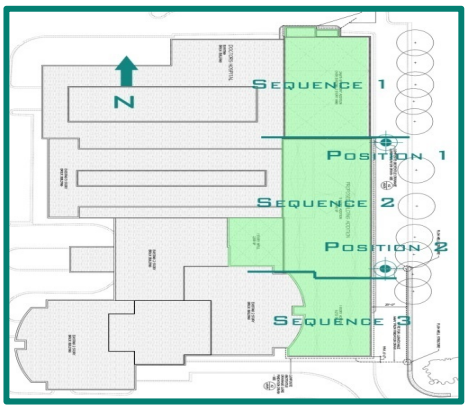


FIGURE 2-STAFFING PLAN FOR GILBANE BUILDING COMPANY ON DCH

DESIGN AND CONSTRUCTION OVERVIEW

TABLE 1-BUILDING SYSTEMS OVERVIEW

Scope of Work	Summary Features
Demolition	• Demolition occurs in two main phases o **Exterior Prep**- To ready existing site and portions of existing façade for new structure (Brick and asphalt) o **Interior Renovations**- as the 2nd through 5th floors in the existing structure are renovated (Drywall, casework, partitions, Limited concrete deck fill) • **Asbestos and lead paint** abatement is expected in the interior portion of renovations. As of yet, **quantity is undefined** for both. (Original construction in 1970's) o Expecting to find asbestos in existing pipe insulation o Expecting lead paint in most/all painted rooms o Contractor is expected to remove any asbestos encountered, even if it is not friable • Contractor to **salvage existing** hospital items in renovation area as directed by owner. **Contractor is responsible** for all salvaged material until reinstalled.
Structural Steel	• **W-Shape** columns and beams placed on concrete footers o Size range W8x30 to W12x170 o Placed from North to south via a 130 Ton truck crane o The crane uses two locations as shown in Figure 3-Crane Location for Steel Erection. FIGURE 3-CRANE LOCATION FOR STEEL ERECTION  • **Composite slab** on metal deck with shear studs o **Lightweight concrete** 5" slab (3 ½" Topping slab on ½" metal deck) o 6x6x8/8 WWM typical throughout for deck reinforcement • **Moment resistance: 6 K-frames** located at 6 different

Scope of Work	Summary Features
	column lines down center of building o **Full penetration moment welds** at girders tying into these framing units
Cast in Place Concrete	• Caissons, column footers, foundation walls, slab on grade, concrete on metal deck • **Drilled caissons** being used down to a depth of 50' at 11 locations o **No formwork** used; Drilled and placed direct into ground (ground is formwork) o Placed via **Pump** o **4000 PSI** o (14) #11 rebar reinforcing with #3 ring ties 12" O.C. for length of caisson • **Foundation walls and Footers** o Formwork ▪ Footers- Occasional use of stick built form work. Often used ground as form work. ▪ Foundation Wall- **Reusable, prefabricated** form work o Placement ▪ Footers- **Direct Chute** ▪ Foundation Wall- **Pump** o **3000 PSI** o Reinforcement ranges from #3-#12 depending on location • **Slab on Grade** o 2x edge formwork o Placed Via **Direct Chute** o **4000 PSI** concrete on 4" crushed gravel fill and vapor barrier o 6x6x8/8 WWM reinforcement • **Concrete on Metal Deck** o **Pour stops** incorporated in steel work o Placed via **Pump** o **4000 PSI**
Mechanical Systems	• Mechanical plant for all air system **located in penthouse** o Chiller, Boilers, Cooling tower, AHU ▪ All extremely large; must be craned in to place ▪ AHU to be fabricated and delivered in 5 pieces o AHU fed by chilled and hot water loops • **Two mechanical shafts** used for distribution o One at north end, one at south end o **Additional Isolation Exhaust air** from selected rooms at ends of wings on North end. ▪ **High pressure** exhaust ductwork

Scope of Work	Summary Features
	o **VAV's (some with reheat)** are used throughout the facility o **Linear Radiant Heating Panels** are incorporated at all windows in the patient rooms • **Medical Gas, Vacuum** (fed from penthouse compressors) **& Oxygen** (fed from on site oxygen plant) lines feed each patient room • Each Patient room has **private restrooms** • Fire Suppression o Expanded sprinkler system into addition o Wet type, zone activated (4 zones per floor) o Standpipes at 4 locations (each stairwell) per floor- 2 existing
Electrical System	• System ties into **two existing 2500 A** Switch boards o Boards to be reconfigured; consolidating smaller breakers to feed a new distribution panel to allow larger 800 Amp breakers put in place to serve distribution panels in addition • **N+1** Redundancy o **1000 KW** Emergency generator o **5000 Gallon** fuel tank o Located outside away from building. **Requires underground duct bank** to feed into new electrical room o Sized for expansion only; existing structure still feed from existing generator back up plant
Masonry	• CMU, fire-rated stairwells o Self-supporting stair tower o Vertical #5 @ 16" O.C, wall grouted solid o Requires scaffolding whole height o Anchored at each slab on deck with ¾" anchor bolts welded to angle iron • Brick Façade o Veneer, non-load bearing cavity wall assembly o Erected "by face". Slower in opening areas up to begin interior trades, but requires less scaffolding. o Attached to CFMF with veneer anchors
Excavation Support	• **Underpinning** the existing structure was necessary during excavation near existing foundations • **Sheeting and Shoring** were support method of choice for excavation • Ground water was not an issue (above water table), therefore dewatering was not a consideration o Pumps were used if occasional rain or snow created standing water

LOCAL CONDITIONS

Doctors Community Hospital is being constructed in Lanham, Maryland, a suburb of Washington, DC, located just outside of the capital beltway on a 33 acre site. The majority of the site has already been developed by the hospital and consists either of parking lots or other buildings. The remainder of the site is dense trees, which cannot be removed or disturbed during construction due to zoning ordinances and buffer requirements.

Preferred construction methods in the DC area generally focus on Low floor-to-floor heights due to height restrictions within the district. Satisfying this restriction has typically led to an increased use of concrete structures. This project is not subject to these restrictions since it is just outside of city limits, and as such, has elected to use a steel superstructure.

This project is not seeking LEED certification, but Gilbane has set a company policy of achieving 75% recycling on all projects. Debris must be sorted on site between two dumpsters. One is designated for “heavy debris”, concrete, CMU, Brick, etc and the other dumpster has all other construction waste. Dumpsters are averaging being pulled between 1 and 2 times per week, at a cost of $400/pull. EAI, Inc, is responsible for taking them away, and they handle all the recycling needs of the project.

Several borings were taken around the site to establish a good thought pattern on what types of soil were likely to be discovered during excavation. Boring logs confirmed what was already suspected; no rock was to be encountered during excavation and the water table will not be a factor. Water levels were not hit generally until about the 30’ mark below grade. Almost all excavation would stay above this mark. As such, only dewatering due to rain/snow would be a consideration for DCH. The only structure that goes deeper are drilled caissons, for which water levels have minimal impact. Soil types ranged from Lean Clay to Sandy Silt. No rock was discovered via borings, which bodes well for a speedy excavation.

EXISTING SITE CONDITIONS

Space at the Doctors Community Hospital expansion is in very short supply. Four factors contribute to this reality.

1. They are not building on an open site. As seen in Figure 4-DCH Site Plan, there are 6 other structures, including the one they are expanding, already on site. Structures 7 and 8 are currently under way on the south end of the site. One is a new parking deck; the other is a new Medical Office Building. All of these structures take up space that could be used for lay down, but is clearly not available.
2. Construction is occurring on the east side of the current hospital, which abuts a private residence. They are unable to utilize any space beyond the property line, which limits

the path way on the east to a mere 25' from the footprint of the expansion. Between this limited road way, and the existing building they are expanding on the other side, access to the construction is extremely limited and creates an exorbitant amount of congestion.

3. Contractors are competing for space with the other construction site on campus. Both sites are in need of lay down and material storage space, which is a finite quantity. The apparent "green space" in Figure 4-DCH Site Plan is unfortunately not open field, but rather heavily forested areas that they cannot clear to create more space due to zoning regulations.
4. Much of the parking lot space must remain usable so that they hospital may continue functioning normally. Both medical staff and patients must be able to access the fully functional hospital throughout the duration of construction. This fact limits the amount of parking lot space that can be usurped for construction activities.

These factors cause a significant risk of impacting the construction of this project. The congestion can lead to productivity inefficiencies that cause schedule delays and cost overruns. Risk is an evil that must be managed effectively on any construction project, and this one is no different. Space limitation is by far, one of, if not the largest, areas of risk present at the DCH vertical expansion.

Another large area of risk related to site planning is non construction traffic (vehicular and pedestrian). The hospital will maintain full functionality throughout the project. Ambulances must be able to come and go freely and quickly. This need will make it imperative to have prominent and clear signage to direct staff, patients, and construction traffic in the right direction to: reduce congestion, keep people safe, and not impact hospital operations.

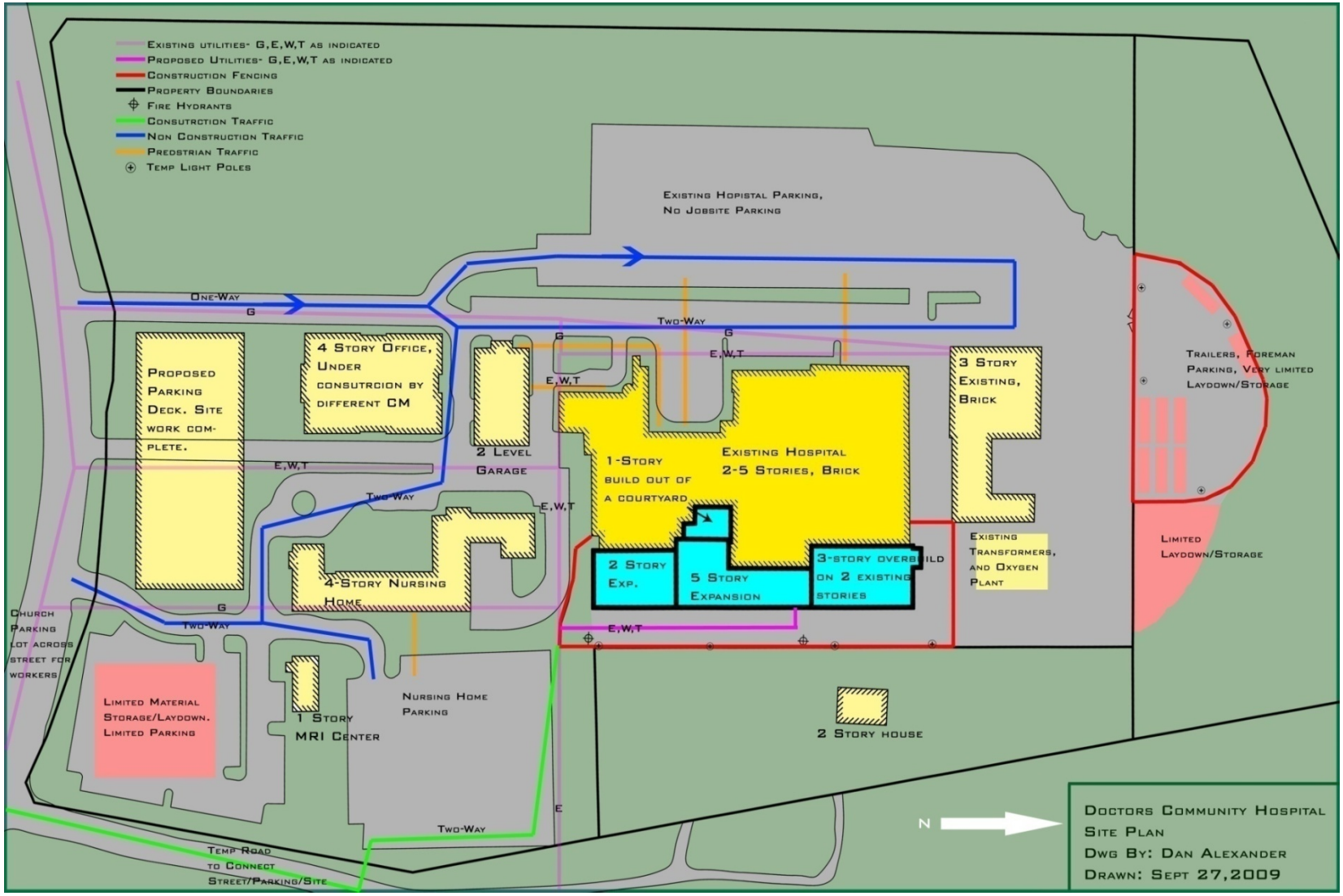


FIGURE 4-DCH SITE PLAN

SITE LAYOUT PLANNING

Site planning is a critical issue on the Doctors Community Hospital project. The site is extremely congested, and there are multiple construction projects going on simultaneously. Furthermore, the hospital is remaining in full operation during the construction. This fact means traffic management will be a critical issue so as not to interfere with emergency vehicles entering and leaving the campus.

If the north side of the site were able to be utilized for traffic flow, it would be a big advantage because one-way traffic could be implemented. However, as noted on the site plan in Appendix I, the area is too congested. Parking for hospital employees limits the traffic to typical pickup trucks and foreman vehicles only. Tractor trailers and other large delivery trucks have too large a turning radius to safely navigate that area. As a result, all larger deliveries (Concrete trucks, Flatbeds, large trucks) must all come in from, and exit at the south gate. This situation also makes communication of traffic patterns to delivery people crucial. If a tractor trailer were to take the west entrance road, they would get stuck and have to navigate out of the lot by backing the whole way back down to the main road. Traffic would be congested if this were too happen, which could impact emergency vehicles entering and exiting the hospital grounds.

EXCAVATION

Excavation was not very extensive on this project. Shallow excavation was all that had to occur at the south end of the building. The grade was already low enough, and the only excavation that occurred was for footings and underground MEP installation. The northern limit of excavation was deeper and also required underpinning along the existing building so as not to undercut existing foundations. (See Appendix I: Site Layout Planning for plan)

STEEL ERECTION

Steel Erection poses one very distinct challenge. With the crane on site, it becomes very difficult to have traffic move through the site. Fortunately, there was just enough room when having the truck crane on site, other vehicles were still able to get by if needed, though it was avoided if at all possible. One crane was used for steel erection, and though it was a truck crane, they only used two locations.

INTERIOR FIT-OUT

Throughout the façade installation and during interior fit out, a hoist will be used to move people and materials vertically. This situation will exist until the permanent elevators are fully functional and protected to be used for the duration of construction. Buggies and trash chutes will be used until the building is closed in. As the façade closes, the chute will be removed, and the buggies will go all the way to the dumpster.

PROJECT LOGISTICS

SCHEDULE

The Doctors Community Hospital (DCH) is a 3 piece addition to the existing building. The first piece is 1 story on the south end that will expand the Emergency Department (ED). Piece two is a five story tower being built alongside the existing patient room tower. The first floor of this tower will tie in with the Emergency Department expansion. The second floor is currently left as shell space, but allowances have been placed in the schedule to facilitate the build out when it is released. The hospital has not finalized what the space will be used for, but it is expected to be partially an MRI suite, with the remainder being used for administrative office space. The top three floors of piece two are all private patient rooms. The final piece is actually an extension of piece two. The north end of the patient tower is being built on top of an existing two story transition care portion of the building. All of these "pieces" are being constructed simultaneously.

When the addition is complete, renovations are to take place on floors three through five of the existing tower. This point will signify the complete of the project. A detailed Gantt chart showing durations and relations can be found in Appendix I | CPM Schedule.

PROJECT COST SUMMARY

Costs on any project are always an important metric to establish at the beginning, and to carefully track throughout construction. Several methods can be used to establish projected costs. These methods range from a very quick ROM estimates based on the cost of some definable unit (Number of beds for a hospital, cost per apartment in a complex, total seats for a theatre) to detailed take offs of each system in the project to develop a final budget.

Cost projections for this project shown below in Table 2-Cost Breakdown for DCH are provided courtesy of Gilbane Building Company. It looks at total project costs, including a breakdown of some major systems in the project. "Total project" includes all costs (Land, sitework, overhead, general conditions) and "Building costs" include only the cost of labor and material.

It is interesting to note that this original cost did not include the 1st floor Emergency Department Fit out, or any potential second story fit out. These spaces were originally designated as shell space only. One change order has been processed already to add the finish scope of the 1st floor emergency department. The total contract as based on this addition stands at roughly $37 Million.

TABLE 2-COST BREAKDOWN FOR DCH

Cost Breakdown			
		Cost	Cost/SF
Total Project (Original)		**$ 31,318,000**	**$ 157**
Total Building (Original)		$ 26,413,000	$ 132
Systems			
	Mechanical	$ 9,203,000	$ 46
	Structural Steel	$ 1,554,000	$ 8
	Electrical	$ 3,084,000	$ 15
	Masonry	$ 1,052,000	$ 5
	Concrete	$ 1,035,000	$ 5
	Sprinkler	$ 444,500	$ 2

GENERAL CONDITIONS ESTIMATE SUMMARY

General conditions at Doctors Community Hospital have been divided into 4 major categories: Personnel, Utilities/Facilities, Site Office Support, and General Requirements. Personnel includes all project management staff that are onsite and employed by the CM, Gilbane. Temporary utilities and the trailers they power are included in the Utilities/Facilities category. Products that are necessary for the proper functioning of an office are in the Site Office Support category. This includes travel, vehicles, office supplies, phones, and furniture. General requirements encompasses everything else that is required for a safe and productive site including but not limited to signage, barriers and fences, waste removal, and hoists. A summary breakdown is shown below in Table 3-Summary of General Conditions Estimate. The final cost is $1,717,335 which translates to %5.5 of the original bid price. A detailed breakdown can be found in Appendix II | Detailed Estimate Breakdowns.

TABLE 3-SUMMARY OF GENERAL CONDITIONS ESTIMATE

Summary of General Conditions Estimate		
Personnel	$	1,104,915
Utilities/Facilities	$	90,190
Site Office Support	$	91,950
General Requirements	$	430,280
Total	**$**	**1,717,335**

DETAILED STRUCTURAL SYSTEM ESTIMATE SUMMARY

Take-offs for this estimate were prepared using a combination of Revit Architecture and Revit Structure. A detailed model of the steel and concrete systems was created based of the hard copy construction drawings. Quantities were generated automatically within Revit using the Schedule/Quantities function. These gross values were then imported into Excel to filter into useful numbers that could be estimated with RS Means. The total for the detailed estimate for the structural system at Doctors Community Hospital was $1,539,912 as illustrated below in Table 4-Summary of Detailed Estimate. A detailed breakdown of the estimate maybe found in Appendix II | Detailed Estimate Breakdowns.

TABLE 4-SUMMARY OF DETAILED ESTIMATE

Summary of Detailed Estimate	
Steel	
Columns	$ 291,324
Beams	$ 623,164
Metal Deck	$ 116,042
Concrete	
Foundations	$ 210,067
Slabs	$ 252,835
Slab Reinforcing	$ 46,480
Structural Total	**$ 1,539,912**

Methodology and Assumptions for Estimate

- Used RS Means online costworks for all cost values (2008 values)
- Adjusted to reflect Maryland's location factor of .97 (Automatically done online)
- Utilized "Concrete in place" category, which includes formwork, finishing, placement, and reinforcement in unit cost
- Overhead and Profit were not included
- Open shop labor was assumed