

Technical Assignment #1

Geisinger Gray's Woods
Ambulatory Care Campus - Phase II
Port Matilda, PA

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* Front elevation rendering photo provided by Alexander Building Construction

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Executive Summary

The Gray's Woods Ambulatory Care Campus is a new multi-specialty outpatient surgery center located in Port Matilda, PA. This facility will be Geisinger Health System's newest addition to their health services organization in Pennsylvania. Built over two phases, this facility will offer primary care, specialty care, and ancillary services to over 100,000 patients around the Centre County region. It will include 70 exam rooms, 16 procedure rooms, an expanding imaging center, laboratory services, and on-site pharmacy.

For this first technical assignment, I will focus on evaluating the conditions and background information concerning the construction of the second phase of Geisinger Gray's Woods Ambulatory Care Campus. This 77,560 GSF addition will allow expansion of the facility's outpatient surgery capabilities and consolidate them into one location. General project and building characteristics such as cost, schedule, delivery method, site conditions, building systems, and client information have been evaluated and summarized below.

Client Information

Founded in 1915, Geisinger Healthcare Systems is a physician-led health services organization providing over 2.6 million people in the state of Pennsylvania. In order to accommodate their continuing expansion around western Pennsylvania, Geisinger Health Services determined to build an outpatient facility on their Gray's Woods Campus in Port Matilda, PA. With over 19 facilities around the state of Pennsylvania, Geisinger is not a new client in the field of construction. Since 2008, they started a new initiative to move into green building in all their future expansions, and for this project they are aiming for LEED Certified. In order to complete the project to the owner's satisfaction, Alexander Building Construction (the CM for this project) will have to put a lot of emphasis on the design quality, time and budget. Geisinger expects a high quality standard and OSHA approved safety conditions for the construction of their new ambulatory care campus at Gray's Woods. Cost and schedule are also of big importance in their projects, as they are both approved by the General Board and wish not to renegotiate the cost nor lose any potential profit due to delays in occupying the facility. But most importantly, Geisinger expects to have a smooth transition between both phases of this project. Constructing the phase II addition while occupying phase I will bring a big challenge to the construction team when concerned with health and safety standards, as well as minimizing the disturbance to the existing faculty and patients occupying the building.



Project Delivery & Staffing

The Geisinger Gray's Woods Ambulatory Care Campus is being delivered through a traditional design-bid-build (DBB) approach, where Alexander Building Construction is acting as the CM @ Risk and Ewing Cole as the Architect/Engineer for this project. The Construction Manager, Alexander, was awarded a Guaranteed Maximum price (GMP) contract for this project. Alexander holds Lump-Sum contracts with all the subcontractors, while self-performing 5-10% of the work. These subcontractors are chosen on a best-value bid process, where best value not only means lowest price, but company qualification such as experience, safety, & financial condition. Ewing Cole, the Architect/Engineer, was awarded a cost + fee contract for their services. Ewing Cole designed the structural and MEP systems for this facility, while contracted Sweet Engineering to prepare the civil designs. The owner also holds separate contracts with geotechnical, security, HVAC controls and commissioning agents for the delivery of this building. For the complete project organization chart, refer to [Appendix – Slide 3](#)

The chosen Design-Bid-Build delivery method allowed Geisinger the time they desired to contemplate exactly what's needed for this project. Having a complete set of drawings sent out for bidding allowed for preconstruction services by the CM, while also reducing the probabilities of change orders during the construction process. Alexander, also being the contractor for phase I, was able to better plan and budget the construction costs, therefore guaranteeing a maximum price for the delivery of this facility.

Geisinger Health System did not require any bonds for the construction of their Gray's Woods facility. The standard subcontractor's insurance (general liability, workman's comp, automobile insurance, umbrella, etc.) is required by Geisinger for all subcontractors. Alexander, as the Construction Manager, holds general liability insurance for the construction of this facility.

Alexander Building Construction has a well-defined project staff that provides both supervision and project management. The majority of Alexander's management and supervision staff are from the State College branch, which is 13 miles from the project site. This facilitates them to visit the site occasionally, especially for owner meetings which are held every two weeks at the Alexander Job Trailer. The site superintendent, Richard Thomas, is the only person from the project team who worked in Phase I of the project back in 2008. This brings a big advantage to the delivery of this project, as he can bring in valuable input in the construction means and methods from the challenges that he experienced during the construction of phase I. The Construction Management Internal Organization Staffing Chart used on this project may be seen in [Appendix – Slide 4](#).

Existing & Local Site Conditions

The Gray's Woods project is located on a 52 acre lot just off the I-99 interchange at Port Matilda, PA. This enormous site houses the existing phase I built over 2008, a three-tier parking deck, and the new construction of phase II. Because this site is already in use by the current facilities, there are some existing utility lines running underground, which serve Phase I and existing site. New electric, telecommunication and TV lines will be added in order to serve Phase II and expanded site, while the existing water, sanitary, and Stormwater lines will be expanded to serve both facilities and surrounding site. The detailed existing utility site plan may be seen in [Appendix – Slide 5](#)

Due to the relatively large amount of space available at Gray's Woods site, the construction team won't have any problems setting up their trailers, parking, material staging and storage areas, as well as waste management bins. The location allows for easy access by construction equipment and employees, as well as patients to park and access the occupied facilities without any disturbances by the construction.

Building Systems Summary

The construction of the second phase of this project follows the design features set by the initial phase constructed in 2008. The Geisinger Campus at Gray's Woods is a 2-story steel framed structure supported over cast-in-place concrete shallow foundation system. In this project, cast-in place concrete is used for wall & column footings, slab on grade, slab on deck, and equipment pads. A concrete truck and a 150 ton crawler crane operated by their respective subcontractor are continually on site in order to install these buildings components into place.

The building's exterior is mainly comprised brick, glass, and aluminum materials. The front façade is completely made up of an aluminum framing curtain wall system with low emissivity glass. The building's sides and back façade, in the other hand, are comprised of brick cavity walls backed by cold formed metal studs or concrete Masonry Units (CMUs). The buildings flat roof is made of EPDM Roofing System, while the sloped roof portion is completely covered by metal roofing along with skylight windows.

To better serve the building Mechanical and Electrical needs, a 3,300 SF Chiller and Boiler Plant (CUP Building) will be constructed between the existing building and parking garage. This CUP Building will house those existing and new water chillers, boilers, domestic hot water heaters, pumps, fans distribution panels and fire alarm system to provide electrical and mechanical support to the whole building.

The electrical service for this building is supplied via a 2,500A, 480/277V, 3-phase distribution panel located in the CUP building. This switchboard then branches the supply into other three feeds, each powering different areas and mechanical equipment within the building. A 480-208/120V transformers located in the building's electrical room will be used to serve various appliance panels around the building. In case of a power outage, a 250kW generator will supply emergency power to the whole building. This generator will serve two 400A, 480/277V main emergency distribution panels (MEDP's) and will be assisted by a 300kVA modular UPS System to allow for uninterrupted power in the event of an outage.

This facility uses an Air-Water Distribution system to provide cooling and heating to the whole building. The distribution of the Variable Air Volume systems will be done through sheet metal ductwork and pipes throughout the whole building, with the help of VAV Boxes and Unit Heaters. Additionally, 4 new rooftop air handling units (AHU's) with a built-in economizer cycle will provide cooling to Phase II only. The mechanical system for this building is designed to receive LEED credits for "Optimizing Energy Performance" and Carbon Dioxide Monitoring".

By incorporating sustainable design features and means and methods of constructing this facility, Geisinger and Alexander hope to achieve LEED Certified for the Gray's Woods addition. The building makes an extensive use of natural daylight through its curtain wall and skylight along its northern façade. The design also incorporates occupancy and photosensor lighting control systems to dim the lights when there is natural daylight available and turns off lights in unoccupied spaces. Alexander is also aiming to recycle 95% of the materials on site, while also utilizing 20% of construction materials from within 300km of the site.

Project Schedule

The construction process of this 77,560 GSF addition to the Geisinger Ambulatory Care Campus began on July 31st, 2012 with an expected substantial completion date set for January 2, 2014. Details over the specific construction dates may be seen in the project schedule on [Appendix – Slide 8](#). The construction of the building's main components (footings, steel structure, enclosure, and interior work) will be completed over two phases: Phase A connecting to the existing building and slowly moving outward to phase B. All the MEP and Interior subcontractors will work simultaneously in each phase, moving along the project at the same measure. The construction sequence will follow the construction of first floor phase A (Phase 1A), then to the second floor (Phase 2A), moving onto first floor of Phase B (Phase 1B) and finally towards the second floor (Phase 2B). This construction sequence was done mainly because of some underground plumbing issues encountered at the beginning of the project, which forced a vertical phasing sequence rather than horizontal.

Because this building will connect to the already existing medical building, Infection Control Risk Assessment (ICRA) wall panels had to be put in place in between to prevent any risk of infections and disturbance to patients in the existing building. This wall panel was placed at the connection between the existing building and new construction, and presents a challenge for the tie-in of both phases of the project. This, along with the tie-in of the new to existing MEP systems will be perhaps one of the most challenging tasks for the construction of this project.

Project Cost

The actual cost of construction for the 77,560 GSF addition to the Geisinger's Ambulatory Care Campus at Gray's Woods was \$20,165,771, or \$260/SF. This only takes into consideration those direct material, labor and equipment costs in constructing the facility. When including additional project costs such as general conditions, sitework, insurance and CM fees, the total project cost escalates to \$25,789,640, or \$333/SF. To better evaluate the costs associated with constructing this facility, I broke down these costs into different building components, as seen the building system cost breakdown in the [Appendix – Slide 9](#). This table also includes a summary of constructing costs (CC), total project costs (TC) and SF estimate.

In order to better compare the actual project costs to similar projects throughout the United States, an RS Means SF Estimate for the Gray's Woods facility. This estimate totaled up to \$26,229,752, or \$338/SF. Geisinger's actual costs were significantly higher than those estimated by RS Means. These cost differences may be attributed to the fact that we used a Hospital Building for our SF Estimate, the different LEED Certifications Requirements on this project, exterior wall type construction, and the different MEP systems used within these buildings.

After familiarizing with the conditions under which the Geisinger Gray's Woods Ambulatory Care Campus' second phase is being constructed, we may now move onto the second technical assignment, where we will be asked to analyze the key features of the project which affect its execution.

CLIENT INFORMATION

■ Geisinger Health Systems

- Founded in 1915
- Physician-led health services organization
- Serves over 2.6 million people in 44 different counties around PA

■ Gray's Woods Ambulatory Care Campus

- Serve 100,000 patients in Western Pennsylvania
- House 70 Exam Rooms, 16 Procedure Rooms, Imagery center, Laboratory services, and on-site Pharmacy
 - Phase I (2007-2008): Ambulatory Services
 - Phase II (2012-2014): Surgery Care
 - 4 Operating Rooms, 4 Endoscopy Suites & 2 Main Therapy Rooms

■ Experienced Owner

- Past Experiences with CM
- LEED Focused Initiative
- Budget & Schedule
- Quality



Geisinger Health Systems

- Physician-led health services organization providing over 2.6 million people in 44 different counties around the State of Pennsylvania
- Over 19 facilities around Pennsylvania
- In order to accommodate their continuing expansion around western Pennsylvania, determined to build an outpatient facility on their Gray's Woods Campus in Port Matilda, PA.

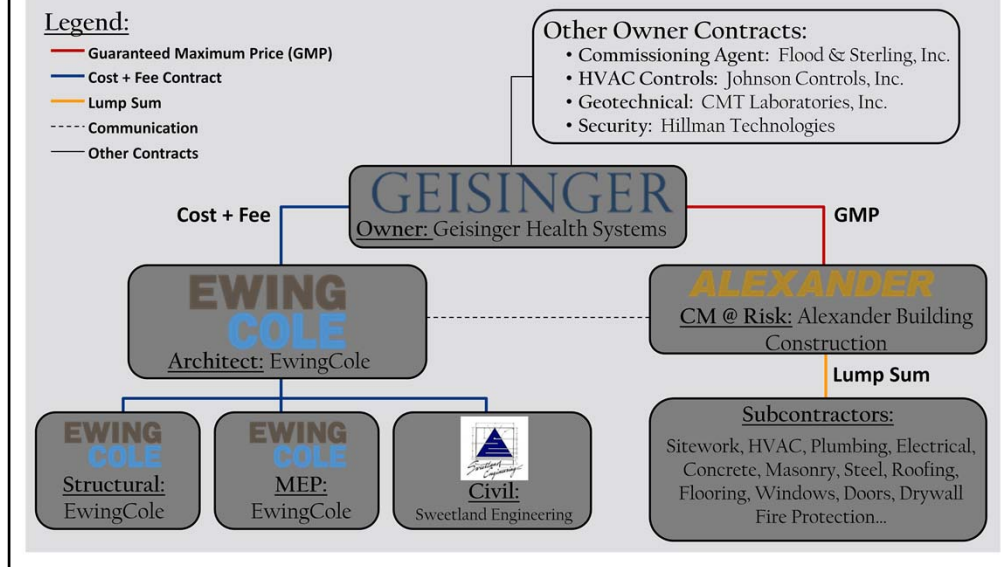
The Gray's Woods Ambulatory Care Campus

- New multi-specialty outpatient surgery center located in Port Matilda, PA
- Serve 100,000 patients in Western Pennsylvania
- Facility will house 70 Exam Rooms, 16 Procedure Rooms, Imagery Center, Laboratory Services and on-site pharmacy.
 - Radiology, Breast Cancer, Cardiovascular, Pulmonary, Urology, Ophthalmology, Otolaryngology, Gastroenterology, GI Nutrition and Pediatric Outreach Departments
- Built over Two Phases:
 - Phase I (completed in 2008) houses ambulatory services (patient not confined to bed).
 - Phase II (currently in construction) houses surgery care
 - 78,000GSF addition will allow expansion of the facility's outpatient surgery capabilities and consolidate them into one location
 - 4 Operating Rooms, 4 Endoscopy Suites, 2 Main Therapy Rooms

Experienced Owner in Construction

- Previous experience with Alexander building phase I and other facilities
- LEED focused initiative since 2008 → LEED Certified for Phase II High quality standard and OSHA approved safety conditions expected
- Cost and Schedule approved by the General Board
- Geisinger expects to have a smooth transition between both phases of this project.
 - Minimizing disturbance, health and safety to existing faculty and patients occupying phase I

PROJECT DELIVERY SYSTEM



Traditional Design-Bid-Build (DBB):

- Allowed owner time desired to anticipate exactly what's needed for this project
- Complete set of drawings sent out for bidding
 - Similar design features from phase I built in 2008
 - Allows for preconstruction services
 - More accurate Cost Estimates
 - Less Change Orders

Project Participants:

- Alexander Building Construction is CM @ Risk, performing around 5-10% work in-house (door frames, scaffolding, etc.)
 - Doing all rough-ins, but equipment provider installs all equipment
- Ewing Cole is Architect/Engineer
 - Designed Structural and MEP systems
 - Contracted Sweetland Engineering to prepare civil designs
- Owner holds separate contracts with geotechnical, security, HVAC controls and Commissioning agent

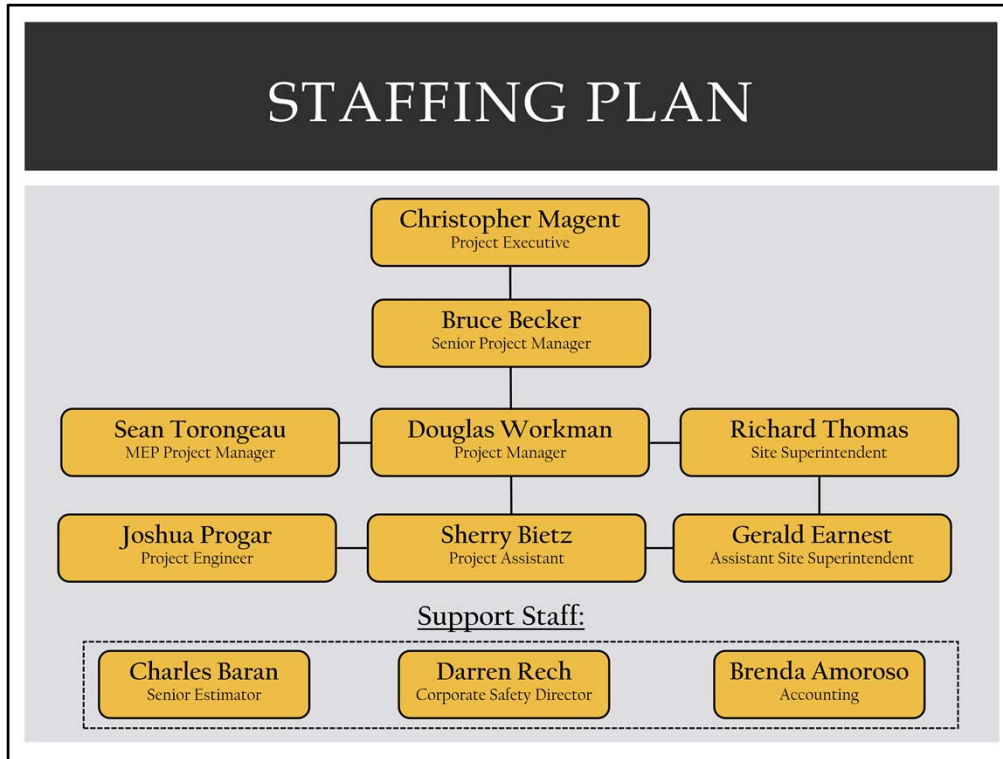
Contracts:

- Geisinger holds Guarantee Maximum Price (GMP) contract with Alexander Building Construction
 - Alexander worked on phase I, so able to guarantee maximum price based on past experience
 - Alexander responsible of costs over the budgeted amount
- Alexander holds Lump Sum contracts with subcontractors
 - Not worrying about impact of large change orders (if any)
 - Subcontractors chosen on a Best-Value Bid process
 - Best Value not only means lowest price, but company qualification for job (experience, safety, financial condition, labor compliance, etc.)
- Designers awarded cost-plus contracts because of nature of service they provide
 - Reimbursed for time spent working on the project + set fee

Bonds & Insurance:

- Geisinger Health System is not requiring bonds for the Gray's Woods addition
- Standard subcontractor Insurance required
 - Workman's Comp, General Liability, Automobile Insurance, Umbrella, etc.
- Alexander holds General Liability Insurance for the project

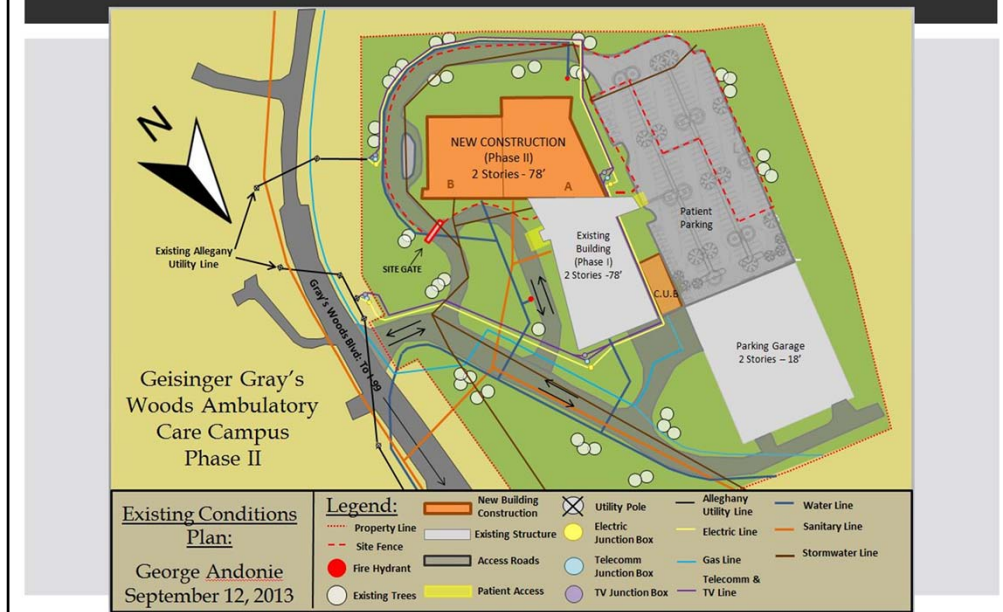
STAFFING PLAN



Staffing Plan

- Construction Manager: Alexander Building Construction
 - Offices in Harrisburg, State College and Philadelphia
 - Majority of Management and Supervision staff are from State College Branch (13 miles away)
 - Close location facilitates biweekly owner meetings
- Most personnel on trailer jobsite all the time except:
 - Project Executive (Christopher Magent) at State College Branch Office
 - Senior Project Manager (Bruce Becker) on site 3-4 days a week as he works on other projects as well
- Project Superintendent (Rick Thomas) worked in construction of Phase I
 - Brings valuable input in construction means and methods
 - Learned from challenges experienced in Phase I and addresses them in construction of Phase II

EXISTING CONDITION



Site Location

- Located on a 52 acre lot just off the I-99 Interchange at Port Matilda, PA
- Site houses existing Phase I, Three-tier Parking Deck + New Construction

Existing Site Conditions

- Existing Utility Lines connect to Phase I and CUP Building
 - Existing Electric, Telecommunication and TV Utility Lines Connect to Phase I
 - New Electric, Telecommunication and TV Lines will be added to serve Phase II
 - Gas Line connects to CUP Building to serve both buildings
 - Existing Water, Sanitary and Stormwater will be expanded to serve expanded site and facility

Local Conditions

- Expansive site allowing for contractor and subcontractor trailer setup, parking, material staging and storage areas, as well as recycling and waste bins setup.
- In this region, extremely hard to find a waste management program that specializes in recycling
 - Centre County's Municipal Solid Waste Authority charges \$66/ton tipping fee and \$10/ton recycling fee
 - 95% recycling material goal on site
- Gray's Woods Boulevard allows for easy access by construction equipment and employees.
 - 20% of materials within 500km
- Two existing patient drop-off points as well as sufficient parking for patients and faculty
- Groundwater level is 100ft below land level in most regions of the site
- Predominant soil types:
 - Wyoming Gravelly Sandy Loam
 - Morrison Sandy Loam
 - Hublersburg Silt Loam

BUILDING SYSTEMS

■ Structural Steel Frame

- Steel Wide Flange Members spanning two floors in height (30')
- Cross-Bracing for lateral supports
- 150 ton Crawler Crane in Site

■ Cast-in-Place Concrete

- Foundations: Footings → NW (4,000psi)
- Slab on Grade → 6" NW (5,000psi)
- Floor Deck Slabs → 3 ¼" LW (3,000psi)
- Equipment Pads
- Pump truck in site

■ Enclosure:

- Brick Cavity Walls
 - Metal Decking (CFMD) Backup
 - CMU Back-up
- Curtain Wall on Northern Façade
 - Aluminum Framing & Low-E Glass
- Traditional two-frame scaffolding system

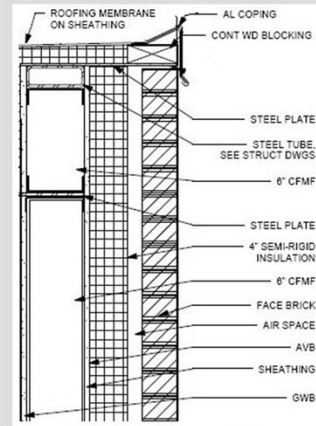


Figure 1: Section Detail taken from Sheet A3.4.2

Structural Steel Frame:

- Project is 2-story Steel Framed structure
 - Supported over shallow concrete foundation
 - All structural steel wide flange members are to be ASTM A992 Grade 50
 - All plates are to be ASTM A572 Grade 50
 - All Wide Flange Members spanning two floor in height (30')
 - Splicing only needed at some columns to allow for screen wall attachment
- Cross Bracing used for lateral support
- 150 ton Crawler Crane on Site

Cast-in-Place Concrete:

- Shallow Foundations → NW 4,000psi Concrete
 - Wall & Column footings
- 6" Slab on Grade → NW 5,000psi concrete
 - Special Additive used to stop transmission of humidity from the soil
- 3 ¼" Floor Deck Slabs → LW 3,000psi concrete
- Equipment Pads
- Wood and Preformed Steel Forms used for casting concrete
- Concrete Truck in site

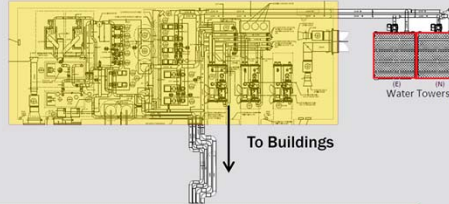
Building Enclosure:

- Building's exterior mainly comprised of brick, glazing and aluminum materials.
 - Brick must match the coursing, bonding, color and texture of the existing masonry of Phase I
- Brick Cavity Walls
 - Cold Formed Metal Decking (CFMD) Backup
 - Concrete Masonry Units (CMU) Back-Up
 - 4" Semi-Rigid Insulation is on exterior side of wall rather than behind sheathing
 - Done due to specific vapor emission of this building
- Curtain Wall in Northern Façade
 - Aluminum Framing used to support the low emissivity (Low E) Glass
- Traditional two-frame scaffolding system to place masonry

BUILDING SYSTEMS

■ CUP Building

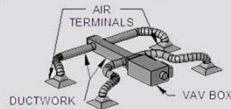
- 3,300SF Chiller Utility Plant
- Houses Existing + New Equipment for MEP
 - Water chillers, boilers, pumps, fans
 - Distribution Panels
 - Fire Alarm System



■ Mechanical System

- Air-Water Distribution System
- Variable Air Volume (VAV) Boxes
- Cooling:
 - 4 Rooftop AHU's w/ economizer cycle
 - Two 1,100 GPM Cooling Towers
 - Two 250-Ton Water Chiller
- Heating:
 - Unit Heaters, Fan Coil Units, and Radiant Heating Panels for Heating

VAV Boxes in Ductwork:
(www.wikipedia.com)



■ Electrical System

- 3 ϕ , 60Hz Transformer (12,470V \rightarrow 480/277V)
- 2,500A Main Distribution Panel (SWBD-A)
 - Feeds to Mechanical Equipment
 - Feeds to Distribution Panels at each Floor
 - 480/277V \rightarrow 208/110V Transformers for appliance panels
- Emergency Power Systems:
 - Emergency Electrical Room
 - 400kW Emergency Generator
 - 300kVA Modular UPS Emergency Power

Chiller Utility Plant (CUP Building):

- 3,300 SF Plant that houses existing and new MEP equipment
 - Mechanical: Water Chillers, Boilers, Pumps and Fans
 - Electrical: Main Distribution Panel
 - Fire Alarm System

Mechanical System:

- Air-Water Distribution System
- Cooling Systems:
 - Two 1,100 GPM Cooling Towers (1 New + 1 Existing)
 - Two 250 Ton Water Chillers (1 New + 1 Existing)
 - 4 Rooftop Air Handling Units (AHU's) with an included economizer cycle
 - Serve Phase II Only
 - Uses waste heat from a boiler flue to preheat the feed water and reduce energy consumption
- Heating System:
 - Unit Heaters, Fan Coil Units, and Radiant Heating Panels for Heating

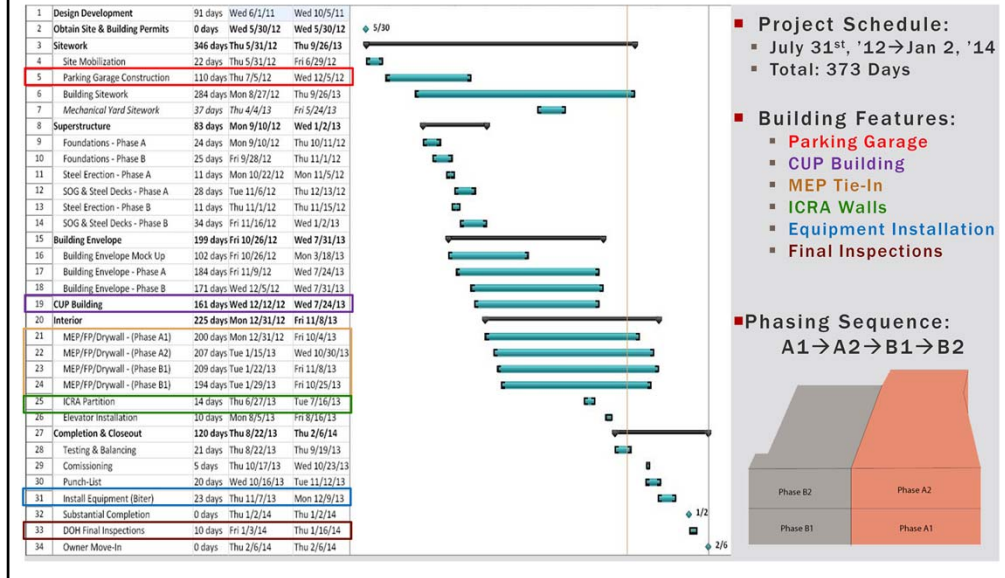
Electrical System:

- 3 ϕ , 60Hz Transformer steps down 12,470V provided by Allegheny power utility Company to 480/277V
- 2,500A Main Distribution Panel (SWBD-A) in CUP Building
 - Feeds to Mechanical Equipment in CUP Building
 - Feeds to Distribution Panels at each Floor
 - Various T480/277V \rightarrow 208/110V transformers located within the building's electrical room to serve appliance panels
- Emergency Power Systems:
 - Emergency Electrical Room Houses
 - New 400kW Emergency Generator will replace existing 250kW serving Phase I
 - Supply emergency power to whole building in case of any outages
 - 300kVA Modular UPS Emergency Power will allow uninterrupted power in event of outage immediately while the generator powers up

Support of Excavation:

- No support of excavation needed, as building built over shallow foundations

PROJECT SCHEDULE



Project Schedule:

- Project Start: July 31st, 2012
- Expected Substantial Completion: January 2, 2014
- Total Construction Duration: 373 Days

Building Features:

- Parking Garage
 - Part of Phase II with Alexander Building Construction
 - Finished 6 weeks early
 - Able to project 6 weeks ahead of expected date
- Infection Control Risk Assessment (ICRA) Partitions
 - Taped Joints for infection control
 - Install and Demolition
- MEP Tie-In
- Chiller Utility Plant (CUP) Building
- Operating Room Mockup
 - 6 months through changes and user inputs
- Equipment Installation (Biter)
 - Alexander does all rough-ins, Biter does equipment installation
- Intensive Testing, Commissioning, and Inspections prior to occupation
 - Patton Township Final Inspections
 - Centre County Conservation District (CCCD) Final Inspections
 - University Area Joint Authority (UAJA) Final Inspections
 - Department of Health (DOH) Final Inspections

Phasing:

- Construction of main building components (footings, steel structure, enclosure, interior work) will be completed over two phases (A & B)
 - Phasing Sequence: A1 → A2 → B1 → B2
 - Vertical phasing sequence rather than horizontal
 - Mainly done because of some underground plumbing issues encountered at the beginning of the project
 - All MEP and Interior subcontractors will work simultaneously in each phase, moving along the project at the same measure

PROJECT COST

Building Systems Cost Summary							
System	Actual			SF Estimate			
	Cost	Cost/SF	% Cost	Cost	Cost/SF	% Cost	
Concrete Foundations	\$2,533,175	\$32.66	12.56%	\$401,000	\$5.17	2.43%	Δ Concrete (\$2.1Mil)
Structural Steel & Misc. Metals	\$1,558,888	\$20.10	7.73%	\$1,170,000	\$15.09	7.09%	
Masonry	\$674,093	\$8.69	3.34%	\$708,000	\$9.13	4.29%	
Interiors	\$4,299,613	\$55.44	21.32%	\$3,696,000	\$47.65	22.40%	
Roofing and Waterproofing	\$960,586	\$12.39	4.76%	\$215,500	\$2.78	1.31%	
Plumbing	\$2,079,012	\$26.81	10.31%	\$3,329,000	\$42.92	20.18%	Δ Plumbing= \$1.4Mil
HVAC	\$3,648,511	\$47.04	18.09%	\$4,236,500	\$54.62	25.68%	
Fire Protection	\$339,803	\$4.38	1.69%	\$289,000	\$3.73	1.75%	
Electrical	\$3,488,440	\$44.98	17.30%	\$2,119,500	\$27.33	12.85%	
Conveying Systems	\$563,840	\$7.27	2.80%	\$333,500	\$4.30	2.02%	
Building Construction Cost (CC)	\$20,145,961	\$260/SF		\$16,498,000	\$213/SF		
General Conditions	\$2,080,506		7.93%				
Site Work	\$2,973,624		11.34%				
General Liability	\$192,290		0.73%				
Contingency	\$400,000		1.50%				
CM Fees	\$437,371		1.67%				
Total Project Cost (TC)	\$26,229,752	\$338/SF					

■ Possible attributions to cost differences:
 ■ Hospital Project
 ■ LEED Certification Requirements
 ■ Exterior Wall Construction
 ■ Different MEP Systems Used

■ Equipment Costs: \$5,220,000

Actual Project Costs:

- Taken from Alexander's most current schedule of values for the project (July 24, 2013)
- **Building Construction Costs:** \$20,145,961 or \$260/SF
 - Only takes into consideration those direct costs in constructing facility
- **Total Project Costs (TC):** \$26,229,752 or \$338/SF
 - Includes GC's Sitework, Insurance, Contingency, and CM Fees
 - Contingency absorbed by owner
- Equipment Costs: \$5,220,000 → Not taken into consideration for cost analysis

Major Building Costs

- Interiors: 21.32%
 - Drywall partitions, ceilings, openings finishes & wall/corner guards
- Mechanical: 18%
- Electrical: 17.3%
- Plumbing: 10.3%

RS Means SF Estimate:

- Performed RS Means SF Estimate based on the following assumptions:
 - New Construction: M.330 Hospital, 2-3 Story, 12ft Story Height
 - Steel Frame, Face Brick with Concrete Block Backup
 - Area: 77,560 GSF
 - Perimeter: 716 ft
 - Two Stories (14' 8" Height)
- Estimated Cost: \$16,498,000 or \$213/SF

Actual vs. SF Estimate:

- Actual costs were significantly higher than SF Estimates
- Highly differed in Concrete Foundations and Plumbing
- Attributions to Cost Difference:
 - Not Fully a Hospital Project (Outpatient Surgery Center)
 - LEED Certification Requirements
 - Exterior Wall Construction
 - Different MEP Systems used