Minitab Headquarters

State College, PA

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Project Delivery Evaluation

This project delivery evaluation report researches and analyzes the agreements and commitments between project players on the Minitab Headquarters project. The intent is to develop a better understanding of the client and the working conditions of the project.

Alexander Constructors, Inc. serves as the construction manager on the project, contractually as the CM At-Risk. Alexander holds contracts with the mechanical engineer/contractor and general construction sub contractors. The owner, Minitab, Inc., holds contracts with the architect, CM/GC, civil/site engineer, and the interior designer. The architect holds the contracts of the electrical/plumbing/fire protection engineer/contractor and the structural engineer. The purpose for this arrangement is to subdivide the contractual arrangements into stages of construction and facilitate fast-tracking of the project. Contract documents where sixty-percent complete at the start of construction. Construction is to be sixteen months and a preliminary cost estimate yields a total building cost of $9.5M. The contractual arrangement between the owner and Alexander Constructors, Inc., is Cost plus Fee with an established guaranteed maximum price (GMP). The GMP is subject to change by modifications of work by change order. Alexander Constructors receives a fee of 3.5% on all work inclusive of the GMP and 5% thereafter. Alexander was awarded the contract for construction management services based on CM proposal. The process began with the issuance from the owner of a 'Request for Qualifications' thereafter eligible contractors presented their proposal for the project and a final decision was made for award of the contract.

The project is staffed in a line-type organization consisting of a project executive, safety advisor, general superintendent, project manager, project engineer, two superintendents, an accountant, and an administrative assistant. Project control methods are defined by the roles of the team. Each team member fulfills a defined role in the success of the project with some overlap of responsibility.

I. Contracts

Project Delivery Method

Minitab, Inc. World Headquarters is a GMP project with Alexander Constructors, Inc. serving as the construction manager. Alexander also serves as an entity for the owner's representation. At the start of construction, contract drawings were sixty-percent complete. There is no contractual relationship between the construction manager and the architect. There is, however, a strong working relationship and a high degree of cooperation between the parties. The owner often consults with both the architect and the construction manager in terms of design development issues. The owner is considerably determined as to the desired outcome of this project, but is not well versed in the means and methods required to achieve project goals. Currently they occupy two buildings; being split causes difficulty in communication throughout the company and they wish to house all services under one roof to alleviate this problem. Minitab, Inc. announced the desire to build a new facility in 2000 and began working with architect, Michael C. Haluga of State College. A decision was made to offer the contract through CM proposal and Alexander was awarded the project in 2001.

Project Contracts

The contractual arrangement for the project is comprised of four main contracts from the owner – architect, interior designer, site engineer, and construction manager. Alexander Constructors, Inc. is contracted as the construction manager. Contracts held with the other above mentioned entities are independent of the contract with Alexander. The architect and the construction manager both hold subcontracts with entities for other scopes of work. The contractual setup for the project is outlined following:

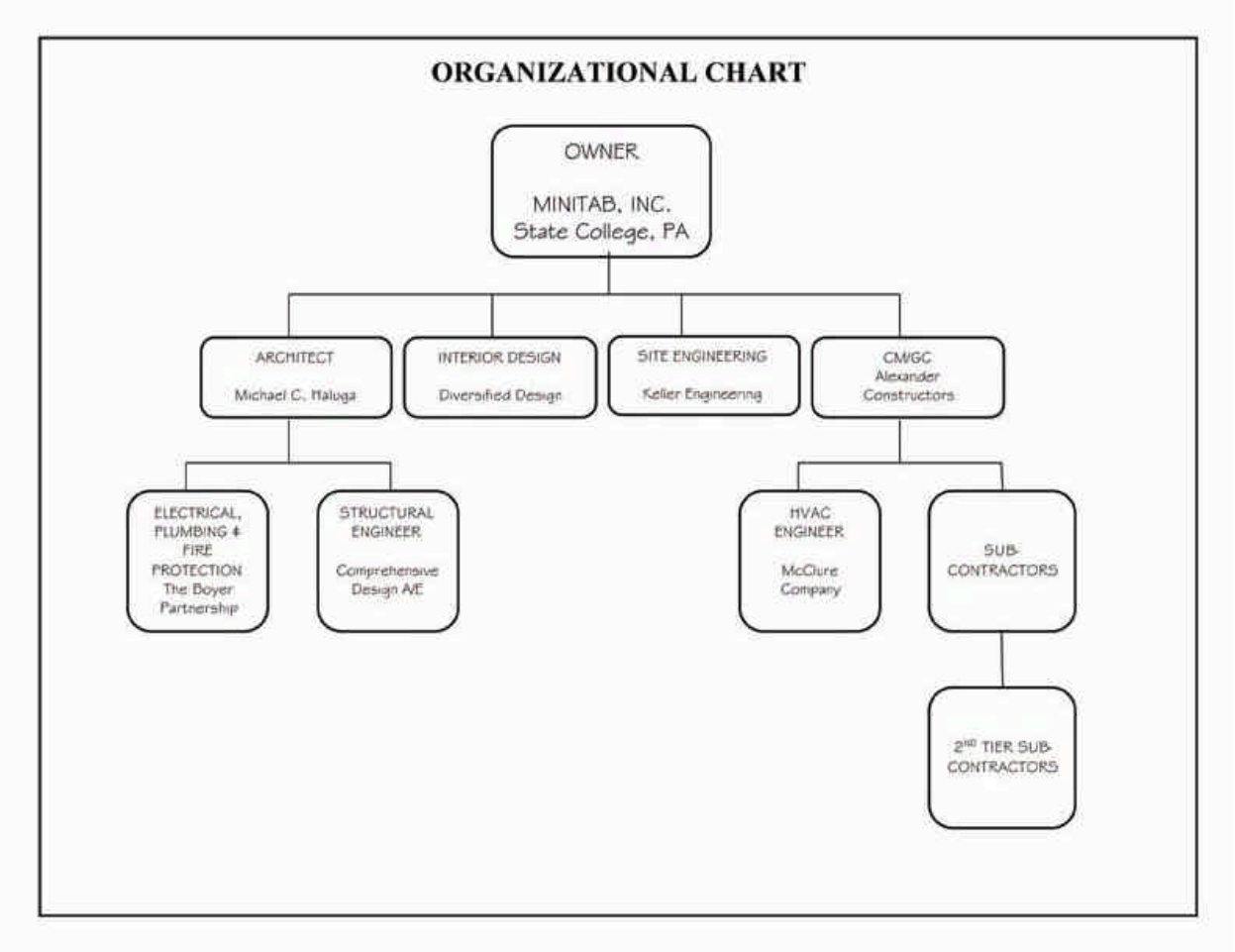


FIGURE 1: Organizational Chart

The contract between the owner and the construction manager; Minitab, Inc. and Alexander Constructors, Inc., respectively, is on the terms of Cost plus Fee with a negotiated Guaranteed Maximum Price (GMP). The intent of this setup is to obtain cost estimates from all subcontractors based on Contract Document completeness at the time of quote. These numbers are used by the architect and owner as a guide to the design process.

Contracts issued separately, which are typically included under the construction manager, are for site work and interior design. The site engineer is contracted individually due to the completeness of design of the site plans. This enables the contract to commence and work to begin on excavation while other contracts are in the arrangement phase. Interior design is largely undeveloped at this point and therefore is contracted separately also. Work can commence in

other areas under established contracts and interior design development can proceed without affecting other areas of the work to a significant extent. The established contract arrangements provide for work to commence in a consistent manner and limit delay in work progress.

Owner – CM Contract

The contractual arrangement between the owner and the CM is Cost plus Fee with a negotiated GMP. The established GMP is subject to change by modifications of work by change order. Under the terms of the contract, the owner is entitled to all project purchase savings for work included within the GMP. The CM collects a fee of 3.5% for all work inclusive of the GMP and 5% on modifications to the scope of work determined through change orders. The owner holds 10% retainage on all work completed by the contractor until the date of substantial completion. After the date of substantial completion, the owner holds 5% retainage until final payment. Retention is not held on the contractor's general conditions or general liability insurance. Final payment is to be made no later than 30 days after the architect's issuance of the final Certificate of Payment. The final payment is to include the outstanding balance based on the contractor's schedule of values and the remaining 5% retainage. Acceptance of final payment constitutes an abandonment of all claims against the project by the contractor.

Insurance & Bonds

The contractor is to furnish both performance and payment bonds to assure that work is done according to Contract Documents and that the contractor remains current on payments of all related obligations. The contractor must submit a 'Certificate of Liability Insurance' prior to commencement of work on site. The insurance policies covered must be active from the date of commencement through the date of final completion.

Policy requirements include the following:

- General Liability
- Automobile Liability
- Excess Liability (Umbrella Form)
- Worker's Compensation and Employer's Liability

The owner is responsible to furnish owner's liability insurance and property insurance, including builder's risk "all risk" for the full amount of the contract sum plus any amounts additional by contract modification.

Each subcontractor is required to furnish a certificate of insurance prior to commencement of work on site to cover the following:

- Comprehensive General Liability
- Contractual Liability
- Automobile Liability
- Umbrella Excess Liability
- Property Insurance (if payment is to be received for stored materials)

All insurance policies must be effective from the date of commencement of work on site through the date of final completion of work. Should the contractor or any subcontractor default on insurance requirements per the contract, work must cease by the subcontractor at once until insurance policies are updated to meet contract requirements.

II. Contractor Selection

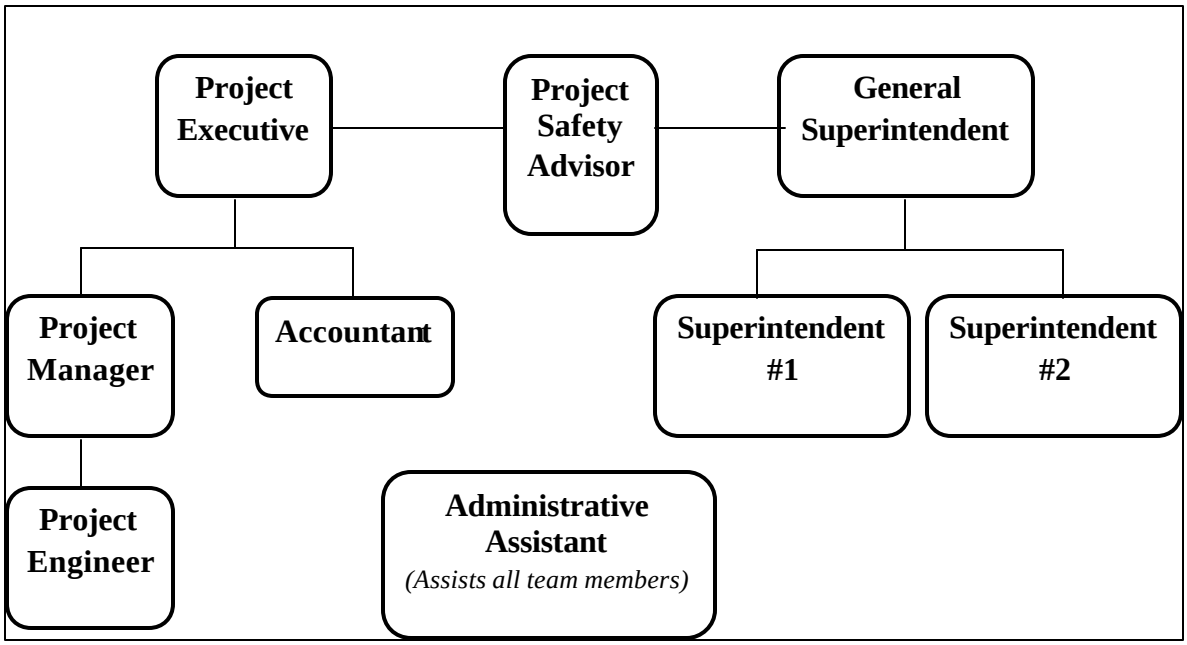
Contractor selection for the project was based on proposal. This process began with a request for qualifications. Alexander Constructors was then included in a list of three contractors who met the owner's determined qualifications. This was followed by a request for proposal and a proposal presentation. Alexander Constructors was awarded the project based on several factors.

- They presented a very experienced, talented team who proved capable of working well on this type of project.
- They have a local office and many contacts with local subcontractors; the architect and owner are also locally based. The owner felt that it beneficial to use all local team members to facilitate a successful design-build project.
- A large majority of projects in the eastern Pennsylvania are steel structure. Since Alexander primarily does work in this area, they are experienced with oversight of steel building.

Alexander was awarded the construction management contract in January 2001 and construction began in June 2001.

III. Staffing Plan

The team setup used for the Minitab project is typical of organization on Alexander projects. Each member serves a distinct role in a line-type organization. The superintendents, project manager, project engineer, and administrative assistant work out of the job site trailer. The project executive, safety advisor, general superintendent, and accountant are based in the Harrisburg office. The organization is as follows:

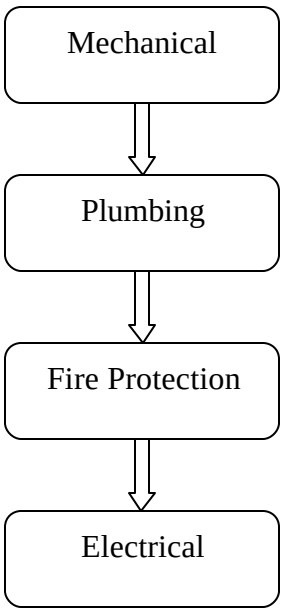


Title	Responsibility	Hrs./Wk.
Project Executive	Oversees multiple projects; monitors project progress, budget, and staff	2
General Superintendent	Oversees multiple projects; monitors project safety, construction methods, and manpower	2
Project Safety Advisor	Oversees multiple projects; monitors safety on the job site	12
Project Manager	Oversees 2-3 projects; manages project schedule, budget, contracts, and meetings	30
Accountant	Assigned to multiple projects; manages project finances	10
Project Superintendent	Dedicated to one project; manages construction process, monitors on site safety, project schedule and assists with updates, manages manpower	40
Project Engineer	Assigned to two projects; manages the submittal process, RFIs, and record documents	30
Administrative Assistant	Dedicated to one project; assists with project fulfillment requirements, filing, and telephone	40

IV. Design Coordination

Coordination between the mechanical, electrical, fire protection, and plumbing contractors began prior to the start of construction. Plans were reviewed in detail and each contractor prepared a set of shop drawings on vellum so the drawings could be overlaid to identify conflicts. Meetings were held as needed prior to the start of construction to ensure that all systems were coordinated per the shop drawings. After commencement of the project, coordination meetings were held weekly as a means to follow up on previous coordination plans, to address current conflicts, and to predict conflicts that may arise in the near future.

Work began with the mechanical contractor, as the mechanical system consumes the most space on this project. Each office is serviced by its own heat pump which is located above the ceiling in the hallway. The plenum ceiling also serves as the return air source, the mechanical contractor directs installation of above ceiling items. Following mechanical installation was plumbing, fire protection, and electrical, as shown below.



Progression of MEP Work

The greatest challenge to MEP coordination arose from ceiling height discrepancies. The roof slopes inward and therefore leads to very little plenum space toward the center of the building. At the outermost wall of the building there is up to 18" of plenum space, while the minimum amount of space is 7" in the center. Also causing conflict of plenum space were 11" light cans. The lights further diminished available space and posed a challenge to coordination of above ceiling work. Due to the fact that extensive coordination efforts were made in the beginning of the project, most conflicts were avoided. Field conflicts that did arise were dealt with in a timely, organized manner.

Several inspections and tests must be done throughout MEP construction and upon systems completion. The local code governing authority, Centre Region Code Administration, must inspect and certify all equipment wiring. Sprinkler plans and hydraulic design calculations must be submitted to and approved by the owner's insurance underwriter and stamped by a licensed professional engineer prior to shop drawing approval by the architect. After installation of the fire protection system and plumbing systems, there must be a hydrostatic test performed on both systems where each is tested to hold water pressure for two hours. Testing and balancing is performed on the mechanical systems and the electrical system requires load testing on all panels. All systems must meet the requirements of each test prior to architect's declaration of substantial completion.

V. Project Controls

Cost Control

Project budget is monitored and maintained by the project manager using accounting software which is shared over the company network with the accountant. The project manager processes subcontractor applications for payment and develops the contractor's application for payment each month. He forwards this information to the project accountant, who reviews the information and approves payment. A 'Job Cost Report' is issued from the project accountant monthly. This enables the project manager to closely monitor spending on the project and keep the schedule of values updated.

Schedule Control

The project manager also updates the project schedule with assistance from the superintendents. The superintendents monitor project progress and the project manager ensures that the project is on schedule. The project manager and superintendents hold weekly schedule review meetings to ensure that work is progressing as necessary.

Quality Control

Through the submittal process, the project engineer ensures that all materials and methods used are according to the contract documents and also conducts field inspections to confirm that submitted materials are in use. The superintendents monitor quality on a daily basis. They are responsible to inspect that all work being done is in accordance with the contract documents and local code requirements and ordinances. The project safety advisor also reviews completed and in-progress work when he is on site.

Safety Control

It is also the superintendents' responsibility to enforce rules of job site safety. Alexander has established its own safety requirements in addition to those ordained by OSHA. These requirements are included in each subcontract and therefore contractors are bound to adhere to the prescribed safety rules. The project safety advisor is typically on site twelve hours per week and performs a comprehensive safety review of the project each time he is there. Project

controls, to some extent, are each team members' responsibility. Anyone who witnesses work going on that does not meet Alexander standards of workmanship reports the incident to the appropriate task manager immediately to avoid detrimental effects to the project.

VI. Building Systems Analysis

Structural System

The building has a structural steel frame. Determining factors in choosing this structural system include cost, schedule, effectiveness of system and system availability. The total cost of the structural steel system is $900,000. Steel is the most economical option for the structural system due to the fact that most construction in Pennsylvania is steel structured and manhours required to erect steel are lower than required labor for other structural systems, such as cast-in-place concrete or precast concrete.

In terms of scheduling, the erection of the steel frame took two months, 35 work days. The erection went quickly as there was much repetition in the structure. Bays are typical 24'-4" x 19'-9"/19'-5" with a 14'-0" floor height. These frames are repeated for each of the four floors with modifications required around the open atrium in the center of the building.

Analysis of using either cast-in-place or precast concrete as alternatives to the steel frame proved to be ineffecient in comparison. The repetition of the typical bays would aid in the use of cast-in-place since forms could be reused. Precast is also a viable alternative, again due to the repetition of typical frame layout. Cast-in-place is significantly more time consuming than steel due to time required for setting forms, placing rebar, pouring concrete, and removing forms.

In the use of the structural steel frame, it was very important to expedite the shop drawing process so that fabrication could begin. Upon delivery to site, two mobile cranes were used to set steel and the entire frame was completed in 35 workdays, which was 5 days under the schedule budget.

Exterior System (Façade)

The exterior skin of the building is comprised of prefabricated EIFS panel assemblies and 4 foot seamless mullion ribbon windows, as shown. Below the bottom run of windows, the building is masonry. This system resulted in many joints in the EIFS panels, which characteristically lead to moisture problems. Centre Region Code Administration issued a new regulation regarding the use of EIFS just prior to the start of construction. The new regulation required the use of a stipulated water managed system to control water seepage behind the EIFS panels. The original estimate for the system

was $12.25/SF at 23,000 SF for a total of $282,000. The new regulation requirements increased that amount by $70,0000, which was taken out of the project contingency. The total adjusted cost of the EIFS system was $352,000.

The EIFS system was chosen for aesthetic appeal as well as cost considerations. Consider brick as an alternative. Brick has a typical installed cost of $18/SF, for a total of $414,000. This is $132,000 over the original EIFS budget and $62,000 over the actual cost of the EIFS system. Brick is a much more durable material and does not pose the moisture problems that have been evident in the use of EIFS systems. Although brick is significantly more expensive than EIFS, there would be a savings in building maintenance costs over the life of the building that would be expected to counter the cost difference.

Technical System

The HVAC system for the building was developed on a design-build basis by McClure Company. The total cost of the system is $1.5M and includes a geothermal heat pump system consisting of 100 wells each drilled to 400 feet, a 100% outdoor air system, and individual heat pumps for each office (approx. 280 heat pumps total). A geothermal heating system was chosen due to its lifetime cost saving benefits. The high initial cost of the HVAC system is intended to be recovered through the cost savings associated with the design. One cost savings will come from energy savings by use of the geothermal system which will significantly reduce heating and cooling cost for the building. The other intent of the design in terms of cost savings is to maximize personnel productivity. By providing each office with a personal heat pump and thermostat, each employee is able to adjust their work environment to meet their personal comfort level. The intent of the design of the HVAC system is high indoor air quality and personnel comfort. When each of these criteria are met, productivity is maximized.