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American Speech-Language Hearing Association National Headquarters
Rockville, MD
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Final Report

American Speech Language – Hearing Assoc. National Headquarters

Rockville, MD • Michael V. Abbondante • Construction Management

http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/MVA107/

Structural:

-Slab on Grade with C.I.P. piers, foundation walls, and grade beams.

-Structural Steel Skeleton above grade

-- Shear walls used for below grade support

-- Glass curtain wall, and pre-cast panels connected to steel for facade

Building Overview:

Name: American Speech Language -Hearing Assoc. National Headquarters

Location: Rockville, MD

Use: Office Space

137,000 Sq. Ft.

5 Stories Above Grade 2 Below Grade

Project Costs: $23 Million

LEED Silver Rating

Construction: July '06 – October '07

Mechanical:

(2) 200 Ton Chillers with condenser and evaporator

-(2) Cooling Towers

- Heat Recovery Unit

-8000cfm ahu

-25000cfm ahu

-(3) 22000cfm ahu

-23000cfm ahu

Architecture:

-Glass curtain wall consisting of seven different types of glass including two storefront glasses, three different glass finishes, and two spandrel glasses.

-The remaining facades are three different types of pre-cast concrete. Each is a different shade of grey. The darkest of which is used to emphasize aspects of the facades.

-Small Metal Panels will also be included on the curtain wall and facades. They provide no structural support but help highlight the building.

Project Team:

Owner: American Speech Language – Hearing Assoc.

Developer: AtSite Construction

Construction Manager: Davis

Architect: Boggs and Partners

Structural Engineer: Cagley and Associates

MEP Engineer: Vanderweil

Lighting Electrical:

The lighting electrical is a separate bid and is still in the design phase.

Executive Summary:

The ASHA is a non-profit organization that is in the process of construction of their new headquarters in Rockville, MD. This project offered many interesting opportunities in the field of construction management involving all aspects from cost and schedule analysis to sustainability and procurement methods.

The ASHA is attempting to attain a LEED silver rating for sustainable design. Green Globes is a new sustainable rating system introduced to America in 2005. This analysis is designed to compare and contrast the systems through surveys, case studies, and by comparing the scorecards of LEED and Green Globes in reference to the ASHA headquarters. These comparisons will not only give insight for the ASHA project but hopefully for sustainable rating in the future.

Traditional design-bid-build was used by the ASHA. However many procurement methods offer different opportunities such as bid-build. Each of these systems is compared through the advantages and disadvantages of both from an economical stand point to the opinions of multiple owners in the construction field. The ASHA was then analyzed based upon the owners opinions as well as an economical standpoint and the better of the two systems was selected. This study also hopes to show what may become the future procurement method for construction.

Energy efficiency of the ASHA building is extremely important especially with a LEED silver rating attempt. The windows of the building were replaced by multiple low energy high efficiency windows and then through EQuest calculations were run to compare energy savings. Finally the prices of the windows themselves were compared and an analysis was completed of whether or not the energy savings were efficient enough for the higher initial costs.

The columns of the building were originally designed as steel to reduce the schedule and complete the building faster. Using pcaColumn the steel was then re-designed as concrete members and the savings were calculated. The extension in the schedule do to the concrete was also analyzed to determine the cost of back renting to discover if the material change was cost effective.

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Joseph Abbondante

BUILDING STATISTICS:

Name:

American Speech-Language Hearing Association National Office

Location:

Rockville, MD

Function:

Office in suburban area of Maryland

Size:

137000sq ft office

Stories:

5 stories above grade 7 total levels

Project Team:

Owner:

ASHA

CM:

Davis Construction davisconstruction.com

Development Team:

Atsite Construction

Building Arch.:

Boggs and Partners Architecture boggspartners.com

Structural Eng.:

Cagley and Associates cagley.com

MEP Eng:

Vanderweil vanderweil.com

Civil Eng.:

Loiederman Soltesz Associates lsassociates.net

Landscape Arch.:

Lewis Scully Gionet lsginc.com

Construction Dates:

July 1, 2006 – October 15, 2007

Cost:

Building:

23 Million

Soft:

Owner Restricted

Total:

23 Million

Delivery Method:

Guaranteed Maximum Price

Design/Functional Components:

LEED silver rating building that will act as an office building. The building will be a standard office building that will hold the administration offices of the national headquarter for the American Speech-Language Hearing Association.

Codes:

Building, Plumbing, Mechanical:
2003 IBC

Fire Prevention:
NFPA 2003

Sprinkler, Fire Alarm:
NFPA 1999

Energy:
1998 International Energy Conservation

Elevator:
MD State Elevator

Handicap:
ADAAG latest edition

Zoning:

City of Rockville Falls Grove Development Guidelines

Site Zoned:
CPD-0004

Site Area:
7265 Acres

Footprint:
24116sq. ft

Gross Floor:

Lower Level Parking	0sq ft
Mid Level Parking	14622sq ft
Plaza	23285sq ft
Second	24116sq ft
Third	24116sq ft
Fourth	24116sq ft
Fifth	23615sq ft
Penthouse	3200sq ft
Total	137070 sq ft

Height:
83ft 6in

Historical:

N/A

Envelope:

The envelope consists of structurally reinforced pre-cast concrete. The concrete façade is used on three of the buildings sides. It is an architectural concrete with three specific colors used for the concrete. Each consisting of a white, gray, and slightly darker gray, on the fourth side of the building and entrance of the building a glass curtain wall is in place. The glass rises on the upper four stories of the building and is surrounded by metal panels. The pre-cast section of the envelope also has strip windows on each of the levels. The roof is a TPO or thermoplastic membrane roof with insulation underneath that rests on metal decking.

Structural System:

The structural system is an interesting one in that it is an integrated steel and concrete building. The building begins with a simple poured in place concrete slab. Then concrete columns will be poured on for the below grade levels. Two of the seven total stories are below grade. The columns are highly repeatable and are primarily 18x30 columns at 5000psi. In each of these columns 9 #7 rebar are used to help with tension support. Once the above grade levels are reached the system switches to a structural steel system, in which the pre-cast panels and glass curtain wall will be attached to. The steel columns vary in size but the two primary columns used are 14x53 and 12x40. A steel deck is then placed on top. The decks are two inches thick and are 18 gage. The concrete beams that will have to be poured on site for the lower levels range from 10x23 to 30x24 with the most common size being 12x18. Most of these beams again have #8 and #9 rebar in them to help with tension. Finally the building has seven shear walls that are of 4000psi concrete and simply help with structural stability.

Mechanical System:

The mechanical system in the ASHA headquarters consists of two 200 ton chillers with condenser and evaporator, two cooling towers on the roof, a heat recovery unit, and air handling units. The mechanical room is located in the penthouse on the top floor as well as the roof for the open cell cooling towers. The heat recovery unit is located in the penthouse and serves for ventilated air. There is one air handling unit per floor each of a slightly different size due to the size of the floor and its primary purpose. The first floor contains a 25000cfm, the basement has a 8000cfm air handling unit, and the second, third, and fourth floors all contain 22000cfm air handling units while the fifth floor has a 23000cfm unit. There are two open cell cooling towers on the roof of the building. Each acts as a condenser and is an induced draft counterflow cooling tower. The two water chillers are centrifugal. The pumps that are contained in the chiller plant are composed of three primary chilled water pumps and three condenser water pumps. Each floor also

consists of a set of diffusers and the fire suppression system is simply the sprinkling of the entire building.

Electrical System:

The electrical system has not been completely determined due to the fact that the space is not being fitted out yet. The electrical will come in the next awarded bid. However in the lobby lighting has been determined. The only thing determined for the lighting in the lobby is the lighting fixture schedule. The size of the lighting for the requirements as well as redundancy will not be determined until the next bid is awarded.

Building Façade:

The building façade is very unique and interesting. It consists of not only a glass curtain wall with multiple glasses, pre-cast concrete panels with different finishes, but also uses steel on the façade for aesthetic purposes only. The glass curtain wall with the primary wall and faces the road but also south which will help with energy absorption and the LEED rating. There are seven different types of glass used on the curtain wall. There are three different types of vision glass that are used on the upper levels primarily are being inserted as gigantic sheets. There are two types of spandrel glass being used, primarily for narrow strips that run across the curtain wall as well as for the strip windows on the other sides of the façade. Finally on the lower levels at ground level two types of storefront glass will be used. One will be tempered and the other will not. The curtain wall also is using metal panels. These will simply be for aesthetic purposes only and will be attached in a similar fashion as the glass. They will be used to help differentiate the levels as well as help the building stand out. One the other sides of the façade three different pre-cast panels will be used. They will vary in color from a light grey, dark grey, and near black color. These are simply being used for aesthetic purposes. The dark black panels are spandrel panels and will be used to primarily "highlight" areas rather than provide the primary closure of the building.

Project Schedule Summary:

The Schedule in appendix a the schedule of all major milestones of the project as well as the important concerns for Davis Construction during preconstruction.

The foundations are very simple but contain a few key elements during construction. The under slab piping must be laid not only on time in order to maintain the schedule but also properly. If there is a problem with the piping and it is not discovered until after the first pour. Either certain pipes or utilities will have to be above the slab or certain areas of the slab may be torn up so that the piping can be corrected. This could and would have a serious impact on a schedule that is crucial to this project. Obtaining the building permit is also essential because the job will be forced to wait until the building permit is obtained which is scheduled to be obtained just before the first pour which again could lead to schedule difficulties. Also the slab will be completed in four pours while walls and other pours occur in-between. If the slab pours are delayed or are not poured properly so that they mesh together re-pours may need to occur again greatly affecting the schedule.

The steel is also a key element. It is important that the steel be erected on time. Not only is obtaining the steel on time important due to its lead time but erecting it quickly is essential. As multiple levels of steel are erected at once such as the second and third floor the concrete for those floors will be waiting until the erection is complete. Meanwhile while pours are occurring the upper floors of steel will be erected keeping the schedule concise and time dependent.

The sequencing of this job is very straight forward. The project will begin with the basic site work and then continue out of the ground. Once the floors begin to be poured and the steel is placed the mechanical systems will be installed. Since there are no real concerns with interior delays due to the lack of an electrical system the overall

enclosure of the building is what is considered most important. Therefore, the project will place the steel and pour all of the floors. Once this is complete the curtain wall and enclosure will begin. While enclosure begins the mechanical systems will begin to be placed at the same time, that way time can be saved in the schedule.

SITE LAYOUT PLANNING:

The advantage to having the project be found in Rockville, MD is that there is very little or no concern for site congestion. Although the site has little to worry about with congestion of other buildings due to the speed of the project it is essential to have the site laid out properly to conserve the most space throughout the project.

While setting up the site one of the essential aspects was having the sediment pond immediately set up. The pond then had a pipe run to it so that any rain water that could have ruined the site due to the water tables was avoided. It was also decided that two different cranes would be used throughout the project which was essential to the sequencing. The project would begin with a tower crane to help with the C.I.P. and formwork. Once the site work was completed the crane would be disassembled and removed from the site and a mobile crane would then enter the site. The mobile crane simply allows for better mobility and for more lifts to occur in a day. The building is not very high, but it is quite long and oddly shaped. Therefore, a tower crane may have difficulty with some of the lifts while a mobile crane could simply move to the most convenient location and continue with the lift.

Although there are no surrounding buildings, the building footprint, stockpiling, and pond all require a lot of the land. The land on the project is the only available place to store machines, workers need to park, and trailers needed to be placed. Access to the site became an essential concern. Trucks and other equipment needed to easily be able to leave the main road enter the site, drop off or pick up the necessary items and leave again. The main access road then became a simply u at the beginning of the site that could be easily accessed and parking was available just off to the side for both workers and machinery that would allow them all to be off and out of the way of construction.

The trailers and temporary utilities were then placed near the road that way

workers and subs could easily access the trailers and they were close enough to the site that it was easy to observe what was occurring on the site. Although the site is large the same rules apply on the importance on conserving space and maintaining easy access are essential to every slight plan. A site layout plan can be observed in appendix b.

SUSTAINABILITY DEPTH:

Problem Statement:

Currently in the construction industry there are multiple sustainable rating systems for green buildings. However, there is no uniform rating system used by all sustainable design in the United States. Instead the United States has multiple programs each popular for different reasons, but each being selected at an owner's discretion. With the ever growing popularity of sustainable design and green buildings it is crucial for the convergence to one rating system.

Analysis Goal:

The two most popular systems currently used are LEED and Green Globes. Through this analysis it will be determined which is currently the more appropriate and progressive of the two systems for the future of sustainable design. Also there will be an analysis to the ASHA which was LEED rated as a Green Globes building and to define the differences between the two.

Summary:

Sustainability has become a high priority interest within the construction industry. Not only is the actual sustainable design a concern but also how these designs will be ranked and compared to other buildings to show sustainable prowess. The most common and popular system is the LEED rating system, however many new sustainable systems have been organized and are gaining popularity. The most popular of these new systems is Green Globes. This depth will compare both the Green Globes system as well as LEED system not only on technical levels but also through the opinions of those currently in the construction industry from owners to project managers and their opinions of each.

Both systems are similar but it is the subtle differences that impact the opinions of so many. LEED is considered the more complex of the two systems, but uses its history as well as in depth rating system to gain popularity and develop the rating system. Green Globes on the other hand focuses on a simpler rating model that can be completed by anyone, and the sustainable process can be rated from design to completion. However some feel that because the system awards points for not only the thought but also the completion that a rating can be given while the building itself has no true green attributes. Although both systems receive mixed emotions and on some levels are quite different both programs' primary goals are to allow for an immediate and measurable impact on the buildings performance.

LEED:

LEED accreditation was created by the United States Green Building Council, or more commonly known as the USGBC. The USGBC is a "coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work." This group was primarily founded to bring sustainable awareness to the rest of the country and show the importance of green buildings. The LEED rating system came into inception in 1998. It is considered to be a scoring system based on the "consensus" of a diverse group of members from the USCGBC. In order for a LEED point to pass, a two-thirds majority must approve the concern or idea. Since LEED was the first sustainable rating system in the United States it has quickly become the most popular among those in the industry today.

Although the LEED system is moving to an online application system it is currently paper based. The LEED certification method requires a highly knowledgeable individual on the project to be able to ensure that the LEED points of interest are being fulfilled. The LEED system can only be awarded by the Green Building Council and will

only be awarded if the checklist document is in compliance with the restrictions placed by the rating system. LEED is based on a point system and one point is awarded for specific criteria covered on the project. At the end of the project a LEED “checklist” is completed and filed to the GBC or Green Building Council. After inspection of all of the points the project will receive a specified rating.

LEED ratings are based on the amount of points accumulated at the end of the project and will allow the project to fall into one of four levels; LEED certified, silver, gold, or platinum. Points can range from the minimum of 26 points for certification to the most possible 69 points, which is for a platinum rating. These points are awarded over six major areas that are considered most important to the construction industry; sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design-process. Before a LEED rated project can even be awarded points the project must be registered and accepted by the board. Therefore, certain requirements must be met on a project even before points can be awarded and a LEED rating can be given.

LEED is a highly in depth rating system that requires great knowledge of both the project and rating system itself. The points awarded to the project will only be awarded by LEED at the end of the construction process. There is no third party analyzing and scoring the information through different the different aspects of construction from schematic design to final construction.

Green Globes:

Green Globes actually originated in Canada in early 1996 as a BREEAM project or Building Research Establishment's Environmental Assessment Method project. A system was designed to simply rate existing buildings on a sustainability level. This project quickly grew and over the years has evolved into an online survey rating system of the sustainability of construction projects from Canada to the U.K. In 2005 the Green

Globes initiative was adopted in the United States. Shortly thereafter in late 2005 the Green Globes system was the first sustainable rating system used by the ANSI or American National Standards Institute.

This rating system is very unique in its methodology. Projects are entered into an online account. Then through a series of survey questions, standard points are awarded to the projects, which are then accumulated to receive a Green Globes rating. Green Globes prides itself on the simplicity of its survey and the fact that any member of a project team with a basic knowledge of the project at hand can input the data for the rating. The Green Globe rating system is completed throughout the project. The point accumulation can begin at the schematic phase as green design is implemented into the project and continues all of the way through completion. Partial points can also be awarded throughout the process if a project attempts a design, but can not complete the design due to restrictions. This is done to avoid point chasing. As the design changes the input in the database can also be changed. This allows for the rating to be up to date at all times and keeps the project team informed on the potential rating of the project.

The rating system has four levels of approval. These levels are based on points out of 1000. These points are awarded based upon seven criteria; project management, site, energy, water, resources, emissions and effluents, and indoor environment. At the end of a project a third party is required to analyze the data input by the construction agency, to ensure that all the points awarded are legitimate and that a specific percentage can be awarded the project to achieve its rating. The ratings are one, two, three, and four. 350 points or a 35% will award the project of a rating of 1, and a score of 850 or 85% or above will allow the project to achieve a rating of 4.

The Green Globes system allows for a simple input of data by any member of a project team throughout the project, from schematic design, until actual completion of the project. The system is then rated, not only for standard points awarded but points can

also be awarded based on a design and outcome basis. Points are then examined by a third party and the appropriate Green Globes rating is given.

Comparison:

While both systems appear to be quite similar, after the surface has been scratched on each method the actual rating systems appear quite differently. Both systems have four levels of ratings from one to four globes for Green Globes, and accreditation to platinum for LEED. Also, according to a study from the University of Minnesota 80% of all aspects of Green Globes are represented in the LEED system and 85% of aspects from LEED are represented in the Green Globes system, however as shown by the same study, systems not only are some of these points in different aspects of the rating systems they are also awarded different points. Green Globes focuses the majority of its points on energy use of the project while LEED focuses the majority of its points on the materials selected. Therefore, although both are intended to rate the overall sustainability building, they simply go about the rating process differently, which can make a comparison slightly difficult.

Points become a concern on the prerequisites of a building to attain a rating. The LEED system requires specific prerequisites to be attained before the project can be LEED rated. These same prerequisites in Green Globes can gain approximately 60 to 70 points for the project. Some critics of Green Globes complain this can make a Green Globes accreditation that much easier since a one globe rating is only at 350 points. Another point of interest in this debate is the opportunity for partial points. Green Globes will award points for not only an outcome but also a design, whereas LEED simply awards points based on a completion basis. Those supporting Green Globes point out that this will avoid an attempt to reach for points in the LEED rating by not only rewarding the outcome but also the design. However many of those in favor of LEED point out that this can be a deceiving attainment of points by Green Globes. They

criticize that a project under Green Globes could award points for design and also the outcome to attain a rating, but the rating is skewed since the points awarded for the design will help the outcome and may not have actually affected the final system outcome.

Currently, a few aspects are directly in favor of Green Globes over LEED, specifically, the cost, the accessibility to anyone, and the ANSI approval. To attain a LEED rating, depending on the project, the cost for certification can be quite expensive, whereas Green Globes uses a flat rate for the project and then the accreditation process cost can fluctuate but is still much lower than that of the LEED. Green Globes, as stated before, can also be used by any individual with a basic knowledge of the project. The simple yes/no questioning is criticized since points can be gained and lost in grey areas throughout the project, but unlike LEED the project does not require someone with a vast knowledge of both the project and the rating system. Most importantly is that Green Globes has attained an ANSI approval which will help with its popularity among projects in the future.

Industry Surveys:

The interview questions that were used in an attempt to gain overall opinions on sustainability, with a focused judgment on both the LEED system as well as Green Globes system can be found in appendix a. These interview questions were asked to those it most affects in the industry, from highly experienced owners to new owners, as well as large general contracting companies and smaller more focused market construction managers.

The survey expressed one consistent theme with everyone that took it. That is that sustainability is essential to the construction world and the future of the industry. It is important that the industry slowly begin to change and accept sustainable design and green buildings on a much larger scale. With the continuing evolvement of past rating

systems as well as that of the creation of new ones the industry must be willing to accept change and that all construction companies must begin to prepare for the future of green construction.

Although the survey expressed very similar opinions about the future of green construction and the need for change in the industry, the views on sustainable design ratings varied greatly from owner to owner and company to company. Many owners were intrigued by LEED which seemed to be the most familiar system to the owners. Since it is also currently the most popular system in the United States, it is what most owners concern themselves with in order to “remain competitive”. Some owners are welcome to the use of a new system but remain concerned with the future popularity of the system and its overall “effect” on the industry. Since LEED is currently so popular with owners in the U.S. many large companies ensure that members of their staff are LEED certified and can complete a LEED project. Companies will admit that it can be troublesome at times with the scorecard and its complexity. However, since members are already LEED certified, they are already familiar with LEED and simply need to become familiar with the project at hand. Large companies also support rating systems such as Green Globes because of the simplicity of the system. Not only can anyone on the project team input information, the project is continually updated so the company always has an idea of how close the project is to attaining a rating.

Many new owners were supportive of LEED because of its popularity. However, newer programs, such as Green Globes peaked their interest. Not only with the overall cost of the system, but also the potential to attain a slightly higher ranking due to the ability to attain points from design and through the qualifying process. The ability to gain attain points in the design phase of a project may also affect procurement methods in the future such as design-build. The ANSI approval also provides an interest to many owners and its influence over national standards and the future of green buildings.

The problem faced by many smaller construction firms is the cost of becoming LEED certified. LEED certification, although not necessary for a LEED project, helps greatly since project managers are already familiar with the points and the system. Since many small companies may not have many LEED certified employees, it can make a LEED project very difficult and may cause some companies to pass on a project. This is why a system such as Green Globes presents a great opportunity for smaller companies. The system requires no true training and can be performed by anyone familiar with the project, allowing the company not be forced to stretch thin on specific projects.

Although LEED is currently at the forefront of green buildings and sustainability, Green Globes is a fairly recent system. If used by enough owners and companies, it could quickly become more popular with its simplicity, ANSI approval, and cost effective nature. The problem however is the lack of knowledge on this system and the overwhelming industry use of LEED.

ASHA Analysis:

The ASHA owners determined that LEED certification would make a statement as a non-profit organization in the D.C. area. They are attempting a LEED silver certification that would be equivalent to two globes in the Green Globes rating system. As new owners, LEED was recommended to them and like so many “young” owners they decided that LEED would be the best system to use on the project based on its popularity. However, Green Globes presents an ANSI approval and would have been less expensive, while possibly providing an equal if not higher rating for the project. Again the problem facing Green Globes is the owner’s want to remain on the cutting edge and want to be compared to other sustainable buildings.

The LEED scorecard, which is currently being used by Davis Construction, which can be seen in appendix c was taken and compared to the Green Globes point scoring system. Points were scored on the Green Globes system as they corresponded to the

LEED scorecard; if information was other general information was able to be attained from Davis the appropriate points were also scored. A potential Green Globes score was then awarded to the project. The project received 580 out of a potential 1000. This would allow the project to achieve two green globes. The minimum for two globes is 550 points and to achieve a three globe rating the project would have had to receive 700 points.

Green Globes Summary		
Project Management (40/50)		Indoor Environment (111/200)
Site (65/115)		Water (55/100)
Energy (241/360)		Resources/Building Materials (40/100)
		Emissions and Effluents (28/75)
	Final Score (580/1000)	
	Green Globes Score: Two Globes	

As pointed out earlier, although both systems present themselves as systems that can give an environmental rating to projects, they still have their differences. The questions that are proposed in Green Globes are simpler, with only yes and no answers, rather than having to reference multiple handbooks or having a broad based knowledge of the system. The concern between the rating systems is finding the appropriate corresponding points between the two systems. Both systems are organized very differently and those found in energy of LEED may be found in not only energy but also emissions and effluents. Another probable concern is that Green Globes presents the opportunity to score points in many aspects that LEED does not. Therefore, the above score for two globes is highly conservative. Specific topics could not be completed on the Green Globes scorecard because LEED did not have a matching topic in its scorecard. When new information was attained from Davis points were scored on the Green Globes scorecard if possible. However, with simple adjustments to the project as well as

reconsideration in the design phase it is highly probable to achieve the 700 points required for three globes.

Case Study Research:

The University of Minnesota's Dr. Timothy Smith completed a Green Globes and LEED comparison on a courthouse in Washington D.C. He too found that it can be quite hard to compare the two rating systems. Although the two systems are somewhat compatible the difficulty is reached between the importance of each area as well as the few areas that are and are not in the comparable system.

University of Minnesota's D.C. Courthouse Analysis		
Rated Topics	***LEED (%of pts attained)***	***Green Globes(Percentage of Points attained)***
Sustainable Sites	70	96
Water Efficiency	60	32
Energy/Atmosphere	11.7	54
Materials/Resources	30.7	31
Indoor Environmental Quality	53	58
Management*	n/a	94
Emission Effluents*	n/a	37

Dr. Smith determined that it seemed much easier to score points in the Green Globes rating system. He also mentioned that there are 69 points accounted for in this project for Green Globes in site management which involves of the prerequisites and the ability to qualify for Green Globes. These points help greatly in affecting the final score. Not only are those points attained but as stated before energy, is the focus of Green Globes and in this project it was easier to score points as a Green Globes project. Although the materials are similar the score is a misnomer because just as in the ASHA project he was unable to determine the strength of materials which would only improve the number. Not only that but management and emission effluents are not rated in LEED and this also helps the project increase its value.

Just as in the ASHA project before this Dr. Smith determined that although the courthouse only attempted LEED certification, if the project had been approached as a Green Globes project it could have attained a two Globe rating or a LEED silver “equivalent”.

Conclusion:

Although LEED is currently the leader in green sustainability due to its overwhelming popularity and use as a “standard” for the past ten years with the progression of sustainability and rating systems it may be surpassed. Although Green Globes is only about two years old in the United States, it has an innovative idea that would allow a project team member to analyze a building not only at the end of a project but also during the design stages. It currently has some problems, such as the ease to be accredited points in some aspects and need for clarification in some areas, but with new versions being created to remedy these problems it maybe the future of sustainable design. It is already approved by the ANSI, and is user friendly, and cost effective. If the ASHA had used the Green Globes scorecard, the project would have easily scored two globes or an equivalent to LEED silver, with more analysis of the Green Globes scorecard and the potential for more points to be scored it may have been possible for the project to actually attain three globes or a LEED gold equivalent. If at the beginning of the project Green Globes had been considered the project could have been re-analyzed and would have been able to score in those categories that are not considered in LEED. It would have been able to achieve more “easy” potentially allowing for a three globe score. As awareness increases the ability to use the Green Globe system will grow.

Green Globes is an outstanding program that through corrections and specifications could very quickly become the most popular system for rating systems. It is competing against the popularity of LEED, its overwhelming strength as more

individuals become LEED certified and the owners and construction companies that prepare to use LEED as their rating systems.

PROCUREMENT METHOD DEPTH:

Problem Statement:

Design bid build procurement has been the primary method for years in the construction industry; however the design-build process is quickly gaining popularity. Design- build allows the construction team to input and help with the current design as the building begins construction. The young ASHA owners decided to have their headquarters built as a design-bid-build. However, with the schedule being so important a design-build method may have allowed the project to be completed earlier.

Analysis Goal:

Through the comparative analysis of both design-bid-build and design-build the proper method that could have been used for the ASHA headquarters will be determined. The project will be analyzed as well as other projects and reports for similarities and differences in the effectiveness of each method. Also a survey will be completed by those in the industry on the use of each method, their differences and the positives and negatives to each.

Summary:

Procurement methods have become an in integral role in the completion of a project and its efficiency. Like so many things in the construction industry such as sustainability change is very slow. Design-bid-build has remained the primary method used by the government, public, and even private owners. New and progressive ideas have been introduced such as design-build and these may increase the speed of projects and lower the overall costs of projects. Even if an owner would like to use a design-build method, some state governments will not allow publicly funded projects to use a design-build method. Design-bid-build may take longer to complete a project however some

owners want to feel very involved in the design process and some feel disconnected if a design-build method is used.

Procurement methods although still somewhat controlled by the government are truly based upon the opinion of the owner and what they feel is most important to the project whether that be the design, speed, complexity or cost.

Design-Bid-Build:

The design-bid-build process is straight forward and simple, for the owner and also all the firms involved. The owner begins by hiring a design team that will solely be responsible for the design of the building from start to finish. These architects and designers will be selected upon qualifications. The firms current work load, as well as former projects will be considered to select the proper design firms. Once the design is completed, it must be approved by the owner. Once the owner approves the design the bid phase will begin.

During the bid process the owner has multiple options. They can elect to ask for credentials and qualifications and then allow only specific firms to bid the job or they can simply open the bid to the public, which means that anyone who wishes may secure a bid on the project. Once the bids are submitted generally the lowest bidder will be awarded the project.

The final aspect of this procurement method is to build the project. Once the bid is awarded it is the job of the winning firm to begin construction and complete the project on time. This is straightforward method and understood by everyone in the construction industry, which helps its popularity.

Design-Build:

Design-build began in the construction industry as a third party agency. It was this agencies job to re-analyze the design in a design-bid-build project and simplify some

of the design or correct some of the mistakes made in the design so that those mistakes would not be multiplied through the entire project in construction. Eventually these third party firms either joined with a construction management firm or construction management firms began to become more involved in the design phases which are how the design-build process began.

Design-build is the conjoining of both the design firm and primary construction company. In some cases this can be one company that has taken on the role of both designer and builder. Mainly it is the two companies coming together at the beginning of the project and working together through the design, in an attempt to produce not only the finest architectural building but also the most economical design, which will simplify the design and hopefully speed the schedule and lower the cost.

Design-build also allows construction to begin before the designs are completely finalized. This allows construction to begin sooner and while the primary design may be nearly finished, this allows for adjustments to be made throughout the project until completion which based on the early start should be completed before a traditional procurement method.

Comparison:

There are many advantages and disadvantages to each system. Many times the procurement method depends upon the owner’s opinion of each method and what they prefer. Design-bid-build has the overwhelming advantage since it is the most traditional of the methods however that statistic is quickly changing as many owners are introduced to design-build.

Ironically the aspects of design-build that are able to save time and potentially save money are those that can scare many owners away. Some owners feel that contractors still control too much of the design process. Since the contractors own the primary contracts it is very easy for a contractor too overlook an architectural design for

simplicity and cost savings. Another common complaint is that owners do not always feel that they are apart of the design phase and feel withdrawn from the project they own. Government restrictions also play a part in the use of traditional procurement methods over design-build. Many state governments still restrict publicly funded projects. They refuse to allow any public funded project to be used on a design-build method; instead they are required to use the traditional method. The overwhelming use of the traditional method also influences new owners, since they can be unsure of what method to use and traditional appears the simplest. Complex design jobs also use a lot of traditional procurement. Traditional is common for complex jobs because the project design receives the highest amount of attention that it requires in order for the job to be successful.

Although traditional procurement is so highly influential, design-build is becoming very popular and for good reason. Many studies show that projects under the design-build method produce not only a more efficient project schedule, but also a lower cost. The design-build process is able to catch and simplify any possible construction complexities. In the actual construction, this reduces the amount of change orders that are required to be made and lowers the overall cost of the project. Below is a common table used that points out the common advantages of each method and helps an owner make a decision about the proper method to use.

Procurement Method Advantages	
Design-Bid-Build	Design Build
Not government restricted	Designer and contractors working together
Designer has full control of design	Less change orders during construction
Owner feels a greater part of design process	Overall faster schedules
Bid selection easy	Generally lower costs
Tradition	Construction begins earlier

These are some of the primary advantages but Richard Mayo in his book Construction Management Fundamentals points out these supporting reasons for Design-Bid-Build:

- Low bid regulations are firmly entrenched in most government systems for the purpose of promoting fairness
- It is easy to justify the selection of the low bidder. The fact that the bidder is low is irrefutable.
- Contractors understand the system
- Voters understand the system
- There is always resistance to change

Richard Mayo however also points out the importance of Design-Build as represented by the DBIA:

- Savings in unit cost of at least 6.1%
- Construction speed at least 12% faster
- Overall project delivery speed at least 35.5% faster
- Cost growth at least 5.2% less
- Schedule growth was at least 11.4% less
- Quality equal or better

Industry Surveys:

Members of the construction industry were surveyed about general opinions of procurement as well as their experiences involving the methods they have used. An example of the survey used is available in appendix d.

Owners were the primary concern for this survey since it is the owner that makes the final decision on the type of method used. The opinions were varied depending on the experience of the owner, as well as the type of the projects they were involved in. Small business owners and new owners still enjoyed the method of design-bid-build because of its simplicity. Small business owners enjoyed being involved in the design process and wanted to ensure that the design was exactly what they had envisioned along with the designers. They preferred the straight forward method of design-bid-build. From this method many owners feel that they were able to control the entire project from start to finish. The project begins with a design that they influence and also have to ultimately approve. The owner is then able to select the bidder and will use a lump sum value confirming the exact cost of the project for the owner. Then they are able to see the building throughout construction. Design-bid-build is still used by many owners today because of two primary reasons; a lot of owners prefer “control” in the design process and throughout the project and they feel that “control” is lost in a design-build method, and new owners feel confident with the simplicity of a traditional procurement method making the project seem easier to understand.

Owners however that produce larger jobs as well as a high amount of projects seemed more comfortable with design-build. These owners are more concerned with the bottom lines of moving individuals into a project and completing the project as cost effective as possible. When asked about no longer feeling a part of the design, a common response was that they were still the owner and had input on the design, they simply had to have their opinion heard so that specific actions were taken on the design of specific projects. More long-term owners understand the power that they have and control over a

project and are not afraid to use that power to make sure a project is completed as they expected.

Although there were differences of opinion between what method to use and why there were a few general consensus among owners. The majority of owners agree that a project method should not be determined or controlled by the government. Owners believe that they are capable of making educated decisions for what is best for a project whether the money be publicly funded or private. Owners understand the benefits of both procurement methods from simplicity and an overall understanding to looking for bottom line values of cost and schedule. However, many owners feel that the popularity of design-build will continue to grow in the industry as those in the industry become more educated of the system, its benefits, and the ability to still control a project while allowing constructability to be taken into consideration in design.

Conclusion:

ASHA elected to use a traditional procurement method of design-bid-build for a few reasons. This was the organizations first building project and they act as a non-profit organization that is run through the government. As younger owners, the ASHA elected a more standard system that allowed them to be involved in all aspects from the design phase to the final construction. The government is slowly beginning to use design-build as a procurement method, but it is still not a standard. Therefore, they also wanted to use what currently is the "standard" of the government which is design-bid-build.

Although these are understandable reasons for an organization to use a traditional method, design-build does offer some outstanding opportunities. The overall design of the building, besides a glass curtain wall on the northern face, is fairly simple. This may have allowed the contractors to not only simplify the design and save money, but the schedule may have been shortened. The ASHA is currently paying back rent on their old building until this construction is complete. Therefore any increase in the final completion date of the project would be of monetary value. For this to occur though

some of the design may have been impacted and the ASHA wanted to make a statement with this new building, which is important to any owner.

For such a young owner having a publicly funded project the traditional method is logical. If the project bottom line of schedule needs as well as cost of the project were re-analyzed a different method may have been selected. As a non-profit organization, money is always important and if certain design steps could have been simplified, money could have been saved. The project schedule may have also been able to be shortened, helping with the rent and allowing those leasing the upper floors to move in sooner which helps the ASHA make money. Overall the financial aspect may outweigh that of a first time owner or being a part of every aspect of the design. Therefore a design-build method may have lead to the greater rewards at the end of the project and possibly should have been selected.

MECHANICAL BREADTH:

Problem Statement:

The ASHA is attempting a LEED certification. An aspect of this consideration is energy efficiency. Currently the system uses not only an efficient mechanical system, but also uses multiple single low energy windows in order to conserve more energy and improve the overall LEED rating. With more efficient windows the project may be able to not only score LEED points, but also re-size the mechanical units to possibly save money.

Analysis Goal:

The current mechanical system as well as windows will be input into the mechanical program EQuest. A baseline calculation will be made to determine the current energy output. While allowing the mechanical system to remain constant more efficient windows, such as an electro double window or possibly a double low energy window or quadruple low energy will be placed. The overall efficiency of the system should increase. The goals are to determine if the energy increases could attain more LEED points, and to determine the increase in the cost of the windows and whether it would be economically smart to re-design the mechanical unit for potential savings.

Analysis:

Throughout the building there are seven different glasses. There are two primary glasses, and these appear on all faces of the building. The other glasses consist of small strip windows, as well as store glass windows for the bottom level. The surface area of these glasses is minute when compared to the primary glasses used and would hardly affect the overall efficiency of the system. Instead the two primary glasses which are the single low e windows will be the glasses used for comparison.

All building information was then entered into EQuest, which requires all data from location of building and size to detailed information for both the mechanical system and windows. The baseline data for the data was then entered as single low – e windows as well as the percentage of each window on each face of the building. Then a building performance was simulated by EQuest. The program then outputted the monthly energy consumption by enduse and figured out the total. It calculated the gas consumption as well as electrical consumption and graph represented where energy was used by a graph. This graph can be seen in appendix e.

Once a baseline system was created the variable became the type of windows used. Three new windows were then replaced in the system while the mechanical system, as well as percentage of each window, remained the same. The windows used were double low – e windows, triple low – e windows, and finally double electro windows. Each of these windows was placed in the system and more simulations of the building performance were created. The graphs of each of these windows can be seen in appendix e along with the baseline graphs. The percentage of both gas and electrical energy conserved were both then calculated.

Once the actual energy savings of the different types of glass were calculated multiple sub-contractors were contacted about possible costs for these three new types of glass. The average of these costs were then taken and used to calculate the cost of replacing the original glass with the new more efficient glasses. Cost percentages were taken from the overall costs of the glass to determine how much more expensive each type of glass would be. These percentages were then compared to the percentage of cost increase due to the use of the more expensive windows. Once these percentages were calculated the decision of whether or not to pursue the new windows needed to be decided or whether or not it would be cost effective to re-evaluate the mechanical system.

Window Efficiency				
Window	***Electric Consumption (kwh x 000)***	***Gas Consumption (Btu x 000,000)***	***% Electricity Saved***	***% Gas Saved***
Single Low E	2761.2	5848.4	n/a	n/a
Double Low E	2747.2	5297.2	1	9
Triple Low E	2681.1	4740.4	5	19
Double Electro	2622.5	4673.2	5	20

The two windows that would conserve the most gas and electrical energy are the triple low e as well as the double electro. Both of these windows save approximately 5% on electricity and %20 percent on gas.

Window Cost				
Window	***Avg. Cost per sqft.***	***Sq.ft***	***Total Cost***	***% Cost Increase***
Single Low E	16.3	59384	967959.2	n/a
Double Low E	19.6	59384	1163926.4	1.202453988
Triple Low E	25.25	59384	1499446	1.549079755
Double Electro	33.6	59384	1995302.4	2.061349693

Although both the triple and electro windows conserve the most energy they are both much more expensive than the single low e windows that were originally placed in the ASHA. The triple low e windows are 1.5 times more expensive while the double electro windows are almost twice as expensive.

Efficiency vs Cost			
Window	% Energy Savings	% Gas Savings	% Cost Increase
Single Low E	n/a	n/a	n/a
Double Low E	1	9	1.2
Triple Low E	5	19	1.5
Double Electro	5	20	2

Above is a comparison of all of the windows, their percentages of energy saved as well as the overall cost increase for each of these windows. From the data above the most logical design change, if applicable, would be to use the triple low e windows. They are able to conserve the most amount of energy and the overall cost of these windows is much lower than that of the double electro windows.

Conclusion:

Although the three types of windows used to replace the baseline windows both saved in gas and electrical energy, the overall cost was extremely high. The double low e windows were only able to save one percent of energy and nine percent of gas energy while still having a steep increase in price.

The triple low e energies would have been the best replacement but again the cost for energy saving does not correlate as well as expected. Finally the double electro windows are nearly twice the cost of the single low e windows and save approximately the same amount of energy as the triple low e windows.

In order for a project to gain LEED points for energy savings, they must save 15% of electrical energy for one point and 20% of energy to attain two points. If a triple low energy window were to replace the original windows used 5% of the fifteen or twenty percent would already be replaced. Unfortunately the cost is 1.5 times that of the original estimate. This would require the mechanical system to be reanalyzed to the point where it would not only be conserving 10% more energy, but also the cost of that mechanical

system could be cut by a lot. This is a highly unlikely goal, therefore as stated before it would make the most sense for the ASHA to maintain its use of the current windows in place. Although they are not the most efficient windows they will assist with LEED and energy consumption while remaining the most cost effective.

STRUCTURAL BREADTH:

Problem Statement:

Washington D.C. and its surrounding suburbs are known for their C.I.P. concrete systems. These systems are used throughout D.C. and surrounding areas primarily because of the height restrictions in the metropolitan D.C. area. These restrictions have allowed cast-in-place concrete to become the niche market in the area and highly cost effective.

The ASHA however chose to use a concrete and steel combination in the building. All of the columns of the structural system are steel. The schedule is important however steel can be costly and requires much lead time, therefore concrete columns may have been able to be used and reduce material cost, while only slightly affecting the schedule.

Analysis Goal:

Steel can be quite costly and also requires a long lead time. The steel was not delivered on time to this project. However, because of permit restrictions the project could not begin on time and the steel was able to arrive before it was required.

The project is on a highly important schedule because the ASHA is renting their previous headquarters and everyday that the project is late it is costing the ASHA money. Steel was selected to ensure that the project would be completed early. With the use of pcaColumn all of the steel columns will be replaced as C.I.P. columns. Then using Ice 2000 the cost savings of using concrete will be determined, the schedule will then be analyzed for the cost comparison of additional schedule days. It will then be determined whether or not the cost savings on the concrete would be worth the addition in schedule, and determine whether concrete columns should be used.

Analysis:

The steel columns were first analyzed to see if they were the most efficient concrete columns possible. Therefore, the sizes and lengths were analyzed from the drawings for each steel column. A Third Edition Steel Manual was then used in order to determine the safest maximum load on each of the columns. Once all of this data was determined it was input into pcaColumn. The vast majority of the concrete used on the project was 4000psi strength and hence was the strength assumed for each of the concrete columns. Since there are sheer walls in the system the moment acting on the columns should be minimal and is therefore assumed constant for all of the columns.

After all data was input pcaColumn then ran calculations to determine the amount of support the concrete column would provide. If the column was over analyzed new sizes data was input in order to produce the most efficient square column. All rebar was kept as close as possible, to one percent, in order to keep the overall cost of rebar in the columns down. All of the structural graphs can be seen in appendix f. These charts exemplify the most efficient square columns to replace the steel columns already in place.

Equivalent Concrete Columns				
Steel Column	Length	Loading (k)	Concrete Equivalent	Rebar
12x58	15	496	18x18 (4ksi)	4 #9
12x58	13.5	535	18x18 (4ksi)	4 #9
12x65	15	626	18x18 (4ksi)	4 #9
12x65	13.5	657	18x18 (4ksi)	4 #9
12x53	15	451	16x16 (4ksi)	4 #8
12x53	13.5	485	16x16 (4ksi)	4 #8
14x90	15	947	22x22 (4ksi)	4 #10
14x90	13.5	979	22x22 (4ksi)	4 #10
14x82	15	694	18x18 (4ksi)	4 #10
14x82	13.5	747	18x18 (4ksi)	4 #11
14x132	15	1390	24x24 (4ksi)	4 #18
14x99	15	1040	24x24 (4ksi)	4 #11
14x74	15	630	18x18 (4ksi)	4 #9
12x72	15	694	18x18 (4ksi)	4 #10
12x72	13.5	729	18x18 (4ksi)	4 #11
12x45	15	299	14x14 (4ksi)	4 #10
12x45	13.5	336	14x14 (4ksi)	4 #10
12x80	13.5	805	20x20 (4ksi)	4 #9
14x43	13.5	312	14x14 (4ksi)	4 #10
14x53	13.5	394	14x14 (4ksi)	4 #11
14x48	13.5	354	14x14 (4ksi)	4 #11
14x68	13.5	678	18x18 (4ksi)	4 #9
14x61	13.5	553	16x16 (4ksi)	4 #11

Once the equivalent structural concrete columns were determined, Ice 200 was then used to analyze each column for an overall cost of the concrete structural columns. Each column was assumed to be at 4ksi since that was the concrete used as the majority on site. The forms used for the analysis were the same as those used for the other pours, a one use rectangular ply-wood form. Since a crane already exists on site for other pours, the columns were assumed to be poured with the crane on site.

The original steel columns were also re-estimated for a more accurate value. Each column was estimated along with an assumed one inch of mineral fiber proofing fire coating since the steel will require a fire-proofing for each of the columns. Once the values of the columns were estimated for the concrete and steel, the estimations were compared to determine approximately how much money would be saved by converting to a concrete column system. Appendix **f** has the entire break down and cost estimations.

Concrete vs Steel Summary		
Total Concrete Cost	***Total Steel Cost***	***Cost Savings with Concrete***
$92,873	$202,011	$109,138

Although the concrete system saves the project approximately $110,000 it is not the only aspect of the project that can be taken into consideration. The ASHA schedule is just as crucial as the overall cost of the project itself. The ASHA is currently paying back-rent to its' old location while the new headquarters is being completed. If the columns were to be poured as concrete the deadline for the project would be delayed. For every additional day that the project is not completed the ASHA will continue to have to pay the back-rent owed at its current location until the project is completed. Therefore, the finish date is just as crucial to the project.

There are 300 columns in the project. It was therefore assumed that the 300 columns could be broken down evenly into groupings for lifts or pours for each floor.

The overall average size of the re-designed concrete columns is approximately .5cy. It was assumed that the average cubic yards carried by a concrete truck is 10cy. If this is the case then twenty columns could be poured in a single day by a single truck. If three trucks were to deliver in a single day then approximately 60 columns could be poured. If the columns were broken down evenly than with 60 columns completed in a single day, then the concrete could be completed in five phases.

The current steel system would be able to complete the same amount of floors in a much shorter period of time. It is a general consensus, in the construction industry, that two floors can be completed in a single day with steel columns. Three days was then placed between the first and second lifts in order for decks and other members to be inserted to provide more support before the next set of columns were raised. A schedule of this comparison between the two systems can then be found in appendix f.

Although the amount being paid back during construction is remaining confidential the chart below shows the cost comparison of structural saving to back rent costs. As the chart shows if the ASHA were paying a minimum of $1,653.61 a day in back rent or $49,608.18 per month than the steel would be the optimal selection, however if the value were less than that the structural concrete makes more economical sense.

Concrete Column Schedule vs Steel Schedule		
Days to complete concrete work	Days to complete Steel work	Savings in Structural Material
71	5	$109,138
Cost/ Day to replace structural Savings	Cost/Month	
$1,653.61	$49,608.18	

Conclusion:

The D.C. metro area is known for its C.I.P. work. All of D.C. as well as the surrounding suburbs have adapted to C.I.P. due to height restrictions within the District. Since D.C. became such a niche market for C.I.P. surrounding areas such as Rockville, MD quickly adapted the process.

The ASHA decided to use a steel and concrete combination for their building instead. The vast majority of the building would remain concrete such as shear walls and beams, but the structural columns between floors would be designed as steel.

The schedule was highly important for this project as back rent is being paid to the previous building while construction continues. After calculations of a complete concrete system with columns over $100,000 could have been saved, however this would come at the expense of an increased schedule. If the schedule were to increase by too much then the back rent would begin to accumulate and using concrete for a shorter schedule would be considered useless. The calculations from before show that if the back rent is no more than approximately $50,000 per month then perhaps the concrete system should have been approached, however since this number remains confidential no absolute conclusion can be drawn without the monthly back rents, but the above statements would confirm the path to take once that value is known.

Summary and Conclusions:

The ASHA was an outstanding building that provided many challenges as well as rewards. Although the ASHA decided to try to attain a LEED silver rating the project may have even had more success under a Green Globes system. The system is not only simpler but the points are easy to score and as shown under Green Globes more points were actually scored for the project. If the scoring had not been so conservative and smaller initiative under Green Globes had been analyzed the project may have received a three globe rating or LEED gold equivalent.

A traditional design-bid-build system was also used for the ASHA however after analyzing the needs of the project itself and what both the traditional and design-build systems provide a design-build method may have provided a more substantial outcome. The project would have started earlier therefore improving the schedule saving money from back renting and through value engineering in the design phase money may have been saved in the project.

The mechanical system was prepared for LEED rating, but the window analysis was used to determine if more points could be scored or if a better cost efficient window was available. Although all of the glasses that were used to replace the single low e windows conserved slightly more energy and gas consumption the costs were to great for the overall replacement of the window system. The most efficient and affordable system of a triple low e window would save nearly 5% in electricity and 20% in gas but would cost 1.5 times the original windows. Therefore, ASHA was correct in using a simple low e window.

The structural system was a concrete and steel mix with steel being used for all of the columns. After replacing these columns with a concrete equivalent and doing a cost analysis nearly 50% of the costs could be saved. The schedule had to be taken into consideration as well though and as long as the back rent was less than $50,000 per month than the system of steel should have been replaced.

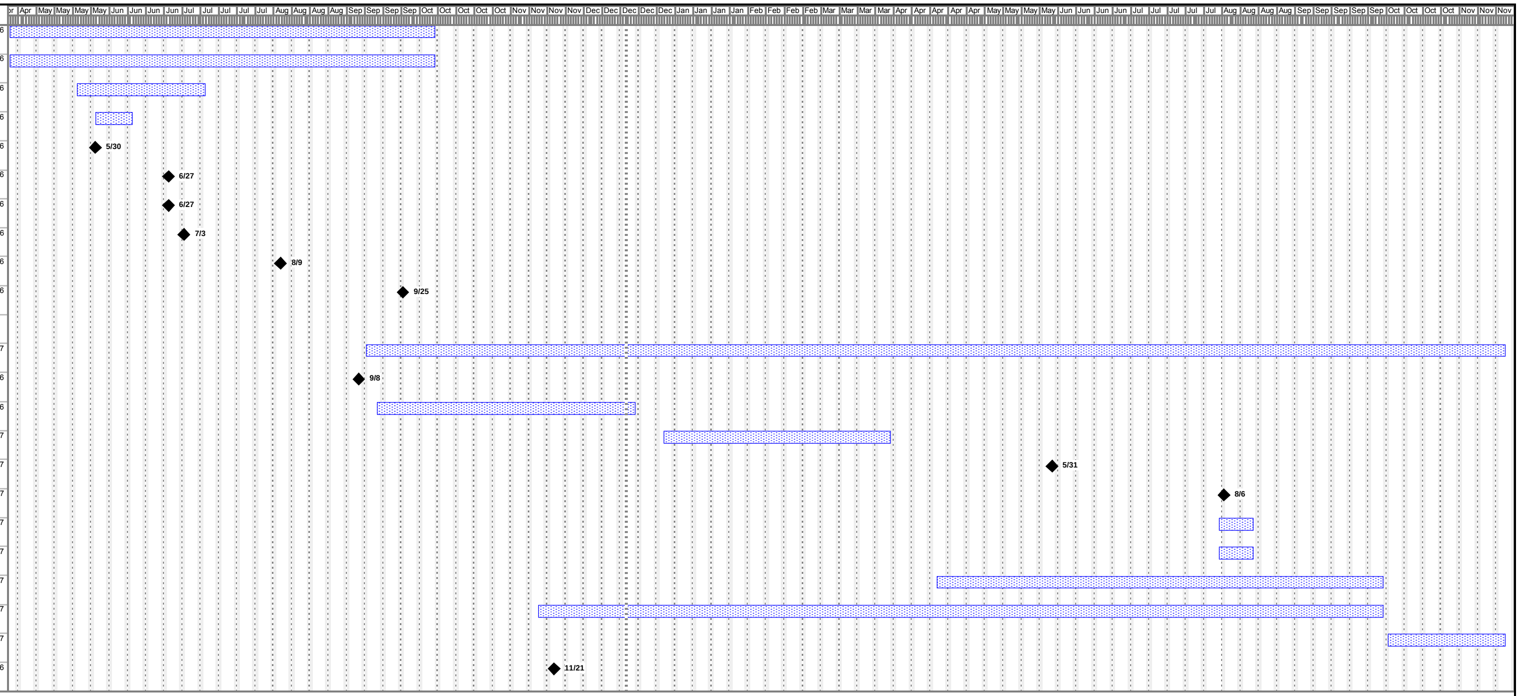
APPENDIX A

- Project Schedule Summary

American Speech - Language - Hearing Association

AtSite Real Estate

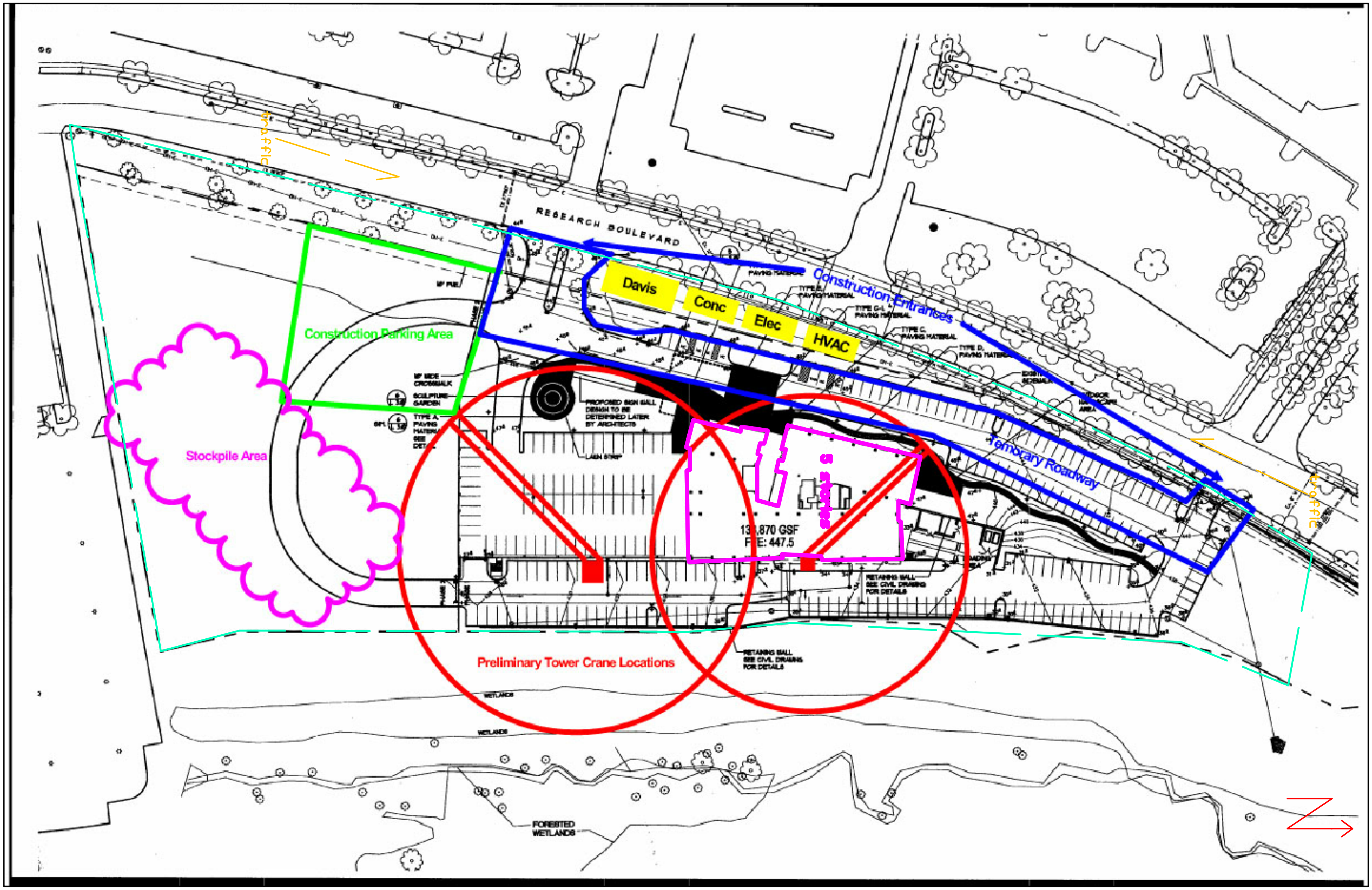
ID	Task Name	Duration	Start	Finish
1	Preconstruction	117 days?	Thu 4/27/06	Fri 10/6/06
2	Temporary Power	117 days?	Thu 4/27/06	Fri 10/6/06
3	MD Tree Permit Issued	35 days?	Tue 5/23/06	Mon 7/10/06
4	Stakeout Property Corners	10 days?	Tue 5/30/06	Mon 6/12/06
5	Start Project	0 days	Tue 5/30/06	Tue 5/30/06
6	Sediment Permit Issued	0 days	Tue 6/27/06	Tue 6/27/06
7	Stormwater Management Permit Issued	0 days	Tue 6/27/06	Tue 6/27/06
8	Forest Conservation Plans Issued	0 days	Mon 7/3/06	Mon 7/3/06
9	Foundation Permit Issued	0 days	Wed 8/9/06	Wed 8/9/06
10	Water/Sewer Permits Issued and Easmonts	0 days	Mon 9/25/06	Mon 9/25/06
11				
12	Milestones	314 days?	Mon 9/11/06	Wed 11/21/07
13	Building Permits	0 days	Fri 9/8/06	Fri 9/8/06
14	Complete Concrete Garage	71 days?	Fri 9/15/06	Fri 12/22/06
15	Steel Completion	63 days?	Wed 1/3/07	Fri 3/30/07
16	Owner Permanent Power	0 days	Thu 5/31/07	Thu 5/31/07
17	Interior Contract Start	0 days	Mon 8/6/07	Mon 8/6/07
18	Complete Façade Installation	10 days?	Sat 8/4/07	Thu 8/16/07
19	Watertight	10 days?	Sat 8/4/07	Thu 8/16/07
20	Complete All Finishes and Perimeter	124 days?	Wed 4/18/07	Fri 10/5/07
21	Complete MEP Risers and Equip Start	233 days?	Thu 11/16/06	Fri 10/5/07
22	Complete Inspections	33 days?	Mon 10/8/07	Wed 11/21/07
23	Current Completion Date	0 days	Tue 11/21/06	Tue 11/21/06



APPENDIX B
- Site Layout Planning

American Speech - Language - Hearing Association

AtSite Real Estate



ASHA National HQ
Site Layout
Oct. 6, 2006
Michael Abbondante

APPENDIX C

- Sustainability Depth
- *LEED Scorecard*
- *Green Globes Scorecard*

American Speech - Language - Hearing Association

AtSite Real Estate

LEED™ Credit Scorecard

LEED-NC Green Building Rating System, version 2.1, final version w/ revisions

ASHA National Office

Rockville, MD

March 12, 2007

Y	?	N	Total Project Score	Possible Points 69
39	6	24		

Certified 26 to 32 points **Silver** 33 to 38 points **Gold** 39 to 51 points **Platinum** 52 or more points

Sustainable Sites

Y	?	N			Possible Points
8	1	5		Sustainable Sites	14
Y			Prereq 1	Erosion & Sedimentation Control	
1			Credit 1	Site Selection	1
		1	Credit 2	Development Density	1
		1	Credit 3	Brownfield Redevelopment	1
1			Credit 4.1	Alternative Transportation, Public Transportation Access	1
1			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	1		Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
1			Credit 4.4	Alternative Transportation, Parking Capacity and Carpooling	1
		1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1			Credit 5.2	Reduced Site Disturbance, Development Footprint	1
		1	Credit 6.1	Stormwater Management, Rate and Quantity	1
1			Credit 6.2	Stormwater Management, Treatment	1
1			Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1			Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
		1	Credit 8	Light Pollution Reduction	1

Water Efficiency

Y	?	N			Possible Points
4		1		Water Efficiency	5
1			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1			Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
		1	Credit 2	Innovative Wastewater Technologies	1
1			Credit 3.1	Water Use Reduction, 20% Reduction	1
1			Credit 3.2	Water Use Reduction, 30% Reduction	1

Energy & Atmosphere

Y	?	N			Possible Points
4	3	10		Energy & Atmosphere	17
Y			Prereq 1	Fundamental Building Systems Commissioning	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	
1	1		Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
	1	1	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
		2	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
		2	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
		2	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
		1	Credit 2.1	Renewable Energy, 5%	1
		1	Credit 2.2	Renewable Energy, 10%	1
		1	Credit 2.3	Renewable Energy, 20%	1
1			Credit 3	Additional Commissioning	1
1			Credit 4	Elimination of HCFC's and Halons	1
1			Credit 5	Measurement & Verification	1
	1		Credit 6	Green Power	1

Credit ready to submit to USGBC

Design Credit not ready to submit to USGBC

Materials & Resources

Y	?	N			Possible Points
7	1	5		Materials & Resources	13
Y			Prereq 1	Storage & Collection of Recyclables	
		1	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
		1	Credit 1.2	Building Reuse, Maintain 100% of Shell	1
		1	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1			Credit 2.1	Construction Waste Management, Divert 50%	1
1			Credit 2.2	Construction Waste Management, Divert 75%	1
		1	Credit 3.1	Resource Reuse, Specify 5%	1
		1	Credit 3.2	Resource Reuse, Specify 10%	1
1			Credit 4.1	Recycled Content, Specify 5% (post-consumer + 1/2 post-industri	1
1			Credit 4.2	Recycled Content, Specify 10% (post-consumer + 1/2 post-industr	1
1			Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1			Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	1		Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

Indoor Environmental Quality

Y	?	N			Possible Points
11	1	3		Indoor Environmental Quality	15
Y			Prereq 1	Minimum IAQ Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Carbon Dioxide (CO2) Monitoring	1
		1	Credit 2	Ventilation Effectiveness	1
1			Credit 3.1	Construction IAQ Management Plan, During Construction	1
1			Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1			Credit 4.2	Low-Emitting Materials, Paints	1
1			Credit 4.3	Low-Emitting Materials, Carpet	1
1			Credit 4.4	Low-Emitting Materials, Composite Wood	1
1			Credit 5	Indoor Chemical & Pollutant Source Control	1
		1	Credit 6.1	Controllability of Systems, Perimeter	1
		1	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1			Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1			Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	1		Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1			Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

Innovation & Design Process

Y	?	N			Possible Points
5				Innovation & Design Process	5
1			Credit 1.1	Innovation in Design: 40% Locally Manufactured Materials	1
1			Credit 1.2	Innovation in Design: User Education	1
1			Credit 1.3	Innovation in Design: 40% Water Use Reduction	1
1			Credit 1.4	Innovation in Design: Green Housekeeping Plan	1
1			Credit 2	LEED™ Accredited Professional	1

Green Globes Scorecard	
Project Management (40/50)	***Water (55/100)***
Integrated design (18/20)	Water Efficiency (30/30)
Environmental Purchasing (5/5)	Water Conserving (15/40)
Commissioning (17/20)	Reduce Off-Site Treatment (10/20)
Emergency Response Plan (0/5)	
Site (65/115)	***Resources/Building Materials (40/100)***
Site Development (15/45)	Materials with Low Environmental Impact (20/40)
Reduce Ecological Impacts (29/40)	Minimized Consumption and Depletion (10/30)
Enhancement of Watershed Features (15/15)	Re-use of Existing Structures (0/10)
Site Ecology Improvements (6/15)	Building Durability, Adaptibility, and Disassembly (3/12)
	Reduction and Re-use (7/10)
Energy (241/360)	***Emmissions and Effluents (28/75)***
Energy Consumption (70/110)	Air Emissions (5/15)
Energy Demand Minimization (70/135)	Ozone and Global Awareness (20/30)
"Right Sized" Energy Efficient Systems (72/110)	Contamination for Sewers/Waterways (2/12)
Renewable Sources of Energy (0/45)	Land/Water Pollution (1/9)
Energy Efficient Transportation (36/70)	Integrated Pest Management (0/4)
	Storage of Hazardous Materials (0/5)
Indoor Environment (111/200)	***Final Score (580/1000)***
Effective Ventilation System (38/60)	Project Management (40/50)
Source Control of Indoor Pollutants (23/45)	Site (65/115)
Lighting Design Integration (10/40)	Energy (241/360)
Thermal Comfort (35/55)	Indoor Environment (111/200)
	Water (55/100)
	Resources/Building Materials (40/100)
	Emmissions and Effluents (28/75)
	Green Globes Score: Two Globes

APPENDIX D

- Surveys

- *Sustainability Survey*

- *Procurement Survey*

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AtSite Real Estate

SUSTAINABILITY SURVEY

- Have you ever been a part of a LEED rated project?
    - If so why was a LEED rating attempted to be attained and what was the rating attempted and finally attained?
    - What difficulties occurred or worries occurred throughout the project that may not have occurred if the building was not LEED rated?
    - How much higher were the initial costs of the project?
    - What is the projected savings on the project due to LEED rating in the future?
    - In your opinion were the difficulties and restrictions worth a LEED rating in the end?
    - Will you pursue LEED rated projects in the future?
- Have you ever been apart of a project that attempted another sustainable rating system other than LEED and which was it?
    - Why did you not attempt a LEED rating?
    - What sustainability system did you use?
    - What were the initial costs compared to a non-green building, and what are the savings projected due to the design?
    - Was attempting sustainability worth the initial costs?
    - Do you wish you had pursued a LEED rating?
    - Will future projects use this sustainable system?
- Is sustainability the future of this industry with or without LEED?
- Do you believe LEED should be followed extensively or are future green and sustainable rankings going to be accepted?
- Although LEED is always a hot topic why is it not always used?
- Is the LEED scorecard to complicated causing its unpopularity?
- Should a simpler system be implemented?
- What should the scorecard include?
- If LEED is not used how should be sustainable buildings be ranked or should sustainable buildings become a standard?
- Have you ever heard of Green Globes?
    - Does Green Globes seem to simple?
    - Does Green Globes appoint to many “easy points”?
    - Do you support the use of points for design as well as completion?
- How important is overall cost to attain a desired rating system?
- Is an ANSI approval important?
- In your opinion is sustainable design worth initial costs, and is it worth the change in the industry or should the industry remain constant?

Procurement Survey

- As an owner which procurement method do you prefer design-build or design-bid-build?
    - Why do you prefer that specific method?

- Have you ever been a part of a Design-Build rated project?
    - If so why did you use design-build procurement?
    - What worries or concerns did you have about the project being design-build instead of a design-bid-build-project?
    - Was the project completed on time and on budget?
    - Were there multiple project saving, if so what were they, and what was the reason?
    - Did you feel disconnected from the project at anytime during the design phase?
    - Will you continue to use the design-build method?

- What aspects of design-bid-build do you prefer?
    - Although design-build generally saves time and money why do you not always use it and why is it not always used in the industry today?
    - Do you feel that a direct low bid is the best way to bid a project?
    - Do you prefer being an integral role in the design process?
    - Do you continue to use a tradition method because it is so popular with the industry and work force?

- Should governments be dictating project methods used?
- Do you see design-build as the future of procurement?
- What makes design-bid-build so popular?
- What makes design-build so popular?

APPENDIX E

- Mechanical Breadth
- Window Efficiencies
  - ***Single Low E***
  - ***Double Low E***
  - ***Triple Low E***
  - ***Electro***

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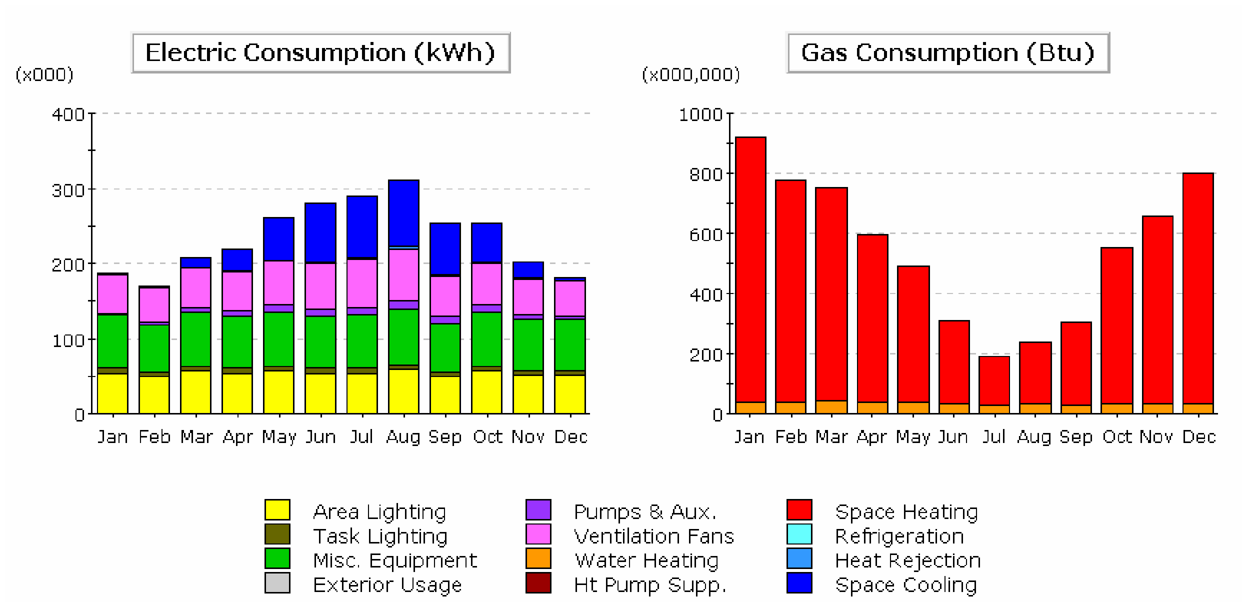
AtSite Real Estate

SINGLE LOW E
(BASELINE)



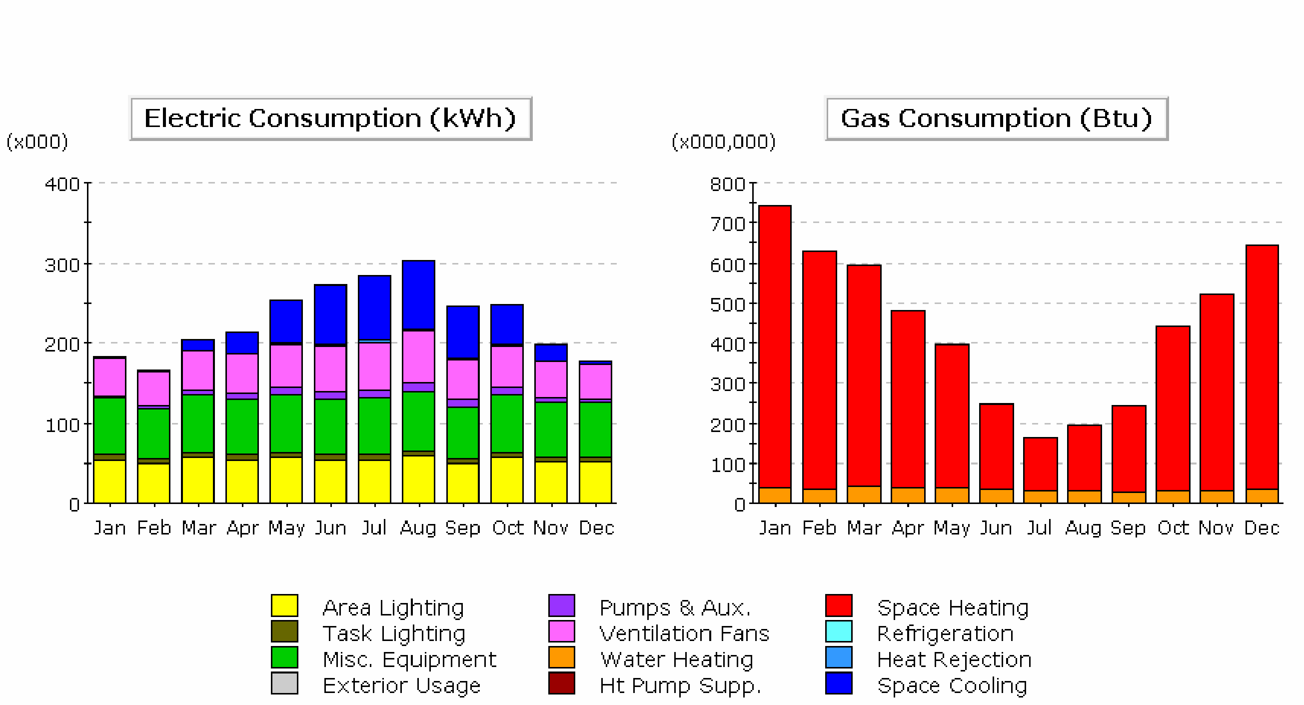
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	2.3	3.2	13.3	29.4	56.5	78.0	81.5	87.2	67.5	50.9	21.5	3.1	494.4
Heat Reject.	-	0.0	0.2	0.5	1.4	2.7	3.4	3.4	2.3	1.2	0.3	-	15.3
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	49.9	45.3	53.9	53.0	58.3	59.7	64.0	68.9	53.4	56.9	49.2	47.6	660.1
Pumps & Aux.	3.3	3.1	5.1	6.9	9.3	10.2	10.4	11.2	9.1	8.8	5.6	3.4	86.4
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	70.5	63.8	72.4	69.5	72.4	69.5	70.5	74.2	65.8	72.4	67.7	68.7	837.4
Task Lights	6.2	5.6	6.5	6.2	6.5	6.2	6.2	6.8	5.6	6.5	5.9	5.9	74.2
Area Lights	54.0	48.9	56.4	53.9	56.4	53.9	54.0	58.7	49.1	56.4	51.5	51.6	644.6
Total	186.2	170.0	207.6	219.4	260.7	280.1	289.9	310.4	252.8	253.0	201.8	180.3	2,812.4

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	878.2	740.3	713.4	557.5	454.0	278.4	161.6	207.6	279.9	522.0	624.3	767.3	6,184.5
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	38.6	36.1	41.3	38.4	37.2	32.7	30.4	31.6	26.5	32.0	31.7	34.6	411.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	916.8	776.4	754.7	595.9	491.2	311.1	191.9	239.2	306.4	554.0	656.0	801.8	6,595.5

DOUBLE LOW E



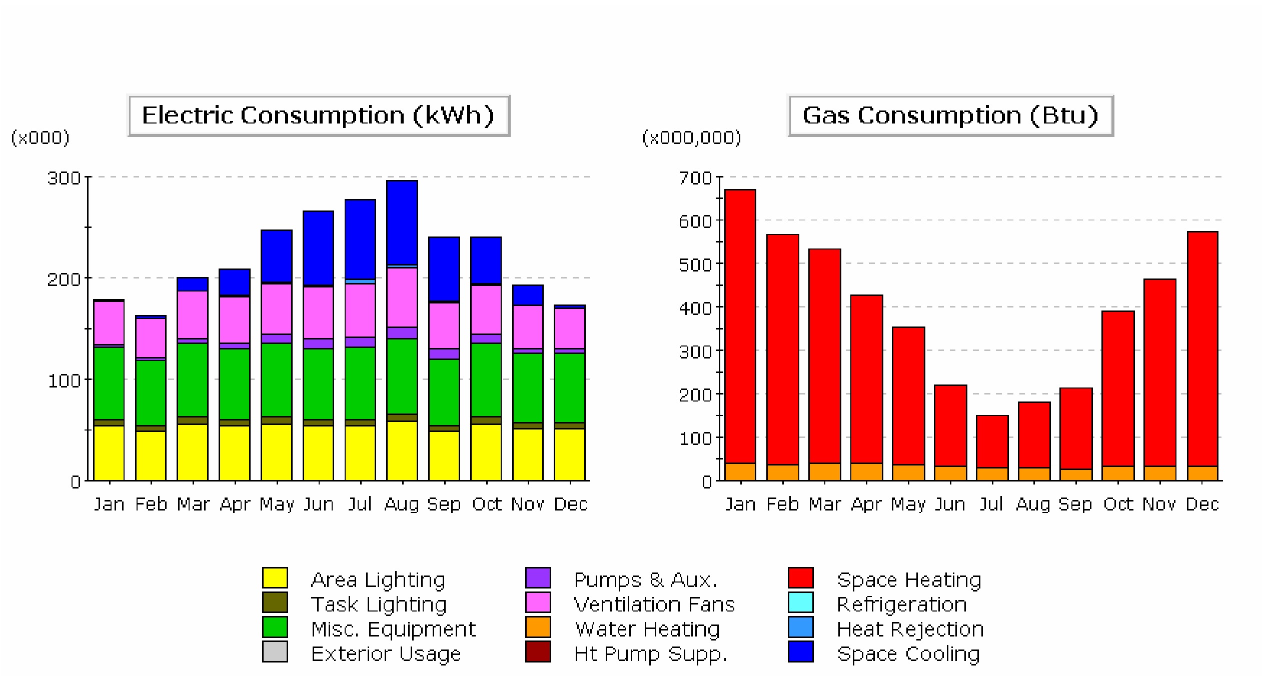
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	2.2	3.1	12.9	27.9	53.5	74.9	80.6	85.2	65.0	48.6	20.6	3.0	477.6
Heat Reject.	-	0.0	0.2	0.4	1.3	2.6	3.3	3.3	2.2	1.1	0.3	-	14.7
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	46.2	42.1	50.4	49.4	54.3	55.5	58.7	63.5	49.7	53.1	46.0	44.3	613.2
Pumps & Aux.	3.2	3.1	5.0	6.8	9.2	10.2	10.3	11.1	9.0	8.8	5.6	3.3	85.5
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	70.5	63.8	72.4	69.5	72.4	69.5	70.5	74.2	65.8	72.4	67.7	68.7	837.4
Task Lights	6.2	5.6	6.5	6.2	6.5	6.2	6.2	6.8	5.6	6.5	5.9	5.9	74.2
Area Lights	54.0	48.9	56.4	53.9	56.4	53.9	54.0	58.7	49.1	56.4	51.5	51.6	644.6
Total	182.4	166.6	203.7	214.2	253.5	272.7	283.7	302.9	246.4	246.8	197.5	176.8	2,747.2

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	704.0	593.4	554.2	441.1	358.1	214.2	132.5	164.6	216.5	409.7	489.3	608.5	4,886.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	38.6	36.1	41.3	38.4	37.2	32.7	30.4	31.6	26.5	32.0	31.7	34.6	411.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	742.6	629.5	595.5	479.5	395.3	246.9	162.9	196.2	243.0	441.7	521.0	643.0	5,297.2

TRIPLE LOW E



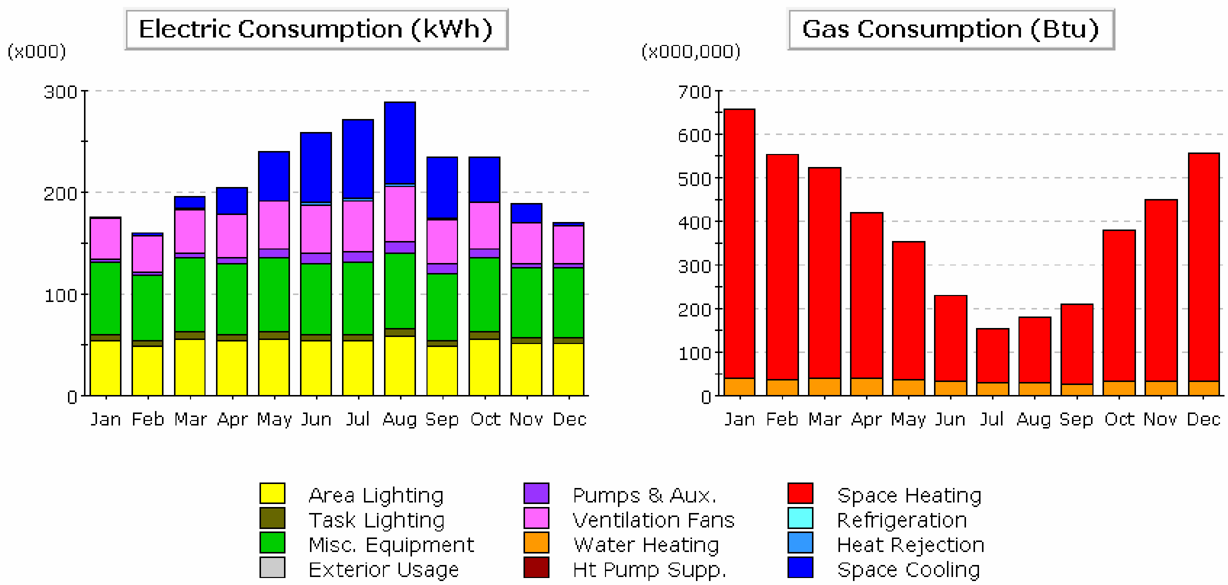
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	2.2	3.0	12.4	26.4	50.9	71.9	79.4	82.9	62.2	45.8	19.5	2.9	459.4
Heat Reject.	-	0.0	0.2	0.4	1.2	2.5	3.3	3.2	2.1	1.0	0.3	-	14.1
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	42.7	38.9	46.6	45.8	50.3	51.4	54.0	58.5	46.0	49.2	42.6	41.0	567.0
Pumps & Aux.	3.2	3.0	4.9	6.7	9.0	10.1	10.2	11.1	8.9	8.6	5.5	3.3	84.5
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	70.5	63.8	72.4	69.5	72.4	69.5	70.5	74.2	65.8	72.4	67.7	68.7	837.4
Task Lights	6.2	5.6	6.5	6.2	6.5	6.2	6.2	6.8	5.6	6.5	5.9	5.9	74.2
Area Lights	54.0	48.9	56.4	53.9	56.4	53.9	54.0	58.7	49.1	56.4	51.5	51.6	644.6
Total	178.8	163.2	199.3	208.9	246.7	265.4	277.6	295.4	239.7	239.9	192.9	173.4	2,681.1

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	631.5	529.2	490.4	389.3	315.0	187.1	121.1	148.5	188.1	359.5	431.3	538.3	4,329.4
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	38.6	36.1	41.3	38.4	37.2	32.7	30.4	31.6	26.5	32.0	31.7	34.6	411.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	670.1	565.3	531.7	427.7	352.1	219.9	151.5	180.1	214.6	391.5	463.0	572.9	4,740.4

ELECTRO



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	2.1	2.9	11.7	25.0	48.5	69.1	76.8	80.1	59.8	43.2	18.5	2.8	440.7
Heat Reject.	-	0.0	0.2	0.4	1.1	2.4	3.2	3.1	2.0	0.9	0.3	-	13.5
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	39.9	36.3	43.4	42.7	46.7	47.5	50.4	54.7	42.9	46.0	39.8	38.3	528.7
Pumps & Aux.	3.1	3.0	4.9	6.7	8.9	10.0	10.2	11.0	8.8	8.4	5.4	3.2	83.6
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	70.5	63.8	72.4	69.5	72.4	69.5	70.5	74.2	65.8	72.4	67.7	68.7	837.4
Task Lights	6.2	5.6	6.5	6.2	6.5	6.2	6.2	6.8	5.6	6.5	5.9	5.9	74.2
Area Lights	54.0	48.9	56.4	53.9	56.4	53.9	54.0	58.7	49.1	56.4	51.5	51.6	644.6
Total	175.8	160.4	195.4	204.3	240.5	258.6	271.3	288.6	234.1	233.9	189.1	170.6	2,622.6

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	619.6	518.2	482.9	382.9	316.5	197.2	123.6	149.6	184.5	346.9	417.8	522.5	4,262.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	38.6	36.1	41.3	38.4	37.2	32.7	30.4	31.6	26.5	32.0	31.7	34.6	411.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	658.2	554.3	524.2	421.3	353.7	229.9	154.0	181.2	210.9	378.9	449.5	557.1	4,673.2

APPENDIX F

- Structural Breadth

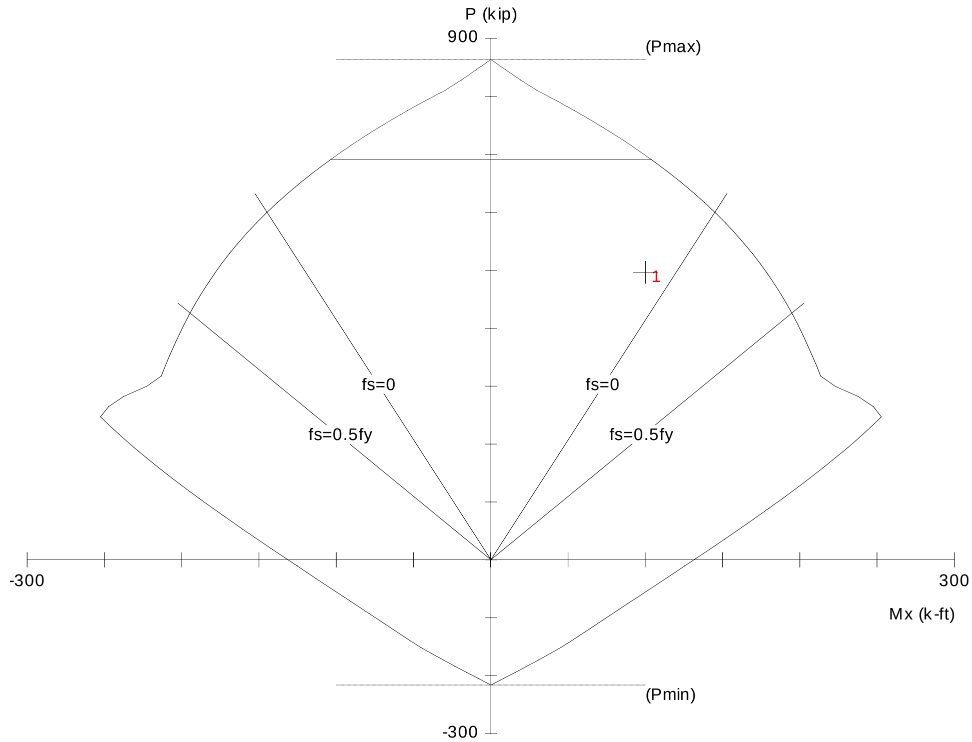
- Concrete pcaColumn graphs

- Concrete vs Steel Costs

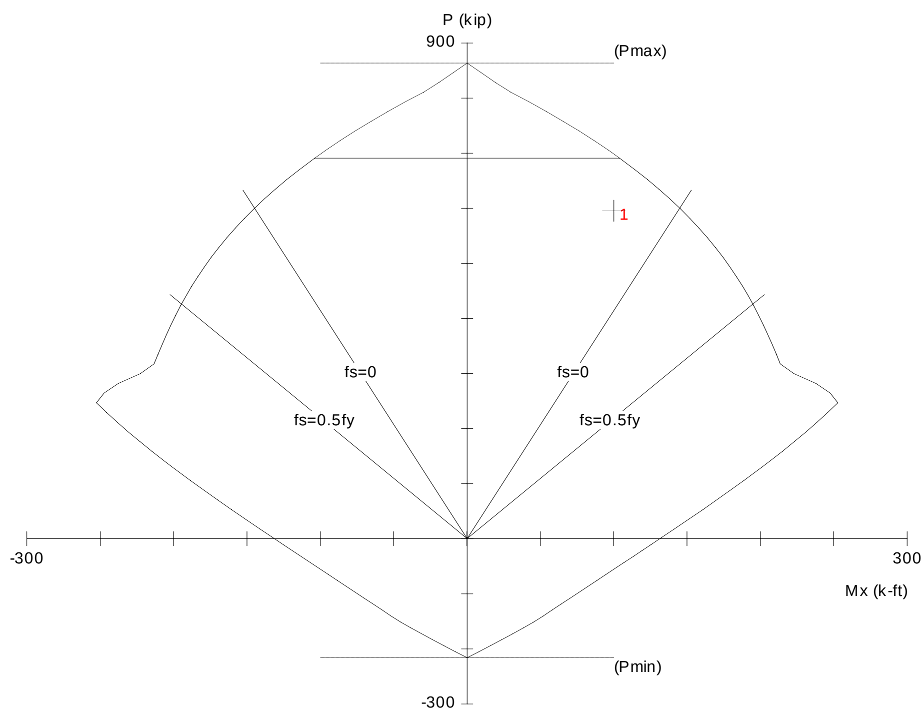
- Concrete vs Steel Schedules

American Speech - Language - Hearing Association

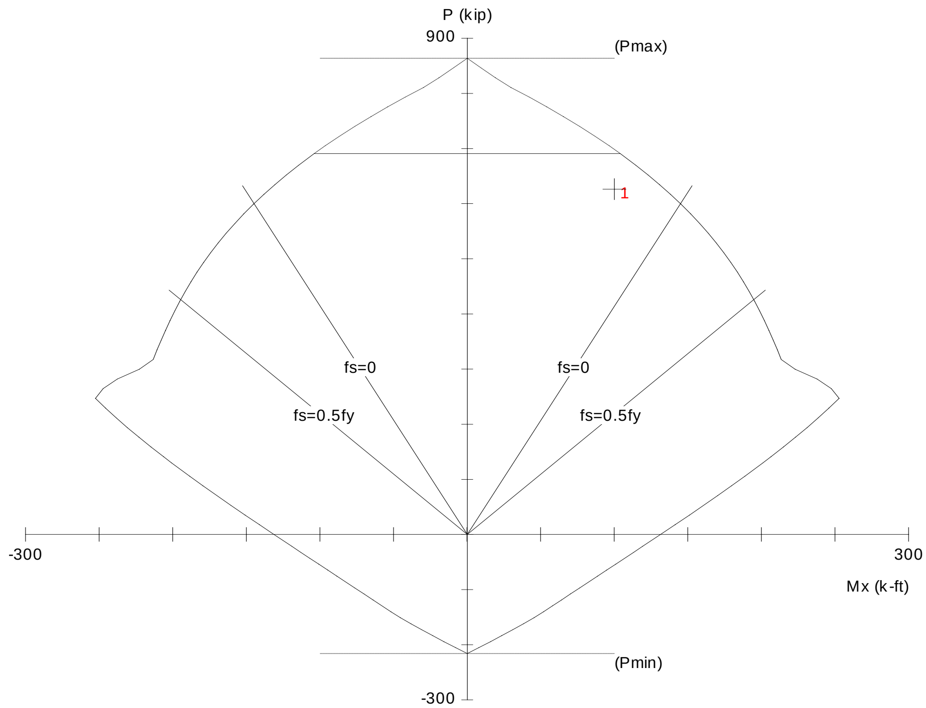
AtSite Real Estate



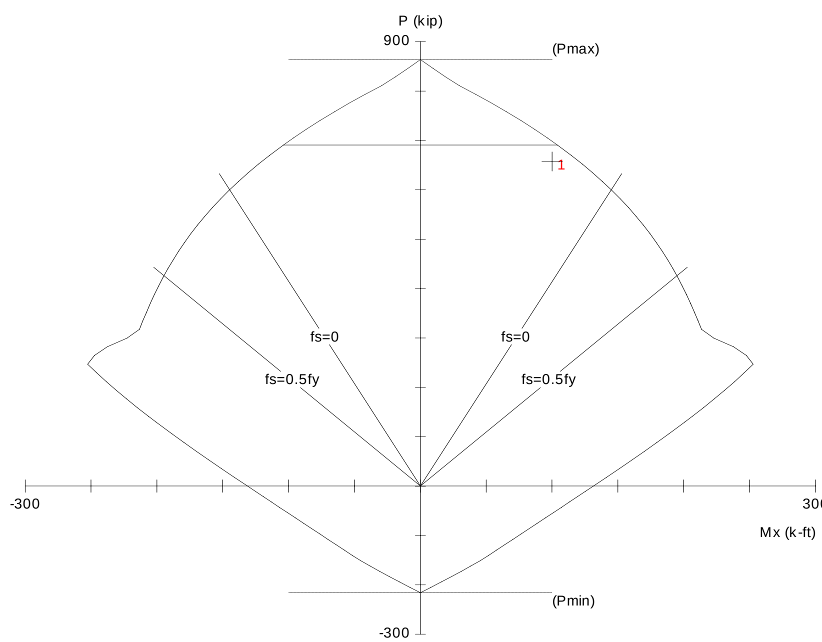
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x58	15	496	18x18 (4ksi)	4 #9



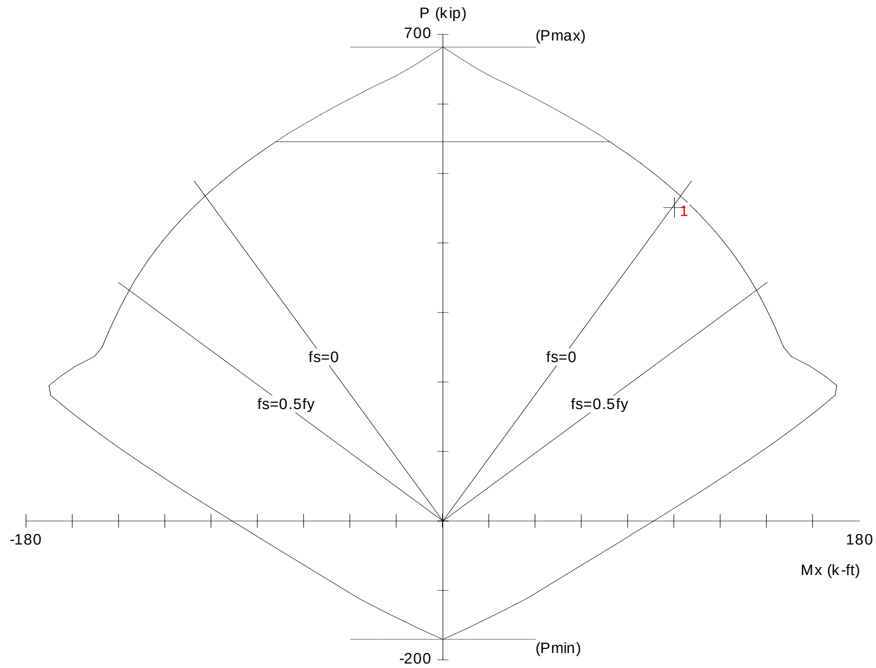
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x58	13.5	535	18x18 (4ksi)	4 #9



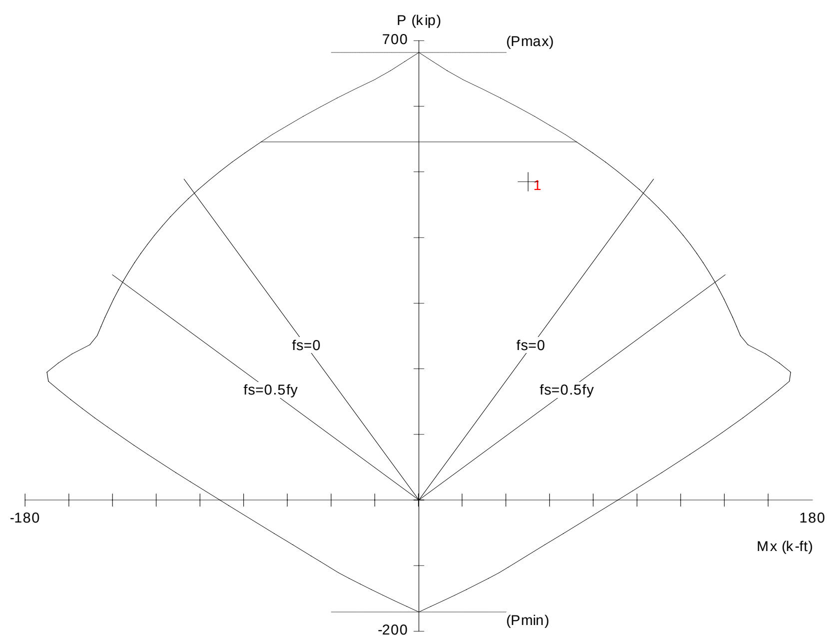
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x65	15	626	18x18 (4ksi)	4 #9



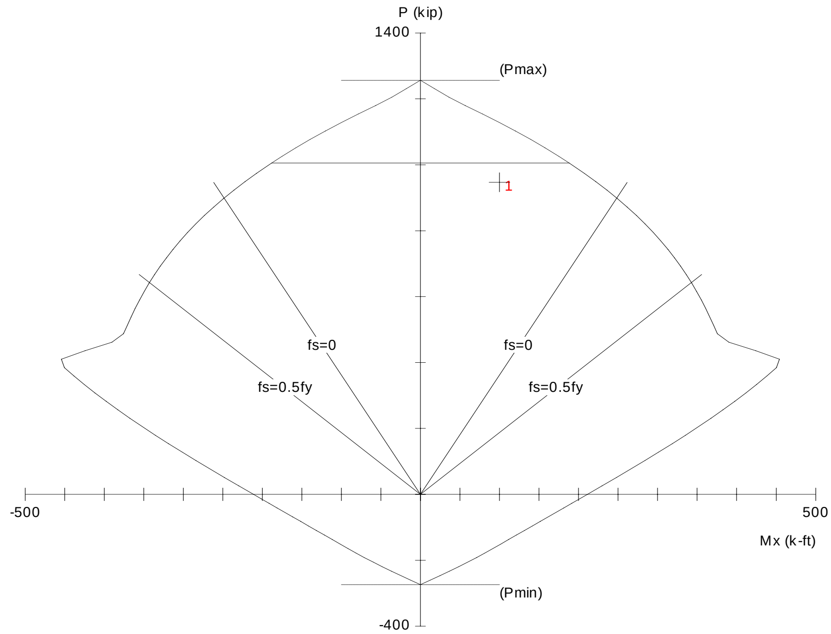
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x65	13.5	657	18x18 (4ksi)	4 #9



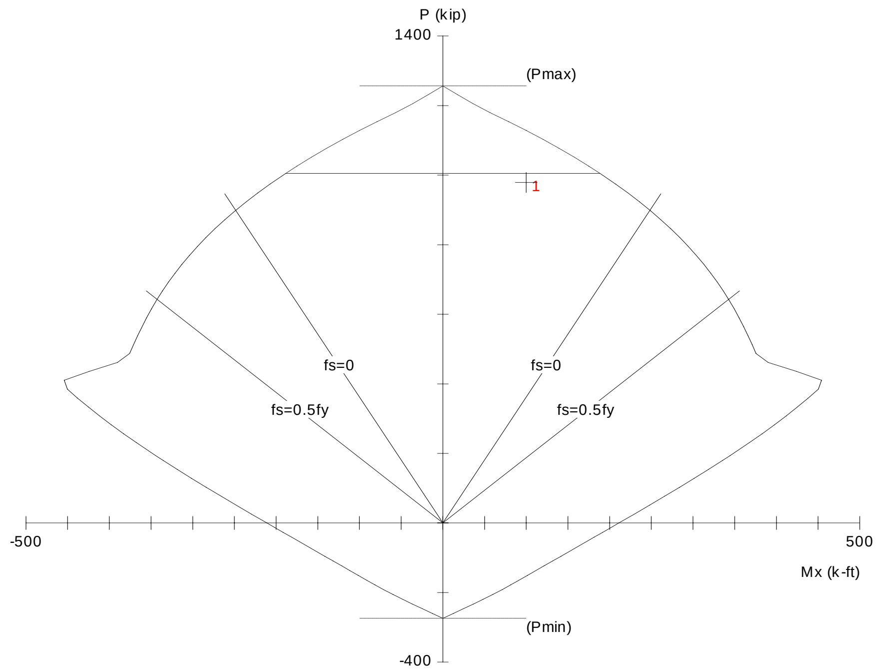
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x53	15	451	16x16 (4ksi)	4 #8



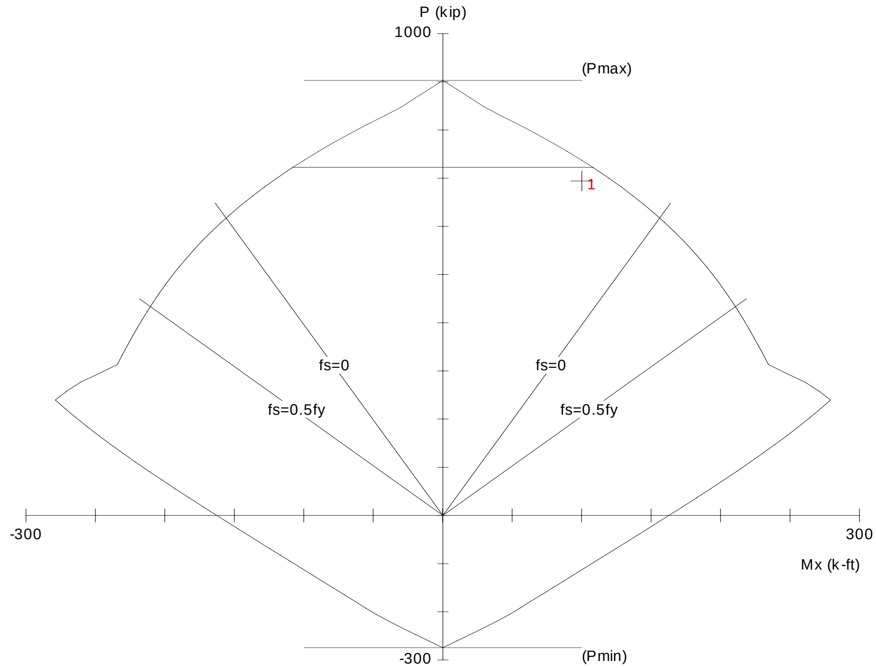
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x53	13.5	485	16x16 (4ksi)	4 #8



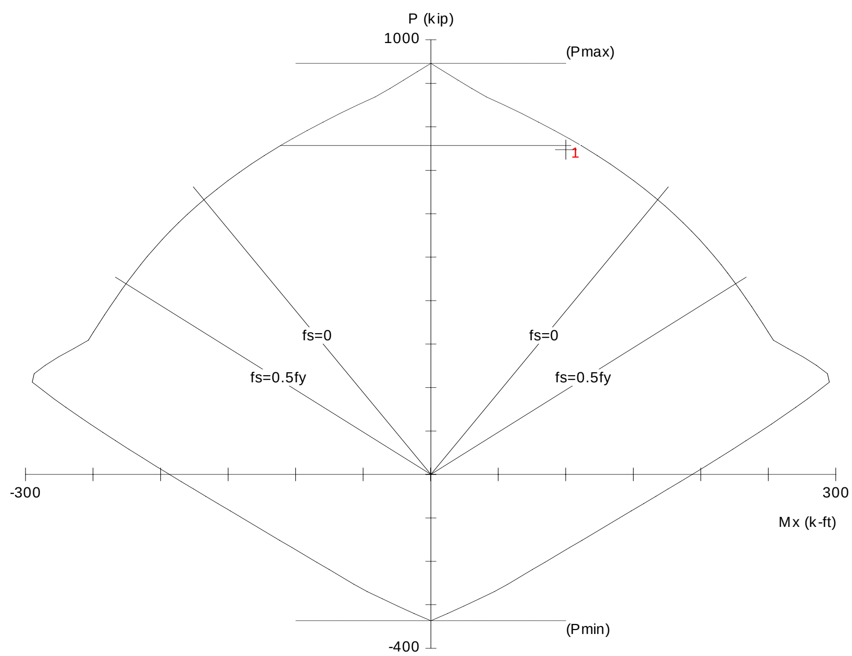
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x90	15	947	22x22 (4ksi)	4 #10



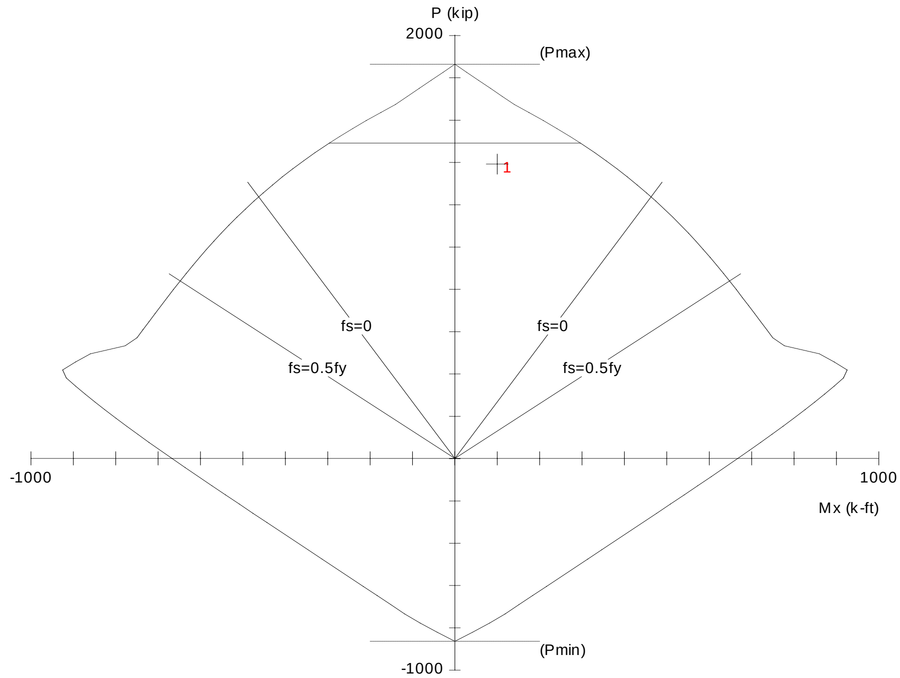
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x90	13.5	979	22x22 (4ksi)	4 #10



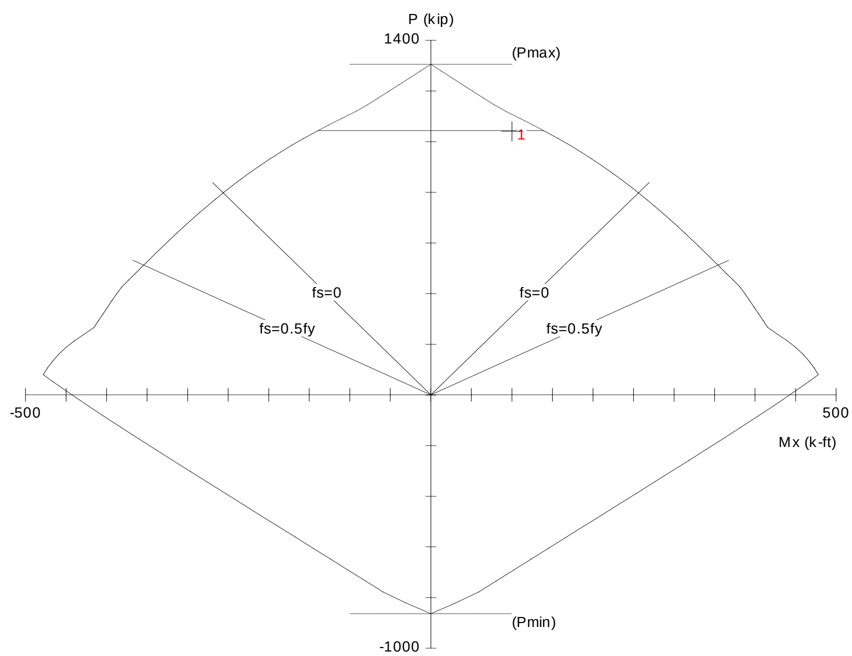
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x82	15	694	18x18 (4ksi)	4 #10



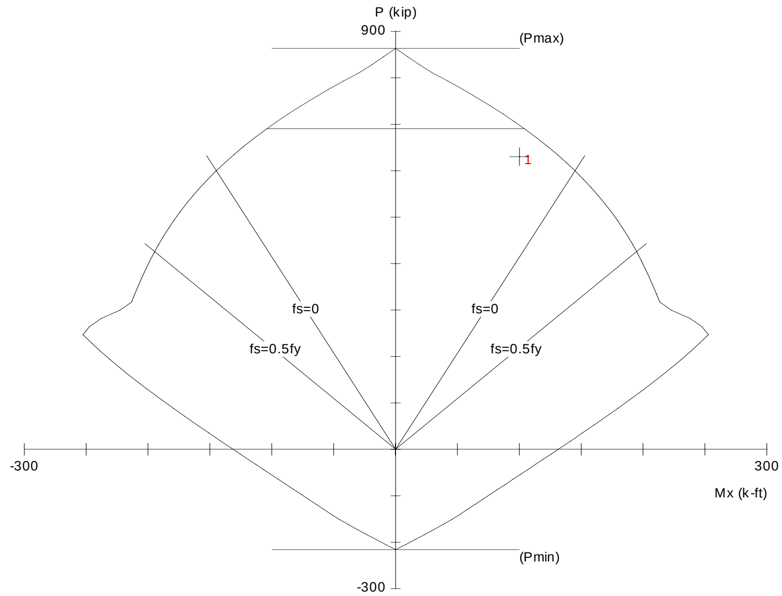
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x82	13.5	747	18x18 (4ksi)	4 #11



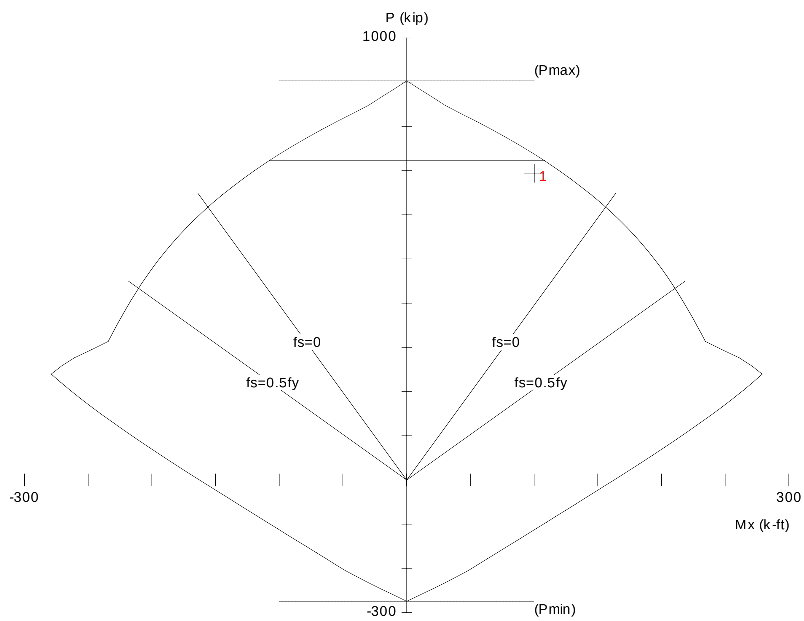
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x132	15	1390	24x24 (4ksi)	4 #18



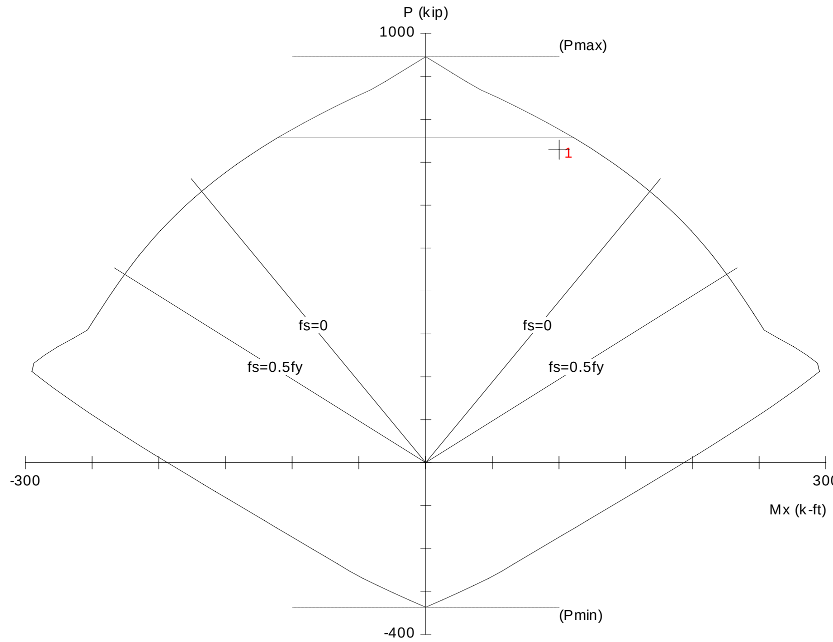
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x99	15	1040	24x24 (4ksi)	4 #11



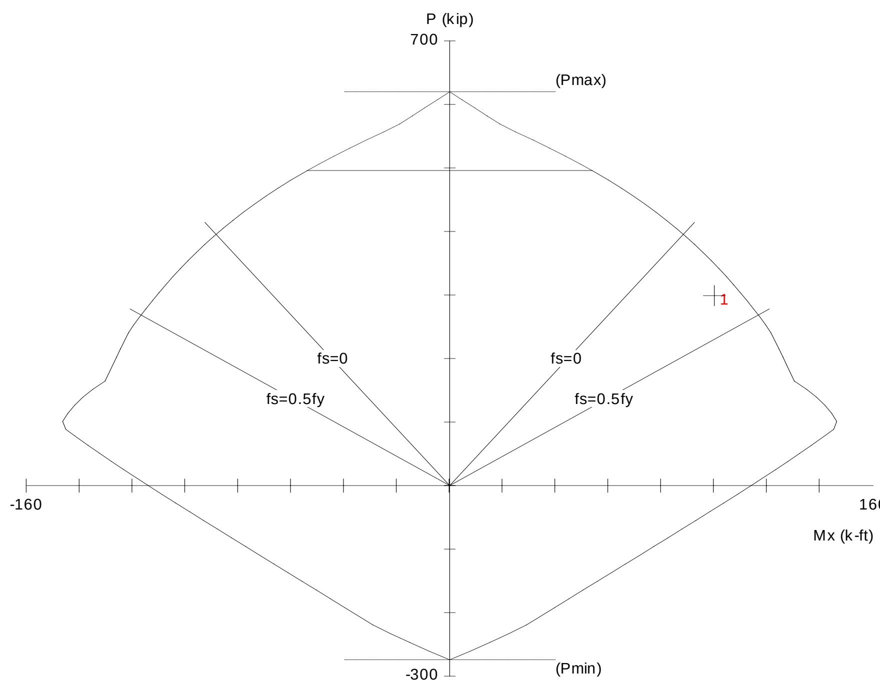
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x74	15	630	18x18 (4ksi)	4 #9



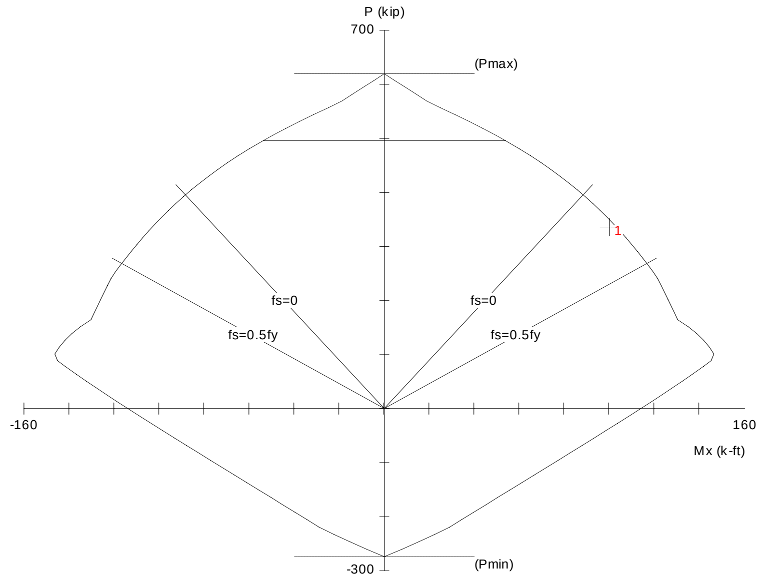
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x72	15	694	18x18 (4ksi)	4 #10



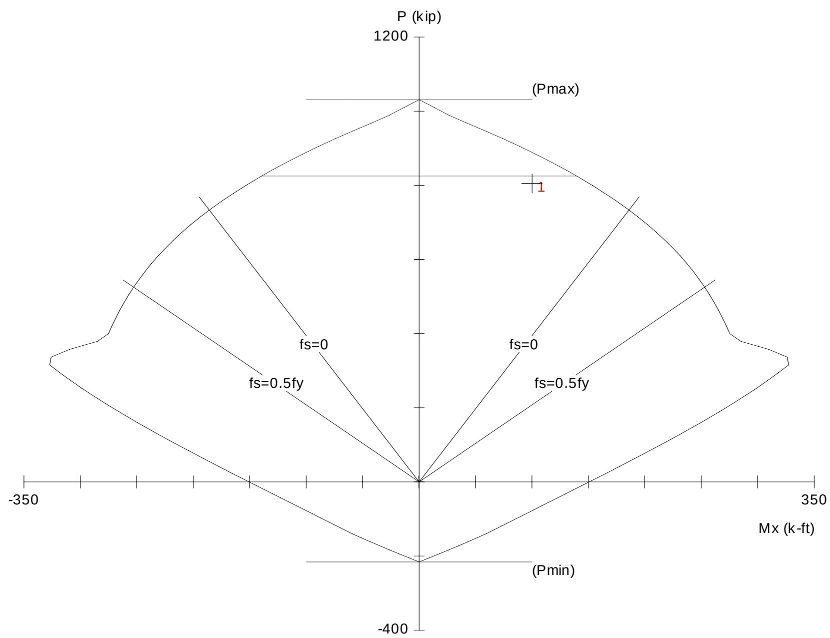
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x72	13.5	729	18x18 (4ksi)	4 #11



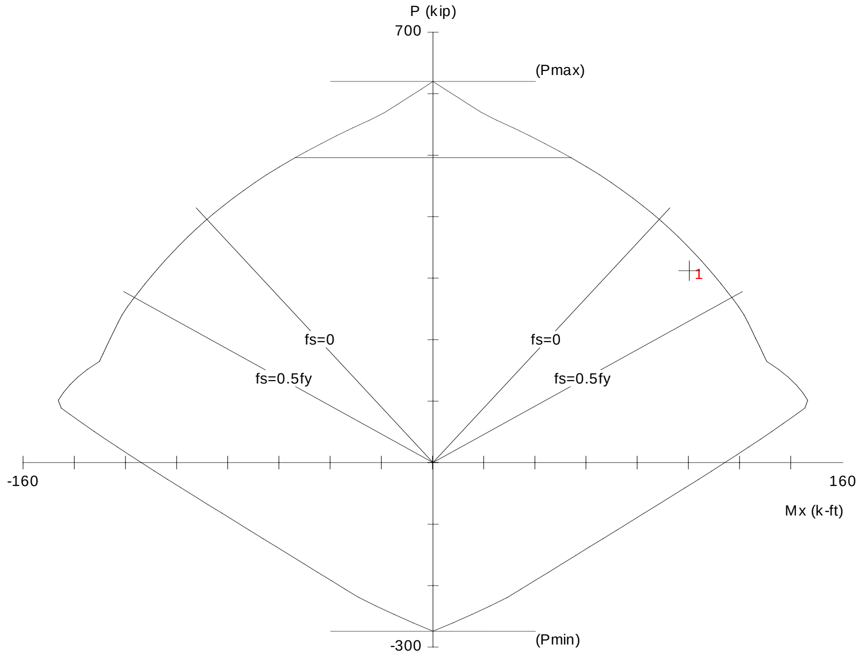
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x45	15	299	14x14 (4ksi)	4 #10



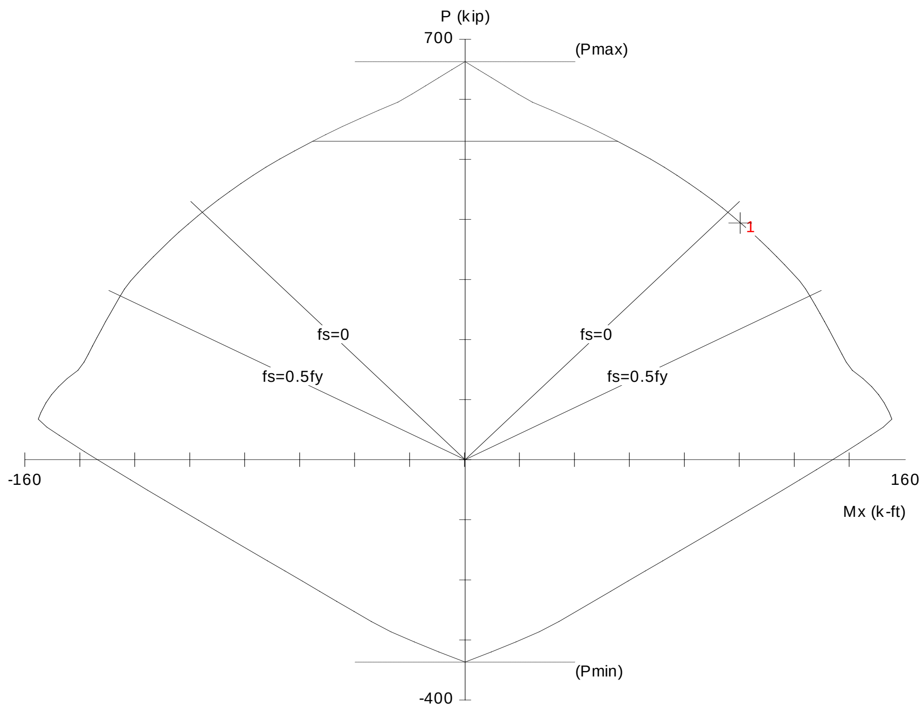
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x45	13.5	336	14x14 (4ksi)	4 #10



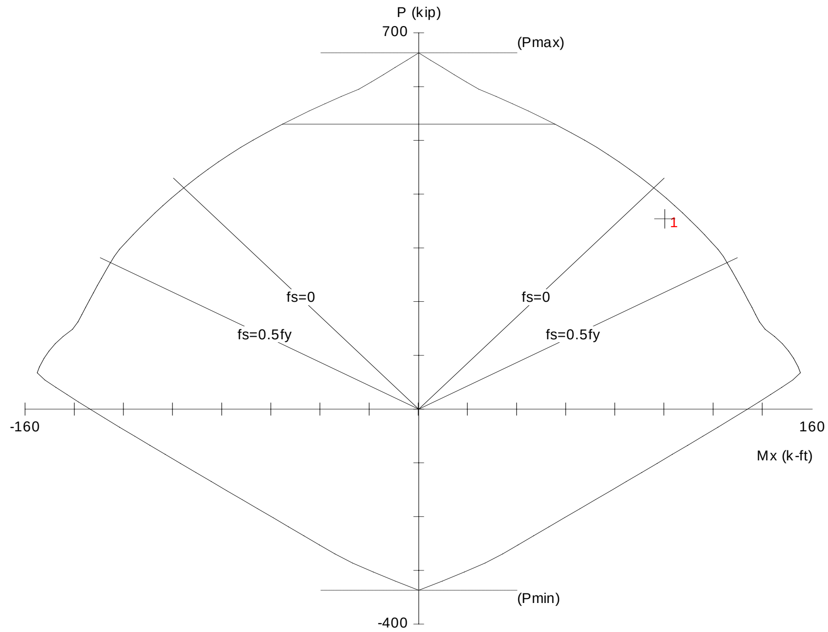
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
12x80	13.5	805	20x20 (4ksi)	4 #9



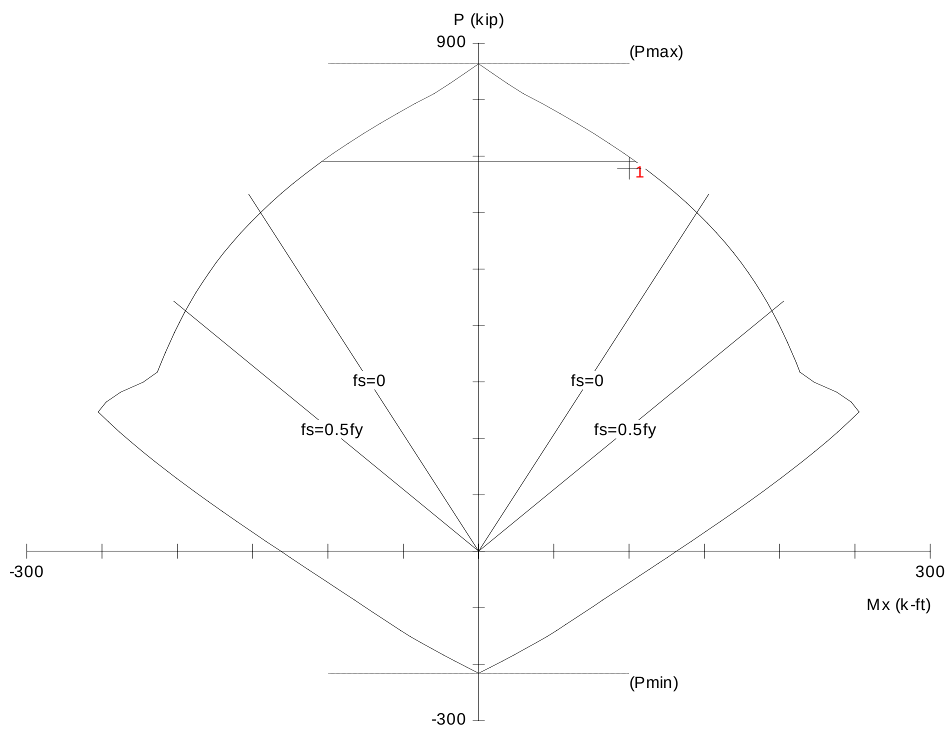
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x43	13.5	312	14x14 (4ksi)	4 #10



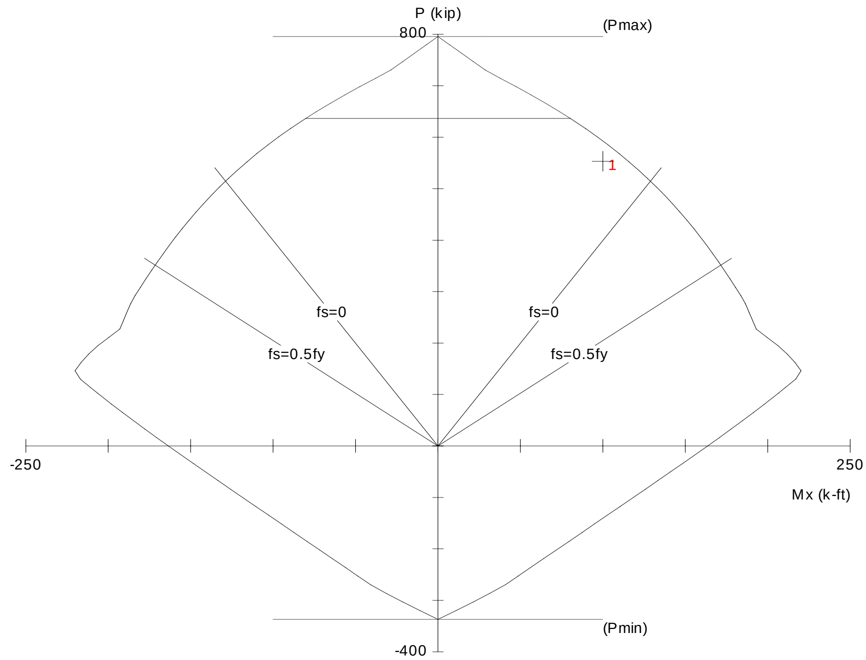
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x53	13.5	394	14x14 (4ksi)	4 #11



Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x48	13.5	354	14x14 (4ksi)	4 #11



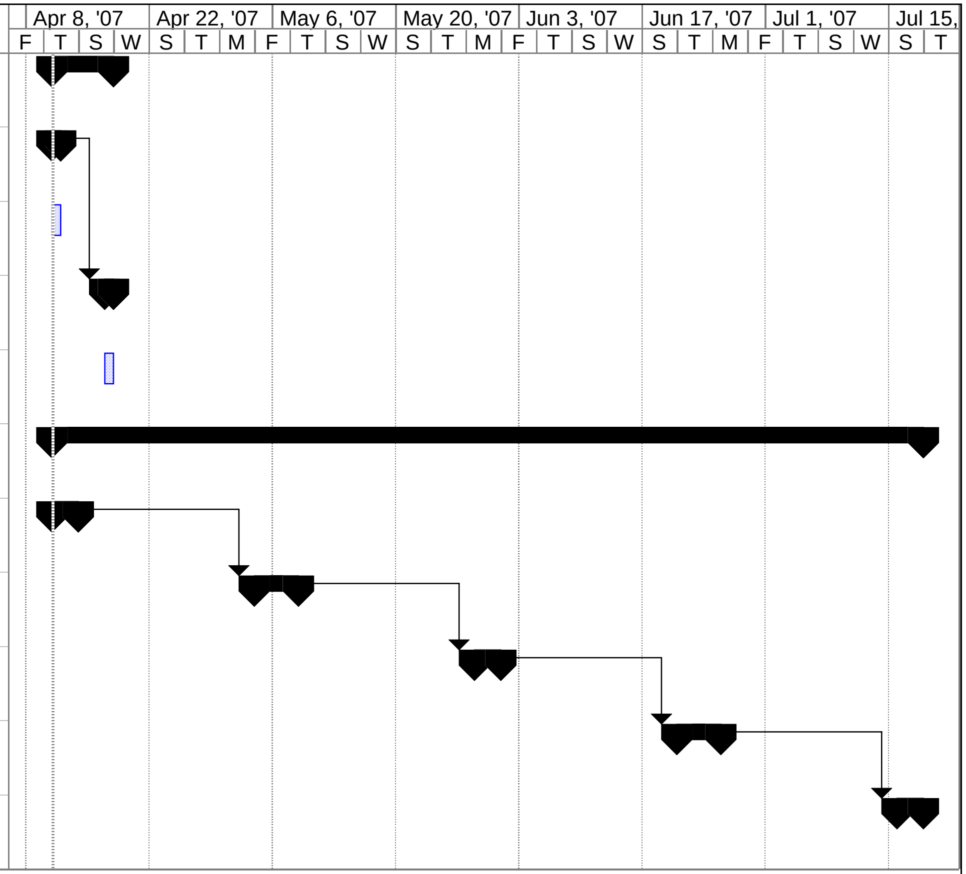
Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x68	13.5	678	18x18 (4ksi)	4 #9



Steel Column	Length (ft)	Loading (k)	Concrete Equivalent	Rebar
14x61	13.5	553	16x16 (4ksi)	4 #11

Concrete vs Steel Cost					
# of Members	Length (ft)	Steel Member	Steel Cost ($)	Concrete Member (4ksi)	Concrete Cost($)
20	15	12x58	13048	18x18 (4 #9)	6867
40	13.5	12x58	23486	18x18 (4 #9)	12361
5	15	12x65	3657	18x18 (4 #9)	1716.75
10	13.5	12x65	6582	18x18 (4 #9)	3090.25
2	15	12x53	1202	16x16 (4 #8)	591
22	13.5	12x53	11897	16x16 (4 #8)	5853
6	15	14x90	6006	16x16 (4 #10)	2676
12	13.5	14x90	10811	16x16 (4 #10)	4817
4	15	14x82	3615	22x22 (4 #10)	1373
8	13.5	14x82	6506	22x22 (4 #11)	2472
1	15	14x132	1436	24x24 (4 #18)	501
1	15	14x99	1094	24x24 (4 #11)	501
1	15	14x74	821	18x18 (4 #9)	343
4	15	12x72	3215	18x18 (4 #10)	1373
8	13.5	12x72	5787	18x18 (4 #11)	1802
2	15	12x45	1023	14x14 (4 #10)	500
3	13.5	12x45	1381	14x14 (4 #10)	676
72	13.5	12x80	56209	20x20 (4 #9)	25499
18	13.5	14x43	7992	14x14 (4 #10)	4054
24	13.5	14x53	12897	14x14 (4 #11)	5405
12	13.5	14x48	5888	14x14 (4 #11)	2703
12	13.5	14x68	8194	18x18 (4 #9)	3708
15	13.5	14x61	9264	16x16 (4 #11)	3991
			Total:		Total:
			202011		92873
				Concrete Savings:	
				109138	

ID		Task Name	Duration	Start	Finish
1		**Steel**	**5 days**	**Wed 4/11/07**	**Tue 4/17/07**
2		**1st-3rd**	**1 day**	**Wed 4/11/07**	**Wed 4/11/07**
3		group 1	1 day	Wed 4/11/07	Wed 4/11/07
4		**3rd-5th**	**1 day**	**Tue 4/17/07**	**Tue 4/17/07**
5		group 1	1 day	Tue 4/17/07	Tue 4/17/07
6		**Concrete**	**71 days?**	**Wed 4/11/07**	**Wed 7/18/07**
7		**1st**	**3 days?**	**Wed 4/11/07**	**Fri 4/13/07**
41		**2nd**	**3 days?**	**Fri 5/4/07**	**Tue 5/8/07**
75		**3rd**	**3 days?**	**Tue 5/29/07**	**Thu 5/31/07**
109		**4th**	**3 days?**	**Thu 6/21/07**	**Mon 6/25/07**
143		**5th**	**3 days?**	**Mon 7/16/07**	**Wed 7/18/07**



Project: Column Schedule.mpp
Date: Wed 4/11/07

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