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Construction Management
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Columbia Heights Community Center
1480 Girard St. NW
Washington, DC 20009
10-05-2005


North Elevation

Existing Conditions

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Executive Summary

Columbia Heights Community Center, located at 1480 Girard St. NW, is just one step Washington DC is taking towards revival of its' neighborhoods. This unique project is a mixed-use facility for learning and recreational activities as well as a satellite office for the DC Department of Parks and Recreation. The community center will be delivered using a CM at Risk delivery method and a general contractor. Columbia Heights is intended to have a minimal impact on the environment as illustrated by a LEED™ Silver Certification.

The following technical assignment was designed to evaluate existing conditions and project management. Included in this is an analysis of the project schedule, a building systems summary, a project cost evaluation, a site plan of existing conditions, and an analysis of local conditions, client information, project delivery system and staffing plan.

Key findings in these analyses have raised questions about project cost and the way it is being delivered. When comparing the cost of Columbia Heights Community Center to other community centers via D4 Cost Analysis and web research, it is found that Columbia Heights is significantly more expensive per square foot. Studies have shown that buildings are slightly more expensive if they pursue a LEED™ rating, but the costs varied more than a few percent. In regards to the delivery system, this project uses a CM at Risk delivery method and a general contractor. The project delivery structure, with a construction manager *and* general contractor, allowed for communications issues. With the position of the Construction Manager as the channel of field information (from the GC) to the owner, the chances of a "bottle-necking" effect and loss of information are increased.

Lastly, as you will see on the site plan and in the building systems summary, the project site is extremely congested. This will require increased planning by all parties. An example of this is illustrated in the project summary schedule where the slab on grade can not be poured until the crane is totally offsite and all steel is erected. Also, a hydraulic scaffold will be used in lieu of a traditional scaffold in order to fit onsite.

Project Summary Schedule

Below is a list that briefly explains the construction logic of the project schedule, which can be seen on the following page (page 4).

Foundation

- Excavate to bottom elevation of concrete foundation
- Strap Beams, Spread Footings, and Tie Beams will be framed and poured
- Structural fill and gravel to be used to backfill between foundation members up to slab elevation upon the curing of the concrete foundation
- On the north side of the site, the foundation is stepped down approximately 10' from the datum elevation of 100' to avoid impacting the cast-in-place water meter vault. This vault will be used as excavation protection. The remaining sides of excavation will be sloped back.

Structural

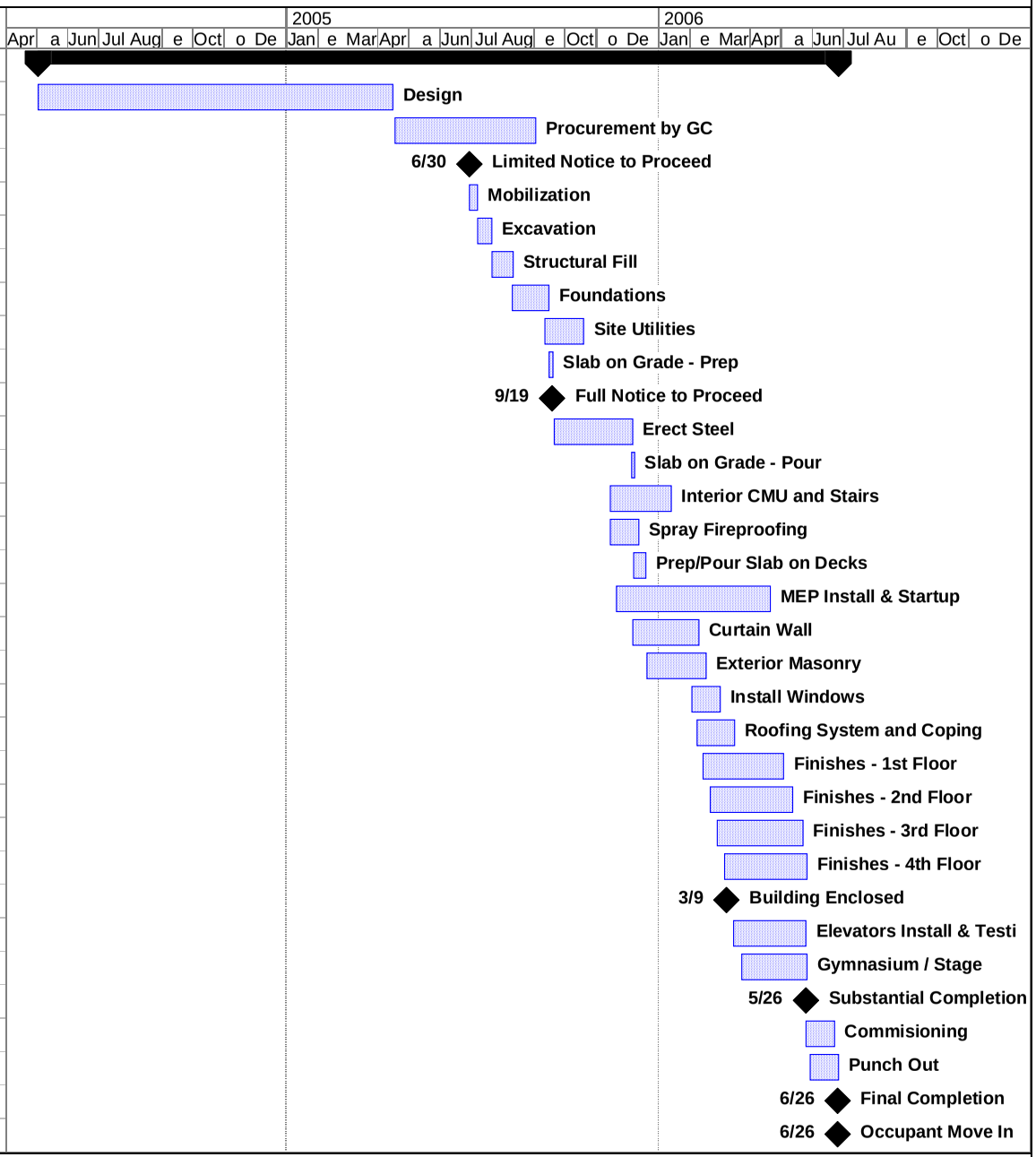
- Slab on grade will be prepped prior to steel erection – gravel will have been placed towards the end of the foundations phase
- Steel is to be erected by bays (using multi-story columns) in three sequences
    - Column Line (M-H), Column Line (H-E), and Column Line (E-A)
    - Last piece of steel to be erected from the street – closing a lane
- The slab on grade will be poured after the steel erection is complete. Slabs on metal deck will follow after the slab on grade.

Finishes

- Finishes (Drywall, Paint, Carpet, Ceramic Tile, Ceiling Tiles, etc.) shall move by floor starting on the first
- Upon completion of the exterior walls, finishes are to begin on the 1st floor and move to the 3rd floor
- Once roofing is completed and the building is enclosed, finishes can start on the 4th floor
- Concurrently, installation will occur of the gymnasium finishes and equipment as well as the stage and theater lighting / audio system
- Individual sequences of the finishes are to follow conventional logic (i.e. ceiling tiles can not be installed until the grid is in place and above-ceiling mechanical equipment is installed)

Columbia Heights Community Center
Summary Schedule

ID	Task Name	Duration	Start	Finish
1	**Total Project**	**546 days**	**Mon 5/3/04**	**Mon 6/26/06**
29	Design	243 days	Mon 5/3/04	Fri 4/15/05
30	Procurement by GC	98 days	Mon 4/18/05	Fri 9/2/05
31	Limited Notice to Proceed	0 days	Thu 6/30/05	Thu 6/30/05
2	Mobilization	5 days	Thu 6/30/05	Thu 7/7/05
3	Excavation	10 days	Fri 7/8/05	Thu 7/21/05
4	Structural Fill	15 days	Fri 7/22/05	Thu 8/11/05
5	Foundations	25 days	Thu 8/11/05	Thu 9/15/05
9	Site Utilities	28 days	Mon 9/12/05	Wed 10/19/05
6	Slab on Grade - Prep	2 days	Fri 9/16/05	Mon 9/19/05
32	Full Notice to Proceed	0 days	Mon 9/19/05	Mon 9/19/05
7	Erect Steel	53 days	Wed 9/21/05	Tue 12/6/05
8	Slab on Grade - Pour	3 days	Tue 12/6/05	Thu 12/8/05
11	Interior CMU and Stairs	40 days	Tue 11/15/05	Fri 1/13/06
12	Spray Fireproofing	18 days	Tue 11/15/05	Mon 12/12/05
10	Prep/Pour Slab on Decks	8 days	Thu 12/8/05	Mon 12/19/05
25	MEP Install & Startup	105 days	Mon 11/21/05	Thu 4/20/06
13	Curtain Wall	45 days	Wed 12/7/05	Thu 2/9/06
14	Exterior Masonry	40 days	Wed 12/21/05	Thu 2/16/06
15	Install Windows	20 days	Fri 2/3/06	Thu 3/2/06
16	Roofing System and Coping	27 days	Wed 2/8/06	Thu 3/16/06
18	Finishes - 1st Floor	57 days	Tue 2/14/06	Wed 5/3/06
19	Finishes - 2nd Floor	59 days	Tue 2/21/06	Fri 5/12/06
20	Finishes - 3rd Floor	60 days	Tue 2/28/06	Mon 5/22/06
21	Finishes - 4th Floor	59 days	Tue 3/7/06	Fri 5/26/06
17	Building Enclosed	0 days	Thu 3/9/06	Thu 3/9/06
24	Elevators Install & Testing	51 days	Thu 3/16/06	Thu 5/25/06
22	Gymnasium / Stage	46 days	Fri 3/24/06	Fri 5/26/06
23	Substantial Completion	0 days	Fri 5/26/06	Fri 5/26/06
27	Commisioning	19 days	Fri 5/26/06	Thu 6/22/06
26	Punch Out	20 days	Tue 5/30/06	Mon 6/26/06
28	Final Completion	0 days	Mon 6/26/06	Mon 6/26/06
33	Occupant Move In	0 days	Mon 6/26/06	Mon 6/26/06



Project: Columbia Heights Community
Date: Tue 10/25/05

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

Christopher Glinski
Construction Management

Building Systems Summary

Architecture:

Columbia Heights Community Center is just one step Washington DC is taking to uplift many of its neighborhoods. In an area where graffiti is a common sight, this building will provide a center for the neighborhood to gather and take part in recreational activities such as sporting events, summer camps, and learning. The facilities that will support this type of use include classrooms, a computer lab, an art room, dance studio, library, weight / exercise rooms, gymnasium, toilets/locker rooms, stage and dressing rooms, as well as administrative offices. Since the design is LEED™ (Leadership in Energy and Environmental Design) Silver Rated, much emphasis is placed on natural lighting and energy efficiency. From the sky-lights in the administrative office area to the many sizeable windows throughout the rest of the building, daylight is ever present. Natural light can even be viewed from the center of the building, such as from the glass balcony that provides a magnificent view of the entire gymnasium and its full-storied windows. Along the lines of energy efficiency, much work went into the design of the mechanical systems as well as the green roof and fourth floor terrace, which overlooks the neighboring park and playground. The glass spiral staircase, which branches off of the spacious main lobby, also gives one a view of the surrounding neighborhood and park.

Building Envelope:

The exterior walls of the Columbia Heights Community Center are primarily norman brick, which creates the illusion of length through its enhancement of horizontal lines. Precast Concrete strips make a grid pattern throughout the brick assembly, giving the building a very rigid appearance. The windows surrounded by the brick and precast are typically 1” Passive Solar Low-E Insulated-Glass Units. At the North-East corner, curtainwall glazing is used to run the entire height of the building. This is the corner where the glass stairs branch off the main lobby and run to the second floor. The remaining curtainwall is used to cover the weight / exercise room and the library. Different colored panes were used in the curtainwall to also give that horizontal appearance. The remaining East side incorporates large full-storied windows above the second floor to allow daylight into the gymnasium. The rest of the North and most of the

West elevation consist of an overhang above the first floor. Precast concrete is used to cover the steel columns at these locations. Along the West elevation, salvaged brick and limestone are used from the previous apartment building that was demolished to be replaced by the community center. This not only enables the community center to blend in with its neighbors, it is environmentally friendly since this material is being recycled. A metal garage door is also used on the West to allow for private entry into the staff parking lot. The South elevation is composed of solid brick with precast accents. This is due to the extremely close apartment building, which is adjacent to this site.

At the roof level, you can observe precast coping along the North-West corner and a Sun Shading Trellis above the North-East curtainwall. From the East, the skylights above the office area can be seen pointing upward from the roof. The roof system is composed of a PVC Membrane, approximately 1/8 of an inch thick, over a ½ inch cover board on tapered insulation. On top of this system, plant modules are placed for a green roof effect. All of this rests on a composite metal deck system.

Construction:

Even before construction of the Columbia Heights Community Center can begin, some demolition has to be performed. The foundation slabs of the pre-demolished apartment buildings will have to be broken up in order to allow the drainage of water into the soils beneath. The existing adjacent apartment wall will have to be abated of lead. Once the abatement is complete, the tongue-and-grooved bricks from the pre-existing apartment wall will be chiseled out. After this demolition and the foundations are poured, the steel can be erected. The Columbia Heights Community Center's steel structure and composite metal decking will be erected by a truck crane. The exact size of the crane has not been determined as of yet, but it will be able to pick the largest piece of steel (W40x215x60') for a distance of roughly 50 feet. Since there are extremely tight site conditions, the crane will eventually have to work from the street, closing down one lane for a weekend. The brick and precast façade, including the curtainwall, are also affected by the tight site conditions. A hydraulic scaffold will be used in lieu of traditional scaffolding since the building line abuts the sidewalk. All in all, there is approximately 8' of working space from the building face to the curb. Increased planning for material delivery and staging will also be needed. The parking garage slab on grade

will not be poured until the crane is removed from within the building and onto the street. Once poured, the garage area will serve as a material staging area. Since this building sits on a corner of two one-way streets, this delivery of materials will have to be carefully orchestrated. Construction was to begin in early May 2005, but was delayed until the beginning of July 2005 due to permit complications. The entire project will last approximately 14 months until its completion in early September of 2006.

Electrical:

Power in the Columbia Heights Community Center is strictly in 208/120V. The main feeder into the building is a 2000A, 3-phase service consisting of 10-#4 conduits. Once the feeder enters the main distribution switchboard, it is split to service the fire pump, the jockey pump, local panel boxes, and the elevators on the ground floor. Other lines rise up the building and service the local lighting and power panel boxes, as well as the three rooftop air handlers. The feeders to the local panels range from a 60A to 150A rating. Each floor has its own set of local panels. Also, a 200A rated line is used to power the high demanding stage lighting, audio, and video system. The two service lines to the rooftop air handlers are rated at 300A and 500A. Lastly, a 125kW Natural Gas Generator located on the roof is used to supply emergency power to the building's elevators, fire control system, and emergency lighting.

Lighting:

Columbia Heights Community Center is mainly composed of fluorescent fixtures which all run at 120V power and have a color temperature rating of 3500K. The two most common lamp types that can be seen throughout the building include the T8 rapid-start low-mercury lamps and the compact fluorescent triple-tube lamps. The T8 lamps have a minimum Color Rendering Index (CRI) of 75 and a minimum of 2800 initial lumens per lamp. The compact fluorescent triple-tubes have a minimum CRI of 80. In the gymnasium, two other lighting systems can be found. For the basketball court, special 15" x 48" fluorescent down lights are used and come included with 4 lamps rated at 54W each. Special theater lighting is used for the stage area. Since this is an energy efficient LEED™ rated building, motion sensors and timers are used to control all of the office, classroom, and multi-use spaces.

Mechanical:

The climate inside Columbia Heights Community Center is controlled by three rooftop air-handler units (RTU's). Whether during heating or cooling modes, all air from RTU-1 (22,000 average cfm) and RTU-3 (3,700 average cfm) is blown to the many Variable Air Volume (VAV) boxes throughout the building where it is then locally heated or cooled. This accounts for much of the system's energy savings. Air from RTU-2 (5,500 cfm) is blown directly into the stage and gymnasium area at a constant volume. Two finned water-tube boilers and pumps are used to serve the VAV heating system during heating mode. Unit heaters are also used in certain areas for local heating. Nine exhaust fans are used in the building, mainly in the ceiling plenums around the exterior as well as on the roof.

Structural:

The structural system of Columbia Heights Community Center is composed of structural steel columns and beams. The floors incorporate a composite concrete slab on metal decking, which is supported by the steel structure. The typical beam size under a classroom or multiuse space is W14x22 where a typical girder is W16x31. Since the gymnasium's two-story high ceiling supports the administrative office floor above, W40x199 girders are used and are laterally braced to two parallel W24x62 girders by W14x22 pieces. The two sizes of girders both span a length of approximately 90 feet. Column sizes range from W10x39 to W14x145. The exterior columns all rest on pedestals which in turn rest on the exterior footing. On the north side of the community center, the footing must be stepped down gradually to an elevation of 10' below the datum so that the zone of influence does not affect the buried water meter vault. The interior foundation system consists of strap beams. Tie beams are used on the south-west corner as a cantilever since the community center is directly next to an existing apartment building. This is to prevent the community center's zone of influence from affecting the foundation of the apartment building. All is topped with a 5" concrete slab on grade. All concrete on this project is to achieve a compressive strength of 4000psi within 28 days.

Fire Protection:

The majority of Columbia Heights Community Center uses a wet sprinkler system. The administrative office area uses a pre-action sprinkler system. Standpipes are used in both stairwells and pressure is controlled by a fire pump, which can be fed from the emergency generator on the roof during power outages. A jockey pump and controller also exists. The alarm system is composed of smoke detectors, bells, pull stations, and strobes. All sprinklers and alarms meet the Washington DC code for fire control as well as ADA requirements.

Plumbing:

The Columbia Heights Community Center domestic water system is supplied by a duplex booster pump assembly, which includes an expansion tank. Cold water is pumped throughout the building as well as to the gas-fired domestic water heater on the roof. A pump is used to re-circulate the hot water through a make-up boiler and back to the water heater. At several locations, electronic trap primers are used to prevent floor drains on the sanitary system from becoming dry. Drains on the roof are used to direct water into the storm drainage system. The sanitary system disposes of all the domestic waste. Motion detectors are used on sinks, toilets, and urinals to limit the amount of water use and meet LEED™ requirements.

Transportation:

There are three elevators inside the Columbia Heights Community Center. All elevators use hydraulic lift. There are two adjacent passenger elevators and one service elevator, all of which access every floor. The service elevator has a rated load of 4500lbs. and travels 100fpm. The passenger elevators both have a rated load of 3500lbs. and travel at 150fpm. Each elevator pit is 4 feet deep and a portable sump pump and alarm will notify and dispose of any standing water.

Telecommunications:

All offices, classrooms, and computer labs are equipped with combined telephone and data jacks. Since this will be a satellite office for DC Department of Parks and Recreation, the telecommunication system must be top-quality. A cable television jack can be found in the multi-purpose room on the first floor.

Special Systems:

Great emphasis is placed on Columbia Heights Community Center's Silver LEED™ Design. Not only is energy efficiency an issue, but air quality and environmental impact also exist as criteria. In order to satisfy air quality guidelines, materials with low Volatile Organic Compounds (VOC's) must be used. Also, an indoor air quality management plan must be developed by the Construction Manager. Environmental impact has to be minimized to meet LEED™ requirements. On this project, materials with recycled content, such as steel or drywall, are used and must be purchased from a location within 500 miles of the project site. Light pollution into the environment is minimized through the use of special outdoor fixtures which direct the light away from the sky and surrounding neighborhood. All of this requires increased planning from all project members.

Project Cost Evaluation

The D4 estimating software showed a total construction cost of $143.74 per square foot (refer to *Figure 1 – D4 Costs* on the following page) when using the Becker Community Center as a reference. This project was used as a reference because its square footage of 45450 is extremely close to Columbia Heights' area of 47395. The price difference between Columbia Heights' square foot cost of $206.77 and Becker's cost is due to materials. For example, the structural system in Columbia Heights is composed of steel whereas Becker is composed of concrete. This is reflected in the square foot costs because the price of steel has dramatically increased in the past few years. The price of concrete has also increased, but not at the scale of steel. The pricing also differs because Becker Community Center has an aquatic center while Columbia Heights has a gymnasium and theatrical stage.

Figure 1 – D4 Costs

	% of Building	Sq. Ft. Cost	Total Cost
General Requirements	**13.97**	**20.08**	**912,634**
CM Fee	$3.13	$4.50	$204,517.49
Contingency Fund	$2.32	$3.33	$151,494.44
Design Fees	$5.36	$7.70	$349,952.16
General Requirements	$3.16	$4.55	$206,670.23
Concrete	**4.50**	**6.46**	**293,683**
Concrete	$4.50	$6.46	$293,682.58
Masonry	**12.27**	**17.63**	**801,293**
Masonry	$12.27	$17.63	$801,293.49
Metals	**7.46**	**10.73**	**487,630**
Metals	$7.46	$10.73	$487,630.31
Wood & Plastics	**4.34**	**6.23**	**283,360**
Wood & Plastics	$4.34	$6.23	$283,359.75
Thermal & Moisture Protection	**7.53**	**10.82**	**491,631**
Thermal & Moisture Protection	$7.53	$10.82	$491,631.27
Doors & Windows	**5.44**	**7.82**	**355,354**
Doors & Windows	$5.44	$7.82	$355,354.46
Finishes	**6.33**	**9.11**	**413,854**
Finishes	$6.33	$9.11	$413,854.03
Specialties	**1.11**	**1.60**	**72,667**
Specialties	$1.11	$1.60	$72,667.34
Equipment	**0.44**	**0.64**	**28,879**
Equipment	$0.44	$0.64	$28,879.39
Furnishings	**0.04**	**0.06**	**2,507**
Furnishings	$0.04	$0.06	$2,507.23
Special Construction	**8.61**	**12.38**	**562,581**
Special Construction	$8.61	$12.38	$562,580.66
Mechanical	**18.93**	**27.22**	**1,237,045**
Mechanical	$18.93	$27.22	$1,237,044.52
Electrical	**9.03**	**12.98**	**590,048**
Electrical	$9.03	$12.98	$590,048.13
Total Building Costs	**100.00**	**143.74**	**6,533,167**
Project Name	Becker Community Center		
Project Cost	$6,533,167		
Site Size	348,480 SF		
Building Use	Recreational		
Bid Date	3/1/1993		
Num Floors	4		
*** Projected to Original Start of Project**			
Projected Month	May		
Projected Year	2005		
Projected Location	District of Columbia		
Building Size	45,450 SF		

Below in *Figure 2 – Actual Costs*, the construction cost, total project cost, and building systems cost is provided. They can be seen as total price or price per square foot.

Figure 2 - Actual Costs

	Total	Per Square Foot (47395 SF)
Construction Cost	$9,800,000	$206.77 / SF
Total Project Costs	$10,900,000	$229.98 / SF
Building Systems Cost		
Mechanical	$1,500,000	$31.65 / SF
Electrical	$600,000	$12.66 / SF
Structural Steel	$1,100,000	$23.21 / SF
Structural Concrete	$600,000	$12.66 / SF
Masonry	$1,000,000	$21.10 / SF

** Building systems costs are approximate due to confidentiality reasons*

R.S. Means Data*

When referencing R.S. Means for costs per square foot for a community center, the highest square footage that could supply data was 20,000 sf. Since Columbia Heights Community Center is 47395 sf. (about 137% larger), R.S. Means was unable to provide an effective comparison. Instead, the list below and *Figure 3 – Comparison Costs*, on the next page, looks at several community / recreational centers that are either in planning, construction, or have been recently completed.

1. Westside Recreational Center
    - $2.7 Million, 19500 sf, Dover, Delaware
    - http://www.cityofdover.com/media/documents/study-Westside_Recreation_Center.pdf
2. Mill Street Recreation Center
    - $2.5 Million, 21000 sf, Springfield, Oregon
    - http://www.springfieldnews.com/articles/2005/09/16/local/news03.txt
3. Milford Highschool Community Center
    - $16.8 Million, 93155 sf, Williamston, Michigan
    - http://www.asbj.com/lbd/2005/projects/milford-hs.pdf

Figure 3 – Comparison Costs

	Construction Cost	Per Square Foot
Square Foot Cost		
Westside Recreation Center	$2,700,000	$139.02
Mill Street Recreation Center	$2,500,000	$128.73
Milford Community Center	$16,800,000	$180.34
Columbia Heights Community Center	$9,800,000	$206.77

Due to limited resources available on pricing for community centers, the comparison centers varied a lot in size. Columbia Heights Community Center is more expensive per square foot than the two smaller centers, mainly due to size. According to R.S. Means 2005, a *basic* community center with 20,000 sf should cost approximately $99.35 per square foot. The two small community centers used here incorporate more options than the R.S. Means basic model, such as swimming pools and gyms. Despite that the Milford Community Center is larger than it, Columbia Heights still costs more per square foot. This can be attributed to the LEED™ Silver Certification. According to the article "Achieving 'Low Cost' LEED™ Projects" in the April 2005 issue of HPAC Engineering, *Figure 2* shows that achieving a Silver LEED™ rating is an average increase of 2.8% of your total construction cost.