Columbia Heights Community Center
Washington, DC
Christopher Glinski
Construction Management

Project Overview

Total Cost: $ 9.8 Million
Size: 47,395 Sq. Ft.
4 Stories
Duration:
16 Months
Revised: July 2005 – September 2006

Building Function:
Public Recreational Activity Center
Satellite offices for DPR

Facilities:
Classrooms, Computer Lab, Gymnasium,
Stage and Dressing Rooms, Dance Studio,
Weight and Aerobics Rooms, Arts / Crafts,
Music Room

Relevant Systems Background

Façade:
• Brick and Cast Stone with CMU backup
• Curtain Wall Assembly
Foundation:
• Step Footings, Strap Beams,
and Tie Beams for cantilever
adjacent to existing apartment
Framing:
• Structural Steel

Mechanical:
• Three rooftop Air-Handling Units
  – 31,200 cfm capacity
• VAV’s at the local level
• Constant Volume used in the Gymnasium

Presentation Outline

Project Overview
Analysis 1 – LEED® Point Research
Analysis 2 – Precast Brick Façade
Analysis 3 – Gymnasium Structure Redesign
Analysis 4 – Foundation Placement Method

Conclusions
Q&A
Analysis 1
LEED® Point Alignment

Interviews of owners of 10 projects
- Selected from the U.S. Green Building Council (USGBC) database
- Focus: New Construction and Major Renovations (LEED®-NC) Version 2.1 projects
- Variable certification levels
  - 4 LEED® Certified
  - 3 LEED® Silver
  - 2 LEED® Gold
  - 1 LEED® Platinum
LEED® Point Alignment

Common Goals

- Healthy indoor environment
  - Priority for office / administrative environments (7 out of 10 projects)
- Lowering operation and maintenance costs
  - Common among owners who plan to occupy (7 out of 10 projects)
- Accessible to the Community
  - Mentioned by owners in urban setting (4 out of 10 projects)
  - Accessible to multiple forms of transportation

LEED® Point Matrix

Projects

LEED® Points

Columbia Heights Community Center

LEED® Point Alignment

Common Goals (cont.)

- "Setting an example" or "being the measuring stick" for future Green facilities
  - Noted by organization with future projects or mandated level of LEED® certification
- As economical and efficient as possible
- Cost an underlying factor
- "Low Cost" LEED® Points research

LEED® Point Matrix

Table 3 - LEED® Point Comparison

<table>
<thead>
<tr>
<th>LEED™ Points</th>
<th>Most Often Earned*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia Heights Community Center</td>
<td>Carl T. Curtis - National Park Service</td>
</tr>
<tr>
<td>LEED-NC Version 2.1 Points Certified</td>
<td>TBD Gold</td>
</tr>
<tr>
<td>Sustainable Sites</td>
<td>Credit 1</td>
</tr>
<tr>
<td>Site Selection</td>
<td>X X X</td>
</tr>
<tr>
<td>Credit 2</td>
<td>Development Density</td>
</tr>
<tr>
<td>Credit 3</td>
<td>Brownfield Redevelopment</td>
</tr>
<tr>
<td>Credit 4.1</td>
<td>Alternative Transportation, Public Transportation Access</td>
</tr>
<tr>
<td>Credit 4.2</td>
<td>Alternative Transportation, Bicycle Storage &amp; Changing Rooms</td>
</tr>
<tr>
<td>Credit 4.3</td>
<td>Alternative Transportation, Alternative Fuel Vehicles</td>
</tr>
</tbody>
</table>

LEED® Point Alignment

Deviations from the "Low Cost" 26

- Patrick H. Dollard Health Center (17 out of the 26)
- Baca/Dlo’ay azhi Community School (18 out of the 26)

Shared Attributes

- Not projects where the organization mandated they go Green
- Goal of obtaining points that were functional to their building

"Low Cost" LEED® Point List – a great start for projects that must obtain Green!
**LEED® Point Alignment**

**Point Alignment Tool**

**Project Overview**
- Analysis 1 – LEED® Point Research
- Analysis 2 – Precast Brick Façade
- Analysis 3 – Gymnasium Structure Redesign
- Analysis 4 – Foundation Placement Method

**Conclusions & Recommendations**
- Mandated projects should consult the “Low Cost” LEED® Point List as a foundation
- Point Alignment Tool can be an aid during design and planning
  - Helps to set goals and determine priorities
  - Reorganizes LEED® Points according to goals
- Next: Test the “Point Alignment Tool” on new projects

**Analysis 2 – Façade Redesign**

**Façade Redesign**

**Problem**
- South wall is extremely close to adjacent apartment
- Space is very limited for material staging
- No access for material delivery, bricks will have to be fed to the masons from the inside

**Goal**
- Can the bricks be replaced with Architectural Precast Brick Panels?

**Outcome**
- Slenderwall® System (Smith Midland™)
  - Architectural precast concrete
  - Reinforced with hot-dipped galvanized welded wire
  - Insulated Nelson® anchors (THERMAGUARD™)
  - Stainless steel framing backup (fill with R13 batt)
  - Cost: $22/s.f. – $33/s.f.
  - Productivity: 15-20 panels/day
  - Depends on complexity

**Analysis 2 – Precast Brick Façade**

**Conclusions**
- Weighs significantly less
- Slightly reduces heat-loss and heat-gain

**Gymnasium Structure Redesign**

**Foundation Placement Method**

**Q&A**
Façade Redesign

Cost Impacts:
- Replacing 5,720 s.f. of façade (110’ x 52’)
- Two types of panels
  - Panel A: 10’-0” x 39’-8”
  - Panel B: 10’-0” x 12’-4”
- No crane impacts: max lift is 5 tons / panel
  - Crane Manufacturer specifications show a 5.5 ton lift with 115’-0” boom and 90’-0” radius (Grove® TMS900E Crane)
- $57,400 more expensive

Structural Impacts:
- Brick: 4” thick
- Slenderwall®
  - 28lbs/sf per manufacturer
  - Slenderwall® weighs 34 tons less
  - Since connection at 16” O.C. (typical), assume no negative structural impacts
  - Evenly distributed

R-Value:
- Slenderwall® Panel
  - R-Value: 17.51
  - U-Value: 0.057
- Brick Wall
  - R-Value: 8.71
  - U-Value: 0.115

Mechanical Impacts:
- Analyzed Gymnasium
  - Constant Volume Supply
  - Slenderwall® doubles R-Value
  - Not enough savings to reduce the Gymnasium AHU

Schedule Impacts:
- Total of 22 Slenderwall® panels
- Assume 16 panels / day
  - 15-20 panels/day from manufacturer
- Reduces schedule by nearly 14 days
  - Saves $21,500 in General Conditions
  - Building Enclosed two weeks early

Conclusions & Recommendations:
- No mechanical and structural impact
- Reduces waste associated with brick
- Reduces site congestion
- Reduces schedule by almost 14 days
  - Saves $21,500 in General Conditions
  - Encloses building
- Ultimately $35,900 more expensive
  - Only 0.37% of entire project
  - Slenderwall® worth the investment
Columbia Heights Community Center

**Problem**
- Gymnasium steel very large
  - Span 60'-0", W40x215
  - Support open office on fourth floor
  - Some members take loads from the roof through transfer columns (15 kips)
- Costly in terms of material
- Large crane needed

**Goal**
- Verify existing member sizes
- Change to open-web steel joist

**Analysis 1 – LEED® Point Research**

**Analysis 2 – Precast Brick Façade**

**Analysis 3 – Gymnasium Structure Redesign**

**Analysis 4 – Foundation Placement Method**

**Conclusions**

**Q&A**

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**Outcome**
- RAM Steel v10.0 modeling software output:
  - Reduced Steel System (I-beams)
  - Open-web Steel Joists
- Extensive review of output showed an error in the results
- Only some members could be changed

**Building Loads**
- Structural Specifications
- Roof Loads (including Green Roof):
  - Snow: 30 psf
  - Live: 80 psf

**Fourth Floor Framing Plan**

**RAM Steel v10.0 Output**
- Reduced Steel Design
  - W40x215x60' reduced to W30x90x60' at 6'-6" O.C.
- Open-web Steel Joists (Long-Span)
  - 44LH09 and 44LH15 (transfer column) at 4'-0" O.C.

Significant reduction – how is this possible?

**Output Error and Recalculations**
- Distributed Loads identified by RAM were incorrect
- Worked with structural consultant to verify loads
  - 327psf (RAM) vs. 785psf (hand) – transfer beams
  - RAM output can not be used
- Can not reduce beams supporting transfer columns
- Looked to replace filler beams...
Gymnasium Steel Redesign

Recalculations
- Filler beams could be replaced by open-web joists
- (16) 26LH13 @ 4'-0" O.C. - replace existing (8) W24x62
- Reduces costs and material:
  - ½ ton of steel
  - $23,000
- No impact on erection speed

Conclusions

Outcome
- Increased safety measures must be taken
- More concrete needed (10%)
- Trench Method Saves
  - $92,400
    - Reduced spoils
    - Removal of formwork labor and materials
    - 4 days off schedule
    - 1653 BCY reduction in spoils
    - Reduced by roughly 77%
    - Reduced site disturbance — supports LEED® ideals
Conclusions

- **LEED® Point Alignment**
  - Rearranged LEED® Points to align with goals

- **Facade Redesign**
  - Slenderwall® system used
    - Costs slightly more but reduces congestion, reduces waste quantities, and saves time

  - Gymnasium steel redesign
    - Filter beams could be changed to open-web joists
    - Saves material quantities as well as costs

- **Foundation Placement Method**
  - "Trench" foundation placement method is a feasible alternative
  - Reduces quantities of spoils and associated costs

Questions?

Façade Redesign

- No crane impacts: max lift is 5 tons per panel
- Crane Manufacturer specifications show a 5.5 ton lift with 115'-0" boom and 90'-0" radius (Grove® TMS900E Crane)

Component

<table>
<thead>
<tr>
<th>Category</th>
<th>Component</th>
<th>Load (psf)</th>
<th>Load (kPa)</th>
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<tbody>
<tr>
<td>I</td>
<td>Concrete slab on deck</td>
<td>70</td>
<td>700</td>
</tr>
<tr>
<td>II</td>
<td>Steel Deck (20 gage)</td>
<td>80</td>
<td>780</td>
</tr>
<tr>
<td>III</td>
<td>Polyisocyanurate Board Insulation</td>
<td>10.0</td>
<td>100</td>
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<tr>
<td>IV</td>
<td>PVC Roofing Membrane</td>
<td>5.0</td>
<td>50</td>
</tr>
</tbody>
</table>

Building Loads

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<tr>
<th>Component</th>
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<th>Load (kPa)</th>
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</thead>
<tbody>
<tr>
<td>Mechanical Impedance</td>
<td>80</td>
<td>780</td>
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<tr>
<td>Acoustical Fiberboard</td>
<td>40</td>
<td>390</td>
</tr>
<tr>
<td>Ceiling System (4th Floor)</td>
<td>50</td>
<td>490</td>
</tr>
<tr>
<td>Livelines</td>
<td>50</td>
<td>490</td>
</tr>
<tr>
<td>Misc</td>
<td>50</td>
<td>490</td>
</tr>
<tr>
<td>Green Roof (lightweight 3&quot; thick)</td>
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<td>490</td>
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<tr>
<td>Ceiling System (Gymnasium)</td>
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<td>490</td>
</tr>
<tr>
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<td>780</td>
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Community Center

Gymnasium Steel Redesign

Recalculations

- Filler Beams
  - w_g = 548 lb/ft
  - M_g = 353 k*ft
  - 36LH13 @ 4'-0" O.C.
  - Canam Steel Corp. Joist Catalog

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Recalculations

Item Number Total Length (ft) Total Material $ Total Labor $ Total Equipment $ Total Cost
W 24x62 8 480.00 14.88 $37,944 $5,357 $2,515 $45,816
36LH13 16 960.00 14.40 $20,808 $1,306 $653 $22,766

Canam Steel Corp. Joist Catalog

Item Material $ / Ton Labor $ / Ton Equipment $ / Ton
W 24x62 2550 360 169
36LH13 1445 90 45

Assume average swell factor to be 10%

Foundation Placement

Method Comparison

<table>
<thead>
<tr>
<th>Item</th>
<th>Trench Excavation</th>
<th>Bulk Excavation</th>
<th>Difference</th>
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</thead>
<tbody>
<tr>
<td>Material (BCY)</td>
<td>987.51</td>
<td>2620.93</td>
<td>1653.84</td>
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<tr>
<td>Material (LCY)</td>
<td>1063.80</td>
<td>2883.02</td>
<td>1819.22</td>
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<tr>
<td>Excavator Demand (Days)</td>
<td>6.9</td>
<td>4.8</td>
<td>4</td>
</tr>
</tbody>
</table>

Total costs include excavation costs and forming costs

* Total costs include excavation costs and forming costs

Assume average swell factor to be 10%