# NATIONALS PARK

24 POTOMAC AVE SE, WASHINGTON DC

2008

Matthew Moore – Construction Management

## Presentation Outline

- Project Overview
- Short Interval Production Schedule – Research
- Structural Column Alternate Selection – Breadth
- Lighting Design For Indoor Batting Cage – Breadth
- Summary and Conclusions

## Presentation Outline

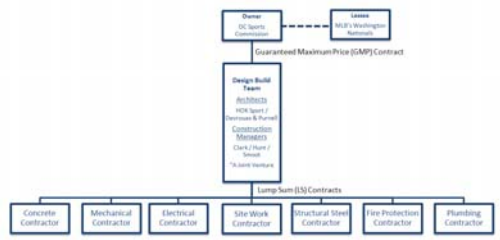
- Project Overview
- Short Interval Production Schedule – Research
- Structural Column Alternate Selection – Breadth
- Lighting Design For Indoor Batting Cage – Breadth
- Summary and Conclusions

## Project Overview

- **Function** – A Major League Baseball Ballpark
- **Occupancy Team** – MLB's Washington Nationals
- **Size** – 1.2 million square ft.
- **Seats** – 41,222 people
- **Construction Schedule** – June 2006 to March 2008
- **Opening Day** – March 30, 2008
- **Cost** – $611 million

## Project Overview

- Fast-tracked design build project




## Project Overview

- **Architecture**
  - Open concourse baseball stadium with conditioned premium spaces
- **Mechanical System**
  - Cooling loads – (2) 800 ton water cooled chillers for the on peak loads and (1) 400 ton water cooled chiller for the off peak loads.
  - Heating loads – (2) 12500 AMBH output, natural gas fired, forced draft hot water boilers
  - The premium spaces will have variable air volume air handling units with VAV Boxes for control
- **Electrical System**
  - (3) 13.2 kV circuit feeders
  - Unit substations – dry type transformers rated for 28500/3330 kVA, 4, 160 volt, 3-phase delta primary
  - The transformers feed a 400 amp switch board rated for 277/480 volt, 3 phase, 4-wire

## Presentation Outline

- Project Overview
- Short Interval Production Schedule – Research
- Structural Column Alternate Selection – Breadth
- Lighting Design for Indoor Batting Cage – Breadth
- Summary and Conclusions

## SIPS - Research

- Short Interval Production Schedule (SIPS) is developed to detail the necessary day-to-day production or task-to-task production during any repeatable construction project
- Extremely detailed way to schedule repetitive construction project
- Many construction projects go over budget and over schedule due to poor detailed scheduling

## SIPS - Research

- 3 main ideas that differentiate SIPS from any other standard scheduling methods:
  - Only one major specific operation is detailed
  - A higher level of detail is developed then typically seen
  - There must be personnel involvement and commitment from everyone contributing to the operation

## SIPS - Research

- There are 4 steps that need to be taken to develop a SIPS:
  1. Break the operation into specific activities
  2. Assign production rates to each activity
  3. Calculate extensions and set goals
  4. Develop a time-scaled, resource loaded bar chart

## SIPS - Research

- **Problem** – Due to the repeatability of the 58 luxury suites, can the use of a Short Interval Production Schedule benefit the completion of the ballpark?
- **Proposal** – The development of a SIPS will have major time implications if it is properly designed and executed for the interior build out for the 58 luxury suites

## SIPS - Research

- **Step 1** – Break the operation into specific activities – Interior Build Out – 18 activities
  - Subroof
  - GWB Framing
  - Tie-in Conduit/Pull Wire
  - Hang GWB Walls
  - Paint Walls
  - Acoustic Ceiling Grid
  - GWB Ceiling Framing
  - GWB Ceilings
  - Light Fixtures and MEP Drops
  - Millwork
  - Plumbing Fixtures
  - Flooring
  - Doors and Architectural Trim
  - Toilet Accessories
  - Finish Painting and Wall Covering
  - Ceiling Pads
  - MEP Devices
  - FF & E

## SIPS - Research

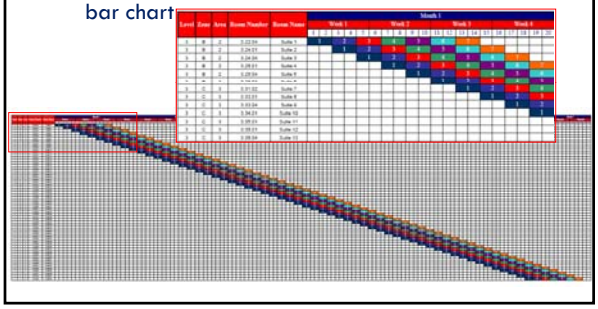
- **Step 2** – Assign production rates to each activity

## SIPS - Research

- **Step 3** – Calculate extensions and set goals
  - Create milestones to track progress
  - Look for any setbacks that might occur
  - Initial schedule - no unforeseen setbacks
  - Serve as a guideline for setbacks to look out for during the installation process

## SIPS - Research

- **Step 4 –** Develop a time-scaled, resource loaded bar chart



## SIPS - Research

- **Conclusion**
  - My Schedule - 123 days to complete the interior build out
  - Project schedule - 157 days
  - Savings 34 days
  - This was due to the repeatability of the suites and the detailed scheduling
  - SIPS will not only help keep the project on schedule it can also help reduce the overall time that a activity can take due to the high level of detail and repetition that can occur

## Presentation Outline

- Project Overview
- Short Interval Production Schedule – Research
- Structural Column Alternate Selection – Breadth
- Lighting Design For Indoor Batting Cage – Breadth
- Summary and Conclusions

## Structural Column Alternate Selection - Breadth

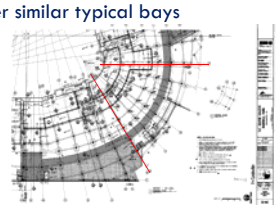
- **Background** – The ballpark is a combination of steel and cast in place concrete
  - The structural steel is unique because it is only located in the structures above the Club Level as well as in the scoreboard in the right field. Cast in place concrete was used for the load bearing columns for the Service Level (1st level only)
- **Problem Statement** – A cast-in-place (CIP) concrete structural system takes more construction time to erect then a steel structural system. Would it save valuable schedule time and be more cost effective if the ballpark was designed using only one type of structural system, specifically an all steel system?

## Structural Column Alternate Selection - Breadth

- **Proposal**
  - Changing all of the structural CIP concrete columns on the 1st level to a steel equivalent would help save valuable construction time and help shorten the overall project schedule
  - The goal is to get the ballpark built as quickly as possible without any extreme added cost

## Structural Column Alternate Selection - Breadth

- Selection of a typical bay for structural columns redesign
  - Located between the column line 33 and the column line 38
  - 5 other similar typical bays

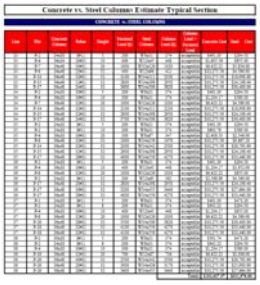


## Structural Column Alternate Selection - Breadth

- **Goal** – to determine the least weight column that can handle the already factored load using LRFD
- Typical column – Located on line 36
  - 36" x 48" concrete column, 12#11 rebar with an effective height of 20 ft
  - The applied load is 1000 kips and is already factored (done by structural engineer)
  - The cost for the concrete column is $6,422.22 @ $722.22/CY
- The effective length for each axis was assumed to be the same in both directions, therefore KL=20 ft
- The Steel Construction Manual was used to find the least weight W member that can carry the already factor applied load of 1000 kips.
- W12 x 120 – selected
  - It can carry a applied load of 1030 kips – acceptable
- The cost for the new steel column is $4,560.00 which is based off the member size and weight @ $3,800.00/ton

## Structural Column Alternate Selection - Breadth

- **Concrete to Steel Column Redesign**



## Structural Column Alternate Selection - Breadth

- **Concrete vs. Steel Costs**

| | |
|---|---|
| SUBTOTAL STEEL TYPICAL SECTION ESTIMATE: | $532,976.60 |
| LOCATION MULTIPLIER 99% FOR DC: | $527,646.83 |
| TOTAL STEEL TYPICAL SECTION COST: | $527,646.83 |

| | |
|---|---|
| SUBTOTAL CONCRETE TYPICAL SECTION ESTIMATE: | $253,617.57 |
| LOCATION MULTIPLIER 99% FOR DC: | $251,081.39 |
| TOTAL CONCRETE TYPICAL SECTION COST: | $251,081.39 |

| | |
|---|---|
| INCREASE IN COST DUE TO ALL STEEL TYPICAL SECTION: | $276,565.44 |

| | |
|---|---|
| SUBTOTAL COMPLETE STEEL ESTIMATE: | $3,197,859.60 |
| LOCATION MULTIPLIER 99% FOR DC: | $3,165,881.00 |
| TOTAL STEEL COST: | $3,165,881.00 |

| | |
|---|---|
| SUBTOTAL CONCRETE ESTIMATE: | $1,521,705.42 |
| LOCATION MULTIPLIER 99% FOR DC: | $1,506,488.36 |
| TOTAL CONCRETE COST: | $1,506,488.36 |

| | |
|---|---|
| INCREASE IN COST DUE TO ALL STEEL: | $1,659,392.64 |

## Structural Column Alternate Selection - Breadth

- **Schedule Analysis**
  - The CIP Concrete took 140 days to construct
  - The Structural Steel would take only 60 days to erect
  - It would save the construction team 80 days

## Structural Column Alternate Selection - Breadth

- **Conclusion**
  - Save the construction team 80 days
  - Cost $1.7 million more to do all steel
- What is driving the project more, cost or schedule?
  - The schedule is the most important factor – acceptable to use an all steel structural system
  - $1 million per day in liquated damages for every day that The Washington Nationals can't occupy the ballpark

## Presentation Outline

- Project Overview
- Short Interval Production Schedule – Research
- Structural Column Alternate Selection – Breadth
- Lighting Design For Indoor Batting Cage – Breadth
- Summary and Conclusions

## Lighting Design for Indoor Batting Cage - Breadth

**Background**

- The indoor batting cage lighting design is based off of gym criteria
- Designed using an illumance of 50 footcandles
- Overdesigned with an illumance of 94.84 fc
- Current design uses metal halide lamps
  - Metal halide lamps take to long to warm up before they light up – Bad for indoor batting cage
  - Use a lot of energy

## Lighting Design for Indoor Batting Cage - Breadth

- **Problem Statement**
  - Is there an alternative lighting solution that can activate instantly without have to warm up and help reduce the electricity cost?
- **Proposal**
  - By selecting an alternate lighting system for the indoor batting cage there will be a way to reduce the overall power use and help save the owner money
- **Goal**
  - The goal is to find a better choice for a lighting system that will not only provide adequate lighting conditions but will also help save the owner operational costs – value engineering

## Lighting Design for Indoor Batting Cage - Breadth

- **Current Lighting Fixture**
  - TX A26: Premium Enclosed Aluminum Optical made by Lithuania
  - The lamp is a 400-Watt Clear BT-37 Metal Halide
  - Areas that require good vertical illumination
  - Excellent glare control at low mounting heights
  - Ideal for general open areas, retail spaces, aisles and manufacturing areas

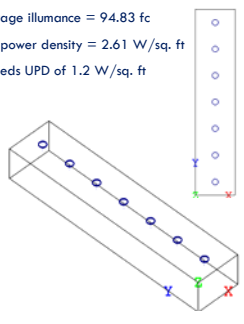
## Lighting Design for Indoor Batting Cage - Breadth

- **Current Lighting Design**

Average illumance = 94.83 fc

Unit power density = 2.61 W/sq. ft

Exceeds UPD of 1.2 W/sq. ft

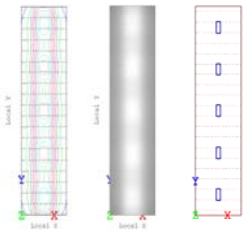


## Lighting Design for Indoor Batting Cage - Breadth

- **New Lighting Fixture**
  - Schelde Sports Light 54 with 4 high output T5 4100K fluorescent lamps
- **Technical Information**
  - Excellent alternative to costly HID fixtures
  - T5 high output 4100K fluorescent lamps
  - Energy efficient high power factor electronic ballasts
  - Reduced energy cost by 50%
  - Closest thing to natural sunlight
  - Color-rendering index rating of 85%


## Lighting Design for Indoor Batting Cage - Breadth

- **New Lighting Design**



Average illumance = 44.39 fc

Unit power density = .93 W/sq. ft

Below acceptable UPD of 1.2 W/sq. ft

## Lighting Design for Indoor Batting Cage - Breadth

**Lighting Comparison**

**400/U Metal Halide vs. Sportlight 54**

| Lighting Type | Initial Lumens | Mean Lumens | Lamp Life (Hours) | Total Wattage/ Fixture | Energy Cost / Fixture / Year @ $0.11/KWH |
|---|---|---|---|---|---|
| 400/U Metal Halide | **36,000** | **23,500** | 20,000 | 458 | $440.12 |
| SportLight 54 | 17,800 | 16,734 | **24,000** | **246** | **$236.40** |

| | |
|---|---|
| (7) Metal Halide Yearly Cost | $3,080.84 |
| (5) SportLight 54 | $1,182.00 |
| Savings by using SportLight 54 | $1,898.84 |

## Lighting Design for Indoor Batting Cage - Breadth

- **Conclusion and Recommendation**
  - Many benefits of switching to Sports Light 54
    - Saved the owner up to $1,895.84 per year in operational cost – value engineering
    - Improved the overall lighting situation for the Nationals.
    - The team will not have to wait for the lights to warm up
    - Better lighting conditions while taking batting practice

## Presentation Outline

- Project Overview
- Short Interval Production Schedule – Research
- Structural Column Alternate Selection – Breadth
- Lighting Design – Breadth
- Summary and Conclusions

## Summary and Conclusions

- SIPS
  - My Schedule - 123 days to complete interior build out
  - Project schedule - 157 days
  - Savings 34 days
- Structural Breath
  - Save the construction team 80 days
  - Cost $1.7 million more to do all steel
  - The schedule is the most important factor – acceptable to use an all steel structural system
- Lighting Breath
  - Saved the owner $ $1,895.84 per year in operational cost – value engineering
  - Improved the overall lighting situation for the Nationals
  - They will not have to wait for the lights to warm up
  - Better lighting conditions while taking batting practice

## Questions?