

Aquarium Hilton Garden Inn

Atlanta, Georgia



John Dixon

Senior Thesis 2007

Construction Management Option



Aquarium Hilton Garden Inn Atlanta, Georgia



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Presentation Outline

- Project Overview
- Analysis 1 - Foundation System Analysis
- Analysis 2 - Façade Investigation
- Analysis 3 - Implementation of BIM on a Construction Project
- Conclusions
- Q & A



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PROJECT OVERVIEW

Project Overview

*ANALYSIS 1 –
FOUNDATION SYSTEM
ANALYSIS*

- GMP Pricing
\$45.2 Million

*ANALYSIS 2 –
FAÇADE
INVESTIGATION*

- Building Size
458,809 SF

*ANALYSIS 3 -
IMPLEMENTATION OF
BIM ON A
CONSTRUCTION
PROJECT*

- Construction Duration
16 months

CONCLUSIONS

Q & A

- Project Function
Hotel and Parking Deck



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PROJECT OVERVIEW

Project Overview

*ANALYSIS 1 –
FOUNDATION SYSTEM
ANALYSIS*

- Hotel
 - 202,464 SF
 - 14 Stories
 - 242 Rooms

*ANALYSIS 3 -
IMPLEMENTATION OF
BIM ON A
CONSTRUCTION
PROJECT*

Hotel Features

- 14,200 SF or Retail Area on Lower Level
- 8,800 SF Sky Bar w/ Mezzanine on Level 14
- Restaurant on Level 2 and Level 4
- Outdoor Pool and Spa and Indoor Pool on Level 7

CONCLUSIONS

Q & A

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- ANALYSIS 1 – FOUNDATION SYSTEM ANALYSIS
- ANALYSIS 2 – FAÇADE INVESTIGATION
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- Parking Deck
 - 256, 345 SF
 - 12 Levels
 - 670 Parking Spaces

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Very Congested Site
Existing 4 Story Parking Structure Must Be Demolished

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Project Team

- Owner
Legacy Property Group
- Construction Manager
Holder Construction Company
- Architect
Stevens & Wilkinson /Stang & Newdow
- Structural Engineer
KSI Structural Engineers

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CM@ Risk w/ GMP





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Foundation System Analysis

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ANALYSIS 1 – FOUNDATION SYSTEM ANALYSIS

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CONCLUSIONS

Q & A

Background

- Existing Parking Structure
 - 41 Caissons (34 -42 in.)
 - Designed to carry 80 kips/sf
 - Currently Carrying 35 kips/sf
 - New construction would increase to 90 kips/sf
 - Proposed 88 new caissons



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Problem

- Delays In Construction
 - Delayed Approx. 40 Days
 - Hitting Existing Caissons
 - Sloped Rock
 - Varying Sizes of Caissons
 - Addition Drilling Rigs Further Congested Site



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Proposal

- Construct Mat Foundation System
 - Avoid Delays in Construction
 - Allow Owner/Client to Take Over Building Sooner
 - Owner/Client Generate Revenue Sooner



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CONCLUSIONS

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Analysis

- Building Loads
 - Total Live Load = 25,401.5 kips
 - Structural Notes
 - Total Dead Load = 152,500 kips
 - Building Self Weight
 - Structural Notes
 - Factored Load of 177,902 kips
 - 1.7 and 1.4 – ACI 318-95

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Foundation System Analysis

Analysis

- Critical Column Load
 - Calculations In Appendix D
 - 5.94 kips/SF based on Load
 - Largest Span contained 5702 SF
 - Gave thickness of 75 Inches
 - No. 11 Rebar spaced 6" o.c.



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Foundation System Analysis

Analysis

- Soil Bearing Capacity
 - Soil Bearing Capacity = 5.65 kips/sf
 - N60 = 20
 - Load on Soil = 3.668 kips/sf
 - Building Load + Mat Slab Weight
 - Factor of Safety = 1.38
 - Existing Caissons



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Foundation System Analysis

Schedule Impact

- Over 2 Month Schedule Gain





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Foundation System Analysis

Owner/Client Revenue

- Previous Parking = \$50K to \$100K
- Assumed 75 of the 242 Rooms
 - \$125 Per Night

Price/Unit	Units	Time	Revenue
\$50,000	1	2 Months	\$100,000
\$125	Rooms	60 Nights	\$662,500
Total:			\$662,500



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Foundation System Analysis

Cost Comparison

- Current System = \$1,307,960
- New System = \$2,347,037

Description	Qty	Units	Unit Price	Cost
Machine Excav/Backfill	80	HR	\$125	\$10,000
Excess Haul-off	12,500	CY	\$15	\$187,500
Gravel	193	Ton	\$18	\$3,474
Concrete (Material,Place,Finish)	10,512	CY	\$104	\$1,093,248
Reinforcing Steel	965	Ton	\$1,091	\$1,052,815
Total:				\$2,347,037

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Foundation System Analysis

Conclusion

- The benefits of the proposed mat slab can clearly be seen in the scheduling impacts of the job.
- The cost of the system does appear to be initially higher than the caisson system.
- With change orders, added general conditions cost, and revenue generated the proposed mat slab does seem like a good choice to keep both the owner and the owners clients happy.

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Façade Investigation

Background and Problem

- South Side Entrance
 - 2000 SF Basalt Stone
 - Produced In Europe
 - Long Lead Item
 - Arrives After Façade is Complete

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Façade Investigation

Proposal

- Use Paneling System Called StoneLite



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Vs.



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Façade Investigation

U-Value Comparison

- Existing System = 0.04595 BTU/Sq.Ft.
- Proposed System = 0.04614 BTU/Sq.Ft.
- w/R21 = .04225

Existing Conditions		StoneLite System	
Air Film	0.17	Air Film	0.17
Stone	0.09	StoneLite	negligible
Air Space	0.7	Air Space	0.7
Gypsum Sheathing	0.56	Gypsum Sheathing	0.56
8" Stud w/ R19	19	8" Stud w/ R19	19
Gypsum Board	0.56	Gypsum Board	0.56
Inside Air Film	0.68	Inside Air Film	0.68
R-Value Sum	21.76	R-Value Sum	21.67
U-Value	0.045953882	U-Value	0.046146747

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Façade Investigation

Construction Impacts

- Site/Schedule Impacts
 - Facade Completed at Once
 - Clears Site of Scaffolding
 - Remobilize Masons
- Constructed in 1 Day
- Structural Impacts
 - 3.3 lbs/SF Vs. 20lbs/SF

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Façade Investigation

Construction Impacts

- Cost Impacts
 - Current System \$297,263
 - Proposed System \$96,000

StoneLite Pricing				
Type	Qty	Units	Unit Price	Cost
Material	2000	SF	\$38	\$76,000
Labor	2000	SF	\$10	\$20,000
			Total:	\$96,000


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Façade Investigation

Conclusion

- The proposed StoneLite has benefits in every category examined.
- The StoneLite system would shorten up the façade schedule allowing for the site to be cleared and less congested.
- The StoneLite system would be very comparable to the stone system mechanically and fights water penetrations better.
- This system is also much lighter and would cost much less then the basalt stone system called for on the project.


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Implementation Of BIM

Creating The Model

- Once at 75% and once at 100% CD's
- Created by Holder Construction
- 3 Models Created and Brought Together
 - Structural, Mechanical, Composite






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Implementation Of BIM

Processes to Kick Start Use of BIM

- BEAMUP
 - Educate Project Team on BIM
- BIM Assessment
 - What to Model?
 - To What Detail?
- BIM Cost Projection
 - What Will Model Cost
 - 368 MH – 75%, 298 MH – 100%, 320MH – MEP Coordination


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Implementation Of BIM

Processes to Kick Start Use of BIM

- Confidential Material



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Implementation Of BIM

Sharing Of Model
– Confidential Material

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– Confidential Material

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Implementation Of BIM

Uses Of Model

- Business Development Pursuit
- Visualization and Understanding
- Enhanced Design Assistance
- Reduced Decision Latency and Cycle Time
- Preconstruction Trades Scope Verification
- Extracting Quantities
- 4D Phasing and Scheduling Animations
- Workflow Sequencing
- 3 Week Look-Ahead Schedules
- Weekly Jobsite Meetings
- Site Logistics
- Collision Detection
- Constructability Review
- Trade Contractor Coordination
- Code Official Review
- Owner Sales, Presentation, Marketing & Fundraising
- Digital As-Built
- Field Engineering Layout Surveying

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Implementation Of BIM

Collision Detection

- NavisWorks Clash Detection
- 55 Pre-RFI Collisions Detected



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Collision Detection

- Confidential Material

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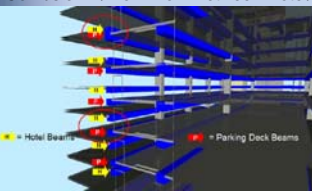
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Implementation Of BIM

Visualization

- Formwork Trade Contractor
- Confusion w/ Formwork Between Hotel/Deck



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Implementation Of BIM

Acceptance of BIM

- The architect S&W/S&N plans on using BIM for all its new projects in 2007
- The structural engineer (KSI) plans on using BIM on projects.
- The owner has used the BIM for sales, presentations, marketing, and fundraising



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Implementation Of BIM

Improvements/ Suggestions

- Earlier Development of Model
 - Integrate into Preconstruction Process
 - Develop by Architect and Structural
 - Learning Curve 25%-30%
- MEP Design
 - Model off Shop Drawings
 - Team Approach in Design Stages
- Development of Cost Savings Database

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Implementation Of BIM

Conclusions

- Implementation very Successful
- Benefits Highly Outweigh Cost
- Still Room For Improvement
- Valuable Tool Should be used on all big Construction Projects

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Conclusions

Foundation System Analysis

- Effectively Speeds Construction
- Savings and Revenue vs. Cost

Façade Investigation

- Cost Effective Replacement to Stone System
- Much Shorter Lead Time

Implementation Of BIM

- Implementation Very Successful
- Room to Streamline Implementation

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Acknowledgments

- Holder Construction Company
- Jason Fetterman
- Paul Hedgepath
- Jessica Potkovich
- Chad Smith
- Carey Steckler
- Stone Panels, Inc.
- Lavern Chamness
- The Pennsylvania State University
- Robert J. Holland
- Dr. John Messner
- Dr. M. Kevin Parfait
- Dr. David Riley

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Questions/ Suggestions?