2011 Annual Conference

BIMM To FM
Building Information Modeling Management To Facility Management
Advanced AEC Solutions, LLC (aAECs) are the top professionals for established as well as emerging BIM technologies.

We deliver Technology and Process Centric Innovations for Design, Strategic Planning, Implementation, Construction and Program Management services that facilitate the transport of Information and enhance Visualization to enable greater comprehension and collaboration within the AEC/O Community.

We work intimately with you and assist your team to successfully transverse the most leading-edge BIM and FM technologies in real world applications.

To that end, we are a Business Partner and Integrator for both AutoDesk (AutoCAD, Revit, Navisworks) and ARCHIBUS, the worlds largest Facility Management software platform.
Brasfield & Gorrie is a general contractor ranking 215 on the Forbes list of America’s Largest Privately Held Companies and serves its clients from offices in Birmingham, Atlanta, Jacksonville, Nashville, Orlando, Raleigh and Dallas. Engineering News-Record ranks the firm 27th among the nation’s Top 400 Contractors.

With a dedicated Virtual Design & Construction (VDC) group, Brasfield & Gorrie utilizes BIM technology on nearly every project as a tool to efficiently execute the project. Since 2008, over 200 projects have successfully been completed utilizing BIM during preconstruction and construction. With a dedicated group of construction and technology professionals, Brasfield & Gorrie remains one of the nation’s most innovative general contractors taking BIM from the office, to the field, and into building operations.
I: INTRODUCTION - COLLABORATORS

On the Jekyll Island Convention Center Project there have been several key companies and firms participating in the process:

**Design Team**

HHCP – Architect  
Stan D. Lindsay & Associates – Structural Engineers  
TLC – MEP/FP Engineers

**Construction Team**

Capri Industries – Electrical Subcontractor  
Mock Plumbing – Plumbing Subcontractor  
Shumate Mechanical – Mechanical Subcontractor  
Gwinnett Sprinkler – Fire Protection Subcontractor  
All State Steel – Structure Subcontractor  
Quincy Joist – Structural Subcontractor
II: Jekyll Island Convention Center - A Case Study

- Only remaining beachfront convention center in the State of Georgia
- Taking advantage of the great natural beauty of Jekyll Island, there will be:
  - Two exquisitely designed covered pavilions for outdoor events
  - More than 5,600 SF of outdoor terraces and event lawns that will allow visitors to enjoy vistas while sheltered from sun or rain.
- Project is seeking LEED Silver Certification.
II: Jekyll Island Convention Center - A Case Study

- The center will feature 128,000 SF
- 78,000 SF of Meeting Space
- 45,000 SF divisible exhibit/ banquet hall
- Eleven breakout meeting rooms, each ranging from 720 SF to 3,100 SF.
II: Jekyll Island Convention Center - A Case Study
II: Jekyll Island Convention Center - A Case Study

Old Convention Center as it existed

New Convention Center Winter 2011

New Convention Center April 2011

CONSTRUCTION TIMELINE
Building Information Modeling (BIM) as WE KNOW IT: is the process of generating and managing building data during its life cycle. It is an 3D object-oriented building development TOOL that utilizes 4D (adding time - phasing, sequencing, scheduled collaboration) & 5D (adding attributes - quantities and cost of materials via cost estimating, specs, energy analysis) utilized to design, construct & operate a building project, as well as communicate its details.

BIM offers:
- Improved visualization
- Improved productivity due to easy retrieval of information
- Increased coordination of construction documents
- Embedding and linking of vital information
- Increased speed of delivery
- Reduced costs
III: BIMM TO FM – THE CONCEPT

6D
- LIFE CYCLE OF BUILDING

7D
- APPLICATION MANAGEMENT

Building Information Modeling Management is a Proprietary Library of Tools that
- Reduces waste and energy consumption
- Consolidates resources
- Augments devices to automate efficiency
- Creates an enhanced visualization and communication tool for all of stakeholders involved
III: BIMM TO FM – THE CONCEPT

REAL TIME BIMM SHARED DATA AND COMMUNICATION BETWEEN MULTIPLE SOURCES AND LOCATIONS

REFLEX Matrix™ Collaborative Central Model

BIMMLink™

BIMMNet™

AS BUILT MODEL

BIMMCampus™ Using Link & Net Data Flow
IV: BIMM TO FM – JIA IMPLEMENTATION

Project Goals:

- **Improve on time and costs** by having virtually zero conflicts between various systems in field
- **Integrate innovation and cutting edge technology** into your processes and workflow
- **Better manage** transition from design to construction and virtually simulate construction processes.
- **Monitor and Develop accurate shop drawings** coordinated in a manner to insure that field construction is without change orders and quality control problems.
- **Develop Accurate As-Built Model (BIM)**, including infrastructure and building systems into a singular virtual construction model.
- **Develop building life cycle costs projections**, and more accurate project cost estimates.
- **Establish a Facility Management Plan and Platform** that will provide cost effective support of Life Cycle and Preventative Maintenance programs.
IV: BIMM TO FM – JIA IMPLEMENTATION

There are three phases of implementation of aAECs and Brasfield & Gorrie have been currently performing and will be performing for the Jekyll Island Authority.

- **PHASE I: Coordination Phase:**
  - BIM Coordination, Sub Model Development and Collision Detection

- **PHASE II: Construction Phase:**
  - As-Built Model Tracking and Development

- **PHASE III: Operational Phase:**
  - BIMMLink™ (Linking Building Information to the Facility Management Platform)
PHASE I : Coordination Phase:

Step 1: Communication Plan–
aAECs and Brasfield & Gorrie gathered all the designers and trades together and held a Kickoff meeting. It was at this time that we established a communication plan with associated file structures and time table for the coordination phase of the project.

Step 2: Modeling Plan–
aAECs and Brasfield & Gorrie outlined what geometries and data should be included in each disciplines models and why.

<table>
<thead>
<tr>
<th>Structural Model</th>
<th>Foundations, slabs</th>
<th>Required for coordination of underground utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beams and Columns</td>
<td></td>
<td>Required for coordinating above ceiling MEP / FP utilities</td>
</tr>
<tr>
<td>Rebar /penetration</td>
<td>Braces and gusset Plates</td>
<td>Required for coordination of the routing of MEP / FP piping</td>
</tr>
<tr>
<td>Miscellaneous support steel like exam light supports or Unistrut, etc.</td>
<td></td>
<td>Required for routing of MEP / FP utilities correctly</td>
</tr>
</tbody>
</table>

IV: BIMM TO FM – JIA IMPLEMENTATION
PHASE I: Coordination Phase:

Step 3: Collision Detection -

- Clash detection allows for the effective identification, inspection and reporting of interferences in a virtual construction model.
- aAECs and Brasfield & Gorrie coordinated all of the disciplines virtual models to resolve many inherent design issues before they were discovered in the field.
Examples of **Coordination**:

1. **STEEL v DUCT**
   **Problem:** Bracing for operable partitions in ballroom spacing would not allow duct to pass
   **Resolution:** Bracing spacing to be redesigned before installation of support steel

2. **STEEL v MECH**
   **Problem:** Size of AHU’s on mezzanine conflicted with the steel joist supported the roof above the units.
   **Resolution:** The joists depths and spacing was redesigned to allow room for the AHU’s.
Examples of Coordination:

STEEL v DUCT

**Problem:** Openings for duct passage through mezzanine slab from AHU-2 and OAHU-1 were not indicated on contract drawings and mezzanine joists were not spread in design to allow room for ducts to pass through

**Resolution:** Redesigned joist layout as needed to allow ducts to pass

**All Penetrations Through Tilt Panels**

**Problem:** Multiple penetrations through tilt panels were either not shown or drawn correctly

**Resolutions:** 90% of penetrations were coordinated and formed before tilt-panels were cast
Examples of Coordination:

Approximately 20,000 other collisions between
- Ductwork
- Piping
- Conduit
- Structure
- Lighting and
- Equipment

Were coordinated and solved prior to being installed in the field.
IV: BIMM TO FM – JIA IMPLEMENTATION

• 20,000 collisions → 408 real collisions

• 13 companies

• 14 meetings over 4 months

• 24 Potential expensive change orders avoided

• $255,000 estimated in cost avoidance
PHASE II: Construction Phase

**Step 1: Aligning Building Information Models with Approved Shop Drawings -**
aAECs will insure the highest quality of model creation and accuracy in the final Virtual Collaborative Model by matching all geometry and data to the final design approved.

**Step 2: Obtaining Manufacturer Data -**
These manufacturers will be helping us make sure that we incorporate only the most accurate and complete data into our As-Built BIMM to FM Database.

- Ferguson
- Viking
- Reliable
- United Rental
- Doherty Pumps
- TAW
- HD Supply
- One Path
- Will Pettrelli
- Floyd Alexander
- Trane
- Georgia Air Associates
- Southeast Pump
- Joe Powell (Liebert)
PHASE II: Construction Phase

Step 3: Tracking As-Built Conditions-
- Once an element has been installed in the field, aAECs will work with Brasfield & Gorrie to decide the most cost effective manner of obtaining data on the installed elements.

Some of those techniques will include:

- Laser Scanning
- Progressive Photography
- Traditional Ground Team Measurement Checking
IV: BIMM TO FM – JIA IMPLEMENTATION

PHASE III: Operational Phase

At beginning of this phase, we have completed the development of the Jekyll Island Convention Center Virtual Collaborative Model.

**Step 1: Data Linking** – Begins with taking the gathered data and consolidating it into a Central Database, then linking that database to the elements in the Collaborative Model.

- Architectural elements
- Structural elements
- Electrical elements
- HVAC elements
- Data/Telecom elements
- Security elements
- Plumbing elements
IV: BIMM TO FM – JIA IMPLEMENTATION

PHASE III: Operational Phase

Step 2: Develop Dynamic Querying Tools that will allow access to the elements and their associated data from the different involved software.

- Floor Plans
- Elevations
- Interior Views
- Event Needs
- Materials
- Security Information
- Virtual Views
- Scheduling Information
- Resources
- Other Information

Jekyll Island Convention Center
Combining existing Facility Management (FM) tools with virtual construction delivers all the necessary packets of information but adds visual and interactive capability as well.
Facility Managers & Engineers will be able to dynamically interact with the collaborative model.

- Track As-Built Conditions as they occur
- Plan around your existing conditions
- Links your Capital Assets in an extremely accurate manner
- Allows easy setup to schedule and execute Preventative Maintenance measures
- Automate on demand work processes with workflows
- Manage and track work separately for external vendors and internal teams
- Track maintenance workloads

Therefore driving lower operating costs and a more accurate Capital Plan
In addition, it can allow Owners to run Real Time Simulations such as:

- Disaster preparedness
- Energy Efficiencies
- Master Planning and Space Planning
- Renovation/Rehabilitation Program Logistics
REPORTING EXAMPLE

V: BIMM To FM – Workflow Process
## User Examples:

<table>
<thead>
<tr>
<th>User</th>
<th>Function</th>
</tr>
</thead>
</table>
| Maintenance Manager                               | • Create PM procedures and schedules  
• Generate Work Orders/Requests  
• Balance schedules and workload  
• Track equipment maintenance                  |
| Craftspersons / Service Providers                | • View Work Requests and update actual results directly                  |
| Maintenance Supervisors (in-house or outsourced) | • Schedule craftspersons  
• Issue and Print Work Orders/Requests  
• Update actual results                      |
| Operations Managers                               | • Utilize reports to reduce costs, buy equipment, hire personnel, forecast maintenance budgets |
| Business Process Owners                           | • Set up background data that is tailored to the facility               |
• Automates maintenance workflows with configurable...
  – Notifications
  – Approvals
  – Surveys
  – Verifications
• Lowers operating costs

### Workload Reports

<table>
<thead>
<tr>
<th>Trade Code</th>
<th>Number of Requests</th>
<th>Total Estimated hours</th>
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<tbody>
<tr>
<td>Total</td>
<td>25</td>
<td>76.00</td>
</tr>
<tr>
<td>CARPENTER-I</td>
<td>2</td>
<td>12.00</td>
</tr>
<tr>
<td>CARPENTER-II</td>
<td>1</td>
<td>3.00</td>
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<tr>
<td>ELECTRICIAN-II</td>
<td>2</td>
<td>5.00</td>
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<tr>
<td>HVAC</td>
<td>3</td>
<td>15.00</td>
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<tr>
<td>LOCKSMITH</td>
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<td>1.00</td>
</tr>
<tr>
<td>MECHANIC</td>
<td>3</td>
<td>12.00</td>
</tr>
<tr>
<td>I-TRADE I</td>
<td>1</td>
<td>2.00</td>
</tr>
<tr>
<td>I-TRADE II</td>
<td>4</td>
<td>20.00</td>
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<tr>
<td>BES ASSISTANT</td>
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<td>0.00</td>
</tr>
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### Costs of Archived Work Requests by Problem Type

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<tr>
<th>Problem Type</th>
<th>Month</th>
<th>Total</th>
<th>2002-1</th>
<th>2002-2</th>
<th>2004-5</th>
<th>2007-11</th>
<th>2008-11</th>
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<tbody>
<tr>
<td></td>
<td>Actual Cost</td>
<td>3.047</td>
<td>465.00</td>
<td>2.022</td>
<td>86.00</td>
<td>474.00</td>
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<tr>
<td></td>
<td>Estimated Cost</td>
<td>2.866</td>
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<td>2.056</td>
<td>0.00</td>
<td>492.00</td>
<td>320.00</td>
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<td></td>
<td>Cost Variance</td>
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<td>-465.00</td>
<td>34.00</td>
<td>-86.00</td>
<td>18.00</td>
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<td>AN EMERGENCY</td>
<td>Actual Cost</td>
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<tr>
<td></td>
<td>Estimated Cost</td>
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<tr>
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<td>Cost Variance</td>
<td>-28.00</td>
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<td>-28.00</td>
<td>-28.00</td>
<td>-28.00</td>
<td>-28.00</td>
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<tr>
<td>CEILING TILE</td>
<td>Actual Cost</td>
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<td>Estimated Cost</td>
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<tr>
<td></td>
<td>Cost Variance</td>
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<td>0.00</td>
<td>0.00</td>
<td>18.00</td>
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<tr>
<td></td>
<td>Actual Cost</td>
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<td>9.00</td>
<td>9.00</td>
<td>9.00</td>
<td>9.00</td>
</tr>
</tbody>
</table>
Benefits Gained from using a BIMM to FM System

• Better Visualization
• Web-based = mobility
• Simulate Before Deciding
• Streamlined Communication
• Easier self service work order management
• Fewer errors out in the field
• Descriptive Data from multiple sources
• Reduced task completion time
• Access FM information from BIM
• Link space, equipment, asset & portfolio inventories to multiple models/facilities
• Combine thousands of models in one infrastructure model for assessment
• 200% productivity increase