A National Initiative for Building Information Modeling for Masonry (BIM-M)
Presentation

- What is BIM?
- Why is it Important?
- Industry’s Response
  - National Initiative and Mission
  - Sponsors
- What’s in it for You?
- What Can be Done?
BIM – A Model, A Process

- Building Information Model
  - a digital representation of physical and functional characteristics of a building.
  - serves as a shared knowledge resource for information.
BIM – A Model

Bird's-eye view of the Sutter Medical Center Castro Valley model
What is BIM?

- A BIM model contains all information needed to design a structure with those unique materials.
- One model can be used to accomplish all design concepts.
BIM – A Process

Visually Conceptualize

Economize Design

Remove Confusion

Construct Quickly

Operate Efficiently
Why is BIM Important?

- Improves business efficiency.
- Improves profitability.
- Reduces waste.
- Being adopted as a process by all segments of the construction industry.
THE BUSINESS VALUE OF BIM
Getting Building Information Modeling to the Bottom Line

Why do Clients Want...
Who Values BIM?

Who can mandate BIM?

Project Participants Who are Perceived to Experience the Most Value

- Architects: 52%
- Structural engineers: 46%
- Construction managers/general contractors: 42%
- Fabricators: 40%
- MEP engineers: 34%
- Owners: 26%
- Specialty contractors: 23%
- Building product manufacturers/distributors: 11%

What’s in Their Best Interest of the Major Users

Build faster, smarter and less expensive.

Build safer with less liability.

Build more profitably.

Maintain for the life of the building.
Growth of BIM

Growth in BIM Use

- All Respondents
  - 2007: 28%
  - 2009: 48%


Importance of BIM in 5 Years

- Very high importance: 11%
- High importance: 31%
- Moderate importance: 39%
- Low importance: 16%
- No importance: 3%

The Facts

- Over 50% of the industry is now using BIM.

- All BIM users plan significant increases in their use.

- The vast majority are experiencing real business benefits directly attributable
Adoption of BIM

Growth in Expertise

Advanced/Expert Users

Engineer: 16% (2007), 37% (2009)
CM/Contractor: 5% (2007), 45% (2009)
Owner: 8% (2007), 21% (2009)

Adoption of BIM

BIM Use In North America

- **56%** WEST
- **49%** CANADA
- **52%** MIDWEST
- **38%** NORTHEAST
- **45%** SOUTH

Who are the Leaders?

Structural steel
Precast concrete
Concrete
Wood
Light gauge metal framing
Architects, Engineers, Construction Managers
Where is the Masonry Industry?

- Missing.
- Fragmented.
- Disconnected.
Why is it Necessary for the Masonry Industry to Respond?

- The advocates of BIM demand it!
  - Architects, engineers
  - Construction managers
  - Owners

Engage or be left behind!
Current Contracts

Subcontractor shall furnish the appropriate labor, equipment and software concerning the Building Information Modeling (BIM) coordination process.
Current Contracts

When the Subcontractor produces drawings by computer aided drafting, the Subcontractor shall also submit electronic data files compatible with AutoCAD computer software. A 1% retainage shall be withheld from the contract sum (separately for the project retainage) until the final as-built drawings are submitted and
Current Contracts

Subcontractor shall provide all close-out documentation as specified in the project schedule. A 0.5 to 2% retainage shall be withheld from the contract sum (separately for the project retainage) until all close-out documentation is submitted and approved.
Current Contracts

This Contractor is advised that because of tight constraints, coordination of fire protection, plumbing, HVAC and electrical utilities within this project is critical. To resolve space conflicts, prior to construction, the HVAC Contractor shall take the lead in coordinating the efforts of all Contractors to produce Coordination drawings. All coordination drawings are required to be completed using Building Information Modeling (BIM) per Owner’s BIM Standards.

REVIT 2011 is the software to be used for this project. Each Trade Contractor shall employ a competent BIM technician to work with the HVAC contractor who will be the lead BIM Manager for the project. The procedure for doing this is as follows:
Current Contracts

In order to define the roles during the coordination process, the coordination team outlined below shall develop a BIM Execution Plan (BEP) for the project as detailed in Owner’s BIM Standards and the contract documents.
How Will It Affect You?

Financially

• Cost of not doing BIM versus cost of doing BIM.
• Your choice!
Masonry Industry Options for

- Do Nothing.
  - Business as usual. Likely result: Lose work to those that provide the services wanted.

- Try to use low price for getting the work and fight for payment over non-performance.
Masonry Industry Options for

- Hire consultant for each project.
- Fake it. Don’t really embrace BIM as a means to improve. Just get through the project.
Masonry Industry Options for

- Everyone for themselves or develop an unified industry response.
What We Did – Unified Response

Solicited industry participation
Formed Executive Committee
Discussed BIM activities with other industries.
Contracted with Georgia Tech to be our consultant.
Developed 5 Working Groups.
Produced an industry Roadmap to
Masonry Industry Response

- National Initiative began in January 2012
- Created BIM for Masonry (BIM-M)
  - the digital representation of the physical and functional characteristics of masonry materials and systems.
  - intermix construction phase activities with design.
## Construction + Design

![3D Model of a Building with Labels](image)

### Material [U3255A] Totals

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National Initiative:

- MCAA
- Team ICI
- Western States Clay Products Association
- National Concrete Masonry Association
- The Brick Industry Association
- The Masonry Society
National Initiative:
Executive Committee (Phase II)

- MCAA – Jeff Buczkiewicz, Ed Davenport
- IMI – Dave Sovinski
- NCMA – Bob Thomas
- IUBAC – James Boland
- WSCPA – Jeff Elder
- TMA – Darrell McMillian, Dan Zechmeister
- BIA – Brian Trimble

Masonry Industry Coordinator – David Biggs, Biggs Consulting Engineering
Industry Consultant Project Manager – Russell Gentry, Georgia Tech
Industry Advisor – Art Theusch, Collaborative Consulting Group
Mission Statement

To **unify** the masonry industry and all supporting industries through the development and implementation of BIM for masonry software to facilitate smoother workflows and collaboration across all disciplines from owner, architect, engineer, manufacturer, mason, contractor, construction manager, and maintenance professionals.
Other Sponsors – growing list!

- Portland Cement Association
- Brick Industry Association
- Cast Stone Institute
- Marble Institute of America
- Tile Contractors Association of America
- Cold Spring Granite
- Interstate Brick
- Masonry Institute of St. Louis
- Masonry Institute of Michigan
- Masonry Institute of America
- Northwest Concrete Masonry Association
- Concrete Masonry Association of California and Nevada
- Masonry Association of Florida
- North Carolina Masonry Contractors Association
- Indiana Limestone Institute
Where are we Going?

Phase I Roadmap completed January 2013
Phases II, III and IV
What’s in it for You!

Survival – without a BIM option, other materials will dominate or other Contractors will get the work, or you will struggle getting paid trying to fake it.

Efficiency. Chance to improve your systems!
What are the Drawbacks?

BIM will magnify poor business practices.

Costly to develop BIM–M.

Requires industry training in the use of digital tools.

Cost information must be reasonable. However, industry often does not share
What are the Potential Benefits to the Mason Contractor?
Clarify Materials
Develop Wall Systems
Improve Material Flow
Coordinate Scheduling
Materials vs. Details
Improve Construction
Maintenance and Materials
Full Building Visualization
Material Layout + Staging
Material Control

Boral Brick
   Modular
   Liberty: Merlot
33 Cubes Ordered: 1/18/13
Deliver Expected: 4/12/13
To:
   32.679503 N
   117.178179 W
Comments:
   Do not stack pallets
   Call 454 299-1113 on deliver
Material Estimating and Site Control

Ordered 12/13/12 by DS
Mark A44
  11'4 x 15 5/8 x 7 5/8
  Qty: 11
  Weight: 1620 lbs
Mark B39
  5'4 x 7 5/8 x 7 5/8
  Qty: 38
  Weight: 320 lbs
# Wall Bracing and Staging

## Wall Bracing and Safety Zones

|                  | March | April | <=rolled up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------|-------|-------|-------------|---|---|---|---|---|---|---|---|---|
|                  | Wed   | Thurs | Friday      | Mon| Tues| Wed |           |   |   |   |   |   |
| CMU              |       |       |             |    |     |     |           |   |   |   |   |   |
| Foundations     | done  |       |             |    |     |     |           |   |   |   |   |   |
| Install to 8ft  | done  |       |             |    |     |     |           |   |   |   |   |   |
| Install, 8 ft to 16 ft | done |       |             |    |     |     |           |   |   |   |   |   |
| Install, 16 ft to 24 ft | ACTIVE |       |             |    |     |     |           |   |   |   |   |   |
| Bracing and Safety Zone | ACTIVE |       |             |    |     |     |           |   |   |   |   |   |
| Cavity          |       |       |             |    |     |     |           |   |   |   |   |   |
| moisture seal   |       |       |             |    |     |     |           |   |   |   |   |   |
| 2' ridgid ties  | pending |       |             |    |     |     |           |   |   |   |   |   |
| Brick           |       |       |             |    |     |     |           |   |   |   |   |   |
| deliver         | pending |       |             |    |     |     |           |   |   |   |   |   |
| install to 8ft  | pending |       |             |    |     |     |           |   |   |   |   |   |
What Can Be Done?

- Implement the Roadmap. Georgia Tech – Lead Consultant

- Begin education of industry.
- Provide funding.
Project 1 – Phase II

- Masonry Unit Model Definition
  - Create material databases
  - Requires masonry industry input.
  - Initiative Material Supplier Working Group is the lead industry committee.

- Target completion December 2014.
Project 2 – Phase II

- Masonry BIM Benchmark
  - Software vendors to model using current tools.
  - Defines current state of software.

- Target completion December 2014
Project 3 – Phase II

- Masonry Wall Definition
  - TMS BIM–M Committee is the lead industry committee.
  - Target completion by TMS December 2013.

- Target completion for project is December 2014.
Project 4 – Phase II

- BIM-M Contractor Input
  - Major activity by masonry industry.
  - Construction Activities and Construction Phase Working Groups to be lead committees.

- Initiate Education program for masons and contractors.
  - Collaborative Consulting Group – lead consultant

- Web site development
Contractor Input

What are the hardest aspects of masonry systems to coordinate and manage?

1. Coordination between Architects, Engineers, GC and the other trades.
2. Lintels, reinforcement (solid grouted), coordinating all penetrations (amount, size and location), expansion and control joints, coordinating pre-fabrication systems (attaching clips to steel through sheathing).
3. Details, details, details. A large portion of time (labor cost) are associated attempting to gather the necessary information for integration of other structural or architectural components related to their attachment and location.
4. Integrating various wall and floor system components. Scheduling masonry work with other trades.
5. Structural elements such as rebar and masonry piers that cannot be interrupted.
To better facilitate high quality project coordination, what information should masonry contractors be providing to the construction manager?

1. All trades need to coordinate access to all work and location of every penetration in the walls and dead space for Mech, Elect, Plumbing, and any other material that needs to penetrate walls or block access to build the walls.

2. Wind bracing (external or internal), staging material/site management.

3. Schedule, flow or intended direction of work i.e. starting work on East wall working clockwise around structure, and integration and coordination of other trade's work necessary to complete the masonry.

4. Accurate schedule needs. List of prerequisites prior to masonry starting.

5. The information that I have been providing is wall heights, bond beam and masonry pier locations, rebar, and openings that require additional reinforcement for lintels.
Contractor Input

Are most masonry contractors currently able to provide the information required for project management? Is the information needed provided in a format that is compatible with BIM?

1. Some times but in most cases everyone is out to get his work done, it's not always coordinated and as I've said before access is often blocked or penetrations are missed. Usually even if the information is given, no one seems to pay it much attention.

2. No. Most masonry contractors have been using some form of modeling, but not BIM (not collaborative).
   Yes, most info can be provided now. I don't know if it is compatible with BIM.
   Possibly but not most contractors – but, the larger contractors who do the vast majority of the work are capable.

5. I am about to complete the first project for our company and now have the tools to supply most anything that is required.
**Contractor Input**

What are the most important issues that masonry contractors should address to become leading partners in construction projects?

1. Not just masonry contractors, but all trades need to have a strong GC coordinating the team that understands every trade's needs and the details of the structure. Then if there are design questions, get the answers from the design team in a reasonable time frame.

2. How to streamline the process and make it faster and economical to use masonry rather than steel.

3. Above all "COST" as well as knowledge of design restrictions or enhancements and schedules.

4. Becoming the structural system. Becoming the envelope / enclosure contractor. Otherwise you are simply another sub – not
What information should masonry contractors provide in digital form to facilitate the CM’s job?

1. That is one of the reasons I have agreed to set in on this program. To learn more of what is out there and bring it back to Florida Contractors and the Masonry Association of Fl., talk about it and bring their thoughts back to the BIMM Team.
   Wind bracing, layouts, control joints, etc.
   Submittals, shop drawings, RFI responses and change order request.
   Shop drawings for anchor systems, rebar, scaffold and bracing.
   Anything that helps with trade coordination.

5. We were required to locate bond beams and masonry piers for clash detection.
Contractor Input

Do you communicate with other design and construction professionals through BIM models? If so, is this method of communication a project or contractual requirement? How can these communications be improved? Are there specific aspects of these improvements that apply to masonry design and construction?

No I have little experience with BIM.

Some projects we have started to engage in BIM delivery; however, BIM has been very limited. We are using it mainly for overhead coordination for now. Mechanical and sheet metal contractors have been
In developing a building project with significant inclusion of masonry, what kinds of technical advice is needed to facilitate the project? How could this advice and interaction be embedded or facilitated by your CAD/BIM tools?

Reinforcing steel layout, simplifying embedded connections, and use of standard masonry units and colors in lieu of special order materials. Unfamiliar with CAD/BIM software to comment.

Some people involved in architectural masonry work, like others in the construction industry, are not comfortable with information technology tools. Is this an important problem the industry should address? Please tell us of the reasons for your answer and how we might improve the education of the industry.

1. If you do not have the necessary knowledge or skills required to utilize info technology tools, then they are wasted. Training, education and continuing education are necessary to bring the industry up to date with competing alternative materials. To improve education of the industry professional in the near term could be done through required continuing educations credits,
Contractor Input

Please identify the top three tasks where BIM-M resources should be focused.

1. Detailed Material take-offs and cost-estimating
2. Production planning, including crew sequencing and scheduling
3. Coordination with MEP
Contractor Input

Are there potential improvements to masonry products that would increase mason productivity and effectiveness?

1. Any material improvements that would let the mason contractor work cleaner, faster (not harder) and with less waste of time and materials would greatly increase overall productivity and effectiveness.

2. Continue to develop lighter masonry products to make it easier for men to lift and install. Continue to develop mortar with more consistent color and board life.

3. Ensuring that materials are accurately produced for the job and procured in a timely manner for the project are important, but proper preparation onsite (Layout, stocking, scaffolding, lift plan) before the masons get to an area to work are what benefits production the most.
Educational Programs for Masons and Contractors

Introduction to computers and software.

Introduction to cost estimating and scheduling using software.

Introduction to BIM (AGC program).
Contractor Input

How could improved masonry products be integrated with construction information technology and BIM?

1. Make it easier for product selection based on compatibility, function and sizing among other things.

2. Materials that have basic module data included in BIM which could then be used by the designer to better locate door and window openings, etc., and reduce the need of field cutting masonry units.

3. If you had the ability to prefabricate some aspects of masonry, it seems as though BIM would have to be integrated to ensure proper integration into a model and search for potential clash conflicts. Flexibility would have to be
Contractor Input

In case of a mason contractor installing structural (load-bearing) masonry:
Where could information technology help?

1. Anything that would increase the flow of information regarding material supply and job-site stocking, labor assignment, project schedule milestones, project construction requirements, etc.

2. Locations of steel embeds, reinforcing requirements, scaffolding planning, design, and erection, schedule, Site management of material and equipment
   Consistency with code and generally accepted industry practice
   Detailed Material take-offs and cost-estimating / Shop drawing production / Wall bracing

5. Some benefits could be made in reinforcement placement, CJ placement, etc, but all these are minimal in my opinion.
Contractor Input

Which issues are the most important, from a mason contractor business and profit standpoint?

1. Increased production rates, reduced material and equipment waste, accurate cost tracking.

   Production, safety
   Project coordination and smooth flow of work
   Coordination and sequencing of other trades.

   Having the time to allocate to the productive installation of masonry is what counts the most. Many times, a OPS does not allow for proper allocation of crew size and production to achieve a cost effective installation. This causes you to bounce around a job, further lowering productivity and increasing overhead cost per unit as well.
Contractor Input

In the placement of masonry products, what could improve installer productivity and effectiveness?

1. Daily and weekly list(s) of project material and labor needs (including project schedule milestones and special inspection schedules); BIM generated shop drawings (A/E approved; including wall elevations and details) for installation.

2. Having a crystal clear plan on what work is to be done and how to do it. Coordination with other trades (access to work, scaffolding, flashings, opening details, etc.)

   Access to work area and ancillary products present and laid out

   Lighter units.
Contractor Input

From a mason contractor standpoint, what are the biggest issues regarding material supply and delivery?

- Availability
- Trucking costs for heavy material
- Price/economy
- Having designers and owners make material choices as early as possible in the design process.
- Schedule; On time delivery
- Balancing "just in time" delivery and available job-site storage space
- Time to acquire materials (e.g. contract issued one day and starting project next day)
- Clear specification of material requirements (e.g. not specifying CMU as f'm = 2,500psi)
- Ensuring product meets owner/architect/contractor expectations
- Shop drawings; MSDS and LEEDs paperwork
Contractor Input

From a mason contractor standpoint how could material supply be improved? Will construction information technology and BIM play a role? If yes, explain how?

- Tracking use (installation count), inventory control and delivery scheduling

- Any and all of the items listed in No. 8. Yes, I believe CIT/BIM should play a role, especially by facilitating the flow of project information to and from the mason contractor.

3 Speeding up the shop drawing process, getting answers back on questions quicker, especially involving other trades.
Contractor Input

What should the masonry industry be doing to better promote the use of its products to architects?

1. On-going cross checking of the design process with applicable codes and standards.

2. BIM add-ons for masonry coursing and takeoffs.
Project 4 – Phase II

- **BIM-M Contractor Input**
  - Major activity by masonry industry.
  - Construction Activities and Construction Phase Working Groups to be lead committees.

- **Initiate Education program for masons and contractors.**
  - Collaborative Consulting Group – lead consultant

- **Web site development**
Possible Delivery System
Hands-free computer

- Increases:
  - Personal performance,
  - Improve safety,
  - Improve convenience

- Leverages existing tools & systems.
- Instant remote access to everything.

- Can replace:
  - cell phone, GPS, web cam, tablet/laptop, IR camera, more.
Safety Possibilities

- Passively monitor personal health sensors:
  - body core temp.
  - heart rate
  - blood pressure
  - blood oxygen
  - respiration
  - body salt loss

- GPS location, head position & employee status

- Passively monitor temp, humidity, dust, gases, radiation, etc.
SUMMARY

BIM is growing like it or not!

Work within the masonry industry or deal with it on your own.

Change is not easy! Nor is it cheap!
Thank you!

A National Initiative - Building Information Modeling for Masonry (BIM-M)