BIM-M
Building Information Modeling for Masonry

Jamie L. Davis, PE, LEED AP
TOP 10 THINGS YOU SHOULD KNOW ABOUT BIM-M

BIM-M
Building Information Modeling for Masonry
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.
Building Blocks in Masonry

Updates from BIM-M
Nov 6-8 DALLAS PROFESSIONAL COORDINATION

2017 Fall BIMForum: Dallas – Call For Presentations
By Marisa Strickler on April 04, 2017

Call for Proposals | Fall 2017

The BIMForum is now accepting proposals for the Fall BIMForum conference, November 6-8, 2017 in Dallas, Texas.

Fall 2017 Theme: “Professional Coordination: Expanding the new standard”

Examining the changing standard of care for designers, builders, and owners
Before we get to the top 10……..

Let's talk about this BIM thing…
BIM the verb

The Process:

• 3D collaboration
• Element/Data Based
• Transfer of Data Downstream
• Federated Models
BIM the noun

The Model

- Produced with a BIM platform (Revit)
- Contains 3D and 2D elements
- Content used to produce Construction Documents
The BIM

3D content + 2D content = The BIM

3D ELEMENTS
2D LIVE
2D DUMB
Building Information Modeling vs Construction Documents

2D drawings created from the BIM

Specifications

Construction Documents
1. WHERE YOU CAN FIND US

BIM-M Website
www.BimforMasonry.org
BIM-M has been instrumental in developing LOD for masonry

BIMForum LOD Specification 2014
LOD 100

• The Model Element may be graphically represented in the Model with a symbol, but does not have any indication of actual physical geometry. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements represented in the Model and other Project data.
LOD 200

• The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
LOD 300

- The Model Element is graphically represented within the Model as a **specific** system, object or assembly accurate in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
LOD 350: Detailed Coordination

• NEW! The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the Model Element.
LOD 400: Fabrication Assemblies

• The Model Element is graphically represented within the Model as a specific system, object or assembly that is accurate in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element.
3D Content Requirements for Materials
- LOD 100
- LOD 200
- LOD 300
- LOD 350
- LOD 400
THE MASONRY WALL SYSTEM
What are our LOD levels?
### B2010 – Exterior Walls

Solid wall construction that is composite in nature; in other words, multiple layers of materials to form an overall assembly.

<table>
<thead>
<tr>
<th>100</th>
<th>See B20</th>
</tr>
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<tbody>
<tr>
<td>200</td>
<td>Generic wall objects separated by type of material (e.g. brick wall vs. terracotta).&lt;br&gt;Approximate overall wall thickness represented by a single assembly.&lt;br&gt;Layouts and locations still flexible.</td>
</tr>
</tbody>
</table>

| 300 | Composite model assembly with specific overall thickness that accounts for veneer, structure, insulation, air space, and interior skin specified for the wall system. (Refer to LOD350 and LOD400 for individually modeled elements)<br>Penetrations are modeled to nominal dimensions for major wall openings such as windows, doors, and large mechanical elements.<br>Required non-graphic information associated with model elements includes:<br>• Wall type<br>• Materials |

<p>| 350 | A composite wall assembly may be considered for LOD350 only if hosted objects such as windows and doors are provided at a minimum of LOD350.&lt;br&gt;Main structural members such as headers and jambs at openings are modeled within the composite assembly. |</p>
<table>
<thead>
<tr>
<th>Level of Development</th>
<th>LOD 300</th>
<th>LOD 350</th>
<th>LOD 400</th>
</tr>
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<tbody>
<tr>
<td><strong>Primary Use of Model</strong></td>
<td><strong>COLLABORATION</strong></td>
<td><strong>COLLABORATION AND ANALYTICAL PROGRAM INTERACTION</strong></td>
<td><strong>DOWNSTREAM USE</strong></td>
</tr>
<tr>
<td>1. Wythes should be modeled independently to allow back up wythe to adjust to structure. Include rigid insulation in cavity layer if applicable.</td>
<td>1. Bond beam locations and heights should be modeled. Bond beams should ‘flag’ differently for clash detection purposes and should show differently in the model.</td>
<td>1. Individual units.</td>
<td></td>
</tr>
<tr>
<td>2. Veneer and back-up ‘wallpaper’ should be smart enough to show coursing and bond patterns. A default running bond with 3/8” joints could be programmed with options for alternatives. The starting elevation for coursing should be established for each wythe. No need to show individual masonry units, but the selection of the material should ‘inform’ the wallpaper on unit lengths and heights.</td>
<td>2. Vertical bar/grout locations should be modeled. Grouted cells should ‘flag’ differently for clash detection purposes and should show differently in model. The bar locations may be determined from an analytical model and imported back into the BIM model.</td>
<td>2. Cavity information; flashings, weeps, drainage net, air/vapor barriers, etc.</td>
<td></td>
</tr>
<tr>
<td>3. The coursing feature should allow designers to place walls, doorways, windows, with an indicator that informs them whether they are in coursing or not.</td>
<td>3. Control joint and expansion joint locations should be shown (CJs). Program should break wall pans where CJs are placed so this carries into the analytical model as separate walls. There should be an indicator that defaults to placing CJs in coursing (headjoints). Should have ability to place these in elevation or plan views.</td>
<td>3. Joint reinforcing.</td>
<td></td>
</tr>
<tr>
<td>4. The coursing feature should automatically start coursing at floor lines unless the designer overrides this feature.</td>
<td>4. Structural Usage Tags: Bearing walls and shear walls should ‘flag’ differently for clash detection purposes and should show differently in the model. Composite walls should transfer both wythes of masonry into the analytical model.</td>
<td>4. Anchor, ties.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Energy Modeling information should be included if the model will be used for this purpose.</td>
<td>5. Bar laps.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Lintels, shelf angles, relieving angles.</td>
<td>7. Lintels, shelf angles, relieving angles.</td>
<td></td>
</tr>
</tbody>
</table>
Single Wythe Concrete Masonry Wall
Single Wythe Concrete Masonry Wall

SINGLE WYTHE CMU

HATCH PATTERN WALLPAPER
USED AS BOND PATTERN

LOD 300
Single Wythe Concrete Masonry Wall

VERTICALLY REINFORCED & GROUTED CELLS

HORIZONTALLY REINFORCED & GROUTED BOND BEAM

CONTROL JOINT

STRUCTURAL USAGE TAG FOR WALL SYSTEM
Single Wythe Concrete Masonry Wall

- **GROUTING SEQUENCE INFORMATION**
- **CONTROL JOINT GASKETS**
- **BAR LAP SPLICE INFORMATION**
- **MESH FOR GROUT STOP**
- **HORIZONTAL JOINT REINFORCEMENT**
- **FLASHING & WEEP COMPONENTS**
- **SEALANT & BACKER ROD**
- **INDIVIDUAL MASONRY UNITS MODELED; SPECIFY COLOR & FINISH**
Brick and Block Cavity Wall

LOD 200
Brick and Block Cavity Wall

- Veneer Wythe
- Backup Wythe
- Hatch Pattern Wallpaper Used as Bond Pattern
- Coursing
- Thermal Control Layer

LOD 300
Brick and Block Cavity Wall

- Masonry control joint
- Masonry expansion joint
- Vertically reinforced & grouted cells
- Horizontally reinforced & grouted bond beam
- Structural usage tag for wall system

LOD 350
Brick and Block Cavity Wall

LOD 400

- GROUTING SEQUENCE INFORMATION
- CONTROL JOINT GASKETS
- BAR LAP SPLICE INFORMATION
- AIR / MOISTURE / VAPOR CONTROL LAYERS
- MESH FOR GROUT STOP
- HORIZONTAL JOINT REINFORCEMENT
- TERMINATION BAR
- DRAINAGE MATERIAL
- WALL TIES
- SEALANT & BACKER ROD
- INDIVIDUAL MASONRY UNITS MODELED FOR VENEER & BACKUP
- FLASHING & DRIP EDGE COMPONENTS
- FLASHING & DRIP EDGE COMPONENTS

BIM-M Building Information Modeling for Masonry
2. LOD SPECIFICATION

BIMForum LOD Specification 2014
LOD– LEVEL OF DEVELOPMENT
3D CONTENT NOT CONSTRUCTION DOCUMENT CONTENT

BIM-M - CTC Office Building
LOD 350 CMU Backup Walls – Base Details
3. AWARE OF LIMITATIONS
REVIT DATA LIBRARIES
Not so much for walls......
Material ??
Properties ??
Same with brick.....
Graphics
3D - Dumb
3D-D Openings
How about cold-formed?
They have a plug-in....
From LOD 300 to LOD 400
We need better tools

- Very difficult to achieve our LOD recommendations with current REVIT tools
- Need ability to adjust height of separate wythes without duplicate modeling
- Need ‘Smart’ wallpaper for coursing collaboration
- Better graphics for section and plan views
- Ability to easily define bond beam locations within a wall
- Ability to insert intelligent control joints
- Better structural usage tags to flag walls for clash and to identify wythes that push downstream to analytical programs
- INTELLIGENT data that we can push downstream
- Plug-ins to get us to LOD 400
CTC has entered data for the top 20 Generic models for both Clay and Concrete.

Both NCMA and WSCPA are providing family data for generic sizes.
5. BEST PRACTICES GUIDE

- Free Download
- Based on current Revit tools
- Examples of how other firms approach masonry
Model Practices

• For the BIM-M exercise, we utilized modeling techniques that push the boundaries of normal practice further toward a three-dimensional drawing set
• These included:
  • Detailing in three-dimensions
  • Utilizing live sections
  • Modeling as much of the project as possible
Modeling Stone Accents

Three-dimensional quoining sweep in plan

Three-dimensional quoining sweep in elevation

Three-dimensional quoining sweep in three-dimensional view
Sweeps
Reinforcement

• Moving from 2D to 3D

Two-dimensional reinforcement detail

Three-dimensionally reinforced pilaster
Current Advantages of Three-Dimensional Reinforcement

- Coordination is improved
- Accurate schedules
- Tagging
- Correctly warns you when items move
6. YOU TUBE
7. VIDEOS

• Free Videos on You Tube and BIM-M Website

Instructional Videos
BIM-M announces the first is a series of instructional videos to accompany its guide "BIM for Masonry, Modeling Masonry Buildings in Autodesk Revit" for architects, engineers, contractors and other users of masonry. The seven minute video is a free download and addresses Hatch Patterns as described in the overall guide. One PDF file accompanies the video.
8. MASONRY CONTRACTORS DELIVERABLE GUIDE

- Free Download

Table of Contents

- History and Goals of BIM-M
- Why BIM is Important to Mason Contractors
- How to Get Started in BIM
- Developing a BIM Execution Plan
- Software in the BIM Environment
- Examples of BIM Deliverables Being Utilized by Mason Contractors
- Drawing and Model Examples
- Distributing the Information (the 'I' in BIM)
- Return on Investment Realized through the Use of BIM
- Educational Resources
- Summary
Laser Scanning
Laser Scanning
Laser Scanning
9. MASONRY CONTENT PACK FOR AUTODESK REVIT

• Free Download

Masonry Content Pack Setup Video

2017 BIM Project Suite, Masonry Content Package

BIM-M
Building Information Modeling for Masonry

BIM for Masonry
Now Available!
Masonry Content Pack for Autodesk Revit
BIM-M announces the release of its new "Masonry Content Pack for Autodesk Revit". Our experts have created such content as bond beams, vertical reinforcement in grouted cells, movement joints, arches, wall types of numerous conditions, various generic unit profiles, wall hatches for bonding patterns, flashing details, and more. The library can be accessed for free at https://ctcexpress tools.com/bim-masonry/. An instructional video accompanies the library to help you get started.
3D Content: Bond Beams

- Bonding Patterns.
- Wall Types.
- 2D Content.
- 3D Content.
BIM-M
Building Information Modeling for Masonry
10. FUTURE VISION

PLUG-INS!!!!
Direct Design Plug In

What is Direct Design?
The design of common, single-story masonry structures follows a pattern. Recognizing this, The Masonry Society developed the Direct Design Handbook (TMS 403). A fast, rule-based approach that requires no load calculations or conventional code checks.

- Based on M49-C-11 and ASCE 7-10
- Referenced as a “Deemed to Comply” Manual in 2012 IBC and IRC
- Structures must be single-story and meet other limitations

LEARN MORE

Direct Design has revolutionized how I design with masonry and manage my workflow. This software allows me to meet my clients' expectations faster, easier, and more intuitively at every stage in the design process.

Suresh I. Iams, PE
Finally...
... a smart masonry tool inside Revit.
Study modularity.
Properly bonded corners.
See cuts at openings...
... and adjust placement.
Generate custom masonry patterns...
... add Bond Beams...
... adjust cut locations.
Automatically generate custom PAT files...
... and corresponding sections as well.
Design with masonry color and texture.
Let

make you more productive with masonry inside Revit.
Building Information Modeling (BIM) is changing the way projects are constructed. Whether you are a prime contractor using BIM across an entire project or a subcontractor impacted by a specific BIM implementation, this emerging practice requires new mindsets and technological know-how in order to achieve significant improvements in efficiency and cost control.

AGC's BIM Education Program — developed in conjunction with leading BIM practitioners, technology firms and educators — is designed to prepare construction professionals at all experience levels to successfully implement BIM on a construction project.

Unit 1 | An Introduction to Building Information Modeling - Revised Edition

Unit 2 | BIM Technology-Revised Edition

Unit 3 | BIM Contract Negotiation and Risk Allocation

Unit 4 | BIM Process, Adoption, and Integration

The highly interactive program provides 32-hours of instruction and training to get construction industry professionals at all levels ready to take advantage of the benefits of BIM. After participants complete all four courses in the program they become eligible to sit for an exam to earn the Certificate of Management — Building Information Modeling (CM-BIM).
Certificate of Management — Building Information Modeling

The AGC Certificate of Management-Building Information Modeling (CM-BIM) is an assessment-based certificate credential that denotes knowledge and understanding of concepts related to BIM adoption, practice and process transformation outlined in the AGC BIM Education Program. Successful candidates will carry the CM-BIM designation.

Eligibility Requirements: CM-BIM candidates must successfully complete the four AGC BIM Education Program courses, provide AGC with record to completion and have approved application in advance of exam administration. The CM-BIM application is now available to candidates. Please fill out the application once you have completed the four mandatory courses; applications will not be processed if all units have not been completed by application date.

Exam Information: Please see the appropriate Candidate Guide for detailed information needed to prepare for the CM-BIM exam. For candidates who have taken the first edition of BIM EP Units 1-4, please see the Original CM-BIM Candidate Guide. For those who have taken revised BIM courses, including the second edition of Units 1 & 2, please see the Revised CM-BIM Candidate Guide for further details.

Fees: All fees total $550 and will be collected at one time after the candidate application is reviewed and approved. This includes a $150 application and technology fee and $350 exam fee.

Testing Centers: Currently there are thirty one approved testing centers:
when SAM met BIM…..
BIM-M Web site
www.BimforMasonry.org

BIM for Masonry
BIM is an acronym that stands for an object, a building information model and a process for creating and using that object, "building information modeling." The BIM model provides a digital representation of the building, so that the modeling and analysis tools used by architects, engineers, contractors, managers and owners can read from and write to the same information source.

BIM is expanding quickly within the construction industry worldwide. However, the masonry industry is not well represented. Therefore, there is a need to develop BIM tools for masonry to maintain market share. With that intent, an initiative was formed in 2012 specifically to advance BIM for masonry.

The National Building Information Modeling for Masonry Initiative (BIM-M) is identifying barriers to and strategies for the full implementation of masonry materials and systems into BIM software for the design and construction industry.

Our commitment to BIM-M is an indication of the professionalism and dedication of...