Masonry Solutions for BIM

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Masonry & Technology
Analytical Modeling
Material Selection Criteria

► Cost, aesthetics, durability
► Energy and performance
► Sustainability
► Technology friendly/BIM compatibility
Building Blocks of BIM

3D Modeling
- Structural
- Mechanical
- Civil
- Geography

Parametric Integration
- Lighting
- Color
- Texture
- Seasonal

Database
- Energy performance modeling
- Cost analysis
- Project management timelines
- MSDS
- Maintenance Schedules
- Supplier Contact info.
BIM Objects are “Smart”

- Geometry
- Material properties
- Color and texture
- Cost
- Source and distribution information
- Supplied by manufacturers
Assemblies

- Collections of objects.
- Can be simple or very complex.
- Quality assemblies can generate QTO.
- Can be analyzed as systems.
  - Cost
  - Performance
How Does Masonry Fit In?

 ► Define “masonry”
   - Brick
   - Gray CMU
   - Architectural CMU (ACMU)

 ► Understand Modeling Dynamics
Dynamics of Modeling

Easy to Model
- Revolving Door ("low low")
- Roof Tiles ("high low")
- Decorative Precast Panels ("low high")
- Gray CMU, Brick ("high low")

Difficult to Model
- Doors in a Hospital ("high high")
- Architectural Masonry("high high")

# of objects vs. # of unique objects

BRICK    GRAY CMU    ACMU
Modeling Masonry in BIM

BIM objectives

Gray CMU

- Simple Wall Type
  - Geometry
  - Analytics
  - Product Data
  - QTO

Architectural CMU

- Simple Wall Type
  - Basic Geometry Color & Texture
  - Analytics
  - Product Data
  - Complete Modeling
    - QTO
    - Specific Geometry
    - Installation Layout Drawings
Begin DD with wall assemblies
Masonry Modeling
Ordering Challenges

- Quantity
- Product Diversity
- Bond Pattern Diversity
- Shape Specialization
- Mix Design Variety
Current QTO Technology

+ 25%
The Cost of Inaccurate Orders

► Lead time for add orders.
► Additional freight.
► Small quantity charges.
► Sacrifice aesthetics.
► Environmental burden of waste.
► Relationships and future work potential.
► Examples...
The BIM-Masonry Challenge

- Quantity

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The BIM-Masonry Challenge

- Product Diversity
  - Clay, Concrete
  - Structural, Veneer
  - Manufactured, Natural
  - Color, Texture, Shape
The BIM-Masonry Challenge

► Bond Pattern Design
  ▪ Ordered
    ► Stacked, Running, Ashlar, etc.
  ▪ Random
The BIM-Masonry Challenge

► Shape Specialization
  - Open End(s)
  - Bond Beam
  - Solid Bottom
  - 75% semi solid
LAVC Athletic Facility
The BIM-Masonry Challenge

► Mix Design Variety
  - High Stress
  - Lightweight
  - Fire Rating
The BIM-Masonry Challenge

- Architectural Masonry
The BIM-Masonry Challenge

► Manufacturing/Staging Coordination
Industry Response

► Structural Steel
► Precast Concrete
► Masonry
  ▪ Tradesmens
  ▪ CAD BLOX
  ▪ BIM-M
BIM-M Initiative

► Sponsors
  ▪ IMI, IUBAC, NCMA, MCAA, TMS, WSCPA

► GIT, Biggs Consulting

► 5 year roadmap
Collaboration

Masonry Contractors

Material Suppliers

Masonry BIM Solution Software?

General Contractors

Structural Engineers

Architects
The Power of BIM

► Reduce Errors

- Clash detection
- QTO directly from quality model
- Fosters closer relationship with mfgs.
Miami Science Museum

Proposed
WB-3B-03

Top Course of GMU has been shaded to match beam.

Bottom of 10" Sheave would be 7.38" above bottom of beam WB-3B-03.

Beam depth change will require removal of top-most coarse of GMU (= 8" including mortar bed).
The Power of BIM

- Reduce or eliminate errors.
- Prefabrication benefits realized.
Building the Impossible

► Complex geometry
The Power of BIM

- Reduce or eliminate errors.
- Prefabrication benefits realized.
- Resolving Complex Geometry.
The Power of BIM

- Reduce or eliminate errors.
- Prefabrication benefits realized.
- Resolving Complex Geometry.
- Optimizing Products.
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The Power of BIM

► Reduce or eliminate errors.
► Prefabrication benefits realized.
► Resolving Complex Geometry.
► Optimizing Products.
► Powerful Information Record...
Powerful Information Record

► Database for future renovation.
► QTO for repairs.
► Building maintenance.
► Inaccessible or remote locations.
Special Challenges for Architectural Masonry

- Getting finished faces right.
Attention to Detail
Special Challenges for Architectural Masonry

- Getting finished faces right.
- Product limitations.
Special Challenges for Architectural Masonry

- Getting finished faces right.
- Product limitations.
- Design preservation.
Special Challenges for Architectural Masonry

- Getting finished faces right.
- Product limitations.
- Design preservation.
- Special attention to install correctly.
Harmony Gymnasium
Special Challenges for Architectural Masonry

- Getting finished faces right.
- Product limitations.
- Design preservation.
- Special attention to install correctly.
- Staging complex orders.
Delivery Coordination
Special Challenges for Architectural Masonry

- Getting finished faces right.
- Product limitations.
- Design preservation.
- Special attention to install correctly.
- Staging complex orders.
- Resolving complex designs.
Museum of Prairiefire

► Natural stone
  ▪ 5 color/texture combinations
  ▪ Random lengths
  ▪ 3 heights

► Cordova Stone
  ▪ 5 colors
  ▪ 4 specified lengths – randomly blended
  ▪ 3 unit heights
Museum of Prairiefire

- 32 vertical zones specified
- Each zone with unique proportions
Museum of Prairiefire
Museum of Prairiefire
Thank You!

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