Moving Toward a Three-Dimensional Drawing Set
Presenters

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Integrus Architecture

- Integrus focuses on K-12, Higher Education, Civic, and Justice Design
- Integrus Architecture was an early adopter of BIM having worked in Revit since 2006.
- Integrus offers Architectural, Structural, and Interior Design Services.
Presentation

- Standard Practice vs. The three-dimensional drawing set
  - Building exclusively from Models
- Model Practice
  - Three-dimensional vs two-dimensional detailing
  - Live Sections
- Model Elements
  - Arches
  - Stone Accents
  - Reinforcing
  - Bond Beams
- A Look Ahead with BIM
  - Masonry’s Contributions to the Future of BIM
Standard Practice VS. The Three-Dimensional Drawing Set

• What are Integrus standard practices for creating common masonry elements?

• How does Integrus use the model to create drawings?

• What would it mean if the industry did not rely on two-dimensional drawings?
Standard Practice VS. The Three Dimensional Drawing Set
Building Exclusively From Models

- Design/Build vs Design/Bid/Build
- Abbreviated Drawing Sets
  - No Detailing
  - No Wall Sections
- Up to 50% savings in man hours / profit
- Building Industry evolving toward this practice.
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
Detailing in Standard Practice

In our practice, we have traditionally utilized drafting views (two-dimensional) for details.
Detailing in the Three Dimensional Drawing Set

In order to detail in three dimensions, we utilized “detail views”
Detailing in the Three Dimensional Drawing Set

These views are live snapshots of the three-dimensional model.
We take the three-dimensional view and overlay two-dimensional information and graphics on it.
Because the view is three-dimensional, changes in the model occur in real time.
Revit is a three-dimensional parametric modeling software.

The section tool allows you to investigate issues and coordinate at any time during the modeling process.
Live Sections

- Building sections are live and change as you continue to work on your model.
- At this scale the section does not benefit from detail element enhancements.
• Wall sections tend to be a larger scale and consist of both model and detail elements.
• Changes to the model will change the live wall section view.
A majority of a wall section will be generated with model elements, as shown highlighted in orange.
At larger scales, like a wall section, detail elements are added to enhance the view. The detail elements in this view are highlighted in orange.
• Model elements by definition are three-dimensional elements.
• They can be seen in all views
Masonry Arches

- Autodesk does not include masonry arches as a preloaded family.
- In most cases an arch will be a simple wall-applied treatment that is not tied to the opening or necessarily three-dimensional.
Masonry Arches

For the BIM-M initiative, we created a wall-embedded family that cuts through the wall and is parametric with material controls.
In this family we have an opening element, masonry arch element, and a mortar element.
Masonry Arches

Revit allows you to assign materials to geometry. In this family we have control within the project over the material, per family type.
Stone Accents in Everyday Practice

Stone Accents are elements that have traditionally been dealt with in two-dimensional details.
Stone Accents in the Three-Dimensional Drawing Set

• We found ways to utilize model elements for all required stone accents.
• Through the use of sweeps we were able to model stone sills, lintels, and quoining.
Stone Accents in the Three-Dimensional Drawing Set

Three-dimensional quoining sweep in plan

Three-dimensional quoining sweep in elevation

Three-dimensional quoining sweep in three-dimensional view
Stone Accents in the Three-Dimensional Drawing Set

Three-dimensional quoining sweep through out model
Reinforcement

- Two-dimensional reinforcing
- Three-dimensional reinforcing
- Revit extensions
Current Advantages of Two-Dimensional Reinforcement

- Detail lines, components, or groups
- Fast to make changes
- Easy to export details from project to project

Two-dimensionally reinforced wall elevation

An example of a detail group (Jamb Steel)
Current Disadvantages of Two-Dimensional Reinforcement

- No embedded information
  - No clash
  - No scheduling
  - No tagging
- Everything fits
- No warnings as things move
Current Advantages of Three-Dimensional Reinforcement

- Coordination is improved
- Accurate schedules
- Tagging
- Correctly warns you when items move
Current Disadvantages of Three-Dimensional Reinforcement

- Modeling time required
- All walls are treated equal
- Enlarged model file size
Rebar: Built-in Tools & Extensions

- **Built-in**
  - Place individual bars
- **Extension**
  - Helps define wall

Three-dimensionally reinforced wall in elevation
Rebar: Applications

- Different environments
  - Design-Build vs. Design-Bid-Build
- Future Improvements
  - Tools will get better
  - Computers will get faster
  - Expedite shop drawings

Stepped-footings represented in elevation

BIM-M
Building Information Modeling
for Masonry

integrus
ARCHITECTURE
• Model the three-dimensional elements
• Created a three-dimensional family
  • Less memory
  • No embedded information
A Look Ahead with BIM

- Working from three-dimensional models
  - Cloud Based Models that the entire team can access
  - Faster and more streamlined Collaboration
A Look Ahead with BIM

- Working from three-dimensional models
  - Mobile tools that allow contractors to take full advantage of all information that has been built into the model
Masonry’s Contribution to the Future of BIM

- How is masonry represented in the future of BIM
- Information from manufacturers embedded into the model
- Useful for renderings, energy modeling, cost estimating

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BIM-M
Building Information Modeling for Masonry

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Masonry’s Contribution to the Future of BIM

- How is masonry represented in the future of BIM
  - Pre-made content
  - Custom Masonry Tools
Questions