Revit Modeling for Successful Facilities Management

Bill Meyer, FM:Systems, Senior Applications Engineer - Primary Speaker
Gareth Spencer, Cadline, Application Engineer - Co-Speaker

BO5641

This class provides guidance for creating Revit software models that you can use effectively for facilities management. We will focus primarily on the creation of simple models that you can use as the foundations for facility plans to be used for space management, asset management, and maintenance. This class will focus on the basics, such as generating proper area plans, creating areas, and placing assets. We will also explore concepts including level of accuracy; level of development; and communication of your modeling needs to service providers who are creating models for you during the design, engineering, and construction process. We'll wrap up this session by connecting our model to a Computer-Aided Facilities Management / Integrated Workplace Management System (CAFM/IWMS) Solution so we can explore our results in a more traditional facilities management environment.

Learning Objectives

At the end of this class, you will be able to:

- Convert AutoCAD drawings to Revit models
- Understand basic Revit modeling techniques for effective facilities management
- Learn how to use area plans, areas, and families to help generate facility floor plans
- Gain an understanding of how much modeling needs to be done and to what level of detail for basic facilities management needs
- Learn how to capitalize on CAFM/IWMS to take effective advantage of your Revit software models

About the Speakers

Bill Meyer began his career in Facilities Management in 1993 working as an Architectural Designer for StorageTek, a multi-billion dollar mainframe storage manufacturing company. In 2000 Bill was handed FM:Systems software and asked to take it over, within 3 months Bill became the sole system administrator. Bill also provided custom reporting services and training for personnel. In 2006 Bill started his own consulting company performing installations, configurations, custom reporting, training and documentation. In 2008 Bill was hired by FM:Systems as their first Applications Engineer, continuing his work in the FM:Interact product and showing off its remarkable features to prospects and customers alike. Bill continues to speak, teach and train in his role as an AE and loves furthering his knowledge in the product and in Facilities Management in general.
Gareth Spencer has worked as an Application Engineer specializing in the AEC (Architecture, Engineering and Construction) industry at one of the UK's leading Autodesk Re-sellers 'Cadline' since late 2011. Previously he worked as a Senior Technician/CAD Coordinator for Ramboll working on a wide range of projects from Airports, Schools and Colleges, Healthcare, Public Buildings.

Having over 16 years’ experience using Autodesk software Gareth helps clients with all aspects of training in Revit and AutoCAD base platforms. He also assists clients to develop, implement and execute their BIM (Building Information Modelling) strategies using tools within Autodesk products. This also includes managing their data using tools such as Vault and Buzzsaw.

**Principles of Revit modeling for successful Facilities Management**

**Revit uses for FM**

Lifecycle BIM is the practice of creating, maintaining and utilizing building information to manage operations and maintenance of buildings throughout their operational lifecycles.

- **Improved Space Management**
  
  By understanding the details of how space is used, facility professionals can reduce vacancy and ultimately achieve major reductions in real estate expenses. The room and area information in BIM models are the foundation for good space management.

- **Streamlined Maintenance**
  
  The key challenge in developing a maintenance program is entering the product and asset information required for preventive maintenance. The information about building equipment stored in BIM models can eliminate months of effort to accurately populate maintenance systems.

- **Efficient Use of Energy**
  
  BIM can help facilitate the analysis and comparisons of various energy alternatives to help facility managers dramatically reduce environmental impacts and operating costs.

- **Economical Retrofits and Renovations**
  
  A “living” BIM model provides an easier means of representing three-dimensional aspects of the building. Better information about existing conditions reduces the cost and complexity of building renovation and retrofit projects.
Enhanced Lifecycle Management

Some building design professionals are embedding data on life expectancy and replacement costs in BIM models, thereby helping an owner understand benefits of investing in materials and systems that may cost more initially but have a better payback over the life of the building.

Benefits of using Revit for FM

Pre-Occupancy

- Begin space and maintenance planning
- Entering building product data and documents
- Creating inventory of building equipment
- Streamlines the AEC handover process

Post-Occupancy

- Smoother transition to facilities operations
- Leverages BIM investment for the building lifecycle
- Greater efficiency and Accuracy (less polylining!)
- Models are ready for future projects

What do I need to model?

To successfully track and report on facilities data a method to reference “places” in the building is needed, particularly with respect to occupants and assets.

Rooms and Spaces (areas) - In office buildings and buildings where occupancy tracking is important, it is essential to establish a system for tracking workspace areas. Where workspaces are closed offices these will be identical to rooms, but for open plan workspaces multiple areas will exist within a single room. For that reason, a separate system is needed for areas.
Assets - Typically the types of assets that are most important to owners are ones that need to have maintenance performed on them on a routine basis and are required for the functional operation of the building.

Evolution of a model for Facility Management
Understanding the modeling gaps and differences in the types of models created during the AEC process and into building operations

- BIM Design Model
- BIM Construction Model
- BIM As-Built Model
- BIM FM Model
Creating basic facility floor plans with Revit using AutoCAD as your foundation
Capture existing AutoCAD data in a BIM format in the form of Revit models.

1. **Linking AutoCAD drawings into a Revit project.**

We need to start by taking the existing floor plan and loading into Revit using the Link CAD option in Revit.

Select the **Insert (tab) > Link (panel) > Link CAD from the Ribbon.**
> Select B32a.dwg floor plan and load into Revit model.

- Tick – Current view only.
- Colour – Black and White.
- Layers/Levels – All.
- Import Units – inch.
- Positioning – Manual – Centre.

Now click and place the AutoCAD drawing in the centre of your model, don’t worry about it being in the wrong place we can fix it.

2. Specify Coordinates from AutoCAD drawing in a Revit project.

If we took an idea from the AutoCAD drawing and did the same in Revit you will see that they don’t match.

> Select the Manage (tab) > Project Location (panel) > Acquire Coronations from the Ribbon.
You will notice the Revit model will be repositioned itself to suit the linked AutoCAD.

3. Control layers within a Revit model.

Just like AutoCAD you can control the layers of linked AutoCAD drawings. To control the layers we need to open the Visibility/Graphics.

- Select the View (tab) > Graphics (panel) > Visibility/Graphics from the Ribbon.

- On the Import Categories (tab) you will see the B32a.dwg and to change the layers we can select the each layer or all the layers. In the below image you will see we can control the Weight, colour and line pattern.
We are just going to change the line colour to grey on all the layers within the AutoCAD file.

4. Adding gridlines into the Revit model.
   - Select the Architecture (tab) > Datum (panel) > Grids from the Ribbon.
   - By selecting the gridlines from the AutoCAD drawing we can replicate them in the Revit model.

5. Tracing walls from AutoCAD drawing.
   - Select the Architecture (tab) > Build (panel) > Walls from the Ribbon.
From the properties select **Basic Wall Exterior – Brick on Mtl. Stud.**

- On the options bar just below the Ribbon select *Location Line: Finish Face: Exterior.*
- Using the AutoCAD drawing as a guide, trace over the external walls.

For the internal walls select **Basic Wall Interior - 3 5/8” Partition (1-hr).**

6. **Place floor slab.**

- Now we have placed the walls in, we can add a floor slab.
- Select the **Architecture (tab) > Build (panel) > Floor from the Ribbon.**
➢ From the properties select *Floor Steel Bar Joist 14" - VCT on Concrete.*

➢ Select the *Pick Walls* icon from the *Modify|Create Floor Boundary*.
➢ Using the external walls you have just placed move you cursor over one of the external walls. Now press but down hold the tab once, all the walls should be selected now *left-click* on the mouse.
➢ You should see a magenta coloured line.
➢ Now to complete the command select the ✓ from the *Modify|Create Floor Boundary*.

7. Place doors & windows.
➢ Using the AutoCAD drawing we now need add all the doors and windows into the project.
➢ Select the *Architecture (tab) > Build (panel) > Door* from the Ribbon.
Starting at the top left we are going to place a door into the walls where show on the AutoCAD drawing.

- From the properties select *Doors_IntSgl_1*.
- Then click and place as close as you can into the wall where the door is on the AutoCAD drawing. (As shown below).

To move the door select the door and from **Modify|Doors (tab) > Modify (panel) > Move from the Ribbon.**

- Then select a point on the door to move and a point on the door on the AutoCAD drawing. The door will move and sit over the top.
- Now repeat the same exercise for the rest the doors within the project. Please note some of the doors maybe a different size.
- Once you have added all the doors move onto the placing the windows. Following the same steps as above but just select windows instead.

8. **Place ceiling grids.**

- So we now have walls which are forming rooms so let’s add ceilings into our model.
Firstly make sure you switch to your ceiling plan. In the Project Browser select 02-Second Floor Ceiling Plan.

Select the Architecture (tab) > Build (panel) > Ceiling from the Ribbon.

Before you click and place the ceiling grid you need to set the level, so in the properties window type in the correct height the ceiling needs to be for the room you’re placing it in.

Now move your curser over the room you wish to place it, a lines will highlight the room. Now just left-click and the ceiling will be placed.
9. Place rooms and dividing rooms.
   - We are going to add rooms now into the model, which will allow us to schedule that space, give the room a name and number.

   - Select the Architecture (tab) > Room & Area (panel) > Room from the Ribbon.

   - Then just simply move your curser over a room and left-click and place.
Note: If select the Tag on Placement from the Ribbon before you place. It’s not majorly important to do this now as we can always tag afterwards.

- If you left-click once on the tag, then left-click again on either the name or number you can change them.

If you continue around the floor plan and add rooms to all the rooms.

10. Adding furniture.
- To really make your Revit model a great asset you can add all the room furniture into the model.

- Select the Architecture (tab) > Build (panel) > Component > Place a Component from the Ribbon.
From the properties select **Table-L Shape**.

*Note: If you’re using Revit 2015 R2 you can use the search file to find elements.*

Now place the table over the AutoCAD drawing within the model.

*If you need to rotate the table press the Tab key this will rotate it for you at 90° angles.*

Now add the following furniture: Table-Rectangular 49” x 28”, Global_Filing Cabinet and Chair-Executive.

To make it easier to place all these furniture components, we are going to group them. So select just the furniture you have just placed and from the Ribbon **Modify|Multi-Select (tab) > Create (panel) > Create Group.**

In the create model group dialog box name the group **Office Table & Chair_001**. You will see that they are all in one group and it makes it easier to copy around.

Once you have placed all the furniture groups into your model, you might want to select them all and ungroup them. When selected on the Ribbon select **Ungroup.**

11. Scheduling data from the Revit model.

- Revit is a great way to get data out of the model because you can schedule the metadata from the families that are in the model.
- In the Project Browser scroll down to Schedules/Quantities and right-click, now select **New Schedules/Quantities.**
In the New Schedule dialog box you can select to schedule all sorts of things like doors, windows, furniture, etc.

If we just select furniture from the Schedule Properties dialog box you can select what fields you wish have in the schedule. Filter out data, sort/group data, adjust the formatting and appearance.

All the schedules you have created can be either put onto a drawing or exported out of Revit into Excel.
What is needed in your Revit facility models? (especially if you are starting with a model received from the AEC process)

- BIM FM Models should be delivered standalone with multiple models combined to the extent practical.
- The following information should be removed to facilitate a more workable model:
  - Details
  - Annotation pertaining to installation or construction
  - Building sections and elevations
  - Working drawing sheets
  - Most schedules with the exception of those needed to identify electrical circuits and other data need for building operations
- Information that should be retained includes the following:
  - Floor and roof plans
  - Reflected ceiling plans
  - Mechanical ductwork and piping plans
  - Lighting plans
  - Electrical power plans
  - Electrical panel diagrams and schedules
  - Fire protection plans
  - Data system plans
- Information from the following disciplines should be included:
  - Architectural
  - Mechanical, Plumbing and Control Systems
  - Electrical Power and Lighting
o Fire Protection
o Special Equipment
o Data

- Standard naming conventions should exist across all facilities information ranging from file names to object attribution names to ensure consistency, cross software scalability and accurate reporting. Specific guidelines are as follows:
  o File names for models and CAD drawings should follow: Building number – discipline designations.
  o All assets should have unique identifiers and should adhere to the following:
    ▪ All assets to have at minimum a detail level of: Manufacturer, model and serial number.
    ▪ All assets to be placed dimensionally accurate; assets not directly bound within a room will be captured via the nearest room’s area boundary.
  o Room numbers, room names and room finishes.
  o Space numbers for office areas with workspace name and space type.

**Advantage of using your Revit facility models in your CAFM/IWMS system**
- Maintains a live integration between the model and your facilities team
- Allows for the population and maintenance of data at any point in a buildings lifecycle

**Integrating with a facilities management system**

*Common types of systems*

- Computerized Facility Management System (CAFM) – These are systems integrated with CAD or BIM and used to track space and maintenance at a departmental (rather than enterprise) level.
- Computerized Maintenance Management System (CMMS) – These are systems designed to track remedial and scheduled maintenance.
- Integrated Workplace Management Systems (IWMS) – These are systems that manage space, maintenance, real estate, move management, strategic planning, project management and other

**Data organization in a Lifecycle BIM environment**

Although much information may be tracked by both the BIM model and the facility management system, it is critical to determine the authoritative source for each set of data.
Revit Modeling for Successful Facilities Management

- Revit Model is authoritative
- CAFM/IWMS/CMMS solution is authoritative

**How can a CAFM/IWMS make Revit even better for FM**
- Infinite Attribution
- Big Data Reporting
- Space + HR + CMMS + IT + etc.
- Role and User based security
- Integrates BIM Lifecycle process into daily facilities workflows

**A practical demonstration of Gareth’s Revit model in an IWMS environment**
- Brief explanation of model and IWMS security (secure username/password and roles)
- Basic navigation including searching large amounts of data
- Floor plan viewing
- Reporting (across one to many Revit models)
- Bi-directional data exchange