No Need for Fancy Titles: Autodesk® Revit® Structure - Management, Templates, and Standards

Graham H Stewart, Ramboll UK, BIM Associate

SE2583
This class is designed for structural engineering professionals with beginning or intermediate experience in Revit Structure. This class will cover a combination of best practices on how to manage multidiscipline collaboration, setting up templates and general model management principles including using scope boxes, filters, various types of schedules and managing CAD files for large multiuser projects. Attendees should have a general knowledge of Revit Structure.

Learning Objectives

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

- Learning objective 1 - Define standards and protocols for multidiscipline collaboration
- Learning objective 2 - Create templates that address browser organization, shared parameters, schedules, and title sheets
- Learning objective 3 - Apply general model management principles
- Learning objective 4 - Manage CAD files for large multiuser projects

About the Speaker

Graham – Is a BIM Associate who has over 20 year’s experience in the AEC industry (covering 10+ years using various 3D software packages including 5+ years using Revit) specialising in BIM & Revit.

Responsible for managing the Revit Platform in the UK and structural BIM development in Ramboll UK’s Northern Region, seen as a leader in BIM and part of many company initiatives.

One of the original members of the #ukBIMcrew you can catch him at various UK and international events speaking and promoting UK Best Practice. In 2009 Graham co-founded GRUG - The Glasgow Revit User Group which holds meetings with like-minded professionals within the industry covering Architecture, Structures, Building Services, Contractors & Education.

Graham is also a Certified AutoDesk Revit Architecture 2012 Professional and presented SE3520 at AU2011.

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Forward

Just a quick message to personally thank you for taking the time to download these handouts, and hopefully, if you are at AU2012 you can spare the time to attend my class.

A word of warning … my class is at 8am so better not have too much to drink the night before.

The following handout is a combination of a year’s work during my time at Ramboll UK developing various standards, protocols and their new Revit Structure 2012 & 2013 templates.

Hopefully you will find the information contained within these handouts useful and help give you some ideas to new workflows and standards to adopt in your own company.

I hope I have explained enough for you to understand my thoughts, but please feel free to contact me to discuss anything in this handout or anything Revit or BIM related.

Kind Regards

Graham

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Buildings

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Define standards and protocols for multidiscipline collaboration

The following section highlights various elements of collaboration that I have come across that pop up time and time again.

- The BIM Kick Off Meeting
  A series of points to raise at the initial BIM meeting to gather information to pull together the BIM Execution and BIM Strategy Plans.

- Pictures speak a 000’s words – using process diagrams
  Sometimes a diagram is much better at conveying what you are trying to say in the BIM Execution and BIM Strategy Plans, enclosed are a few I have used.

- What do you tell/share with your collaborators
  Don’t leave anyone in the dark! Tell everyone who I using your model as much as possible so they understand your modeling strategy.

- Model & Project Information
  Using views to keep everyone up to date with revisions you have made to the model and the template as well as other important information.

- General points to note
  Some top items for discussion
BIM Kick Off Meeting

In order to prepare the BIM Execution Plan there needs to be an initial BIM Kick Off meeting with all the relevant parties (ie BIM Managers, BIM Coordination ie people that understand BIM) to gather information and share knowledge and experiences and to fully understand the client’s present and future requirements.

Below is an initial list of points to raise with possible outcomes.

1. Introductions
2. Project overview
3. Current modeling status
   • Brief summary from each stakeholder with regards their BIM skills and current project model status.
4. BIM Project Goals
   • To create a fully collaborated 3d model for Architecture/Structure/ Services
   • To clash and integrity check this model.
   • To bring in any supply chain members models
   • To replicate the planned construction programme into the 3d environment (4d)
   • To hand over upon project completion a final handover BIM model for the clients use going forward.
   • Embed an element of information into the models for use with the asset/facilities management team. Details TBA, COBie etc.
5. Project team contacts for BIM co-ordination going forward.
   • Names, Roles, Contact Details, Experience
6. Project BIM Challenges
   • Project timetable
   • Teams relative lack of experience
   • Disparate software
7. KEY BIM delivery dates.

8. Project protocols/modelling standards
   • To assist in the production of the Project protocols, please can we have a copy of each project stakeholders company modelling standards?
   • Is there any agreed file naming or drawing naming conventions in place?
   • 2d output?

9. Authoring Software and Compatibility
   • Discipline, software, build version

10. Other proposed software
    • Navisworks

11. Hardware
    • 64 bit, RAM???

12. Model Spatial Organisation
    • Has this been set? Do all models come together with regards origin, level, rotation?

13. Proposed model structuring
    • One model or split by floor / zone or movement joints?

14. Informal issuing of models for co-ordination
    • Timing?
    • File format?
    • Method – Extranet?
    • Feedback process from co-ordination check – define.

15. Project Deliverables.
    • As built 2d drawings for architecture, Structure and all trade contractors
    • As built 3d models for architecture, Structure and all trades contractors
    • 6d model with agreed level of embedded data.
16. Training and support
   • Collaboration viewing software
   • Authoring software
   • Project specific modelling concerns

17. Future project BIM meeting schedule.

18. AOB
After all this information is collected we can now begin to formula the BIM Execution Plan.

To ensure key elements of the coordination process is understood we should also prepare process maps as a high level overview of the information.

Examples are:

**Model Exchange for Project Collaboration (Design data Exchange)**

The example below highlights the model exchange workflow between each consultant using a combination of Revit Architecture, Revit MEP & Bentley Structure.
Model Exchange Matrix

The following highlights the various file formats which each consultant will need as part of the BIM interoperability process. This matrix indicates the files which each consultant will issue as well as the file formats they will need to receive.

<table>
<thead>
<tr>
<th>Originator</th>
<th>File format to Export</th>
<th>BFL</th>
<th>RST</th>
<th>RME</th>
<th>RBM</th>
</tr>
</thead>
<tbody>
<tr>
<td>BFL</td>
<td>RVT</td>
<td>N/A</td>
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<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2D dwg</td>
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</tr>
<tr>
<td></td>
<td>IFC</td>
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<tr>
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<td>NWC</td>
<td>N/A</td>
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<td>✓</td>
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<tr>
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<td>3D dwg</td>
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<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2D dwg</td>
<td>✓</td>
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<tr>
<td></td>
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<tr>
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<tr>
<td></td>
<td>NWC</td>
<td></td>
<td>N/A</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Navisworks Exchange Matrix

Autodesk NavisWorks is a BIM collaboration tool which is able to read a multitude of different 3D file formats. Navisworks is used for BIM collaboration and 3D review of published models by the design team. Each consultant issues their files to the Shared Project Server, these files are combined by the BIM team and are made available for viewing by the design team and others.
What should you tell your collaborators?

When working with other partners in Revit for collaboration it is important to tell them everything you are doing to their model in order for you to work efficiently.

By keeping them informed they can then adjust the way they set up their models to suit how others are using their model.

Examples are:

- By Linked Views:
  Why reinvent the wheel if other design team members have views set up that you can use – This is important if we want to use architects drawings as backgrounds for either structural or MEP drawings.

- Copied Scope Boxes
  To ensure all views match the architect should set up layouts that the rest of the design team should follow where appropriate – views are best governed by assigning scope boxes to control boundary (at present time this is a manual process of copying scope boxes from the linked architects revit model – user wishlist item for the future ,the ability to copy/monitor scope boxes)

- Phases
  List all phasing into project with clear descriptions

- Linked RVT:
  List all models you have referenced into your model for coordination including: name, revision & date

- Linked CAD:
  List all CAD files you have referenced into your model either as backgrounds or details.
Model Specific Information

The following view has been set up as a one stop shop for everyone using the model to get information you think others will need to understand the modeling process.

- Project Specific Information
- Reference Information
- Scope Boxes
- Linked By View
- Project Phasing In Use
- Model Revision Information
- Template Revision Information
- Company digital copyright statement
Project Information

To help users specify all project information that will apply to all Title Sheets this view has been set up.

Note: All this information can also be added via Manager > Project Information

**Project Information**

- **Project Name:** PROJECT TITLE LINE 1  
  PROJECT TITLE LINE 2
- **Project Number:** Project Number
- **Client Name:** Owner
- **BIM Coordinator:**
- **Project Engineer:**
- **Model Reference:**
- **Date Created:**
- **Original Model by:**
- **Revit Version Build:** Revit Structure  
  20121003_2115(x64) Update Release 2
- **Template Date:** 19th October 2012

**Notes:**

This template is designed to complement the ROUK.C AEC(UK) BIM Standard for Revit.

Default elements are intentionally conceptual with the expectation that users will load manufacture-specific components as required, based on design decisions.

Complete the project information on this page and switch off the Note from the element properties.

Leave this page in place and ensure that, when saving, this view only appears.

Place an image here to represent the model.
Collaboration – General Points to Note:

Note the following points that should be noted and discussed with the design team.

- Always modify host elements rather than delete them and replace with new elements.
- All rooms must be defined correctly and properly enclosed with bounding elements.
- All models must be phased mapped to ensure correct results when linking models.
- Any copy/monitored elements must be placed on the same workset as the linked model.
- All linked models from other design team members must also come with any supplementary linked CAD, RVT files.
- Ensure that the Room Bounding parameter of all floors and walls IS selected by default.
- Ensure Room Bounding parameter of all Architectural columns IS NOT selected.
- Care should be taken with certain structural elements such as Structural Beams, Structural framing, Slab Edges etc. cannot be Room Bounding. Where these elements specifically interact with the Architectural walls they can leave gaps between the Architectural walls and the slabs, etc.
Create templates that address browser organization, shared parameters, schedules, and title sheets

The following example shows how I currently have set up our company standard browser which breaks it down to 9 unique groups with a further 6 sub-groups.

By doing this we are able to split the browser up so that we work in specific environments each of which have defined view types ie sections, elevations, call-outs etc to avoid these being seen in other groups.

Using these Views we can assign:

Technician – User, Documentation, Coordination

Engineer – User, Coordination, Analytical

The above can be refined to suit the experience & collaboration levels of each party.

This also helps separate key views ie documents clear and clean for issue.
Project Browser (Views)

Browser Organisation & Filtering Properties
Project Browser (cont. – Legends, Schedules & Sheets)
Browser Organisation Explained

| 01. User Review | For all users to create their own respective ‘working’ views. These views should be duplicated from the existing documentation views where appropriate. **Note:** 3D View: User Review highlights ALL constrained elements and elements not designed
  - Constrained (GREEN)
  - Constrained in 2 directions (BLUE)
  - Not Designed (RED) |

| 02. Documentation | Views that are generated from the 3D model, and placed on sheets for printing, complete with annotation. |
| 03. 2D Documentation | Views that are drawn in 2D and placed on sheets for printing (material specific); complete with annotation. N.B: this includes any views referenced from AutoCAD. |
| 04. Reinforcement Documentation | Reinforcement specific views (including 2D Reinforcement details), to be placed on sheets for printing. |
| 05. Note & Abbreviations | General Notes and Abbreviations, to be placed on sheets for printing |
| 06. Coordination | Views in which other discipline drawings can be linked-in and left visible for anyone to refer to, at any time, regardless of how many people are working in the project (eliminates reference ownership problems on multi-user projects). **Note:** Location of ALL constrained dimensions. |
| 07. Analytical | Views in which only the analytical model should be shown. **Note:** 3D View: Analytical highlights ALL adjusted elements as RED Dashed |

| Analytical Model Adjustment | ✓ |

**Note:** 3D View: Fastrak Integration Status highlights ALL any changes from round tripping with CSC Fastrak Software

| CSC_FBD Unchanged | ✓ |
| CSC_FBD Updated | ✓ |
| CSC_FBD New | ✓ |

| 08. Navisworks Export Views | 3D views for exporting to Navisworks, for clash detection (.nwc). |

**Note:** Making any geometry changes in any of the above views will affect other drawings
Section / Elevation / Callout / Plan Types

The following section, elevation and callout view types have been set up to suit the browser view groups. As these view types have associated pre-defined filters, this enables them to be view specific i.e. a user-review section will only be seen in user-review views, and not in any other views so wouldn’t appear in any documentation etc.

<table>
<thead>
<tr>
<th>Section Types Available:</th>
<th>Building Elevation Types Available:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUK_User Review Section</td>
<td>RUK_User Review Elevation</td>
</tr>
<tr>
<td>RUK_Documentation Building Section - RUK</td>
<td>RUK_Documentation Building Elevation - RUK</td>
</tr>
<tr>
<td>RUK_Documentation Rebar Section - RUK</td>
<td>RUK_Documentation Core Elevation - RUK</td>
</tr>
<tr>
<td>RUK_Coordination Section</td>
<td>RUK_Documentation Rebar Elevation - RUK</td>
</tr>
<tr>
<td>RUK_Analytical Section</td>
<td>RUK_Coordination Elevation</td>
</tr>
<tr>
<td></td>
<td>RUK_Analytical Elevation</td>
</tr>
<tr>
<td>Detail Section/Callout Types Available:</td>
<td>Plan Types Available:</td>
</tr>
<tr>
<td>RUK_User Review Section</td>
<td>RUK_Structural Plan - RUK</td>
</tr>
<tr>
<td>RUK_Documentation Building Section - RUK</td>
<td>RUK_Structural Plan - RUK - UP</td>
</tr>
<tr>
<td>RUK_Documentation Core Section - RUK</td>
<td></td>
</tr>
<tr>
<td>RUK_Documentation Rebar Section - RUK</td>
<td></td>
</tr>
<tr>
<td>RUK_Coordination Section</td>
<td></td>
</tr>
<tr>
<td>RUK_Analytical Section</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Plan Types with suffix UP are to be used for reflective ceiling plans.
Plan Types For 2013

With the release of 2013 we can now link View Templates to Plan Types which means when you are creating a level you now have the option to create multiple copies for different types.

You can now also assign and lock view types to all views (See Properties - Identity Data > View Template) which means you cannot change any visual graphic settings, filters etc also note you cannot Override Elements by Category only by Element – this also applies to the sun glasses.

If you wish to override any of the above you need to either

1. change view template to none
2. duplicate view template and edit where necessary – preferred method
View Templates

Below is a comprehensive list of view templates that I have created in order to satisfy most view types – this means we have set up the most commonly user drawings types to suit our company standards.

Note 1: Take care to apply the correct view template to the correct view to ensure all the filters and the view appears in the correct browser location.

Note 2: As elevation, section & drafting views can only be assigned to a single view type please specify which one you are using so that user can apply specific view types once created.

Once you have created your view you will need to apply the appropriate view template to adjust the RUK View Group/Sub Group and filters.
**View Template Filters**

Note the following Filters that are applied to the View Templates

**GREEN Box**

The section type filters are applied to control the visibility of the various sections types.

**BLUE Box**

The material filters are applied to correctly shade elements in elevation.

Note: For workset projects set up each material as a separate workset then edit the above Filters and replace Filter_Material with Workset > Equals > Material Name.
Materials

Model Families loaded into Revit Structure have their material properties set to ‘By Category’ and then defined globally in the Object Styles.

Applying generic surface patterns to these materials, through the materials dialogue box, produces undesired results where tops of walls and sides of slabs do not shade correctly. It is thus necessary to employ graphic overrides in views to overcome this. Filters have therefore been set-up in all views and view templates for all structural elements, to obtain the desired shading in plan, section and elevation. The Filter Material parameter needs to be manually input for each element from the following list, or retrospectively applied in order to achieve this:

Filters [Filter Material Parameter]

- Concrete – Insitu
- Concrete – Precast
- Concrete - Mass
- Timber
- Steel
- Aluminium

Note: You can also apply the view filters to worksets set up for different materials instead of the above method of filtering by the Filter Material Parameter. Working this way means you would have a workset for each material in the project. You can easily amend the filters in the template to filter by workset (once set up in the project) if doing this – Just make sure you are on the correct workset when drawing your elements.

As a background the above method of using the Filter Material Parameter has been used so that we can pre set up all the material filters which we can edit once the project has been set up for worksharing. This avoids the user having to do this manually for every project as we cannot pre set filters for worksets projects in the template.
Assigning Material by Object Styles:

Note the following procedure to assign materials to object styles – note that by creating new object styles this will also help in assigning new layers when exporting CAD files ie instead of exporting Structural Framing member to the one common CAD layer we can now assign various layers based on material.

For this example we will use Structural Framing concrete & steel families

1. Open - \Structural\Framing\Concrete\Concrete – Rectangular Beam
2. Go to Manage > Object Styles
3. Select New under Modify Subcategories – create a new sub category – Beam  Concrete
4. Go to Create > Family Types
5. Set Structural Material to By Category

1. Open - \Structural\Framing\Steel\UB-Universal Beams
2. Go to Manage > Object Styles
3. Select New – create a new sub category – Beam  Steel

Points 4 & 5 as above

1. Open - \Structural\Framing\Steel\Rectangular Hollow Sections
2. Go to Manage > Object Styles
3. Select New – create a new sub category – Beam  Steel – Hollow

Points 4 & 5 as above

Now that we have these amended families we can now load these into our template.

In the template we can now assign materials to the new Object styles that have appeared.
Element Parameters

The following parameters have been added to elements to allow us to included additional information which can we used as noted.

Filter Groups
RUK_Filter Comment 01 - Level information -- i.e. U3-U2, 01-03 or B, GF etc
RUK_Filter Comment 02 - Category – This is used to separate framing members between BRACING and TRUSS
RUK_Filter Comment 03 - Host-Ref – This is use to state any host Ref ie for Door and Windows you would enter the host wall ref or for Truss the Truss Ref
RUK_Filter Comment 04 - Phase Filter
RUK_Filter Comment 05 - Phase Filter – These 3 groups are used to build filter groups for phases
RUK_Filter Comment 06 - Phase Filter
RUK_Filter Comment 07 - View Filter – This group is used to amend the view ie turn elements off, change the colour, lineweights etc.
RUK_Filter Comment 08 - Comments – Add any comments of information for others to note
RUK_Filter Comment 09 Specification Clause
RUK_Filter Comment 10 Zone Information

View Shading
Filter Material

Note: For workset projects set up each material as a separate workset then edit the above Filters and replace Filter_Material with Workset > Equals > Material Name – once set up you will no longer need to fill out the Filter_Material Parameter.
Analytical
RUK_Analytical Model Adjusted This is a tick box for any adjustments ie rigid links
Note: This will show up in the Analytical 3D View as RED.

Design Confirmation
RUK_Design Date
RUK_Design Reference Analytical Ref or other ref code
RUK_Designer By Engineers name
RUK_Element Designed This is a tick box to indicate member has been designed
RUK_Beam Start Load For adding any loadings (tagged)
RUK_Beam End Load For adding any loadings (Tagged)
RUK_Rebar Allowance Reinforcement allowance kg/m³ to schedule tonnage

Constraints
RUK_Member Constrained This is a tick box to indicate member has been constrained
RUK_Member Constrained This is a tick box to indicate member has been constrained
Two Directions in 2 directions ie horizontal + vertical
Note: These will show up in the Coordination 3D Views as GREEN & BLUE
Schedules

The following schedules have been created in order to work out the following structural quantities:

Concrete Volume
(Note: In order to get a total sum of volumes you need to use the Material : Volume parameter)

Concrete Weight
(This has been calculated by simply multiplying the volume by the weight per m³)

Material: Volume / 1 m³ * 2.4

Reinforcement Tonnage
(This has been calculated by the use of a shared parameter Rebar Allowance)

Material: Volume * RUK_Rebar Allowance / 1000 m³

Steel Tonnage
(This has been calculated by replacing the W parameter in all families by a shared parameter RUK_W – this enables us to now calculate the weight of steel properly by multiplying it by its length instead of using volumetric calculations which is inaccurate.)

Length / 1000 mm * RUK_W

Note: In order for us to check steel tonnage we can also calculate this based on the cut length and also by using the volumetric method (Material : Volume/1)*7.85 which is based on Detail Level : medium – this will then give us an overall plus/minus value.
RC BEAM MATERIAL TAKEOFF SCHEDULE

These Framing Schedules are filtered by and must contain a Type Mark beginning with BC.
STEEL BEAM MATERIAL TAKEOFF SCHEDULE

<table>
<thead>
<tr>
<th>MEMBER REF</th>
<th>MEMBER SIZE</th>
<th>NO. OFF</th>
<th>LENGTH (mm)</th>
<th>WEIGHT (T)</th>
<th>NOTES</th>
</tr>
</thead>
</table>

Scheduled fields (in order):
- Type Mark
- Type
- Material: Name
- Count
- Length
- Weight of Steel
- RUK_W
- RUK_FILTER COMMENTS 02
- Type Comments

Material Takeoff Properties

Filter by: Material: Name
- Steel

And: Type Mark
- BS

And: RUK_FILTER COMMENTS 02
- does not contain BRACING

And: RUK_FILTER COMMENTS 02
- does not contain TRUSS
These Framing Schedules are filtered by and must contain a Type Mark beginning with BS and not contain BRACING or TRUSS in element Filter Comment 02.
STEEL BRACING MATERIAL TAKEOFF SCHEDULE

These Framing Schedules are filtered by element Filter Comment 02 which must contain BRACING
TRUSS MATERIAL TAKEOFF SCHEDULE

Scheduled fields (in order):

- RUK_FILTER COMMENTS 03
- Type Mark
- Type
- Material: Name
- Count
- Length
- Weight of Steel
- RUK_WM
- RUK_FILTER COMMENTS 02
- Type Comments

Material Takeoff Properties

Filter by:

- Material: Name
- Contains

And:

- RUK_FILTER COMMENTS 02
- Contains

TRUSS
These Framing Schedules are filtered by element Filter Comment 02 which must contain TRUSS.

Note: Element Filter Comment 03 which must contain the TRUSS host reference ie TR01.
Titleblocks

The following section highlights various parameters and formulas that have been adopted to create a titleblock that can change to suit various scenarios.

The titleblock shown is an A1 indicating:

- General Notes
- Date/Time Stamp
- SHE Box for drawing specific Safety Health and Environment Information (This is to suit the Construction Design Maintenance (CDM) Regulations in the UK)
- Help notes to assist the user
Title Sheet Parameters

Instance Parameters (Apply ONLY to the current Title Sheet)

<table>
<thead>
<tr>
<th>Graphics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet Name Viz</td>
<td>On = Browser Sheet Name is used</td>
</tr>
<tr>
<td>Scale Viz</td>
<td>On = Revit Controlled Scale</td>
</tr>
<tr>
<td>SHE Box</td>
<td>Off = Use parameter ‘Sheet Scale’ to manually specify scale</td>
</tr>
<tr>
<td>General Notes</td>
<td>Used to turn On/Off the SHE Box on the Title Sheet</td>
</tr>
<tr>
<td></td>
<td>Used to turn On/Off the General Notes on the Title Sheet</td>
</tr>
</tbody>
</table>
Type Parameters (Apply to ALL Title Sheets)

<table>
<thead>
<tr>
<th>Graphics</th>
<th>▶</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUK Drawing No</td>
<td>✔</td>
</tr>
<tr>
<td>Date/Time Stamp</td>
<td>✔</td>
</tr>
<tr>
<td>AEC Drawing No</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layers</th>
<th>▶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help</td>
<td>✔</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identity Data</th>
<th>▶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Address</td>
<td></td>
</tr>
<tr>
<td>&lt;Generic Annotation</td>
<td>blank</td>
</tr>
</tbody>
</table>

RUK Drawing No          This is selected via the Title Sheet Family Type
Date/Time Stamp         Used to turn On/Off the stamp
AEC Drawing No          This is selected via the Title Sheet Family Type
Help                     Used to turn On/Off all RED guidance notes
Office Address          Select an office from the drop down list
Formulas to Drive Graphics

In most titleblocks we use the simple Yes/No parameter to drive most of the layout.

An example of avoiding over excessive numbers of parameters we can use the formulas: not plus and as indicated below.

If we take **Sheet Scales Viz** this is currently off because the formula specifies not(Scale Viz) ie if **Scale Viz** is On then **Sheet Scale Viz** is Off.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Formula</th>
<th>Lock</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Graphics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheet Name Viz (default)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale Viz (default)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHE Box (default)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUK Drawing No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Notes (default)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date/Time Stamp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEC Drawing No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Layers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help SHE Box (default)</td>
<td></td>
<td>= and(SHE Box, Help)</td>
<td></td>
</tr>
<tr>
<td>Help</td>
<td></td>
<td>=</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheet Scales Viz (default)</td>
<td></td>
<td>= not(Scale Viz)</td>
<td></td>
</tr>
<tr>
<td>SHE Box General Notes (default)</td>
<td></td>
<td>= and(SHE Box, General Notes)</td>
<td></td>
</tr>
<tr>
<td>Keep Notes (default)</td>
<td></td>
<td>= not(SHE Box)</td>
<td></td>
</tr>
<tr>
<td>Help SHE Box OFF (default)</td>
<td></td>
<td>= and(not(SHE Box), Help)</td>
<td></td>
</tr>
<tr>
<td>General Notes SHE Box OFF (default)</td>
<td></td>
<td>= and(not(SHE Box), General Notes)</td>
<td></td>
</tr>
<tr>
<td>Drawing Title Lines Viz (default)</td>
<td></td>
<td>= not(Sheet Name Viz)</td>
<td></td>
</tr>
<tr>
<td><strong>Identity Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Address&lt;Generic Annot&gt; blank</td>
<td></td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>
To create the drop down Office Address List:

- created by each office address formed as a generic annotation family
- create an Office Address parameter with Type of Parameter set to Family type: then select Generic Annotation

- load in all the office addresses, select them and assign label to Office Address
Main Title

<table>
<thead>
<tr>
<th>Sheet Status</th>
<th>Fill details in:</th>
<th>Schedules</th>
<th>AEC/Ramboll Sheetlist(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project Name 1 & Project Name 2
Fill details in:
Management > Project Information

Please select an office address from the sheet properties

Project Drawing List

<table>
<thead>
<tr>
<th>Sheet Name/Drawing Title Lines 1-4</th>
<th>Date</th>
<th>Drawn</th>
<th>Checked</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: A visibility instance parameter has been added to switch between Sheet Name/Drawing Title Lines 1-4

Family Types have been set up to switch between:
AEC Drawing No.
ProjectNumber, Originator Code, Zone/System, Level, Type, Rule-Sheet
Number
Fill details in:
Schedules > AEC Sheetlist

Ramboll Drawing No.
ProjectNumber, Zone/System, Rule-SheetNumber
Fill details in:
Schedules > Ramboll Sheetlist

NOTE: Rule has been added to the Sheet Number in S-001
General Notes

1. DO NOT SCALE FROM THIS DRAWING
2. ALL DIMENSIONS ARE MILLIMETRES U.N.O.
3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

Title sheet when SHE Box is turned OFF.
### HEATH AND SAFETY INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following construction.

### MAINTENANCE/CLEANING/OPERATION:

### DECOMMISSIONING/DEMOLITION:

**Notes**

1. **DO NOT SCALE FROM THIS DRAWING**
2. **ALL DIMENSIONS ARE MILLIMETRES U.N.O.**
3. **ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.**
4. **THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.**

SHE Notes:
A Visibility instance parameter has been added to switch off on individual sheet from the sheet properties.

General Notes:
A Visibility instance parameter has been added to switch off on individual sheet from the sheet properties.

Title sheet when SHE Box is turned ON.
Apply general model management principles

This section is a general overview of various points that should be looked at to help assist better management of your model.

Note the following quick win items:

- Revit Viewer

This does not require a license so is great for just viewing the model and avoids any mistakes by the user being unable to save or make any changes but it is limited – better option is to open the model as Detach from Central

- Orient To View

A good method to help assist the coordination and understand of your model is to set up 3D views of each floor – this is easily done by using Orient to View from the View Cube.

- Weekly To-Do List

A simple sets of rules to help improve model performance

- Remove any unnecessary views/Tidy Project browser
- Check Warnings
- Purge unused
Map Out Your Process
File Maintenance on Project

Note the following file management procedure that will help keep the file size as small as possible and avoid errors.

- Because of the memory leaks that are within Revit you should completely close out of Revit at least once a day and restart the program.
- Every day you open the project you should be making a new local file. This helps keep a consistent local file.
- If your models crashes perform the following steps (ensure everyone has sync'd with the central file and closed down all local files):
  1. Open up the recovery model and perform a sync to ensure everything has been saved over.
  2. Audit the central file
  3. Create a new local file – Note: Ensure all members of the project create new local files.

Revit Files with multiple users

1. Create a new Central File every month or at different stages of the project (eg. Stage C, D or at major milestones)
2. Audit the Central File week
3. Create a new Local File every day.

Note: When creating a new Local File always appendage the existing file so that backups are kept, these can be deleted every week or every month depending on how often new Local Files are created (see above)

Purge unused regularly but check what is being removed – Note: This should only be done by the lead BIM Project Coordinator.
Revit Origin

The Revit origin is marked in plan with two reference planes in the template file. You should:

- Model all circular/elliptical/symmetrical buildings with their centre positioned on the origin point. All sports grounds should be modeled with the center of the pitch on the origin point.
- Model all rectilinear buildings with bottom left grid intersection on the origin point.

Structural Plans have been set up with a Scope Box called RUK_Scope Box with the initial Levels 0 & 1 assigned to it.

All view boundaries should be defined by scope boxes especially dependent views as these are easier to control if you make changes later.
Creating Selection Sets

Another way of using filters is the ability to create selection sets which in turn can show up in filters.

By using this method you can quickly set up filters without having to go through all the normal rules.

**Quick Tip:** For all saved section sets please prefix with SS-

Note: When you create a saved selection set this also appears in the filter list (Important – you cannot edit this filter and if you select this filter and click edit you will be unable to create or edit any filter) Please ensure you have set up a filter prior to creating saved selection sets.

Example: This example shows a wall loading plan (Figure 1) where selection sets have been set up to identify different walls loadings as different colours.

Filters have been used to change the colour of the selection sets (Figure 3)

To Create a Selection Set: Pick an element(s) then in Manage (Figure 2) pick save (please prefix with SS-)

To Edit a Selection Set: In Manage (Figure 2) pick Edit, then select the required prefixed SS-selection set (Figure 4) then pick Edit – then use Add to/Remove from Section (Figure 5) to make amendments

Filter Case Study:

**The Problem:** (Figure 6)

To create a 3D view that highlights all walls in the model that have the incorrect naming. As all walls are named 2??-level-W(unique reference) we are looking for walls that do not start with 2.

**Solution:** (Figure 7)

Create a filter which looks at wall categories only and filters by Mark that does not being with 2.

This Filter is then used to surface shade walls soild RED.

**Note:** No additional filters have been added to show all walls that do being with 2 and are made transparent and switch all elements off except walls.
Figure 2

Figure 3

Figure 4
Figure 7
Scope Boxes

Scope boxes perform functions as noted below:

Grids & Levels should be assigned to a name scope box to ensure uniformity of grid and level extents between views. This works best for orthogonal/square buildings rather than round buildings with radial grids because the scope box can only be cubic and radial grids won't usually conform to this shape on plan.

Views – Scope boxes can also be used to align views at specific angles without the need to rotate views on title sheets – this can be useful if you have a project where you have various angled areas you wish to show orthogonal on plan.

Quick Tip: How to remember the rotation of scope boxes?

As a scope box does not remember its rotation angle set up ref lines to show the angle the scope box has been rotated.
Cast Study 1:

Problem:

Project had 5 unique areas at different orientations with 5 surrounding towers all at different levels.

Surrounding towers had to show floors plus levels

Main model had to be split up to show each area orthogonal on drawing sheets.
Solution:

- Each area had a unique scope box with all grids and levels assigned
- Dependent views where set up each one assigned to a different scope box
Issuing Model Data

The design team should agree and document a **Data Exchange Protocol** as part of the **Project BIM Strategy Manual**. Revit model file size can often exceed 100mb for a single file; as such it is not possible to distribute the information by email. Methods such as FTP, Extranet or Online Document Management Systems are some of the methods which can be used for sharing large files.

1. Model Preparation:
   - Check model file name conforms to Project Standards
   - All users to “Save to Central” relinquishing all editing rights
   - Review and fix all warning messages where possible
   - Check that all families conform to Standard naming conventions
   - Check that all content is in the correct Workset and conforms to Standards
   - Check model is correctly assembled through visual inspection
   - Update “Model Information - PLEASE READ” Sheet view with any relevant model notes

2. Validation of Model
   - Open Central file with “Detached from Central” and “Audit” selected
   - Remove non transmittal linked-in files
   - Unload (Not Remove) all RVT Files
   - Remove all Title Sheet Families (depends on your companies QA policy)
   - Remove all Views / Legends / Schedules / Images not placed on Sheets
   - Remove all non-issued Sheets
   - Remove unwanted Design options
   - Purge model (repeat three times as materials are only removed after the parent object has been removed)
   - “Save as” file to published folder
Note the following app from case that will assist to Delete Sheets, Views, and Revit Links - http://apps.case-inc.com/content/delete-sheets-views-and-revit-links

The model is now ready for distribution via the process agreed in the Data Exchange Protocol.
Worksets

A good workflow is to set up an ADMIN user to lockdown certain aspects of your model to restrict user functionality ie Grids & Levels, Scope boxes, Ref Planes.

This can be further enforced by setting up an additional workset called ADMIN for any specific elements the Project BIM Coordinator wants to control.

By doing this we keep important changes under the control of the Project BIM Coordinator (admin).

To achieve this, you only need a separate admin User Name in Options. Once inside as admin create a Workset and call this as Admin. Now you can move the items you want to work on the new set, and before you close the file, make sure you do not relinquish User-created worksets.

Now if you try to delete or amend any of the admin controlled elements you will get the following message:
Manage CAD files for large multiuser projects

Were possible all CAD Data should only be linked into a Revit model through the process of ‘linked view’ from a linked master CAD Data Revit model. By doing this all members of the team are kept up to date with the latest drawings controlled by the Project BIM Coordinator.

With multi-model projects this ensure all users are using the correct CAD data and will also eliminate potential CAD corruption in the main model – one good point is by using By linked view – you can rapidly switch between CAD layouts within the same view without having to copy/paste from other floors.

By using this process we also significantly reduce the amount of RAM resourcing being used by linked CAD data.

Note: Files must not be linked to local office drives (use FULL network path) or users desktops.

AutoCAD Data Preparation

AutoCAD data to be imported should be correctly prepared prior to linking into the Revit project models. The following procedures should be carried out on the base AutoCAD file(s) prior to linking:

- Remove or bind all Xrefs
- Delete all unnecessary layers including frozen and switched off layers.
- Delete all hatching.
- Check the UCS is located at a suitable location in or close to the model information.
- Purge (including nested blocks)
- Audit
- Save into an earlier release format such as AutoCAD 14, 2002 etc...
CAD Data Revit Model Procedure:

1. Set up a new model to act as a placeholder for all CAD data.

Setting up Views:

As the CAD Data Revit model is only a placeholder for CAD data, levels are not necessarily important but you may wish to link in the main model and copy/monitor all the required levels and a few grids to ensure the CAD data is easily located.

2. Link in original model
3. Copy/monitor all required levels then create floor plans
4. Copy/monitor a few gridlines to ensure CAD Data can be easily located

Linking in CAD Data:

5. Ensure you are in the correct view / level
6. Select File, Import/Link, CAD Formats
7. Browse to the project subfolder
8. Select the dwg file to be linked
9. Ensure the following options are selected within the bottom of the dialog box – Note that Import units & Positioning: will be to specific project requirements.

10. After the CAD data is linked ensure you pick this element and in the Options Bar select Foreground – this will ensure the CAD data is overlaid ie on top of all revit information.
Main Revit Model Process:

Now that we have the CAD data Revit model set up – we can now link this placeholder into various revit models.

Link in the placeholder:

1. Link in the CAD data Revit model using Origin to Origin (Note this may need to change to suit overall project set up)

2. In your view type VV (Visibility/Graphics) > Revit Links – you will see your CAD data Revit model – pick By Host View under Display Setting.

3. After you pick ok a few times you will see that the linked view has been overlaid onto your plan.

Note this this procedure can be applied to Section and Elevation views.
“The greater our knowledge increases, the greater our ignorance unfolds” JFK

Thank you for taking the time to attend my class.

If you would like to discuss any of the class content or have suggestions or different points of view then I would love to hear from you as knowledge is something that should be shared so that everyone can benefit.

I would like to thank…..

My family and friends, the following reviteers who through discussion and past presentations have inspired some of my class content Allan Brown – BIM Coordinator at URS Corporation Ltd, Michael Boyd – BIM Manager at WSP, Matthew Perry – Senior Technician at Buro Happold, and colleagues at Ramboll UK for their support.

I look forward to meeting you all again at Autodesk University 2013.