

BIM e – Submission Guideline Structural

Annex 1b

Template Training Guide – Revit 2010



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1.0	October 2010		Issue to Pilot Participants
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1. Overview

This document explains the “BCA Structural BIM e-Submission Template” (or known as “ST Template”) and the default settings for the template based on the BCA BIM e-Submission requirements. It also consists of a generalised modeling workflow to help one prepare for Structural BIM e - Submission using the template.

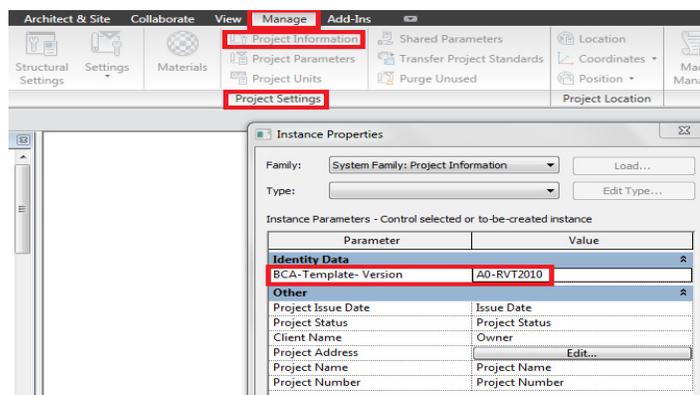
2. BCA BIM Submission Template

Generally, each project can consist of multiple submissions, for instance the 1st submission (ST01) usually meant for the project substructure (such as piling and foundation), while subsequent submissions (ST02, ST03) are for superstructure (such as floor, column, beam and roof). It is also possible that the entire project can be done within one submission. The ST Template is designed for either one or multiple submissions. It consists of few main sections as shown below.

- Template Version
- Project Browser
- View Templates
- Schedules
- Phase Settings for A&A project
- Tags and Families
- Detail Line Styles

2.1. Template Version

As the ST template will be reviewed and refined over time, a version parameter known as “BCA-Template-Version” has been added to the template. This would help one to use the latest version of the template. The parameter can be verified from menu Manage→ Project Settings→ Project Parameters. The current version is **A1-RVT2010**.



2.2. Project Browser

The Project Browser shows a logical hierarchy for all views, schedules, sheets, families, groups, linked Revit models, and other parts of the project.

The Project Browser consists of the following set of views/drawings

- Architectural Drawings
- Structural Site Plan
- 3D Structural Model
- Structural Drawings, General Assemblies
- Structural Drawings, Elevations
- Structural Drawings, Sections
- Structural Drawings, Details

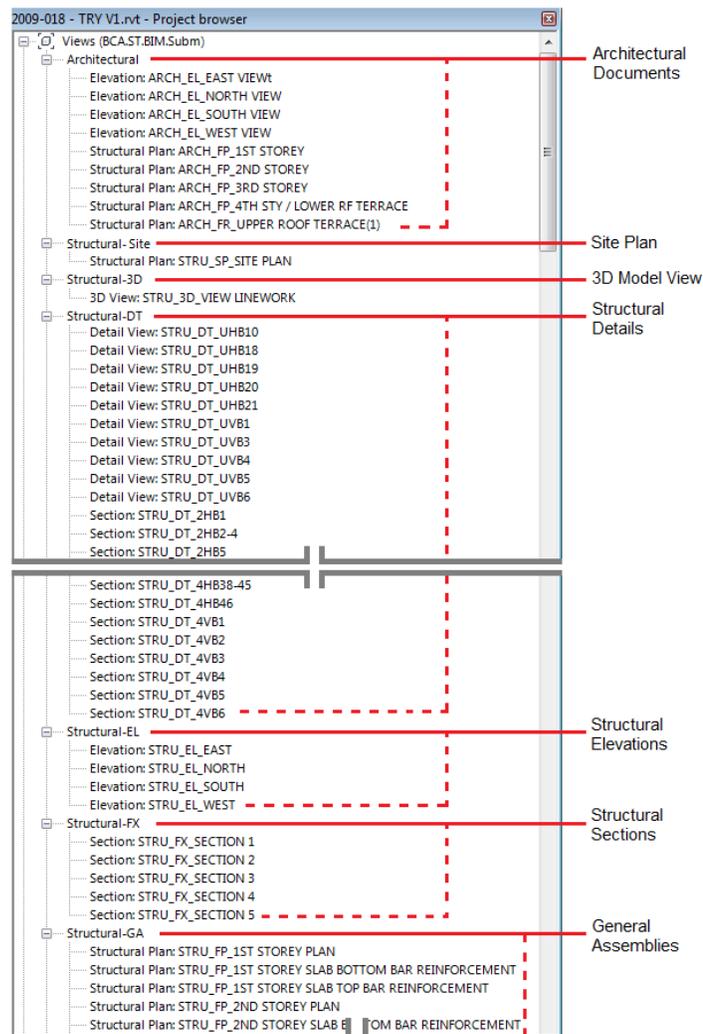


Fig 2 A typical view of project browser

2.2.a BCA-View-Category

Each set of views are grouped into category called “BCA-View-Category”. In the ST template, the specific types of views for each category are explained in the following table.

No	BCA-View-Category	Explanation
1	Architectural	These views are the relevant Architectural drawings required for Structural Submission including Architectural Site Plan, Floor Plans, Sections and Elevations. Please ensure that these drawings are the latest/correct version at the point of submission.
2	Structural-Site	This is for the structural site plan that contains the boundary and project grids. The view must be aligned to the right coordinates, orientation and datum.
3	Structural-3D	This section must have at least one view to represent the Structural 3D views for the project.
4	Structural-GA	These views are the General Assemblies (GA) of the structural project (Structural Floor Plans) generated from the model. The users need to add in the annotations and dimensions to complete the view (Refer to the section “Plan Views Preparation”).
5	Structural-DT	These views are the Project Details (DT) such as reinforcements, members and connections. The outline profile of the members such as Frames, Columns and Floors must be generated from the GA. It’s recommended to add in the reinforcements using detail line to manage the file size. The users need to add in the annotations and dimensions to complete the view (Refer to the section “Detail Views Preparation”).
6	Structural-EL	These views are the project Elevations (EL) generated from the model. The users need to add in the annotations and dimensions to complete the view (Refer to the section “Elevation and Sectional Views Preparation”).
7	Structural-FX	These views are the project Sections (FX) generated from the model by creating the section line position in the plan. The users need to add in the annotations and dimensions to complete the view (Refer to the section “Elevation and Sectional Views Preparation”).

No	BCA-View-Category	Explanation
8	Working	These are active views of the project where modeling work is on-going. Once the views are ready it can be changed to the above view. Note: this category will not form part of the submission and will not be considered for regulatory approval.
9	Others	Users can extend this View to support their organisational needs. But this View will not form part of the submission and will not be considered for regulatory approval.

2.3. View Template Settings

View Settings is a quick way of controlling (e.g. turning on/off) the objects in the various views. This feature is conceptually similar to AutoCAD/Microstation's layers/levels. The ST Template has a pre-configured set of setting as follows,

No	Properties	Description.
1	View Scale	Scale for a view.
2	Detail Level	Detail level such as Coarse, Medium and Fine for a view
3	V/G Overrides Model	Visibility control for structural elements like walls and columns
4	V/G Overrides Annotation	Visibility control for annotation elements like texts, tags and dimensions
5	V/G Overrides Import	Visibility control for those linked/imported CAD/BIM files.
6	V/G Overrides Filters	Visibility control for a preset filter.
7	View Range	To display objects within a view range. Applicable only to Plan and Reflected Ceiling Plan views.
8	Orientation	North orientation: either True North or Project North. Applicable only to Plan and Reflected Ceiling Plan views.
9	Phase Filter	Phase filter like Existing, New and Deleted.
10	Discipline	Visibility control for objects based on discipline. For an example, load bearing walls, structural columns and structural annotations will only be displayed in "Structural" discipline

Note: The above listing does not cover all the properties of view settings. Please refer to specific Software User Manual for more information.

Next table explains the View Templates in BCA ST Template

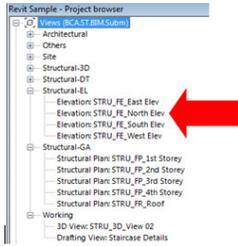
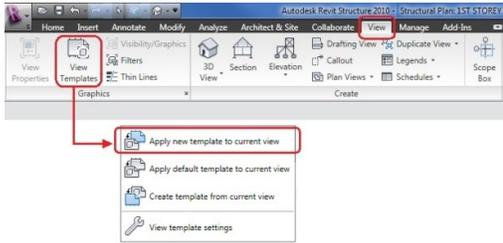
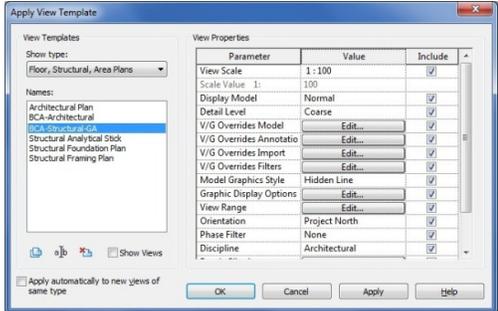
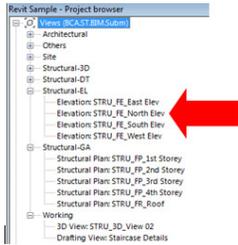
No	View Template	Description
1	BCA-Architectural-PL	This setting is for the Architectural Plans.
2	BCA-Architectural-EL	This setting is for the Architectural Elevations and Sections.
3	BCA-Site-PL	This setting is for the Site Plan.
4	BCA-Structural-GA	This setting is for the Structural General Assembly (GA) Plan View.
5	BCA-Structural-DT.PL	This setting is for the Structural Detail-Plan View.
6	BCA-Structural-DT.EL	This setting is for the Structural Detail-Elevation View.
7	BCA-Structural-DT.DV	This setting is for the Structural Detail done in Drafting View.
8	BCA-Structural-EL	This setting is for the Structural Elevation View.
9	BCA-Structural-FX	This setting is for the Structural Section View.
10	BCA-Structural-3D	This setting is for the Structural 3D View.

Note: Please do not overwrite the above visibility settings. If there is a need for additional visibility settings to support your company standard then duplicate and modify (Refer to the Software User Guide on how to duplicate and modify). If accidentally overwritten then transfer the visibility settings from the ST Template back into the project.

Next table shows the BCA-View-Category and their corresponding View Template

No	BCA-View-Category	View Template
1	Architectural (Plan)	BCA-Architectural-PL
2	Architectural (Elevation)	BCA-Architectural-EL
3	Structural-Site (Site Plan)	BCA-Site-PL
4	Structural-GA (Plan)	BCA-Structural-GA
5	Structural-DT (Plan)	BCA-Structural-DT.PL (Detail Plan)
6	Structural-DT (Elevation/Section)	BCA-Structural-DT.EL (Detail Elevation)
7	Structural-DT (Drafting View)	BCA-Structural-DT.DV (Detail in Drafting View)
8	Structural-EL (Elevation)	BCA-Structural-EL
9	Structural-FX (Section)	BCA-Structural-FX
10	Structural-3D (3D)	BCA-Structural-3D

2.3.a Applying View Template

Step	Description	Illustration
1	Select the view in the project browser to which you want to apply the View Template.	
2	Apply the relevant View Template. Menu: <i>View</i> → <i>View Templates</i> → <i>Apply new template to current view</i>	
3	Apply View Template dialog box will appear and a list of View Templates will be shown. Select the View Template and Click Apply.	
4	The selected view will relocate to the respective category in the “Project Browser”. The content in the view will also change according to the View Template setting.	

2.4. Schedules

The ST Template consists of the following Schedules

- BCA-Beam-ID
- BCA-Column-ID
- BCA-View-List

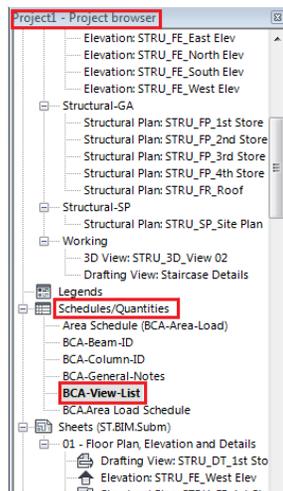
Open the schedules by double clicking on them from the Project Browser under Schedules/Quantities to explore the content of the schedules.

2.4.a BCA-Beam-ID and BCA-Column-ID

BCA-Beam-ID and BCA-Column-ID are not the typical schedules prepared for the Structural Submission. They are in table format and created to manage the ID and quantities of the structural objects found in the BIM model.

2.4.b BCA-View-List

BCA-View-List is a listing of views and their properties as shown below.



View Name	BCA-View-Use	BCA-View-List		Sheet Name
		Discipline	Family and Type	
2nd Storey Details	Others	Structural	Drafting Views (Detail)	
ARCH_FE_East Elev	Architectural	Architectural	Elevations (Building Elevation)	
ARCH_FE_North Elev	Architectural	Architectural	Elevations (Building Elevation)	
ARCH_FE_South Elev	Architectural	Architectural	Elevations (Building Elevation)	
ARCH_FE_West Elev	Architectural	Architectural	Elevations (Building Elevation)	
ARCH_FP_1st Storey	Architectural	Architectural	Structural Plans	
ARCH_FP_2nd Storey	Architectural	Architectural	Structural Plans	
ARCH_FP_3rd Storey	Architectural	Architectural	Structural Plans	
ARCH_FP_4th Storey	Architectural	Architectural	Structural Plans	
ARCH_FR_Roof	Architectural	Architectural	Structural Plans	
Staircase Details	Working	Structural	Drafting Views (Detail)	
STRU_3D_Model	Structural-3D	Structural	3D Views	
STRU_3D_NEW	Structural-3D	Structural	3D Views	
STRU_3D_View 02	Working	Structural	3D Views	
STRU_DT_1st Storey Beam Detail	Structural-DT	Structural	Drafting Views (Detail)	Floor Plan, Elevation and Details
STRU_FE_East Elev	Structural-EL	Structural	Elevations (Building Elevation)	
STRU_FE_North Elev	Structural-EL	Structural	Elevations (Building Elevation)	
STRU_FE_South Elev	Structural-EL	Structural	Elevations (Building Elevation)	
STRU_FE_West Elev	Structural-EL	Structural	Elevations (Building Elevation)	Floor Plan, Elevation and Details
STRU_FP_1st Storey	Structural-GA	Structural	Structural Plans	Floor Plan, Elevation and Details
STRU_FP_2nd Storey	Structural-GA	Structural	Structural Plans	
STRU_FP_3rd Storey	Structural-GA	Structural	Structural Plans	
STRU_FP_4th Storey	Structural-GA	Structural	Structural Plans	
STRU_FR_Roof	Structural-GA	Structural	Structural Plans	
STRU_SP_Site Plan	Structural-SP	Structural	Structural Plans	
{3D}	Structural-3D	Structural	3D Views	

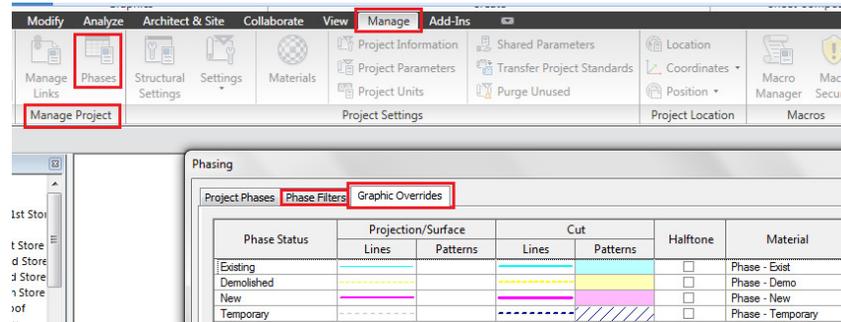
BCA-View-List helps the users to manage the views and its properties. Renaming the views and properties can be done directly on the list.

The Sheet Name column in the above table shows the sheet in which the view is placed. It also helps to identify views that have not been placed in sheets yet.

2.5. A&A Phase Settings

The ST Template uses concept of a Phase to manage A&A works and Amendments to an Approved Plan. It has also incorporated CP83 colour standards into the ST template.

The setting can be found in Menu panel: *Manage* → *Manage Project* → *Phases* as shown belows



Users are required to use clouding to identify the areas that have been changed in the Approved Plan.

2.5.a Element's A&A Phase Property

This section will explain how to set the element properties to reflect BCA A&A Phase Setting.

Step	Description	Illustration
1	<p>Set the “Phase Created” parameter for all the existing elements to “Existing”.</p> <p>Note: This need to be done before creating any new elements.</p> <p>Select all the elements in the view and use the filter in the illustration to remove the non-relevant elements from the selection.</p> <p>The filter function is found in the lower right hand corner (Refer to illustration).</p>	
2	<p>Right click and open the Instance Properties dialog box from the context menu</p> <p>The Instance Properties dialog box will be opened as shown in the illustration.</p> <p>Set the “Phase Created” parameter under Phasing to “Existing”.</p>	

Step	Description	Illustration
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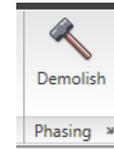
3 Set the demolish status for elements that need to be altered.

Note: follow the rule strictly **Do not use the Modify or Delete function**

Use Demolish function to demolish the selected element and create new one to effect the change.

Menu: *Modify* → *Phasing* → *Demolish*

Do not **MODIFY** or **DELETE**
Use **DEMOLISH** Only !!



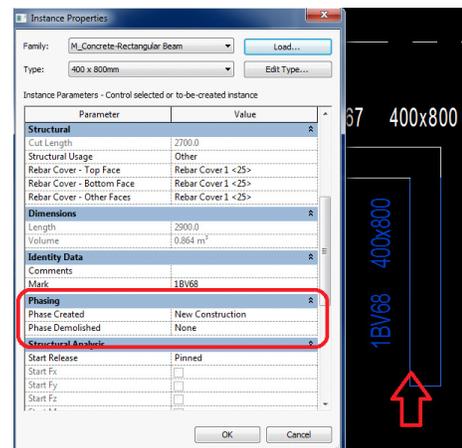
4 Note: The above step will set the “Phase Demolished” parameter of the element as “New Construction”. The element is still in the project, but has been virtually set as deleted from the model.

The demolished elements can be deleted in the next amendment.

5 When you create new elements from now onwards they should have the “Phase Created” parameter as “New Construction” and “Phase Demolished” parameter as “None”.

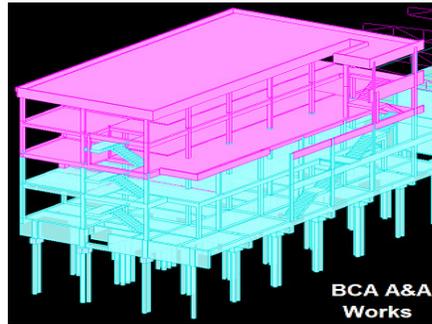
If the values are not set correctly then select the elements, right click and choose Element Properties from the context menu and set the values correctly.

Note: Revit will manage the connections between the Demolished element and New Element.



6 Additional to the typical A&A elements you can create temporary works in Revit as well. For the temporary works set the “Phase Created” parameter as “New Construction” and “Phase Demolished” as “New Construction”.

Sample A&A project is shown below. Next section will explain how to use the BCA A&A Phase Settings to display the elements with correct CP83 A&A color requirement



2.5.b Using A&A Phase Settings

Step	Description	Illustration
1	<p>Right click in your active view and select View Properties from the context menu.</p> <p>Set the appropriate value for the “Phase Filter” parameter.</p> <p>By default the value is “None”.</p> <p>BCA ST Template has the following filters preset for you.</p>	
	<p>BCA A&A – All</p> <p>Displays the Existing, Demolished and New elements in CP83 Color.</p>	
	<p>BCA A&A – All + Temp</p> <p>Displays the Existing, Demolished and New elements in CP83 Color. The temporary elements will be displayed as well.</p>	
	<p>BCA A&A – Demolish</p> <p>Displays only the Demolished elements in CP83 Color.</p>	
	<p>BCA Original – Existing + New</p> <p>Displays the Existing and New elements in their original color.</p>	

Note: Structural walls have been used to illustrate the A&A Phase settings for clear visual.

2.6. Tags and Families

The ST Template has a set of Families/Tags to jump start your documentation process.

Note: These Tags/Families are not exhaustive and there will be new/enhanced families over the time. If your company already has the Tags/Families then you can use them. Ensure the Tags have similar information as those found in BCA ST Template. You can enhance the tags for your needs.

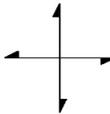
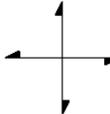
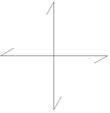
2.6.a Span Marker Families

Span Markers are used to indicate the structural floors span direction in the Floor Plan views. The ST Template consists of two types of span markers.

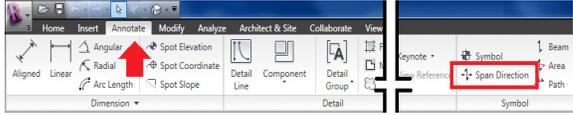
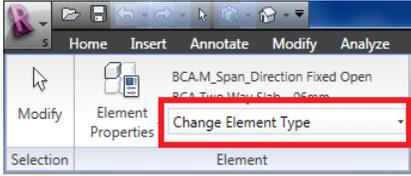
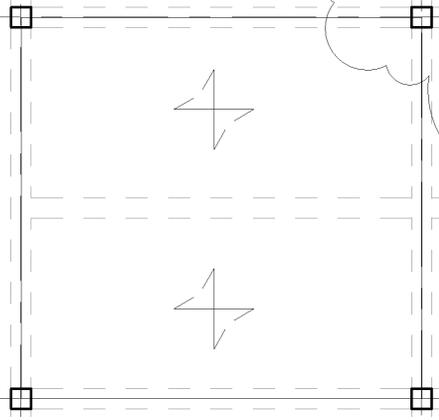
Type 1: Marker will be drawn across the entire slab.

Type 2: Marker will be drawn with the preset sizes.

The following are the span markers found in the ST Template

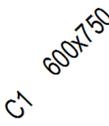
No	Family Name	Family Type	Illustration
1	BCA.M_Span_Direction Note: Type 1 marker	BCA One Way Slab	
		BCA Two Way Slab	
2	BCA.M_Span_Direction Fixed Filled Note: Type 2 marker. The available sizes are 6mm, 12.5mm and 25mm.	BCA One Way Slab	
		BCA Two Way Slab	
3	BCA.M_Span_Direction Fixed Open Note: Type 2 marker. The available sizes are 6mm, 12.5mm and 25mm.	BCA One Way Slab	
		BCA Two Way Slab	

Next section below describes how to place these Markers in your project.

Step	Sequence	Illustration
1	Select the Span Direction tool. Menu: <i>Annotate</i> → <i>Symbol</i> → <i>Span Direction</i>	
2	Select the correct type of span marker from “Change Element Type” drop down menu.	
3	Select the Floor/Slab element by one of the edge. Notice the marker hovering over the slab, move it to the position you want and place it.	

2.6.b Column Markers

Column Markers are used to indicate the column identity and size in Structural Plan View. Basic information required for the column marker is “Column-ID” and “Column-Size”. The following are the column markers in the ST Template.

No	Family Name	Family Type	Illustration
1	BCA.M_Structural_Column_Tag-Mark_Sk For Use in Structural Plan View	BCA	
2	BCA.M_Structural_Column_Tag-Mark_Ft For Use in Structural Plan View	BCA	

2.6.c Beam Markers

Beam Markers are used to indicate the beam identity and size in Structural Plan View. Basic information required for the beam marker is “Beam-ID” and “Beam-Size”. The following are the beam markers in the ST Template.

No	Family Name	Family Type	Illustration
1	BCA.M_Structural_Framing_Tag-Mark_Ft For use in Structural Plan View	BCA	1BH001 300x600
2	BCA.M_Structural_Framing_Tag-Mark_Sk For use in Structural Plan View	BCA	1BH001 300x600
3	BCA.M_Structural_Framing_Tag-Mark_EI For use in Structural Plan View	BCA	<u>1BH001 300x600</u>

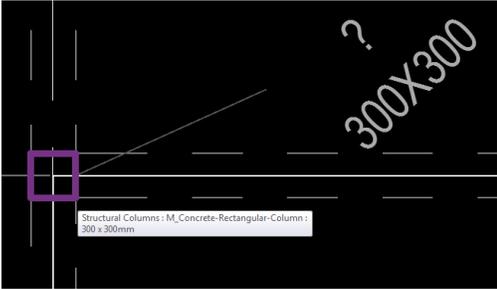
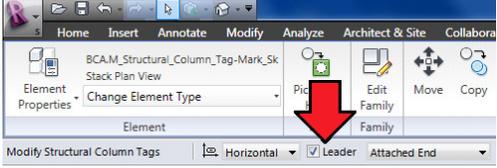
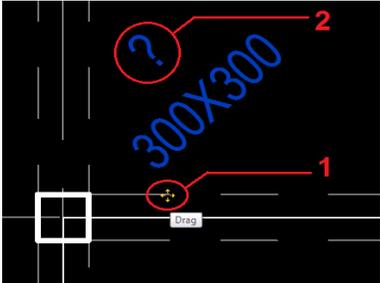
2.6.d Slab Markers

Slab Markers are used to indicate the thickness in Structural Plan View. Basic information required for the slab marker is “Slab-Thickness”. The following are the slab markers in the ST Template.

No	Family Name	Family Type	Illustration
1	BCA.M_Structural_Slab_Tag_Ft For Use in Structural Plan View	BCA	300

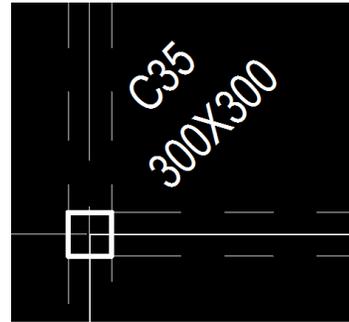
2.6.e Placing Column/Beam/Slab Markers

The section below describes how to place the markers in the project. The process of placing these references is known as “Tagging” in Revit. The process is the same for all the elements and for the purpose of explanation we will take Column Marker tag as an example.

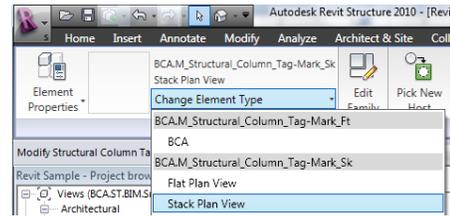
Step	Description	Illustration
1	Tag elements by category Menu: <i>Annotate</i> → <i>Tag</i> → <i>Tag</i> → <i>By Category</i>	
2	Move the mouse to any of the column and notice similar annotation as shown in the illustration. If this is the first time you are tagging then you will see “?” instead of ID and Size. Click on the element to tag.	
3	If you do not want to see the leader lines to your column when you tag, make sure the “Leader” item is checked-off before you start tagging.	
4	Completing the tagging. Once tagged you are free to move the tag to place it clear of any elements. <ol style="list-style-type: none"> 1. Select the tag. 2. Click on the tag origin shown as “1” in the illustration. Double click on the “?” shown as “2” in the illustration and key in the relevant information as per the naming convention.	

Step	Description	Illustration
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- 5 Completed tag look similar to the illustration shown here.



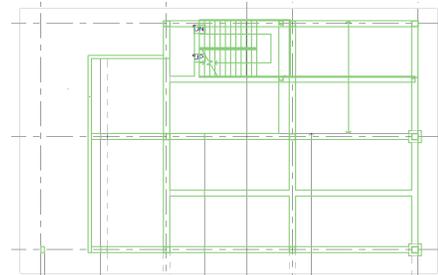
- 6 If you need to change the type of tag then select the tag and change from the “Change Element Type” drop down list as shown in the illustration.



The above section describes how one tags member individually. The following section describes how one tags all members automatically at one go. The entry for column-ID will still be carried out individually.

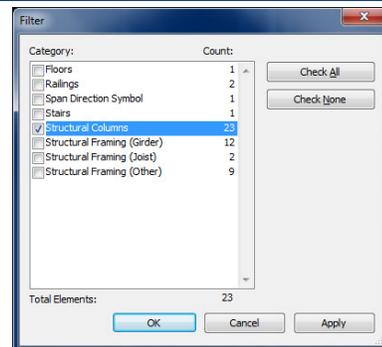
Step	Description	Illustration
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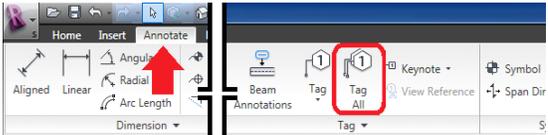
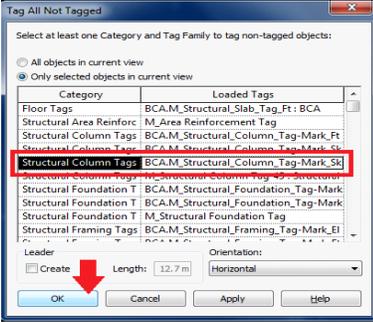
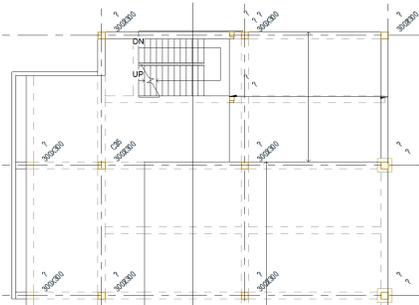
- 1 Select all the elements as shown in the illustration.



- 2 Use the filter to select only the “Structural Columns”.

Filter function is found in the lower right hand corner as shown in the illustration.



Step	Description	Illustration
3	<p>Tag all elements</p> <p>Menu: <i>Annotate</i> → <i>Tag</i> → <i>Tag All</i></p>	
4	<p>“Tag All Not Tagged” dialog box will be shown. Select “Structural Column Tags”. Click on “Loaded Tags” to select your choice of tag to use. Click “OK” when done.</p>	
5	<p>All the columns will be tagged as shown in the illustration.</p> <p>Complete the process by adding in the ID and Size. Move the tags and place in a clear space such that they are not on top of any element.</p>	

2.6.f Drop Markers

Drop Markers are used indicate the drop value between different floor levels, and any objects. Basic information required for the drop marker is “Drop Value”. The following is the drop marker in the ST Template.

No	Family Name	Family Type	Illustration
1	<p>BCA.Drop_Tag</p> <p>For Use in Floor Plan</p>	BCA	 <p>50</p>

Drop markers can be placed freely.

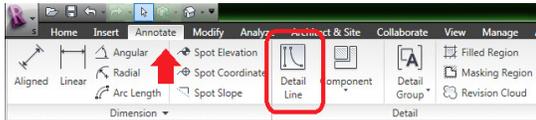
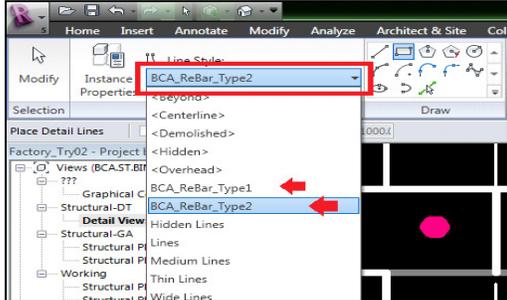
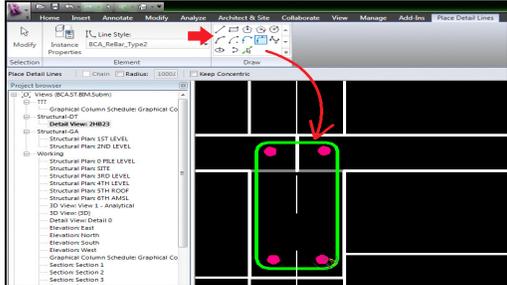
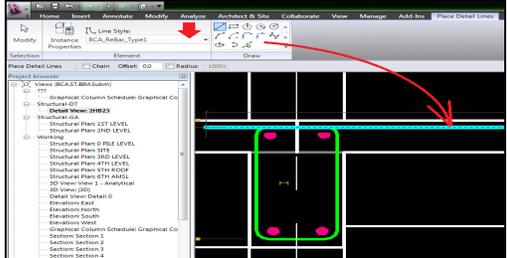
Menu: *Annotate* → *Symbol* → *Symbol*

2.7. Detail Line Styles

At present it is not practical to add all the reinforcement details in 3D and it is recommended to go for a hybrid approach. There are 2 basic type of annotation styles incorporated into ST Template. If there is a need for more line types then it's ok to expand the list.

No	Line Style	Illustration
1	BCA_ReBar_Type1 For drawing thicker lines	
2	BCA_ReBar_Type2 For drawing thinner lines	

The following section explains how to use the line styles for the detailing

Step	Description	Illustration
1	Use Detail Line to draw the rebar. Menu: <i>Annotate</i> → <i>Detail</i> → <i>Detail Line</i>	
2	Select the line type from “Change Element Type” drop down menu.	
3	Choose any of the drafting methods to draw the rebar. In the illustration the tools used was “Rectangle” followed by “Fillet-Arc”	
4	For the different type of rebar repeat step 2 and 3.	

Step	Description	Illustration
5	Annotate the rebar as per the current practice of labeling.	