

Structural

Submission Template for Archicad 24

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INTRODUCTION

The objective of this document is to assist structural engineers in developing BIM models collaboratively based on both the *Reference Model* and *One-Model Concepts*.

This is a generic reference and shall not be considered as an extensive document including all project cases. The template and actual workflows may be changed based on certain scenarios and the users are recommended to audit and revise their workflows from project to project.

This document is focusing on the use of GRAPHISOFT Archicad 24 with regard to the requirements of BIM collaboration and it does not include the explanation of Archicad terms in general.

Though the solutions demonstrated in this guide are aligned with the specifications of the Singapore BIM e-Submission Guidelines and Code of Practice, the users are required to check the actual requirements and GRAPHISOFT shall not be held responsible for non-compliance.

Architectural project delivery and submission is not covered in this document, for details refer to the relevant Archicad templates and guides available at the CORENET website.

The current version of the template and its user guide is under constant development and updates may be available at a later time.

Find the **BIM e-Submission Templates and Guidelines** at the CORENET website here:

[https://www.corenet.gov.sg/general/building-information-modeling-\(bim\)-e-submission.aspx](https://www.corenet.gov.sg/general/building-information-modeling-(bim)-e-submission.aspx)

Find the **Archicad Libraries** for each template on the GRAPHISOFT SG website here:
(requires GRAPHISOFT ID and SSA license to log in)

<https://graphisoft.com/sg/ssa/downloads>

ONE-MODEL CONCEPT vs. REFERENCE MODEL CONCEPT

Compared to the *Reference Model Concept* where each discipline is able to edit and modify its own model only while using the others' models as protected references alongside their own, the One-Model Concept allows different disciplines to work on one central model. The members of these disciplines have different access rights to edit elements and properties depending on their role in the project.

The One-Model Concept can be followed in case all three disciplines (architects, structural engineers and MEP engineers) **are using Archicad as the BIM authoring tool.**

Working with the One-Model Concept does not mean that there are no links in the project or that there is only one single project file for the modeling and documentation.

Creating modules/groups improves the workflow for example by the easier management of repetitive parts. It also helps by separating the work areas of disciplines if needed, for example in case of combined models of architects and MEP engineers where the two disciplines usually should not change the other domain.

In case of collaboration between architects and structural engineers however, it is necessary that **the structural team has access to certain elements that were originally defined by the architects** (beams, columns, etc.) for refinement. These **refinements are done on the architectural elements directly by the structural engineers** with the One-Model Concept.

The One-Model Concept may also have **file separation for documentation purposes** or performance optimization.

Since the architectural model can be used for structural purposes, modeling time is significantly shorter when compared to reference modeling, however since the representation requirements are the same, the differences between the two methods require more preparation on the workflows and not the actual modeling work/element settings or documentation process. Hence this guide can be used as a generic reference for both one-model and reference model workflows.

Note: No IFC file exchange is necessary when using the One-Model Concept compared to the Reference Model Concept.

STRUCTURAL WORKFLOW

In regular reference-based workflows the structural team provides design consultation during the Conceptual Design stage and is not expected to create BIM content until the Preliminary Design stage.

In the One-Model Concept however, no additional modeling of existing elements is needed since the architectural elements are directly accessible - the **structural modeling and core information aspects can be set by the structural team in the early phases**, shortening the overall project delivery time.

- 1 **The architectural team prepares the block file, which includes certain structural elements**, like Slabs, Columns and Beams.
- 2 **The structural team** (marked with red in the diagram below) **has access to the core information of these elements and can change the dimensions as well**. Typically, only a few members of the structural team should have access to the architectural teamwork projects.
Depending on the project setup, the structural team member will most likely have access to the architectural unit files as well, since structural elements will also be included at that level.
- 3 **The architecturally complete block is hotlinked into a structural base project**. The block is linked as a whole teamwork project, there is no need to publish MOD or PLN files.

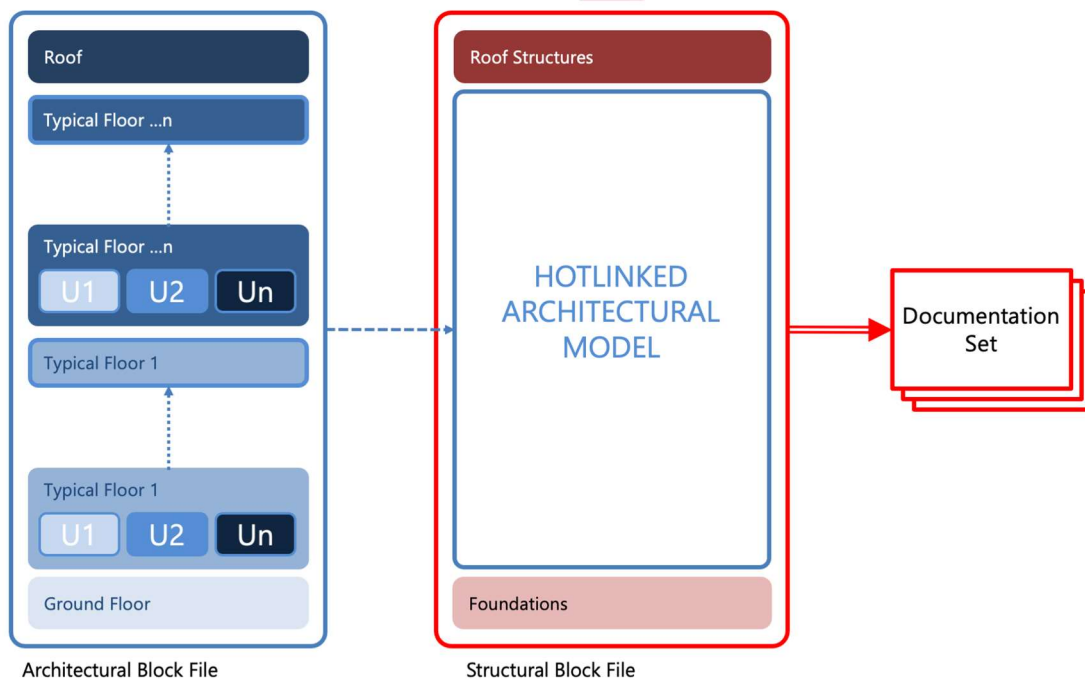
Note: To avoid discrepancies between attributes within each file, it is recommended to set up and use a *Project Base File* or a template with common attributes if such hotlinking occurs. The preparation of these base files is the scope of the BIM Manager. Any interim changes to the attributes should be thoroughly carried out in all related project files.

- 4 **The structural team will complete the architectural model with structural elements**, typically by adding:
 - roof story structures
 - roof levels - these should have been defined in the architectural file already.
 - foundations

Otherwise **the architectural model is not edited**. If some editing is still needed it will be done in the architectural block file.

- 5 **The structural team then completes the documentation in the structural block file,** which is a regular teamwork project.
During the import of the architectural model (including its documentation and annotation elements) unnecessary content will be created that the structural team will have to filter by Layers for example.
- 6 **The structural Documentation Set is produced from the structural block file** file/teamwork project.

Example of workflow:



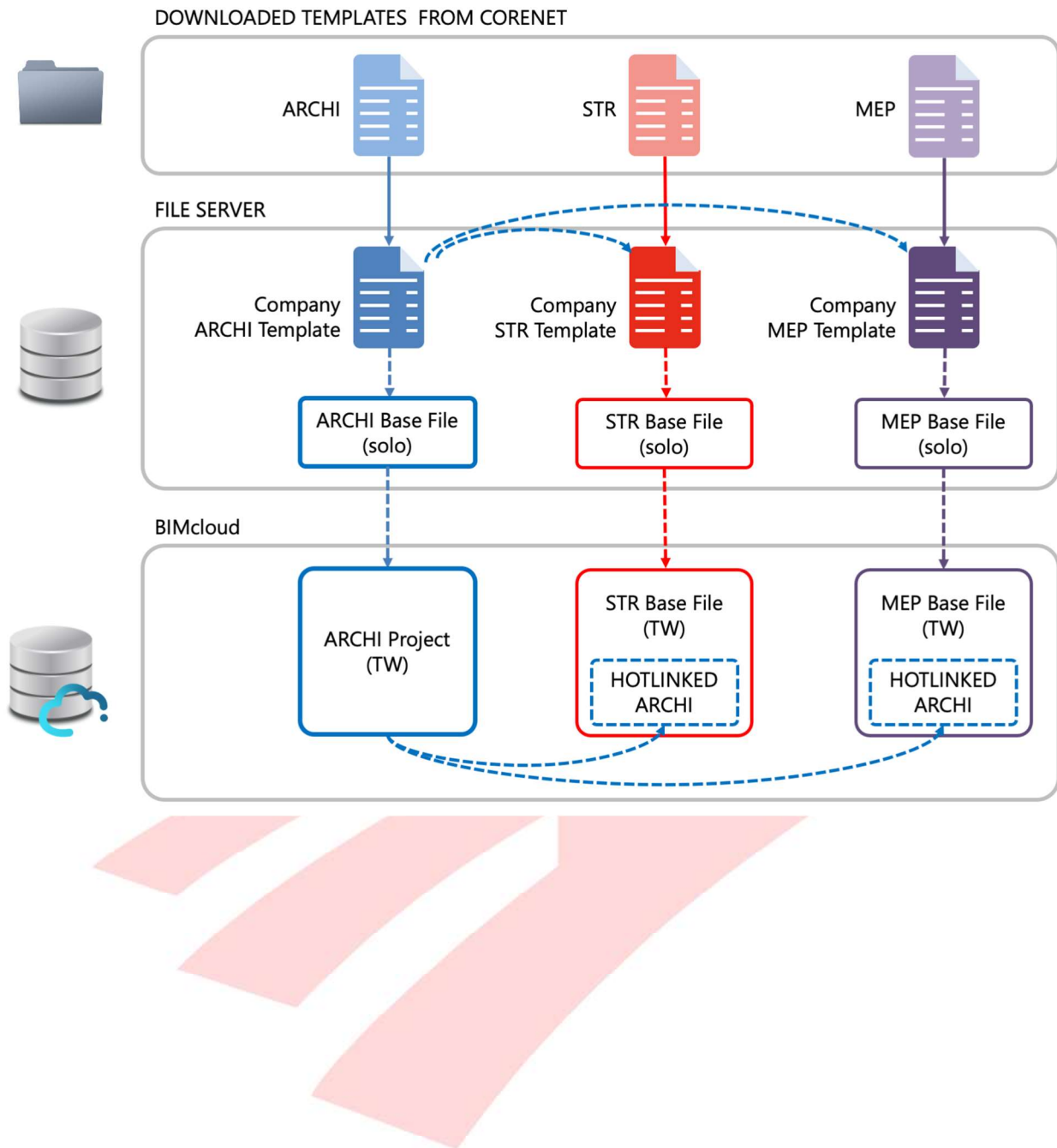
TEMPLATES AND PROJECT BASE FILES

Project Base Files can be created based on the existing company templates or the templates discussed in this document before the project starts.

The Project Base File allows the different teams to link the model portions smoothly. **Usually, the structural and MEP teams use the empty architectural file as a base to inherit their settings and update their templates for the actual project.**

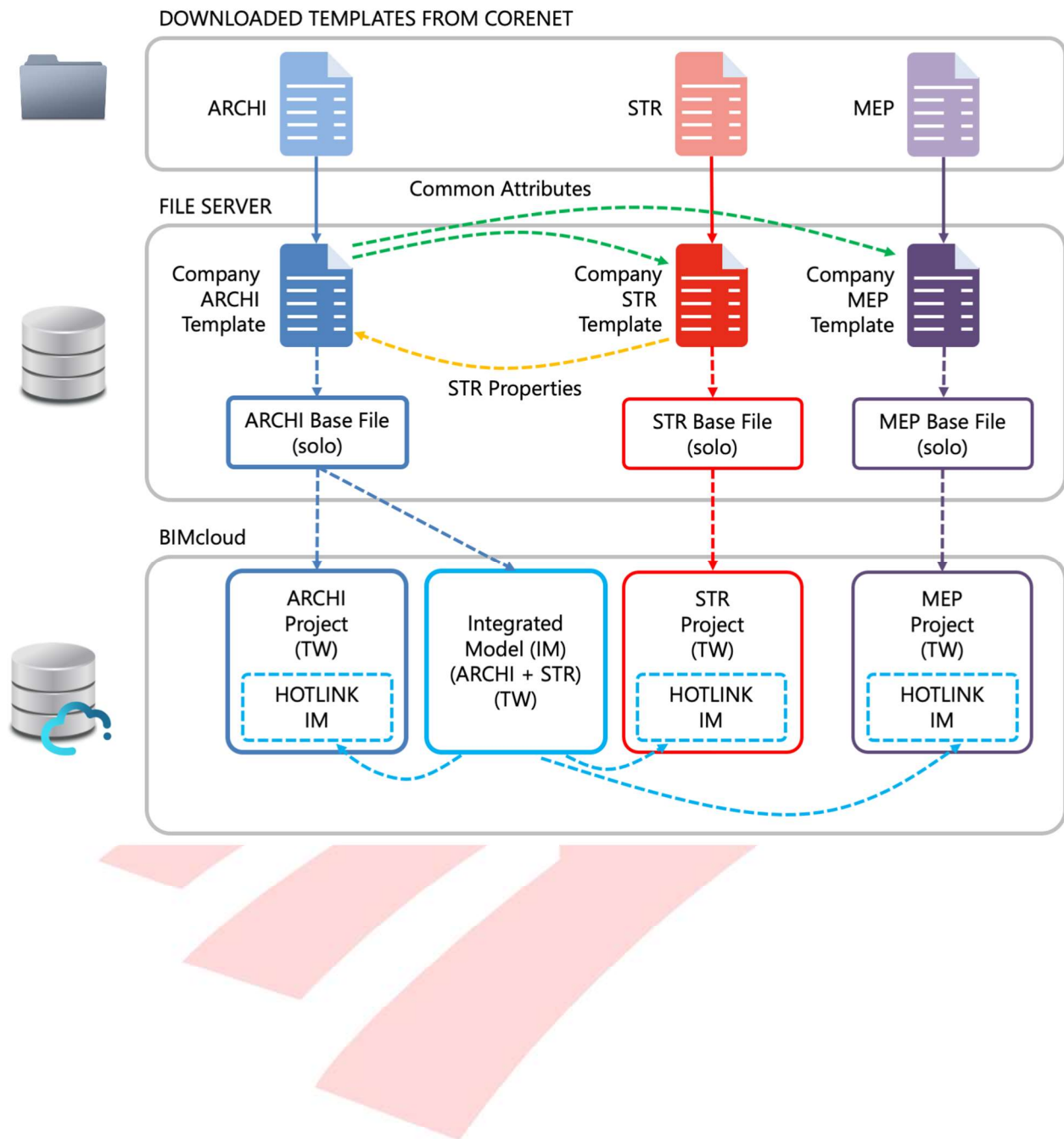
- 1 The BIM Manager should **collect the templates for all the disciplines**. These are generic templates.
- 2 As the **architectural team** leads the project development, they **set the base design and update their template** for the actual project (ARCHI Template).
- 3 **The structural and MEP teams will use this new template as a reference to set the same framework for their projects** (STR Template and MEP Template. These template files are stored in a common folder on the company File Server.
- 4 **The new templates will be used for solo Archicad files, which can be shared** to the BIMcloud later. These solo files can still reside on the File Server.
- 5 **Share the architectural solo Base File** and start working on the Teamwork Project.
- 6 Meanwhile **the structural and MEP teams also create a solo Base File based on their updated templates**.
- 7 **The structural and MEP teams share their Base File to the BIMcloud** to make it a Teamwork Project.
- 8 **The structural and MEP teams hotlink the architectural projects** into their Teamwork Projects.
- 9 **All disciplines work on their own projects** and create the relevant Documentation Sets onwards.

Example 1 of file structure and workflow.
Based on hotlinking to Architectural Model.



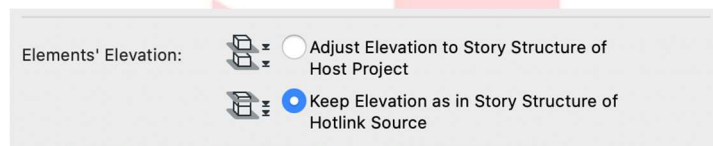
Example 2 of file structure and workflow.

Based on an Integrated Model approach between Architectural and Structural teams.



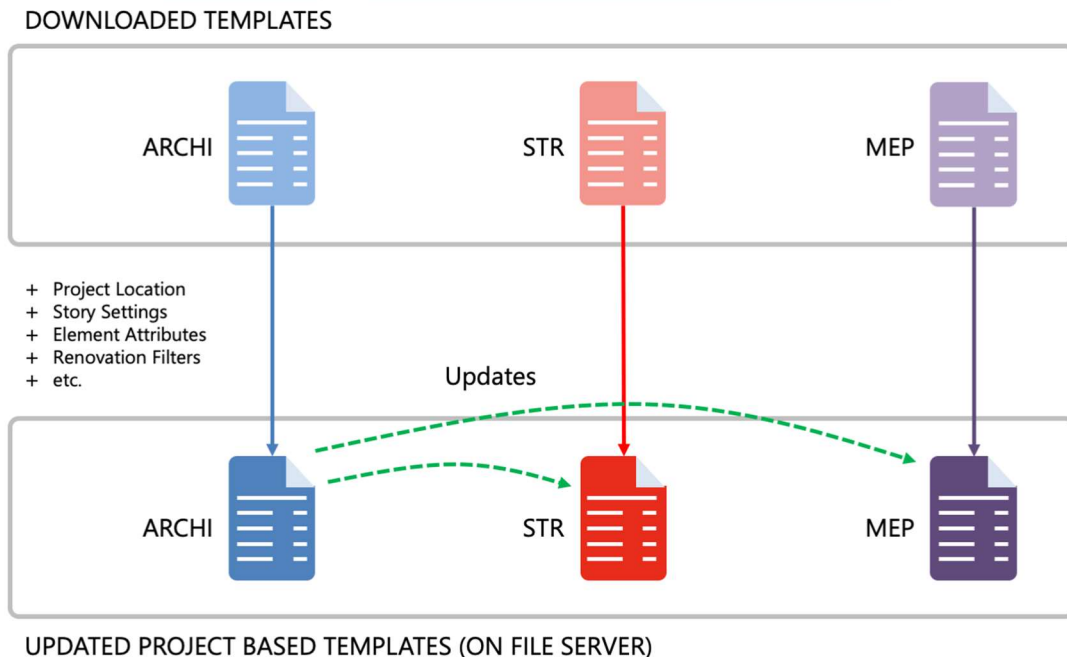
The following are necessary to be defined in the Project Base Files/Templates:

- **Project Location** - based on surveyors' input (external drawings, list of coordinates, point cloud surveys, etc.).
- **Story Settings** - when content is hotlinked in Archicad via the **File/External Content/Place Hotlink** command, check the **Elements' Elevation** settings and choose to:
 - **Adjust Elevation...** when the hotlink's story heights should adjust to the host's story heights, or
 - **Keep Elevation...** when the hotlink's story height should remain intact, and not adjust to the host's story heights.



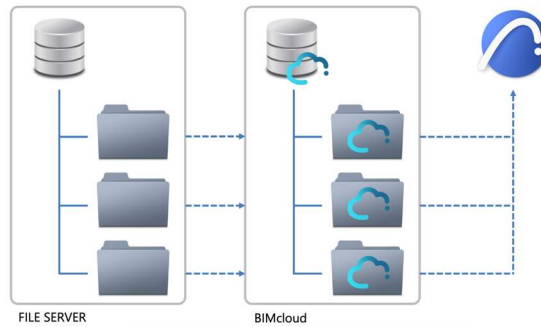
It is advised to coordinate the story heights between all linked files, to avoid any mismatch or overlapping elements. The setup of Stories is a **process done in each file as they cannot be imported**. Once created, **make sure that affected View Map Cloned Folders are updated** with the IDs and Names.

- **Element Attributes** - to ensure that content shows the same in all linked files, any newly created attributes have to be careful added and synchronized in all project files.



LIBRARY MANAGEMENT

The **original downloaded libraries are placed onto the company file servers**. These will be uploaded to BIMcloud, then accessed and loaded by Archicad. When sharing a solo project with the libraries attached, these libraries will also share (and upload) to the BIMcloud if they weren't uploaded previously.



- 1 To add these libraries to BIMcloud, go to **File/Libraries and Objects/Manage BIMcloud Libraries...** in Archicad.
- 2 Log in and select the correct **BIMcloud** from the popup control, with the appropriate logged in user.
- 3 Click the icon button **Upload a local Library to the BIMcloud** to browse the downloaded libraries on the file servers to add into the BIMcloud.
- 4 Click **Choose** once the library/folder on the file server is selected, this will upload the selection to BIMcloud.
- 5 **Close** the Manage BIMcloud Libraries dialog once all libraries have been uploaded.
- 6 To add these BIMcloud libraries to an active Teamwork project, go to **File/Libraries and Objects/Library Manager...**
- 7 **Reserve** the Library Manager dialog, and click **Add** – this will open the Choose BIMcloud Libraries dialog
- 8 **Select** the previously uploaded Libraries, and click **Add**, to add these libraries to the current Teamwork Project.

Note: After the libraries are uploaded to the BIMcloud, the originals on the file server will remain offline and untouched.

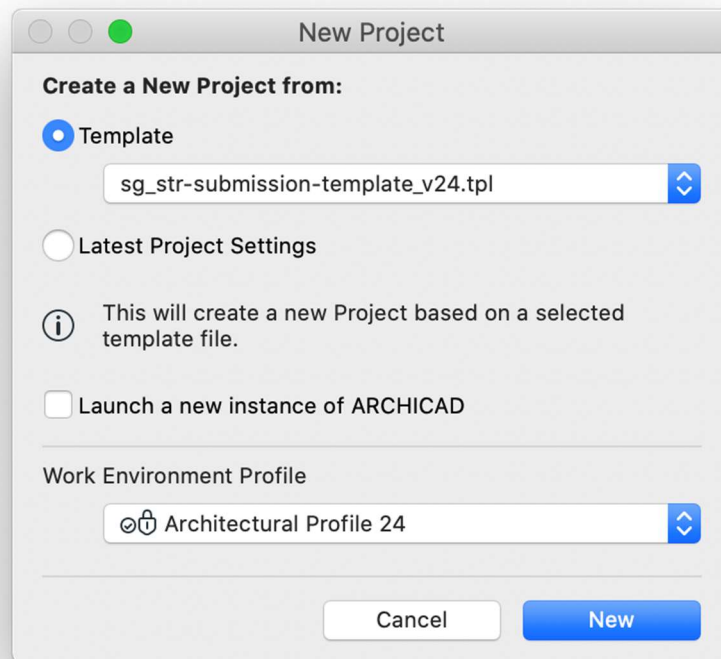
GETTING STARTED

Once you have downloaded the template from the CORENET website, do the following preparations before using the template for the first time.

- 1 Place the **sg_str-submission-template_v24.tpl** file to:
Option 1: On your file server in a dedicated template folder. Then in Archicad 24 New dialogue, use "Browse" and load this template. If the path or name changes, then you'll need to browse again to load this template again.
Option 2: Copy the template to the Archicad application folder, the template will auto load into the New dialogue when you start the application. This folder is usually located at
C:/Program Files/GRAPHISOFT/ARCHICAD 24/Defaults/ARCHICAD.
- 2 Place the **GSSG STR Library.lcf** library container file into a folder where it will not be modified/moved/deleted, such as a company file server. There are following sections that will go into this in more detail.
- 3 Launch **GRAPHISOFT Archicad 24** using the desktop shortcuts.



- 4 The Start Archicad 24 dialog appears, choose **New...** at the top of the dialog.
- 5 Click into the dropdown list and use the **Browse Template...** option to locate the **sg_str-submission-template_v24.tpl** template file.
- 6 Choose the **Architectural Profile 24** Work Environment and click **New**.



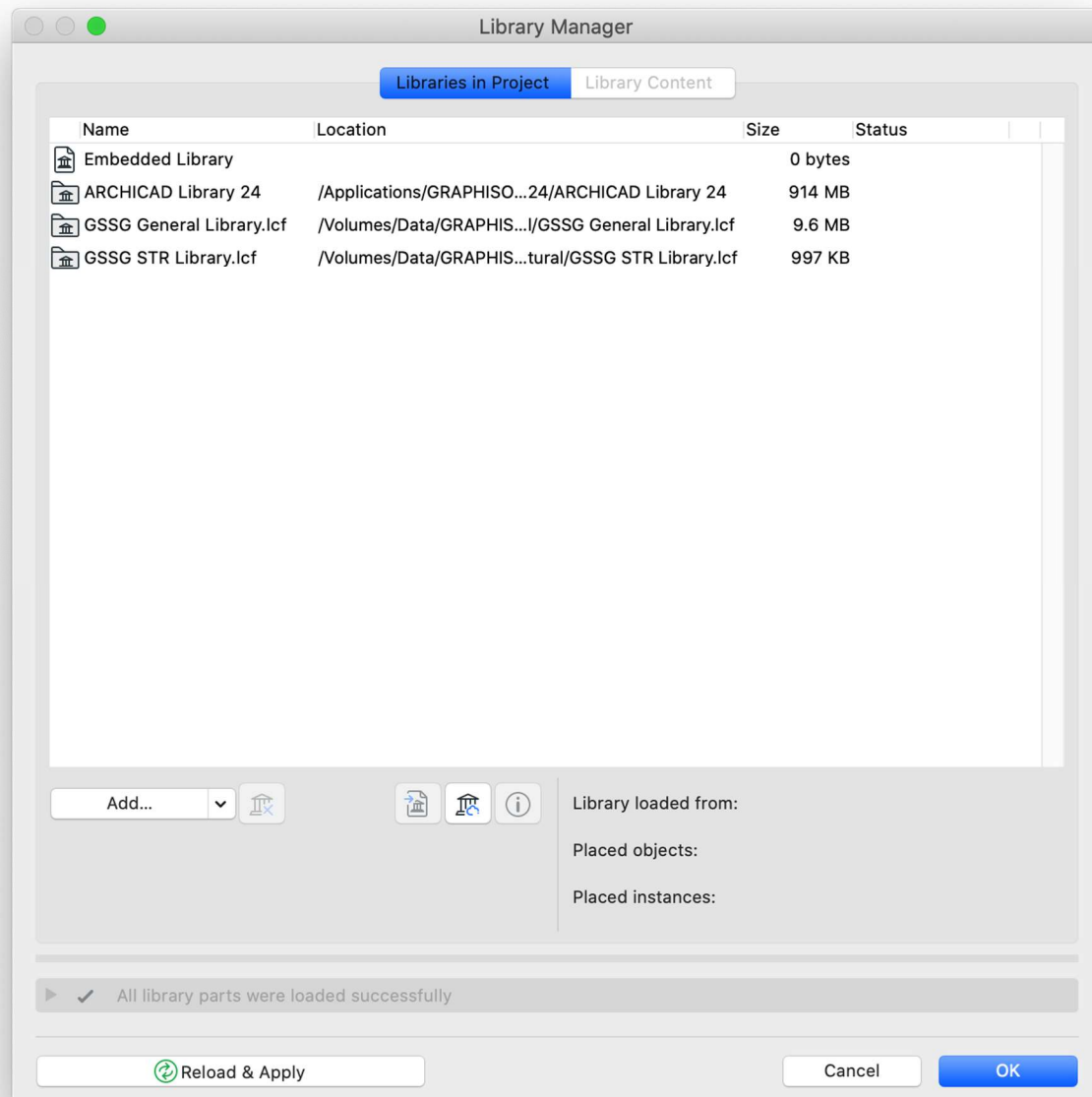
Note 1: To ensure the authenticity of the downloaded template file, make sure you obtain it from the CORENET BIM e-Submission site:

[https://corenet.gov.sg/general/building-information-modeling-\(bim\)-e-submission.aspx](https://corenet.gov.sg/general/building-information-modeling-(bim)-e-submission.aspx)

Note 2: The template is constantly improved based on user feedback, therefore minor differences may occur between the actual version and the screenshots presented in this guide. Only the latest versions of the template are available on CORENET.

The naming of the template file indicates the updates and revisions, such as **...template_v24.tpl** for the initial version, then **...template_v24.1.tpl**, **...template_v24.2.tpl**, etc., if available subsequently.

- 7 Once Archicad 24 is launched, it will not prompt for missing libraries as all warnings are collated into the Action Center, therefore go to **File/Libraries and Objects/Library Manager...** to check if both the GSSG STR Library.lcf and GSSG General Library.lcf are linked to the project. If not, then you need to Add them.

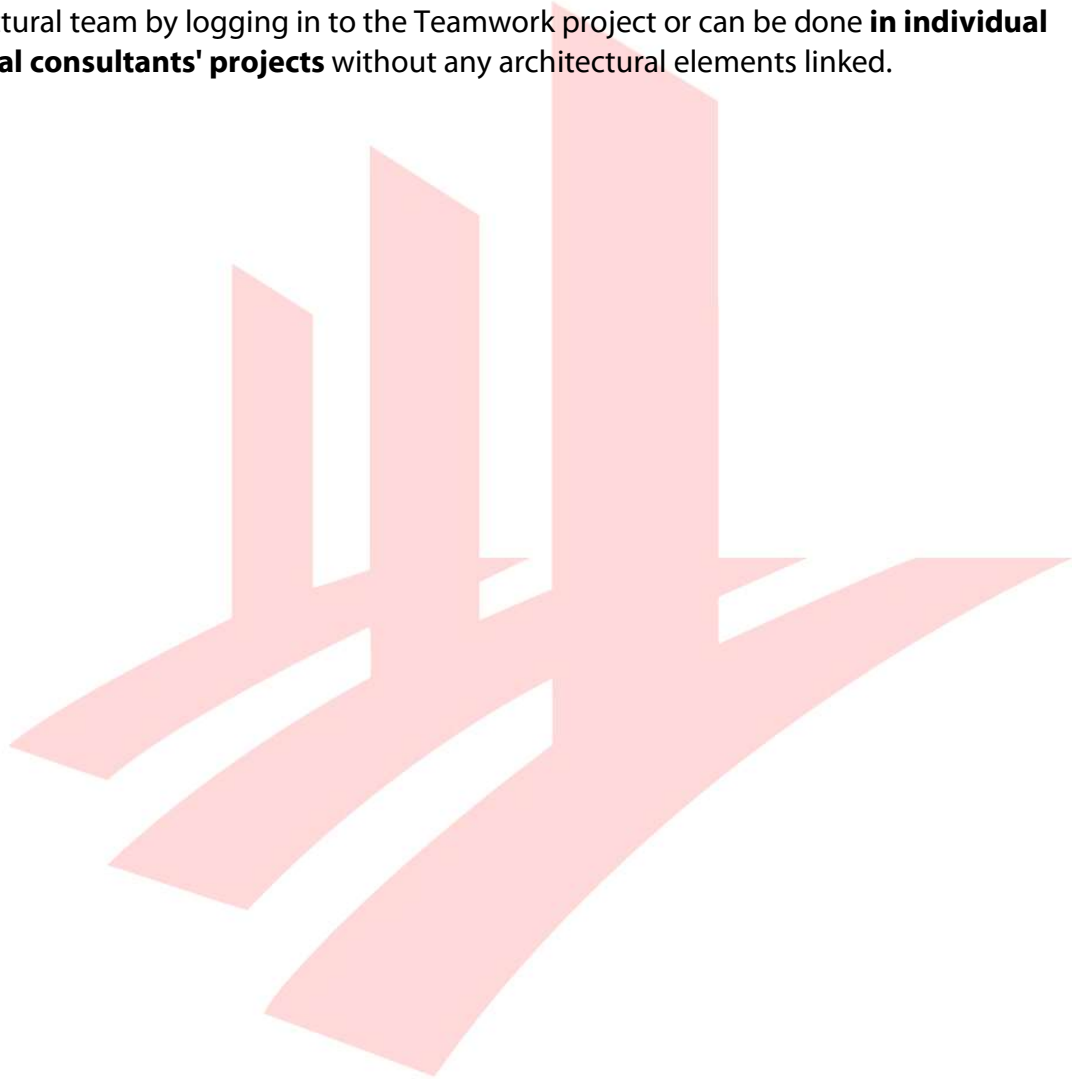


- 8 Click **Add....** Locate the LCF file and click **Open**.
- 9 Click **OK** to close the Library Manager and load the libraries.

STRUCTURAL MODELING

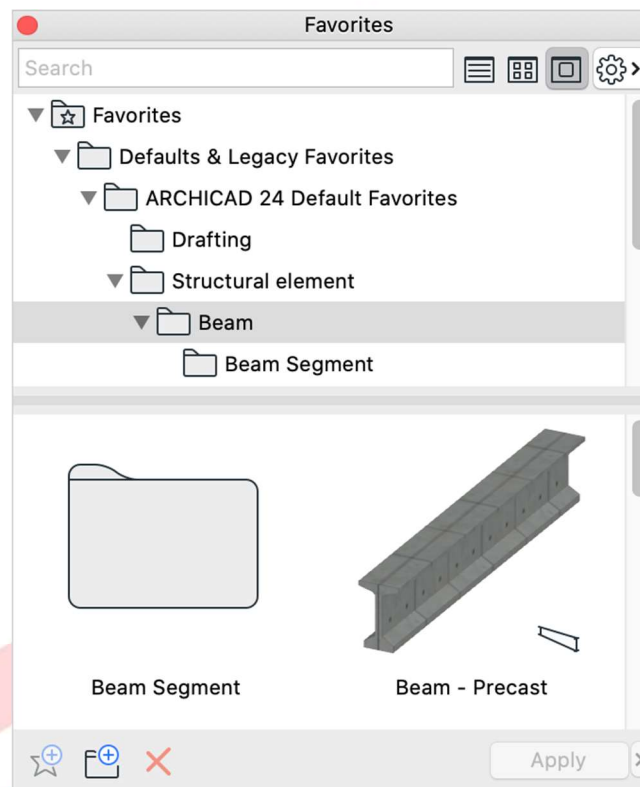
The architectural and structural plans need two significantly different representations of the same elements. Archicad has various options to achieve the desired views, which can be used based on their pros and cons, and project. The display methods can also be combined within a project.

The following settings can be carried out **in the architectural project** by the key members of the structural team by logging in to the Teamwork project or can be done **in individual structural consultants' projects** without any architectural elements linked.



Beams

- 1 When modelling Beams, they should be placed correctly with the home story and elevation set as per structural requirements – at the story and structural slab level, not at the ceiling level of its home story.
- 2 The Archicad Default and stored **Structural Favorite** are set to ensure proper representation of Beams.



Note 1: The **Structural Elements Settings** Worksheet contains a summary of the different Favorites settings for reference.

Note 2: Beams are set with **Show on Stories: All Relevant Stories** option, which is the default setting. The Show on Stories: **Home Story Only** setting in the structural project might seem to be a good solution, but it **will spoil the architectural representation**.

It is not recommended to use, only in projects where the architects are not required to show beams on their plans.

The listed/**scheduled length of Beams is based on the length of their Reference Lines**, usually **modeled as a single Beam** above a set of columns by the architects.

At the same time the **structural team would model the Beams starting and finishing by the edge of the columns to get real lengths**.

To fulfil both requirements:

3a If **modeling in an 'architectural' way**:

- model **continuous Beams as one**
- either **send the Beams backward** or **Sent to Back** or **bring the Columns forward**
- **bring the Grids to the Front.**

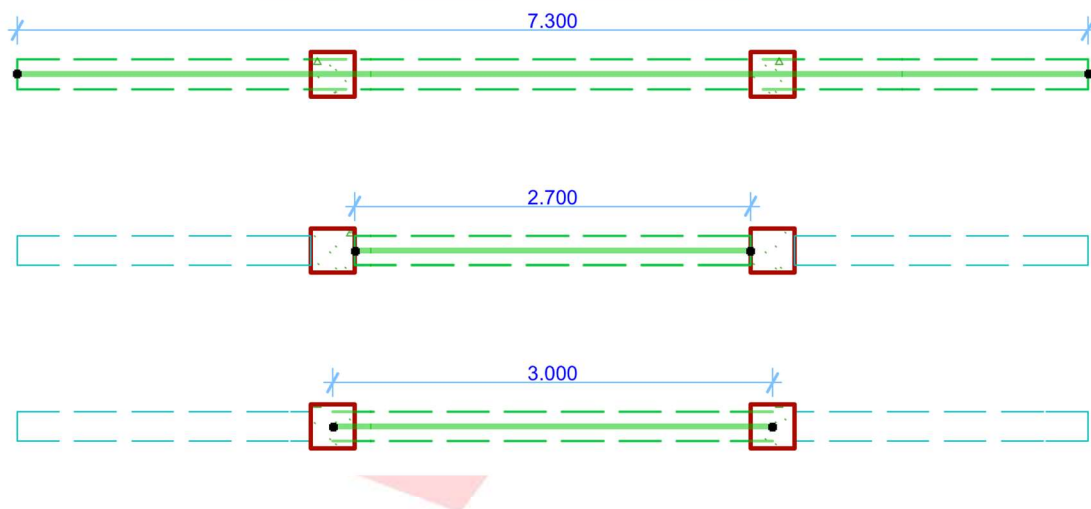
3b If **modeling in a 'structural' way**:

- model the Beams in between the Columns as separate elements.

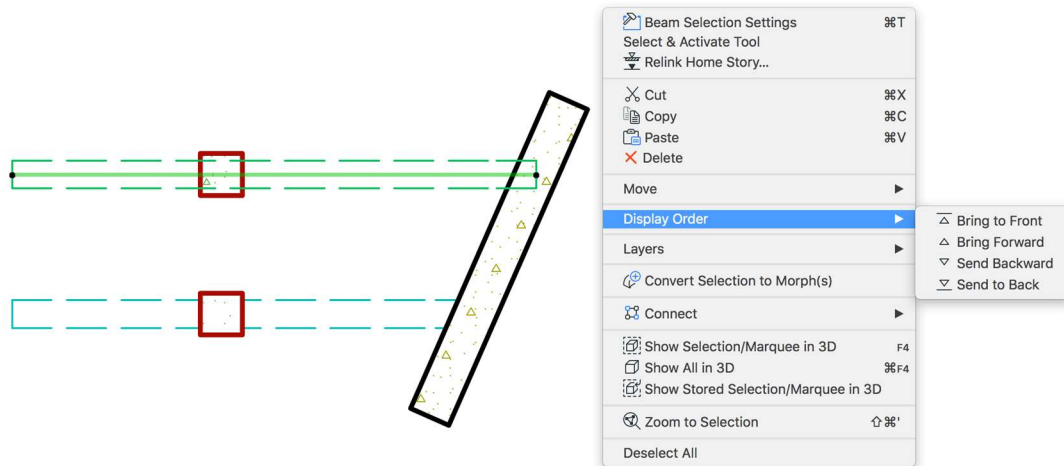
3c Modeling with a **combined method**:

- model the Beams **from one Column center point to another, but as separate elements.**
- **send the Beams backward** or **Sent to Back** or **bring the Columns forward.**
- **bring the Grids to the Front.**

Example of the previous three methods:



When Beam Floor Plan representation is set to Symbolic, **they do not follow the Priority-Based Connections in the floor plan representation**, this should be corrected with the Display Order settings or switch the Beam's Floor Plan representation to Projected. See 'before' and 'after' states on the screenshot below.



Beams that are covered by Slabs will be displayed automatically as dashed or solid depending on their covering, when the Model View Options *Hidden Line under Slab* option is checked.

- 4 Additional **STR | ...** Properties to be filled out according to submission requirements.
- 5 **Set the Layers** as needed.

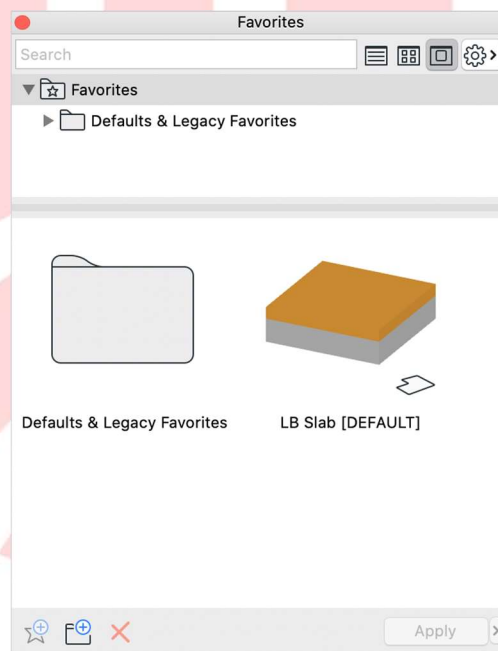
Slabs

Slabs on the Floor Plan have to be shown as transparent on structural plans, but since they are set by the architectural team, they are likely to have a *Cover Fill* on top. This Cover Fill is visible even when using the *Core of Load-Bearing Elements Only* setting for the *Partial Structure Display*. This Cover Fill can be turned off by using **Graphic Overrides**, overriding the Slab Cover Fills to Transparent.

Even though the architectural model is likely to be hotlinked into a structural project, some structural team members can edit those elements in the architectural project source. **Any changes to these elements should be coordinated with the architectural team**, as changes may modify the representation of the elements in the architectural documentation. As described earlier, any attribute changes in one file should be transferred into all other connected files – such as edits to Building Materials.

The following settings can be carried out **in the architectural project** by the key members of the structural team by logging in to the Teamwork project or can be done **in individual structural consultants' projects** without any architectural elements linked.

- 1 Use the stored **structural Favorite** to ensure proper representation of elements.



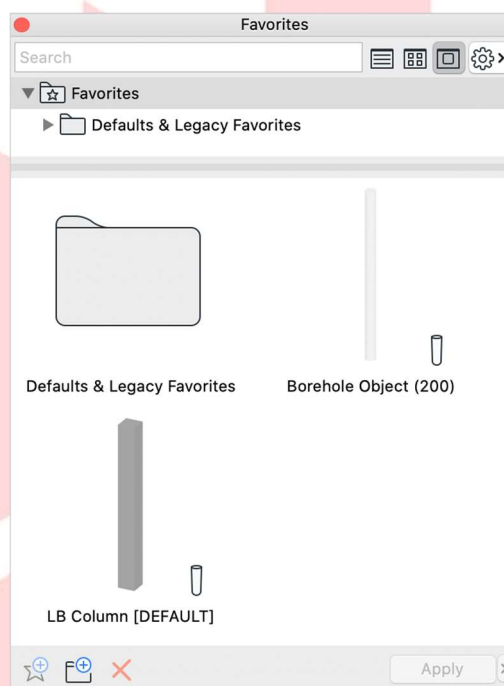
- 2 Make sure to set the Slab **Structural Function** to **Load-Bearing Element**.
- 3 Additional **STR | ...** Properties to be filled out according to submission requirements.
- 4 **Set the Layers** as needed.

Columns

Columns are also to be modeled with certain predefined settings. Regular columns show solid cut lines on plans, unless that column is on a topmost floor or if it is not covered by slabs, for example it is part of a frame. In a collaborative workflow, the Columns created by the architectural team will have to be completed by defining some Properties.

The following settings can be carried out **in the architectural project** by the key members of the structural team by logging in to the Teamwork project or can be done **in individual structural consultants' projects** without any architectural elements linked.

- 1 Use the stored **structural Favorite** to ensure proper representation of elements.



- 2 Make sure to set the Column **Structural Function** to **Load-Bearing Element**.
- 3 Additional **STR | ...** Properties to be filled out according to submission requirements.
- 4 **Set the Layers** as needed.

Grid Systems

Depending on the chosen workflow, Grids can be defined in two ways for structural representation. As they have already been defined or placed by the architectural team, below is an overview on the effects in the structural project.

- **Structural Plan Views with Graphic Overrides:**
 - **Place the Grids onto one Story viewpoint**, such as the Platform Level or the 1st Storey **in the architectural project**.
 - Use the **Show on Stories: All Stories** setting.
 - **Make sure that the Graphic Overrides of the structural project will include the colour override for the Grids** if needed.

Note: Optional **Graphic Overrides for Grids** are not part of the template.

If the architectural team has already defined the Grids - which is likely and recommended – **then the structural team only needs to use Graphic Overrides if necessary**, to override the colours or Line on the regular structural floor plan Views.

Alternatively, the **structural team may decide to place their own Grids for creating their structural plans**. This means no difference compared to the methods used in the architectural projects.

Favorites

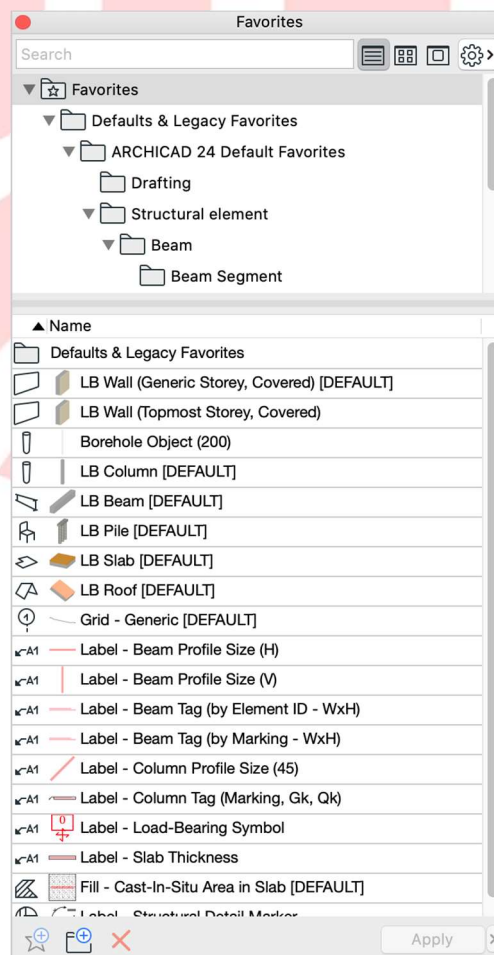
The **structural (and architectural) templates both include structural Favorites** for the convenience of the structural modelers as shown in the examples above as well.

If the practice is **using the one-model concept then these Favorites will be needed in the architectural project**, otherwise - with the reference model workflow - the structural model will be built separately from the architectural model and the Favorites will be used in the structural template directly.

The Favorites store settings of building elements and annotation elements that relate to the content and libraries that are provided with this template.

The Favorites are organized into the following hierarchy (in the structural template):

- **Defaults & Legacy Favorites** - contains a portion of the architectural Favorites and **generic default settings**:
 - **Archicad 24 Default Favorites** - These Favorites come with the factory default template of Archicad, **they can be deleted**.
 - **Element Default Settings** - stores the **initial element settings** (if available)
 - **Legacy Archicad 22 Structural Favorites** – the collection of previously used Favorites, for migrated projects only, **they can be deleted**



- **Favorites** (root folder) - relevant Favorites **for structural modeling and documentation**:

- **Borehole Object** - needs to be placed separately for structural submission.
- **Fill - Cast In-Situ Area in Slab** - for distinguishing CIS areas of Slabs.
- **Grid - Generic** - Grid to be placed natively in the structural project (when not using the linked architectural Grid)
- **Label - Beam Profile Size (H)** - displays the profile dimensions with a horizontal text
- **Label - Beam Profile Size (V)** - displays the profile dimensions with a vertical text.
- **Label - Beam Tag (by Element ID - WxH)** - automatically displays a complex tag, based on an IFC Property, showing the Element ID as the identifier
- **Label - Beam Tag (by Marking - WxH)** - automatically displays a complex tag, based on an IFC Property, showing the STR | Core Information/Beam Marking Property as the identifier
- **Label - Column Profile Size (45)** - displays the profile dimensions with a 45-degree tag.
- **Label - Column Tag (Marking, Gk, Qk)** - displays the STR | Core Information/Column Marking Property and the STR | Annotations/Gk and Qk values
- **Label - Load-Bearing Symbol** - displays the thickness of the Core of the Slab with two-way load-bearing direction.
- **Label - Slab Thickness** - displays the thickness of the of the Slab.
- **Label - Structural Detail Marker** - draws a circular Detail Marker and displays the Reference ID of the Marker.
- **LB Beam** - regular Beams which are covered by Slabs, most Beams will have these settings.
- **LB Column** - sets the required Properties of regular Columns which are covered by another Column and/or Slab above.
- **LB Pile** – places piling object.
- **LB Roof** - generic structural default
- **LB Slab** - generic structural default
- **LB Wall (Generic Storey, Covered)** - default for placing regular load-bearing walls on generic storeys
- **LB Wall (Topmost Storey, Covered)** - default for placing regular load-bearing walls on the topmost storey.

CORE INFORMATION (ELEMENT PROPERTIES)

The Structural Requirements (from the BIM e-Submission portal) has several required Core Information properties that have to be defined for submission. Since **the elements having the properties are part of the architectural model, any editing requires the structural team members to log in to the architectural Teamwork project and edit the properties there.** The properties are also used in schedules besides the COP requirements, see details in the [Details and Schedules/Schedules](#) chapter.

- 1 Go to **Options/Element Attributes/Property Manager...** to see the available properties (in both architectural and structural projects).

There are two main types of properties available in the structural template on their own (so they can be used directly in case the user works with the reference model workflow and builds the structural model independently from the architecture), differentiated by their prefixes:

- **STR | - required to be filled out correctly for submission.** These are also present in the architectural template partially to be filled out for schedules by the structural team.









When hotlinking the architectural model into the structural project, the architectural Properties will be shown in the structural file. These are prefixed by:

- **ARCH | - the Properties used for the architectural native BIM submission.** These Properties will be irrelevant for the structural workflow.

Note: Properties are not considered as Element Attributes and are identified by the Groups they are in and their Names, not by Index Number.

These imported properties will be greyed out, like other settings of hotlinked modules, **they are not editable in the host file**. To edit, **open the source file to make changes**.

It is possible **to fully import the properties from the module by clicking the Merge icon** on the right, next to the name of the property. This way the property will be available in the host file as well and it can be set for native elements of the host file. **Merging does not change any property values set in the module file** itself, the connection to the external file for the property will be broken.

▼ REGULATORY REQUIREMENTS			
Accessible (spaces an...	True/False	False	
Amendment Status	Option Set	Proposed	
Mode of Ventilation	Option Set	Mechanical	
Cluster ID	General		
Accessible Room	True/False	False	
Elderly Friendly	True/False	False	
Detectable Warning S...	True/False	False	

If a linked property has different settings than in the host file (for example the value is *General* in the module, but *Option Set* in the host) then it can be highlighted as a conflict by checking the **Show conflicts with Properties in Hotlinks** checkbox. Merging the properties will override the host file property settings.

Find more info on **Properties in Hotlinks**
at the GRAPHISOFT Help Center here:

<https://helpcenter.graphisoft.com/user-guide/128340/>

HOTLINKING THE ARCHITECTURAL PROJECT

Once the architectural elements are ready for documentation, it can be hotlinked into the structural project. Assuming that the Structural Template has also been modified as per the base settings of the architectural project, the Structural Project Base File is also ready for sharing. In a Teamwork environment the following steps are required:

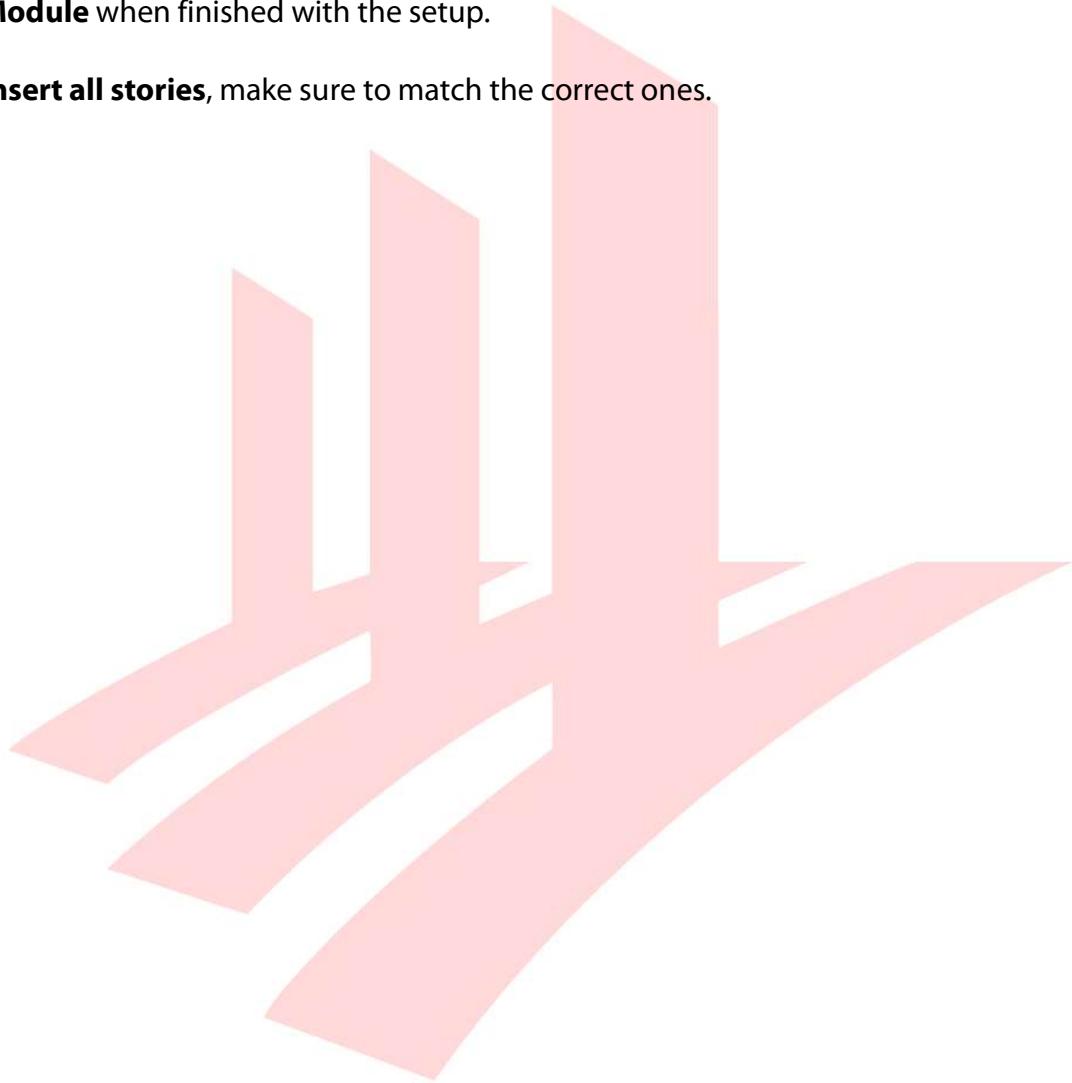
- 1 **Open the Structural Base File** (TPL or PLN format) in Archicad as an offline file and **verify that it has the same settings (such as Attributes) as the architectural project. Do not load any additional Libraries** other than the default Archicad Library and the Structural Object Library.
- 2 Go to **Teamwork/Project/Share...**, name the project accordingly to the company standards and share it. **The file will be uploaded, and the linked Libraries will also be shared on the first occasion when they are shared.** In subsequent cases Archicad will detect **if the Libraries are already present on the server and will use those instead of re-uploading** new libraries.
- 3 Go to **File/Libraries and Objects/Library Manager...** and review the Libraries, to make sure there are no missing objects or libraries.
For example, Archicad 24 Library, GSSG Libraries and any custom company libraries should be loaded.

Note: Usually the two discipline projects would reside on the same server. In case they are hosted on separate servers, **make sure that the offline Libraries are located on the same location of the file server** to ensure easier update of the uploaded library content.

- 4 **Go to a plan view** in the structural project and insert the module via the **File/External Content/Place Hotlink...** command.
- 5 **Make sure that the Master ID and Master Layer are defined** for each module to make filtering easier later.

Note: Master ID will add a prefix to the ID that is set in the Element Settings dialog (*Compact ID*). The Master ID and the Compact ID together will result in the *Full Element ID*. **All elements in the module will get the Master ID prefix when linked**, the source will preserve the Compact IDs of course.

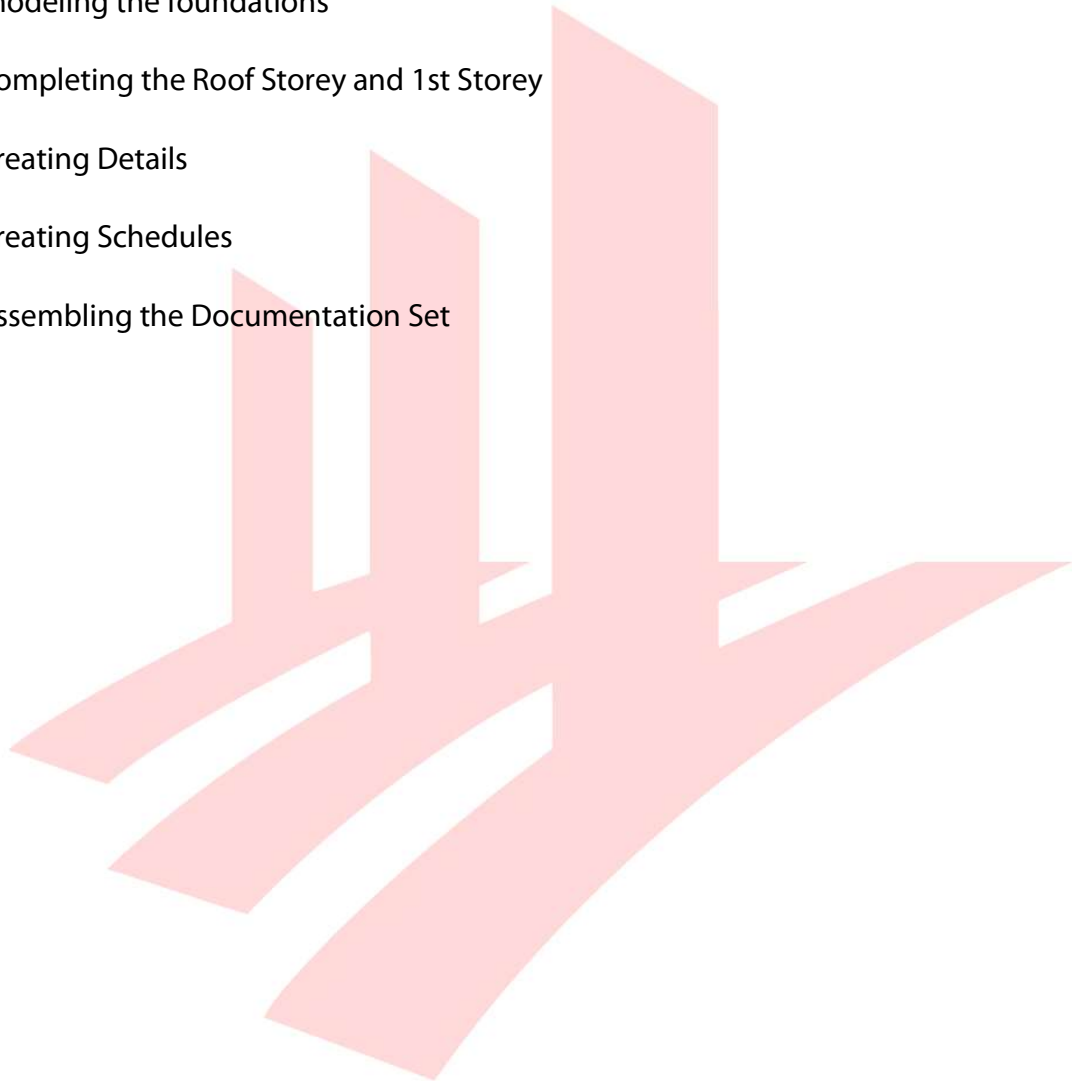
- 6 **Choose Hotlink from Teamwork file** in case of the architectural block. Click **Place Module** when finished with the setup.
- 7 **Insert all stories**, make sure to match the correct ones.



PLAN REPRESENTATION AND MODELING IN THE STRUCTURAL PROJECT

Once the architectural model is inserted, the predefined Views in the *Navigator* should show the proper representation of the elements on the generic stories. The structural team has to complete the project by:

- modeling the foundations
- completing the Roof Storey and 1st Storey
- creating Details
- creating Schedules
- assembling the Documentation Set



Structural Object Library

GRAPHISOFT Singapore provides custom, localized content for its users with a software service agreement (SSA). The library contains various elements, which will be presented in the following chapters.

The library is named **GSSG STR Library** and has a uniform **_GSSG** ending for all included Objects.

Find the **GSSG Libraries** on the GRAPHISOFT Singapore website here:
<https://graphisoft.com/sg/ssa/>

Once loaded, the Library Manager shows three main folders and subfolders within the Library:

- **2D Objects**
 - **Graphic Symbols**
 - **Marker Symbols**
- **Foundation**
- **STR Macros & UI** (contains non-placeable objects, used by other objects in Library)

Updating Libraries

The **custom office library might change frequently** by new Objects being added to it in the early project phases or during the implementation process. These **updates should be distributed to the Teamwork users and projects regularly**.

The **updated/new objects should be replaced on the file server first**. Then **the updated folders have to be uploaded to the server**. The BIMcloud libraries can be easily updated without deleting and re-uploading existing libraries.



- 1 Go to **Files/Libraries and Objects/Manage BIMcloud Libraries...** in Archicad.
- 2 **Select the BIMcloud library** you wish to update and click the icon button **Update BIMcloud Libraries with a local Library...**

Note: If the user has the necessary access rights then there is no need to reserve in order to update the libraries.

- 3 **Browse the updated library** on the file server and click **Choose**. An information message will appear indicating the number of objects changed (such as new, deleted or if library is already up to date)
- 4 Click **Close** and **Reload** when prompted. The new Objects are ready to use.
- 5 As with newly uploaded libraries, **notify users to Receive**.

2D Elements

The following Library Parts, can be used for structural annotations of plans and drawings:

Library Part	Usage	Tool
Breakline (layout)	Mark the edges of drawings on Layouts. The size can be set in paper space sizes.	Object
Breakline (model space)	Mark the edges of drawings in the Views/Viewpoints already before placing them onto Layouts. The size can be set in model space sizes.	Object
Detail Marker (circular)	Create new Detail Viewpoints using this Marker Head.	Detail
Load-Bearing Direction Symbol	Show the span directions, thickness and any Element Property or IFC Property values of Slabs.	Label
Reinforcement	For generic annotation purposes of reinforcement.	Object
Slab Slope	For annotation purposes of Slabs.	Object
Top Steel	For generic annotation purposes of reinforcement.	Object
Top Steel (2)	For generic annotation purposes of reinforcement.	Object
Tramming Bar	For generic annotation purposes of reinforcement.	Object

Foundations

The pile Objects are for modeling purposes. Since structural representation requires specific presentation of such substructures, it is recommended to use these Objects, instead of modeling the piles and pile caps using traditional tools, like Slabs and Columns.

The pile cap and pile layout plans will be created as normal 2D floor plan Views, even if the typical storey floor plans are done using 3D Documents.

- 1 Open the **Object Tool** settings and browse for the pile Objects.
- 2 Select the desired combination of piles:
 - **Pile** - single pile without a pile cap
 - **Pile Cap with One Row of Piles** - multiple piles under a common pile cap in a single row
 - **Pile Cap with Two Rows of Piles** - multiple piles under a common pile cap in two rows
 - **Pile Cap with Three Rows of Piles** - multiple piles under a common pile cap in three rows
 - **Triangular Pile Cap** - three piles under a common 'triangular' pile cap

The number of piles per rows can be set for all the Pile Cap Objects.

- 3 Place the objects onto the *-1. Foundations 1* storey, using the following settings:

- **Bottom Offset to Home Story equals Pile Cap/Depth**

The value can be calculated by the following formula:

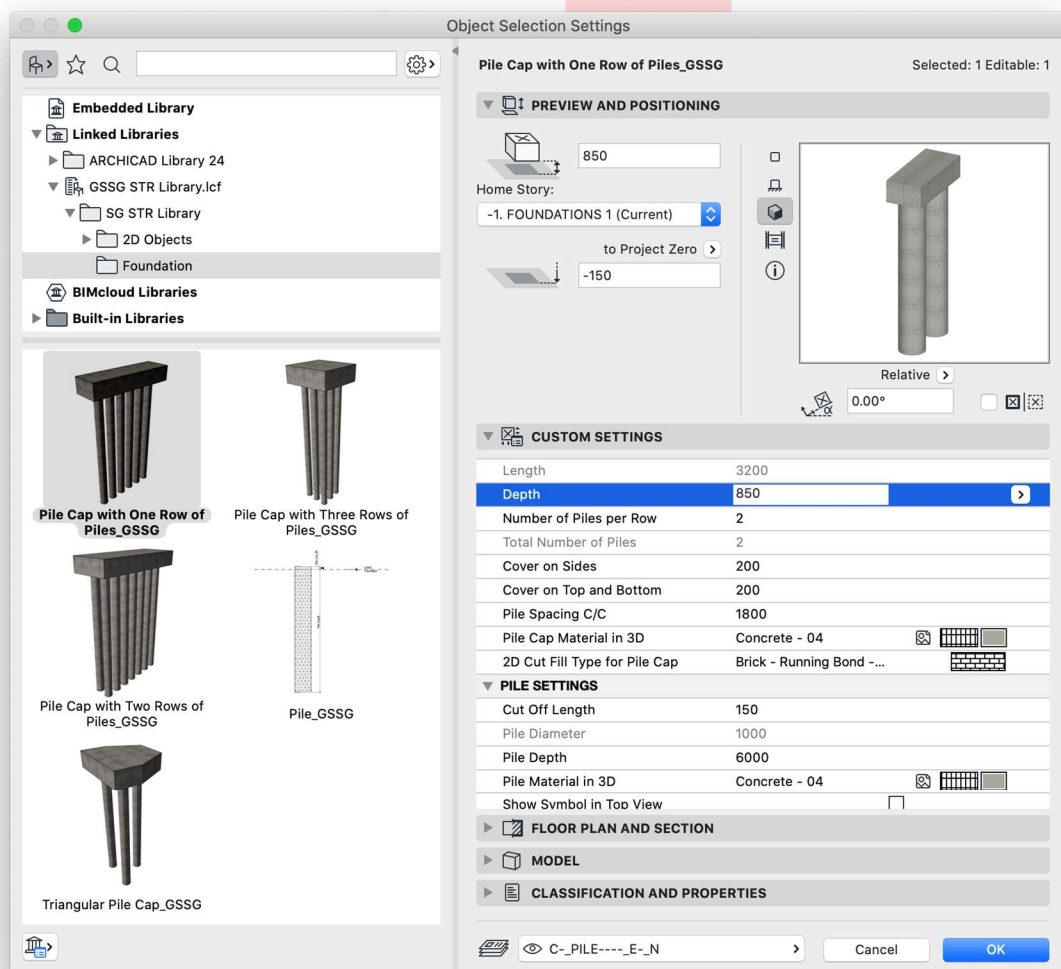
$$\text{Pile Cap Depth} = F1 - (\text{Slab} - \text{PL})$$

(example in the template: $850 = 1000 - (200 - 50)$)

- F1: height of *-1. Foundations 1* storey
- Slab: Thickness of the Slab Core
- PL: height of Platform Level
- **Pile Settings/Pile Depth equals the storey height of *-2. Foundations 2* storey**

- 4 Set **Pile Type** under the Pile Settings and fill the **Core Information** Properties at the bottom of the settings dialog.
 - 5 Check the following settings:
 Element Classification = **Footing**
 Structural Function = **Load-Bearing Element**
 Layer = **S-_PCAP-----E-**.
-

Note: The **pile caps** are inserted by the top anchor points.



- 6 **Place the Object** and adjust the position of the numbers using the pink hotspots if necessary.

NAVIGATOR - PROJECT MAP AND VIEW MAP

The **Project Map** contains sample Stories, Sections, Elevation, Worksheets, 3D Documents and Schedules to start with.

The **View Map** has the following folder structure:

- **S | 3D (Load-Bearing Elements)** - Partial Structure Display filters the view to **show Load-Bearing Elements Only**.
- **REFERENCE VIEWS** - These views show the **architectural representation (overhead Beams shown with dashed lines) of the plans for a reference only** (since these views are only available in the architectural project otherwise) and overall 3D views to provide a better overall understanding of the project. This folder **can be deleted** from the structural template.
 - **A | FLOOR PLANS** - These plans have View Settings very similar to the default Archicad settings with all Layers turned on and an extended architectural Pen Set, originally used for the architectural native BIM submission. The Floor Plan Cut Plane settings are kept as defaults as well.
 - **A | 3D (Entire Model)** - Generic 3D view, without Zones for better understanding the architecture.
 - **A | 3D (Simplified)** - Similar to the previous one.
- **S | WORKING VIEWS** - This folder has a structure for Stories, Sections and Elevations:
 - **STRU_FP_...** plan views for creating the model.
 - **GA PLANS** folder - Generic **storey plans to show the common areas**. In housing projects created for pile layout, pilecaps separately, 1st storey, typical and roof storeys.
Except the foundation plans, all storeys have two Views to show annotations of **top and bottom reinforcements separately**.
This folder is not Cloned as it would not be effective due to the large number of identical typical plans.
The pile cap plan also has its own MVO Settings.
 - **UNIT PLANS** folder - Similarly to the generic storeys, top and bottom reinforcement Views are available for units.
 - **SECTIONS** – cloned folder
 - **ELEVATIONS** – cloned folder
 - **DETAILS** – cloned folder
 - **3D DOCUMENTS** - **samples of plan views**, cloned folder, as the GA PLANS and UNITS folder above **but created with the 3D Document** feature of Archicad. This content can be deleted.
 - **SCHEDULES** folder
 - **COVER PAGE** folder

Views in *Cloned Folders* are automatically created with the preset View Settings, whenever new viewpoints are created in the Project Map.

The initial View Map structure is merely a sample that can be changed and/or completed according to actual project needs:

- 1 Create new regular folders using the **New Folder...** button.
- 2 Select an item to create a folder inside it. Use the **Clone a Folder...** button to **choose a viewpoint folder** from the Project Map and **set its View Settings**.

When creating a Cloned Folder, **all viewpoints of the referred Project Map section will be cloned. There is no option to remove certain cloned Views while keeping others** in the View Map, therefore consider the need of cloning to avoid the unnecessary number of Views and to keep their number to the necessary minimum to provide a simpler structure and to avoid performance issues.

The **decisions above should be made by the BIM Manager** after consulting the project team before actual work begins.

Find more details on the **Cloning a Folder**
on the GRAPHISOFT Help Center here:

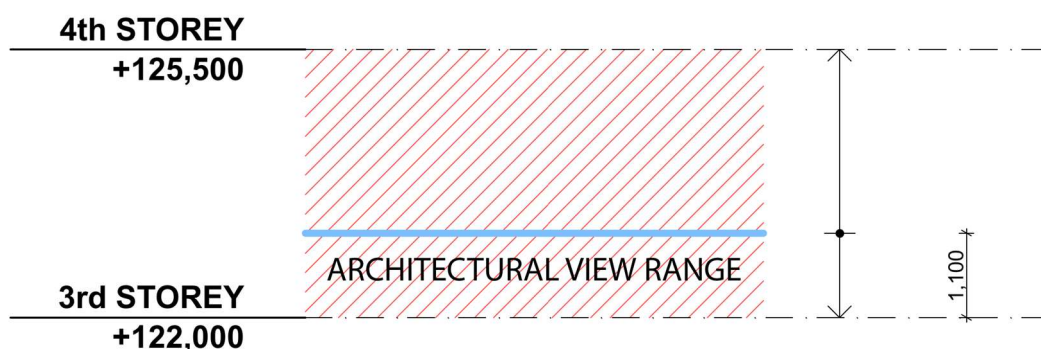
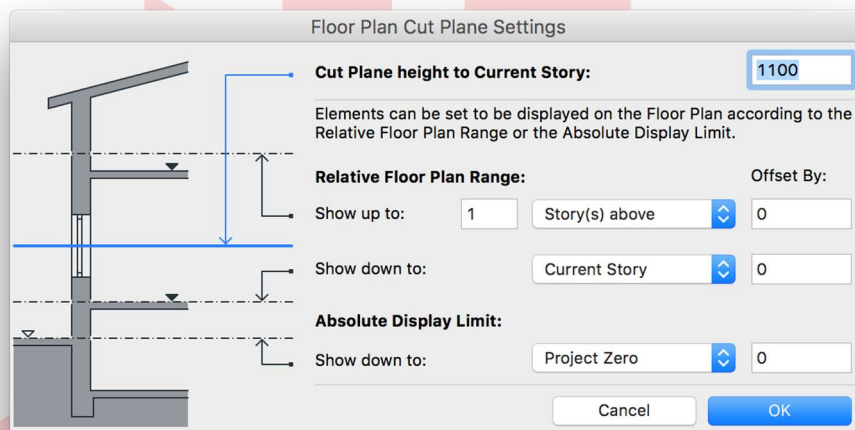
<https://helpcenter.graphisoft.com/user-guide/127944/>

Floor Plan Cut Plane and Projection Settings

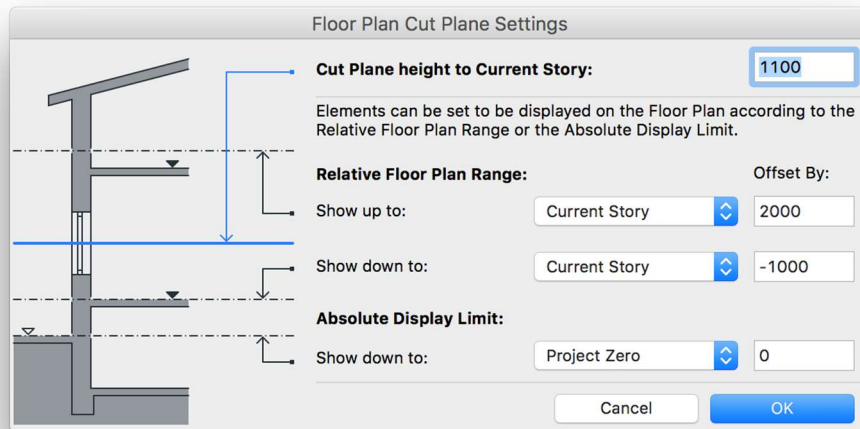
As a generic reference, find the Floor Plan Cut Plane settings of architectural and structural views below. **Depending on the actual Story Settings and the heights of elements these settings might have to be revised.**

To **check the View Settings of the actual Views**:

- 1 **Select a View**, multiple Views or Cloned Folder.
- 2 **Right-click and select View Settings....**
- 3 Go to **Floor Plan Cut Plane Settings....**
 - The **architectural plan views** use the default Archicad settings:



- The **structural plan views offset the view range downward**. Depending on the size of actual elements (typically Beams) and story heights the preset values might be adjusted. The ranges above and below the stories should equal the story height when added up.



4th STOREY
+125,500

3rd STOREY
+122,000

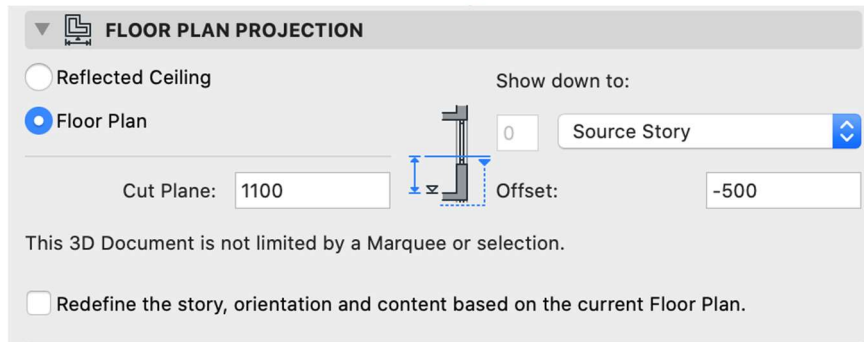
2nd STOREY
+118,500



Find more details on the **Floor Plan Cut Plane**
on the GRAPHISOFT Help Center here:
<https://helpcenter.graphisoft.com/user-guide/128350/>

To **check the settings of the 3D Documents**:

- 1 **Select a View**, multiple Views or Cloned Folder.
- 2 **Right-click and select 3D Document Settings....**
- 3 Go to the **Floor Plan Projection** panel.
 - Define the cut plane and offset by adjusting **Offset below the Source Story**. This can be adjusted depending on the actual element sizes.



4th STOREY
+125,500

3rd STOREY
+122,000



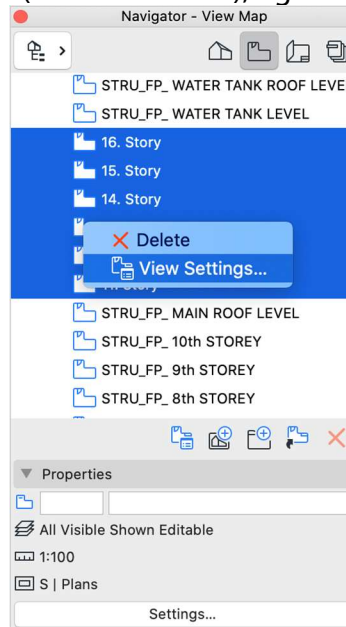
2nd STOREY
+118,500

Find more details on the **3D Document Settings**
on the GRAPHISOFT Help Center here:
<https://helpcenter.graphisoft.com/user-guide/128996/>

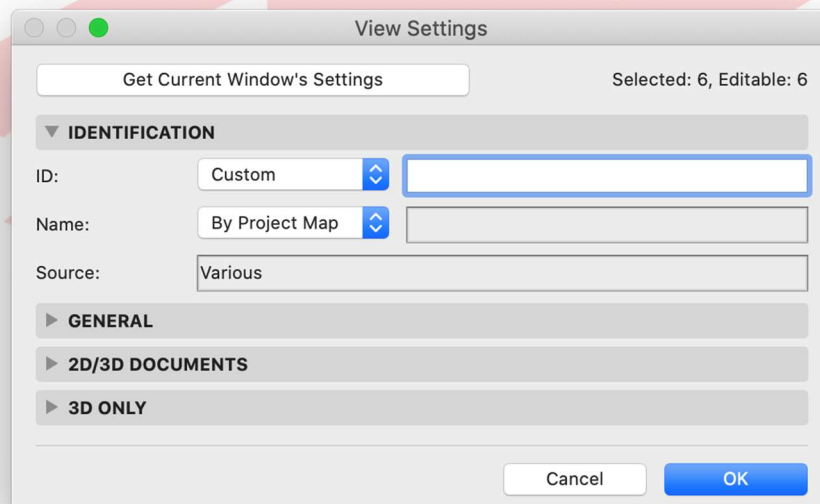
Updating the View Map

When creating Cloned Folders, any settings for **individual Views inside that folder can be set manually and override from the initial clone.**

- 1 **Select the necessary Views (not the folders!), right-click and choose View Settings....**



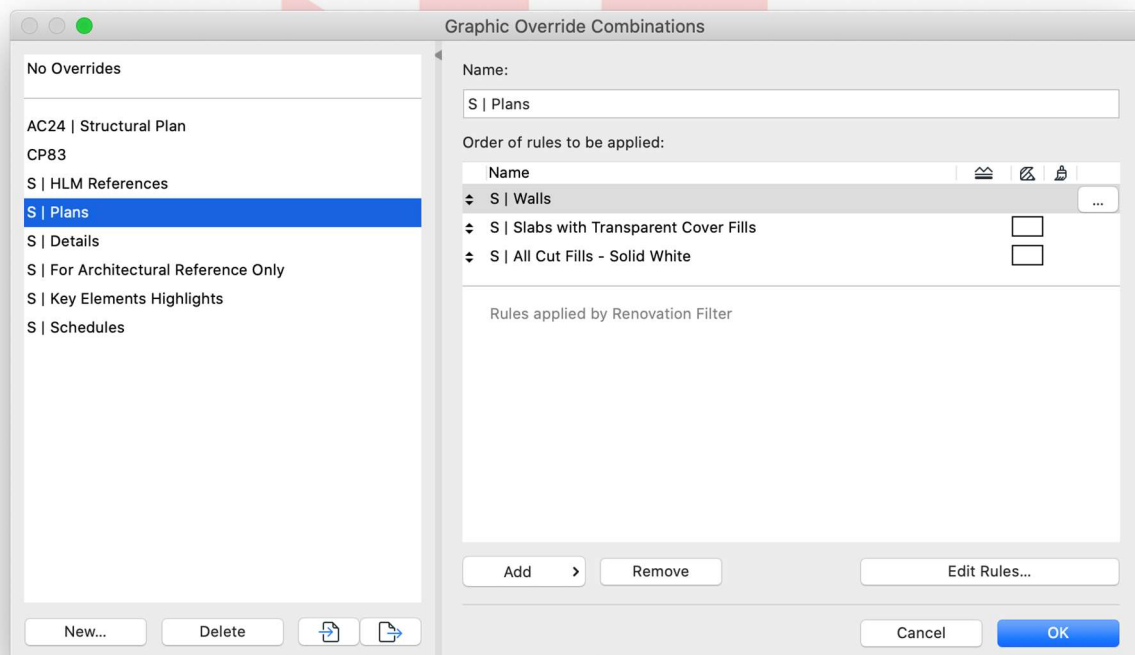
- 2 **Make sure the ID type is set to Custom and define the IDs**



GRAPHIC OVERRIDES

The following Graphic Override Rules and Combinations are available in the structural template:

- Combinations and Rules with the prefix **AC24 |** are the defaults coming from the factory template of Archicad. The **Combinations can be deleted from the structural file**, but some of the **Rules are used for structural Combinations as well - deleting these will change the representation**.
- **S |** prefixed Combinations **must be used for the correct structural representation if using the Graphic Overrides version**.
- **Unmarked Combinations/Rules are present in all discipline templates.**



Structural Graphic Overrides

The following Graphic Override Combinations and Rules are provided for structural representation:

- **S | HLM References** - Shows hotlinks with transparent 3D.
 - **Hotlinked Module - Source 1...5** – These are sample rules for 5 different modules that the user can customize.
- **S | Plans** - Must be used for correct structural representation.
 - **S | Walls** - Pen override on outlines.
 - **S | Slabs with Transparent Cover Fills** - Slab Cover Fills are overridden to transparent fills.
 - **S | All Cut Fills - Solid White** - Creates an empty fill for cut elements (Walls and Columns typically).
- **S | Details** - Changes the fills to transparent and the lines to black, includes the following Rules:
 - **AC24 | All Cover Fills - Transparent**
 - **AC24 | All Cut Fills - Transparent**
 - **AC24 | All Zone Fills – Transparent**
- **S | For Architectural Reference Only** - Generic checking option for the structural team to see the regular architectural representation with the overhead beams shown.
 - **S | Beam Outlines in Architectural View** - Beam outlines are overridden to dashed lines.
- **S | Key Elements Highlights** - Shows the marked key elements with the required colours according to the structural code of practice, marking is set using *Properties*.
 - **S | Key Elements - Cantilever**
 - **S | Key Elements - Long Span Structure**
 - **S | Key Elements - Transfer Structures**
 - **S | Key Elements - Permanent ERSS**
- **S | Schedules** - Shows all details that are inserted into the *Plan Previews* cells of the Schedules with transparent fills.
 - **AC24 | All Cut Fills - Transparent**

DETAILS AND SCHEDULES

Details

Details can be created in a hybrid workflow, the **Viewpoints are generated from the model, while the actual Details are completed using the 2D documentation tools** of Archicad.

- 1 Choose the **Detail tool** and apply the **Label - Structural Detail Marker Favorite**
- 2 Set the **Reference ID** according to the company naming standards.
- 3 Set the attributes of the Marker under the **Marker panel**.
- 4 The **Marker Angle options** will either keep the Marker fixed to the screen or fixed to the model – select the necessary option based on needs.
- 5 **Place the Marker** and open the new Detail Viewpoint generated from the model.

Use regular 2D tools to annotate (Dimension, Text, Label) **and to draft** (Fill, Line, Arc/Circle, Polyline). **Draw rebars manually.**

Note: To make this process faster, **graphical favorites can be created on Worksheets, similar to blocks in AutoCAD** for regular bars, stirrups, trammig bars, etc.

- 6 **To edit** these elements, **use the editing commands on the Standard Toolbar:**

Schedules

The STR template includes sample schedules for Beams, Columns and Key Elements. These samples cannot be used as is, as their actual setup is determined by the actual projects and their Hotlinked Modules names.

To setup the schedules in a hotlinked workflow:

- 1 **Log in to the architectural Teamwork project** first.
- 2 **Edit the relevant properties** (Core Information, Reinforcement, etc.) you wish to list.
- 3 **Go back to the structural project and update the Hotlinked Modules.** The properties will also be updated, reflecting the latest state in the schedules.

During the project, there will likely be changes and therefore **updates have to be added to the architectural project again** due to hotlinking.

The structural engineers are likely to use Microsoft Excel for analysis, therefore the **structural properties have to be exported to Excel.** These schedules are not available in the architectural project (even though the properties are) therefore, to **transfer the schedules from the structural project to the architectural project they need to be exported:**

- 4 Go to the **Scheme Settings, select the schedules to Export**, and click the export icon to generate an XML file per selected schedule.
- 5 **Switch to the architectural project and open the Scheme Settings** and click the **Import** icon and select the previously exported XML files. Once imported, the properties in the schedule are ready for smart export to Excel.

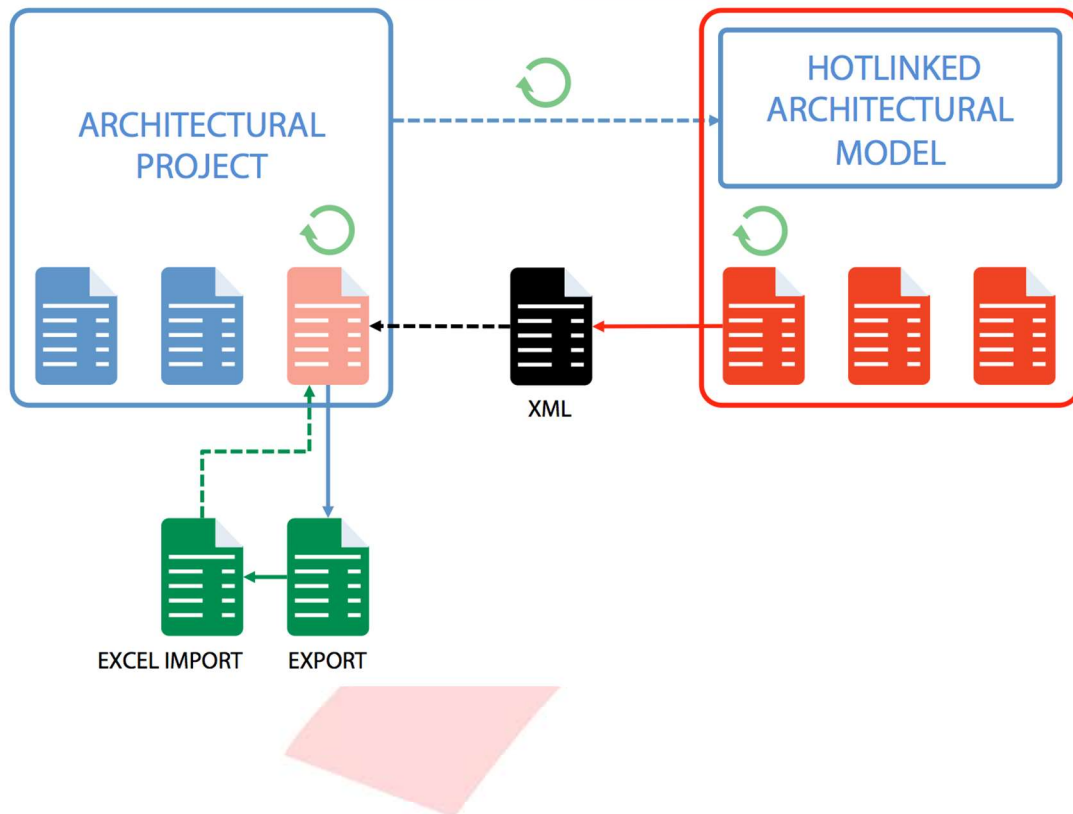
Note: Smart export to Excel (exporting Element Properties) is not possible without having the necessary properties listed in a schedule.

- 6 Go to **File/Interoperability/Classifications and Properties/Export Property Values from Schedule.....**
 - 7 **Save the selected scheme to an Excel file**, then open it.
 - 8 **Update the required fields in Excel and save a new file.** It is recommended not to overwrite the imported file to be able to track changes later if necessary.
-

Note: The updated **data must be in the same format (General, Integer, Number, Tags List, Option Set, Tags List or True/False)** as it was defined in Archicad originally, otherwise the

Property Manager in the structural file will prompt for conflicts with Hotlinks.

- 9 **Switch to the architectural project in Archicad.**
- 10 Go to **File/Interoperability/Classifications and Properties/Import Property Values into Elements...**
- 11 **Check the report**, if there are any warnings, correct the Excel file (usually format conflicts due to misspelling and typos), otherwise **Import**.
- 12 **Send and Receive changes**, then **switch to the structural project**.
- 13 Go to **File/External Content/Hotlink Manager...** and **update the source of the architectural project**. The new values will appear in the structural schedules.



ATTRIBUTES

Lines

The following Line types were included in the structural template. These are to be used for the Graphic Overrides of the plan Views.

- **STR | Hidden Line (Plans)** - This line is used to **override the covered Columns below the current story** with the *S | Plans* Graphic Override. The Line type has a smaller scale than the default dashed/hidden lines so that it is visible with relatively smaller geometries.
- **STR | Hidden Line (Architecture Only)** - Only used for the architectural reference views. **Can be deleted along with the related Views and the Graphic Overrides.**
- **STR | Invisible Line** - Used **for hiding the overhead Beams** on structural plans only.

Layer Combinations

The Layer Combinations use the naming convention introduced in previous chapters. Also refer to the *Architectural BIM Submission Template User Guide* for further details on Attributes in general.

- **S |** prefix marks the required for structural representation.
- **unmarked items are generic**, available in all discipline templates.

The following Layer Combinations are present in the structural template as a base by purpose (listed in alphabetical order in the Layer Settings):

- Generic purpose:
 - **All Visible Shown Editable** - shows all Layers turned on
- For actual annotated plans there are specific Layer Combinations for separating annotations for bottom and top reinforcements.
 - **S | Pile Cap Plan**
 - **S | Pile Layout Plan**
 - **S | Slab BOT & Beam** - includes the bottom reinforcement of Slabs and all Beam reinforcement.
 - **S | Slab TOP** - includes the top reinforcement of Slabs.

DOCUMENTATION

Layouts and Master Layouts

The structural Layout Book includes some mandatory items and samples for customization as follows:

- **COVER PAGE** - Required for submission, this Layout includes Project Information and the list of drawings for approval and reference.
- **S | 01 Sample Subset** - Samples of structural and architectural layouts, the users have to create their own based on their company standards. This folder therefore **may be deleted** from the office template.
- **S | 02 FOR APPROVAL** - Required for structural submission to BCA.
- **S | 03 FOR REFERENCE** - Required for structural submission to BCA.
- **S | 04 TENDER**

The **S | SHEET LIST Project Index** lists Layouts by their *Subset Name* and *Layout ID and Name* from the subsets included in the template, excluding the Cover Page. Therefore, this index needs to be modified if additional content and subsets are created.

Project Indexes are similar to Interactive Schedules but cannot list elements, instead they list items in the Navigator.

Find more details on **Project Indexes**
on the GRAPHISOFT Help Center here:

<https://helpcenter.graphisoft.com/user-guide/128433/>

Master Layouts are available as references for:

- **S | A1 LANDSCAPE (Grid)** – as above, with a grid for auto drawing arrangement
- **S | A1 LANDSCAPE** - generic Structural Layouts with modified title block
- **S | A1 COVER PAGE** - cover page only

Additional Master Layouts can be created according to the office standards.

To **set a Master Layout as a default** for newly created Layouts:

- 1 **Select the Master Layout.**
- 2 **Right-click and choose Set as Default.**

Project and Layout Info

Project Information is accessible via **File/Info/Project Info**. Use the **Export.../Import...** buttons on the Project Info dialog to transfer project info between projects.

Project Info is referred to by *Autotexts*, which are also available for Layout and Drawing Information.

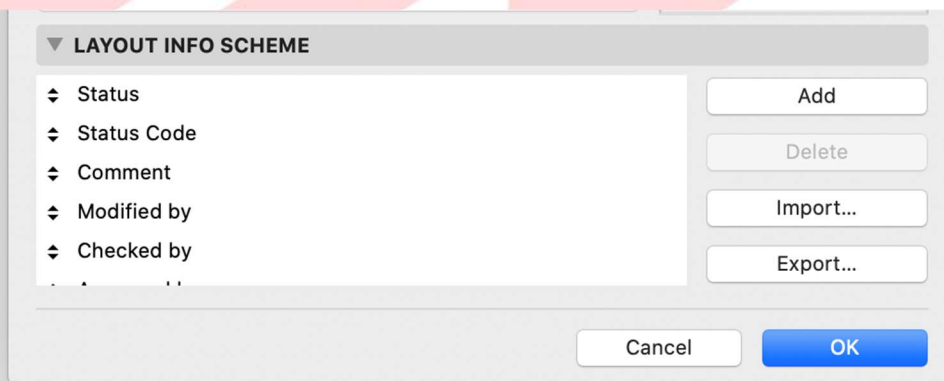
To add these, use the **Text or Label tool** and the **Insert Autotext** icon to add different types of autotexts along with any relevant custom text.

The values of these autotexts can also be defined in the Layout Settings dialogs.

- 1 **Select the Layout** in the Layout Book.
- 2 **Right-click** and choose **Layout Settings....**
- 3 **Add values** as needed under the Layout Info panel.

The contents of this Layout Info panel can be customized and expanded by going to the Book Settings.

- 1 **Select the Layout Book** - the topmost item in the Layout tab of the Navigator.
- 2 **Right-click** and choose **Book Settings....**
- 3 **Add** items as needed under the **Layout Info Scheme** panel. The new fields will be available for all Layouts in this project.



Publisher

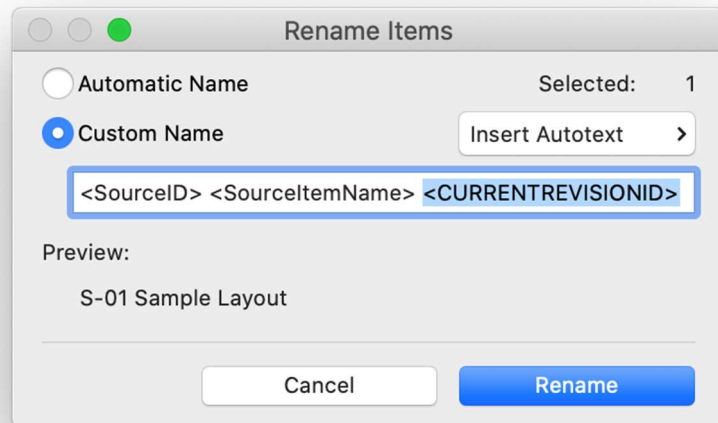
Publisher Sets have to be created manually. Once the Layout Book subsets are created, use the **Add Shortcut »»** button in the **Organizer** to create continuously updated content within the Publisher Sets.

The default Publisher Sets contain:

- **1 - Views** - the content of the View Map in PDF format
- **2 - Layouts (PDF)** – the content of the Layout Book in PDF format
- **S | Layouts (DWG)** – the content of the Layout Book in DWG format
- **S | Ref.Model for Structure (IFC/DWG)** – the 3D model in IFC and the GA/UNIT PLANS folders in DWG format for export to Revit for example
- **S | Submission - For Approval (DWG/PDF)** – the content of the Layout Book/FOR APPROVAL folder in DWG and PDF format
- **S | Submission - For Reference (DWG/PDF)** – the content of the Layout Book/FOR REFERENCE folder in DWG and PDF format
- **S | Tender Documents (DWG/PDF)** – the content of the Layout Book/TENDER folder in DWG and PDF format
- **S | Tender Documents (PDF)** – includes the TENDER subset of the Layout Book in PDF format
- **S | Views (PMK) for Separated Doc. File** – the content of the View Map is published in PMK format, which files can be later referenced in a separate documentation file

The Publisher Set item names can also include Autotexts, such as codes, IDs, revision numbers, etc. Those custom fields that were created under the Layout Info Scheme can also be inserted.

- 1 **Right-click** on any item(s)/folder **and choose Rename Items....**
- 2 **Add Autotexts from the Insert Autotext control**, these can be combined with custom text as well.



Find more details on **Revision Management** in general
on the GRAPHISOFT Help Center here:
<https://helpcenter.graphisoft.com/user-guide-chapter/85600/>

Submission File Format

Saving the files requires a specific naming format to define the following.

- 1 Make sure that the **COVER PAGE layout is opened** and **moved to the beginning** of the Tab Bar, followed by the Floor Plan of the project (which must be open to keep the file open in Archicad). This COVER PAGE has to be the first one that officers see when they open the file. All other tabs are to be closed.



- 2 Use **File/Save as...** menu command and save the file in one of the required formats.

- **BIM native file format and software version in a single file:**

Archicad **.PLA**, version **24**, indicated in the file name, for example:

ABCDEF_S1_BLK01_A_A24_123456.pla

Note: PLA files include all library elements used in a project and make the file management easier for the submission, therefore it is highly recommended to use this format.

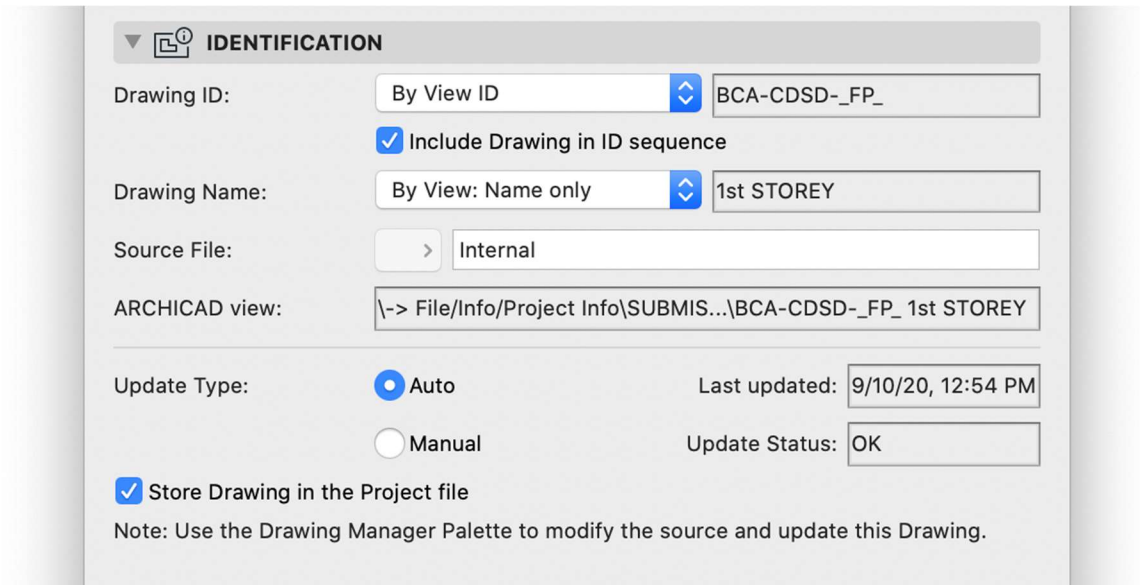
File naming conventions – as per the **BCA General Requirements**, indicating maximum number of characters per part:

Project ID (6)						–	Author (2)		–	Model Part (6)						–	Submission Version (1)		–	Software Version (3)			–	User Defined (6)					
A	B	C	D	E	F	–	S	1	–	B	L	K	0	0	1	–	A	–	A	2	4	–	1	2	3	4	5	6	

Before submitting the file make sure all necessary views are set correctly and show the relevant information.

Make sure that all external references (2D drawings) are stored within the project file, to ensure that the checking officers will see the same content as the QP.

- 1 Select the linked drawings (this can be done through the **Drawing Manager**) and open their settings.
- 2 Check the **Store Drawing in the Project file** checkbox for each drawing.



IDENTIFICATION

Drawing ID: By View ID BCA-CDSD-_FP_

☒ Include Drawing in ID sequence

Drawing Name: By View: Name only 1st STOREY

Source File: > Internal

ARCHICAD view: \-> File/Info/Project Info\SUBMIS...\BCA-CDSD-_FP_ 1st STOREY

Update Type: ☒ Auto ☐ Manual

Last updated: 9/10/20, 12:54 PM

Update Status: OK

☒ Store Drawing in the Project file

Note: Use the Drawing Manager Palette to modify the source and update this Drawing.

ACKNOWLEDGEMENT

Revision of the current template and guide done by GRAPHISOFT Singapore, with the help and input from our users at Surbana Jurong, and HDB BRI.

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