

**Trimble** Buildings

Training Manual



## Vico Office Introduction



## Legend

The following symbols are used in this training.

-  **Important**  
Indicates an important concept, step, or caution.
-  **Tip**  
A shortcut or time-saving tip.
-  **Note**  
Additional information or situation users may encounter.

## Trademarks

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## 2 About This Course

This guide includes both conceptual lecture topics and procedural exercises. Your instructor will present procedures in short, easy to understand segments. The training day includes a combination of hands-on learning, visual aids, and lecture to ensure you get the most you possibly can from this course.

### Course Objectives

Before beginning this course, you should be familiar with **location based estimating** and **scheduling**.

This class will provide you with a solid understanding of how **Vico Office** is used as an integrated construction management solution which spans 2D, 3D, 4D, and 5D Building Information Management (BIM). You will begin to learn about design coordination, model coordination, location-based scheduling, and cost planning using Vico Office.

After completing this course, participants will be able to:

- Activate a model
- Review and correct takeoff items
- Use takeoff items and takeoff quantities for cost planning
- Develop an estimate
- Generate a cost variance report
- Define tasks
- Map cost assemblies to tasks
- Define floors and zones in the location breakdown structure
- Run 4D simulation

### 3 About Vico Office

The construction industry is changing rapidly. The increased demand for **efficiency, shorter delivery times, and higher quality** is pushing owners and contractors to adopt new business models and technologies which will give them a competitive advantage.

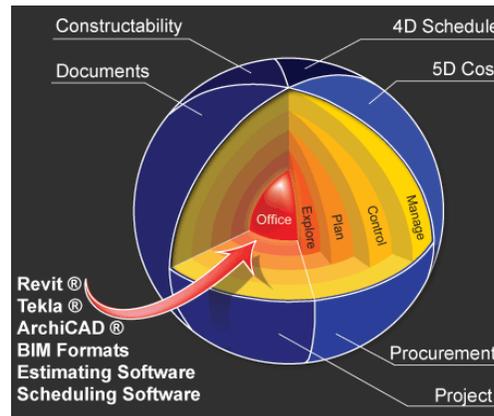
The integration of processes and improved communication throughout the design-to-construction life cycle has proved to be an essential part of this change. **Integrated Project Delivery** and **BIM technology** are the necessity of a truly integrated social-BIM platform.

Vico's **5D BIM solution** was created for this need.

- Vico Office™ is purpose-built for construction, and is designed as a tightly-integrated, BIM-neutral platform to which multiple types of BIM models can be published, synthesized, and augmented with cost and schedule information.
- To maximize efficiency and meet the distinctive needs of the various construction process trades and phases, Vico Office is structured in a modular way, providing you with a tailored, yet expandable solution and a consistent, easy to use environment.

Using Vico Office, **building owners, general contractors** and **subcontractors** can:

1. collaborate efficiently
2. improve predictability
3. reduce risk
4. manage cost
5. optimize schedules



**Note**

**2D** - Objects that represent width and height (X and Y).

**3D** - Objects that represent width, height and depth (X, Y and Z).

**4D** - Objects that represent width, height, depth and time. For example, 4D BIM integrates quantity takeoff, location-based quantities, resources, productivity rates, and labor costs.

**5D** - Objects that represent width, height, depth and cost or quantity extraction from a model.

# Vico Office Overview



## 4 Class Overview

This **General Introduction** overview will describe the Vico Office workflow and begin to expose participants to the Vico 5D solution.

### Business Value



- Vico Office supports the integration of processes and improved communication throughout the design-to-construction life cycle using **integrated Project Delivery** and **BIM technology**.
- The design management process is **budget driven**. Changes between cost plan versions can be analyzed in Vico Cost Explorer, which graphically presents the cost breakdown structure and uses colors to indicate the status of groups of cost.
- The Vico Office environment delivers the right tools in the right context at the right time through a system that ensures **data integrity**.
- Building owners and general contractors can leverage **real time data** to collaborate efficiently, improve predictability, reduce risk, manage cost, and optimize schedules on large, complex building projects.

### Training Objectives

Upon completion of this **General Introduction - Vico Office Overview** module, you will be able to:

- Describe the business challenges that Vico Office solves
- Understand important concepts related to Vico Office workflow
- Refer to use cases and sample projects where Vico Office met specific business objectives

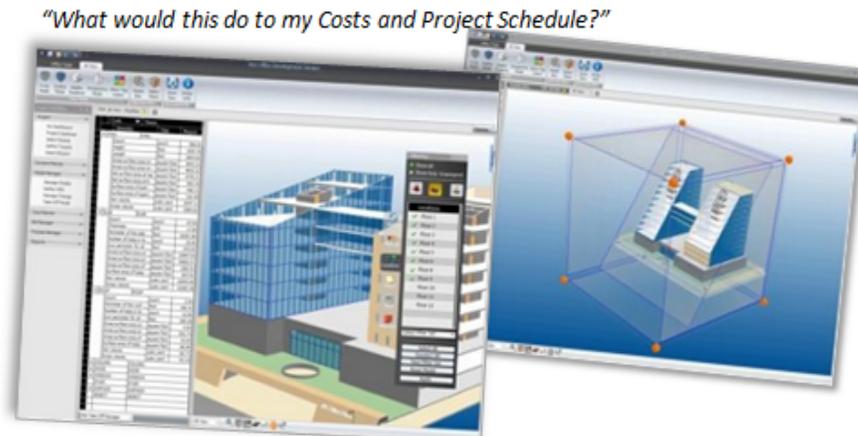
## 5 Vico Solutions

Vico Office is a different way of working with BIM models. Used for much more than visualization, Vico Office extends the basic 3D model with constructability analysis and coordination, 4D location-based scheduling and production control with flowline principles, and 5D estimating.

Vico's **5D Virtual Construction™** solutions pioneered the category of BIM for Construction, and they remain the industry's **most integrated approach** to coordination, quantity takeoff, cost estimation, project scheduling, and production control.

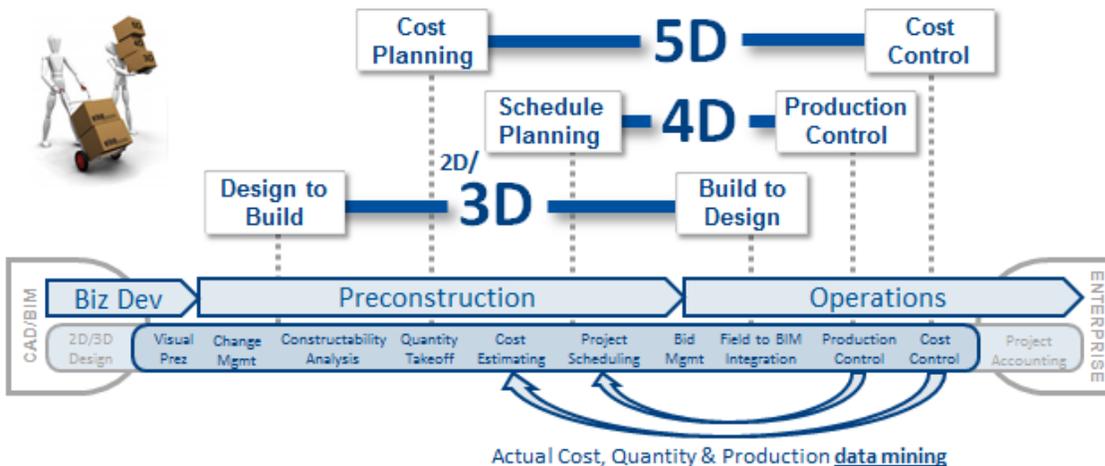
### Vico Solutions:

- Integrate Model, Cost & Schedule
- Leverage software your company already owns
- Allows you to view changes made in one place throughout your system



### Who Works with Vico Office?

Building owners, general contractors, and construction managers use **Vico Office** software and services to reduce risk, manage costs, and optimize schedules on complex building projects.



## 6 Vico Office Modules

Construction Management Reporting

**Vico Office Client** is the cornerstone of the Vico Office Suite. Here model versions are managed, information is shared across the team, and an inline reporting engine pulls information from all departments to deliver constructability reports, cost- and resource-loaded schedules, proposed design changes, cost estimates, cash flow reports, and other customizable reports.

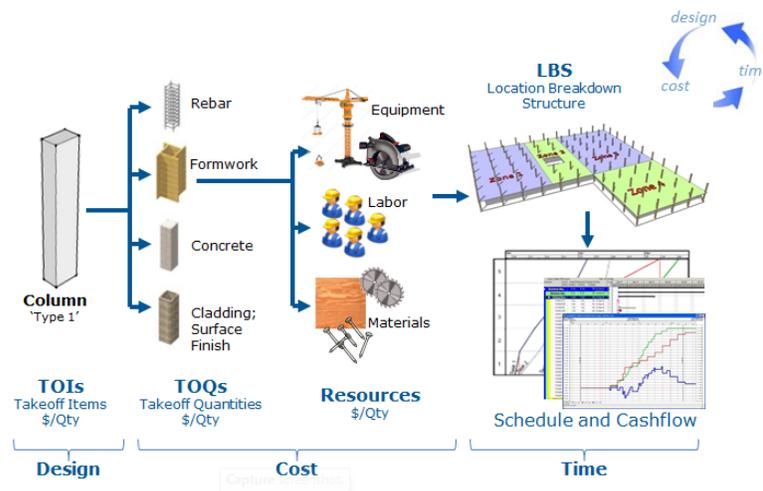
3D BIM for Visualization

**Vico Office** works out-of-the-box with popular BIM authoring tools such as Graphisoft ArchiCAD, Autodesk Revit, and Tekla Structures. Vico Office also includes additional importers for Google SketchUp, CAD Duct, 3D DWG, and IFC files.

3D BIM for Clash Detection

**Vico Constructability Manager** provides an integrated solution for clash detection and coordination resolution so that your team can identify constructability issues in the planning stage before they occur in the field.

### How It Works - Integrated Process Overview

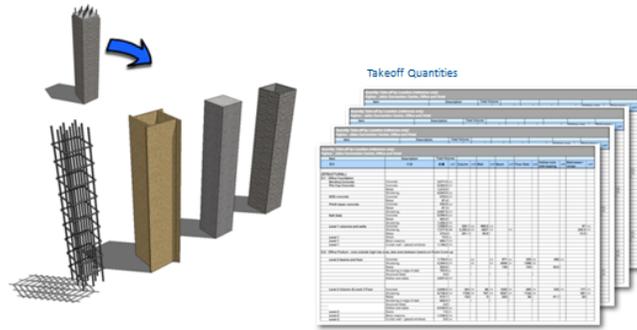


3D BIM for Layout

**Vico Layout Manager** maps critical points in the virtual model to their corresponding physical points on the jobsite, speeding installation and eliminating costly rework.

3D BIM for Quantity Takeoff

**Vico Takeoff Manager** derives construction-caliber quantities by location from BIM models; these quantities by location power more accurate schedules and estimates.



**Vico Location Breakdown Structure (LBS) Manager** is an organized approach to dividing the project into work locations. Location-based planning and management ensures that trade crews flow smoothly from predecessor to successor tasks without interference. Locations defined in LBS Manager also yield quantities by location for use in scheduling and procurement.

4D BIM for

Scheduling **Vico Schedule Planner** creates construction schedules by using BIM model and elements and associating them with tasks and the corresponding materials, Production resources, and labor; all of which are optimized by location. Control

**Vico Production Controller** is used in the build phase. Planning the schedule is only half the battle - the other half is managing on-site production.

**Vico 4D Manager** is a 4D simulation presentation tool that provides rich 3D visualization of the project timeline to the extended construction team.



5D BIM for  
Estimating

**Vico Cost Planner** is a powerful cost estimating solution. Based on the concept of Target Cost Planning, Vico Cost Planner provides an environment for an evolving cost estimate that readily compares one version to another and any version to the original Target Cost Plan.

**Vico Cost Explorer** is the first model-based budgeting application that allows the extended project team to visually understand which aspects of the project are contributing to changes in cost. Pouring over rows and rows of spreadsheet data is a thing of the past.



# Vico Office Navigation



## 7 Navigation Overview

The Vico Office workflow guides team members through the process of **activating models, calculating costs, and analyzing schedule impacts**.

After the BIM models are completed, publish and compare 3D models from multiple project stakeholders all within the Vico Office Client.

For example, the architect can contribute an architectural model in ArchiCAD; the structural engineer can contribute a structural model in Tekla; the mechanical subcontractor can submit a model in Revit MEP; the HVAC subcontractor can submit a model in CAD-Duct.

These models can be combined in Vico Office where any constructability issues are identified and reported to the design team for resolution. If the issues cannot be resolved, they are promoted to an RFI and tracked through the project management data flow.

### Business Value



- Integrate BIM models to support a strong **design management** and project controls system
- **Analyze** project cost data in real time
- **Improve communication** among project stakeholders through standardized reports

### Training Objectives

Upon completion of this **Navigation** module, you will be able to:

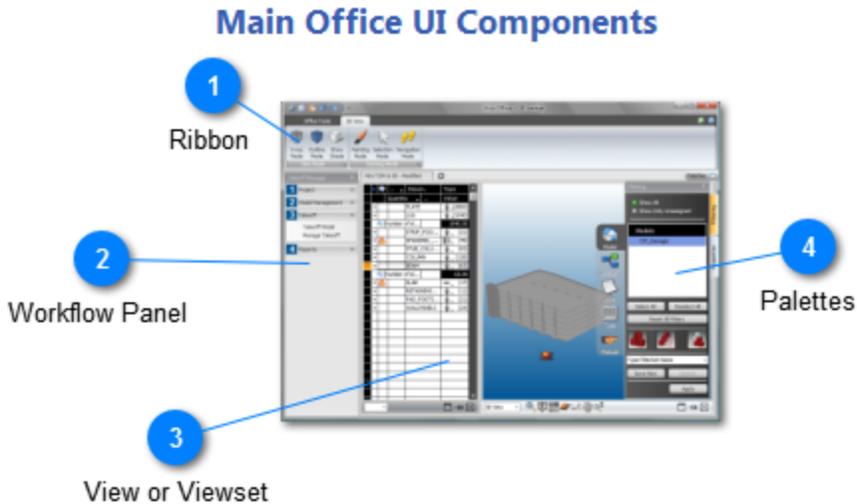
- Create a new Vico Office project
- Navigate through the user interface
- Activate a model

## 8 Vico Office User Interface

Vico Office's **User Interface** is generally divided into four major components.

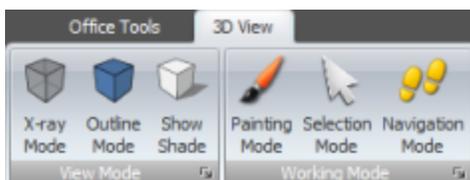
This includes the **Workflow Panel** from which an action based **View or Viewset** can be accessed to perform the action implied work.

Each **View or Viewset** in turn will be complimented with its own **Ribbon menu** and or selected **Palettes** that will provide you with dedicated tools to perform the tasks at hand.



### 1 Ribbon

All Workflow Items have context sensitive Ribbon menus for each of the Views activated in Viewsets. The active View prompts a set of tools and options intended for the selected tasks to be performed.



## 2 Workflow Panel

The Workflow Panel predefines the recommended sequence of the tasks that can be performed with the set of building information that is integrated in Vico Office. It is designed to provide guidance in the steps that you should take, starting with the definition of a new project and ending with the creation of a report. Each Vico Office Module will add a specific set of actions to the workflow panel.

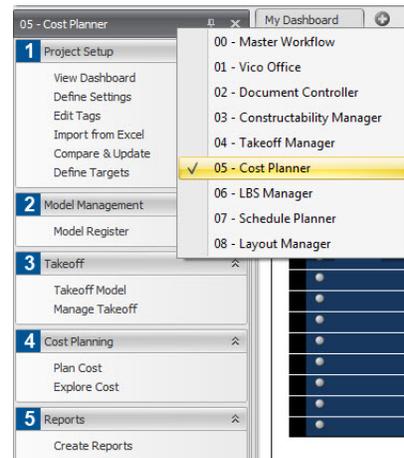
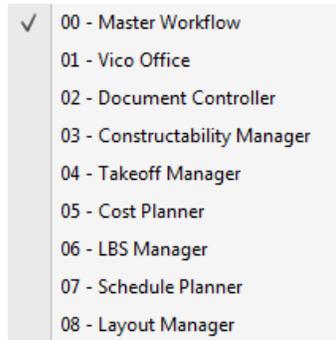
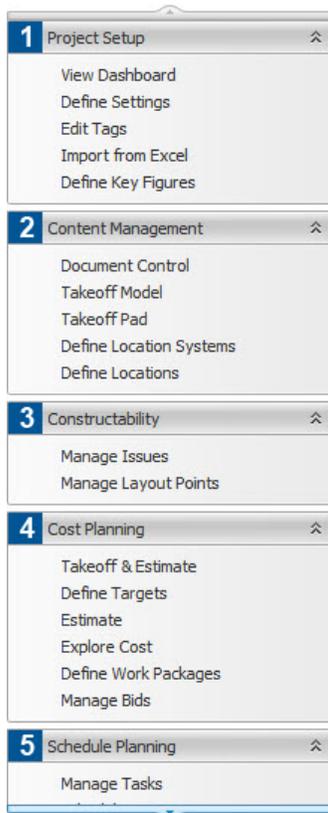
During the training we will use the Master Workflow panel.

**Note**

Right click on the Workflow Panel to select specific workflow items. The modules available may differ when selecting specific workflow items instead of using the Master Workflow.

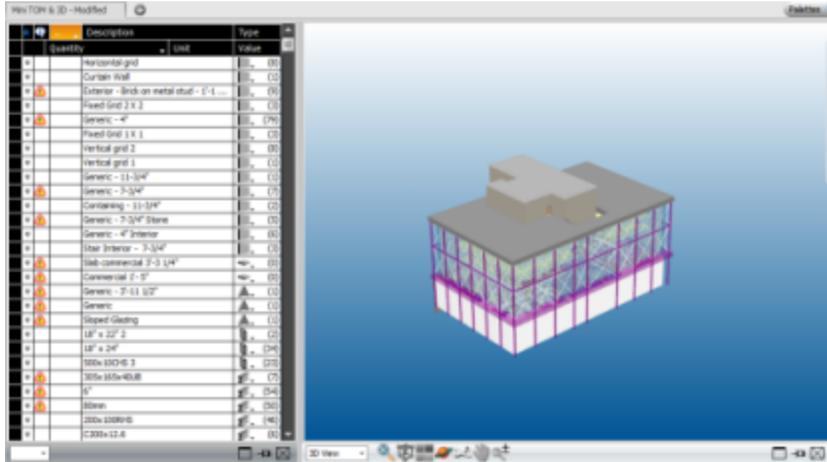


If you have a license for one module, you will need to select the corresponding workflow group.



### 3 View or Viewset

When you select a Workflow Item, a dedicated View or a split screen combination Viewset is activated. You can work in the default view or choose to work in a custom multi-task viewset that lets you size, restructure, and view any combination of available views.



#### Tip

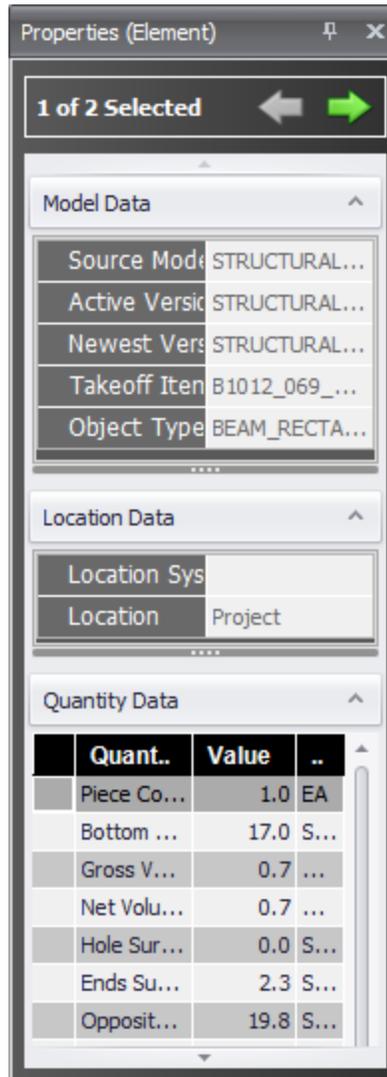


From any view, click on the green arrow on the upper right hand corner to see a list of available **Shortcuts** that apply to that module.

Click on the blue question mark in the upper right hand corner to access the **Help**.

## 4 Palettes

A View or Viewset may have designated palettes available that will aid you to organize project information via filters and view properties of selected elements. The Filtering Palette contains the tools to filter the 3D View based on properties of the BIM Elements. The Properties Palette displays the properties of the selected elements so that they can be analyzed and or edited.



## 9 Exercise: Creating a New Project

The **Dashboard view** lets you manage your projects, pack and unpack projects, and preview project information.

You can think of the Dashboard as a project control center which allows you to easily switch between projects and project specific information available via the **Workflow Panel**. The information available in views, via all the **Workflow Items** is dependent on the currently opened project in your dashboard.

This exercise will introduce you to the basic steps used to create a new project.

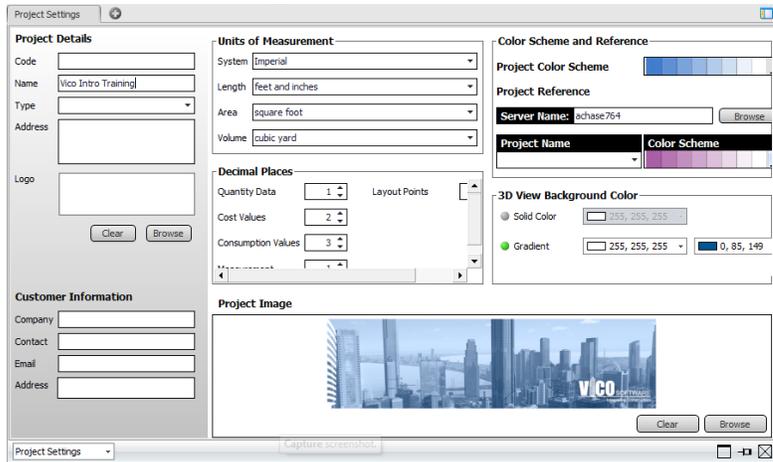
1. To create a new project, select the **New Project button** from the Ribbon or from the Dashboard View.
2. In the Project List area, a new project line will be added. In **project name**, type: *Vico Intro Training*.



After typing in the project name, Office will generate a time stamp in the Created and Last Edited fields.

You can then decide to type in the project Code and Type if desired. The Code fields will allow you to categorize your projects numerically while the Type field will allow you to sort similar projects.

3. On the left navigation pane, select **Project Setup | Define Settings**.



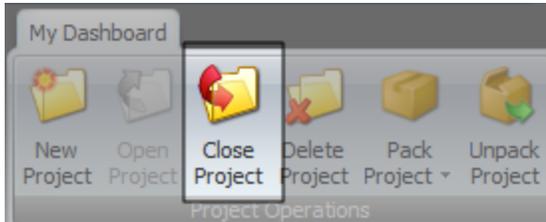
4. In **Units of Measurement**, confirm the following settings.  
 System: *Imperial*  
 Length: *feet and inches*  
 Area: *square foot*  
 Volume: *cubic yard*
5. In **Decimal Places**, confirm the following values:  
 Quantity Data: *1*  
 Cost Values: *2*  
 Consumption Values: *3*  
 Measurement: *1*  
 Layout Points: *2*
6. In **Project Image**, click **Browse**.
7. **Navigate** to the training files provided by your Instructor.
8. Select the sample logo file titled **Project Image.jpg** and click **Open**.
9. In **3D View Background Color**, select a gradient color of your choice.

## 10 Exercise: Closing Projects

Since only one project can be opened at a time, we must close a project before opening a new one.

After closing a project, the model will not be visible anymore, and you will not be able to edit the project, until you open it again.

1. With the newly created **Vico Intro Training** project selected on your Project Dashboard, click the **Close Project** button on the Ribbon.



### Note

To open another project, select the project you wish to work in from the Dashboard view and select the Open Project button.



If you open another project, the software automatically closes the previously opened one.

## 11 Exercise: Packing Projects

Vico Office allows you to copy projects and share them with other members of the project team. It is also possible to archive projects.

The process to copy, share or archive Vico projects is referred to as packing and unpacking projects. Packing a project creates a copy of the selected project in an archive file. The packed Vico Project data are stored in a file with a .vico file extension. Unpacking a project extracts the project data and allows the end user to open the project from the Project Dashboard.

There are two options available when packing projects.

1. **Compatible Pack** - allows users to unpack the project on any operating system (32 bit or 64 bit) and on the same Vico Office version or higher. A project archived using Compatible Pack can be upgraded with a higher version of the software.
2. **Quick Pack** - takes less time to pack a project but only the same Vico Office version and the same architecture of operating system (32 bit or 64 bit) can unpack it later.

 **Important** No operation will be possible in Vico Office when a project is being packed.

In this exercise, you will use the Compatible Pack option to archive a project from your Dashboard.

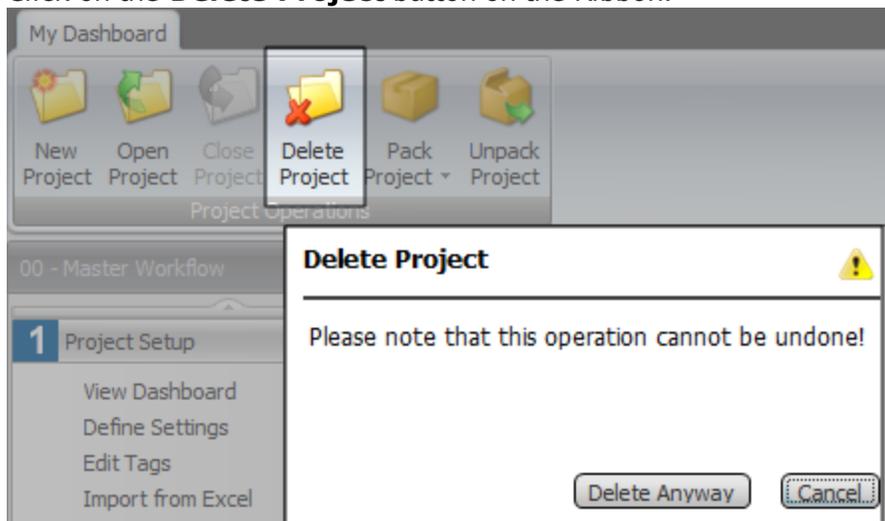
1. On the Workflow Panel, select **Project Setup | View Dashboard**.
2. Click on the **Pack Project** button on the Ribbon.
3. Select **Compatible Pack**.
4. Name your .vico file *VO Intro Training* and save it to your computer.

## 12 Exercise: Deleting a Project

Deleting a project will remove the project from your Project Dashboard and all stored project information will be permanently discarded from your database.

 **Important**  
The delete operation cannot be undone.

1. On the Workflow Panel, select **Project Setup | View Dashboard**.
2. Select the newly created *VO Intro Training* Project from the Project Dashboard by clicking on that row.
3. Click on the **Delete Project** button on the Ribbon.



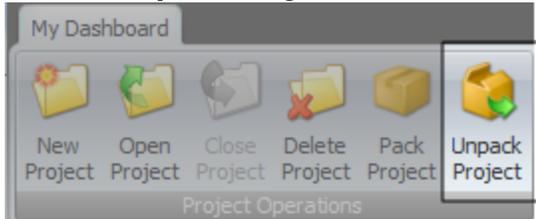
4. In the Delete Project dialog box, select **Delete Anyway**.
5. The project is removed from the Project Dashboard.

 **Note**  
Because you packed this project earlier, you can unpack the project at any time to restore the data to your Project Dashboard.

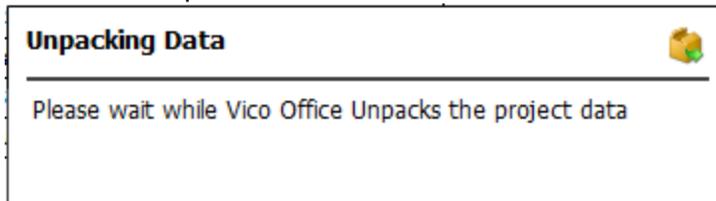
## 13 Exercise: Unpacking a Project

Vico Office projects can be shared between software users. Once you receive the project file, identified with a file extension of .vico, use the **Unpack Project** button on the **Dashboard** view to enable the project in your installation.

1. On the Workflow Panel, select **Project Setup | View Dashboard**.
2. Click on **Unpack Project** on the Ribbon.

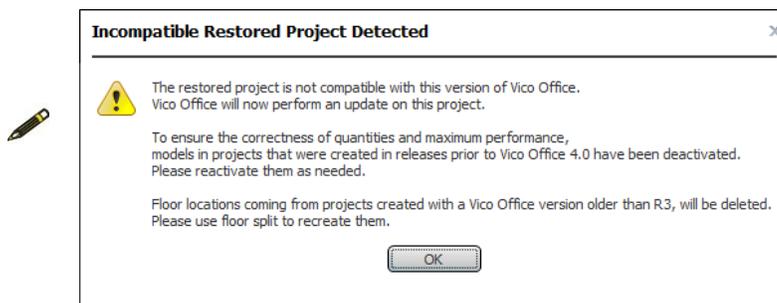


3. **Browse** to the 01 Quantity Takeoff.vico file provided by your instructor.
4. Click **Open**.  
The software processes the file.

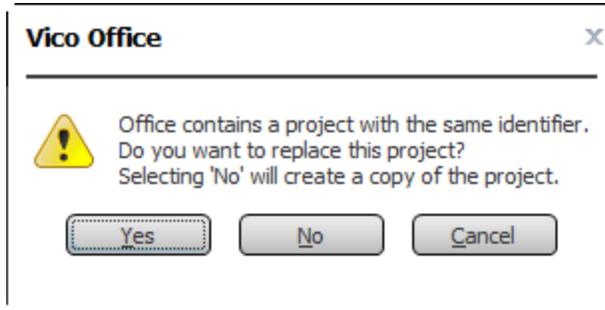


**Note**

If the project was created in a higher version of Vico Office, you may receive a message identifying this. Click **OK** to this message to continue unpacking the project.

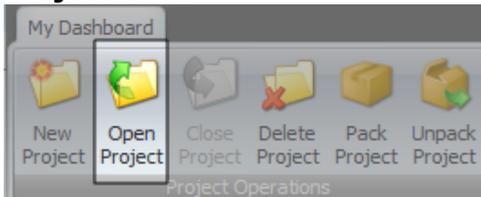


If you attempt to unpack a project and the same project identifier already exists in your project dashboard, the following message will be displayed.



Yes – you'll overwrite the existing project on your dashboard  
 No – will create a new project (safer)

5. **Select** the project you wish to work in from the Dashboard view and select the **Open Project** button.



6. The currently opened project is identified by the **green dot** in the row indicator to the left of the project name in the Dashboard Project List.



**Note**

The color of the circle to the left of the project code indicates the status of the project.



- Gray - the project is not active
- Orange - the project has not been upgraded / opened with the new Vico Office version

## 14 Publishing Models

The **Publish to Vico** process is a key part of the Vico Office workflow. The first step to publishing a BIM model into Vico Office is to open a Building Information Model in one of the supported CAD applications. Examples of supported CAD applications include:

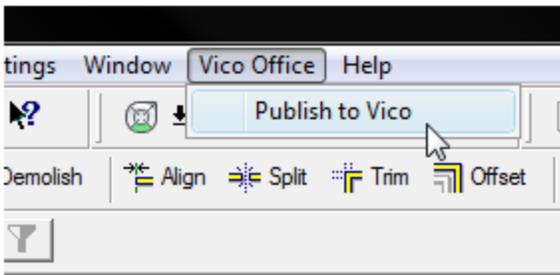
- Autodesk Revit (Architecture, MEP and Structure)
- Tekla Structures
- ArchiCAD

**Tip**

- ✓ Refer to the Vico Office SupportLink website for a list of supported CAD applications and versions <http://support.vicosoftware.com>

**Important**

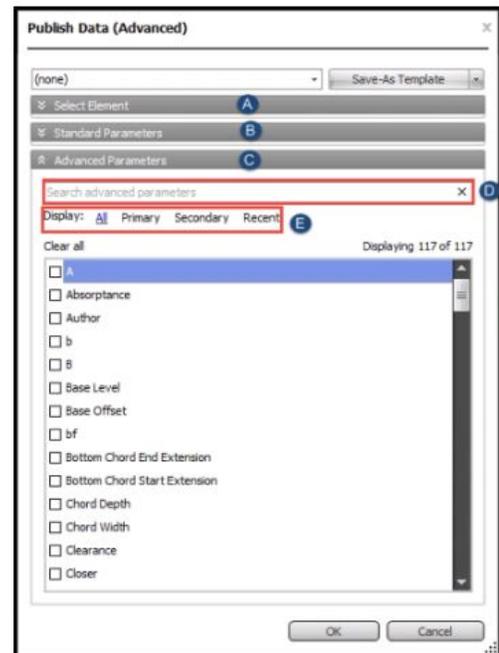
- ✘ Vico Office must be installed **after** the modeling application. If the modeling application is installed after Vico Office, the publisher will not appear.



For each of the BIM applications, Vico Office will install an **add-on**. This add-on will introduce a Publish to Vico item to the applications' user interface.

The **Publish Data** dialog box, (previously known as the 'Select Vico Office Project' dialog box) which is available in your CAD publisher after you install the Publisher Add-ons, contains an 'Advanced' section that lists all the elements and parameters from your model. From this list, you select which elements and parameters you wish to publish. Do keep in mind that the more you choose to publish, the longer it will take to complete the import process.

- When the publishing process is completed, you can activate the model in the Document Controller module or in the Model Register task.
- During the model activation process, an initial set of takeoff items are generated based on model element geometry and properties stored in the project during the publish operation.
- Only the active model feeds quantities to the Takeoff Pad and the Cost Plan tasks.



**Note**

The **Database Server** is by default set to the Vico Office database that is running on the user's computer. However, there is an option to publish to a project that is stored in a database that exists on another computer in the network. Click the browse button to specify that computer's name.

If no previous model exists under a specific project, you can choose the Add New Model option.

When you choose to perform an update of a previous Model and not a new Model publish, a version number will be assigned to the selected Model's name. The previous Model version will not be replaced, but a new Model version with the assigned number will appear in the Document Controller | Model Manager when the publish process is completed.

**Important**

Only the visible elements will be published to Vico. This allows you to hide high polygon elements like bicycles from the architectural model, which are not serving any construction purposes.

You don't need to have a modeling tool license for opening and publishing a 3D model to Vico Office. For Revit you can use the viewer. For ArchiCAD and AutoCAD you can have the trial version.

**Tip**

Complex geometries increase the duration of the publishing process. Therefore, it is recommended that you use the **Advanced** section of the **Publish Data** dialog box to select only the elements that are absolutely necessary for your project.

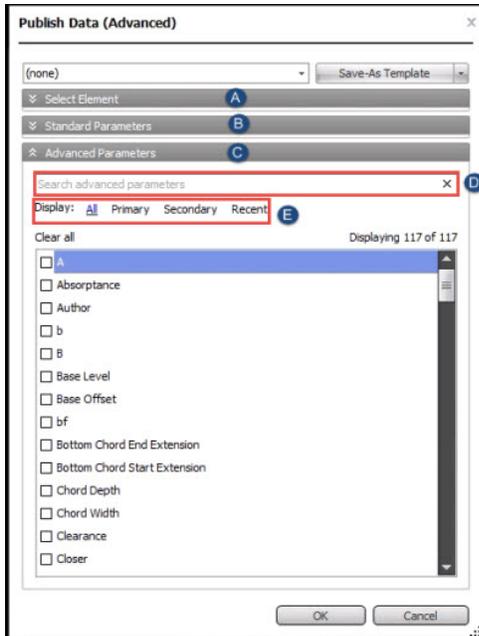
For example, exclude items such as microscopes or curtains as they don't provide any value to your project's cost estimate.



Other publishing rules that will decrease duration:

- Use the simplest geometry.
- Use solid elements.
- Use boxes to represent elements that are needed only for counting.
- Hide unnecessary objects to include in the estimates.
- Publish links separately if possible.

On the Publish Data (Advanced) dialog box, choose which elements and parameters you wish to publish to Vico Office. Keep in mind that if you choose more elements and parameters to publish, it may have an impact on the publish duration. Therefore, it is highly recommended that you exclude elements that do not add any value to your project.



**A - Element:** All the elements are selected by default. Select which elements you wish to exclude by clearing their check box.

**B - Standard Parameters:** All standard parameters are selected by default. It is recommended that you include all the standard parameters.

**C - Advanced Parameters:** Parameters that are available in the current model, including user-defined parameters, are listed in this dialog box. They are grouped into four subgroups: All, Primary, Secondary, and Frequent. Unlike the Standard parameters, none of the advanced parameters are selected by default to be published.

**D - Use the Search box** to quickly find the advanced parameters that you wish to include/exclude.

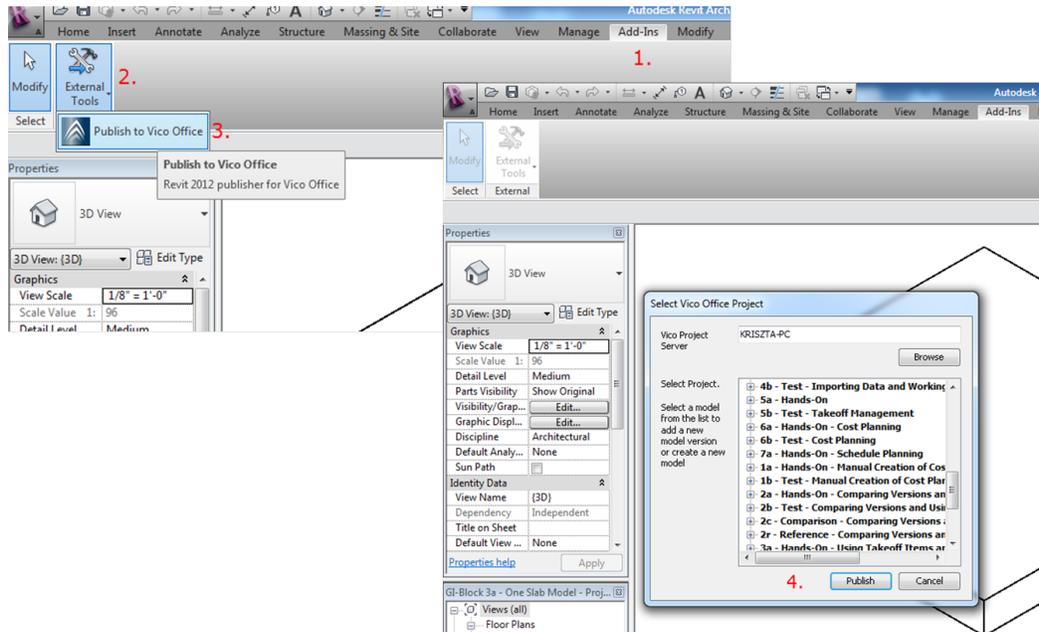
**E - Click on a subgroup filter** to display only the parameters from that group or click All to display all the parameters.

#### Note

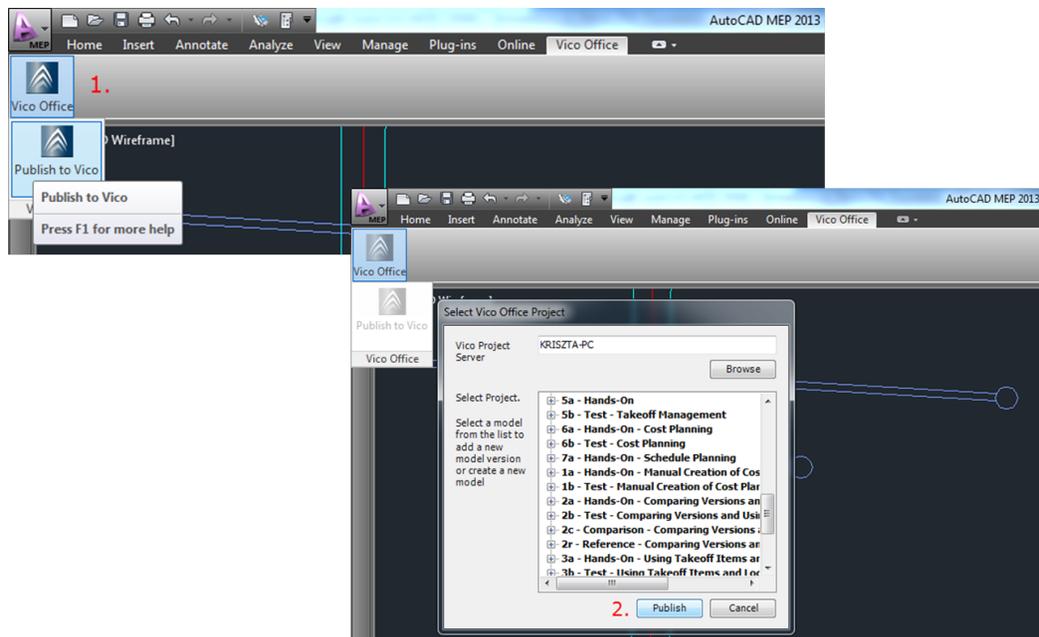


The Advanced dialog has a 'template' feature that saves the elements and parameters that were chosen to be published.

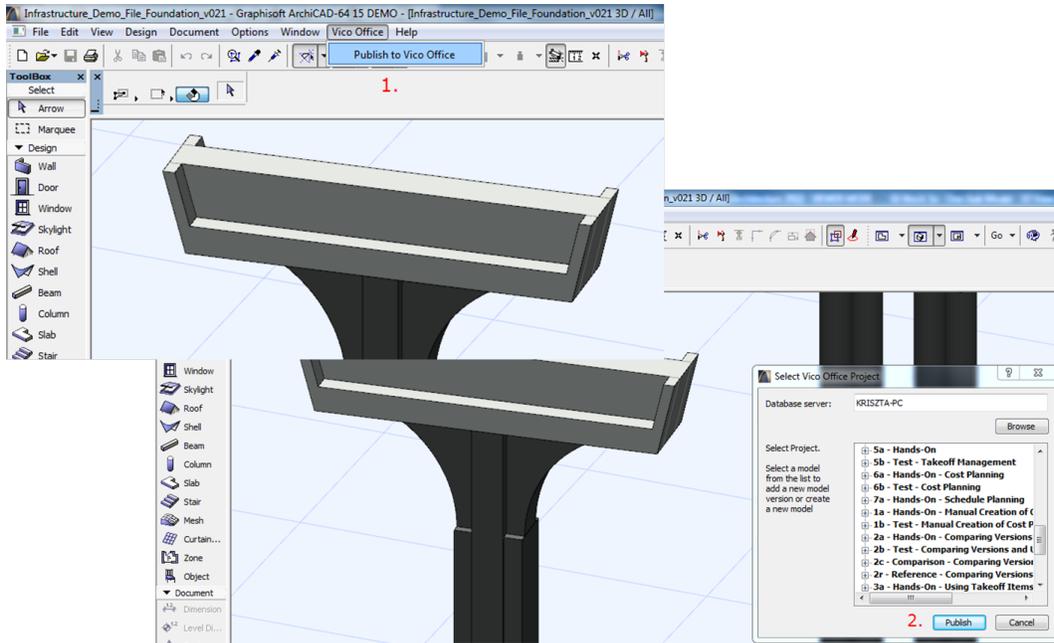
Additional examples of publishing from different modeling applications.



### Publishing from Revit



### Publishing from AutoCAD



## Publishing from ArchiCAD

## 15 Exercise: Activating Models

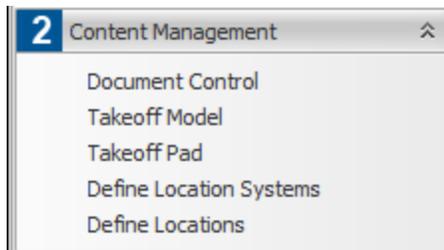
After publishing models from the selected BIM application, the models need to be **activated** in Vico Office.

During the activation process in the **Document Control** workflow item, **Takeoff Items** are created based on the selected properties in the **Publish Data Dialog**.

When the model is activated, takeoff items are created. To generate **quantities**, use the Takeoff Model workflow item to reorganize takeoff items using the TOI Builder, apply selective quantification to analyze the model's geometry with Vico's **quantity calculation algorithms** and optionally merging takeoff items to create a less detailed estimate.

In the following exercise you will activate a published model from the Model Register. Be sure you have unpacked the project referenced below first.

1. On the left navigation pane, select **Project Setup | View Dashboard**.
2. **Open** the **01 Quantity Takeoff.vico** training project by selecting the project row and clicking the **Open Project** button on the Ribbon.
3. On the left navigation pane, select **Content Management | Document Control**.



4. Under the **Document Controller** tab, select the first published model row.

| 3D Models  |           |            |     |      |        |  |
|--|-----------|------------|-----|------|--------|--|
| Document Name  | File Name | Ref. Plane | LOC | TYPE | Notice |  |
|   02-SUB | 02-SUB    |            |     |      |        |  |
|   03-SUP | 03-SUP    |            |     |      |        |  |

### Note



When several versions have been published, right click on the version that you want to activate.

### Note

The **version column cell colors** tell you if a document is part of a version and if it has been changed between versions.

- **Grey** Cell denotes there is no published model version
- **Green** Cell denotes there is NO change in the new model version compared to the previous one
- **Red** Cell denotes there is a change in the new model version compared to the previous one



The **version column icons** tell you if the model is active (indicated by a grey circle) or if marked up screenshots have been created from those models for

Constructability Reports (indicated by a cloud).

5. Select the **Model Register** tab.
6. Select the **SUB, SUP and EXT** model versions by holding the **CTRL** key down.
7. Click the **Activate Selected Models** button on the Ribbon.

**Note**



The Model activation is completed when the published Model Version is shown in the 3D View and a circle icon is displayed under the Version column.

**Important**



In Takeoff Manager, the Takeoff Items and Takeoff Quantity information associated with the active model version will be available for quantity takeoff calculations after model activation and quantification.

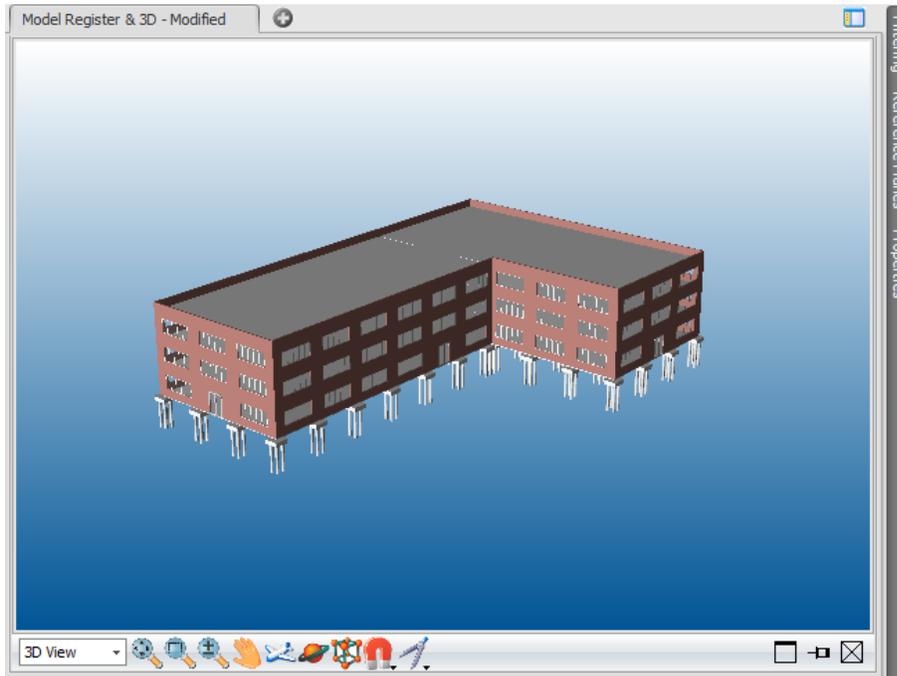
**Note**



To hide a model from the 3D View, click on the eye icon to the left of the model name in the Document Register.

## 16 Navigation Tools

**Document Controller** contains the **3D View** and the **Document Register View** by default.



This 3D View allows you to verify the model elements using the following user interface features which can be pinned, docked or minimized based on your preference.

- Filtering Panel
- Reference Planes
- Properties Panel
- 3D Navigation Toolbar

## 17 Exercise: 3D Navigation Tools

The 3D Navigation tools available through the tool bar, located on the bottom of the 3D view, are used to reveal details of 3D models and 2D drawings. In this exercise, you will practice using these tools.

### Tip

See the online Help for definitions of each of the tool bar options.



1. Activate the **Pan** navigation mode to move the camera without changing the viewing angle.



2. Click on the **Section Box** and move section planes to filter only the first floor.



### Note



If you cut the model with the section box, you can see the cut geometry highlighted with red. Click on the **Turn Off Capping** button on the Ribbon, to turn off the red fill and look inside of the model elements.

3. Activate **Zoom** mode by clicking and dragging the mouse cursor in the model.



4. Click the **Zoom Extents** button to fit the full model in the 3D view.



### Tip



If you made a lot of changes in the 3D view and wants to reset the original model view just click on the **Reset View** button on the Ribbon.

5. Activate the **Orbit** mode to rotate the model.



### Note

For the **Orbit** mode:

- Use <Ctrl> + <Left Click> to Define Pivot Point

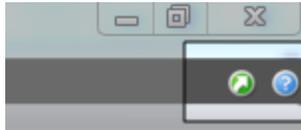


### Tip

If you prefer using **keyboard shortcuts**, click on the Shortcuts icon (green circle) in the upper right hand corner of the user interface.



- The list of shortcuts will change based on the View that you have selected on the user interface. For example, if you click on the Document Register View, you will see one list of shortcuts. If you click on the 3D View, you will see a different list of shortcuts.



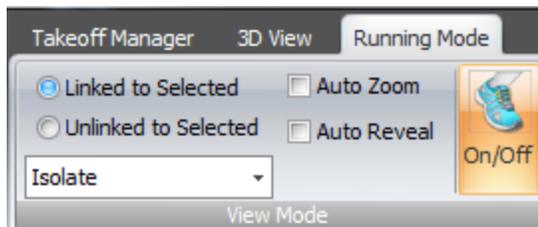
| Keyboard Shortcuts              |                      |
|---------------------------------|----------------------|
| Command                         | Shortcut             |
| <b>3D View</b>                  |                      |
| Painting Mode                   | Ctrl+Shift+P         |
| Selection Mode                  | Ctrl+Shift+S         |
| Navigation Mode                 | Ctrl+Shift+N         |
| Start Orbit                     | O                    |
| Start Pan                       | P                    |
| Start Zoom                      | Z                    |
| Start Fly                       | F                    |
| Show/Hide Section Box           | S                    |
| Reset Section Box               | R                    |
| <b>Painting Mode</b>            |                      |
| Paint/Unpaint                   | Left Button          |
| Pan                             | Scroll Wheel / Mi... |
| Orbit                           | Shift + Scroll Wh... |
| Zoom                            | Scroll Wheel         |
| <b>Selection Mode</b>           |                      |
| Select/Unselect                 | Left Button          |
| Unselect All                    | Left Button in 'S... |
| Pan                             | Scroll Wheel / Mi... |
| Orbit                           | Shift + Scroll Wh... |
| Zoom                            | Scroll Wheel         |
| <b>Orbit Mode</b>               |                      |
| Orbit forward (around x-axis)   | UP                   |
| Orbit backward (around x-axis)  | DOWN                 |
| Orbit Counter Clockwise (aro... | LEFT                 |
| Orbit Clockwise (around z-axis) | RIGHT                |
| Return to Default View          | SPACE BAR            |
| Zoom out                        | -                    |
| Zoom in                         | +                    |

Print Shortcuts List      Close

## 18 Exercise: Highlighting and Isolating

Next, you will practice **highlighting** and **isolating** takeoff items. This feature allows you to narrow down the model or drawing elements that are visible in the Vico 3D View.

1. On the left navigation pane, select **Content Management | Takeoff Model**.
2. Click on the **A1012\_003\_Pile Cap-ID** takeoff item.
3. Select the **Running Mode** tab on the Ribbon.



4. Select **Highlight** from the drop down list and confirm the **On/Off** button is enabled.

### Note

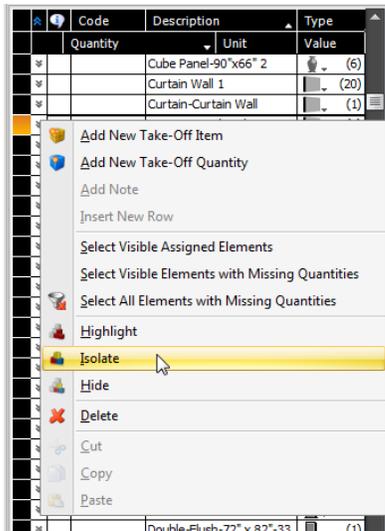
Running Mode provides an on/off filtered view that can provide full-time visual properties to the display of Vico Office. Select the On/Off button on the Ribbon to enable or disable this setting.



- Linked data: Applies to line item that is selected
- Unlinked data: Applies to line item that is not selected
- Auto Zoom: An automatic close-up of content
- Auto Reveal: The peeling away of content that is obstructing the view from preferred content

5. The selected element is highlighted in the 3D model.
6. Expand the **A1012\_003\_Pile Cap-ID** takeoff item by clicking on the + sign in the Takeoff Manager spreadsheet.

7. Use the Isolate feature to view the selected element. Right click and select **Isolate**.



8. To view multiple elements simultaneously, hold down the **CTRL** key on your keyboard and select the first three rows on the Takeoff Manager View: **Pile, Pile Cap** and **Slab on Grade**.
9. Each element should be isolated in the 3D View.
10. Select the **Running Mode** tab on the Ribbon.
11. Click the **On/Off** button to disable this setting.

### Tip

Click on the **Running Mode** tab on the Ribbon and use the **On/Off** button to control whether the 3D view retains the isolated or highlighted configuration setting.

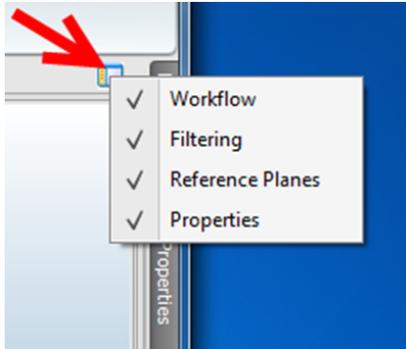


For a more permanent isolation use Filtering Palette. Here you have an option to save specific filtered views.

## 19 Exercise: 3D Navigation Tools - Palettes

To conclude the 3D navigation exercises, you will explore options available when using **palettes**.

Palettes are available for use with Workflow, Filtering, Reference Plans and Properties.

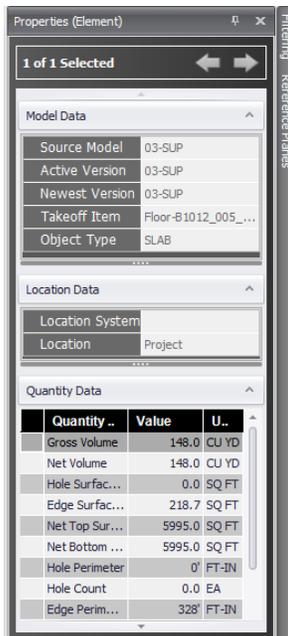


### Note



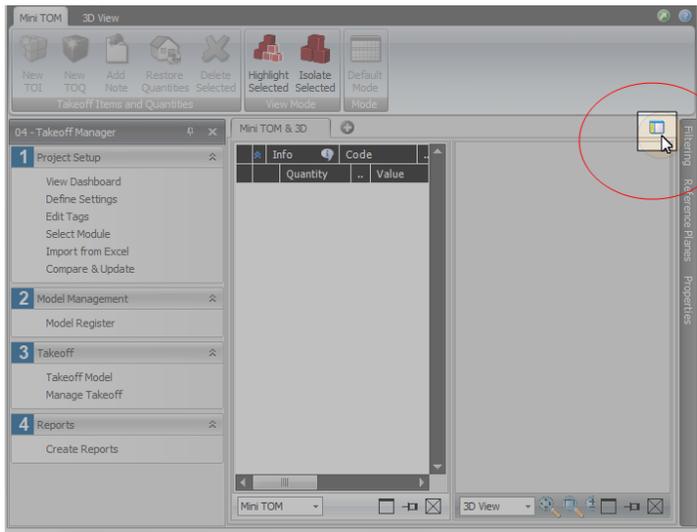
If you don't see the Filtering or Properties palettes on the right hand side of the user interface, click on the  Palette icon in the upper right hand corner of the 3D View and check these palettes to enable them in the user interface.

1. Select a model element. Click on the **Properties** palette. This will provide a list of model, location and quantity data.

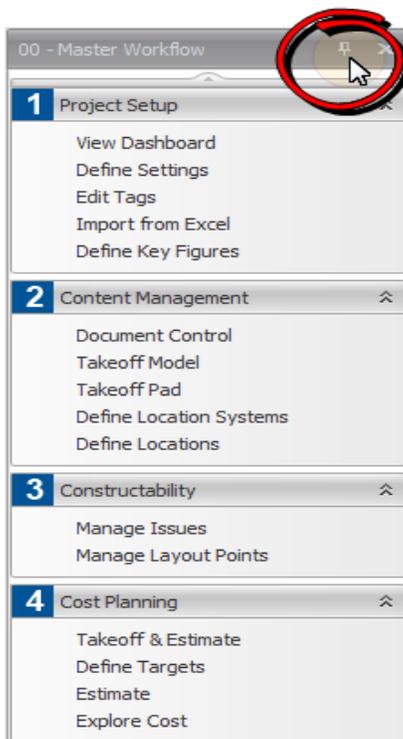


2. **Open** the Workflow palette and **close** it using the x in the upper right hand corner of the left navigation pane.

3. **Display** the Workflow palette by using the Palette icon on the top right corner of the screen.



4. **Dock** and **undock** the Workflow palette.



## 20 Filtering Palette

The Filtering Palette is located to the right side of the **3D view**. Hovering over the Filtering tab will make it appear.



**Filter Options** are to show all elements, or only those elements that are not assigned to any Takeoff Item.

**Filter Types** provide selection criteria for what to include in the view by applying the filter.

- Available criteria are 'Model', 'Location' (from Location Breakdown Structure), 'Layer' (not available for Revit models), 'Type' (Vico Office element types) and 'Manual'. The 'Manual' filter selection allows for selecting elements in the 3D view and them including them in the filter.

For each of the criteria (types), available values are presented in a list. In this list, the content to be filtered can be selected by clicking on the desired values.

After selection, a check mark is presented for the selected value. To speed up the selection process, '**Select All**' and '**Deselect All**' are available.

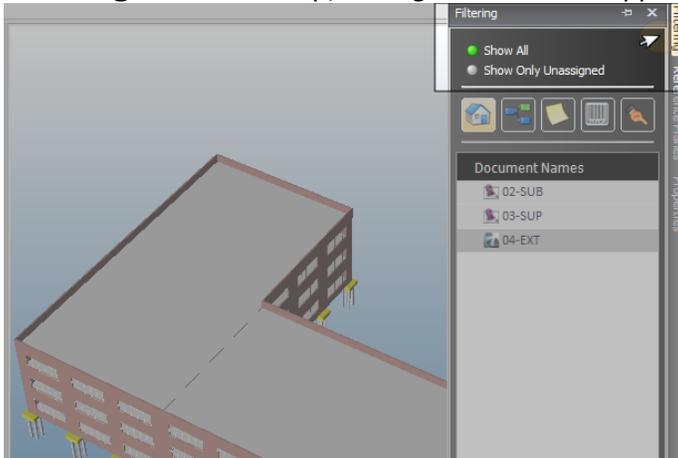
After selecting the content that should be filtered, a **Filter Mode** can be selected to determine how the selected content will be filtered. Available options are 'Isolate', which isolates the selected content, 'Hide', which hides the selected content from the 3D view and 'Transparent', which makes all non-selected 3D elements translucent.

The **Save Filter Set Name** option allows for reuse of defined filters. After entering a name, click 'Save' to save as a new Filter Set, or 'Update' to update an existing one.

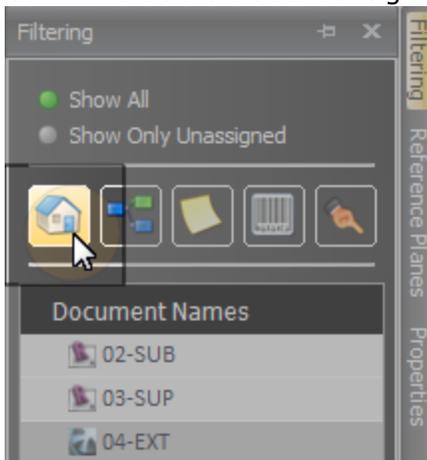
## 21 Exercise: Working with Filters

Occasionally you may receive a model with missing quantities or an element was mistakenly assigned to an incorrect takeoff item. To validate the model, you can create a filter which can be applied to the model. In this exercise, you will practice using the available filtering options, create a filter that will isolate the superstructure and hide that part of the model so you can easily view the exterior only.

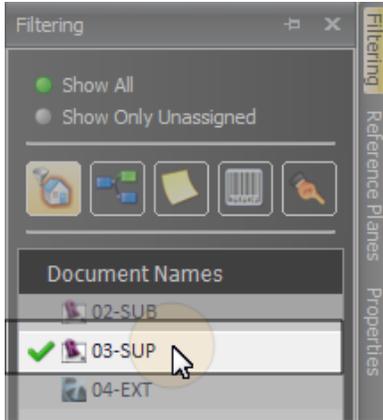
1. Continuing in the **Content Management | Takeoff Model** workflow item, click on the **Filtering** tab on the top, far right side of the application.



2. Confirm that the **Document** group is selected by clicking on the house icon.



- Click on **03-SUP** in the list under Document Names.



A green check mark will appear to the left of the row.

**Note**



Usually when there is a defect in the Takeoff Item, there is an exclamation mark visible in the Info cell. It is recommended to check all the Takeoff Items one by one.



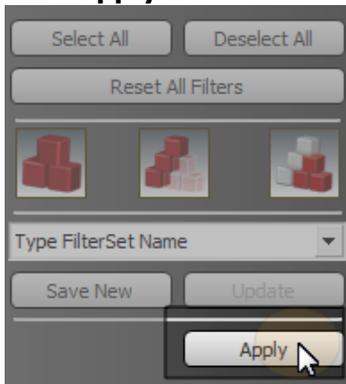
- Click on the **Isolate Selected** button under the Reset All Filters button.



**Note**

Hovering over the three icons will display a description of each button's functionality.

- Click **Apply** to view the filtered model.



- Select **Hide Selected | Apply** to view the model without the superstructure.
- Select **Translucent Mode | Apply**.
- Click the **Reset All Filters** button



**Tip**

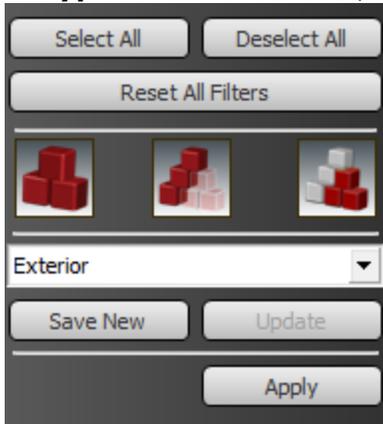


Pin the filtering panel to the viewset to lock it in place on the user interface.

## 22 Exercise: Saving Filters

In this exercise, create a filter that will isolate the **model exterior** so you can easily view the exterior only.

1. In the Filtering panel, click on the **Document** group.
2. Click on **04-EXT**.
3. Confirm a **green check mark** is displayed next to the 04-EXT row.
4. Click on the **Isolate Selected** button.
5. In **Type Filter Set Name**, type: *Exterior*



6. Click **Save New**.
7. Click **Apply**.

## 23 Review Questions

1. How would you share a Vico Office Project with other team members?
2. What does publishing a model do?
  - a. Moves the 3D BM information into VO
  - b. Creates the Takeoff Items in VO
  - c. Creates the project estimate in VO
3. Where can you change the units of measurement for your project?
4. What are the 4 palettes that you can use?
5. How can you isolate an element in the 3D view.

# Working with Quantity Takeoff

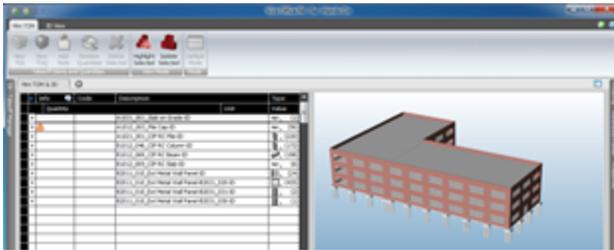


*Courtesy: RBB Architects, Boise State University Center for Environmental Science and Economic Development*

## 24 Quantity Takeoff Overview

Quantities and locations are the linchpins to the Vico Office Suite. An accurate quantity takeoff is the start to both a precise schedule and a precise estimate. So it is important to start with a comprehensive quantity takeoff that analyzes each piece of 3D BIM geometry or 2D design.

The Takeoff Pad and Takeoff Manager views automate calculations, measurements and item counts.



### Business Value



- Design quantities  $\neq$  construction caliber quantities
- Validating subcontractor's quantities
- Integrate BIM models to support a strong project controls system
- Share same project data (quantities) with team members

### Training Objectives

Upon completion of this **Working with Quantity Takeoffs** module, you will be able to:

- Utilize the 3D navigation tools
- Practice working with the Takeoff Pad and Takeoff Model
- Create Takeoff Items and Takeoff Quantities
- Assign quantities to Takeoff Items and Takeoff Quantities
- Fix identified quantity problems



| Takeoff Pad  | Takeoff Manager   | Cost Planner  |
|--|---|---|
| <ul style="list-style-type: none"> <li>Review and validate TOI/TOQ Components</li> </ul>       | <ul style="list-style-type: none"> <li>Review and validate project level TOI/TOQ</li> </ul> | <ul style="list-style-type: none"> <li>Read TOQ from Takeoff Manager</li> </ul> |
| <ul style="list-style-type: none"> <li>Create user defined TOQs and Pads</li> </ul>            | <ul style="list-style-type: none"> <li>Quantify Elements</li> </ul>                         |   |
| <ul style="list-style-type: none"> <li>Choose what TOQ will be displayed within TOM</li> </ul> | <ul style="list-style-type: none"> <li>Paint TOI/TOQ information to 3D model</li> </ul>     |   |
|  | <ul style="list-style-type: none"> <li>Assign TOI/TOQ to Cost Plan</li> </ul>               |   |

### Typical Business Process

- In **Takeoff Pad**, review and validate Takeoff Item (TOI) element assignments.
- You can also create a new **Takeoff Quantity (TOQ)** and assign **model geometry** for automatic quantity takeoff.
- The **reassigning** of assigned and unassigned elements into new or existing TOI's is an **interactive process** between the Takeoff Pad view and the 3D View.
- Takeoff Item and Takeoff Quantity items can also be created and selected in the Takeoff Manager view so that you can then use the **Paint Mode** in the 3D View to assign or reassign the model elements and geometry.
- The process of verification, assigning, and reassigning model elements and quantities in the 3D View can be greatly enhanced by the use of the **Filtering Panel** and **Properties Palette**.

When you are satisfied with the collection of TOI's and their assigned TOQ's, you can view a full breakdown of the all the TOI's and their quantities in the **Takeoff Manager view**.

The **quantity totals** displayed by your projects location breakdown can subsequently be used to generate customizable quantity **Reports**.

## 26 Quantity Calculation Rules

When you are activating models, Vico Office analyzes the geometry that was brought in from a BIM application and calculates, for each element:

- **Volume**
- **Surface Area**

Quantities such as 'Length' and 'Width' are not calculated in Vico Office, but derived from meta data, that is saved with the geometry during the publish operation.

**Volume** is calculated by creating a solid element where the element's boundaries are defined by the faces of the published element. After the volume is created, Net Volume quantities can be obtained through solid element analysis.

When the published geometry contains faces that are not entirely closing a 3D volume, Vico Office attempts to fix this geometry, with increasing levels of tolerance.

If the volume correcting does not succeed, the element is marked as 'incomplete' and will return to '0' volume value. In this case, the Takeoff Item which the element belongs to will be marked with an exclamation mark icon.

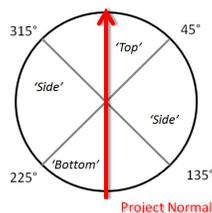
In calculating the Surface Area, the most important thing is to give the correct direction of the element faces.

The calculation rules in Vico Office use the corkscrew rule to determine what the direction of a face is.

By following the drawing direction of the points of a face, this direction can be determined. The direction of the face is then compared to the project's normal vector, which is a vector that points exactly in the z-direction.

Based on this comparison, an angle variance with the normal vector can be determined, which then lets Vico Office classify the face.

- If the direction of a face is in the 315° to 45° range, the face is classified as **Top**.
- If the direction of a face is in either 45° to 135° or 225° to 315° range, the face is classified as **Side**.
- If the direction of a face is in the 135° to 225° range, the face is classified as **Bottom**.

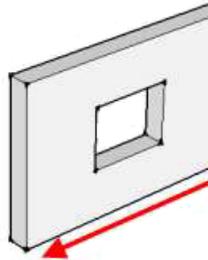


The initial classification is then further processed based on the Vico 'Element Type'. Each Element Type has its own set of Takeoff Quantities, which are collections of faces that are classified based on the rules explained in this page.

Besides the element's 3D geometry, published information of Wall elements also contains the 'Reference Line' or 'Placement Line', which is saved as a start point and an end point.

For Walls, the classified faces are processed as follows:

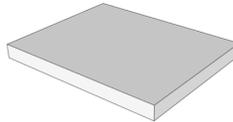
- 'Top' faces are assigned to **Top Surface Area**
  - 'Bottom' faces are assigned to **Bottom Surface Area**
  - 'Side' faces which are parallel to the Reference Line are assigned to **Side Surface Area**
- AND
- the 'Side' face that is nearest to the Reference Line is assigned to **Net Reference Side Surface Area**
  - the 'Side' face that is farthest from the Reference Line is assigned to **Net Opposite Reference Side Surface Area**



- 'Side' faces that are not parallel to the Reference Line are assigned to **Ends Surface Area**
- Window openings are found by looking for 'loops within loops'. Any loop that matches this definition is considered 'Opening' and will be used to calculate **Opening Surface Area**.
- Door openings are found by looking for points in a side surface that go 'straight up' then horizontal. If this condition is found, an opening polygon is created and calculated.

**For Slabs**, the classified faces are processed as follows:

- 'Top' faces are assigned to **Net Top Surface Area**
- 'Bottom' faces are assigned to **Net Bottom Surface Area**
- 'Side' faces are assigned to **Edge Surface Area**
- 'Internal Loops' are used to calculate **Hole Surface Area**
- 'Top' faces are used to calculate **Edge Perimeter**



**For Columns**, the classified faces are processed as follows:

- 'Top' faces are assigned to **Top Surface Area**
- 'Bottom' faces are assigned to **Bottom Surface Area**
- 'Side' faces are assigned to **Vertical Surface Area**



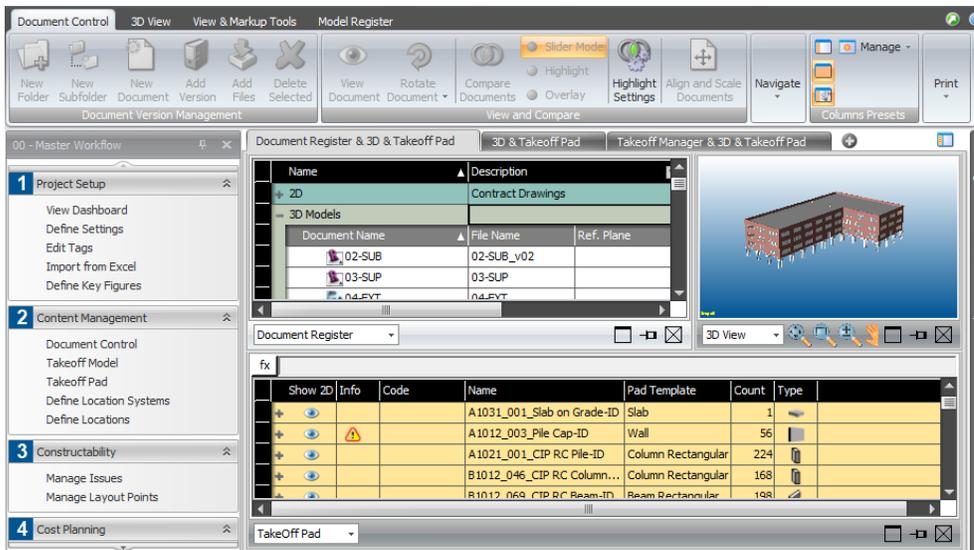
## 27 Exercise: Creating Takeoff Items

Occasionally some Takeoff Items are not defined and they must be created. What makes it necessary to create a new Takeoff Item?

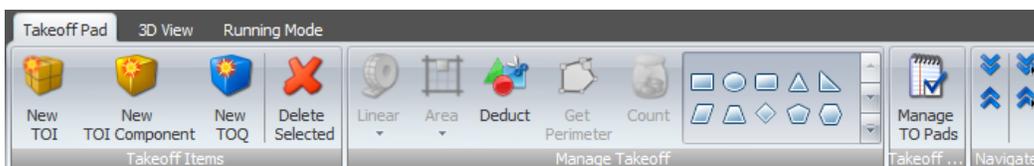
- Differences between similar Takeoff Items (Slab-Roof)
- There is no element belonging to the Takeoff Item but we have to count it in the Cost Plan (like inspections)

After receiving the initial 2D design drawings, you will review the Takeoff Items. In this exercise you will manually create a room Takeoff Item using the Takeoff Pad.

1. On the left navigation pane, select **Content Management | Takeoff Pad**.
2. The Takeoff Pad viewset displays the Document Register, 3D View and Takeoff Pad, which includes Takeoff Items generated during the model activation.

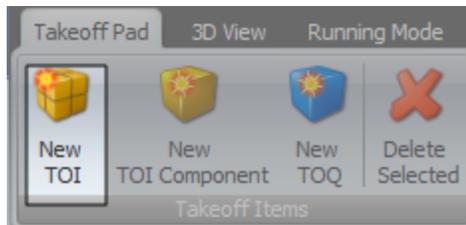


3. To **add a new Takeoff Item**, place your cursor on the first row in the Takeoff Pad register. This will enable the Takeoff Pad tab on the Ribbon and position the new item at the top of the existing items displayed.



- ✓ **Tip**  
Click on a column heading to sort rows by that attribute.

4. Select the **New TOI** button on the Ribbon. Optionally, you can also right click and choose Add New Takeoff Item.



### New Room Takeoff Item

5. In **Code**, leave blank.
6. In **Name**, type: *R1010\_001\_Room*.
7. In **Pad Template**, select: *Room*.

#### Note

- Newly created TOIs/PADs are titled 'Manual' by default. Each new pad that is added thereafter will be indexed by number (i.e.: Manual [1], Manual [2], etc.).
- The Count column is the default TOQ applied after creating user defined pads.
- A message is displayed with each new pad created letting you know that you've created a new item that will be managed separately from all other pads.
- Changing the Pad Template value from Manual to another value will modify the available Takeoff Quantities displayed in the Takeoff Component. For example, the Manual Pad Template will only display the Count TOQ initially. The Roof Pad Template will include Perimeter, Count, Surface Area, Net Volume, etc TOQs for you to populate.

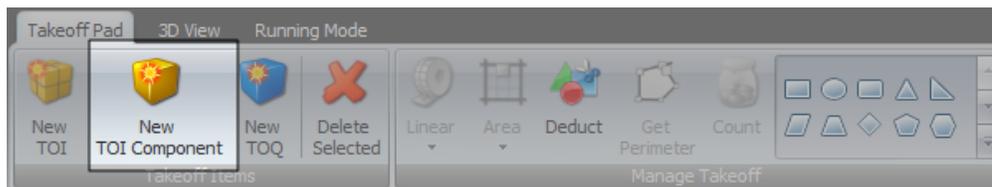
8. In the **Type** cell, confirm: *Room* is selected.

## 28 Creating Takeoff Components

Now that you've created your Takeoff Item, you want to create a Takeoff Component to define the TOQ detail. In this exercise, you will create two Room Takeoff Components for each zone of the building and use the Count feature to record the number of rooms from the latest design.

You will then continue by viewing the 2D Architectural drawing of the 3rd floor to complete an onscreen takeoff of the room measurements.

1. With your cursor in the new Rooms TOI row, **add a new Takeoff Component** to your Takeoff Item by selecting the **New TOI Component button** on the Ribbon.



2. In **Code**, leave the default system assigned code.
3. In **Description**, leave the default system assigned description.
4. In **Location**, double click in the project cell. Then, click on the ellipse, which becomes visible in the Location cell, to access the **Select Location** dialog box.
5. Assign the **3rd Floor Zone A** location by checking the corresponding box.
6. Click **OK**.
7. Leave the remaining columns with their default values for now.

### Tip

Configure the Graphic Settings to apply specific colors and patterns to Linear and Area takeoff.



- Double click in the Graphic cell to enable the ellipse.
- Click on the ellipse to configure the graphic settings.

8. With your cursor in the new Rooms TOI row, **add a new Takeoff Component** to your Takeoff Item by selecting the **New TOI Component button** on the Ribbon.
9. In **Code**, leave the default system assigned code.
10. In **Description**, leave the default system assigned description.
11. In **Location**, click twice to access the **Select Location** dialog box.
12. Assign the **3rd Floor Zone B** location.
13. Click **OK**.
14. Leave the remaining columns with their default values for now.

## 29 Exercise: Creating Takeoff Quantities from the Takeoff Pad

There are several methods for completing an onscreen takeoff using the Takeoff Pad.

- Linear
- Area
- Get Perimeter
- Count
- User Defined

**Linear** takeoff extracts distance information between two or various points within the program. A linear takeoff can be applied by the Snap Points, Pick Lines or the Get Perimeter options.

**Area** takeoff extracts the measurement of a specific region by allowing users to apply a shape to the takeoff item.

Linear values can also be extracted from the perimeter of shapes that are created using the Area Takeoff tool. The **Get Perimeter** option is used for these Takeoffs.

**Count** takeoff includes unit-based quantities derived from drawings or models.

Use the **New TOQ** button on the Ribbon to add **user defined TOQs**.

### Important

The Linear, Area, Get Perimeter and Count buttons are enabled on the Ribbon by either the TOQ **unit of measure** value or by the **Takeoff Pad Template** or **Takeoff Item type**.

For example, creating a Slab Takeoff Item will expose the Edge Perimeter TOQ. Clicking in the Edge Perimeter TOQ cell will enable the Linear and Get Perimeter buttons on the Ribbon.



Unit of measure examples include:

- Select 'SQ FT' or 'M2' if the component is intended to be an Area-based takeoff.
- Select 'FT' or 'M' if the component is intended to be a Length-based takeoff.
- Select 'EA' if the component is intended to be a Count-based takeoff.

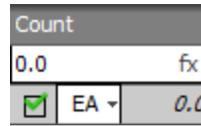
### Working with the Count Quantity Type

1. On the **Document Register** view, select the **Arch.03.Page 1.pdf** row. This is the contract drawing for the 3rd floor of the building.
2. Click the **View Document** button on the Ribbon.

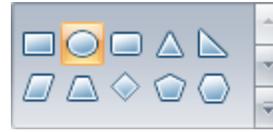
#### Note

When using the onscreen takeoff tools on a 2D drawing, **scale** the drawing to size first. Refer to the Online Help for more information about working with Reference Planes and the Align & Scale feature.





3. **Left click** your cursor in the **Count** cell for the **Zone A Room** TOQ row.



4. On the Ribbon, click on the **circle symbol** then click on the



**Count** button.

5. Move your cursor over the model to place the symbol on each room. **Click** on each room in Zone A (the west side of the building) to increase the Count TOQ value.
6. Hit the **Escape** key on your keyboard to return your cursor to the default select mode.
7. The Count quantity value has now increased.
8. Repeat steps 3 through 5 for the **Zone B Room** TOQ row.

- ✓ **Tip** To remove a measurement or value from a cell, enter 0.

## Working with the Linear and Area Quantity Types

### Snap Points

This exercise will enter the **Floor Surface Area TOQ** for the Zone A Room Takeoff Component.

1. In the **3D** view, confirm the **Arch.03.Page 1.pdf** 3rd Floor drawing is displayed.
2. Use the 3D navigation tools to zoom and position the drawing so you can see the rooms on the west side of the building.
3. Click in the **Floor Surface Area** cell on the TOQ row.
4. Click on the **Area** button drop down list on the Ribbon and select **Snap Points**.
5. In the **3D view**, **click** on each corner of a room.
6. Click **Enter**.
7. The measurement is calculated in the TOQ.

### Pick Lines

This exercise will enter the **Edge Length** for a Room.

1. Confirm that the 3rd Floor drawing **Arch.03.Page 1.pdf** is displayed in the 3D View.
2. Use the 3D navigation tools to zoom and position the drawing so you can see each corner of a room.
3. Click in the **Edge Length** cell on the TOQ row.
4. Click on the **Linear** button drop down list on the Ribbon and select **Pick Lines**.

5. In the 3D View, place your cursor over one side of the room until a poly line is highlighted.
6. Left click on the **line** along the room.
7. Click **Enter**.
8. The Length measurement is calculated in the TOQ.
9. Reactivate the Manual Takeoff model from the Document Register to assign the quantities to locations.

## 30 Exercise: Creating Takeoff Items from Takeoff Manager

This exercise will demonstrate how to create a Takeoff Item and generate the Takeoff Quantity. This is an alternate method for creating model based Takeoff Quantities in addition to or instead of the Takeoff Pad.

1. On the Master Workflow, navigate to **Content Management | Takeoff Model**.
2. Add a new Takeoff Item by selecting the **New TOI button** on the Ribbon. You can also just type the Takeoff Item name into an empty cell.
3. In **Name**, type: *Roof*
4. Click in the **Type** cell and select **Roof** from the drop down list.
5. Add a new Takeoff Quantity by selecting the **New TOQ button** on the Ribbon.
6. In **Name**, type: *Opening*
7. In **Unit**, select: *SF*
8. In **Project**, type: *2,000*

### Note

Takeoff items that have not been quantified will have the CAD quantities (Basic Quantities) from the published models. Using Vico Office to quantify Takeoff items involve a more sophisticated process that includes Vico algorithm and locations.



Takeoff items that have not been quantified by Vico Office appear italicized in Takeoff Manager.

## 31 Exercise: Quantifying Takeoff Items

The **Takeoff Item (TOI) Builder**, which is available from the ribbon on the Takeoff Manager module, is designed to give you the flexibility to group your Takeoff items after the model has been activated. Once you have grouped your Takeoff items, you can quantify them.

Once takeoff items have been quantified, the Premium Quantities include additional TOI components. Vico Office offers various options in which to quantify your Takeoff items:

**Quantify All:** Quantifies all the Takeoff items in your list. This process may take some time depending on the number of Takeoff items.

**Quantify by Element Type:** Quantifies only the Takeoff items with the selected element type, such as Beams, Curtain Walls, Columns, Ducts and more.

**Quantify Selected:** Quantifies only the Takeoff items that are selected. Use CTRL+click to multi-select.

**Update Quantities:** Quantifies out-of-date takeoff items.

### Note

If you decide not to use Vico's premium quantities, you can 'switch back' to CAD quantities by 'Dequantifying' a Takeoff item. Right click on the Takeoff Item and select **Dequantify**.



Vico provides you with the ability to manage the level of granularity for your Takeoff items. Detailed Takeoff items can be merged into a selected Takeoff item, into a new item, or into an existing item.

This exercise will demonstrate how to quantify Takeoff Items.

1. On the Master Workflow, navigate to **Content Management | Takeoff Model**.
2. Select the **Roof** takeoff Item.
3. Click the **Quantify Selected** button on the ribbon.

### Note

Takeoff items that have not been quantified will have the CAD quantities (Basic Quantities) from the published models. Using Vico Office to quantify Takeoff items involves a more sophisticated process that includes Vico algorithm and locations.



Takeoff items that have not been quantified by Vico Office appear italicized in Takeoff Manager.

## 32 Checking Takeoff Items

After reviewing the content of a Takeoff Item by selecting it, checking the highlighted elements and/or isolating included elements, changes may be required due to incorrect naming of the element in the authoring BIM/CAD application.

**Elements** can be re-assigned to other Takeoff Items using the **'paint'** tool.

- Select the Takeoff Item then select Painting Mode.
- When you hover your cursor over the 3D View, your cursor will change to a paint brush.
- Click on the element in the 3D View with the paint brush to assign the selected Takeoff Item.
- Click the Escape key on your keyboard to return your cursor to select mode.

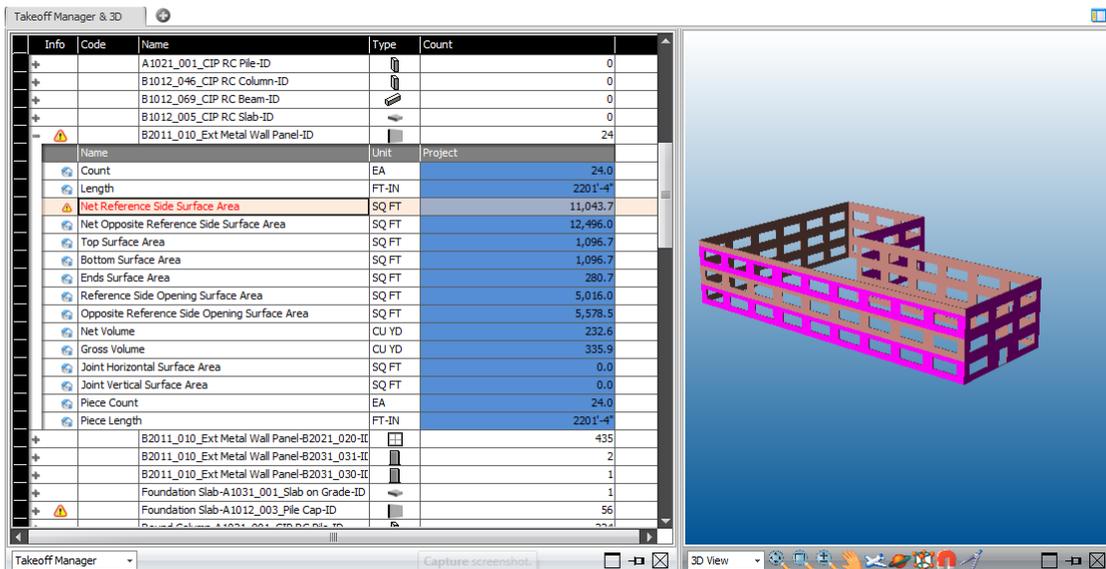
Takeoff Items have a **default element type**, which matches the type of the first element that is assigned to the Takeoff Item. This element type can be changed – resulting in a different (and maybe more fitting) set of Takeoff Quantities – by clicking the element type dropdown button.

|  | Code     | Description               | Type  |
|--|----------|---------------------------|-------|
|  | Quantity | Unit                      | Value |
|  |          | Double-Flush-72" x 82"-20 | (1)   |
|  |          | Double-Flush-72" x 82"-19 | (1)   |
|  |          | Double-Flush-72" x 82"-18 | (1)   |
|  |          | Double-Flush-72" x 82"-17 | (1)   |
|  |          | Curtain-Vertical grid 2   | (8)   |
|  |          | Curtain-Vertical grid 1   | (1)   |

## 33 Exercise: Checking Element Assignments

In the following exercise, you will check an element assignment using the isolate feature and assign missing Takeoff Quantities using the Painting Mode feature.

1. Navigate to the **Takeoff Model** view.
2. Select the **Roof** takeoff item row.
3. In the 3D View, use the **Orbit tool** to position the building so you can clearly see the roof from a bird's eye view.
4. Click on the 3D View tab on the Ribbon and select the **Painting Mode** button.
5. In the 3D View, place your cursor over one zone of the **roof** until it is outlined with a white line. Click on both zones on the roof.
6. Note the Takeoff Quantity has been updated.
7. To check the next item, select the **B2011\_010\_Ext Metal Wall Panel-ID** row.
8. Note the yellow triangle with an exclamation mark in the Info column indicating an issue with this element. Place your cursor over this icon which indicates this element contains missing quantities.
9. Note the parapet and second floor exterior metal wall panel are highlighted a different color in the model.

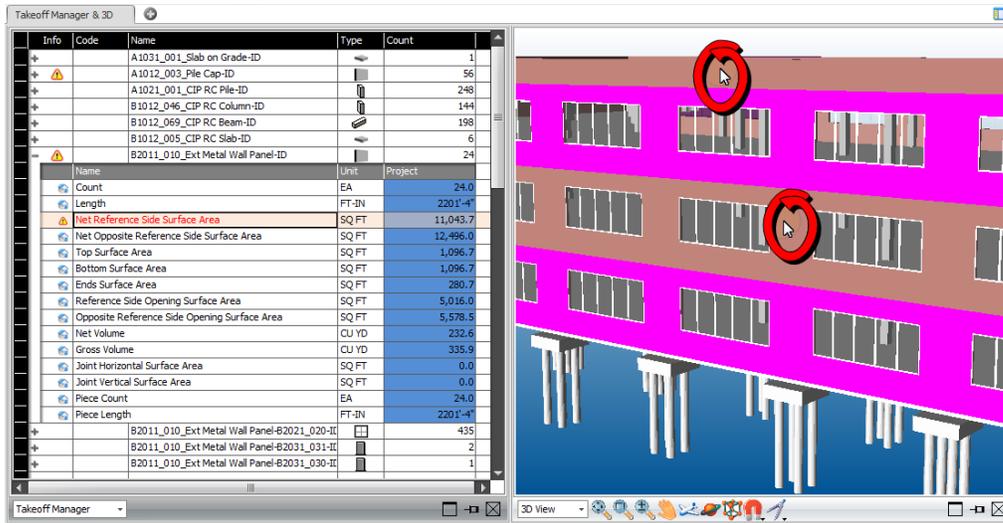


10. In the 3D View, **zoom in** to clearly see the wall detail on the model.

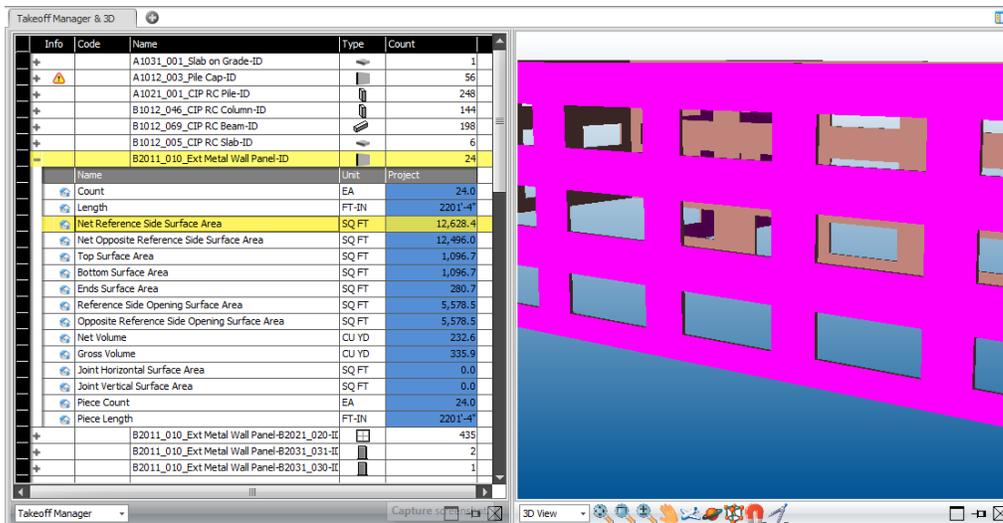
### Important



It is important to be able to view and select the exact element on the model when using the Painting Mode. Using the zoom tool will assist in accurately selecting the desired element.



11. In the Takeoff Manager tab, select the **Isolate** button. The exterior wall is displayed in the 3D View.
12. Click on the 3D View tab on the Ribbon and select the **Painting Mode** button.
13. In the 3D View, place your cursor over the **second floor wall** until it is outlined with a white line. Click on the second floor exterior wall.
14. In the 3D View, place your cursor over the **parapet** until it is outlined with a white line. Click on the parapet.



15. Note that the TOQ value is now increased to include the measurement for the parapet and second floor which were previously missing from the model takeoff quantity.
16. The element is now assigned to the selected Takeoff Item and will be highlighted in a yellow color.

### Note



Once an item is assigned to the takeoff item you can click the 3D item with the paint brush to un-assign the item.

## 34 Takeoff Quantities Analysis

Takeoff Manager calculates quantities by analyzing the geometry that was published and/or imported from BIM project files. Two types of geometry analysis are performed during model activation:

- surface areas
- volumes

**Surface Area** geometry analysis is performed by determining the 'normal vector' direction of each surface in an element.

For example, if the normal vector's direction is 'up', the surface is considered a 'top surface area' and classified as such; if the normal vector's direction is 'down', the surface is considered a 'bottom surface area' and also classified as such.

All surfaces classified as 'top surface area' of all elements in a Takeoff Item are collected and summed to calculate the total number for 'top surface area' of a Takeoff Item.

**Volume** analysis is performed by combining the faces of an element so that a solid element can be derived. The solid element is then used to calculate the 'volume' quantities for each element.

Sometimes, elements have a shape that cannot be processed 100% accurately by the Vico Office calculation algorithms.

In this case, Takeoff Quantities may be missing for one or more elements in a Takeoff Item. Missing surface area quantities can be corrected manually, using the Takeoff Quantity Painting tool.

|  |                                     | Curtain-Vertical grid 1 | (1)          |
|--|-------------------------------------|-------------------------|--------------|
|  | Number of elements                  |                         | 1.00         |
|  | Height                              | fractional foot ...     | 46'-3 1/8"   |
|  | Length                              | fractional foot ...     | 53'-1 51/... |
|  | Gross surface area on reference ... | square foot             | 0.02         |
|  | Gross surface area on opposite o... | square foot             | 0.02         |
|  | Net surface area at top             | square foot             | 11.72        |
|  | Net surface area at bottom          | square foot             | 11.81        |
|  | Surface area of both wall ends      | square foot             | 55.69        |
|  | Surface area of openings on refe... | square foot             | 0.07         |
|  | Surface area of openings on opp...  | square foot             | 0.07         |

Use the paint feature to locate missing quantities after reviewing takeoff quantity geometry assignments.

## 35 Identifying Defects in Takeoff Items and Quantities

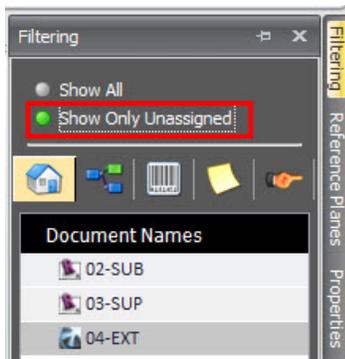
The difference between Isolating model elements and creating Filters is that Filter settings remain in effect until the end user selects a different option. The Isolate option is useful for isolating Takeoff Items, while the Filtering option is good for isolating single elements. Use the Filtering feature to fix identified defects in the Takeoff Items and the Takeoff Quantities.

Typical problems that usually arise with Takeoff Items and Takeoff Quantities include unassigned elements, missing quantities, elements assigned to the wrong TOI group and incorrect element types.

### Unassigned elements:

This could happen if you activate a model without checking any properties or some elements do not have a property that you used for Takeoff Item creation. This means there are elements in the model that do not belong to any Takeoff Item.

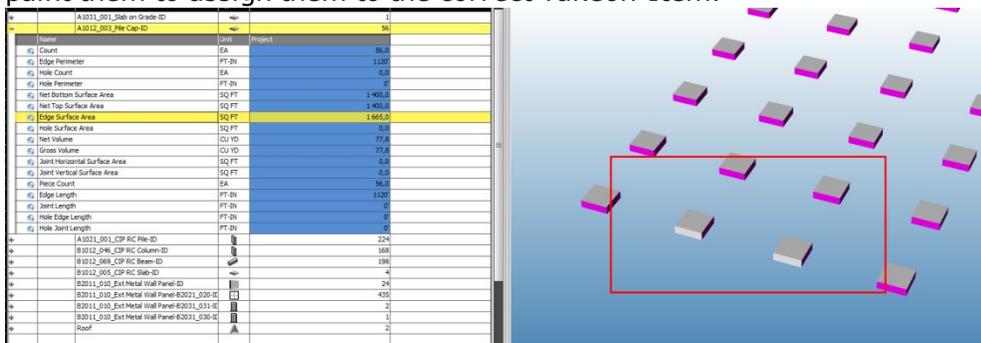
In this case you can use the Filtering Panel to find the unassigned elements easily.



### Missing quantity:

This could happen when the geometry is broken and Vico can't run its calculations.

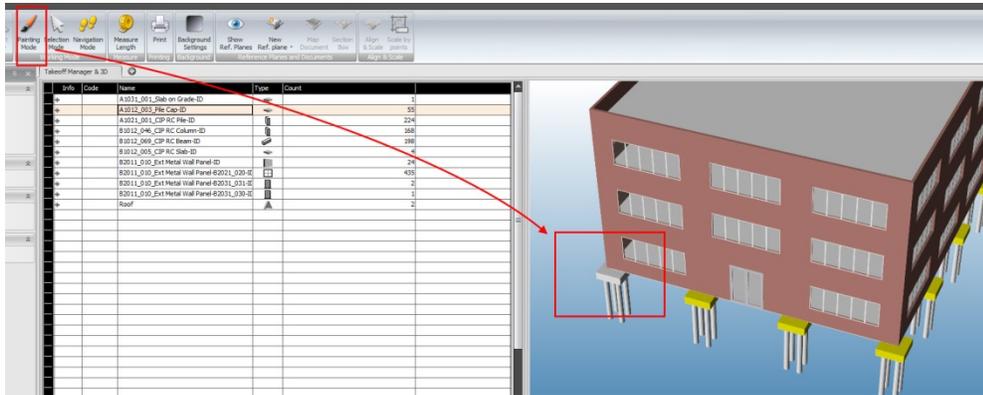
For example, one or more sides of the geometry may belong to another Takeoff Item or simply is missing. In this case you have to find these quantities using the Filtering Palette, and paint them to the correct Takeoff Item.



### Elements assigned to the wrong TOI group:

This could happen when modelers pick the wrong family type in Revit or wrong layer in ArchiCAD.

On the picture below you can see a pile cap that does not belong to the right Takeoff Item. You can find these elements using the Filter Palette for each Takeoff Item one by one. If you find a defect the only thing to do is to select the right Takeoff Item from the list and paint the problematic element in the Model.



**Wrong element type:**

This happens when there was a wrong modeling tool used in the modeling application. In this case you only have to change the element type.

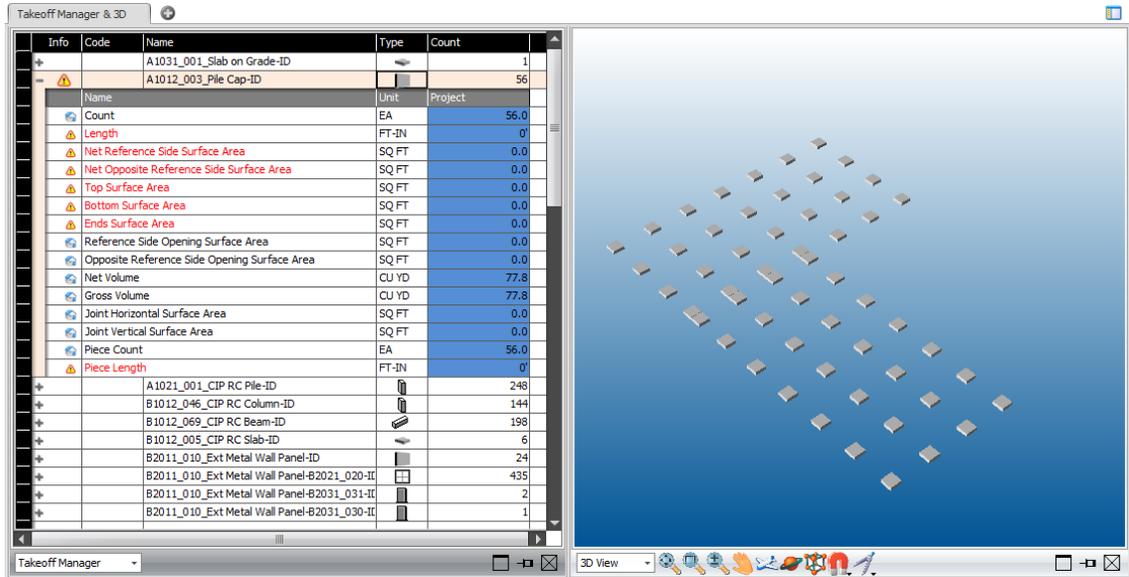
On the picture below you can see the Pile Cap with Wall element type. The pile caps were modeled with floor tool and do not have a reference line which is used for length calculation.

| Info | Code      | Name   | Type  | Count   |
|------|-----------|--|-------|---------|
|      | A1012_003 | Pile Cap-ID                                  | Wall  | 56      |
|      |           | Name   | List  | Project |
|      |           | Count  | EA    | 56.0    |
|      |           | Length                                       | FT-IN | 0       |
|      |           | Net Reference Side Surface Area              | SQ FT | 0.0     |
|      |           | Net Opposite Reference Side Surface Area     | SQ FT | 0.0     |
|      |           | Top Surface Area                             | SQ FT | 0.0     |
|      |           | Bottom Surface Area                          | SQ FT | 0.0     |
|      |           | Ends Surface Area                            | SQ FT | 0.0     |
|      |           | Reference Side Opening Surface Area          | SQ FT | 0.0     |
|      |           | Opposite Reference Side Opening Surface Area | SQ FT | 0.0     |
|      |           | Net Volume                                   | CU YD | 77.8    |
|      |           | Gross Volume                                 | CU YD | 77.8    |
|      |           | Joint Horizontal Surface Area                | SQ FT | 0.0     |
|      |           | Joint Vertical Surface Area                  | SQ FT | 0.0     |
|      |           | Piece Count                                  | EA    | 56.0    |
|      |           | Piece Length                                 | FT-IN | 0       |
|      | A1021_001 | CIP R/C Pile-ID                              |       | 248     |
|      | A1031_001 | Slab on Grade-ID                             |       | 1       |

## 36 Exercise: Correct Takeoff Item Element Type

In this exercise you will reassign the Pile Cap element type.

1. In the **Takeoff Manager** view, navigate to the **A1012\_003\_Pile Cap-ID** row.
2. In the Takeoff Manager Info column, note the yellow triangle with an exclamation mark indicating an issue with this element.



| Info | Code  | Name   | Type  | Count   |
|------|---|--|-------|---------|
|      | A1031_001_Slab on Grade-ID                  |  |       | 1       |
| ⚠    | A1012_003_Pile Cap-ID                       |  | Wall  | 56      |
|      |   | Name   | Unit  | Project |
|      |   | Count  | EA    | 56.0    |
|      |   | Length                                       | FT-IN | 0'      |
|      |   | Net Reference Side Surface Area              | SQ FT | 0.0     |
|      |   | Net Opposite Reference Side Surface Area     | SQ FT | 0.0     |
|      |   | Top Surface Area                             | SQ FT | 0.0     |
|      |   | Bottom Surface Area                          | SQ FT | 0.0     |
|      |   | Ends Surface Area                            | SQ FT | 0.0     |
|      |   | Reference Side Opening Surface Area          | SQ FT | 0.0     |
|      |   | Opposite Reference Side Opening Surface Area | SQ FT | 0.0     |
|      |   | Net Volume                                   | CU YD | 77.8    |
|      |   | Gross Volume                                 | CU YD | 77.8    |
|      |   | Joint Horizontal Surface Area                | SQ FT | 0.0     |
|      |   | Joint Vertical Surface Area                  | SQ FT | 0.0     |
|      |   | Piece Count                                  | EA    | 56.0    |
|      |   | Piece Length                                 | FT-IN | 0'      |
|      | A1021_001_CIP RC Pile-ID                    |  |       | 248     |
|      | B1012_046_CIP RC Column-ID                  |  |       | 144     |
|      | B1012_069_CIP RC Beam-ID                    |  |       | 198     |
|      | B1012_005_CIP RC Slab-ID                    |  |       | 6       |
|      | B2011_010_Ext Metal Wall Panel-ID           |  |       | 24      |
|      | B2011_010_Ext Metal Wall Panel-B2021_020-II |  |       | 435     |
|      | B2011_010_Ext Metal Wall Panel-B2031_031-II |  |       | 2       |
|      | B2011_010_Ext Metal Wall Panel-B2031_030-II |  |       | 1       |

3. Hover your cursor over the **Type** cell.
4. Note this element is mistakenly assigned to the Wall type.
5. Click in the **Type** cell and select **Column Rectangular** from the drop down list.
6. The Info column no longer displays the yellow triangle with an exclamation point indicating this element issue has been resolved.

## 37 Review Questions

1. What is a Takeoff Item?
2. What is a Takeoff Quantity?
3. Why would you change an element type of a TOI?
4. What does it mean when you see an exclamation mark next to the TOI name?
5. When would you create a new TOI manually?
6. What are the two levels you can use painting feature on?

# Planning Cost

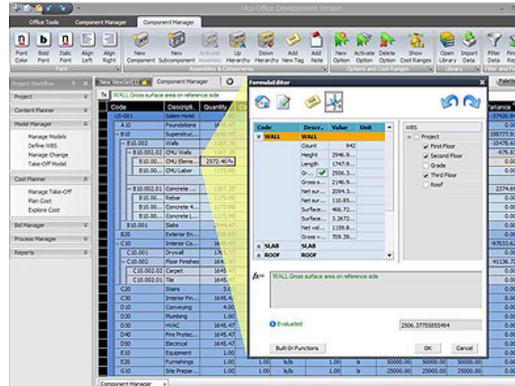


## 38 Cost Planning Overview

Planning Cost is typically an evolutionary process, in which more specific and more accurate cost information is added throughout the design and pre-construction phases, to replace assumptions that were made in the initiation and early design phases.

The Plan Cost view supports this process and provides continuous cost feedback throughout all project phases. You can start with a costing scheme at the business development phase, and gradually increase granularity as more specific data and accurate quantities become available from the 3D BIM model or manually entered quantities.

The Cost Planner concept and unique structure allow you to build a 'living cost estimate,' which is key to helping you make information-driven decisions that keep the budget on track.



### Business Value



- Constant **Value Engineering**
- Achieve **higher quality** design when using the Explore Cost View to analyze project cost variances
- **Reduce** wasted efforts by comparing cost plan versions against a defined budget target in a visual format
- **Proactive** project management instead of reactive

### Training Objectives

Upon completion of this **General Introduction - Planning Cost** module, you will be able to:

- Manually create a cost plan
- Understand how to transition from a non-model based estimate to a model based estimate
- Understand the concept of evolving estimates
- Compare cost plan versions
- Use Vico Office Cost Explorer

## 39 Cost Planner View

The **Explore Cost** view contains an n-tiered 3D spreadsheet; a graphic scheme which emphasizes the hierarchical structure of the cost estimate.

| Code        | Description                    | Sourc..  | Consump.. | Waste/Fa.. | Quantity | Unit | Unit Cost    | Total Price    |
|-------------|--------------------------------|----------|-----------|------------|----------|------|--------------|----------------|
| 002         | Vico Office Help Example       | 1.0      | 1.0       | 1.0        | 1.0      |      | 1,055,748.78 | ▲ 1,055,748.78 |
| └ A         | SUBSTRUCTURE                   | 1.0      | 1.0       | 1.0        | 1.0      | LS   | 255,748.78   | ▲ 255,748.78   |
| └ A10       | FOUNDATIONS                    | 1.0      | 1.0       | 1.0        | 1.0      | LS   | 255,748.78   | ▲ 255,748.78   |
| └ B         | SHELL                          | 1.0      | 1.0       | 1.0        | 1.0      | LS   | 600,000.00   | ▼ 600,000.00   |
| └ B10       | SUPERSTRUCTURE                 | 1.0      | 1.0       | 1.0        | 1.0      | LS   | 600,000.00   | 600,000.00     |
| └ B1011_001 | Slab on Deck-ID                | 87,627.6 | 1.0       | 1.0        | 87,627.6 | SF   | 6.00         | 525,765.46     |
| └ B1012_003 | Reinforced Concrete Topping-ID | 161.4    | 1.0       | 1.0        | 161.4    | SF   | 800.00       | 129,103.45     |
| └ B1012_004 | Equipment Pad-ID               | 1,236.9  | 1.0       | 1.0        | 1,236.9  | SF   | 12.00        | 14,842.56      |
| └ B1012_015 | Built-up Concrete Slab-ID      | 2,141.2  | 1.0       | 1.0        | 2,141.2  | SF   | 18.00        | 38,540.91      |
| └ B1012_025 | CIP RC Wall-ID                 | 280.5    | 1.0       | 1.0        | 280.5    | SF   | 30.00        | 8,415.94       |
| └ B1012_052 | Steel Column W-ID              | 3,585.8  | 1.0       | 1.0        | 3,585.8  | FT   | 1.00         | 3,585.79       |
| └ B1012_062 | Steel Column HSS-ID            | 1,793.5  | 1.0       | 1.0        | 1,793.5  | FT   | 0.05         | 89.68          |
| └ B1012_078 | Steel Beam W-ID                | 14,351.8 | 1.0       | 1.0        | 14,351.8 | LF   | 0.05         | 717.59         |
| └ B1012_082 | Steel Beam C-ID                | 10.8     | 1.0       | 1.0        | 10.8     | LF   | 0.15         | 1.61           |
| └ B1012_083 | Steel Beam MC-ID               | 69.6     | 1.0       | 1.0        | 69.6     | LF   | 0.05         | 3.48           |

Every line item can be further refined to gradually develop your cost plan from a basic abstract level to a highly-detailed cost estimate.

You can use the Explore Cost view in three ways:

1. As a spreadsheet, by manually entering quantity and cost information in place;
2. With manually entered location based quantity takeoff, using a Formula in your cost line items;
3. With model-based quantity takeoff, using quantities extracted from your BIM files as input for your cost line items.

The three supported cost planning techniques can be combined as desired.



### Note

Cost planner through the manual input feature could serve as a stand alone budget creation tool. A project BIM deliverable is not required to use Vico cost planner.

## 40 Components and Assemblies

**Components and Assemblies** are important elements of the **Cost Planner** user interface.

### Note

**Components** are cost line items.

- These cost line items represent parts of a construction project that can be priced or allowances for construction project parts that are not defined in enough detail in the project documentation.
- Components are always included in an Assembly.
- Components have attributes, which are defined as a Tags.

**Assemblies** represent a collection of Components.



- Assemblies are a container for a group of components that contain more detailed cost information.
- Component prices are rolled up into the Assembly line item price once a component is activated.
- The sum of the cost of the included Components is calculated and presented at the Assembly level. By including sub Components in an existing Component and subsequently turning it into an Assembly, the Level of Detail (LOD) of the estimate, and thus the accuracy level of the estimate, increases.

- **Component:** line items that are actively contributing to the calculation of cost in the project

| Code | Description | Source .. | UOM | Unit Cost | Net Total    |
|------|-------------|-----------|-----|-----------|--------------|
| 000  | Project     | 1,000.0   | SF  | 1,000.00  | 1,000,000.00 |
| B    | Shell       | 1,000.0   | SF  | 1,000.00  | 1,000,000.00 |

| Code | Description    | Source .. | UOM | Unit Cost | Net Total    |
|------|----------------|-----------|-----|-----------|--------------|
| 000  | Project        | 1,000.0   | SF  | 1,000.00  | 1,000,000.00 |
| B    | Shell          | 1,000.0   | SF  | 1,000.00  | 1,000,000.00 |
| B10  | Superstructure | 1,000.0   | SF  | 450.00    | 450,000.00   |
| B20  | Exterior       | 1,000.0   | SF  | 650.00    | 650,000.00   |

- **Subcomponent:** non-active cost line items, not contributing to the project cost.

| Code | Description    | Source .. | UOM | Unit Cost | Net Total    |
|------|----------------|-----------|-----|-----------|--------------|
| 000  | Project        | 1,000.0   | SF  | 1,100.00  | 1,100,000.00 |
| B    | Shell          | 1,000.0   | SF  | 1,100.00  | 1,100,000.00 |
| B10  | Superstructure | 1,000.0   | SF  | 450.00    | 450,000.00   |
| B20  | Exterior       | 1,000.0   | SF  | 650.00    | 650,000.00   |

- **Assembly:** activated container for a group of components.

| Code  | Description        | Source .. | UOM | Unit Cost | Net Total    |
|-------|--------------------|-----------|-----|-----------|--------------|
| 000   | Project            | 1,000.0   | SF  | 1,150.00  | 1,150,000.00 |
| B     | Shell              | 1,000.0   | SF  | 1,150.00  | 1,150,000.00 |
| B10   | Superstructure     | 1,000.0   | SF  | 500.00    | 500,000.00   |
| B1010 | Floor Construction | 1,000.0   | SF  | 500.00    | 500,000.00   |
| B20   | Exterior           | 1,000.0   | SF  | 650.00    | 650,000.00   |
| B2010 | Ext Walls          | 1,000.0   | SF  | 400.00    | 400,000.00   |
| B2020 | Ext Windows        | 1,000.0   | SF  | 600.00    | 600,000.00   |

Cost Planner supports the concept of the **evolving estimate**: the idea that the cost plan becomes more detailed and accurate throughout the design and pre-construction phases, as a result of design and construction planning decisions that allow the cost planner to add more specific cost information to the project.

Cost Planner supports this by allowing you to add **sub-Components to Components** and **activate** these when the collection of sub-Components matches the scope of the Component.



At this point, the sub-Components can be activated, which then turns the Component into an Assembly and the sub-Components into Components.



### Key Cost Plan Definitions

|                        |  |
|------------------------|--|
| <b>Source</b>          | A number entered manually in the Cost Plan or a formula that refers to a Takeoff Item.   |
| <b>Quantity</b>        | Multiplication factor relative to the Source Qty to define an actual quantity. For example, number of tons per CY of concrete or labor hours per unit.   |
| <b>Consumption</b>     | The amount of a component required to install a certain element. This column is mainly used to calculate labor (per HR price) and to define production rates for scheduling purposes. For example, how many hours do you need to install a certain amount of work like pouring concrete. |
| <b>Consumption Inv</b> | Inverse of the consumption column. Generally used for labor when the production rate of a material is high and it is easier to calculate units per hour rather than hours per unit. The program will rely on the most recently entered value to calculate the final quantity.            |
| <b>Waste/Factor</b>    | Unwanted material produced directly or incidentally by the construction project component.<br>Example: Building materials such as insulation, nails, electrical wiring, and rebar.   |
| <b>Quantity</b>        | Calculated field. $\text{Source Quantity} \times \text{Consumption}^1 \times \text{Waste Factor} = \text{Quantity}$<br><sup>1</sup> Where Consumption is either Consumption or Inv Consumption   |
| <b>Unit Cost</b>       | Cost per unit  |
| <b>Total Price</b>     | Calculated field: $\text{Quantity} \times \text{Unit Cost}$  |

## 41 Exercise: Creating Components

In the following exercise, you have produced a high level estimate for the Substructure Pile Cap scope of work and will add a new Component to an existing Cost Plan to enter net total cost.

1. **Unpack and open** the **Cost Planning Intro** project by selecting the project row and clicking the Open Project button on the Ribbon.
2. On the left workflow panel, select **Cost Planning | Estimate**.
3. On the **Cost Planner Ribbon**, confirm you are using the standard **Cost view** by clicking on the View Controls and Layout Presets option.



The default Cost view columns are displayed in the spreadsheet view.

| Code       | Description          | Source Qty | Consumption | Waste | Qty | UOM | Unit Cost | Net Total | CostParent Assembly | %Parent Assembly |
|------------|----------------------|------------|-------------|-------|-----|-----|-----------|-----------|---------------------|------------------|
| GI-Block 2 | 6a - Hands-On - Cost | 1.0        | 1.000       | 1.000 | 1.0 |     | 35,000.00 | 35,000.00 | N/A                 | N/A              |
| + A        | SUBSTRUCTURE         | 1.0        | 1.000       | 1.000 | 1.0 | -   | 35,000.00 | 35,000.00 | 35,000.00 /         | 100.00 %         |
| + B        | SHELL                | 1.0        | 1.000       | 1.000 | 1.0 | -   | 0.00      | 0.00      | 0.00 /              | 0.00 %           |
| + D        | SERVICES             | 1.0        | 1.000       | 1.000 | 1.0 | -   | 0.00      | 0.00      | 0.00 /              | 0.00 %           |

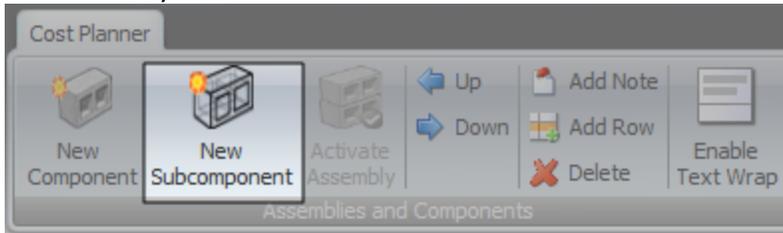
4. In the spreadsheet view, **expand** the **Substructure** row by clicking on the + sign to the left of the Code (A) .

| Code       | Description          | Source Qty | Consumption |
|------------|----------------------|------------|-------------|
| GI-Block 2 | 6a - Hands-On - Cost | 1.0        | 1.000       |
| + A        | SUBSTRUCTURE         | 1.0        | 1.000       |
| + A10      | Foundations          | 0.0        | 1.000       |
| + B        | SHELL                | 1.0        | 1.000       |
| + D        | SERVICES             | 1.0        | 1.000       |

5. Continue expanding the rows until the **A1010 Standard** line is selected.

| Code       | Description          | Source Qty | Consumption |
|------------|----------------------|------------|-------------|
| GI-Block 2 | 6a - Hands-On - Cost | 1.0        | 1.000       |
| + A        | SUBSTRUCTURE         | 1.0        | 1.000       |
| + A10      | Foundations          | 0.0        | 1.000       |
| + A1010    | Standard             | 1.0        | 1.000       |
| + A1020    | Special Foundations  | 1.0        | 1.000       |
| + A1030    | Slab on Grade        | 1.0        | 1.000       |
| + B        | SHELL                | 1.0        | 1.000       |
| + D        | SERVICES             | 1.0        | 1.000       |

- On the Ribbon, click the **New Subcomponent** button. You can also right click and insert from the keyboard.



- A blank row is displayed beneath the Standard line at a lower code level.

| Code       | Description          | Source Qty | Consumption |
|------------|----------------------|------------|-------------|
| GI-Block 2 | 6a - Hands-On - Cost | 1.0        | 1.000       |
| - A        | SUBSTRUCTURE         | 1.0        | 1.000       |
| - A10      | Foundations          | 0.0        | 1.000       |
| - A1010    | Standard             | 1.0        | 1.000       |
| [0]        | New Component        | 1.0        | 1.000       |
| - A1020    | Special Foundations  | 1.0        | 1.000       |
| + A1030    | Slab on Grade        | 1.0        | 1.000       |
| + B        | SHELL                | 1.0        | 1.000       |
| + D        | SERVICES             | 1.0        | 1.000       |

- The initial Net Total estimate for the Pile Cap-ID scope of work is \$44,000. Enter the following **Component details** to reflect this estimated cost. Note, the Net Total value does not need to be entered. It is included below so you can confirm your values were entered correctly.

| Code      | Name        | Source Quantity | UOM | Unit Cost | Net Total |
|-----------|-------------|-----------------|-----|-----------|-----------|
| A1012_003 | Pile Cap-ID | 80              | CY  | 550.00    | 44,000    |

## 42 Exercise: Creating Sub Components

This exercise assumes additional details for the Pile Cap-ID cost have been determined. You will now create subcomponents under the Substructure Pile Cap-ID Component to further refine the detailed costs in your Cost Plan.

The original high level estimate for the Pile Cap-ID scope of work was 44,000.00 . The newly received more detailed estimate indicates the actual costs are expected to be lower for 30,934.00 .

1. With the new Pile Cap-ID (A1012\_003) row selected, use the **New SubComponent** button on the Ribbon to create five new rows below the Pile Cap-ID row at the next level of detail. This represents the additional cost details received from the material estimates.

### Tip

- ✓ Use the Insert key on your keyboard as an alternate method for inserting rows.
2. Enter the following **Sub Component details**. Note: the Net Total column values do not need to be entered. It is included below so you can confirm your values were entered correctly.

| Code            | Name                      | Source Quantity | UOM | Unit Cost | Net Total        |
|-----------------|---------------------------|-----------------|-----|-----------|------------------|
| 03.05.00.060.0  | Layout Concrete           | 340             | LF  | 1.10      | 374.00           |
| 03.11.00.060.0  | Erect Forms               | 1200            | SF  | 9.40      | 11,280.00        |
| 03.11.00.061.0  | Strip Forms               | 1200            | SF  | 1.40      | 1,680.00         |
| 03.21.00.060.0  | Reinforcement Steel       | 4               | TON | 1800.00   | 7,200.00         |
| 03.31.00.060.0  | Casting Concrete in Place | 80              | CY  | 130.00    | 10,400.00        |
| <b>Subtotal</b> |                           |                 |     |           | <b>30,934.00</b> |

| Code           | Description               | Source Qty | Consumption | Waste | Qty     | UOM | Unit Cost | Net Total |
|----------------|---------------------------|------------|-------------|-------|---------|-----|-----------|-----------|
| GI-Block 2     | 6a - Hands-On - Cost      | 1.0        | 1.000       | 1.000 | 1.0     |     | 35,000.00 | 35,000.00 |
| A              | SUBSTRUCTURE              | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A10            | Foundations               | 0.0        | 1.000       | 1.000 | 0.0     | -   | 0.00      | 35,000.00 |
| A1010          | Standard                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A1012_003      | PileCap-ID                | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 550.00    | 44,000.00 |
| 03.05.00.060.0 | Layout Concrete           | 340.0      | 1.000       | 1.000 | 340.0   | LF  | 1.10      | 374.00    |
| 03.11.00.060.0 | Erect Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 9.40      | 11,280.00 |
| 03.11.00.061.0 | Strip Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 1.40      | 1,680.00  |
| 03.21.00.060.0 | Reinforcement Steel       | 4.0        | 1.000       | 1.000 | 4.0     | TON | 1,800.00  | 7,200.00  |
| 03.31.00.060.0 | Casting Concrete in Place | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 130.00    | 10,400.00 |
| A1020          | Special Foundations       | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| A1030          | Slab on Grade             | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| B              | SHELL                     | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| D              | SERVICES                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |

## 43 Updating the Cost Plan

At this point, note that the Pile Cap-ID Sub Components and Components are not included in the net total cost for the project, which is represented on the first line of the spreadsheet.

| Code              | Description                 | Source Qty | Consumption | Waste | Qty   | UOM | Unit Cost | Net Total |
|-------------------|-----------------------------|------------|-------------|-------|-------|-----|-----------|-----------|
| <b>GI-Block 2</b> | <b>6a - Hands-On - Cost</b> | 1.0        | 1.000       | 1.000 | 1.0   | 1.0 | 35,000.00 | 35,000.00 |
| <b>A</b>          | <b>SUBSTRUCTURE</b>         | 1.0        | 1.000       | 1.000 | 1.0   | -   | 35,000.00 | 35,000.00 |
| <b>A10</b>        | <b>Foundations</b>          | 0.0        | 1.000       | 1.000 | 0.0   | -   | 0.00      | 35,000.00 |
| <b>A1010</b>      | <b>Standard</b>             | 1.0        | 1.000       | 1.000 | 1.0   | -   | 35,000.00 | 35,000.00 |
| <b>A1012_003</b>  | <b>PileCap-ID</b>           | 80.0       | 1.000       | 1.000 | 80.0  | CY  | 550.00    | 44,000.00 |
| 03.05.00.060.0    | Layout Concrete             | 340.0      | 1.000       | 1.000 | 340.0 | LF  | 1.10      | 374.00    |
| 03.11.00.060.0    | Erect Forms                 | 1,200.0    | 1.000       | 1.000 |       |     | 9.40      | 11,280.00 |
| 03.11.00.061.0    | Strip Forms                 | 1,200.0    | 1.000       | 1.000 |       |     | 1.40      | 1,680.00  |
| 03.21.00.060.0    | Reinforcement Steel         | 4.0        | 1.000       | 1.000 |       |     | 1,800.00  | 7,200.00  |
| 03.31.00.060.0    | Casting Concrete in Place   | 80.0       | 1.000       | 1.000 |       |     | 130.00    | 10,400.00 |
| <b>A1020</b>      | <b>Special Foundations</b>  | 1.0        | 1.000       | 1.000 |       |     | 0.00      | 0.00      |
| <b>A1030</b>      | <b>Slab on Grade</b>        | 1.0        | 1.000       | 1.000 | 1.0   | -   | 0.00      | 0.00      |
| <b>B</b>          | <b>SHELL</b>                | 1.0        | 1.000       | 1.000 | 1.0   | -   | 0.00      | 0.00      |
| <b>D</b>          | <b>SERVICES</b>             | 1.0        | 1.000       | 1.000 | 1.0   | -   | 0.00      | 0.00      |

The Pile Cap-ID Net Total is not included in Substructure Net Total yet.

Once the estimates have been finalized and approved, Vico Office uses an activation process to update the net totals.

During the **activation** process, the following changes take place.

- Sub Components become Components
- Components become an Assembly and include the Assembly Net Total cost in the summarized net total for the project which is represented on the first line of the spreadsheet.
- Part of the conversion of a Component into an Assembly is that Unit Cost and Total Price are now calculated based on the sum of the included Components.

**Total Price of the Assembly = Sum of included active Component Price values**

**Unit Cost of the Assembly = Sum of included active Component Price values divided by the Assembly's quantity**

**Tip**

Use the row indicator icon, on the left most column, to quickly identify the active status of each component.

- All Sub Components/Assemblies are active
- One or more Components in included Sub Assemblies are inactive
- All Components in included Sub Assemblies are inactive

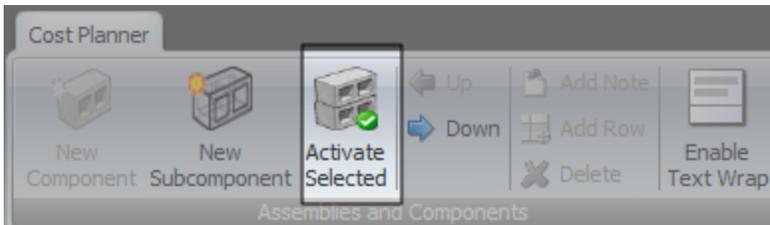
## 44 Exercise: Activating Assemblies

Once all costs have been finalized or you are ready to begin reflecting the current costs in your project cost plan, you will activate the parent level component. This will turn the existing Component into an Assembly. The Assembly Net Total will be calculated as the sum of all included Sub Components.

1. **Select** the Pile Cap-ID row (Code A1012\_003) so it is highlighted.

| Code           | Description               | Source Qty | Consumption | Waste | Qty     | UOM | Unit Cost | Net Total |
|----------------|---------------------------|------------|-------------|-------|---------|-----|-----------|-----------|
| GI-Block 2     | 6a - Hands-On - Cost      | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A              | SUBSTRUCTURE              | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A10            | Foundations               | 0.0        | 1.000       | 1.000 | 0.0     | -   | 0.00      | 35,000.00 |
| A1010          | Standard                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A1012_003      | Pile Cap-ID               | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 550.00    | 44,000.00 |
| 03.05.00.060.0 | Layout Concrete           | 340.0      | 1.000       | 1.000 | 340.0   | LF  | 1.10      | 374.00    |
| 03.11.00.060.0 | Erect Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 9.40      | 11,280.00 |
| 03.11.00.061.0 | Strip Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 1.40      | 1,680.00  |
| 03.21.00.060.0 | Reinforcement Steel       | 4.0        | 1.000       | 1.000 | 4.0     | TON | 1,800.00  | 7,200.00  |
| 03.31.00.060.0 | Casting Concrete in Place | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 130.00    | 10,400.00 |
| A1020          | Special Foundations       | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| A1030          | Slab on Grade             | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| B              | SHELL                     | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| D              | SERVICES                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |

2. Note, at this point, the Project Net Total and Substructure Net Total differences. The high level estimate for the Pile Cap-ID line item is still 44,000 because that component and its sub components are still inactive.
3. On the Ribbon, click **Activate Selected**.



4. Note the updated Net Total values. The Project and Substructure Net Totals remain the same because the Standard component is still inactive. The Pile Cap-ID assembly Net Total has been updated to reflect the lower anticipated cost. The blue arrow to the left of the Net Total amount indicates this change.

| Code           | Description               | Source Qty | Consumption | Waste | Qty     | UOM | Unit Cost | Net Total |
|----------------|---------------------------|------------|-------------|-------|---------|-----|-----------|-----------|
| GI-Block 2     | 6a - Hands-On - Cost      | 1.0        | 1.000       | 1.000 | 1.0     |     | 35,000.00 | 35,000.00 |
| A              | SUBSTRUCTURE              | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A10            | Foundations               | 0.0        | 1.000       | 1.000 | 0.0     | -   | 0.00      | 35,000.00 |
| A1010          | Standard                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A1012_003      | Pile Cap-ID               | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 386.68    | 30,934.00 |
| 03.05.00.060.0 | Layout Concrete           | 340.0      | 1.000       | 1.000 | 340.0   | LF  | 1.10      | 374.00    |
| 03.11.00.060.0 | Erect Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 9.40      | 11,280.00 |
| 03.11.00.061.0 | Strip Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 1.40      | 1,680.00  |
| 03.21.00.060.0 | Reinforcement Steel       | 4.0        | 1.000       | 1.000 | 4.0     | TON | 1,800.00  | 7,200.00  |
| 03.31.00.060.0 | Casting Concrete in Place | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 130.00    | 10,400.00 |
| A1020          | Special Foundations       | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| A1030          | Slab on Grade             | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| B              | SHELL                     | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| D              | SERVICES                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |

5. Select the Standard row (Code A1010) so it is highlighted.

| Code           | Description               | Source Qty | Consumption | Waste | Qty     | UOM | Unit Cost | Net Total |
|----------------|---------------------------|------------|-------------|-------|---------|-----|-----------|-----------|
| GI-Block 2     | 6a - Hands-On - Cost      | 1.0        | 1.000       | 1.000 | 1.0     |     | 35,000.00 | 35,000.00 |
| A              | SUBSTRUCTURE              | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A10            | Foundations               | 0.0        | 1.000       | 1.000 | 0.0     | -   | 0.00      | 35,000.00 |
| A1010          | Standard                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 35,000.00 | 35,000.00 |
| A1012_003      | Pile Cap-ID               | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 386.68    | 30,934.00 |
| 03.05.00.060.0 | Layout Concrete           | 340.0      | 1.000       | 1.000 | 340.0   | LF  | 1.10      | 374.00    |
| 03.11.00.060.0 | Erect Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 9.40      | 11,280.00 |
| 03.11.00.061.0 | Strip Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 1.40      | 1,680.00  |
| 03.21.00.060.0 | Reinforcement Steel       | 4.0        | 1.000       | 1.000 | 4.0     | TON | 1,800.00  | 7,200.00  |
| 03.31.00.060.0 | Casting Concrete in Place | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 130.00    | 10,400.00 |
| A1020          | Special Foundations       | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| A1030          | Slab on Grade             | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| B              | SHELL                     | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |
| D              | SERVICES                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |

6. On the Ribbon, click **Activate Selected**.

7. Note the updated Net Total values. The Project Net Total and Unit Cost have been updated to reflect the latest costs entered for the Substructure Pile Cap scope of work.

| Code           | Description               | Source Qty | Consumption | Waste | Qty     | UOM | Unit Cost | Net Total |
|----------------|---------------------------|------------|-------------|-------|---------|-----|-----------|-----------|
| GI-Block 2     | 6a - Hands-On - Cost      | 1.0        | 1.000       | 1.000 | 1.0     |     | 30,934.00 | 30,934.00 |
| A              | SUBSTRUCTURE              | 1.0        | 1.000       | 1.000 | 1.0     | -   | 30,934.00 | 30,934.00 |
| A10            | Foundations               | 0.0        | 1.000       | 1.000 | 0.0     | -   | 0.00      | 30,934.00 |
| A1010          | Standard                  | 1.0        | 1.000       | 1.000 | 1.0     | -   | 30,934.00 | 30,934.00 |
| A1012_003      | Pile Cap-ID               | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 386.68    | 30,934.00 |
| 03.05.00.060.0 | Layout Concrete           | 340.0      | 1.000       | 1.000 | 340.0   | LF  | 1.10      | 374.00    |
| 03.11.00.060.0 | Erect Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 9.40      | 11,280.00 |
| 03.11.00.061.0 | Strip Forms               | 1,200.0    | 1.000       | 1.000 | 1,200.0 | SF  | 1.40      | 1,680.00  |
| 03.21.00.060.0 | Reinforcement Steel       | 4.0        | 1.000       | 1.000 | 4.0     | TON | 1,800.00  | 7,200.00  |
| 03.31.00.060.0 | Casting Concrete in Place | 80.0       | 1.000       | 1.000 | 80.0    | CY  | 130.00    | 10,400.00 |
| A1020          | Special Foundations       | 1.0        | 1.000       | 1.000 | 1.0     | -   | 0.00      | 0.00      |

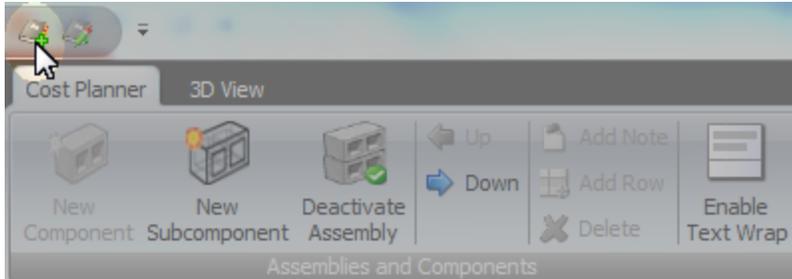
The software has applied the following business logic to the cost plan.

**Total Price of the Assembly = Sum of included active Component Price values**  
**Unit Cost of the Assembly = Sum of included active Component Price values divided by the Assembly's quantity**

## 45 Exercise: Creating Cost Plan Versions

Cost Planner lets you save versions of the Cost Plan that you are working on, which then allows you to compare the saved Cost Plan Version to earlier or later versions.

1. In the Plan Cost view, click on the Save Snapshot button located at the top left corner of the user interface.



Office presents the Save Snapshot dialog.

**Save Snapshot** \_ □ X

---

Date: 03 October 2013

User: achase

Class:

Description:

2. In **Class**, type: *v1*
3. In **Description**, type: *v1 - Cost Plan*
4. Click **OK**.
5. The created version is automatically assigned a number, which will increment every time a new Cost Plan Version is created. The description will be visible in the Version Selection in Cost Explorer.

## 46 Exercise: Linking 3D Model

In this exercise, you will use the Takeoff & Estimate view to identify takeoff items which are not included or linked.

1. Navigate to **Cost Planning | Takeoff & Estimate**.

The default Takeoff Manager, Cost Planner and 3D viewsets are displayed.

### Tip

- ✓ If this workflow item is not available for you due to licenses just create a new custom layout with two windows and select Takeoff Manager on the left and Cost Planner on the right.

### Note



If there is a constant value or Parent.Quantity in the Source Quantity cell it will be added. If there is a formula already you can replace it if you press the Shift button. You can drag and drop more TOQs at the same time. The mapped TOQs will be summarized automatically.

2. Select the **A1012\_003 Pile Cap** row in the Cost Plan.

| Source Qty |
|------------|
| 1.0        |
| 1.0 fx     |
| 1.0        |

3. Click on the Source Qty "fx" icon to launch the **Formula Editor**.
4. **Enter** the following formulas separately for each component.

| Code         | Description               | Formula                                 |
|--------------|---------------------------|---|
| A1012_003    | Pile Cap-ID               | A1012_003_Pile Cap-ID.Net Volume        |
| 03.05.00.060 | Layout Concrete           | A1012_003_Pile Cap-ID.Edge Perimeter    |
| 03.11.00.060 | Erect Forms               | A1012_003_Pile Cap-ID.Edge Surface Area |
| 03.11.00.061 | Strip Forms               | A1012_003_Pile Cap-ID.Edge Surface Area |
| 03.21.00.060 | Reinforcement Steel       | A1012_003_Pile Cap-ID.Net Volume *0.06  |
| 03.31.00.060 | Casting Concrete in Place | A1012_003_Pile Cap-ID.Net Volume        |

### Tip

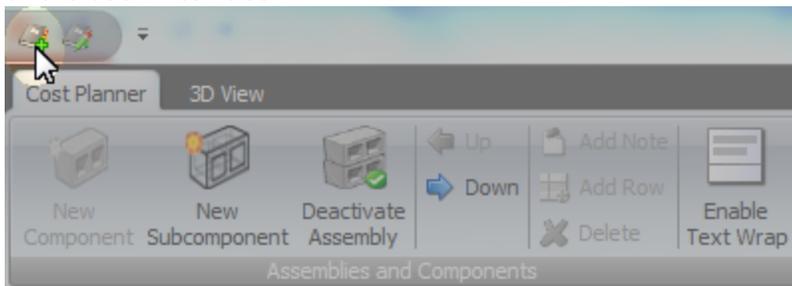
If you click on the Description/Quantity column header, the Formula Editor will sort the TOIs in alphabetical order which makes it easier to find required Takeoff Items based on their codes.



To use the same Formula on another Cost line Item, just copy it from the Formula bar and paste it into the new line item's Formula bar.

## 47 Exercise: Saving Cost Plan Version 2

1. In the **Plan Cost** view, click on the **Save Snapshot** button located at the top left corner of the user interface.



Office presents the Save Snapshot dialog.

**Save Snapshot** \_ □ X

---

Date: 03 October 2013  
 User: achase  
 Class:   
 Description:

2. In **Class**, type: v2
3. In **Description**, type: v2 - Cost Plan
4. Click **OK**.

## 48 Exercise: Generating Cost Plan Reports

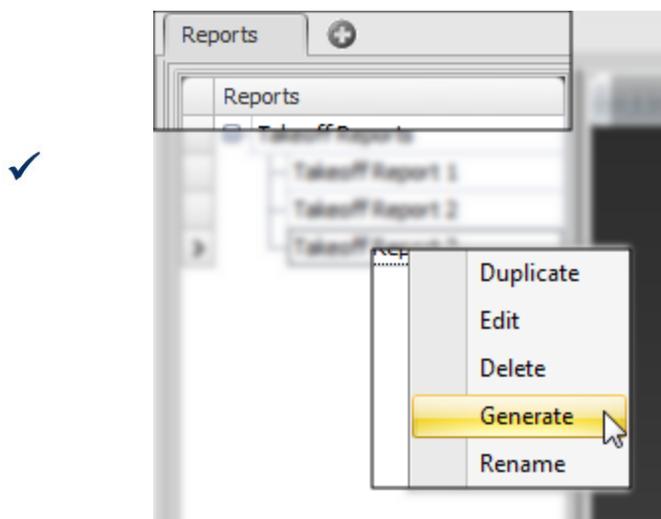
Now that several cost snapshots have been saved, use the Cost Plan Reports to analyze the project variances.

1. Navigate to **Reporting & Data Mining | Create & Run Reports** on the left navigation pane.
2. Click the **New Category** button on the Ribbon.
3. **Name** the new category: *Cost Reports*
4. Click on the **Import Template** button on the Ribbon.
5. Select **7 Target Cost Variance Report-Letter.repx**
6. Click **Open**.
7. On the Ribbon, click **Generate Report**.
8. This report was written to require the end user to enter in parameters.
9. **Expand** the parameters dialog box.
10. In **Left Version**, select: *Cost Plan v1*.
11. In **Right Version**, select: *Cost Plan v2*.
12. Leave **Hide Above Level** at the default selection. This setting allows you to control the number of child levels of the cost code on the report.
13. Click **Submit**.

### Tip

To run a report:

- Double click on the report, or
- Click the + sign next to Report category name to expand the section.
  - Select the **Report** row on the Reports tab left navigation to enable the Generate Report button on the Ribbon.
  - Click the **Generate Report** button on the Ribbon or right click and select Generate.



14. **Save** the report as a PDF file.

## 49 Exercise: Defining Targets

A **Target Cost Set** can be used to define a budget or baseline for the cost of your project. The structure of the Target Cost Set is automatically created with the Assembly/Component structure. This allows you to define a total budget for the project, which can then be allocated to the cost divisions in your project defined with the Assembly/Component structure.

To define the Target:

1. In the Workflow panel, navigate to **Cost Planning | Define Targets**.
2. Select the first row for the Project.
3. In **Cost**, type: *2,350,000.00*
4. Enter the following targets for individual line items.

| Code  | Name                | Percentage | Target       |
|-------|---------------------|------------|--------------|
|       | <b>PROJECT</b>      | 100%       | 2,350,000.00 |
| A     | <b>SUBSTRUCTURE</b> |            | 650,000.00   |
| A10   | Foundations         |            |              |
| A1010 | Standard            | 6%         |              |
| A1020 | Special Foundations | 75%        |              |
| B     | <b>SHELL</b>        |            | 1,700,000.00 |

### Note



Select **Set Target Cost from Snapshot** on the Ribbon to select a previously saved cost plan version and use that as the baseline for targeted cost planning.

## 50 Cost Explorer

The **Cost Explorer** view provides a graphical representation of the project's breakdown structure, which can be used to analyze project cost status per cost group as compared to the defined Targets, and also to determine the variance between two project versions.

Project teams often struggle with communicating cost and cost variance in a project.

Traditional communication means are printouts of both cost estimate (versions) and design plans, both of which are disconnected and voluminous, thus hard to use to explain an occurring cost variance between version 1 and version 2 in meetings.

As a result, much time is spent on creating a common understanding of the project information, which leaves insufficient time for analysis and decision making.

A missing understanding of where budget overruns occur in the project, because cost comparisons are done at the project level, often results in an inability to define accurate and targeted project changes to bring the project back on track.

The Explore Cost view in Vico Office helps project teams visualize and analyze project cost and cost variances. The color coded Cost Explorer and 3D Model integration provides a powerful way to communicate what the cost of a certain group is, where it exists in the project and how it compares to budget and previous versions.

The Cost Explorer user interface contains a tree structure that matches the Assembly/Component structure that was setup in Cost Planner. All Assemblies are shown as nodes in the tree.

**Nodes** can contain two shapes, representing the **active versions** in the comparison:

- The **square** represents the older version in the pair
- The **circle** represents the newer version in the pair

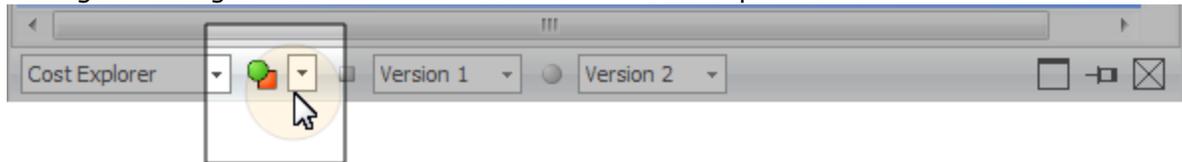
Two **comparison modes** are available:

1. Assemblies to Components shows how the parent Component's cost allocation compares to the sum of the included sub Components
2. Cost to Target shows how the two selected version's costs compare to the defined Targets

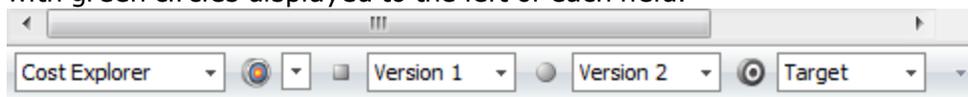
## 51 Exercise: Using Cost Explorer

Now that you have created multiple cost plan versions, you will use the cost explorer to compare changes between the two versions.

1. On the left navigation pane, select **Cost Planning | Explore Cost**.
2. Select the **Cost to Target Comparison Mode** by clicking on the drop down arrow to the right of the green circle at the bottom of the Cost Explorer view.



3. Click on the drop down arrow to the right of Version 1 and select that version by clicking on that row.  
A green circle will appear to the left of the version name.
4. Return to the Cost Explorer view and click on the drop down arrow to the right of Version 2. Select version 2 by clicking on that row.  
A green circle will appear to the left of the version name.
5. Confirm Version 1 and Version 2 are displayed at the bottom of the Cost Explorer view with green circles displayed to the left of each field.



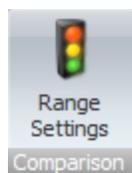
6. Click on the **Target** drop down list and select a target version by clicking on the row under Target Versions.
7. Each version will be displayed in the Cost Explorer view represented by a circle and a square.

### Note



- For the 'square' version, choose the created 'Baseline'.
- For the 'circle' version, choose the created 'Adjusted Version'.
- For the 'target', click on the defined Target.

8. **Compare** the cost status by clicking on nodes in the tree to see the associated cost and model elements.
9. Note the **percent difference** between versions.
10. Evaluate the cost plan by using the **Show Filtered** view option.
11. Click on the **Cost Explorer** tab.



12. Click the **Range Settings** button on the Ribbon.

### Cost Comparison Range Settings

|   |           |                                    |     |                                    |
|---|-----------|------------------------------------|-----|------------------------------------|
|  Too High      | More than | <input type="text" value="120 %"/> |     |                                    |
|  At Risk       | Between   | <input type="text" value="100 %"/> | And | <input type="text" value="120 %"/> |
|  Within Budget | Between   | <input type="text" value="80 %"/>  | And | <input type="text" value="100 %"/> |
|  Too Low       | Less than | <input type="text" value="80 %"/>  |     |                                    |

13. Change the **Too High** setting to *100%*.
14. Change the **At Risk** setting to between *90 %* and *100%*.
15. Click **Save**.
16. The Cost Explorer definitions are updated.
17. In the Explore Cost view, expand the project node and then the **Substructure node**.
18. The 3D view and cost planner view display the substructure details.

## 52 Review Questions

1. What is the difference between the Source Quantity and the Quantity column in the Cost Plan?
2. What does activating a component mean?
3. What are these icons in the Cost Plan?

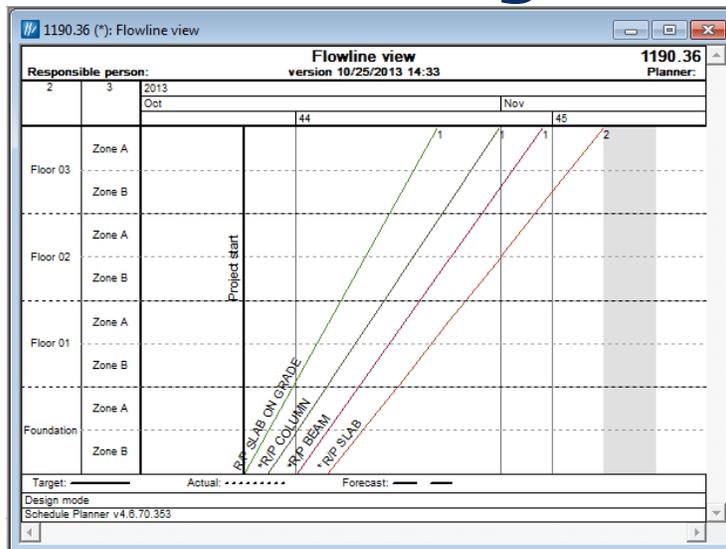


4. How is the assembly unit cost calculated?
5. How do you change a cost plan item from manual to model based?
6. What are these three symbols in the Cost Plan?



7. What does blue, green, yellow and red mean in Cost Explorer?
8. Where can you adjust the target range settings?

# Introduction to Schedule Planning



## 53 Schedule Planning Overview

Most features of Schedule Planner are grouped into toolbars. The toolbars can be enabled / disabled from the View-menu – Toolbars.

The Toolbars and their main features are:

- Tools
  - Basic tools (new project, open file, save project, etc.)
  - View Control tools (schedule selector, zooming)
  - Printing tools (preview, print)
  - Flowline tools (new task, split, draw, create dependencies, etc.)
  - Gantt chart tools (edit hierarchy, indent/out-dent tasks, etc.)
  - Operating mode tools (planning / control / history mode selector)
  - View settings tools (show forecasts, actuals, weekends, etc.)
  - Task editing tools (copy, paste, etc.)
  - Reporting tools
  - Bill-of-Quantities tools

### Business Value



- Location based schedule allows to plan **continuous workflow**
- Plan crews and resources
- Optimize schedule and resources
- Location based quantities allows to differentiate difficult locations
- Utilize empty locations
- Eliminate stops and starts
- Eliminate crew clashes in the same locations

### Training Objectives

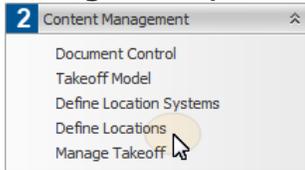
Upon completion of this **General Introduction - Introduction to Schedule Planning** module, you will be able to:

- Create a project Location Breakdown Structure
- Define Tasks in Task Manager
- Plan the schedule using the Flowline View

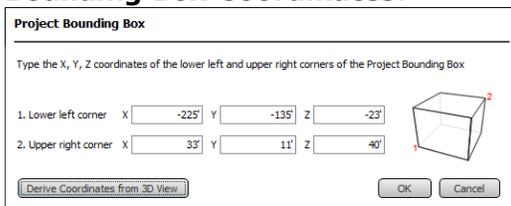
## 54 Exercise: Defining Floors

In the following exercise, you will add four locations.

1. Unpack and open the **Schedule Planning** project.
2. With the Master Workflow selected on the left navigation pane, select **Content Management | Define Locations**.



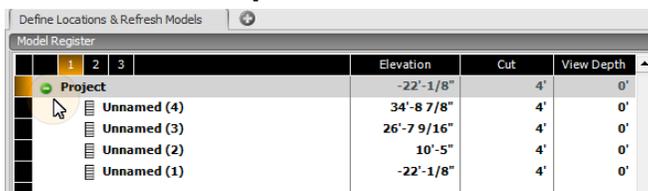
3. **Left click** on the **project** node to select that row. Then **right click** and select **Set Bounding Box Coordinates**.



4. Click on the **Derive Coordinates from 3D View** button. Click **OK**.
5. **Right click** on the **project** node again and select **Floor Split**.
6. In **Number of Floors**, type: *4*.
7. Leave the **Floor Height** default value.
8. In **Prefix**, type: *Floor*.
9. Leave the default **Even Distribution** setting selected.
10. Click **OK**.
11. **Four locations** have been added below the project node. By default Vico Office assigns Floor 1 through 4.

### Tip

- **Elevation:** from project 0 (always the bottom of the bounding box)
- **Cut:** from floor-level elevation
- **View depth:** from the Cut DOWN



|             | 1 | 2 | 3 | Elevation   | Cut | View Depth |
|-------------|---|---|---|-------------|-----|------------|
| Project     |   |   |   | -22'-1/8"   | 4'  | 0'         |
| Unnamed (4) |   |   |   | 34'-8 7/8"  | 4'  | 0'         |
| Unnamed (3) |   |   |   | 26'-7 9/16" | 4'  | 0'         |
| Unnamed (2) |   |   |   | 10'-5"      | 4'  | 0'         |
| Unnamed (1) |   |   |   | -22'-1/8"   | 4'  | 0'         |

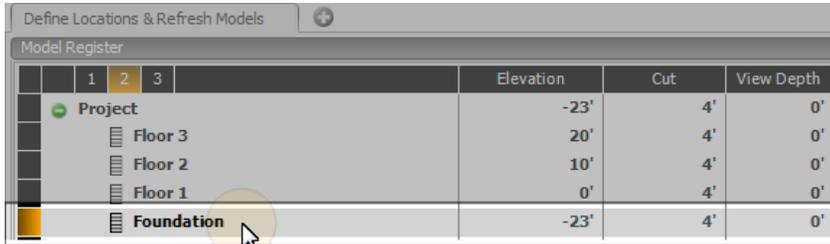
12. Since this project building contains a foundation and three floors, **rename** the Floors so that the highest elevation is Floor 3 and the lowest is named Foundation by right clicking and selecting **Rename**.
13. Enter the elevations listed in the following table by double clicking in the LBS Manager elevation cell for each row. The Foundation elevation value should already be populated by the system.

| <b>Location Name</b> | <b>Elevation</b>    |
|----------------------|---------------------|
| <b>Floor 3</b>       | <b>20'</b>          |
| <b>Floor 2</b>       | <b>10'</b>          |
| <b>Floor 1</b>       | <b>0'</b>           |
| <b>Foundation</b>    | <b>-10'- 6 1/8"</b> |

## 55 Exercise: Defining Zones

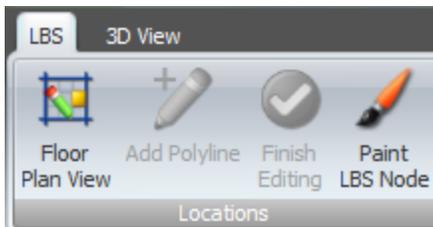
In the following exercise, you will update the zones for the Foundation location created in the previous exercise.

1. Select the **Foundation Location** row.

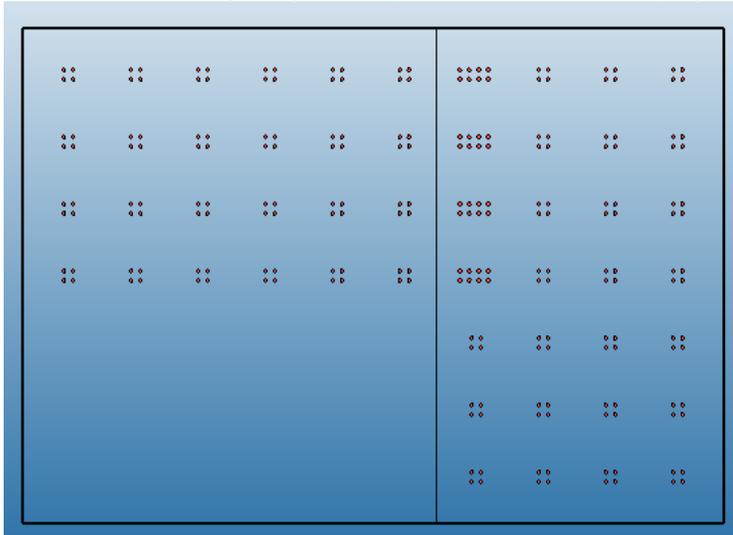


| Define Locations & Refresh Models |   |   |   | Elevation | Cut | View Depth |
|-----------------------------------|---|---|---|-----------|-----|------------|
| Model Register                    |   |   |   |           |     |            |
|                                   | 1 | 2 | 3 |           |     |            |
| Project                           |   |   |   | -23'      | 4'  | 0'         |
| Floor 3                           |   |   |   | 20'       | 4'  | 0'         |
| Floor 2                           |   |   |   | 10'       | 4'  | 0'         |
| Floor 1                           |   |   |   | 0'        | 4'  | 0'         |
| Foundation                        |   |   |   | -23'      | 4'  | 0'         |

2. Click on the **Floor Plan View** button on the LBS Ribbon.



3. In the **Cut** column, type: *1*
4. Click the **Add Polyline** button on the Ribbon.
5. **Left click** at the top of the boundary box.
6. Drag your mouse down the model and **left click** at the opposite bottom of the boundary box.
7. Hit the **Enter key** on your keyboard to finish the polyline.



8. In the LBS Manager, expand the Foundations row and **double click** in 'Unnamed' to rename the newly created zones. Type: *Zone A* and *Zone B*.

| Define Locations & Refresh Models |   |   |   |   |           |     |            |
|-----------------------------------|---|---|---|---|-----------|-----|------------|
| Model Register                    |   |   |   |   |           |     |            |
|                                   | 1 | 2 | 3 | 4 | Elevation | Cut | View Depth |
| Project                           |   |   |   |   | -22'-1/8" | 4'  | 0'         |
| Floor 03                          |   |   |   |   | 20'       | 4'  | 0'         |
| Floor 02                          |   |   |   |   | 10'       | 4'  | 0'         |
| Floor 01                          |   |   |   |   | 0'        | 4'  | 0'         |
| Foundation                        |   |   |   |   | -22'-1/8" | 15' | 0'         |
| Zone A                            |   |   |   |   | -22'-1/8" | 4'  | 0'         |
| Zone B                            |   |   |   |   | -22'-1/8" | 4'  | 0'         |

9. **Right click** on the Foundation, and select *Copy Child Nodes*, then right click on upper floors locations and select *Paste Child Nodes* to use the same zones on each floor.

| Define Locations & Refresh Models |   |   |   |   |           |     |            |
|-----------------------------------|---|---|---|---|-----------|-----|------------|
| Model Register                    |   |   |   |   |           |     |            |
|                                   | 1 | 2 | 3 | 4 | Elevation | Cut | View Depth |
| Project                           |   |   |   |   | -22'-1/8" | 4'  | 0'         |
| Floor 03                          |   |   |   |   | 20'       | 4'  | 0'         |
| Floor 02                          |   |   |   |   | 10'       | 4'  | 0'         |
| Floor 01                          |   |   |   |   | 0'        | 4'  | 0'         |
| Zone A                            |   |   |   |   | 0'        | 4'  | 0'         |
| Zone B                            |   |   |   |   | 0'        | 4'  | 0'         |
| Foundation                        |   |   |   |   | -22'-1/8" | 15' | 0'         |
| Zone A                            |   |   |   |   | -22'-1/8" | 4'  | 0'         |
| Zone B                            |   |   |   |   | -22'-1/8" | 4'  | 0'         |

|                                    |        |
|------------------------------------|--------|
| Add Location System                | >      |
| Edit Location                      |        |
| Manually assign 3D Elements        |        |
| Unassign all 3D Elements           |        |
| Define Level Z Value from 3D Model |        |
| Isolate                            |        |
| Hide                               |        |
| Translucent                        |        |
| Rename                             |        |
| Delete                             | Delete |
| Delete All Child Nodes             |        |
| Floor Split                        |        |
| Floor Plan View                    |        |
| <b>Copy Child Nodes</b>            |        |
| Paste Child Nodes                  |        |

| Define Locations & Refresh Models |   |   |   |   |           |     |            |
|-----------------------------------|---|---|---|---|-----------|-----|------------|
| Model Register                    |   |   |   |   |           |     |            |
|                                   | 1 | 2 | 3 | 4 | Elevation | Cut | View Depth |
| Project                           |   |   |   |   | -22'-1/8" | 4'  | 0'         |
| Floor 03                          |   |   |   |   | 20'       | 4'  | 0'         |
| Zone A                            |   |   |   |   | 20'       | 4'  | 0'         |
| Zone B                            |   |   |   |   | 20'       | 4'  | 0'         |
| Floor 02                          |   |   |   |   | 10'       | 4'  | 0'         |
| Zone A                            |   |   |   |   | 10'       | 4'  | 0'         |
| Zone B                            |   |   |   |   | 10'       | 4'  | 0'         |
| Floor 01                          |   |   |   |   | 0'        | 4'  | 0'         |
| Zone A                            |   |   |   |   | 0'        | 4'  | 0'         |
| Zone B                            |   |   |   |   | 0'        | 4'  | 0'         |
| Foundation                        |   |   |   |   | -22'-1/8" | 15' | 0'         |
| Zone A                            |   |   |   |   | -22'-1/8" | 4'  | 0'         |
| Zone B                            |   |   |   |   | -22'-1/8" | 4'  | 0'         |

### Important

The Location copying feature requires the following criteria be met.

- The source node (copy from) must be a floor or location system node.
- The source node cannot be a zone node.
- The source node and the destination node must be under the same parent node. Pasting between location systems is not supported.
- The source node may only contain zones under it. It cannot include any additional floor splits in it.
- The destination node can only be a floor or location system node.
- The destination node cannot already have existing zone nodes below it.

10. Reactivate the models by navigating to the **Document Control** workflow item. Right click on each active model and select **Activate Selected**.

### Tip

If you are using Define Locations from the Master Workflow you can also access the model register from above the locations window.

✓

| Define Locations & Refresh Models - Modified |   |         |   |   |           |     |            |  |
|--|---|---------|---|---|-----------|-----|------------|--|
| Model Register                               |   |         |   |   |           |     |            |  |
|  | 1 | 2       | 3 | 4 | Elevation | Cut | View Depth |  |
|  | + | Project |   |   | -22'-1/8" | 4'  | 0'         |  |

### Important

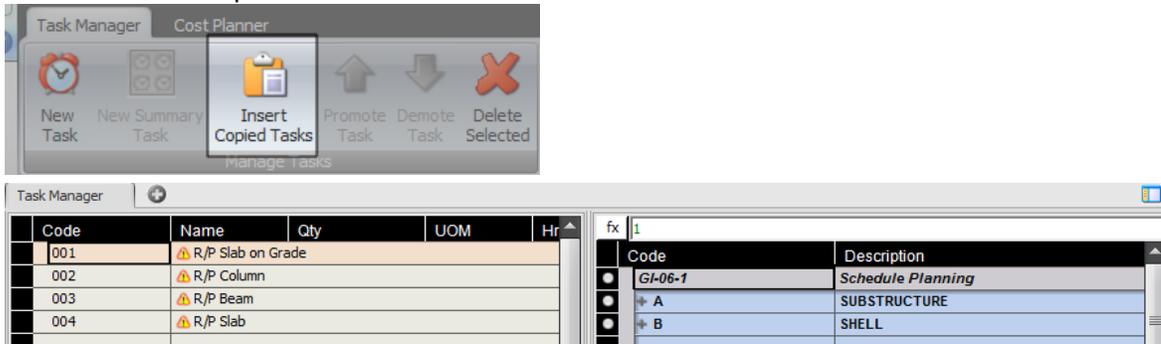
Models must always be reactivated after adding or modifying locations or nodes. Reactivating models will update quantities by location.

## 56 Exercise: Defining Tasks

1. From the Workflow Panel, select **Schedule Planning | Manage Tasks** Workflow Item.
2. Confirm you have both the **Task Manager** and **Cost Planner** views displayed.
3. **Open** the file provided by your Instructor **Schedule Planner Task List.xlsx**.
4. **Copy** the following tasks from the spreadsheet.

| Code | Description       |
|------|-------------------|
| 001  | R/P Slab on Grade |
| 002  | R/P Column        |
| 003  | R/P Beam          |
| 004  | R/P Slab          |

5. Use the Insert Copied Tasks button on the Ribbon to insert the tasks.



6. In the **Cost Planner** view, navigate to the corresponding component and **drag and drop** it onto the corresponding new task listed in the Task Manager view. This will map the component to the task.

### Note



Left click on the black cell to the left of the Cost line item row and drag your mouse until a yellow arrow is displayed on the Task Manager row you want to map to. Release your left mouse click to complete the mapping.

7. Use the mapping below to associate each component with the correct task.

| Task Manager          | Cost Planner               |
|-----------------------|----------------------------|
| 001 R/P Slab on Grade | A1031_001 Slab on Grade-ID |
| 002 R/P Column        | B1012_046 CIP RC Column-ID |
| 003 R/P Beam          | B1012_069 CIP RC Beam-ID   |
| 004 R/P Slab          | B1012_005 CIP RC Slab-ID   |

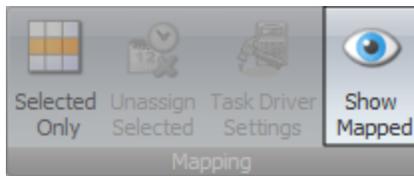
| Code       | Name              | Qty       | UOM |
|------------|-------------------|-----------|-----|
| = 001      | R/P Slab on Grade |           |     |
| A 1031_001 | Slab on Grade-ID  | 296.28    | CY  |
| = 002      | R/P Column        |           |     |
| B 1012_046 | CIP RC Column-ID  | 1,569.33  | FT  |
| = 003      | R/P Beam          |           |     |
| B 1012_069 | CIP RC Beam-ID    | 3,564.00  | LF  |
| = 004      | R/P Slab          |           |     |
| B 1012_005 | CIP RC Slab-ID    | 35,970.00 | SF  |

| Code       | Description        |
|------------|--------------------|
| -06-1      | Schedule Planning  |
| A          | SUBSTRUCTURE       |
| A10        | Foundations        |
| A1030      | Slab on Grade      |
| A1031_001  | Slab on Grade-ID   |
| B          | SHELL              |
| B10        | Superstructure     |
| B1010      | Floor Construction |
| B 1012_005 | CIP RC Slab-ID     |
| B 1012_046 | CIP RC Column-ID   |
| B 1012_069 | CIP RC Beam-ID     |

**Manage Tasks View - Components mapped to Tasks with Show Mapped setting enabled**

**Tip**



Use the **Show Mapped** button on the Task Manager Ribbon to highlight tasks that have been mapped to Takeoff Items.

## 57 Exercise: Identifying Task Drivers

After mapping Assemblies and Components, which contain the calculated resources and quantities, a **Task Driver** needs to be defined to derive the duration of a Task.

The formula that is used for this is:

$$\text{Quantity} \times \text{Consumption} = \text{Total work hours needed}$$

By calculating this formula in each of the Locations where Takeoff Quantities used in a Component exist, the duration for Tasks per Location can be determined.

### Note



Components that have a quantity expressed in 'Hours' can be assigned a factor of '1'; the duration for these Components has been calculated in the Cost Planner view by defining a Consumption factor.

In the following exercise, you will enter the production rates for the substructure and shell components into the Hrs/UOM column to get the accurate Work hours. The consumption rates entered previously are used to obtain the total duration of the component. Then, the calculated work hours can be divided with the quantities.

1. **Expand** the Tasks in the **Task Manager** view to see the included Assemblies and Components.
2. **Expand** the Elements in the **Cost Planner** view.



### Tip

The Navigate button on the Task Manager Ribbon will expand all rows one level.

3. In the Task Manager view, enter the following production rates in the Hrs/UOM column.

For task **A1030\_001 R/P Slab on Grade**, in **Hrs/UOM**, type: *2.09*

For task **B1012\_046 R/P Column**, in **Hrs/UOM**, type: *0.95*

For task **B1012\_069 R/P Beam**, in **Hrs/UOM**, type: *0.82*

For task **B1012\_005 R/P Slab**, in **Hrs/UOM**, type: *0.21*

| Code      | Name                 | Qty       | UOM | Hrs/UOM | UOM/Hr | Work   | Duration |
|-----------|----------------------|-----------|-----|---------|--------|--------|----------|
| - 001     | R/P Slab on Grade    |           |     |         |        | 619.22 | 0.00     |
| A1031_001 | R/P Slab on Grade-ID | 296.28    | CY  | 2.09    | 0.48   | 619.22 | 0.00     |
| - 002     | R/P Column           |           |     |         |        |        | 0.00     |
| B1012_046 | CIP RC Column...     | 1,569.33  | FT  |         |        |        | 0.00     |
| - 003     | R/P Beam             |           |     |         |        |        | 0.00     |
| B1012_069 | CIP RC Beam-ID       | 3,564.00  | LF  |         |        |        | 0.00     |
| - 004     | R/P Slab             |           |     |         |        |        | 0.00     |
| B1012_005 | CIP RC Slab-ID       | 35,970.00 | SF  |         |        |        | 0.00     |

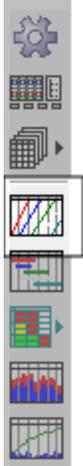
4. After defining a Production Rate for each Component per Task, all Tasks should have a Task Driver. No exclamation mark icon should be visible in the Task list Name column anymore.

| Task Manager New ViewSet(1) |                       |           |     |         |        |          |          |   |
|-----------------------------|-----------------------|-----------|-----|---------|--------|----------|----------|---|
| Code                        | Name                  | Qty       | UOM | Hrs/UOM | UOM/Hr | Work     | Duration |   |
| = 0001                      | 001 R/P Slab on Grade |           |     |         |        | 619.22   | 0.00     | ⚠ |
| A 1031_001                  | Slab on Grade-ID      | 296.28    | CY  | 2.09    | 0.48   | 619.22   |          |   |
| = 0002                      | 002 R/P Column        |           |     |         |        | 1,490.87 | 0.00     | ⚠ |
| B 1012_046                  | CIP RC Column-ID      | 1,569.33  | FT  | 0.95    | 1.05   | 1,490.87 |          |   |
| = 0003                      | 003 R/P Beam          |           |     |         |        | 2,922.48 | 0.00     | ⚠ |
| B 1012_069                  | CIP RC Beam-ID        | 3,564.00  | LF  | 0.82    | 1.22   | 2,922.48 |          |   |
| = 0004                      | 004 R/P Slab          |           |     |         |        | 7,553.70 | 0.00     | ⚠ |
| B 1012_005                  | CIP RC Slab-ID        | 35,970.00 | SF  | 0.21    | 4.76   | 7,553.70 |          |   |

## 58 Exercise: Assigning Resources

In this exercise, you will optimize the schedule by evaluating assigned resources.

1. On the Master Workflow, navigate to **Schedule Planning | Schedule**.
2. Select the **Flowline view**.



### Tip

- ✓ To change the **timeline selection** on the view, right click on the calendar under the Flowline View name and select **Properties**. Click on the Top, Center and Bottom drop down lists to select your desired timeline. For example: Year, Quarter, Month.

3. **Double click** on the first task.  
The Edit Task dialog box is displayed.

### Note



To view the Floors and Zones configured in the Define Locations exercise, verify that the **Location Precision** setting for each task is set to the number 3. This represents the level of the location breakdown structure that will be displayed in Flowline view on the left most columns.

4. Select the **Resource tab**.

### Tip

- ✓ If the Resource tab is not visible, click on the **Advanced** button to change views.

Edit task: \*R/P SLAB (Total monitored quantity: <no selection>, Target production rate: <no selection>)

Task Part: R/P Slab Split... Combine... Copy

6: Risks | 7: Monitoring | 8: Cost | 9: Expense events | 10: Customize | 11: Diary  
 1: General | 2: Resources | 3: Dependencies | 4: Quantities | 5: Duration

Crew composition

| Code | Name | Quantity | Pf | Supplier |
|------|------|----------|----|----------|
| 1    |      |          |    |          |

Number: 1  
 Duration: 10 shifts  
 Update resources from quantities  
 Risks

Consumption

| Item | Consumption person hours/units | Production rate units/shift | Quantity | Cost type |
|------|--------------------------------|-----------------------------|----------|-----------|
|      |                                |                             |          |           |

Use dependency order  << OK and previous OK and next >> OK Cancel

5. Under Crew Composition, click in the **Name** drop down field, then click on **New**. The Code and Name Editing dialog box is displayed.
6. In **Code**, type: AAA
7. In **Name**, type: AAA Piling

Code and name editing

Code: AAA

Name: AAA Piling

OK Cancel

8. Click **OK**.
9. Quantity represents the number of people in a crew. In **Quantity**, type: 3
10. The Number field is used to represent the number of crews assigned to a task. In **Number**, type: 2

Edit task: \*R/P SLAB (Total monitored quantity: <no selection>, Target production rate: <no selection>)

Task Part: R/P Slab

6: Risks | 7: Monitoring | 8: Cost | 9: Expense events | 10: Customize | 11: Diary  
 1: General | 2: Resources | 3: Dependencies | 4: Quantities | 5: Duration

Crew composition

|   | Code | Name       | Quantity | Pf | Supplier       |
|---|------|------------|----------|----|----------------|
| 1 | AAA  | AAA Piling | 3        | 1  | <no selection> |
| 2 |      |            |          |    |                |

Number:

Duration: 10 shifts

Consumption

|  | Item | Consumption person hours/units | Production rate units/shift | Quantity | Cost type |
|--|------|--------------------------------|-----------------------------|----------|-----------|
|  |      |                                |                             |          |           |

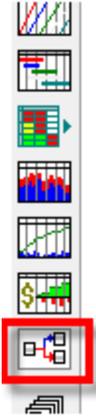
Use dependency order

11. Click the **OK and Next** button to update the next task's resources.
12. Create new Crews for each task.
13. After assigning resources to each task, click **OK**.
14. Click the **Save** button on the Schedule toolbar.

## 59 Exercise: Defining Task Dependencies

Once you have assigned resources to tasks, set up task dependencies using the Network View.

1. In the schedule window, select the **Network View**.



The Network View is displayed in a separate window.

2. Locate the **R/P Slab on Grade** task. **Drag and drop** it on to the **R/P Column** task.
3. Drag and drop the R/P Column task on to the Beam task.
4. Drag and drop the R/P Beam task on the Slab task.
5. Click **Save** on the Schedule toolbar.
6. **Close** the Network View window.
7. In the **Flowline View**, click on the crew number at the top of the second task. Drag the line to the left to shorten the duration of the task.

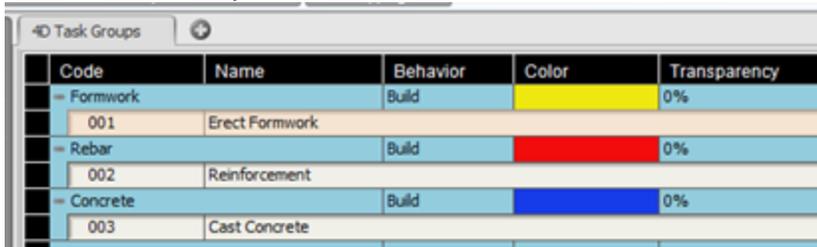
## 60 Exercise: Defining 4D Groups

Creation of **4D simulations** is an integrated part of the Vico Office workflow and does not require any additional effort to create and maintain.

3D model elements are connected to Tasks through Takeoff Items and Cost Planner Components; as a result, after mapping Cost Planner Components and Assemblies to Tasks, the 4D simulation is created implicitly and is ready to use for review and communication of the created schedule.

In this exercise, you will create a new 4D Group Set, create three new 4D Groups and finally assign tasks to the groups. These will be used to support the 4D simulation exercise.

1. From the Master Workflow, select **Schedule Planning | 4D Playback Settings**.
2. Click on the **New 4D Group Set** button on the toolbar.
3. In **4D Group Set Name**, type: *Training*
4. Click on the **Add 4D Group** button on the toolbar.
5. **Enter** the following groups.  
 Formwork (yellow)  
 Rebar (red)  
 Concrete (blue)
6. **Assign Tasks** to 4D Groups by dragging and dropping from the Task Manager view to the 4D Task Groups view.

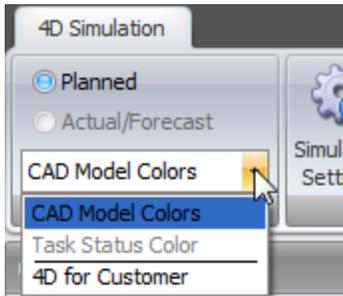


| Code | Name           | Behavior | Color  | Transparency |
|------|----------------|----------|--------|--------------|
| -    | Formwork       | Build    | Yellow | 0%           |
| 001  | Erect Formwork |          |        |              |
| -    | Rebar          | Build    | Red    | 0%           |
| 002  | Reinforcement  |          |        |              |
| -    | Concrete       | Build    | Blue   | 0%           |
| 003  | Cast Concrete  |          |        |              |

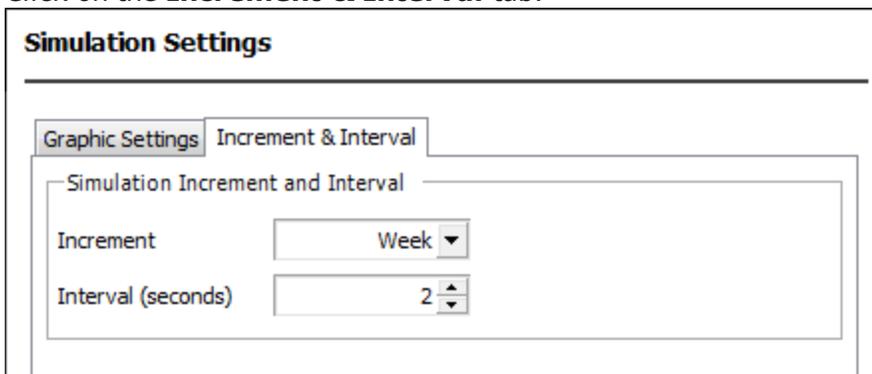
## 61 Exercise: Using 4D Simulation

The **4D Simulation** that is defined using 4D Groups can be viewed interactively in the 4D Explorer view, which has functionality for playback, date selection and information to be presented on top of the simulated model.

1. From the Workflow Panel, select **Schedule Planning | Explore 4D** Workflow Item.
2. In the **4D Simulation tab**, click on the drop down list above the **4D Presentation Mode**.



3. Select the **4D Group Set** created in the previous exercise.
4. On the **4D Simulation Ribbon**, click the **Simulation Settings** button.
5. Click on the **Increment & Interval** tab.



6. Change the Increment to **Week**. Click **OK**.  
This setting will allow you to view the planned progress in the simulation based on the current schedule.
7. Click the **Legend Pane** button in the Ribbon to view the legend when running the simulation.
8. To start the playback of the 4D Simulation, click the **Play** button from the 4D View timeline banner at the top of the view.



## 62 Review Questions

1. What is a project bounding box?
2. Is it editable?
3. What is the most important thing to do after editing locations in Vico Office?
4. How do you define the duration of a task?
5. Why do we need to reactivate the 3D models after modifying locations?
6. Why did we map assemblies to tasks?
7. What is a task driver?
8. Do you define the schedule logic in LBS Manager or in Schedule Planner?

# Definitions



## 63 Definitions

**Activity** - a Task that occurs in a Location. Activities can be defined manually, or automatically, as the result of model-based quantities that exist in a Location and drive the duration of a Task.

**Add-On** - An Add-On contains overhead cost and profit margin that cannot be included in line items, or the markup for line items. Example: 'GC Compensation, 5% of total project cost'.

**Assembly** - Assemblies are summary cost items that contain cost Components to calculate the cost of unique items in the project. The sum of the cost of the included Components is calculated and presented at the Assembly level. By including sub Components in an existing Component and subsequently turning it into an Assembly, the Level of Detail (LOD) of the estimate, and thus the accuracy level of the estimate, increases.

**Component** - Components are cost line items: parts of a construction project that can be priced or allowances for parts that are not defined in enough detail in the project documentation. Components are always included in an Assembly. Components have attributes, which are defined as a Tags.

**Constructability Issue** - a design problem in the project that can be the result of an automatically detected clash, or a manually entered issue related to missing or incomplete design information.

**Flowline** - Flowline theory asserts that subcontractors can work at optimum productivity rates with optimum safety and craftsmanship if their location is free of unnecessary materials and other crews. Flowline view represents a flow of the crews through the locations.

**Formula** - the input for a Quantity Cell in the Cost Planner view; Formulas contain references to Takeoff Items and Takeoff Quantities, defined with Takeoff Manager.

**Markup** - Markup is defined as the profit margin over an individual line item. Typically, default profit margins are based on cost types.

**Model** - A Model is the Building Information Model that is published from one file into the Vico Office project. Multiple Models can be combined in one project.

**Model Version** - Each time when the same model file is published into Vico Office, a version of the Model is created. Only one Version of a Model can be active at a time.

**Painting** - Painting is the name of the process for (re)assigning elements to Takeoff Items. During this process, the cursor will change into a Paint Brush.

**Tag** - A Tag is an attribute of a component that can be used for categorizing and filtering estimating content, as well as for storing additional properties. The Tag is not specific to any certain view, but finds its most typical use in the Spreadsheet view. Each Tag has a list of possible values and a default value.

**Takeoff Item (TOI)** - A Takeoff Item is a group of takeoff information that is created manually, or based on properties of elements extracted from CAD models.

**Takeoff Quantity (TOQ)** - Each Takeoff Item contains one or more Takeoff Quantities, which can be defined manually, or are extracted by the software automatically. The set of Takeoff Quantities that is included in a Takeoff Item is based on the Element Type that is assigned to the Takeoff Item ('Walls' have different Takeoff Quantities than 'Slabs')

**Task** - definition of work that needs to be performed to complete a part of the building. A Task contains Activities for each Location in the project where it occurs.

**View** -A View is a window in the Office User Interface that provides a specific set of functionality. Views can be combined into Viewsets to provide context for the presented information.

**Viewset** - Views can be combined by displaying multiple frames at once. Standard Viewsets are available through workflow items (for example, 'Takeoff Model'), but can also be defined as desired by adding a new Viewset tab.

**Workflow Group** - A group of Workflow Items in Vico Office workflow panel. Workflow Groups contain one or more Workflow Items.

**Workflow Item** - Each Workflow Item represents a task in the 5D workflow and has a specific viewset.

