Virtual Construction 2008 User Guide

A Guideline for the Vico Virtual Construction Process

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Introduction to Virtual Construction

Welcome to the Vico Software Virtual Construction User Guide!

This Vico Software™ Virtual Construction™ user guide is designed as a tool to familiarize you with the work flow and the methods of construction modeling associated with the Vico Software Constructor™, Estimator™, Cost Manager™, 5D Presenter™ and Control™ applications.

We recommend this user guide to construction modelers, estimators, schedulers, and project managers.

This user guide offers a consistent and methodical approach to learning how to use construction project information in an integrated way with Virtual Construction™ processes.

This user guide assumes that the reader is already skilled in the use of the Constructor or Graphisoft ArchiCAD modeling tools, which are described in detail in the ArchiCAD Training Guide, which is also part of the Vico Software Constructor 2008 package.

Structure of the Virtual Construction User Guide

We recommend that you study the chapters of the Virtual Construction User Guide in sequence.

The first section describes the use of Vico's Virtual Construction process in the *Design Phase*, which includes:

Preparation: Describes how to set up a content plan and how to setup the database and favorites;

Modeling: Guidelines and hints on how to build a useful construction model using Vico Constructor 2008;

Estimating: Helps you to setup a project database by using data from your knowledge database and to extract quantities from your Constructor model as well as manually defined quantities;

Managing Cost and Budget: Explains how you can use Vico Cost Manager to define project budget and analyze variance between your estimating versions using the Target Costing concept.

In the second section, the use of the Virtual Construction process in the *Planning Phase* is outlined. This section includes:

Sequencing: Uses the Work Breakdown Structure Manager to setup the breakdown of your project that is used for scheduling purposes later;

Scheduling: Explains how Constructor's sequencing data can be imported and used for scheduling your project with Control and 3rd party scheduling applications.

Simulating: Assists you in the use of 5D Presenter to simulate your schedule.

In the third sections, using Virtual Construction in the *Production Phase* is explained. Included sections:

Controlling: Demonstrates how to use Vico Control's project controlling features and Estimator's Cost Control functionality;

Simulating: Shows how project cost and schedule tracking information can be used to generate "as built" schedule simulations;

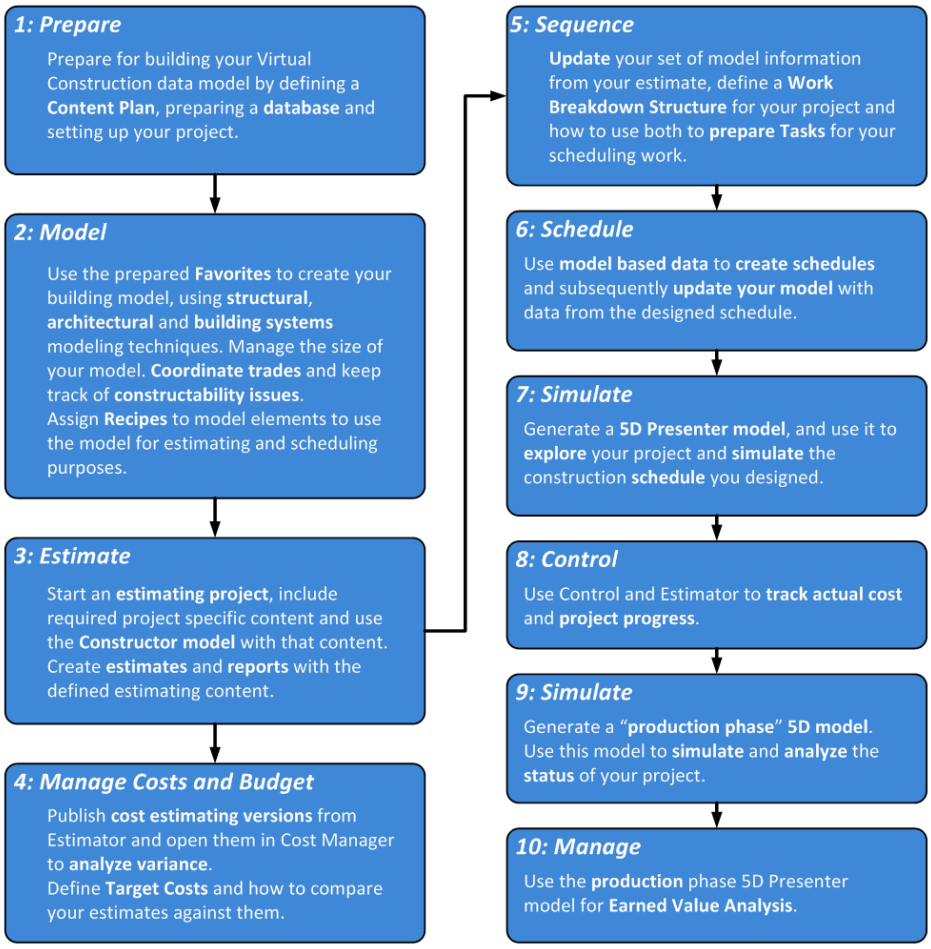
Manage: Explains the use of Earned Value Analysis information, generated from the 5D Construction model and presented in 5D Presenter.

"How To:…" Sections and "Advanced" Functionality

Throughout this user guide, you will find "**How To: …**" sections, that explain step-by-step how to achieve certain goals with your model, estimate and schedule.

> "**Advanced**" functions (not strictly necessary for basic use) are described in a gray font with gray background.

By completing all of the "How To: …" sections you will master the Virtual Construction process as presented in the flowchart below:



Newsgroup

You can share your experiences with other virtual construction users on the following Vico online newsgroup: http://www.vicoforum.com.

What is Virtual Construction?

The Virtual Construction process provides the basis for forward-thinking construction companies to save time and money by rapidly creating and utilizing simulations of project time and cost. Virtual Construction allows you to coordinate design and schedule alternatives, and to synchronize and analyze changes between design, cost and schedule.

Construction modeling is a new discipline. The construction modeler creates a Virtual Construction model that is accurate for construction purposes, and which drives the Estimating and Scheduling processes.

The role of construction modelers is quite different from that of architects. Architects have a broader range of responsibilities, and must be able to convert a client's requirements into a safe, usable, energy-efficient, and aesthetically appealing design. This is all while staying within the boundaries defined by the client's budget and local building codes. The increasing complexity of building structures; due to the development of new materials, the addition of mechanical and electrical systems, and other technological refinements, has increased the complexity of the architects role to such a degree that a new specialism had to emerge.

Project managers, project engineers and site managers, working within general contracting firms, all have either an in-depth of knowledge of one subject area, or a higher level of understanding in many subjects related to construction modeling; perhaps with the exception of modeling technology. The additional requirement of having a thorough knowledge of the technology behind the modeling process presents a barrier to existing team members; preventing them from taking on the additional responsibility of actually *creating* construction models.

The Task of construction modelers is to consider every intended use of the model when planning the creation of each building element. Planning **constructability analysis** needs an insight into how an element is assembled, including the space requirement of the equipment needed for its assembly. **Estimating** requires knowledge of the properties of each building element on which the estimating formula relies. **Sequencing** depends on an understanding of the possible stages involved in constructing each element. **Fabrication** requires knowledge of shop drawings and/or the CNC machinery (computer-driven manufacturing equipment) involved in the fabrication of each element. Modeling for fabrication also requires an understanding of the acceptable tolerances for each element to reduce fabrication costs and to subsequently improve the ease of assembly. Ultimately, construction modelers must also have an extensive knowledge of the technology used in Virtual Construction.

The 3D Virtual Construction model created with Vico Software **Constructor** reduces the errors inherent in design documents. Vico Software **Estimator** connects to Constructor and extracts, links, and publishes the model information with respect to cost. The suite's sequencing functionality automatically links the construction model to the project schedule, which can then be deployed using a best-in-class, location-based scheduling application: Vico Software **Control**. The resulting 5D Construction Model facilitates the synchronization of the design, cost, and time information throughout the project's design and build phases.

Virtual Construction Processes: an Overview

The use of Virtual Construction in projects' processes can roughly be divided into three main phases: Design, Preconstruction and Construction. Although these phases will largely overlap each other in practice, and the use of processes may not be limited to one of these phases; we have chosen to use this division to outline and explain the main work flow patterns for the Vico Software Virtual Construction applications in this user guide.

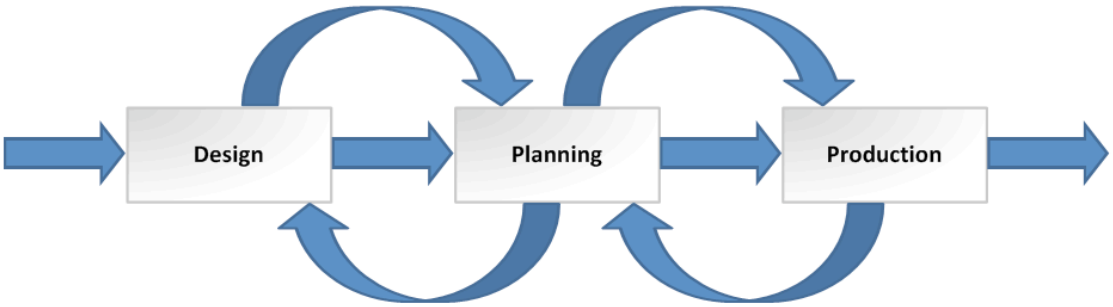


Figure 1 - Schematic representation of the iterative design and construction process

In this diagram, the information provided and required by the project teams throughout the project phases (represented by the blue feedback curves) is supported by integrated 5D deliverables. This user guide will explain to you how you can support your projects by creating integrated 5D information with Vico Software's Virtual Construction tools.

In the **Design Phase**, integrated 5D project information can be used to create a building model of your project's plans for coordination and visualization purposes, to create accurate model-based estimates, and to compare several cost estimating versions, and for providing visual feedback.

In the **Planning Phase**, Vico Software can help you to define the zoning in your project, to analyze construction sequencing alternatives and to simulate your schedule.

Throughout the **Production Phase**, you can use the 5D project information to track the progress of your production and perform forecasts, which you can also visualize with simulations and graphics.

A Typical Virtual Construction Process

The diagram below presents a typical Virtual Construction process. The project phases identified in the previous section, are used to provide us with an outline for the remaining part of the user guide: numbers in each of the steps in the diagram refer to chapter numbers.

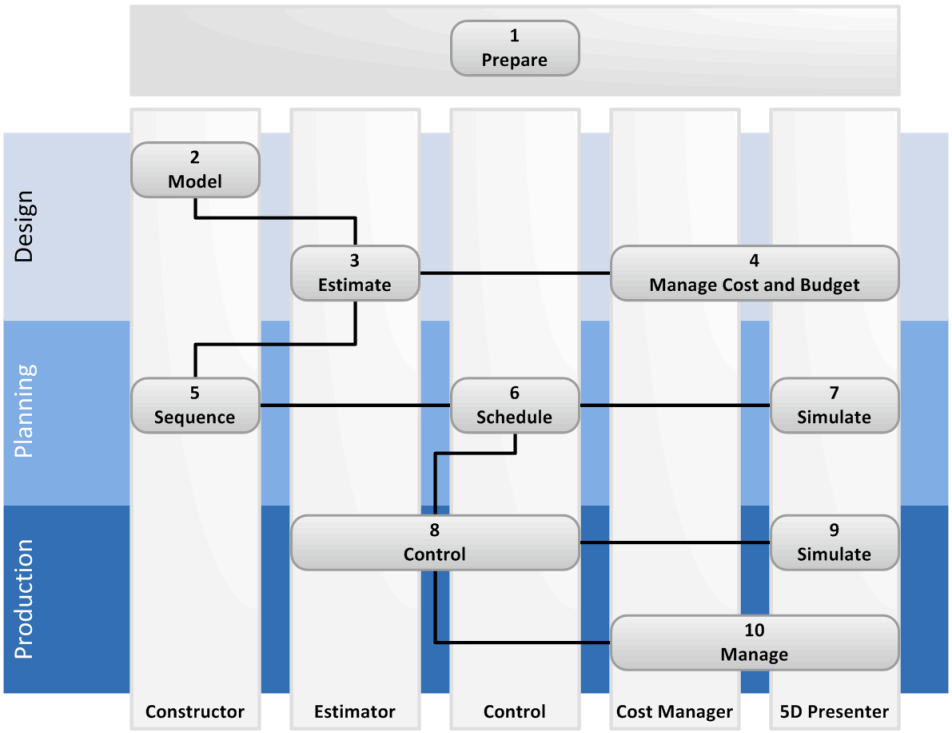


Figure 2 - Typical Virtual Construction Process

1: Prepare

Each Virtual Construction process starts with a preparation phase. In this phase, you will collect the data available for the project, prepare the database and define “Favorites”.

Project data typically include drawing sets (architectural, structural and mechanical), as well as specification documents. The goal of applying Virtual Construction is to translate the fragmented set of project information into integrated 5D information. In order to achieve this, you will need to define *how* project data should be used to create the content for the 5D model that you are about to build.

You will need to make decisions regarding which model element type to use, any properties that are required, and the “Level of Detail” in which you want to capture the project information. All these decisions will be documented in a “Content Plan”: a guideline and a reference for each 5D project. The Content Plan will be refined and completed throughout the project; you will learn that it is impossible to define a plan that covers everything in advance of modeling.

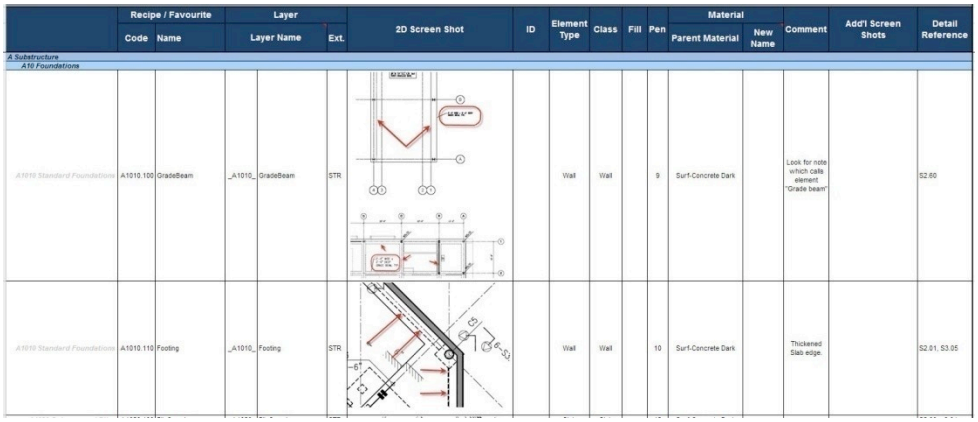


Figure 3 - Example Content Plan

Once you have completed analyzing and defining content, you are ready to set up the project. A library database needs to be selected, and you should define or select a new project in the Projects database. After finishing this part, both Constructor and Estimator can read and write information to and from the central database.

Elements that you recognized in the data set during the creation of the “Content Plan” can be predefined for use in Constructor by creating “Favorites”: named element settings, which include model settings and an estimating Recipe assignment. The collection of Favorites will function as your tool set for the creation of the model in Constructor.

2: Model

After finishing the preparation phase, you can start building your project in the computer, before you build it in reality. With the predefined content, the “Favorites” and the Content Plan, you will create a digital mockup, which allows for constructability analysis and improved coordination.

In Constructor, you can insert the 2D project plans that you have available in digital format on floors of the project. This enables "tracing" of 2D design information with Virtual Building elements.

Elements that you missed when you documented the content during the preparation phase can be added to the plan continuously: the plan will be enriched throughout the modeling phases and will become a valuable reference for the project.

To establish the link with time and cost aspects of your project, you will assign Recipes to model elements. Each Recipe represents a data package that contains all information required for estimating, scheduling, and controlling.

Most of the "Favorite" elements will have pre-assigned Recipes, but elements that you did not predefine will require you to select a Recipe. To ensure that each element in the model is included in the database, you can perform model checks with Constructor's "Recipe Checker" functionality. During the creation of the model you can already get an overview of the quantities by selecting elements and displaying the quantities that will be saved to the database.

After completion and checking of the model, you can publish the model-based information – by Recipe and by Location – to the central database. From there, it will become available for estimating, scheduling, and controlling purposes.

Additionally, you can make 3D information available for use in a Total Station: by placing site surveying points in the desired positions of the model. X, Y and Z coordinates of these points can be transferred into a site surveying data file.

3: Estimate

In Estimator, you can use the model-based quantities, saved from Constructor, to create a model-based estimate. The "Recipe" data package contains two additional layers of information that make it possible to calculate costs from model-based quantities: Methods, which represent activities or trades. and Resources, in which the prices of labor, material, equipment, and subcontracted work are defined.

From each of the layers of information (Location, Recipe, Method, and Resource), a cost report can be created, providing you with Location-Based™, element-based, activity-based and resource-based cost views of the project. For each layer of included information, you can define your own cost grouping – classification – which is used to categorize your cost reports.

Resource prices are maintained in the Estimator library, which allows you to centrally update the prices of labor, material, equipment, and subcontracted work. Updating price information can be done at any moment on a project-by-project basis.

You can create customer tender documents by defining profit and risk margins and subsequently dividing them over the specified cost groups in your estimate.

Estimator's Bid Package functionality will help you to create Bid Packages, receive and compare quotes, and to create cost reports in which quoted prices are used.

4: Manage Costs and Budget

From Estimator, you can create a "snapshot" of the current estimating status at any moment. This frozen status of the estimate can be opened in Cost Manager; a tool that helps you to check the project status compared to the budget, and to analyze variance between versions.

In Cost Manager, you can specify the project's budget by defining "Target Costs". After importing versions from Estimator, you can directly see what the status of the project is.

When you import several versions of your estimate over time, Cost Manager will help you to compare these versions: cost and quantity variances are shown graphically, and help you to identify where changes were or should have been made.

With the interactive link of Cost Manager to 5D Presenter, you can get feedback from the model for cost line items that you select in Cost Manager: 5D Presenter highlights elements from the model that provided quantities for the selected item.

5: Sequence

To define the sequence of your project, you will divide the project into phases and zones, similar to designing a construction sequence on print outs of 2D plans. Activities that were defined in the Recipes are grouped into Tasks and each of the Tasks can be assigned an order of execution.

In Constructor, construction phases and zones are defined using a Work Breakdown Structure (WBS). The WBS exists of a collection of filters ("all concrete elements") and zones ("zone B on story 8") and can contain as many levels as required for your project.

Options for (parts of) the WBS provide you with the flexibility that you need to perform "what if?" analyses to arrive at the optimal sequence for the project.

The WBS that you define can be used for both estimating and scheduling purposes, which makes it possible to generate cost estimates for construction zones.

6: Schedule

The complete set of Tasks and their sequencing information that you defined in Constructor are available for scheduling, providing you with an automated way of schedule content creation.

The specified WBS gives you the organization of the schedule or – in Control – the Locations for the location-based schedule.

In Control, all quantity, labor, material, equipment and subcontractor information is available. With this set of input data, crews and production factors, as well as predecessor and successor relations between Tasks, can be defined, resulting in a model-based schedule.

Synchronizing the created schedule in Constructor completes the 5D model.

7: Simulate

All Virtual Building information, including time and cost, can be saved into a 5D Presenter model. With 5D Presenter, you can navigate through the Virtual Building model, dynamically create sections, and simulate the schedule that you created.

5D Presenter shows where Tasks are executed in the building by means of color coding: each color represents a type of Task (trade, phase, etc.). With the schedule simulation, you can analyze your schedule from every point in the project and you can jump to dates of interest, as desired.

8: Control

After the planning phase, you can control the cost and progress of the project with Control and Estimator.

In Control's Control Chart, Tasks can be marked completed by Location. Instant feedback is provided by comparing the current progress to the plan. Data entered in the Control Chart are used to perform forecasts of future completion of Tasks, based on actual production rates.

In Estimator, you can enter the actual costs for the project to date by defining milestone dates, and entering the costs, per cost type to date.

9: Simulate

After synchronizing the Constructor model with the actual progress and cost data entered into the system through Control and Estimator, an updated version of the 5D Presenter model can be published.

In 5D Presenter, you can now visually compare any differences between scheduled production and actual production. Different visualization modes allow you to highlight sections of the building that are delayed.

10: Manage

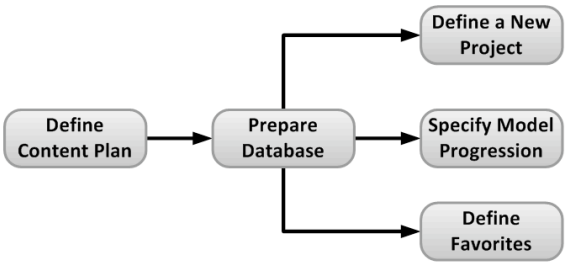
At any moment during the design, planning and construction phases, you can analyze the cost of the project by comparing it to the budget in Cost Manager.

5D Presenter's Earned Value Analysis functionality helps you to quickly analyze the performance of your project. Cost filters support focusing on specific areas and elements.

Virtual Construction in the Design Phase

1: Prepare

This first section describes how you can prepare for building your Virtual Construction data model by defining a Content Plan, preparing a database and setting up your project.



Collect Content and Define Content Plan

Virtual Construction projects start by collecting the available project information, and subsequently planning how this information can be translated into a Virtual Building model. By analyzing the set of project information and defining for which purposes Virtual Construction processes will be used, a plan should be made for how to capture the information that will be in the model you create.

The definition of the "Level of Detail" plays an important role in the Content Plan. The Level of Detail is a scale that represents the amount of information and the level of accuracy of the 3D representation that is included in the Virtual Building model. For conceptual phase planning and estimating, the Level of Detail can be kept low; for detailed planning and estimating, the Level of Detail of the model (and thus the elements included in it) can be higher, but only if needed.

In most of your projects, it will be worth modeling complicated building structures with complex shapes by using model elements having more simple geometry. This speeds up modeling and will, most of the time, still result in the quantities you need and the desired visualizations.

Model simplifications, i.e. applying a lower Level of Detail to elements, have to be traceable and clearly documented to give all users of the model-based data insight into how parts of the project are represented in the project information.

From Vico Software's Services experience, content documentation is best recorded using lists created in a spreadsheet application, supplemented by any corresponding screenshots, taken from the available project documentation.

The so-called "Content Plan" describes recognized real building elements from the construction documentation, the tools and attributes used for modeling, the location of the given structure, and the properties that will be extracted, plus their purpose in the entire system.

The Content Plan contains components taken from the architectural, structural, and mechanical documentation that is available for the project.

Note: a large proportion of the information that is essential for construction purposes is provided by knowledge data packages called Recipes, while the model displays the geometry of the building elements and feeds the Recipes with the appropriate quantities.

How To: Create a Content Plan in Steps

We suggest the following steps when you create a Content Plan:

1. Review the construction documents to familiarize yourself with the building; look for typical construction methods by system classification division.
2. Identify each unique element in the drawings, for example a Slab on Deck, and capture a screenshot of it from the drawings. Give additional information, such as thickness for example, to assist the estimator. *This ties the graphical description from the documents to the Content Plan, which will, in turn, describe how the element will be represented in the model.*
3. Define an element's properties by first designating the layer it will be stored on (to organize your work efficiently, we recommend defining a layer for each item in the Content Plan). Make the layer name similar to the Recipe name to make it easier to find and select elements. Keep in mind that the maximum number of characters that you can use in a layer name is 27.
4. Define which tool (element type) will be used to model an element. This requires you to have thoroughly studied the collection of properties and quantities that are available for each tool. This step needs close coordination between the modeler and the estimator. What might be an 'easy' tool for modeling the particular element might be not be the most useful tool for producing the correct estimating quantities.
5. Define the element's Fill type and Pen color; this is how the element will appear in the 2D plan view and other 2D views.
6. Define the element's material representation; this is how the element will appear in 3D.
7. Add comments, additional screenshots, and detail references, as needed, to communicate element geometry and positioning.
8. Define a Recipe code and name that will represent this element in the Knowledge Database.
9. Define the Class of the element which tells the Recipe with which tool to be used in Constructor, or which quantity types can be determined. For example, if a foundation beam Recipe is to be used for a beam modeled with the Wall tool.

Creating a Content Plan is a team effort: all users of the integrated 5D information have to ensure that the input they need will be represented in the level of accuracy that is required to enable creation of the desired deliverables (e.g. plans, estimates, schedules, status reports, visualizations).

When you create the Content Plan, you will experience the first benefit of creating 5D information for the project: by discussing the required input for each team member's goals, you will get a common understanding of the project.

You can create a good content plan by using the table below as a template.

Classification	Recipe / Favorite		Layer		2D Screen Shot	ID	Element Type	Class	Fill	Pen	Material		Comment	Add'l Screen Shots	Detail Reference
	Code	Name	Layer Name	Ext							Parent Material	New Name			

Figure 4 – Example Content Plan

Tips & Tricks:

Layers – Use an underscore as the first character in the Layer name, so that when you organize the list alphabetically, all of the model layers move to the top and any XREF layers imported with the DWGs will settle to the bottom. As best practice, include a classification division code in the layer name to make it easier to coordinate elements with Recipes during Recipe linkage. Another best practice naming convention is to include an extension for each model layer (for example, STR for a structural layer); this provides another helpful method of sorting the list.

Screenshots – Mark up and annotate the screenshots to clearly communicate element identifiers in the drawings. Remember, the Content Plan is meant to be the main guideline for modeling on what elements to include in the model and how they should be represented. Additionally, it helps the project estimator to understand which Recipe classifications and names should be assigned.

ID – The ID is used for Doors, Windows and Objects. It helps you to distinguish between elements that have been modeled using the same GDL object, but have different sizes (for example, W steel beams). Windows and Doors do not appear on a separate layer, because they are tied to the Wall element in which they are placed; the ID will help you to filter and isolate each element type later in the process.

The use of IDs is also useful in the case where many types of one element are included on the same layer (for example, if five different interior wall types were stored on the same Interior Walls layer)

Element Type / Class – Most of the time, an element's type and class will be the same (for example, modeled with the slab tool, classified as a slab); however, this is not always the case. An element can be modeled using the Stair tool, but there is no class called "stair"; stairs are classified as objects in the Constructor modeling engine.

Also, it sometimes takes a combination of elements to accurately represent one system in the model. For example, when you have two adjacent 5 ½" / 150mm Slabs on a Deck with a difference in elevation of 7" / 175mm. There would be a 1 ½"/ 40mm space gap between the two elements unless you filled the gap with a wall. This wall element would technically be a thickened edge and should be represented by the same Method assembly in Estimator. The difference between the slab and wall elements would be distinguished by the Element Type and Class in the Content Plan and given a separate row and code.

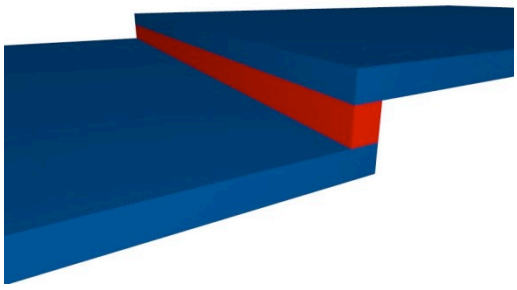


Figure 5 – Example of the combined use of Slab and Wall element types

Material – The material texture is the first thing that is exposed when viewing a model. Take this opportunity to enhance the communicational value of the model by choosing realistic textures and finishes for the model elements.

Organize the content you recognize in the project documentation by classification (structural, architectural, MEP, etc.) for a structured Content Plan. A good way to organize your content is by applying a classification system (for example, Uniformat (*US*), BCIS (*UK*) or Talo (*Finland*)).

The Content Plan does not have to be complete before modeling can commence. It can be done in the order of construction, which is how the model is optimally built. For example, substructure first, then frame, then envelope, etc.. This means that once a section is done, the estimator can start creating Recipes while the next section is being compiled. Favorites can be created with Recipes already attached, while the content plan is still being developed in other areas, making the whole process concurrent as opposed to linear.

The Content Plan is not only a tool to define what to include in the building model. After the model is completed, it will serve as a record of how the model was created, and as a legend for how to read, understand, and filter through to each individual element, as they were interpreted from the Construction Documents.

Prepare the Database

The Virtual Construction database is the central repository for all 5D information generated in the system. The database is divided into two sections:

- The Standards database, which will contain all knowledge and information gathered by your company over time
- The Projects database, one or more database sections that contain all project-specific data.

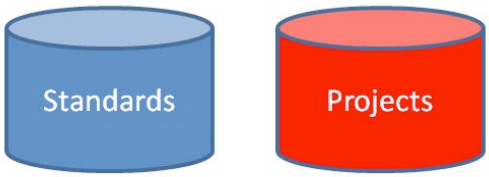


Figure 6 – The Virtual Construction Database consists of a Standards and Projects Database

When you work on a project, you will pull knowledge base information from the Standard database and save that in the Projects database. This allows you to alter the data to meet project specific estimating and scheduling needs without affecting the valuable knowledge data. Also, you can create project-specific information in the Project database, without saving it into the Standards database.

Both Standards and Project databases contain Recipes, Methods and Resources, which include all the required information for estimating, scheduling, and controlling a project.

An Introduction to Recipes, Methods and Resources

Recipes, Methods, Resources, and Locations are terms used very specifically in Vico Software applications:

Recipes are tags that are attached to model elements. A Recipe is a group of process and item definitions, included in the Recipe as *Methods* and *Resources*, that are needed to construct the building part.

Methods define the processes required to build a building part. A Method may be compared to an activity performed by a trade that is involved in the construction of the building part.

The Methods each represent a distinct work activity. It is not necessarily a linear process where each step follows directly after the other. There may be a significant time delay between each of the Methods.

The Methods are a refinement that is necessary to allow the implementation of scheduling in the 5D solution. Methods are assignable to a given location.

Each Method will have one or more **Resources**: an individual, identifiable, and, more importantly, chargeable items that contain cost and consumption data.

- Labor
- Material
- Equipment
- Subcontracted Work
- Other

Instead of including Resources, cost can also be defined at the Method level by specifying cost for the process by cost type.

Location is the term used to describe a very specific area of a building. Location is important in identifying Recipes, Methods, and Resources, but also plays a significant role in scheduling.

When you tag an element by assigning a Recipe to it, the system will generate one or more "Method Instances": occurrences of the Methods included in the Recipe. Each Method Instance carries Location information; Method Instances drive Location-based scheduling and estimating.

Recipe Data Structure

The Recipe information in the Virtual Construction database is structured in such a way that parts of Recipes (i.e. Methods and Resources) can be used in more than one Recipe, which makes it easy to manage your content. This reusability is achieved by the use of "Consumption Factors", which define how much of a standard Method is needed for a unit of Recipe and – one level below that – how much of a standard Resource should be used for a unit of Method.

For example,

- The amount of standard Method needed in a Recipe: 1 m3/cy of concrete column requires 4m3/12 sf of formwork
- The amount of standard Resource needed for a Method: 1m2/sf of formwork requires 1.1m2/sf of timber. Note that a waste factor is included here to compensate for the loss of material caused by processing the timber.

The Recipe data structure with the consumption factors is visualized in the following diagram.

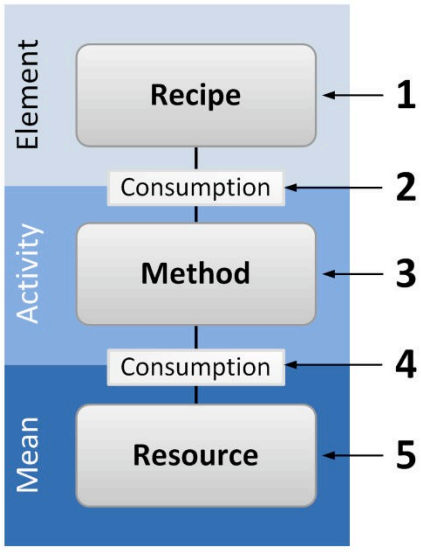


Figure 7 – Recipe Data Structure

1. The **Recipe** is the element level information package, and can be assigned to 3D model elements. One element in the model can only have one Recipe. The quantity data type of the Recipe should be the quantity that best describes the element's quantity (for example, m1 or lf of Wall).
   Each Recipe is assigned a **Recipe Classification**, which places the Recipe in an element cost group for organizational and reporting purposes.

2. The Recipe contains Methods. How much of a Method is needed for one unit of Recipe is defined as a **Consumption** "Method of Recipe".

3. The **Method** is an information package that contains activity or trade specific cost data and is included in the Recipe.

   Each Method is assigned a **Method Classification** (or "Work Type").

4. Each Method contains Resources; the amount of a Resource needed for one unit of Method is defined in a **Consumption** "Resource of Method". The consumption "Resource of Method" also includes factors that accommodate for waste and reuse of materials and equipment.

5. Cost per unit of labor, material, equipment or sub contracted work is defined in the **Resource**.
   Each Resource is assigned a **Resource Classification** (or "Procurement Group"). Additionally, Resources are assigned a "Cost Type", which can be Labor, Material, Equipment, Sub Contracted Work, or Other.

Example Recipes

Recipes can be defined for information with varying Level of Detail, which makes it possible to perform estimating and scheduling Tasks from the very early design phase until detailed design and production phases.

An example of the use of a Recipe with low Level of Detail information:

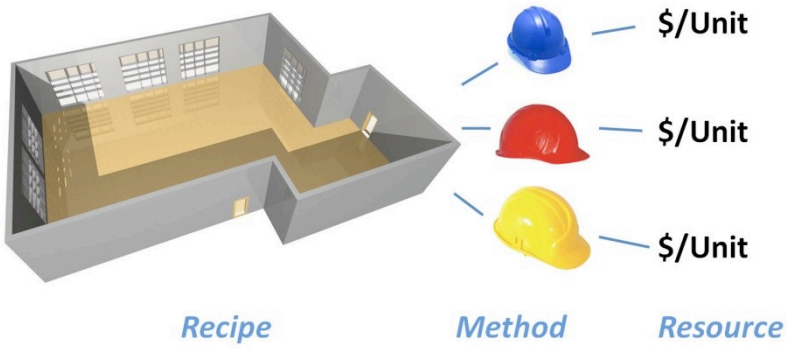


Figure 8 – Zone-based Recipe

The example shows the use of a Recipe to calculate the costs of a building unit that is typically used in the early design phases, when the Level of Detail of the model is low: a Zone element represents a space or room in a building.

The Recipe in this example is: “Office Space”; the Methods are the trades that need to perform the activities to build this office space (Structure, MEP, and Finishing), and the Resources contain the cost information for each of the trades.

An example of a high Level of Detail Recipe:

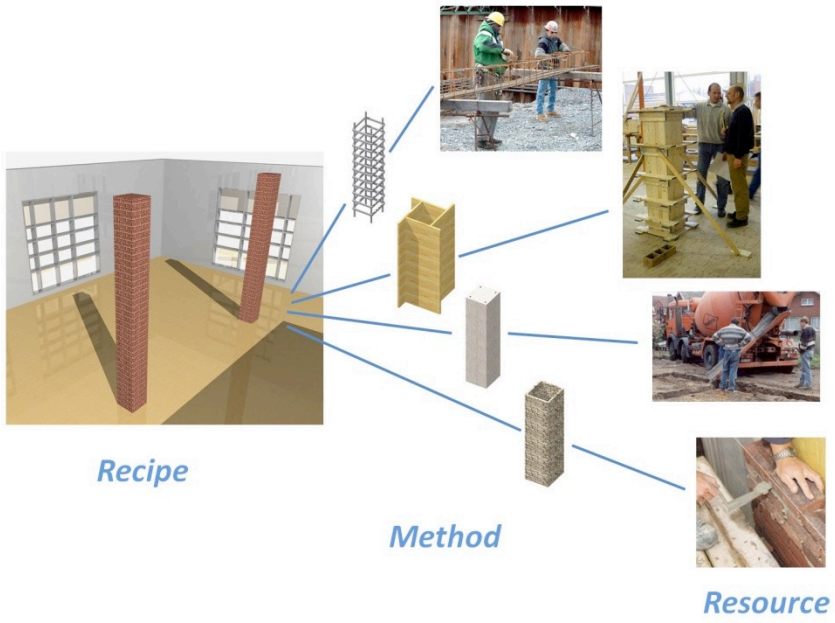


Figure 9 – Element-based Recipe

The second example above, is a Recipe for a column inside the office space of the first example. Once the design plans and the model contain more detailed information, you can assign Recipes to elements, and by doing so, use the more accurate quantities from the elements.

This “Concrete Column with Brickwork Cladding” Recipe contains the activities (or trades) that should be included in the cost calculation at the element level: rebar, formwork, concrete, and brickwork.

Each of the Methods contains one or more Resources that are required for completing the activity as defined by the Method. This can be labor, material, equipment, or sub contracted work. The Recipe in the example requires labor (iron workers, carpenter, a concrete crew, and a bricklayer), material (rebar, formwork, cement, and brick) and equipment (crane, concrete mixer).

Costs for the column element are defined for each of the mentioned Resources.

Creating Recipes, Methods and Resources in the Standards Database

The collection of Recipes, Methods and Resources is saved and maintained in the Standards database. Your Constructor software comes with an example Standards database, containing an extensive collection of Recipes, Methods and Resources. However, to create estimates for your own projects, you will have to modify the prices in this database and you will probably need to add additional Recipes.

HOW TO: OPEN THE STANDARDS DATABASE

The Standards database is accessed through Vico Estimator. After starting up the Estimator application, you will see the main application screen:

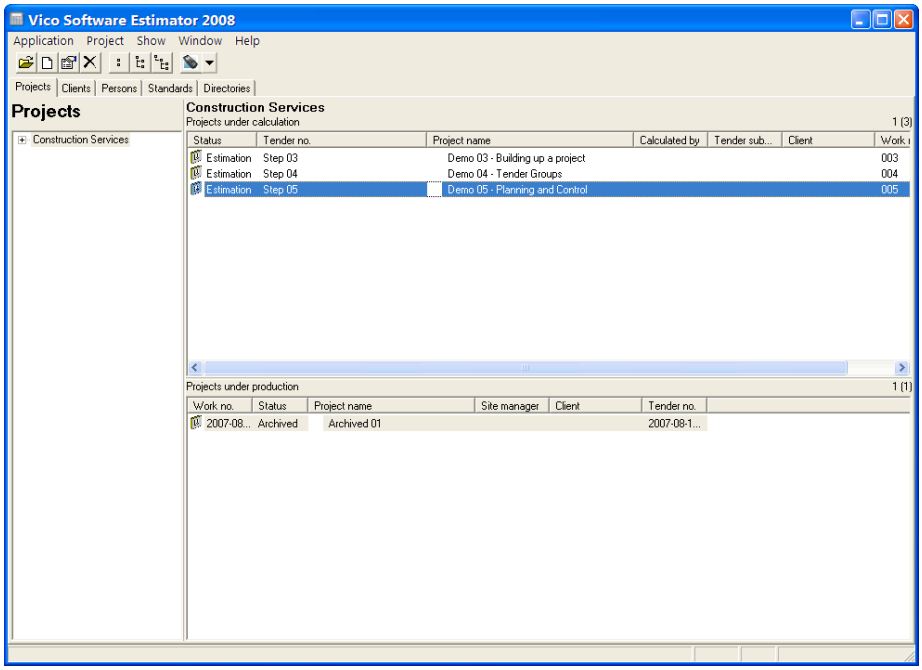


Figure 10 – The Estimator Main Application Screen

To access the Standards database, select the “Standards” tab in the main application screen.

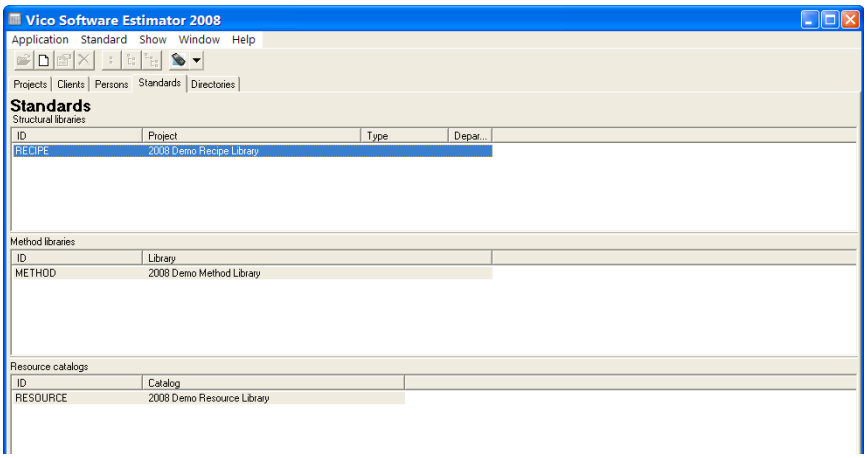


Figure 11 - Estimator Standards Screen

Each of the information package types (Recipe, Method, and Resource) is saved in a separate library, which can be accessed from the Standards screen. This makes it possible to define new information packages on any of the data structure's levels (for example, new sub-contractors can be defined in the Resource library).

To create a new Recipe, or to modify an existing Recipe, you have to open the Recipe library and perform the desired modifications.

How To: Create a New Recipe

To create a new Recipe in the Recipe Library, open the "2008 Demo Recipe Library".

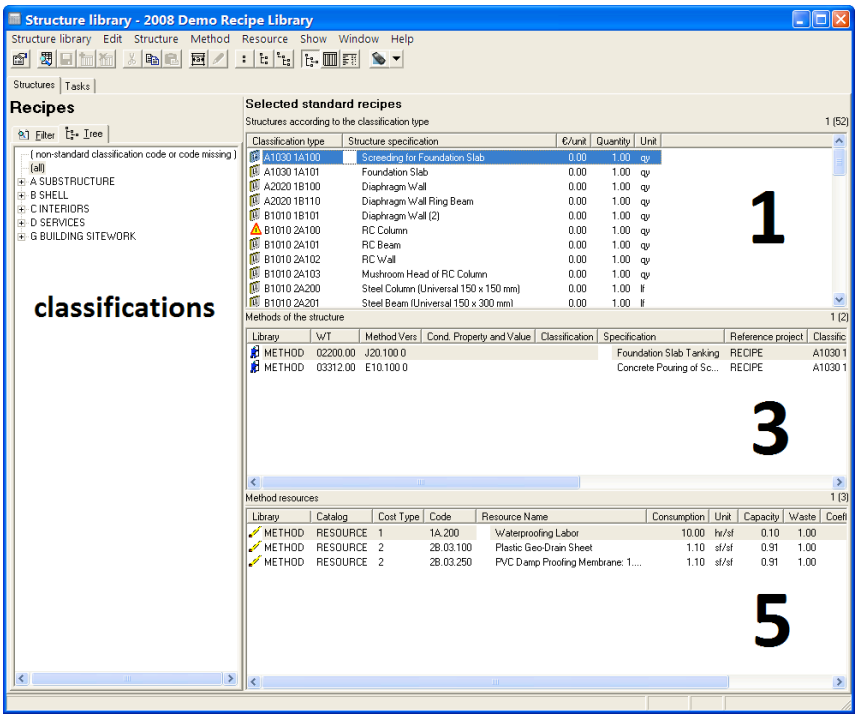


Figure 12 - Recipe Library

After opening the Recipe library, you will see the Recipes (1), the Methods used in the selected Recipe (3), and the Resources used in the selected Method (5). The numbers refer to the Recipe structure diagram, which we will use to explain the creation of a new Recipe. The "Classification" section to the left contains the categories with which the Recipe content is organized. Classification is used for quick access to the desired Recipe, as well as for the generation of chapters in cost reports.

To add a new Recipe, right click in the Recipe window (1) and select "New".

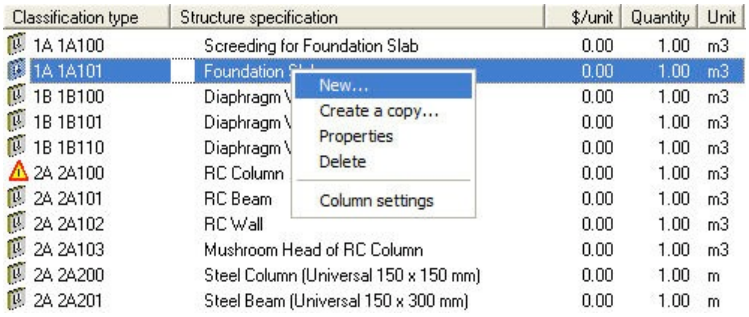


Figure 13 - New Recipe

Estimator will open the "New Recipe of the Library" dialog box, which will allow you to define estimating content on level 1 of the Recipe structure.

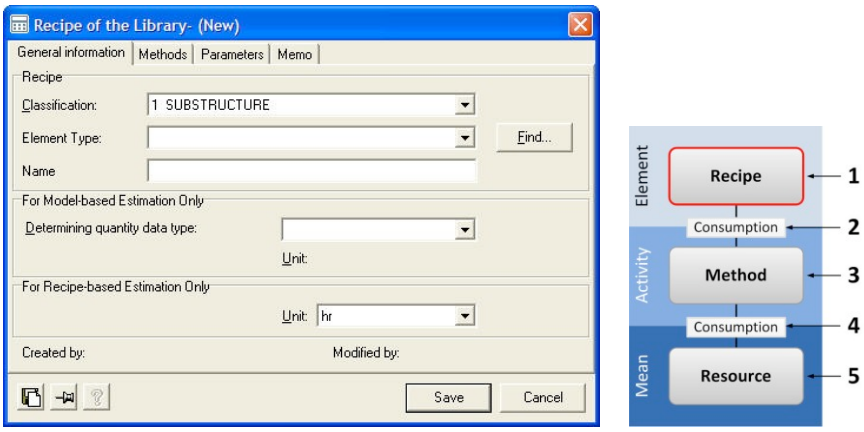


Figure 14 - New Recipe of the Library Dialog Box

To define a new Recipe, you need to fill out the following fields:

Classification — The element cost category, used for organizational and reporting purposes. Standard classes are defined in the "Classifications" tab in the "Directories" section of the main application screen.

Element Type — The code for the new Recipe. We recommend using the code of the selected classification, plus an incremental code. For example, 1B.001. Note: The code defined for each Element Type must be unique!

Name — A description of the new Recipe. This can be text that includes spaces.

Determining Quantity Type — The model-based quantity that should be used to calculate the unit cost of the Recipe. Unit costs are

calculated by aggregating the cost of all included Methods and Resources and dividing it by the selected quantity type (for example, Net Volume). You can find the available quantity types in the "Virtual Construction 2008 Quantities and Properties" document.

A quantity data type needs to be defined for "Model-based Estimating" AND a unit needs to be defined for "Recipe-based Estimating", to make the new Recipe available for both types of estimate.

To learn how to set up a *Model-based* or *Recipe-based* estimate, go to "Define A New Project".

After completing the definition of the Recipe, click "Save" to add the new Recipe to the library.

A new, empty Recipe is added to the Library:

Classification type	Structure specification	$/unit	Quantity	Unit
1A 1A100	Screeding for Foundation Slab	0.00	1.00	m3
1A 1A101	Foundation Slab	0.00	1.00	m3
1A 1A102	Slab On Grade	0.00	1.00	m2
1B 1B100	Diaphragm Wall (1)	0.00	1.00	m3
1B 1B101	Diaphragm Wall (2)	0.00	1.00	m3
1B 1B110	Diaphragm Wall Ring Beam	0.00	1.00	m3
2A 2A100	RC Column	0.00	1.00	m3
2A 2A101	RC Beam	0.00	1.00	m3
2A 2A102	RC Wall	0.00	1.00	m3
2A 2A103	Mushroom Head of RC Column	0.00	1.00	m3
2A 2A200	Steel Column (Universal 150 x 150 mm)	0.00	1.00	m

Figure 15 – The New, Empty, Recipe in the Library

To complete the Recipe by adding Method and Resource content, you need to re-open the Recipe by double clicking it or by right clicking and selecting "Properties". The new Recipe is opened at level 1.

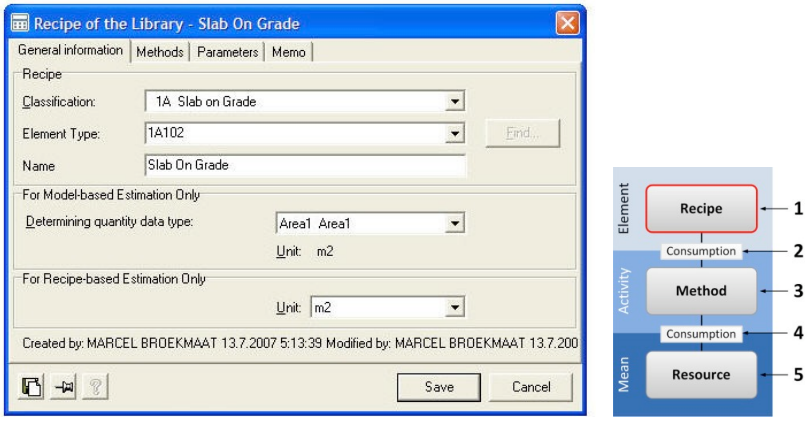


Figure 16 – The New Recipe of the Library Dialog Box.

Methods included in the Recipe can be accessed through the "Methods" tab of the Recipe properties dialog box. Activating this tab will show an empty collection of Methods for the new Recipe.

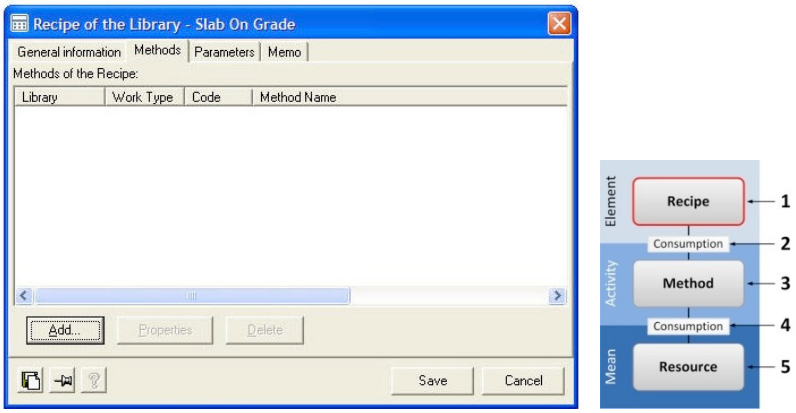


Figure 17 – "Methods" Tab in Recipe Properties Dialog Box.

You can add Methods to the Recipe by clicking the "Add…" button. This will open the "Method of the Recipe" dialog box.

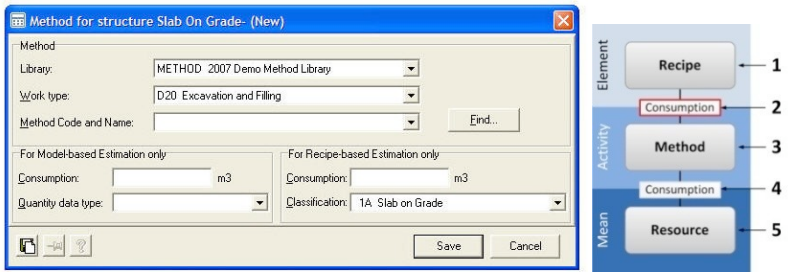


Figure 18 – "Method of the Recipe" Dialog Box.

The "Method for Structure" dialog box represents the Consumption of a Method in a Recipe, which is level 2 in the Recipe structure.

When the "Method for Structure" dialog box first opens, no Method has yet been added to the Recipe. To start adding a Method from the library, click "Find". This will open the "Find Method in Library" dialog box, which will allow you to select the Method you want to include in the current Recipe.

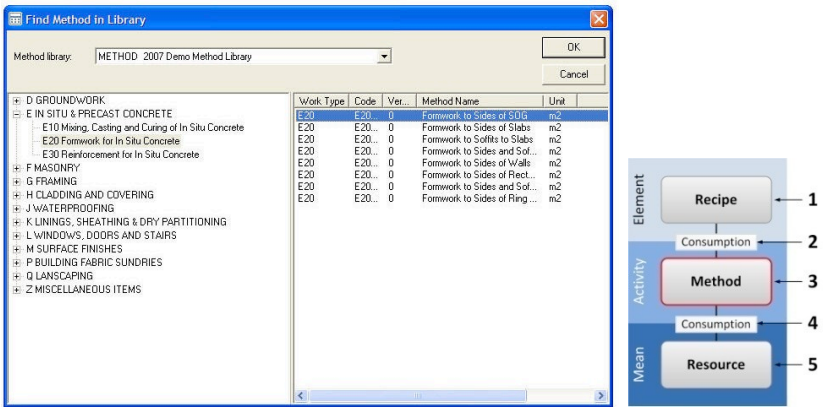


Figure 19 - Find Method in Library Dialog Box

When you select a Method, you are on level 3 of the data structure.

After selection of the Method, you need to define the consumption of the selected Method for the Recipe that you are working in.

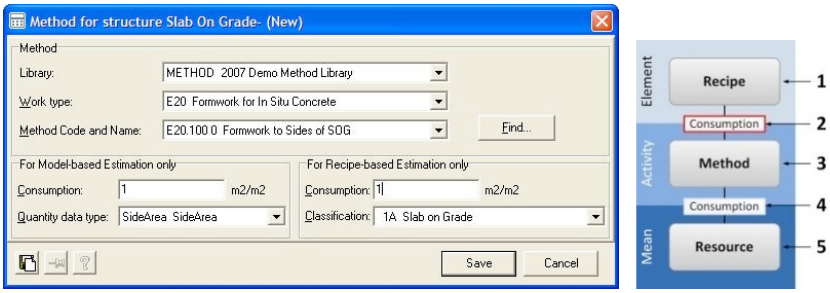


Figure 20 - Method of Recipe

The following data entry fields need to be completed:

For Model-based Estimation only

Consumption	The amount of Method units required for one unit of the selected Recipe quantity. For example, x tons of steel for each linear unit of steel beam. For model-based estimating, this represents one unit of the selected quantity data type.
Quantity data type	The quantity type, extracted from the model that you want to use as input for the selected Method. You can find the available quantity data types for each model element type in the "Virtual Construction 2008 Quantities and Properties" document. Any quantity data type defined in your database can be chosen, regardless of what the selected quantity data type is at the Method level.

For Recipe-based Estimation only

Consumption	The amount of Method units required for one unit of the selected Recipe quantity. For example, x tons of steel for each linear unit of steel beam.
Classification	By default, the classification to which the Recipe that you are working on belongs. *Advanced use: you can change this classification to access quantity data types that have only be assigned to specific classes in the Recipe classification system.*

When you have completed entering values for all fields, click "Save". You have added a Method (including the Resources that were included in the Method definition!) to your new Recipe. Repeat these steps to include Methods for all activities or all trades that add cost to the element for which you defined the Recipe.

The explanation above described the process of how to create a new Recipe in the Standards database, using existing Method and Resource definitions. It may happen that you want to include costs for a trade or activity that does not yet exist in your Method Standards library.

In this case, you will need to open the Methods library in Estimator's Standards and add a new Method.

HOW TO: CREATE A NEW METHOD

To create a new Method in the Method Library, open the "2008 Demo Recipe Library" in the "Standards" tab of Estimator.

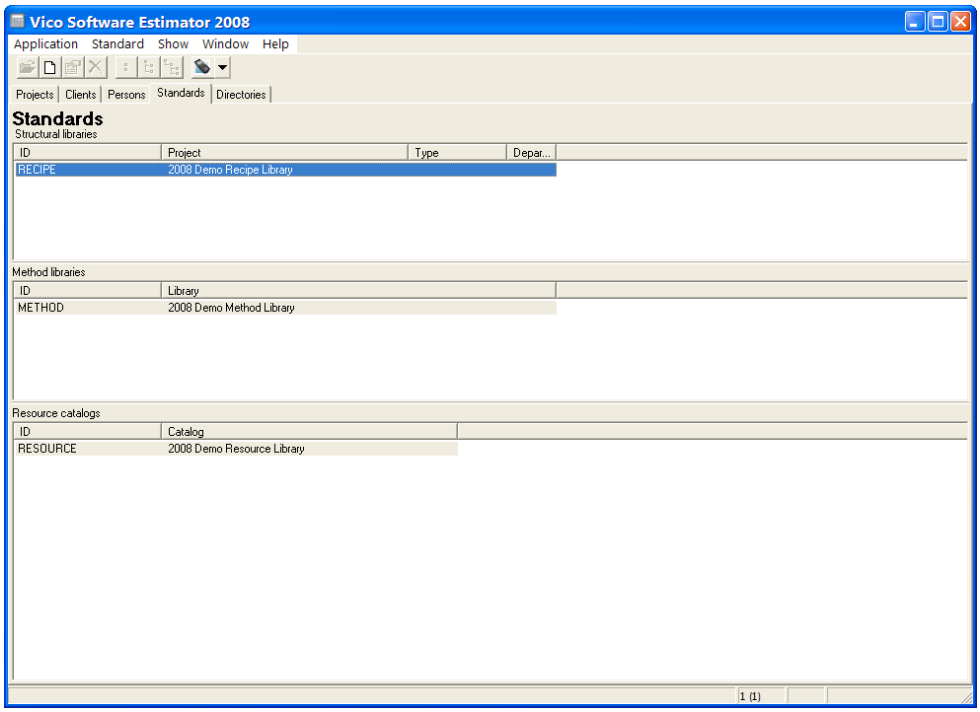


Figure 21 - Standards tab in Estimator

When you are in the Method library, create a new Method by right-clicking and selecting "New".

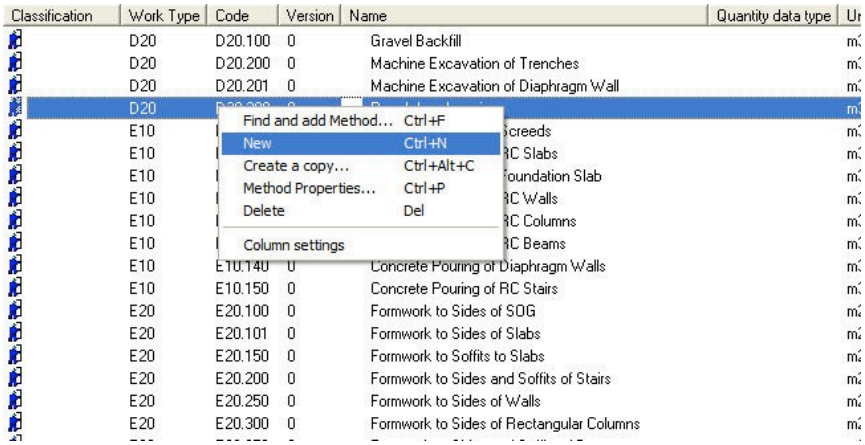


Figure 22 - New Method in Method Standards library

This will open a new "Method of the Library" dialog box.

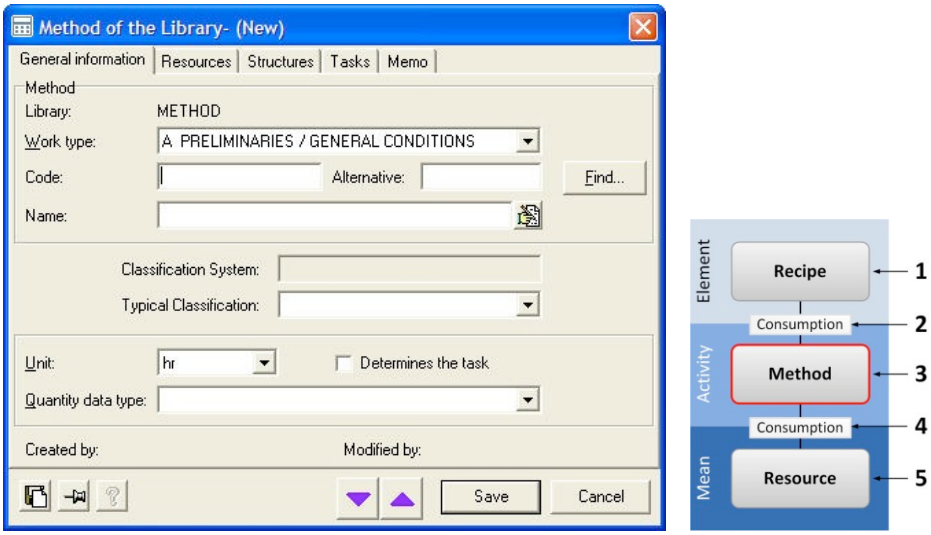


Figure 23 – The New Method Dialog Box

The following information is needed to define a new Method:

Work Type — The Method cost category – classification – used for organizational and reporting purposes. Standard classes are defined in the "Work Types" tab in the "Directories" section of the main application screen.

Code — The code for the new Method. We recommend using the code of the selected classification plus an incremental code. For example, E20.001.

Advanced: Use series (101/102/…, 201/202/…, 301/302/…) to define sub sets in your work types. This makes it easier to organize and maintain you standard dataset.

Alternative — You will use Alternative if you create a copy of an existing Method. This will help you recognize that the Method was created based on another version; several Methods can have the same originator, indicated with incremental "Alternative" numbers.

Name — A description of the new Method. This can be text that includes spaces.

Typical Classification — The typical Recipe classification for which this new Method will be used.

For example, if this is to be a "Formwork" Method, the typical classification could be "Structure".

Advanced: this option is used to make the quantity type, assigned to specific Recipe classifications, available for defining Method consumption.

Unit — The unit in which the cost of the activity or trade reflecting the Method is expressed.

Consider the available quantity data types when you define the unit; the consumption (level 2 in the Recipe

structure) allows you to convert quantities to the unit you need.

For example, the quantity data type provides volume, but you need the weight to calculate the cost of the Method. In which case, you will define the consumption as a weight/volume.

Quantity Data Type

The model-based quantity data type that should be used to calculate the cost associated with the Method.

You can find the available quantity types in the "Virtual Construction 2008 Quantities and Properties" document.

After entering the required data in the dialog box, click "Save" to add your new Method to the Method Standards library.

Your new Method will appear in the library and will be empty: no Resources are yet included in the Method definition. You can recognize an empty Method by the triangular warning symbol.

Classification	Work Type	Code	Version	Name	Quantity data type	Unit	$/unit
	E10	E10.130	0	Concrete Pouring of RC Beams		m3	54.03
	E10	E10.140	0	Concrete Pouring of Diaphragm Walls		m3	56.20
	E10	E10.150	0	Concrete Pouring of RC Stairs		m3	55.68
	E20	E20.100	0	Formwork to Sides of SOG		m2	23.07
	E20	E20.101	0	Formwork to Sides of Slabs		m2	22.73
	E20	E20.150	0	Formwork to Soffits to Slabs		m2	29.62
	E20	E20.200	0	Formwork to Sides and Soffits of Stairs		m2	51.64
	E20	E20.250	0	Formwork to Sides of Walls		m2	24.40
	E20	E20.300	0	Formwork to Sides of Rectangular Col...		m2	24.63
	E20	E20.350	0	Formwork to Sides and Soffits of Beams		m2	22.73
	E20	E20.400	0	Formwork to Sides of Ring Beam		m2	22.73
2	E20	E20.001		Column Formwork	SkinSurface	m2	0.00
	E30	E30.100	0	Reinforcement of Slabs		t	510.64
	E30	E30.101	0	Reinforcement of Foundation Slab		t	531.63

Figure 24 – The New Method without Resources

To start adding Resources to your new Method, double-click the new Method to open it. Alternatively, you can right-click on the Method and select "Method Properties".

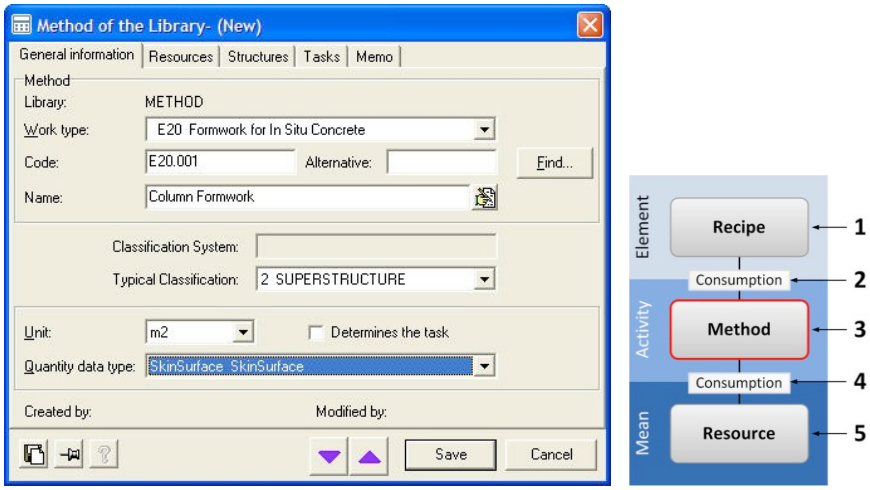


Figure 25 – The Method Properties Dialog Box

Opening the new Method brings you directly to level 3 – the Method – of the Recipe structure.

To view the Resources included in the opened Method definition, click on the "Resources" tab.

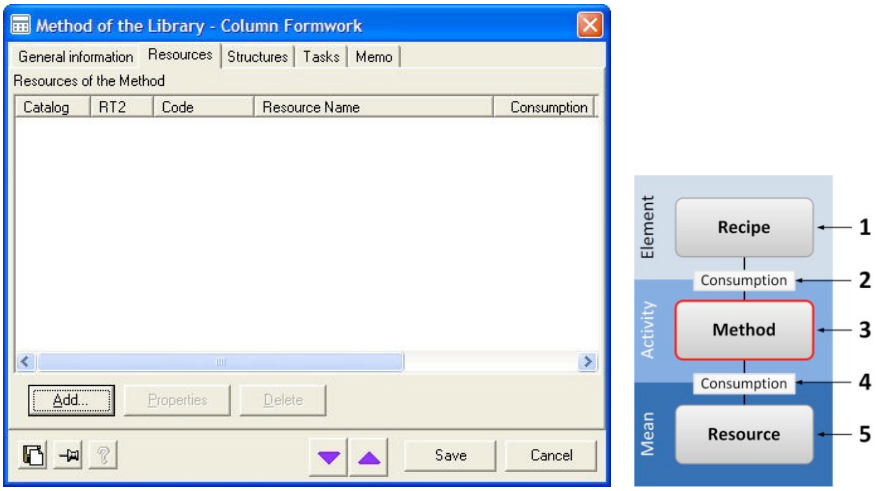


Figure 26 – The Resources of the Selected Method

As recognized in the Method library, your new Method does not yet contain any Resources. Click the "Add" button to start adding a Resource to your Method.

Clicking the "Add" button opens the "Resource of the Method" dialog box, in which the consumption of Resource for the selected Method is defined.

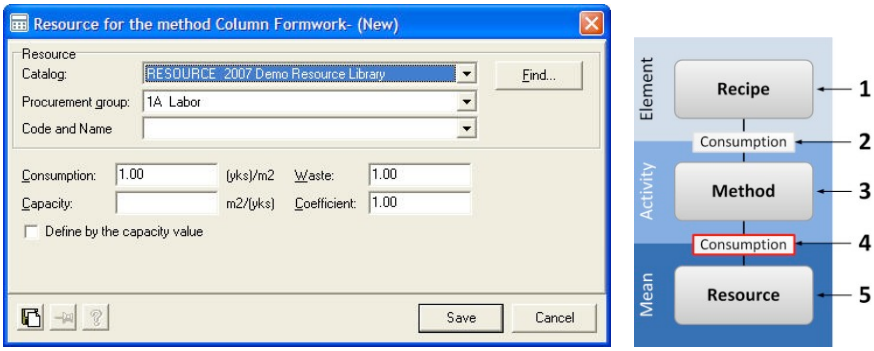


Figure 27 – The Consumption "Resource for the Method" Dialog Box

You have not selected a Resource yet, so the next step is to find the Resource you want to add to the Method in the Resource Standards library. Click the "Find" button to open the Resource Standards library. Note that you have the option to change the library (catalog) from which you want to select the Resource that you want to use. You can use this option when you have created more than one Resource library. (For example, one for every area in the country in which your company operates.)

Clicking the "Find" button will bring you to level 5 in the Recipe structure.

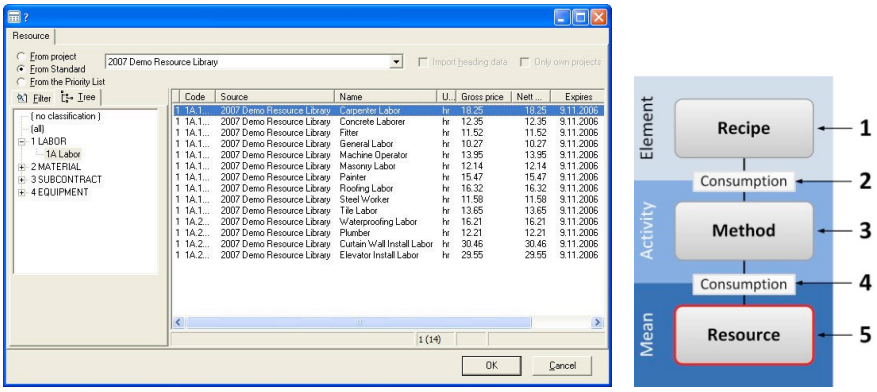


Figure 28 - Selection of Resource from Resource Standards Library

The Resource selection dialog box offers you the opportunity to select from another Resource data source other than the Standards library. Select “From Project” to include a Resource from an earlier project in the Projects database.

The tree on the left of the Resources dialog box allows you to select a Resource classification (or “Procurement Group”), in which you want to search for the desired Resource. The “Filter” function lets you specify search criteria for the required Resource. In both cases, the list with the available Resources is filtered.

The list contains the available Resources that meet the filter criteria from the selected Library or Project. You can see the price (“Gross Price”), the unit that is used to calculate costs, and also what the expiry date of the Resource is. The expiry date provides you with an indication of the validity of the defined Resource price: when the expiry date has passed, the cost will be out of date.

Select a Resource and click “OK” to add it to your Method; Estimator will take you back to Level 4, where you can define the consumption of the selected Resource in your Method.

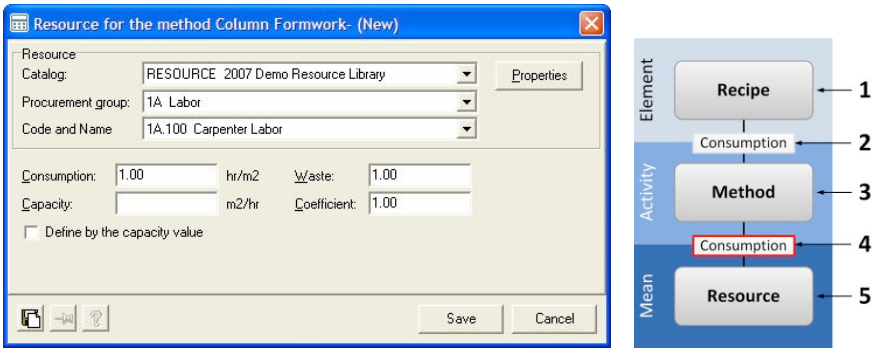


Figure 29 - Resource of Method Consumption

The “Resource for the Method” consumption dialog box contains the following fields that you need to complete:

Catalog	The Resource catalog from which you are selecting/using the Resource to be included in the active Method.
Procurement group	The Resource classification to which the selected Resource belongs.
Code and Name	The unique code and description of the selected Resource.
Consumption	The amount of selected Resource that is needed for one

	unit of Method. For example, 1 hr of labor for 1m^2 or 10sf of formwork.
Capacity	Sometimes it is easier to define the use of a Resource by "capacity". For example, a carpenter can complete 1 m^2 or 10sf of formwork in one hour of work. *The capacity number only becomes active when the "Define by the capacity value" checkbox is activated.*
Waste	The waste factor compensates for material is lost while processing it (for example, timber when it is cut on the job). Waste factors > 1 increase the material quantity.
Coefficient	The coefficient is a generic factor that can be used to increase or decrease the calculated material quantity. For example, the coefficient can be used if you want to increase the amount of labor to build part of the building with a higher than average complexity.

Click the "Save" button after completing your consumption settings to finish the definition of the new Method in the Method Standards database.

In addition to defining new Recipes and Methods in the Standards database, you can also define new Resources directly in the Resource Standards.

It is possible to maintain more than one Resource Standards catalog in your Standards database, for example, to reflect the difference in costs for projects in different parts of the country, or to reflect any differences in cost for varying project types (e.g. residential, commercial, healthcare).

How To: Create a new Resource Catalog

To create a new Resource Catalog, go to the "Standards" tab in Estimator's main application window.

In the menu bar, select "Standard"> "New" > "Resource catalog…".

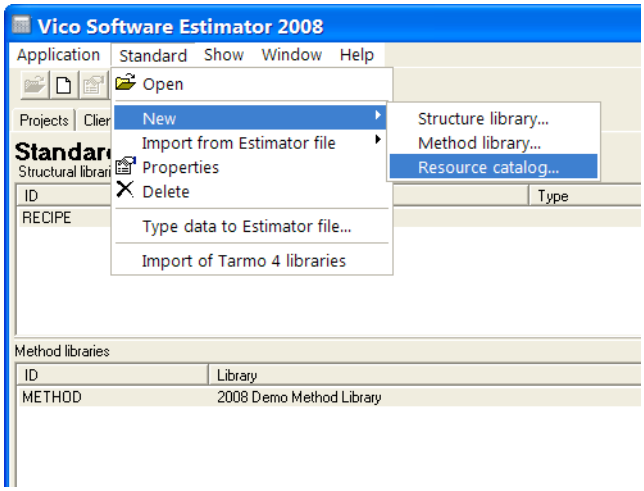


Figure 30 - Creating of a new Resource Catalog in Standards

Estimator will open the "New Resource catalog" dialog box.

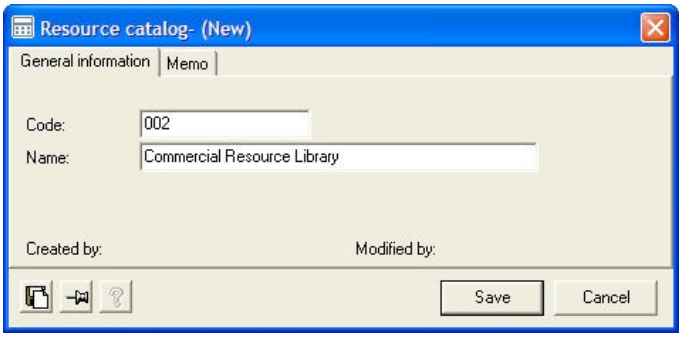


Figure 31 - New Resource Catalog Dialog Box

Enter a code and a name for the new catalog and click "Save" to add the new – empty – Resource catalog to your Standards.

The new Catalog will automatically use the Resource classification ("Procurement Groups"), defined in the "Directories" section of the main application window.

The Resources library plays an important role in Estimator. The Resource library will become your knowledge base of cost information for labor, material, equipment, and sub contracted work. All project estimates will derive their cost information from the Resource level of the Recipe structure in projects.

You can assign an expiry date for each Resource in your database, which helps you to identify when price information needs to be updated. When an update is needed, you can perform maintenance of your cost data centrally in the Resource Standards. Estimator includes tools that let you update cost information in projects on demand, once you have updated the costs in the library.

HOW TO: CREATE A NEW RESOURCE

To create a new Resource, open the Resource catalog from Estimator's "Standards".

In the Resource catalog, right-click and select "New".

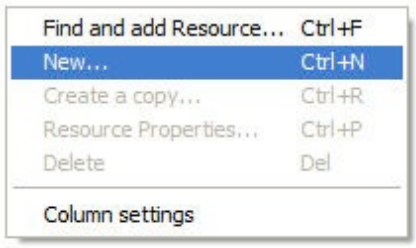


Figure 32 - Add a New Resource to the Catalog

Estimator will open the new Resource Properties dialog box, which is on level 5 of the Recipe structure.

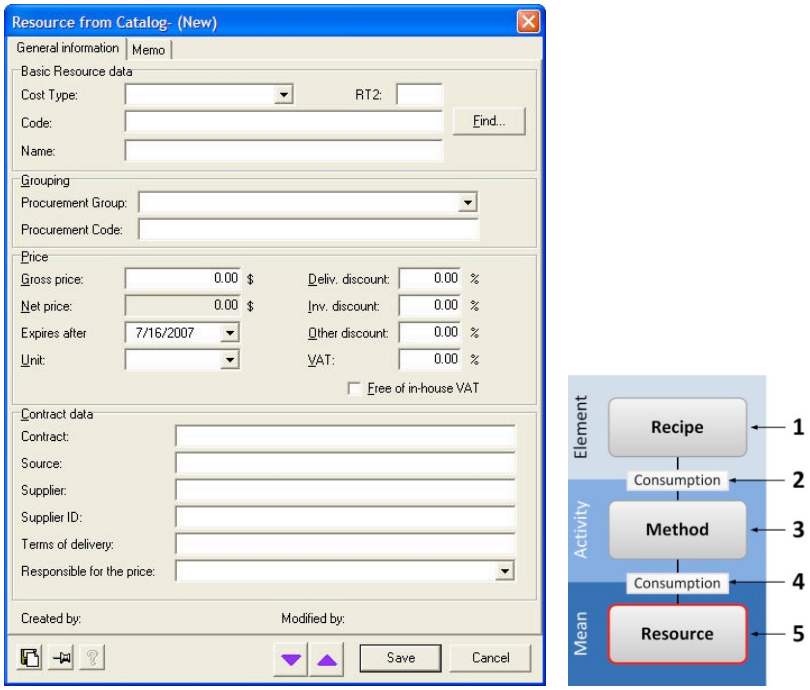


Figure 33 - New Resource Properties

When you create a new Resource, the following data entry fields are mandatory:

Cost Type	The type of Resource that you are defining. This can be labor, material, equipment, sub contracted, or other. Depending on the configuration of your database, the names of these types may vary.
Code	The unique code for the new Resource. We recommend using the classification (Procurement Group) for the first part of the code, followed by an incremental number. For example, **2A.01**.001.
Name	A description of the new Recipe. The description may contain spaces.
Procurement Group	Resource classification, which is used for organizing your Resource data and for generating reports.
Gross Price	The base price of the Resource, which does not include discounts (delivery, invoice and other) or Value Added Tax (VAT).
Unit	The quantity unit with which the total cost associated with the Resource is calculated. Consider the quantity data type, defined for the Method in which the Resource is included; use the consumption (level 4) to convert from the Method quantity type to the desired Resource quantity type.

Explanation of the non-mandatory data entry fields:

RT2	An alternative Resource Type that could optionally be used when a Resource could be considered to belong to a second type. For example, a subcontractor who provides equipment services.
Procurement Code	A user defined code entry field that can hold the procurement code used to communicate with suppliers.
Net Price	An automatically calculated value, based on Gross Price, minus reduction, plus tax.
Expires after	The validity time of the defined price. After the expiry date, Estimator will display a warning icon in the project(s) in which the Resource is used to notify you that the price has expired.
Delivery, Invoice and Other Discounts	Reduction percentages, subtracted from the Gross Price.
VAT	Value Added Tax, as a percentage of the Gross Price that will be added to the total price.
Free of in-house VAT	A setting that will exclude the tax percentage from the cost of the Resource when the Resource is used for the company's own processes.
Contract Data	Contract information for the Resource.

After entering all required information, click "Save" to add the Resource to the library, or click the "up" or "down" button to proceed to the next Resource.

When you modify any existing Resources in the Standards database, the changes will not automatically update the Resources in your existing estimates! Go to "How To: Update Resources" to learn how you can implement these changes in your active estimates.

When you define database content, you may find that the existing structure of content classifications; Recipe classification, "Work Type" classifications for Methods and "Procurement Group", or classification for Resources, do not meet your company standards, or fall short in certain areas.

In such cases, you can modify the classification structure of your Standards database in the "Directories" tab of Estimator's main application window.

HOW TO: MODIFY ESTIMATOR'S STANDARD CLASSIFICATION STRUCTURES

Open Estimator's main application window and select the "Directories" tab. The Directories tab contains all the Standards needed for categorizing and quantifying your cost estimates.

Select the classification structure that you want to edit – in this case, "Recipe Classification" is selected.

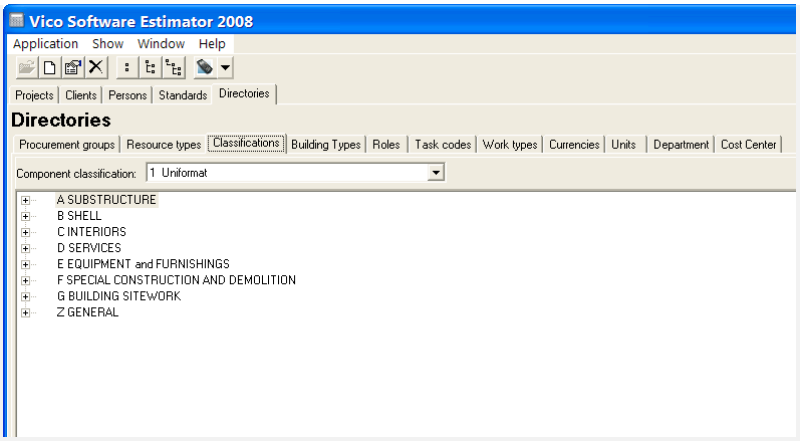


Figure 34 - Directories tab in Estimator's main application window

Expand the section of the classification that you want to modify. Select the class you want to edit and right-click – you have the following options:

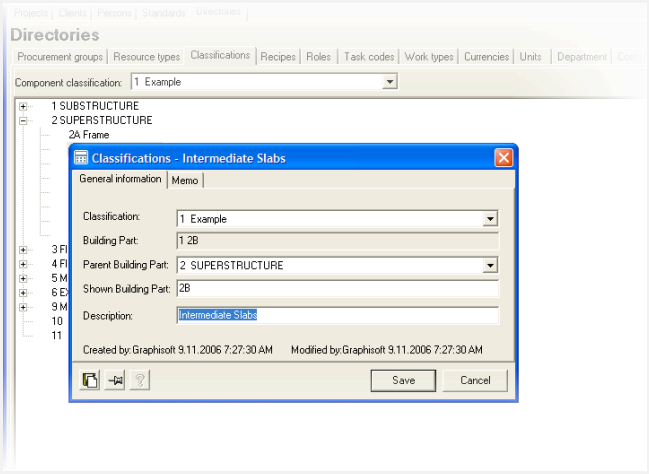


Figure 35 - Adding a new class to a classification system

The following information is required:

Classification	The currently selected classification system. *Note: It is possible to maintain more than one classification system; this however requires advanced database configuration.*
Building Part	The code for the new or currently opened classification
Parent Building Part	Classification to which the new or currently opened classification should belong, known as "parent".
Shown Building Part	New or currently opened classification
Description	Description for the new or currently opened classification.

Click the "Save" button after completing your definition edits. The new classification will be active for all **new projects**.

Defining Database Content with the Database Tool

In addition to defining estimating content in Estimator's "Standards" section, you may consider Vico Software's Database Content Tool (not included in the Constructor package) to prepare your Virtual Construction database.

The Database Content Tool allows you to copy and paste your existing estimating data into a spreadsheet. The tool then converts these data automatically into a Vico database. For more information about the Database Content Tool, contact Vico at techsup@vicosoftware.com.

Creating New Databases with the DB Admin Tool

The DB Admin Tool, which can be found in the "Vico Software" folder in the Start menu, allows you to run a database on a network server that can be accessed by client machines.

HOW TO: SET UP A NEW DATABASE ON THE SERVER

To setup a new database on the server, start the DB Admin Tool and select "New DB Server". The DB Admin Tool will ask you to specify the database that you would like to run from the server.

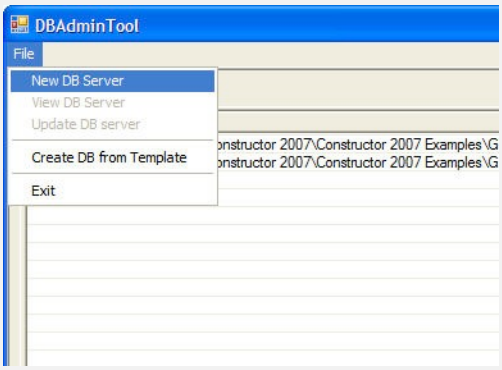


Figure 36 - Create a new Database on the server with the DB Admin Tool

When you would like to run both Project and Standards databases from a server, you will have to create two DB servers!

You can also use the DB Admin Tool to quickly create a backup of your (local) database. Simply right-click on a "server" and select "Backup".

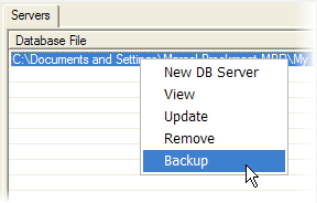


Figure 37 – Backup your data with the DB Admin Tool.

Model Progression

Projects do not reach the 100% design-complete stage in one step. Design and cost estimating are highly iterative processes, and additional information is added to the set of design documentation at each stage.

Updating the Content Plan and the database content will be required every time a new version of design data is released in order to keep your model and estimating data coordinated and synchronized.

If you are involved in a Design and Build project, or partnering with an architectural office, information availability for the project should be planned. By defining the stages in which design information is planned to be released, and also what information will be included, all parties involved are able to anticipate data availability.

Vico Software recommends using a Model Progression Specification for model development planning.

Defining Levels of Detail for Building Elements

The Model Progression Specification methodology allows you to define so-called "Levels of Detail" for building elements: this in the form of a code which reflects the amount of information included in a Virtual Building element. The amount of information that a Virtual Building element contains determines for which purposes it can be used.

The following example shows how Levels of Detail could be defined for a Pad Footing.

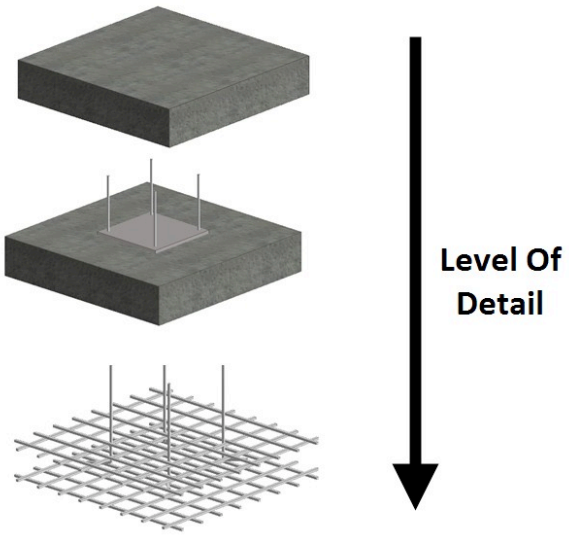


Figure 38 – Level of Detail example for a Pad Footing element, first represented as a simple block, later refined with rebar and anchor details.

HOW TO: CREATE A MODEL PROGRESSION SPECIFICATION

Create a matrix using the horizontal axes as a scale for the "Levels of Detail" for phasing the design documentation completeness. A Level of Detail (LoD) can be represented by a number or a code. For example, you can use a three digit number: a higher number indicates the next phase of completion for the required design information.

Place the purposes for which you want to use the Virtual Construction model on the vertical axis. Typically for 5D modeling, this includes Estimating, Scheduling, Procurement, and Fabrication.

In each cell on the intersection of LoD and defined purpose, you can define which processes the modeled element should be able to drive, or what information it should deliver. The matrix is in fact a schedule of information delivery for each specific building element.

In our example, we defined that when the “Pad Footing” model element reaches LoD 200, it should be usable for calculation, and include sufficient information to define purchase orders or sub contracts for procurement purposes. At LoD 300, the element should provide enough detail for the fabrication of its component parts.

The number of levels of detail can differ from element to element. A Curtain Wall element, for example, will typically go through more design phases (iterations) than a Pad Footing.

The Project Model Progression Specification

For each phase of a project you can define a required LoD that is defined at the element level. For example, you may want to make a decision about a curtain wall structure modeled in the project, which requires a certain amount of detail included in the specifications. Therefore, in phase 4, the LoD 400 should be achieved.

Define Favorites

When you have finished analyzing the set of design documentation, and when you have completed the Content Plan, you are then ready to define the set of model elements that you want to use to create the 3D Constructor model.

In Constructor, you can predefine and save model elements by setting element parameters. Predefined elements are called “Favorites” in Constructor. In addition to the geometric parameters (for example height, width and fill type), you can also predefine the Recipe that will be linked to the element when it is added to the model.

By using Favorites to define both the geometry and Recipe links before you start modeling, the connection to the project estimate is established with no extra effort. When adding a new element to the construction model that is chosen from the Favorites collection, the associated Recipe will automatically be assigned to the newly added element.

HOW TO: DEFINE A FAVORITE

To define a Favorite, you should follow the following steps:

Open the “Default Settings” dialog box by double clicking on the tool button or by clicking the tool properties in the “Info Box”. In the example below, you can see the Wall Default Settings. The Settings dialog box enables you to modify the element’s geometric and representational properties, as required.

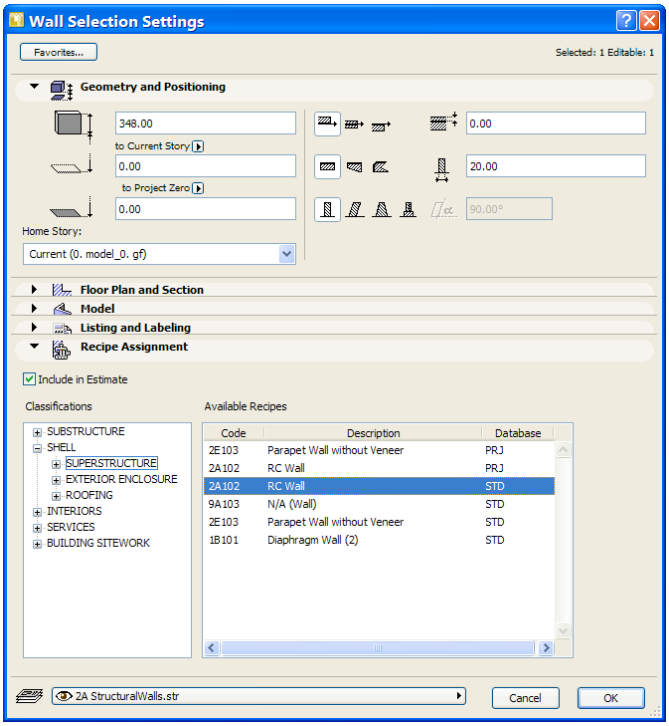


Figure 39 - Wall Selection Settings

The Default Settings dialog box also contains the "Estimating" tab, which enables you to define a default Recipe assignment.

In this example, the Recipe "**RC Wall**" is selected.

You can now save both the geometry/representation and Recipe assignment settings as a Favorite by clicking the "Favorites…" button at top of the "Default Settings" dialog box. Constructor will open the "Apply Favorites" dialog box.

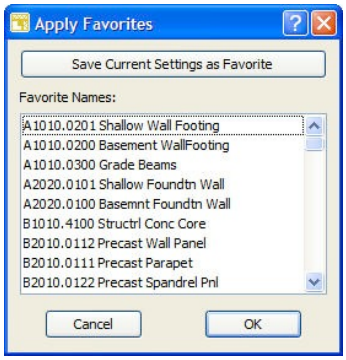


Figure 40 - Favorites Dialog

The next step is to save the currently defined settings into a new Favorite definition. This is done by clicking the "Save Current Settings as Favorite" button.

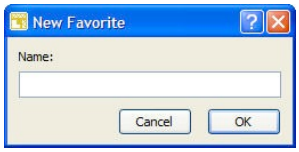


Figure 41 - Define New Favorite Dialog

A name for the new Favorite can be entered; the operation is completed by clicking OK and OK again in the “Apply Favorites” dialog box.

You can now close the “Default Settings” dialog.

After completing the Favorite definition process, the newly created Favorite: “Example Favorite”, will appear in the Favorites palette, which can be opened from the menu: “Window” > “Palette Display” > “Show Favorites”.

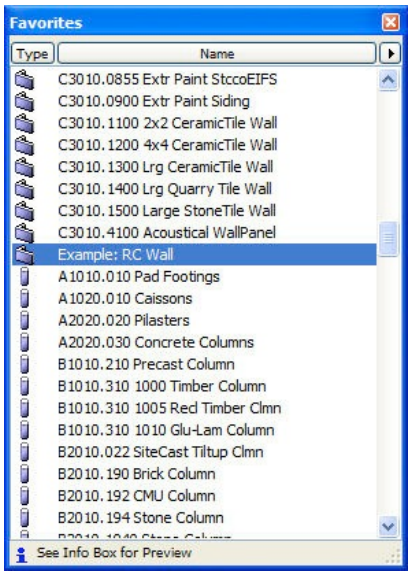


Figure 42 - New Favorite in the Favorites Panel

The new Favorite is in the list and can be activated by double-clicking it.

While browsing the list of Favorites, the Recipe associated with the Favorite is shown in the Info palette on the user interface, where the properties of the selected Favorite are displayed.

When your work environment is not set up to display the linked Recipe information, you can add this section to your Constructor Info box.

HOW TO: ADD RECIPE INFORMATION TO YOUR CONSTRUCTOR INFO BOX

Recipe information can be included in the Info Box from the “Work Environment…” settings in the “Options” menu.

In the “Info Box” branch of the “Work Environment Profiles” tree, select the tool for which the Recipe information needs to be displayed.

In the example below, the Wall Tool is selected.

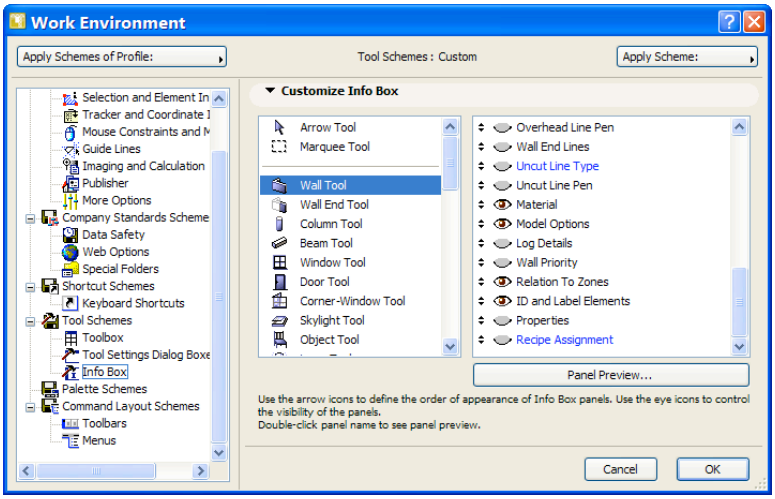


Figure 43 – Enabling and locating the "Recipe Assignment" information of a tool in the Info Box.

From the available panel list, click on the "eye" icon (Recipe Assignment), so that the eye is opened – from now on, the "Estimating" panel will be included in the Info Box for the Wall Tool.

Depending on the screen resolution and the number of other panels that are activated for the Info Box, the "Estimating" panel will either be displayed on the bottom of the Info Box, or hidden.

The "Estimating" panel can be made visible by clicking on the up and down arrow icon ( ) and dragging the panel to the desired position. For example, you could drag the "Estimating" panel to a position just below "Main", which will display the Recipe information just below the Tool Type bar of the Favorite.

Define a New Project

The last preparation item that you need to complete before you start working on a new Virtual Construction project is to add a new project to the Projects database, in which all model, estimating and scheduling information will be saved.

HOW TO: CREATE A NEW PROJECT

To create a new Project in the Projects database, start Estimator and go to the "Projects" tab in Estimator's main application window.

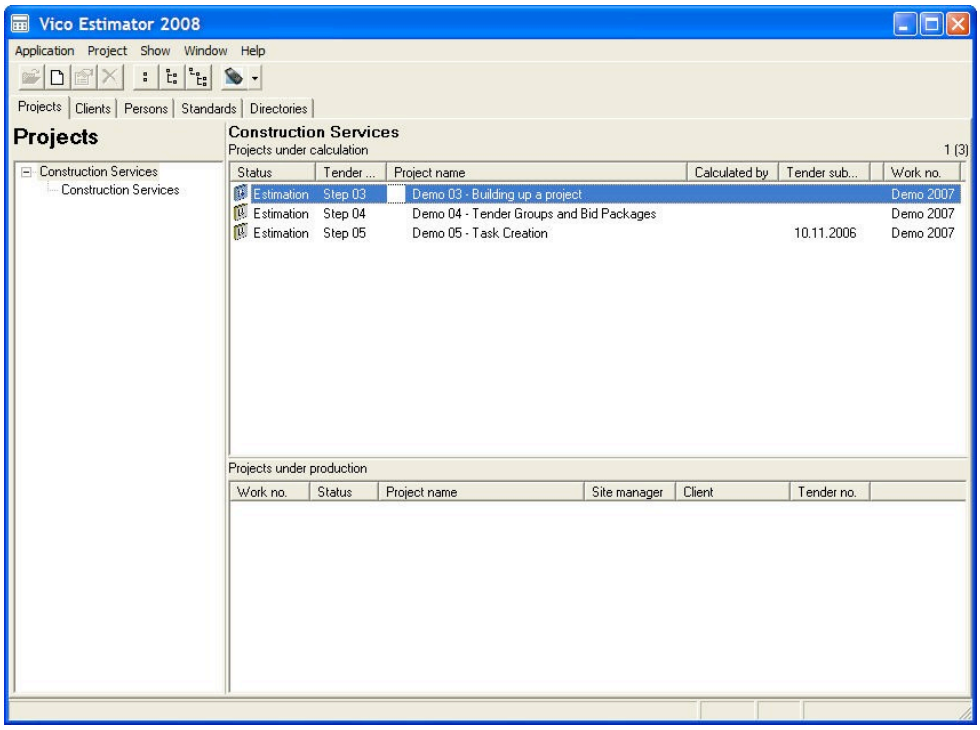


Figure 44 - "Projects" in Estimator's main application window

Right click in the “Projects under calculation” pane and select “New”, or select “New” from the “Project” item in the menu bar.

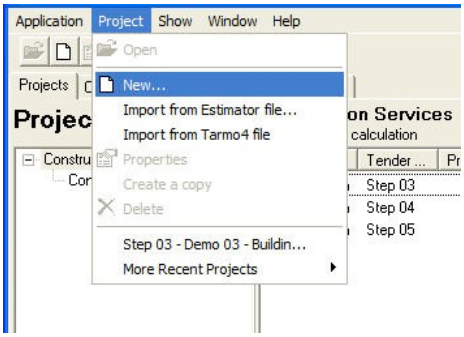


Figure 45 - Create a new project from the "Project" menu

Estimator will open the “Project Properties” dialog box where you can define the properties of the project you want to add to the database.

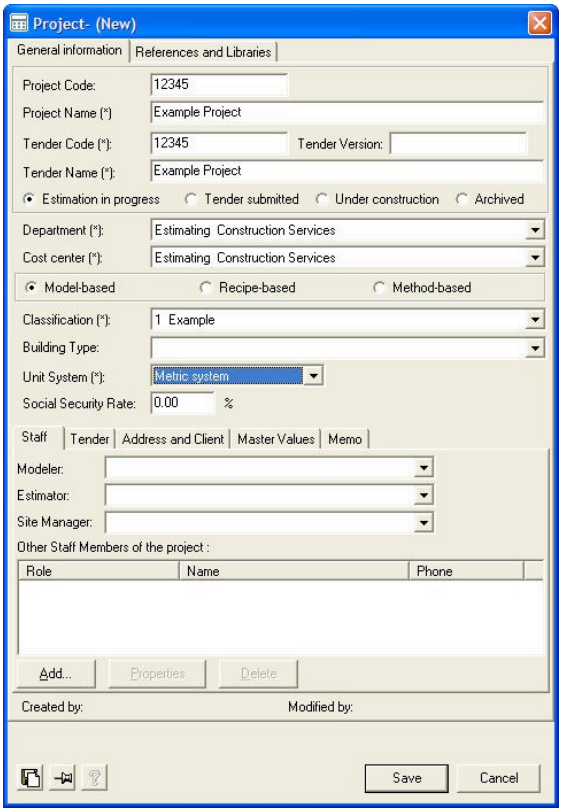


Figure 46 – The New Project Properties dialog – General Information

You can enter the following information to specify the new project's properties (fields marked with a "*" are mandatory):

General Information Tab:

Project Code	A unique number for the new project that you are creating.
Project Name *	A description of your new project.
Tender Code *	A unique code that is added to the database for all Tender documents, generated for the project.
Tender Version	The version of the project's cost estimate for tendering purposes.
Tender Name *	A description of the project for tendering purposes.
Status *	The status of the project. The options are: Estimation in progress (default), Tender submitted, Under construction and Archived. Changing this option will include the project in a different part of the Estimator "Projects" tab. The Default status is "Estimating in Progress".
Department* and Cost Center *	Your project will be organized into folders according to departments and cost centers. The project's location should be defined by setting the corresponding values here.

Estimate Type *	The options are: Model-based, which you should use if you want to connect to a Constructor model; Recipe-based, which uses the same Recipe – Method – Resource cost estimating structure, without a model connection; or Method-based, which lets you estimate without the Recipe level of information (an activity-based estimate).
Classification *	The classification system that you want to use to organize cost information at the Recipe (element) level.
Building Type	The building category to which your new project belongs. New building types can be added to your database in the "Directories" tab of Estimator.
Unit System *	The unit system for the new project: this is either "Metric" or "Imperial"
Social Security Rate	If applicable, you can specify the Social Security rate that should be added to all "Labor" Resource costs. Social Security is automatically included and reflected at the Recipe level of your cost estimate.
Staff	Allows you to define which persons will work on the project, and which roles they will fulfill. You can add new persons and roles at any moment in the "Roles" tab of the "Directories" section in Estimator.
Tender	Lets you define the properties of the Tender that you need to prepare for the project, including tender deadline and tender document classification.
Address and Client	On this tab, you can specify customer information for your project, which will be included in the reports you generate.
Master Values	Master Values are high level key figures of the project, which can be used in your Tender reports to present a "cost per unit". (For example: cost per sf or m^2 of floor surface area.)
Memo	Provides you with space to add memos to the project's information.

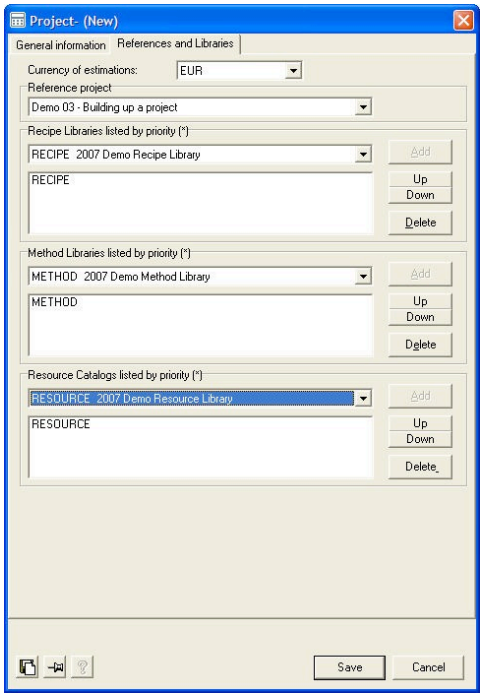


Figure 47 - New Project Properties dialog – References and Libraries

References and Libraries Tab:

Currency of Estimations	The currency in which you want to express the cost of your project.
Reference Project	The project that you want to include in the search path for pulling estimating content into the new project.
Recipe Libraries	The Recipe library or libraries from which you want to read Recipe information for your project.
Method Libraries	The Method library or libraries from which you want to read new Methods to be used in your project.
Resource Libraries	The Resource library, or libraries, that should be used for your project.

You can place the Recipe, Method and Resource libraries in an order in which Estimator should search for any items that you are searching for, or that are referenced from either the Recipe or Method levels. Typically, you will only use one library on each level.

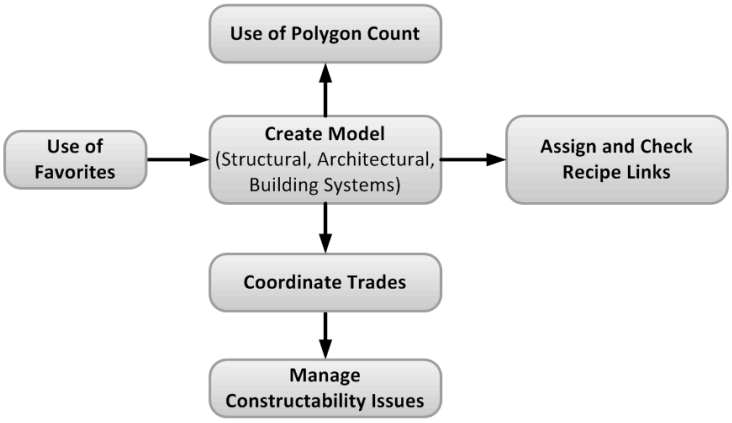
After you have completed entering the mandatory information on both tab pages, you can click “Save” to add the new project to the database. The new project can now be used in Estimator and Constructor.

Mastered Process Steps

This section has taught you how to prepare for building your Virtual Construction data model by defining a Content Plan, preparing a database and setting up your project. In the next section, you will use this information to start building your model.

2: Model

In this section, you will learn how to use your prepared Favorites to create your building model, using structural, architectural, and building systems modeling techniques. The Polygon Count tool helps you to manage the size of your model; by coordinating trades and keeping track of constructability issues, you can derive direct benefit from your modeling efforts. You will learn how to assign Recipes to model elements to enable you to use the model for estimating and scheduling purposes.



Characteristics of the 3D Modeling Tools

3D construction modeling in Vico Constructor is typically based on any provided 2D floor plans, ceiling plans, and section and elevation drawings.

To create the construction model, you will use Constructor 3D building elements: Walls, Slabs, Roofs, Columns, Beams, Objects, Windows and Meshes, Stairs, and Doors.

It is the Recipe assignment process that defines the actual content and role of the building element. This means that you can use the modeling tools in a context that is quite different from their original intent.

Foundations are the best example of this. Constructor does not have a dedicated Foundation tool, but the characteristics of a number of its tools; such as the Wall, Slab and Column tools, allow you to model different basic shapes.

- The Wall tool is adapted to the modeling of linear structures with a constant cross-sectional value, e.g. continuous footings and raft footings.
- The use of the Slab tool is recommended for the modeling of block-like or plated floor plan structures with variable geometry, e.g. block footings and plate footings. It delivers the best results when modeling elements, where the surface level and thickness are predetermined.
- The Column tool allows you to model point-type repeated structures, e.g. spread/pad footings.

3D bodies created with a combination of different Constructor tools can be named and saved, and subsequently used as library parts.

For the initial steps of the modeling process, examine the received plan files and read the geometric parameters; e.g. the height or elevation values or the horizontal and vertical sizes of

the building element you wish to model. Select the modeling tool that best suits your needs, then set the appropriate geometric parameters, and then select the appropriate Recipe to assign to the element. Finally, place the 3D model element using the selected tool.

There are two ways of entering geometric parameters for 3D elements in Constructor:

- Open the tool settings dialog box to enter the elevation of the element and its actual height, in the case of Walls or Columns; or its actual thickness, for example, with Slabs. This is the best solution where there is one level dimension on the drawings for the elevation value and another linear dimension for height.
- If reading height values from a section drawing, use the selected tool's Info Box to set the parameters, in the same way you normally would with sections, by using absolute height values. In such cases, you can enter the top and bottom heights of the element.

Use of Favorites

The Favorites feature allows you to save and easily recall default tool settings. If you choose a stored Favorite, you can create an element that has the same parameters and attributes as the Favorite.

Favorites can be accessed from two locations:

- The Favorites palette that stores all saved favorite settings, regardless of the tool that created them. The palette is hidden by default; choose "Window" > "Palettes" > "Favorites" to display it. It remains visible on top of the other Windows.
- The Favorites button in the top left corner of all tool Settings dialog boxes (except Camera). The dialog box that opens will list the favorite settings saved for the selected tool only.

The stored settings include:

- The element's attributes, including the line type, fill pattern and pen color, as well as surface material choices.
- The Recipe assigned to the element.
- In the case of Library Parts, the name of the Library Part.
- All of the element's dimensions that can be entered in the settings dialog boxes for the element, e.g., wall thickness and height (but not length).

Favorites are saved with your Project file. You can also save a separate Favorites file for reuse in other projects.

We recommend defining a Favorite for all identified elements of the Content plan. Saving your Favorites in a separate file gives you a way to distribute elements from the content plan as predefined Constructor elements, including Recipe settings, which improves the coordination of team work.

Use of 2D Drawings as Overlay

A Constructor 3D Model is built using predefined element types, available from the toolbox. By importing 2D drawings from the set of available project documentation, the design can be built virtually on top of the 2D drawings by *tracing* 2D lines with 3D building elements.

Document Register

When you work on a large project involving many plans of various types, e.g. architectural, structural, civil engineering, HVAC and plumbing, creating a document register can speed up your work, and will allow you to better organize the drawings.

The plans provided should be systematically entered into this register by establishing priority levels. You need to select the key plans that will be included. You can do this either based on the register provided with the plans or, if a more precise register is needed, it may be desirable to open every plan, check its content and then organize the drawings into a new folder hierarchy.

It is recommended that this register is kept in a spreadsheet table. Each plan must have a name and number, as well as a link to the name and access path of the file in the database.

NO. OF SHT.	30.06.06 PRELIM DSGN	SHEET NO.	SHEET TITLE	DWG SCALE	DESCRIPTION	REV	APPROVAL STATUS	COPIES
222	222							
		GENERAL						
1	X	A1126-18-A0-A-000-1	COVERSHEET					
1	X	A1126-18-A0-A-001-1	DRAWING INDEX					
1	X	A1126-18-A0-A-001-2	DRAWING INDEX					
1	X	A1126-18-A0-A-010	GENERAL NOTES, ABBREVIATIONS AND SYMBOLS					
		CIVIL						
1	X	A1126-18-C1-A-021	MASTER SITE REFERENCE PLAN					
1	X	A1126-18-C1-A-022	CONCOURSE C - GEOMETRY PLAN					
1	X	A1126-18-C2-A-040	POINTS OF INTERFACE					
		ARCHITECTURAL						
			SUMMARY PLANS					
1	X	A1126-18-A1-A-050	SUMMARY PLAN - GROUND FLOOR					
1	X	A1126-18-A1-A-051	SUMMARY PLAN - LEVEL 1					
1	X	A1126-18-A1-A-052	SUMMARY PLAN - LEVEL 2					
1	X	A1126-18-A1-A-053	SUMMARY PLAN - LEVEL 3					
1	X	A1126-18-A1-A-054	SUMMARY PLAN - ROOF LEVEL					
1	X	A1126-18-A1-A-060	AIRCRAFT POSITION LAYOUT CONCOURSE C					
1	X	A1126-18-A1-A-070	CONCOURSE C - OCCUPANCY & EXITING GROUND FLOOR PLAN					
1	X	A1126-18-A1-A-071	CONCOURSE C - OCCUPANCY & EXITING FIRST FLOOR PLAN					
1	X	A1126-18-A1-A-072	CONCOURSE C - OCCUPANCY & EXITING SECOND FLOOR PLAN					
			FLOOR PLANS					
1	X	A1126-18-A1-A-101	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 1	1:100				
1	X	A1126-18-A1-A-102	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 2	1:100				
1	X	A1126-18-A1-A-103	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 3	1:100				
1	X	A1126-18-A1-A-104	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 4	1:100				
1	X	A1126-18-A1-A-105	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 5	1:100				
1	X	A1126-18-A1-A-106	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 6	1:100				
1	X	A1126-18-A1-A-107	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 7	1:100				
1	X	A1126-18-A1-A-108	CONCOURSE C - PARTIAL GROUND FLOOR PLAN - AREA 8	1:100				
1	X	A1126-18-A1-A-111	CONCOURSE C - PARTIAL FIRST FLOOR PLAN - AREA 1	1:100				

Figure 48 - Example Drawing Register

In addition to organizing the received data files, you also need to determine whether the received data are sufficient and adequate. If you feel that data are missing, inform the client.

Graphisoft has prepared a document aimed specifically at users wishing to create large building models. It gives guidance on how to set up models and sub models and can be found here (2.4 MB pdf document): http://download.graphisoft.com/ftp/pdf/CreatingDatabases_Final.pdf

Model Template

Before starting a project, we recommend that you create a model template. This template is an empty plan file that includes the entire story structure of the model. The DWG files which form the basis of the modeling are merged into this template file on stories with zero height. Modeling will be carried out on the empty stories, while the merged DWG files are used as ghost stories. Modelers carry out the modeling on the basis of these ghost stories.

Using a model template is especially useful when working on larger projects where the model is subdivided into a number of smaller, partial models. The model template can serve as a starting point for all the sub models. This means that you will not have to perform time-consuming

merging and XREF-ing operations for each of the sub models. On the other hand, if data are provided continuously, it may be better to create a model template for each sub model with its own XREF links, since XREFs can be updated.

How To: Define your Story Structure

Model Stories: These stories have real heights, and this is where you will build up your model.

XREF stories: These stories have a zero height. This is where the structural, architectural and civil engineering plans will be added through merging, using XREFs or copying. These stories will then serve as ghost stories to help you model.

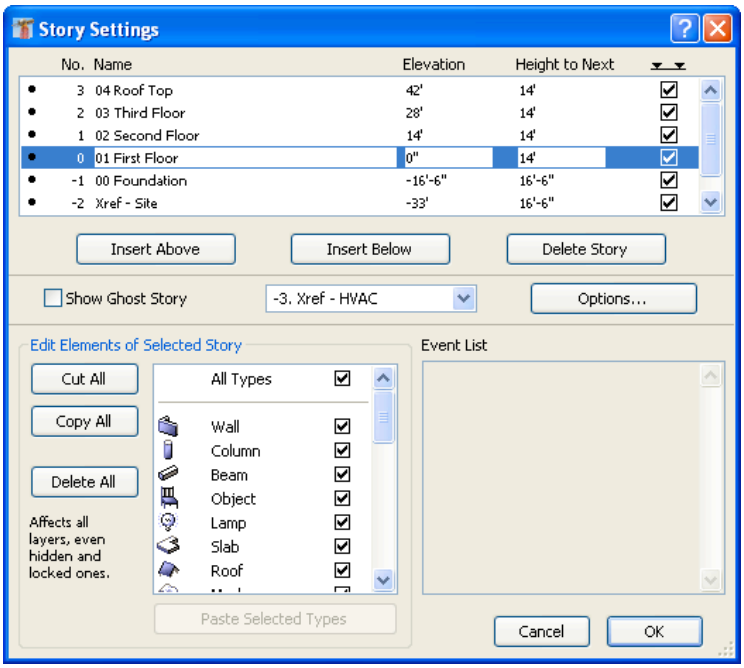


Figure 49 - Story Settings in Constructor

Adding XREFs to Ghost Stories

Vico Constructor provides three methods of managing DWG files:

- XREFs
- Merging
- Copying

Using XREFs is the recommended solution when data are provided continuously, and changes can occur to the plan during modeling. Since XREFs are linked to the inserted plans, they can be updated at any time.

Merging DWG files allows you to edit and move the inserted drawings in a very flexible way. This method is best used when working with final plans.

Copying can be used when the same layouts are to be used in the template files of the various sub models, such as a site improvement plan or a detailed plan that covers several buildings.

Structural Modeling Techniques

Modeling work for a construction project typically starts by capturing the designed load bearing structure in your model. Using the structural drawings as and overlay, you will establish the framework for the Virtual Building.

In this chapter, we will provide you with modeling guidelines that reflect Vico's best practices for the creation of the various structural building elements.

When you decide to use one of the described methods for modeling a building element in your project, always consider the purpose that it should serve, taking into account the quantities and properties the chosen element type can provide, plus the level of detail that will be required for your estimating and scheduling work.

Foundations and Ramps

Three types of foundation modeling techniques are explained in this section:

- Continuous footings under load bearing walls
- Spread footings under columns connected by footing beams
- Raft footings to evenly distribute large concentrations of weight

Continuous Footings

The continuous footing and the footing beams created for the spread footing of the pillars are linear structures, so the Wall tool is the most appropriate for creating them.

HOW TO: MODEL A CONTINUOUS FOOTING

From the Constructor toolbox, select the Wall tool. Read or measure the height and thickness of the structure on the applicable structural plans and sections.

Set the appropriate layer, enter the elevation values, and also enter the thickness of the Wall element to match the width of the basic body.

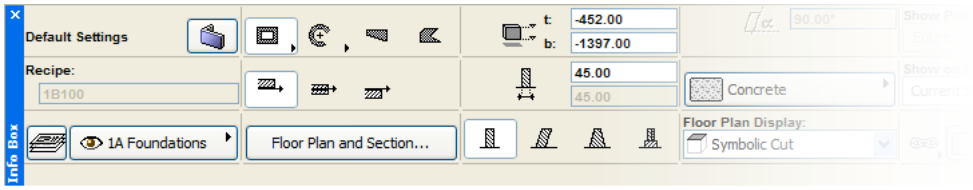


Figure 50 - Constructor Info box with Wall properties

In the 2D plan window, create the Wall element according to the structural plan.

Check the model by selecting the footings with the marquee tool and opening the 3D window.

Figure 51 - Continuous Footing Elements in the 3D view

Spread Footings

The best tool with which to model a spread footing is the Column tool, which allows you to quickly insert multiple spread footings with the same dimensions on after the other, using the same insertion point, which is beneficial when aligning to grid lines.

HOW TO: MODEL A SPREAD FOOTING

Select the Column tool in the toolbox.

Read or measure the horizontal and vertical sizes of the structure on the applicable structural plans and sections.

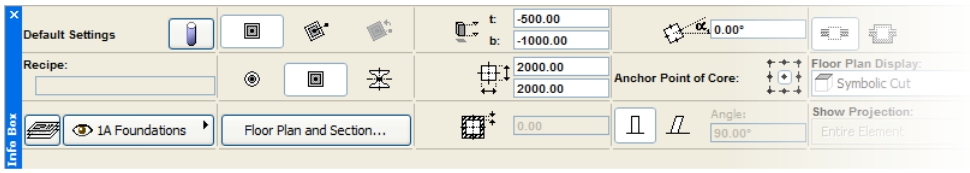


Figure 52 – The Constructor Info Box with Column Properties.

Set the appropriate layer and Recipe chosen for the Slab and enter the horizontal measurements and elevation values of the element.

Place the Column element in the 3D window according to the structural plan, taking advantage of snapping to grid lines where possible.

Switch to the 3D view (F3 for the whole model or F5 for just the selected elements), to see the results of your work.

Raft Foundation

Raft footings are best created using the Slab tool. Select the Slab tool to edit the raft footing visible on the structural plan.

HOW TO: MODEL A RAFT FOUNDATION

Click on the Slab tool button in the toolbox.

Read or measure the height and thickness of the structure on the applicable structural plans and sections.

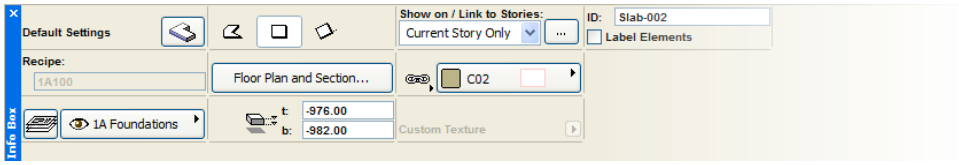


Figure 53 – The Constructor Info box with Slab properties.

Set the appropriate layer, enter the structure's thickness value and also enter the elevation values in the Slab Info box.

In the 2D plan window, create the Slab element, according to the structural plan. This tool can also be used for modeling base plates, floors, or even block footings.

A complete foundation structure, modeled using the techniques explained in the previous sections:

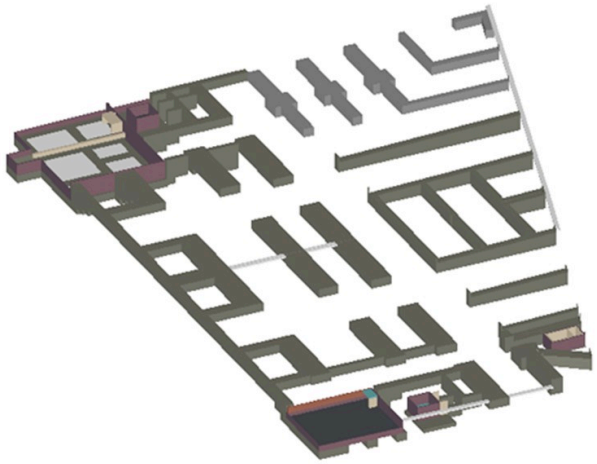


Figure 54 – A Foundation Structure Modeled with the Described Techniques

Ramp

Ramp elements are best created using one of the predefined parametric Ramp objects that you can find in the Constructor library. These objects provides you with an extended set of parameters, which you can use for estimating and scheduling purposes.

HOW TO: ADD A RAMP

Start the Object tool and open the settings of the tool by clicking the properties button in the Info box.

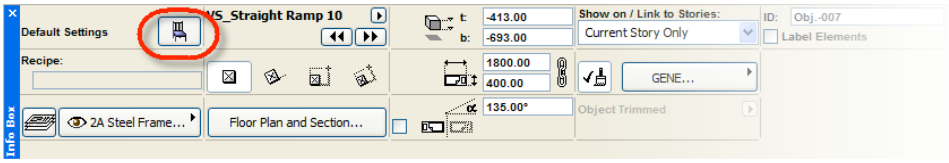


Figure 55 – The Constructor Object Info box with Properties button

In the Object settings dialog, browse to the Constructor library and select a Ramp object. Constructor will show the available parameters of the Ramp object.

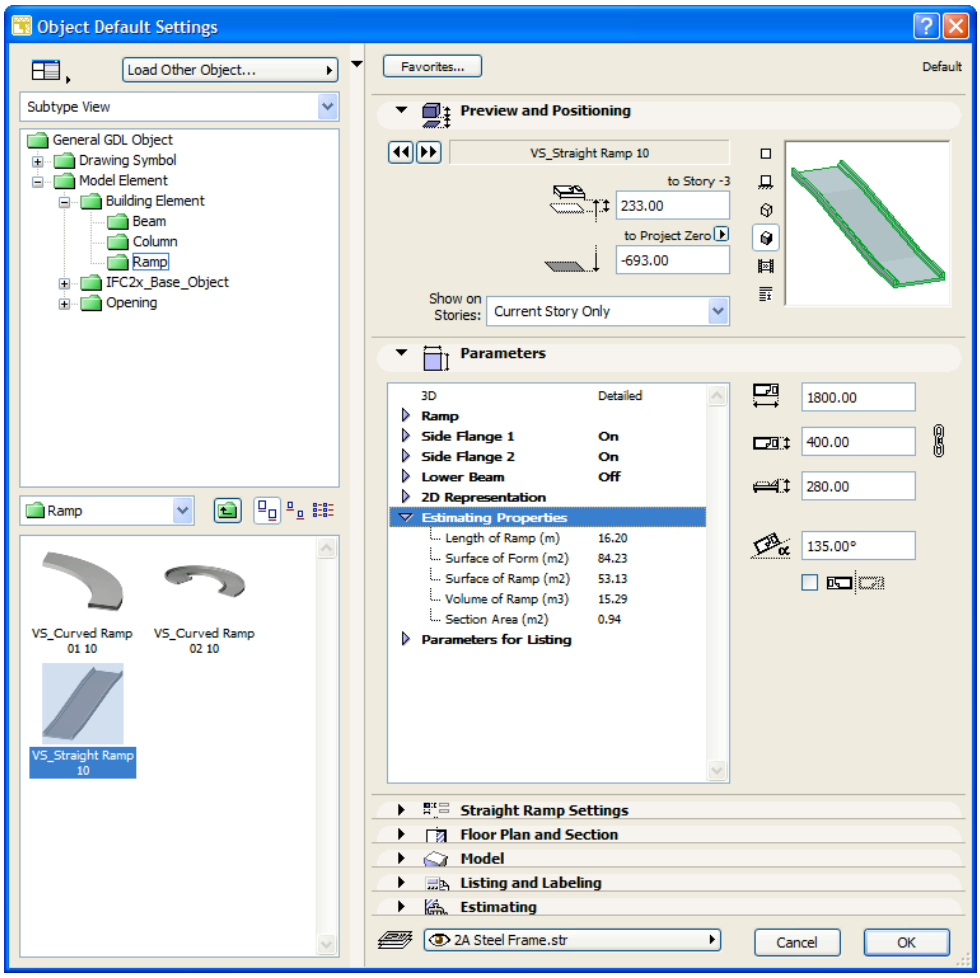


Figure 56 - Ramp Object Settings

Read the ramp's dimensions from the structural drawings, and specify the values in the Ramp Object settings dialog.

Click OK to add the ramp to your model and place it in the desired position.

Load Bearing Structures

Most buildings have a load-bearing structure that consists of walls, columns, beams, and slabs. To include these elements in your model, we recommend that you use sections for height references.

Walls and Openings

Walls are modeled with Constructor's Wall tool, which you can find in the Toolbox.

HOW TO: MODEL A MULTI-COMPONENT EXTERIOR LOAD BEARING WALL

Select the Wall tool. In the example below, both exterior walls and insulation parts are created with this tool.

Select a *composite* fill type to reflect multi-component Walls.

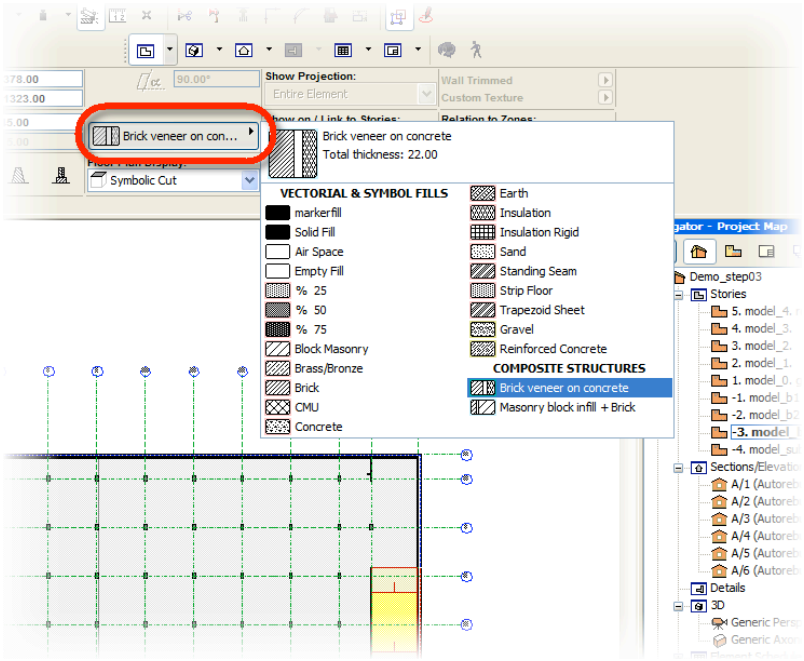


Figure 57 - Fill type selection for Wall element

Open to the appropriate structural section drawings to read or measure the thickness and height of the wall.

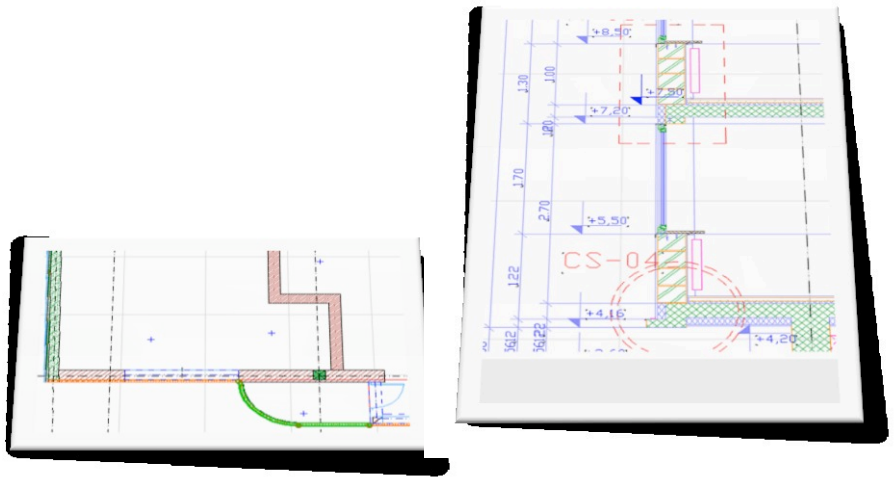


Figure 58 - Structural Drawings Containing Wall Information: Floor Plan and Section

Enter the thickness of the wall, and also enter the height values in the Wall Info box. In the 2D plan window, create the Wall element according to the structural plan.

Openings

The procedure to place an opening is the same for all types of Walls.

HOW TO: PLACE AN OPENING

To place an opening in a wall, select the Door or Window tool, depending on the type of opening.

Read or measure the thickness, height and sill height of the opening on the applicable structural and architectural plans and sections, and check the type of the window or door.

Select the Door or Window object that corresponds to the opening on the plan, and then set the appropriate layer and the size and height values of the element. Also specify the height for the sill (Window) or threshold (Door).

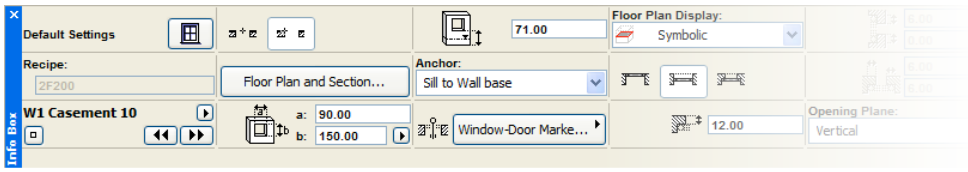


Figure 59 - Window and Door parameters in Info box

Place the opening in the Wall at the location shown on the structural and architectural plans.

Columns

You can add Columns to your model using either the "Column" tool or the "Object" tool. Both techniques have their own modeling methodology, and your selection depends on the type of column you wish to add and your preference.

Columns in ArchiCAD are made up of two components: the load-bearing core and the optional veneer used to simulate fire proofing or any kind of sheathing around the core. The Column's section can be rectangular or circular, or it can be complex, as defined in a profile. Columns can stand free, or they can be connected to walls. The column's axis can be either vertical or slanted.

Objects are parametric elements. This means that you can freely configure the placed instance, using the Object Settings dialog box, or the dialog boxes associated with the Object-type tools, without actually modifying the external file.

Concrete columns are typically modeled with the "Column" element type. For steel columns, you can choose which element type you want to use, depending on the desired behavior. When making your choice, you should keep in mind that only one Recipe can be assigned to one element type.

A comparison between the Column and Object element types:

Column	**Object**
Can be tilted using "slanting" functionality.	Can be tilted using the "angle" property of the Object element.
Steel profile defined using "Profile Manager" and "Structural Steel Profiler", which includes an extensive collection of predefined steel profiles.	Steel profile defined by selecting the desired profile from the available collection of profiles in the steel column Object.

How To: Add a column with the "Column" element

Select the "Column" tool from the tool box.

In the Info box, specify the dimensions of the column to be added. Also specify the shape of the column you want to add. You can choose from circular, rectangular or profile:

Profile gives you the opportunity to select a steel profile from the collection of Profiles in your model. You can find the Profile selection in the "Floor Plan and Section …" section of the Column Info box.

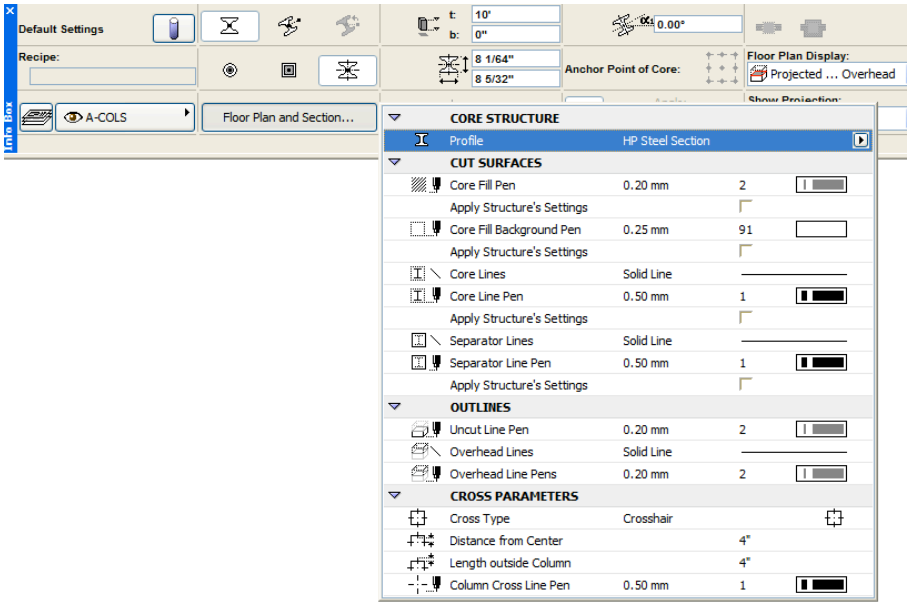


Figure 60 - Floor Plan and Section settings of Column element

When you choose to add a circular or rectangular column, you can specify the thickness of the veneer (for example brickwork) layer of the column in the Column Settings dialog. Quantities for core and veneer layers of the Column will be available for estimating and scheduling separately.

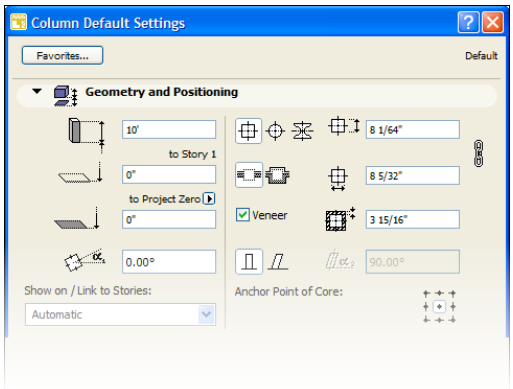


Figure 61 - Rectangular and Circular Column settings

Read or measure the horizontal and vertical values of the structure on the applicable structural plans and sections, set the appropriate layer, and then enter the size and height values of the element.

In the 2D plan window, place the Column element according to the structural plan.

As described in the Column instructions, you can automatically generate steel profiles with the **Structural Steel** function, which can be found in the "Structural Steel Profiler" menu item.

How To: Generate a steel profile with Structural Steel Profiler

To start generating a new steel profile from Constructor's library of predefined profiles, start the "Project Section Catalog" from the "Structural" menu.

Constructor opens the Project Section Catalog, which contains the collection of predefined steel profiles from 16 countries, plus the European standard definitions.

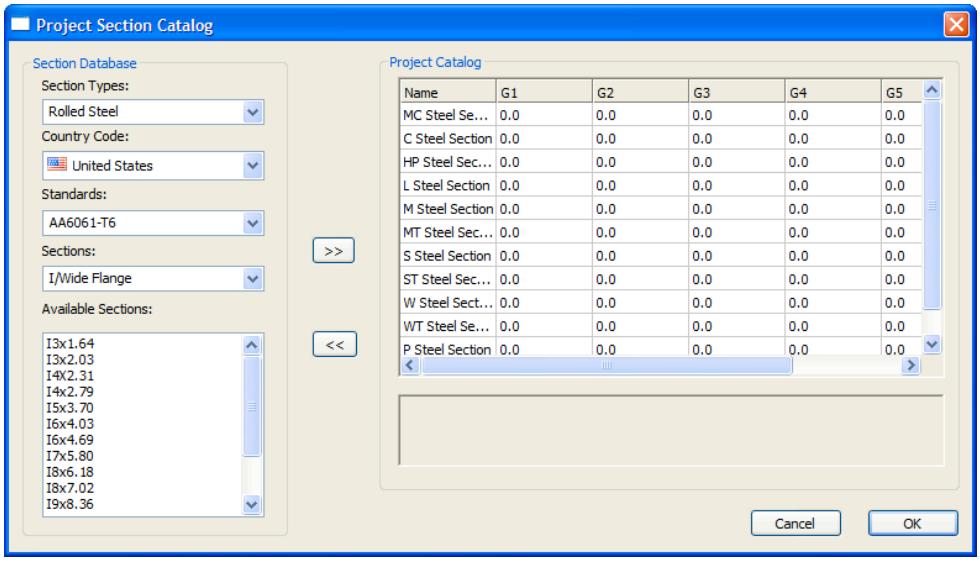


Figure 62 – The Steel profile Project Section Catalog dialog

To add a new Profile that can be used with Column, Beam and Wall Objects in your project, first select the desired country standard. Next select the type of steel profile and the desired standard. Constructor will show the available section types and numbers that can be added to the project.

Select the steel profile you want to add from the list of available sections and click the >> button. The profile you selected is now available in the "Custom Profile" settings for Column, Beam and Wall element types.

When you decide to model a steel column with an Object element type, you can select any of the steel profile Objects from the Constructor library.

How To: Add a Column with an "Object" element type

Activate the "Object" tool from the Tool box and open the Object settings dialog box.

Select one of the available predefined Steel column objects from the library.

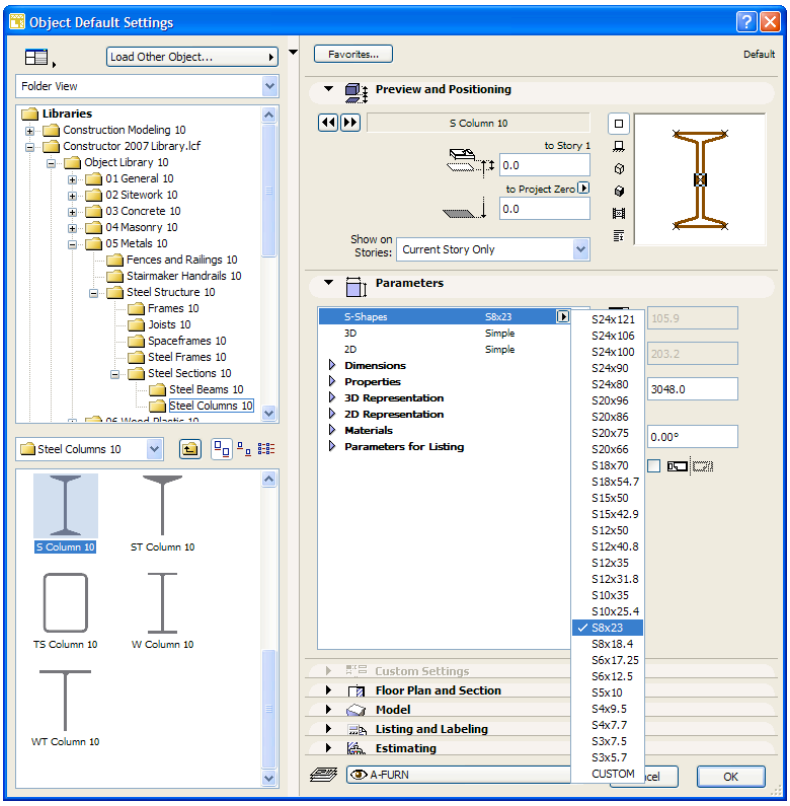


Figure 63 - Object Selection settings: steel column profile

After selecting the required steel profile, click "OK" and place the steel Column in your model.

Beams

You can add beams to your model by either using the "Beam" or the "Object" tool. Beams are horizontal or inclined construction elements with vertical end faces. They can be rectangular or complex in shape.

As with columns, both options have their own modeling methods. An important difference when considering the element type for beams is the ability to cut the ends of the beam when you use the Object element type.

Beam	**Object**
Can be tilted using the "slanting" functionality.	Can be tilted using the "angle" property of an Object element.
Ends cannot be cut under an angle.	Can be cut under an angle by using the "cutplanes" properties.
The steel profile is defined using the "Profile Manager" and the "Structural Steel Profiler", which includes an extensive collection of	The steel profile is defined by selecting the desired profile from the available collection of profiles in the steel column object.

predefined steel profiles.

HOW TO: ADD A STEEL BEAM WITH THE "OBJECT" ELEMENT TYPE

Select the "Object" tool from the Tool box and open the Object settings dialog box.

From the Constructor "Steel Beams" library folder select the steel profile for the beam you want to add.

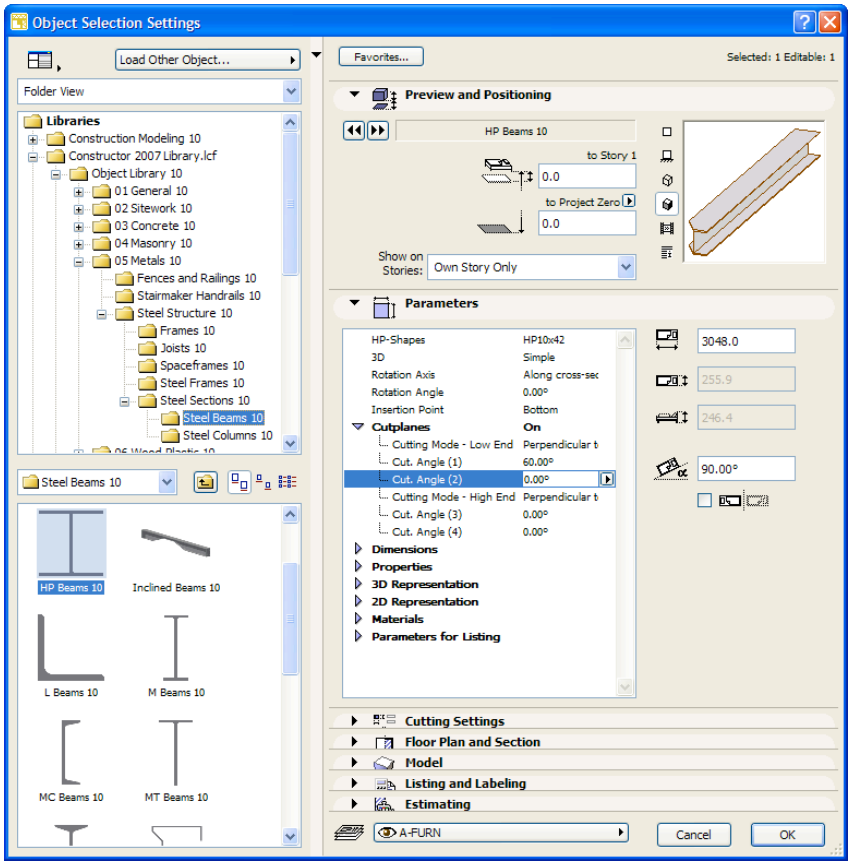


Figure 64 - Object Settings dialog for steel beam

After clicking "OK", place the beam in the model. You can cut the ends of the beam Object under an angle by specifying cut-planes in the "Parameters" section of the "Settings" dialog.

Slabs

Slabs are modeled with the "Slab" tool. Slabs are the basic horizontal building blocks in Constructor. They are typically used for modeling floors or split levels.

The default slab structure is a composite slab. The thickness of such a composite slab is defined in "Options" > "Element Attributes" > "Composites", and equals the sum of the skin thicknesses. A composite slab's thickness cannot be edited in Slab Settings. If you want to edit the slab thickness in Slab Settings, choose a non-composite slab structure, or change the thickness of the composite skins in "Options" > "Element Attributes" > "Composites".

Roofs

Commonly used roof types are pitched roofs and flat roofs. For the modeling of flat roofs we advise using the Slab tool; and for modeling of pitched roofs the Roof tool. Both tools are quite similar, the main difference being the ability to set the pitch angle using the Roof tool.

Stairs

The “Stair” tool is the dedicated tool used to add stair elements to your model. Stair elements are defined as parametric objects, which can be loaded from the library.

Constructor includes two stair objects developed specifically for construction modeling purposes. These objects feature simplified geometry, which provides a more efficient use of polygons. Also, extra properties that can be used for estimating and scheduling purposes are added.

HOW TO: ADD A STAIR ELEMENT

To add a Vico stair Object to the model, activate the “Stair” tool from the Toolbox.

After activating the Stair tool, open the tool settings dialog box.

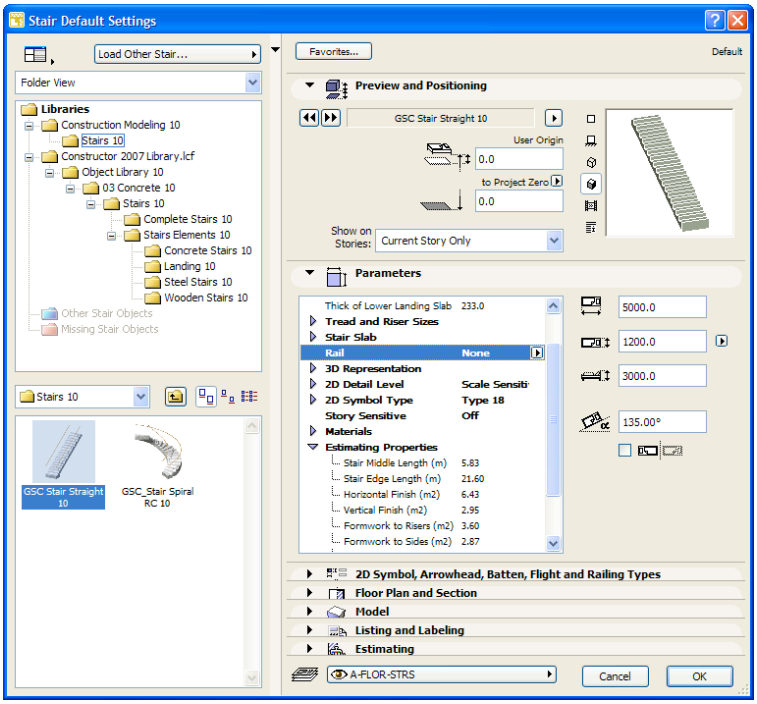


Figure 65 – The Stair Settings Dialog Box

Load one of the Vico software stair Object definitions from the “Construction Modeling” folder. Note that the extra estimating properties are visible in the “Parameters” section of the Settings dialog.

Define the dimensions (length, width and height), set the parameters as desired, and click “OK” to place the stair Object in your model.

Beams and Girders

You can create special Beams and Girders with a tool in Constructor called TrussMaker. TrussMaker is a built-in tool that allows you to create girder and truss objects. You can access it from the “Design” > “Design Extras” menu.

HOW TO: CREATE A GIRDER

To model beams and girders, use the TrussMaker tool.

Use the axes of the frame in the 2D window by drawing new lines with the Line tool.

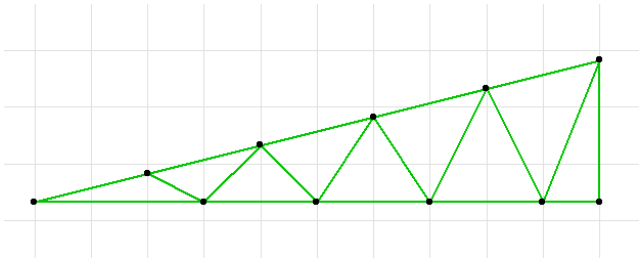


Figure 66 - Draw framework of Truss with Line tool

Select the lines, go to the Design/Design Extras/ menu and choose the Create Truss command in the TrussMaker hierarchical menu to create the truss you need.

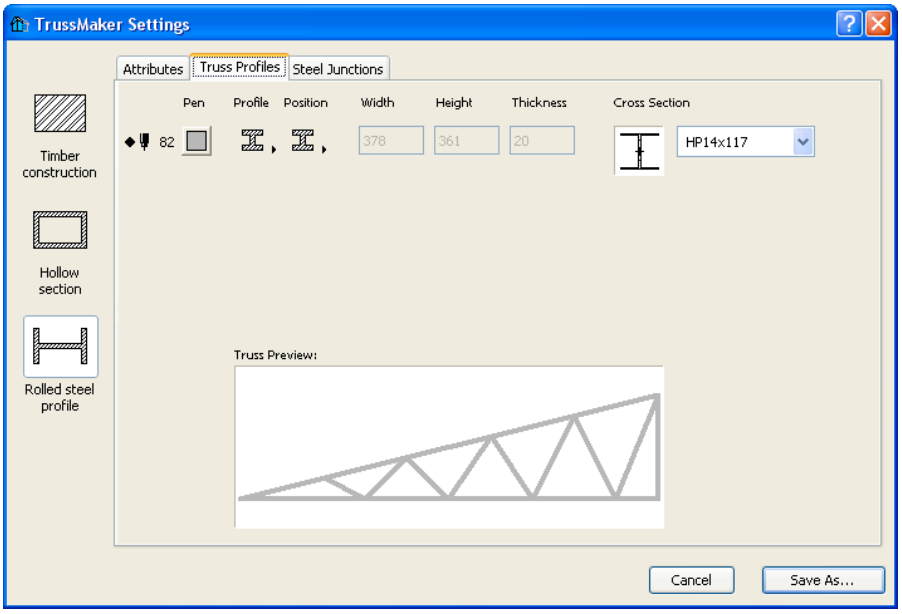


Figure 67 - Settings for the Truss to be created

Select a profile for the elements of the truss, and set its type.

When done, name and save the element. You can then place the element in the plan as an Object.

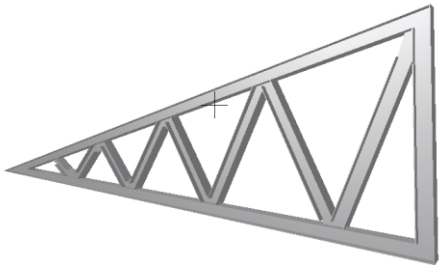


Figure 68 – The Resulting Truss Object

You can set the parameters the same way you would for any other object.

Prefabricated Elements

To place prefabricated reinforced concrete beams and columns, panels, or slab elements, choose one of the predefined objects in the Constructor library.

If you cannot find an Object that corresponds to your needs, you can create the required element yourself. Simple basic elements, such as slabs, walls, roofs, columns, and beams can be combined to create more complex shapes. Refer to the "Graphisoft ArchiCAD 11 Reference Guide" for more details.

HOW TO: USE PRECAST ELEMENTS FROM THE CONSTRUCTOR LIBRARY

To place a prefabricated element into the building, use the Object tool.

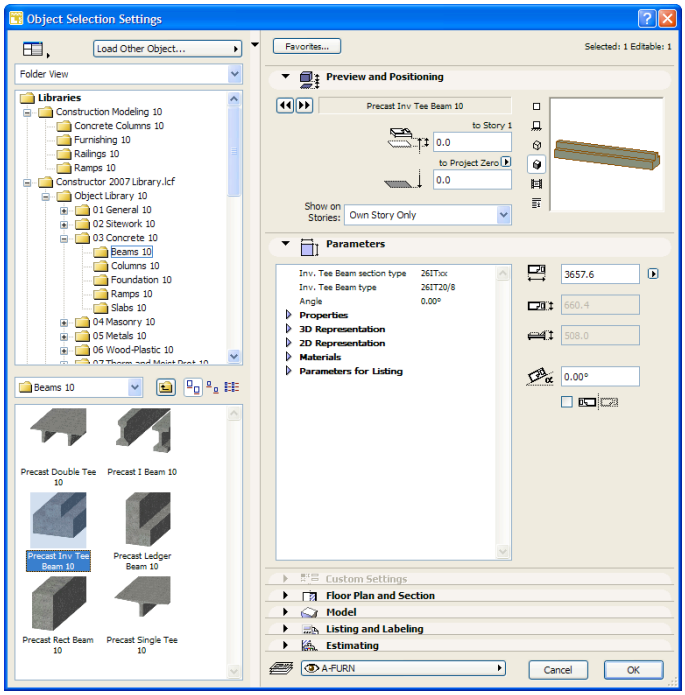


Figure 69 - Object settings for Precast Concrete Elements

Set the parameters and the appropriate layer, and place it on the floor plan according to the specifications of the structural plan.

Architectural Modeling Techniques

For instructions on how to use Constructor for modeling and configuring basic architectural elements like Windows, Doors and Curtain Walls, we refer to the ArchiCAD reference guide, which can be found in Constructor in the "Help" menu item.

Partition Walls

Partition walls are modeled with the "Wall" element type. To ensure correct use of the different thicknesses of interior wall systems, and to make it easier to check your Recipe assignments in a later phase, we recommend that you use predefined wall thicknesses and wall types using "Composite" definitions.

When you are modeling interior walls, the modeling direction requires extra attention: quantities that can be extracted in a later phase may refer to the "reference line side" or the "non reference line side". If you use modeling direction and position of the baseline at will, these (valuable!) quantities will be rendered less useful.

Finishes

For construction modeling purposes, finishes are typically included in the model by means of another – "parent" – element.

You can describe finishes by including descriptions (and cost / resource calculations) in the Recipe that you assign to elements such as Walls and Slabs.

In special cases, for example irregularly shaped tiling on walls and/or floors, you may want to consider using a special "surface Object". You can easily create such an Object using simple geometry that describes the shape of your finishing layer and convert that into a GDL Object. You can then assign a Recipe to the GDL Object and extract basic quantities, such as surface area and volume, from it.

Zones

Zones are spatial units in your Project. They usually represent rooms; wings of a building; blocks of a housing estate or the functional areas of a building. Zones in 3D can also be used for simple mass modeling.

Zone area is an important component in your early phase project cost calculations, and you can customize the way in which zone areas and 3D zone spaces are calculated. Zone dimensions are associative; following an update, zone areas will be recalculated to reflect any modifications.

You can use zones to *trace* 2D design information and extract a large collection of quantities and properties from a very simple Constructor model. See "How To: Use Zone Based Model Input for Estimating Purposes" for instructions on how to do this.

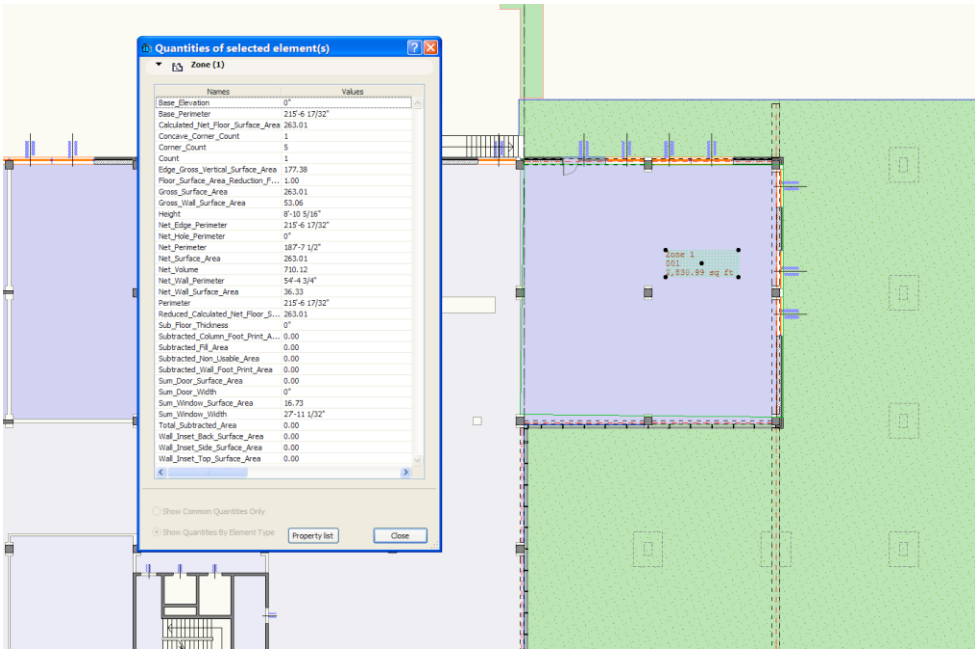


Figure 70 – The Zone Element Provides You with an Extensive Set of Quantities that Can Be Used for Estimating and Scheduling Purposes.

For more information on the use of the Zone element type, please refer to page 217 of the ArchiCAD 11 Reference Guide, accessible through the “Help” menu in Constructor.

Building Services Modeling Techniques

Constructor contains a full building systems modeling module that will help you to create detailed 3D models of all mechanical, electrical, and plumbing installations in your project.

MEP System Manager

To create and choose how your systems will be represented, use the MEP System Manager, located under the MEP Modeler Menu.

HOW TO: CREATE MEP SYSTEMS

Within the System Manager, you should create a three-level hierarchy:

- Main System (e.g. HVAC)
    - Sub System (e.g. Piping)
        - Sub System (e.g. CHWS)
        - Sub System (e.g. CHWR)

Create Main System by selecting "Add Main". After naming the Main System, Sub-Systems and their properties can be created by selecting the new Main System and selecting "Add Sub".

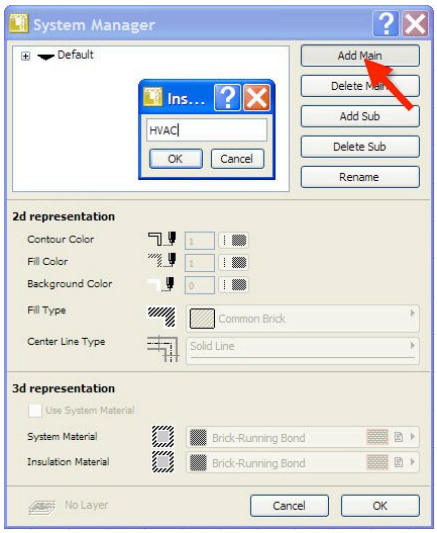


Figure 71 - Adding a Main System

Similarly, you must add Secondary Sub-Systems by selecting an Intermediate Sub-System and selecting "Add Sub".

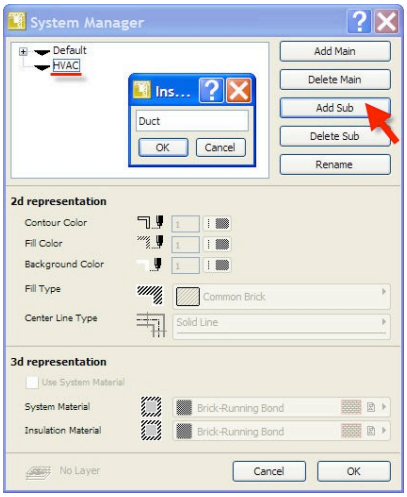


Figure 72 - Adding a Sub-System

Once a second level sub-system is created and selected, you can define the 2D and 3D representations for that system (e.g. Fill Color, Fill Type, and System Material)

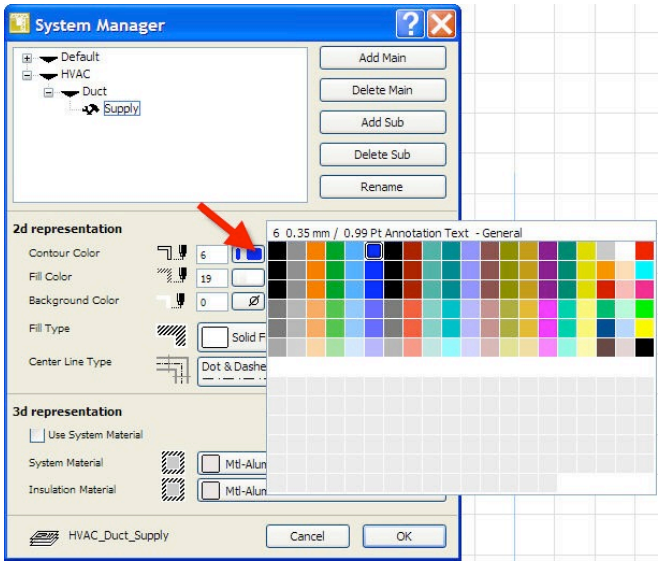


Figure 73 – Selecting the 2D and 3D Representations for Your System

After you have created a system hierarchy, a layer is automatically created for that system within the "Layer Manager". (Ctrl+L)

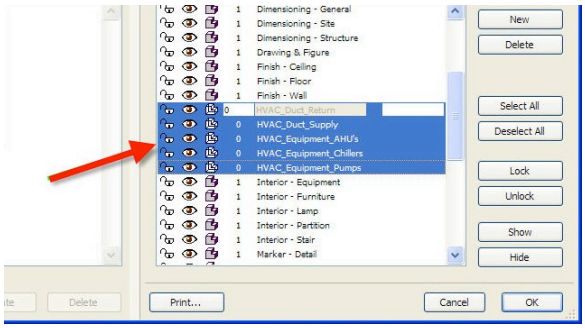


Figure 74 – Layers Generated from the MEP System Manager

The MEP module in Constructor contains a specification driven routing system that allows you to choose the properties of the pipe or ductwork that you would like to use. This then enables you to route using the parameters and routing constraints of the straight routes and fitting types that are truly in existence, giving more accurate design constraints and bill of materials. However, should you prefer to use custom fittings, you have the flexibility of unconstrained routing as well.

How To: Set Up the Specifications of Piping and Ductwork

To begin modeling pipes or ducts, choose the "Pipe Tool" ( ) or "HVAC Duct Tool" ( ) from the "Tool Box". Next, turn your attention to the "Info Box", where you should select the system that you would like to model.

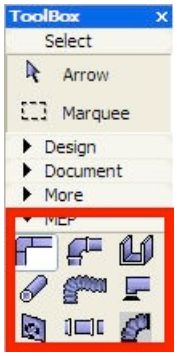


Figure 75 – MEP Tool

Figure 76 – Info Box

Modeling both the Piping and Ductwork element types is very similar with respect to their routing abilities. However, there are some options you should choose from that are specific to each routing element type. We consider these to be Pipe Specifications and Duct Specifications.

HOW TO: SELECT PIPE AND DUCT SPECIFICATIONS

Pipe Specification

Within the "Info Box" you should define "Pipe Specification" by using the pull-down arrows ( ) to select each property of the pipe:

- Material
- Gauge
- Connection Type

Building Services pulls from its library a list of available pipe and fittings to accurately fill the route you choose based upon these specifications.

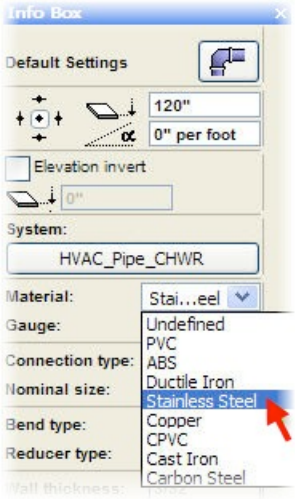


Figure 77 – Material Selection

Because some piping systems vary, you are also allowed to select your preference in "Bend Type" (e.g. "Long Radius" and "Short Radius"), "Reducer Type" (e.g. "Concentric" and "Eccentric"), and "Insulation" (Check the box on or off and entered the desired thickness. Please note that an "Eccentric Reducer" will only be available when the Elevation Orientation, shown below, is set "off-center".

Duct Specification

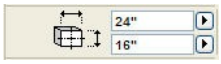
Before beginning a duct route, you should define the "Duct Specification" by using the pull-down ( ) arrows to select each property of the duct:

- Material
- Gauge
- Connection Type

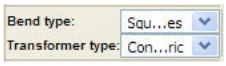
In the "Info Box", you should define:

1. The duct shape" by selecting the button representing the shape (rectangular, circular, or oval.

2. The duct dimensions, either by manually typing the size that you desire, or by using the table arrows. ( )

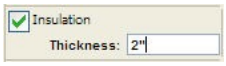


3. The Bend Type and Transformer Type, by using the pull-down arrow ( ) for each type.



The transformer type "Eccentric" can only be selected if the elevation is oriented off-center. Please read the section below for information to learn how to change elevation orientation.

4. The Insulation. Check the insulation box to turn it on, if desired, and manually type the insulation thickness in the given box.



5. The Take-Off length, by manually typing the desired take-off length in the given box.

The image below shows the format and placement of these options in the Info Box. These options will not have to be entered each time you begin a route, but should be adjusted as your route or system needs evolve.

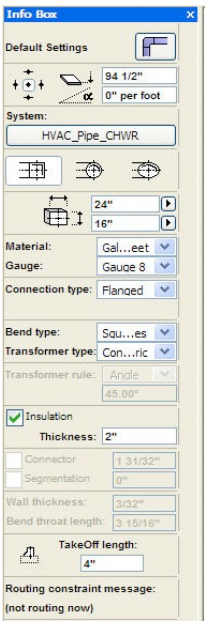


Figure 78 – Duct Specification

For both Pipes and Ducts, you can enter your starting Elevation and Slope in the upper most settings boxes, and begin to model your pipe, duct, or conduit in the 2D or 3D window.

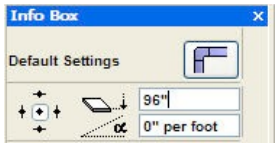


Figure 79 – Elevation and Slope Settings

The Orientation Box ( ) allows you to choose from where the elevation is taken. Center orientation is selected in the visual example, above. Use the mouse to select the top, bottom, left, or right node-like buttons to define from where the elevations are taken.

How To: Route Piping or Ductwork in 2D

Once you have chosen the settings of the piping or ductwork that you would like to model, you are ready to place it into the 3D model by following the instructions below.

Begin a route in 2D by clicking the mouse once in the start location.

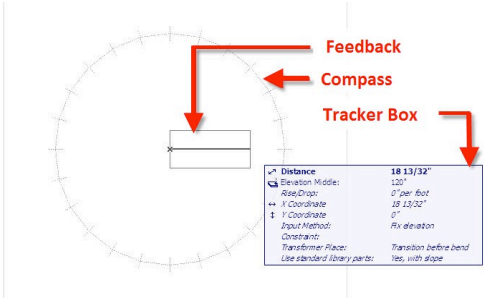


Figure 80 – The Routing Compass and Tracker Box

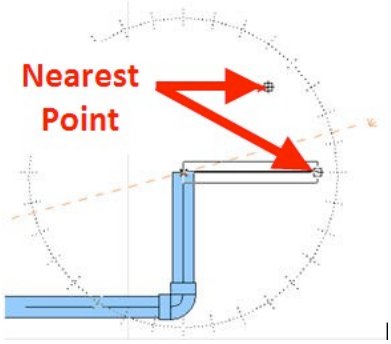


Figure 81 – Routing Assistance Points

While routing, Assistant Points show the directions of bends that are available as standard elements in the chosen material specification. The cursor will skip over to the direction defined by the available bends.

You will notice the "Tracker Box" that follows your routing mouse closely while showing you:

- Distance

- Elevation (Dependant on the Orientation of your pipe or duct)
- Rise/Drop
- X and Y Coordinates
- Input Method
- Constraint
- Input Plane
- Transformer Place
- Use of Standard Library Parts

The settings in the "Tracker Box" can also be modified to assist your routing by using the <Tab> key. After entering a value for one of these settings, press the <Tab> key again to activate that setting. Then, press <Esc> to exit the Tracker Box.

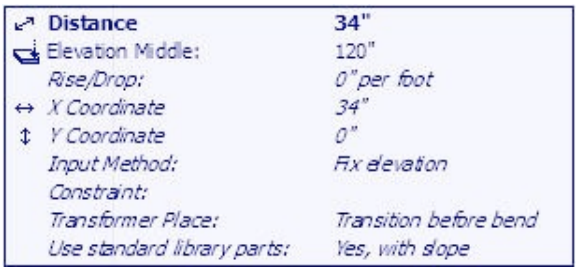


Figure 82 – The Tracker Box

Continue routing by left-clicking the mouse at either the desired end-point or the next change in direction that we call a Control Point. Notice the "Constraint" display in the "Tracker Box" shows the permitted bend angles based upon the available bends in the Specification. If you should wish to deviate from the available bends, enter the tracker box using <Tab> and left-click on the arrow (▶) and choose "No" to the "Use Standard Library Parts" option. This will allow you to create custom bends and the **Assistant Points** will no longer be displayed.

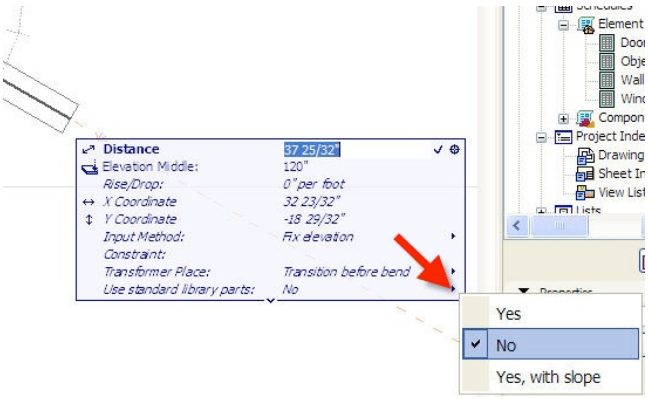


Figure 83 – Using Custom Library Parts

To End a route**,** left-click a second time on the last point that you have selected. It will be evident that you are selecting the point for a second time, due to the **darkened pen**. If you would like to

see what you have routed so far in 3D, press F5 on your keyboard. F2 will return you to the 2D view.

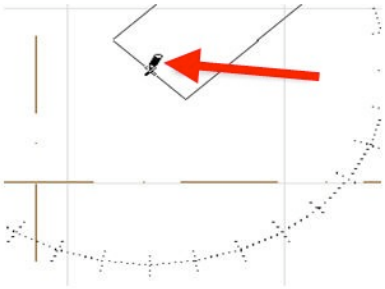


Figure 84 – The Darkened Pen Indicating the Control Point.

Routing Vertically

To change the elevation of your route while routing in 2D, press <Tab> to activate the tracker box. Left-click on the current elevation, (it will be highlighted in blue) and enter the new elevation you would like to route to. Press <Tab> (Not <Enter>!) to lock in your entry and then <Esc> to exit the tracker box to continue the route.

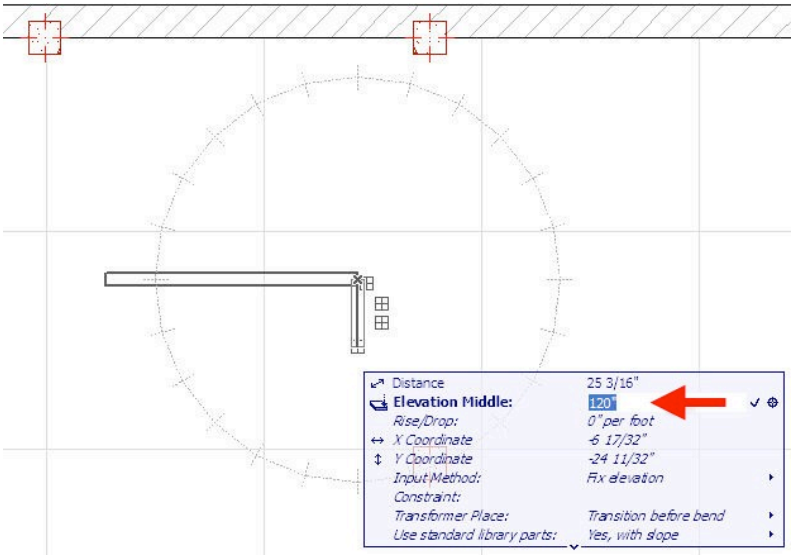


Figure 85 – Change the elevation of a point in the route using the Tracker box.

Note that once you resume routing, the elevation for your next control point is going to be at the elevation you entered. To route directly vertically, click above the last control point you inserted before changing your elevation (The Pen will darken as if you were ending the route). The subsequent segment will then be on the 2D XY plane, at the elevation you have just entered.

Routing Sloped Piping

Sloping your Gravity Piping systems is necessary to create a valid, constructible Building Model. However, there is some flexibility in the fittings and methods used by plumbers and pipe fitters that is non-typical for the precision of software. For instance, when you have been routing with a positive slope of 1 degree, and then you want to turn up vertically an 89 degree bend will not

be available. To account for this, Constructor has a tolerance at the fitting connection points called the “Slop Mode.”

How To: Route Pipes in Slop Mode

To enable the “Slop Mode”, check the box and type in the tolerance to the “MEP Modeler” > “Options”, under the “Pipe Routing Options” tab.

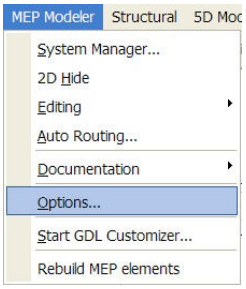


Figure 86 – MEP Modeler Options

Constructor will open the “MEP Options” dialog:

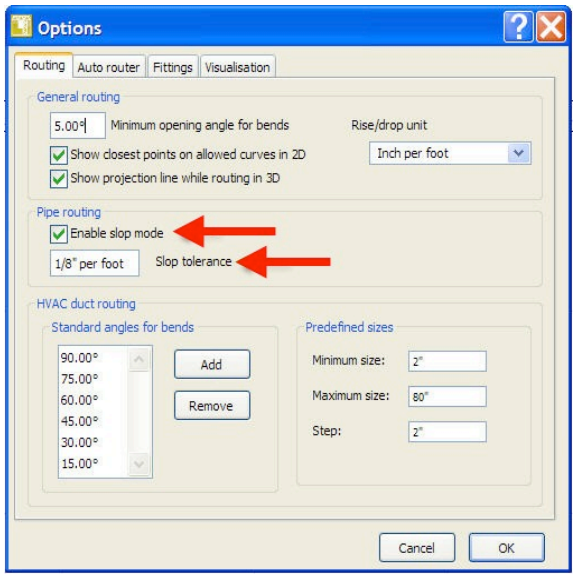


Figure 87 – Enable Slop Mode

Enable “Slop Mode” in the “Pipe Routing” settings and specify the permitted tolerance. Click “OK” to close the “Options” dialog and apply your changes.

To begin routing with a sloped pipe, enter a value for the “rise/drop” field of the “Info Box”.

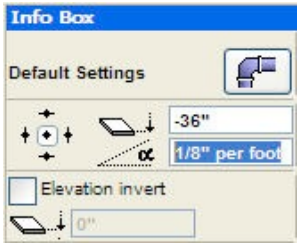


Figure 88 – Rise/Drop Input

Route in the 2D plane as normal. However, there will be a few changes needed in your process as you turn vertically. When you tab into the tracker box, you will notice that you are unable to adjust your elevation. This is because your current "Input Method" is that of a fixed slope. To route vertically you must change this to "Fix Elevation" as shown below.

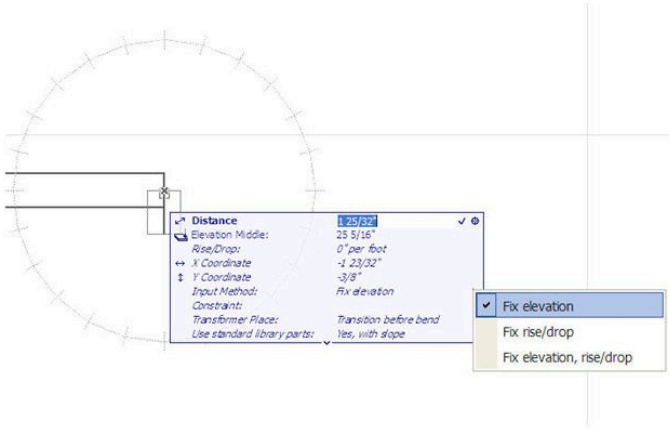


Figure 89 – Changing the Vertical Setting from the Tracker box.

Next, input the elevation that you would like to change to as you would with a non-sloping pipe. Press <Tab> and <Esc> continue placing the top point of the vertical segment.

Notice the location of the assistance points, and how none of them will snap directly above the last control point. This further illustrates the "slop" that is needed. To allow the slop to take effect in the routing, hold down the <Ctrl> key before you check the placement over the last control point.

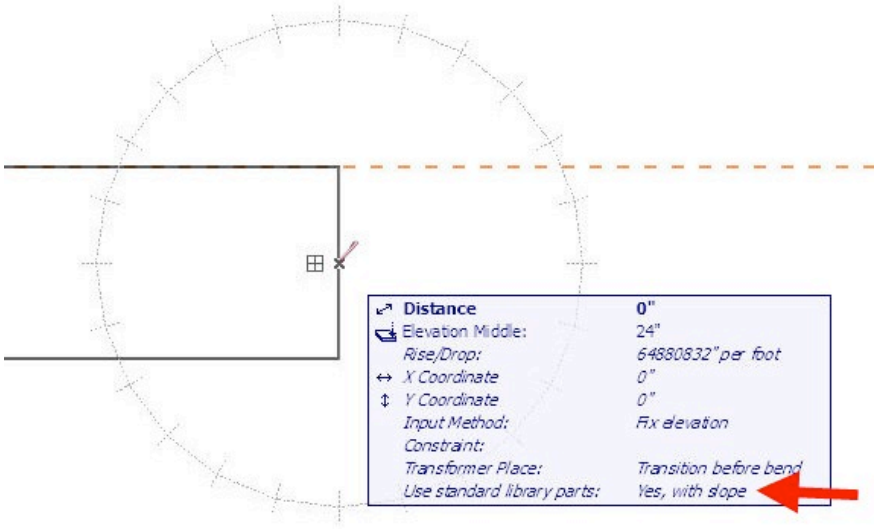


Figure 90 – Turning Vertically from a Sloped Pipe

You will notice that as you hold down <Ctrl> to allow this "slop" to take effect, the "Use standard library parts:" option inside the tracker will change from "Yes" to "Yes, with slope".

Changing the Size of the Route

Piping and Ductwork sizes increase and decrease as flow requirements change. To change the size while you route, simply place a control point with the click of the left mouse button, and adjust the size or sizes in the "Info Box" before you click for the next control point.

HOW TO: CHANGE PIPE AND DUCTWORK SIZES

First, place a control point in your route by left-clicking on the route. Then, select the control point, and adjust the side of the route at the selected control point in the "Info Box".

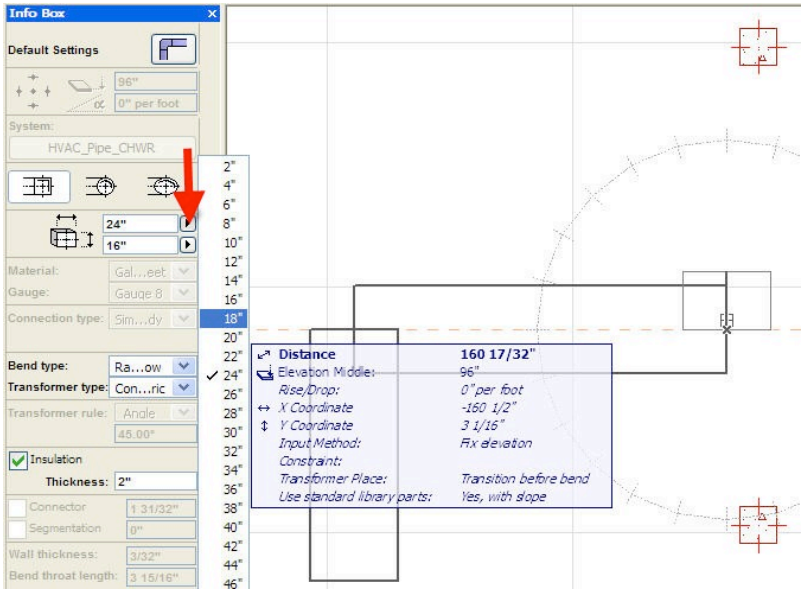


Figure 91 – Change the Size in the Info Box

Note that it places the appropriate transformer/reducer to make the transition in size. This reducer is considered an In-line Element. Refer to the section on inline elements for information regarding the inline editing functionality.

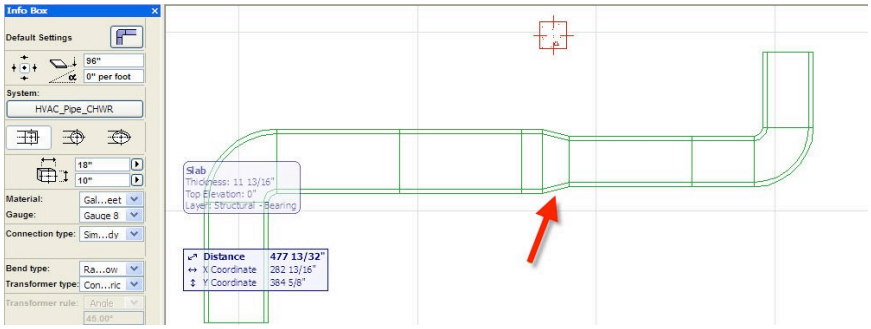


Figure 92 – Reducers are Inline Elements

Routing in 3D

Besides routing in the 2D plan view, Constructor also allows you to define pipe and ductwork routes in the 3D space.

HOW TO: ROUTE PIPE AND DUCTWORK IN 3D

Start a route in 3D by clicking the mouse at the start location after the routing tool has been selected, and after you have defined the settings and specifications as described in the 2D routing process.

Note that the "compass" that appeared in the 2D window is now shown parallel to the XY plane. The compass represents in which you are currently routing.

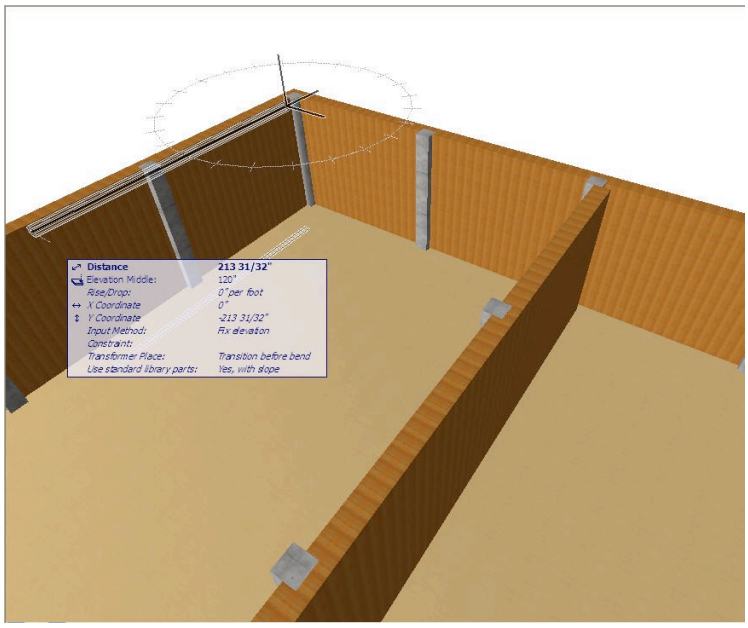


Figure 93 – Beginning a Route in 3D

While routing in 3D, you can change the input plane by using the <Tab> key to enter the "Tracker Box". While in the "Tracker Box", left-click on the table arrow (▶) next to "Input Method", and choose the desired input plane. Note the change in compass orientation. Press <Esc> to exit the Tracker Box, and continue routing in your newly selected plane by using the mouse to choose each new control point.

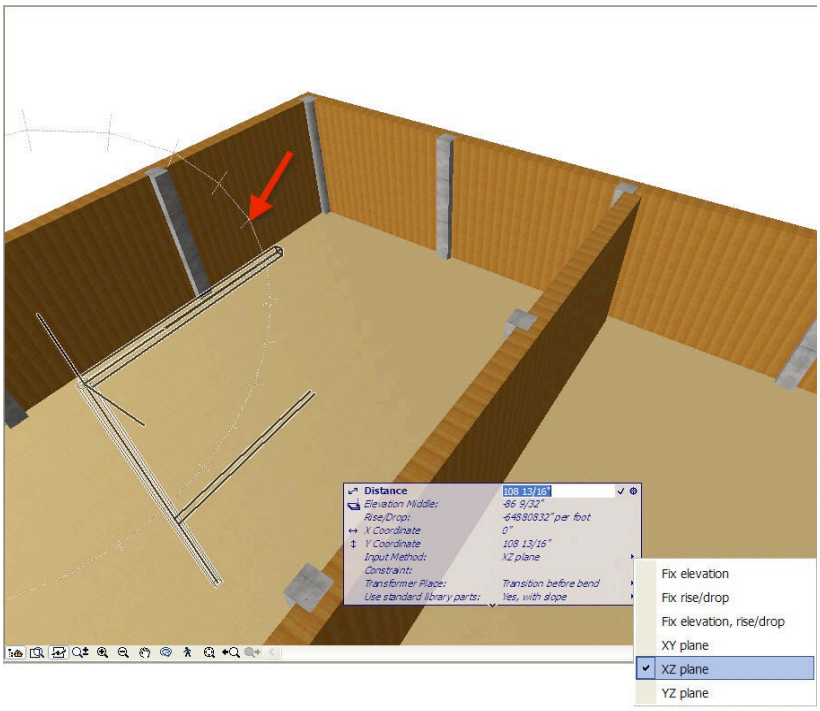


Figure 94 – Changing the Input Method from the Tracker box.

Changing the Input plane can be done as often as necessary to complete your 3D pipe or duct route. Use the compass to verify the plane on which you are routing and the bends that you are using. Continue routing just as you did in 2D by selecting each location for bends with a left click of the mouse button.

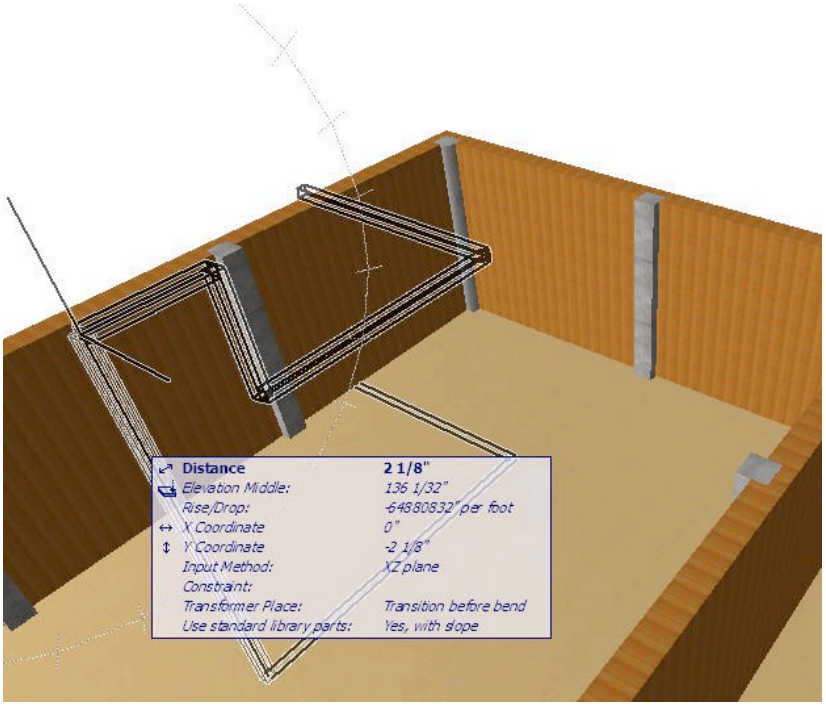


Figure 95 – Continued 3D Routing

Editing Pipe and Duct Runs

In the design or coordination processes, you will find the need to modify your existing pipe and duct routes. The key to Constructor's MEP Modeler route editing functions is based upon the centerline of the route.

HOW TO: EDIT A PIPE OR DUCT RUN

Select the centerline by placing the cursor over the pipe or duct route, until the "Mercedes" symbol appears over the path. When you have successfully done this, the control points will be highlighted in black.

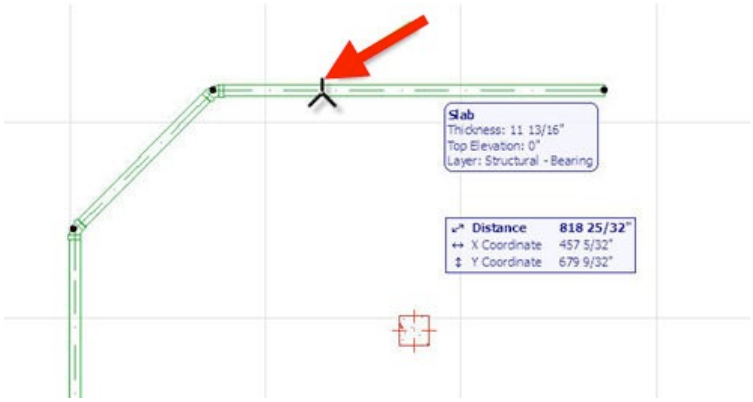


Figure 96 – Move the Cursor over the Pipe or Duct Until It Changes into a "Mercedes" Symbol and Click to Select.

Elevating an Entire Route

Elevating an entire route can be done by selecting "Edit" **>** "Move" **>** "Elevate" as shown below. The hot key for this function is <Ctrl> + <9>.

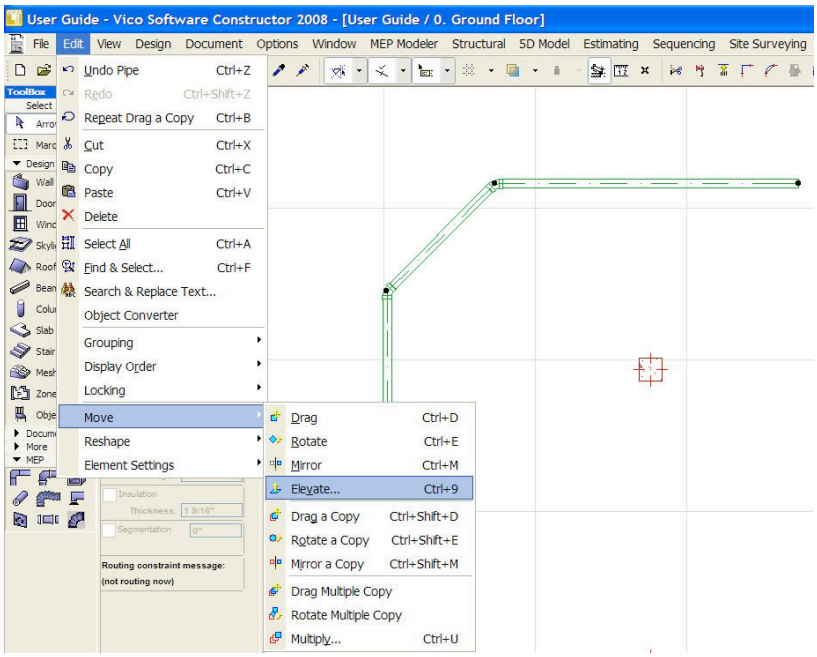


Figure 97 – Changing a Route Elevation

This will bring up the "Elevate" palette, in which you can input the vertical distance by which you would like to increase or decrease the elevation. After you have entered the elevation change into the box, select OK and the elevation will be changed accordingly.

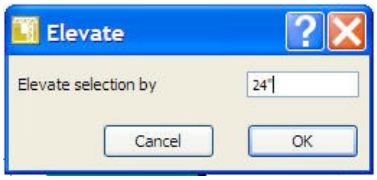


Figure 98 – The "Elevate" Palette.

Elevating a Control Point

You can also change the elevation and 2D location of an individual control point by selecting it after selecting the centerline. This will bring up the "Pet Palette":

Figure 99 – The "Pet" Palette.

If you select the far right button on the "Pet Palette" (), it will give you the options of the Special Editing Functions.

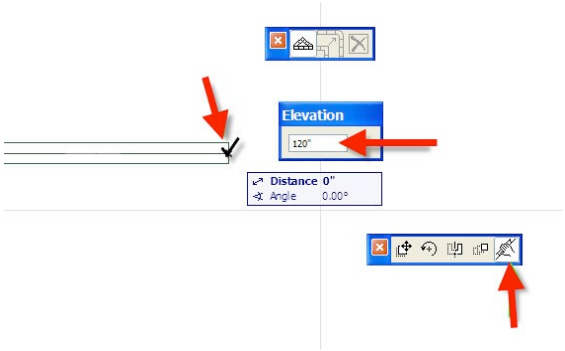
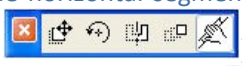


Figure 100 – The Special Editing Functions.

With the special editing functions selected, you can change the location of the control point and/or adjust its current elevation in the elevation box. Left click with the cursor on the 2D location on which you wish to place the control point, and the new location and elevation will take effect.

Shifting a Horizontal Segment of a Route

Shifting horizontal segments of a pipe is also possible after you have selected the centerline of the route. Simply select the horizontal segment again at the centerline of the route. This will bring up the "Pet Palette".() Ensure you select the Special Editing Functions button again, and select the "Offset Segment" () from the editing palette.

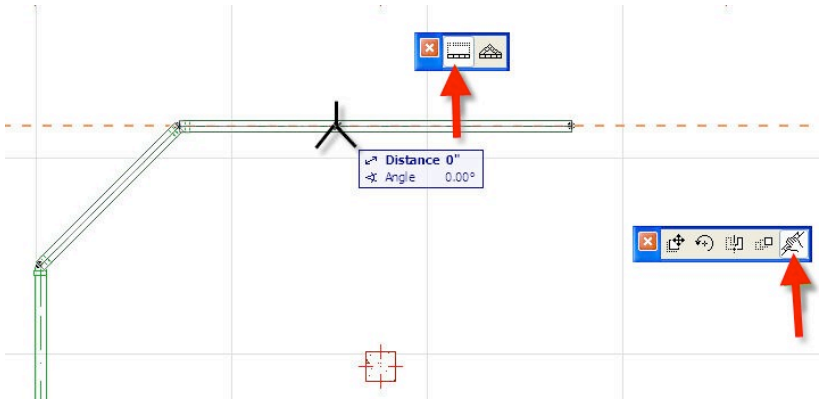


Figure 101 – Selecting the Offset Segment Button

This will enable you to drag the segment of the route to a new location parallel to the previous location. Left-click to fix the route to its new placement.

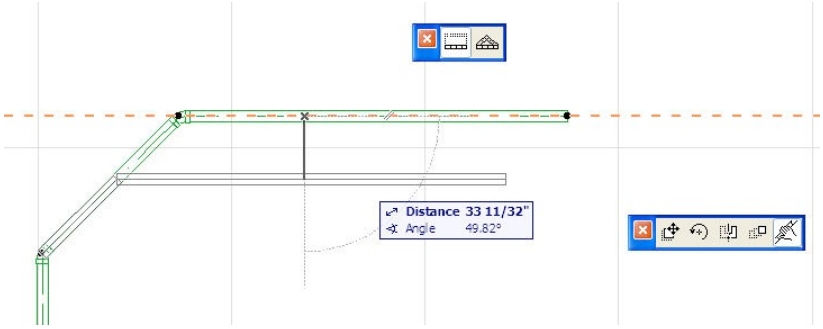


Figure 102 – Offset the Segment

Inserting a New Control Point

Instead of translating the route from the location you have selected, you can also choose to insert a new control point by selecting the "Insert a new control point" button ( ) in the same palette. This will, in a sense, break the segment into two pieces and allow you to determine the angle in which they intersect. ** **Caution**: this function is unconstrained by standard library parts and will allow you to create any angle between the two segments.

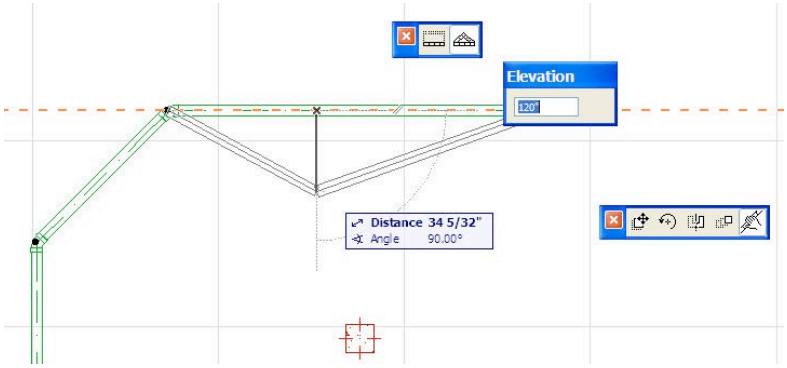


Figure 103 – Inserting a New Control Point

Splitting and Existing Route

Quite often, you will find that you would like to modify a section of a route, rather than the entire run. The ability to split routes allows you to disconnect a portion of the route from the route you would like to remain in-situ.

HOW TO: SPLIT AN EXISTING ROUTE

To split the route, select the centerline of the route.

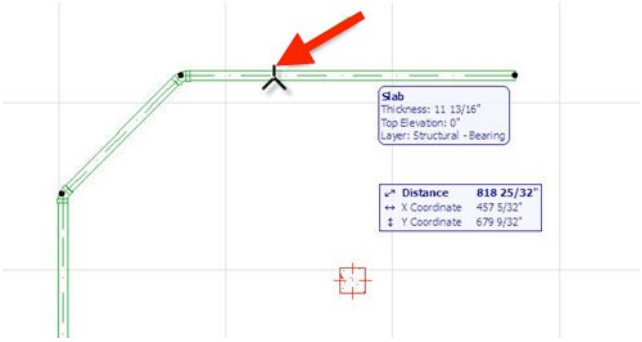


Figure 104 – Select the Centerline

Next, select the "Split Tool" ( ) from the main toolbar. Click on one side of the route and drag the line across the route with the cursor that has been activated. Click a second time across the route to finish the line of the split.

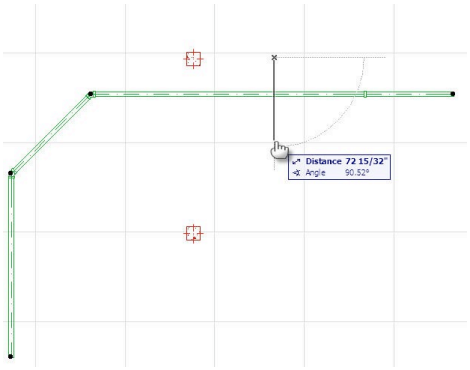


Figure 105 – Split Tool Line

Lastly, select the side of the route that you would like to continue having the centerline selected.

Figure 106 – Selection of the Segment to Keep Selected.

The result is a separation of the route segments which can now be edited individually.

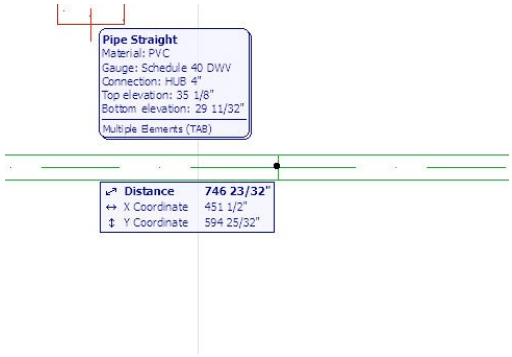


Figure 107 – The Results of the Split Tool

Inline Fittings

Inline fittings are tees, valves, inline fans, etc. All of these elements can be placed into previously routed pipe and duct runs. The placing tool reads the pipe's or duct's dimensions to direct you to the correct dimension fittings, which are available in the database.

HOW TO: INSERT INLINE FITTINGS

To insert an inline fitting into a pipe or duct route, double-click on the Inline button in the Toolbox.

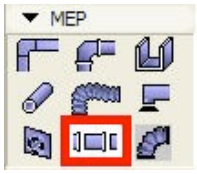


Figure 108 – The Inline Fitting Button

Constructor will open the “Inline Settings” dialog box. In the-top hand window of the Settings dialog, you can browse the hierarchy of libraries of available fittings to insert.

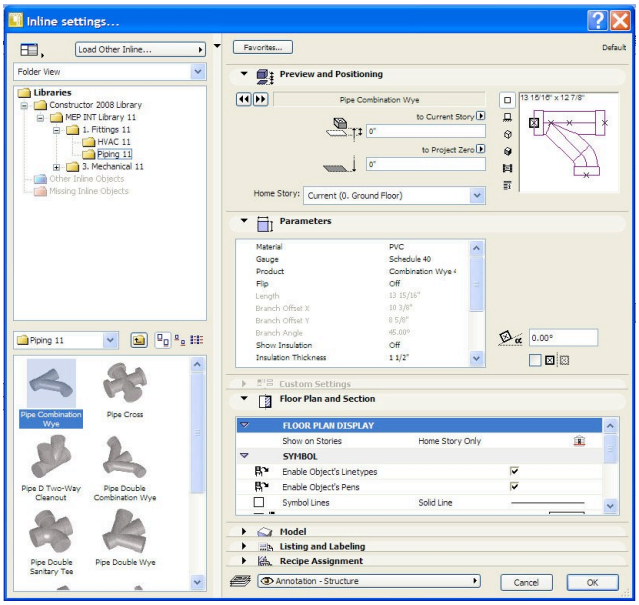


Figure 109 – The Inline Settings Dialog Box

When you find the desired fitting type, you may choose to modify the dimensions, parameters, or orientation of that fitting. You can do this in the parameters section of the “Inline Settings” dialog.

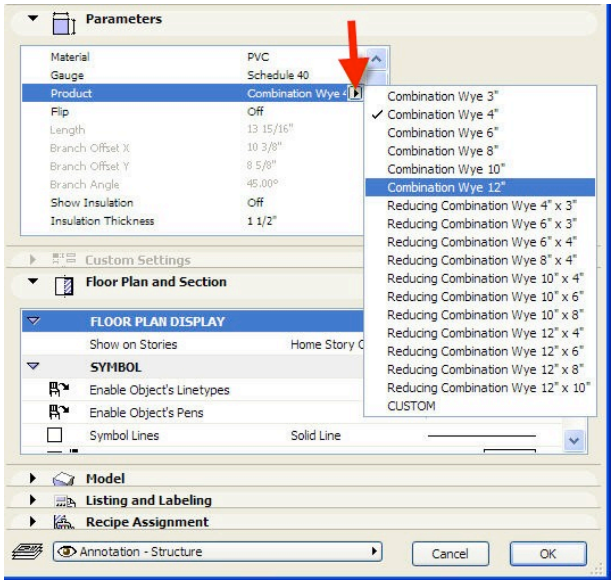


Figure 110 – Inline Fitting Parameters

Once you have chosen and modified the fitting to your liking, select “OK” in the bottom right corner of the “Inline Settings” dialog and proceed to place your fitting.

To place the fitting, simply left-click on the center line of the pipe or duct route. The “Mercedes Symbol” will confirm that you are in fact selecting the centerline.

Now as you rotate around the center point at which you wish to place the inline fitting, you can define the fittings.

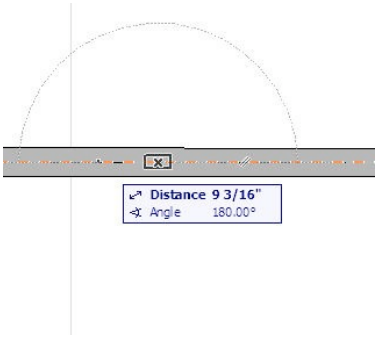


Figure 111 – Inline Up

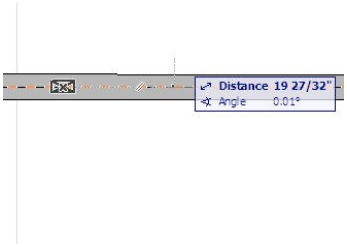


Figure 112 – Inline Down

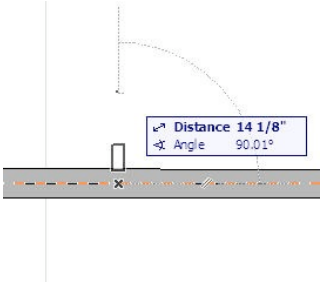


Figure 113 – Inline Left

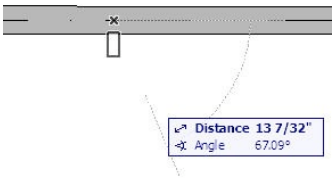


Figure 114 – Inline Right

Left click again in the direction of the orientation you wish for, and the inline fitting will be placed accordingly. The example below shows the result of the fitting being placed to the left.

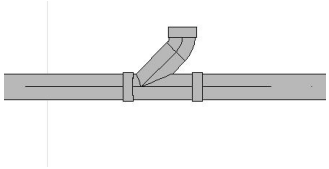


Figure 115 – Inline Placement Example

Now you can simply select the routing tool (Pipe or Duct tool) and connect to the branch inline by clicking on the connection point.

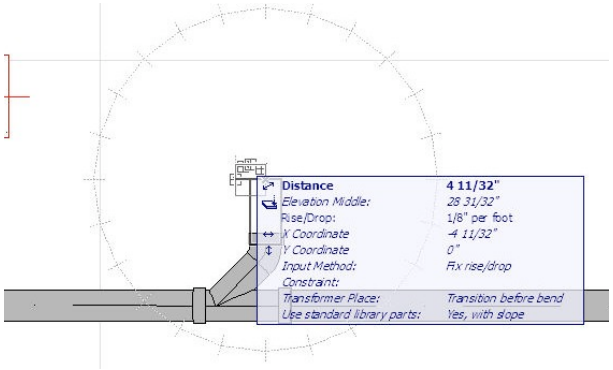


Figure 116 – Connecting to a Branch Inline

Placing Inline Fittings in the Vertical

You can also insert an inline fitting into a vertical route. To do so, select the vertical centerline in plan view.

HOW TO: INSERT AN INLINE FITTING INTO A VERTICAL ROUTE

To insert an inline fitting into a vertical route select the vertical centerline in the plan view (this will simply be a point.)

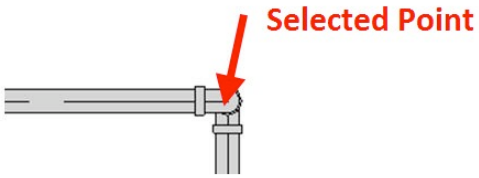


Figure 117 – Select the Vertical Centerline

After choosing the vertical centerline, the vertical segment will be projected into plan view so that you may choose the vertical position of the inline fitting.

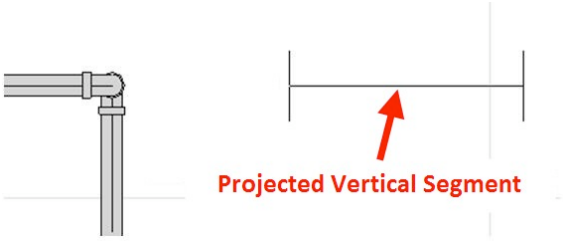


Figure 118 – Vertical Projection Line

The end marks of the projected vertical segment represent the top and bottom control points as shown in the illustration below.

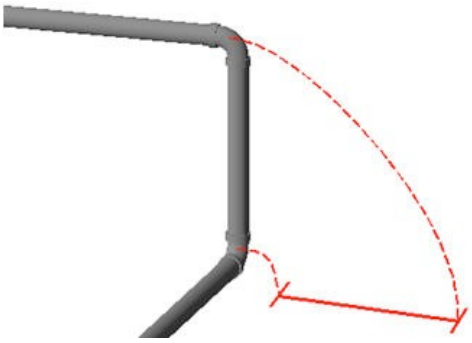


Figure 119 – Top and Bottom Representation

Inserting Duct Take Offs

The Duct Take Off is a special inline fitting. All of the takeoff's placement functions are the same, except that you will select the takeoff from the duct info box, rather than the in-line fitting button.

How To: Insert a Duct Take Off

Select the Duct Tool and then the **takeoff** button in the info box.

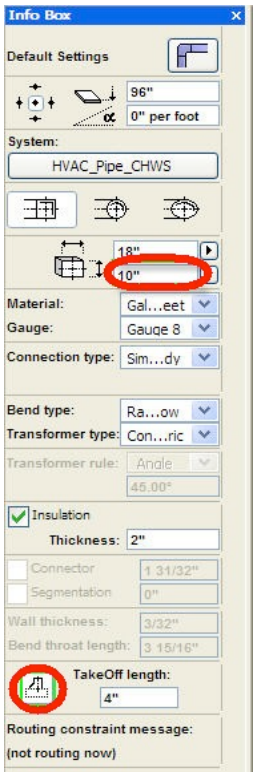


Figure 120 – Duct Take Off

Before placing the takeoff on the centerline of the duct, change the duct shape and size to the properties of the branch that the takeoff will facilitate. Place the takeoff on the duct with the same steps mentioned in the section regarding inserting and in-line fitting. Note the takeoff has a full list of parameters that can be modified to your liking by right clicking on the fitting and viewing the path type settings.

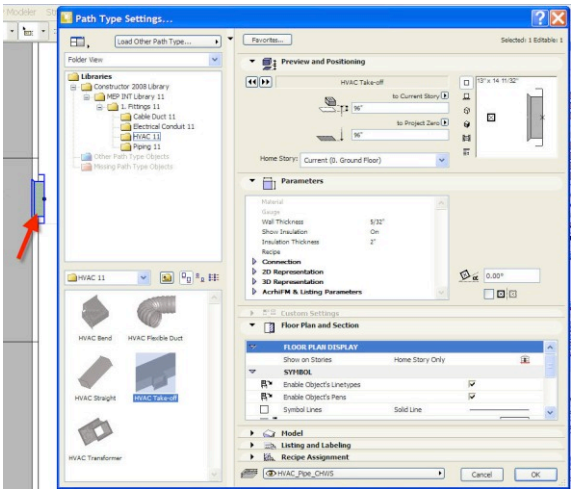


Figure 121 – The Takeoff's Path Type Settings

Moving an inline element

The placement of the inline element is adjustable within the routed segment's control points (e.g. the bend and the endpoint shown in the next illustration.) Adjusting the inline placement is possible in both a horizontal segment and a vertical segment.

HOW TO: MOVE INLINE ELEMENTS IN PLAN VIEW

Choose the centerline of the route in which the Inline element can be found. Make sure that centerline and not the element has been chosen. The figure below shows a correctly selected centerline.

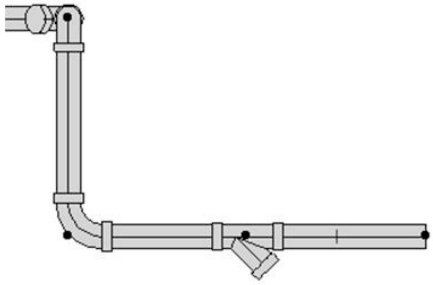


Figure 122 – Select the Centerline

It's easy to see that the Inline element has a control point. If we click on the inline element's control point, a pet palette will come up. On that, the main modifying tools buttons including the "Routing Edit" button can be found. This can be seen in the following figure:

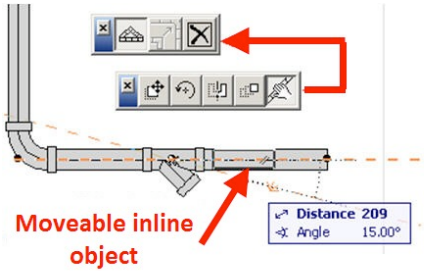


Figure 123 – The Inline Control Point is Selected and Can be Moved

Press the Routing Edit button. Then you will see a new pet palette on which you should select the move element button as shown above.

After this, the inline object will become moveable on this segment. With the help of tracker you can set the exact translation distance. If you press the <Tab> button during this operation you can activate the tracker's values. You can then set the desired values and press <Enter> to validate them.

Special Inline Editing Applications for Horizontal Routes

All Inline fittings have a control point that is located at the midpoint of its overall length. This is very useful the alignment of branch fittings with the intended locations of branches. However, some inline fittings' connection points are not

located at the midpoint, and others have connection directions that aren't perpendicular. The following section will give you the instructions to adjust these inline fittings to the appropriate plan view location.

How To: Move Inline Elements With Offset Connection Points

The placement of the inline fittings occurs about its midpoint, as shown below. To adjust the fitting to match the connection plane, follow these instructions.

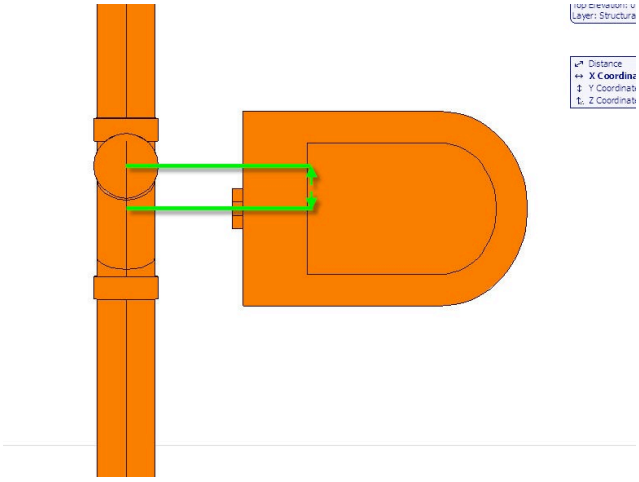


Figure 124 – Offset Connection

6. Select the centerline on which the inline fitting resides. Notice the control points of the route and the inline fitting will become highlighted with black dots.

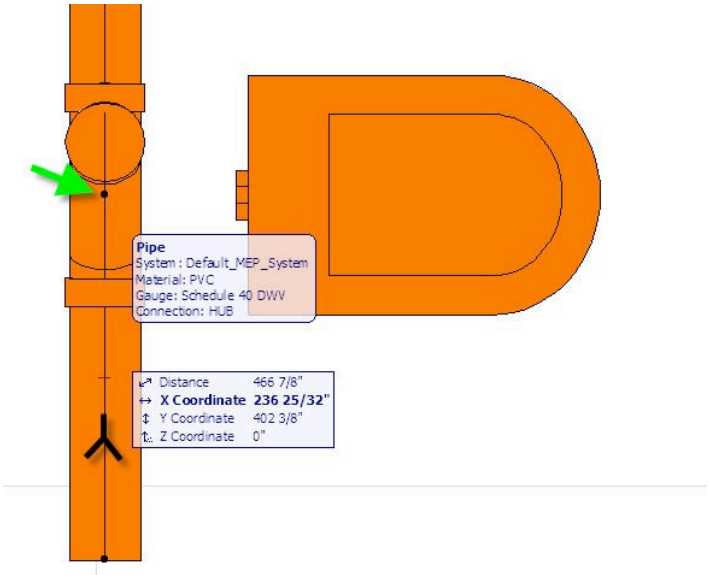
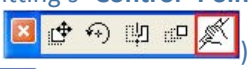


Figure 125 – Select the Centerline of the Route

7. Select the Inline fitting's **Control Point** and the **Special Editing Functions** button () and then the **Move Item** button () in the **Pet Palette.** Follow the numbered

selection points in the image for step clarification. You will notice that a representation of the inline fittings' shape is capable of being drug into a new position.

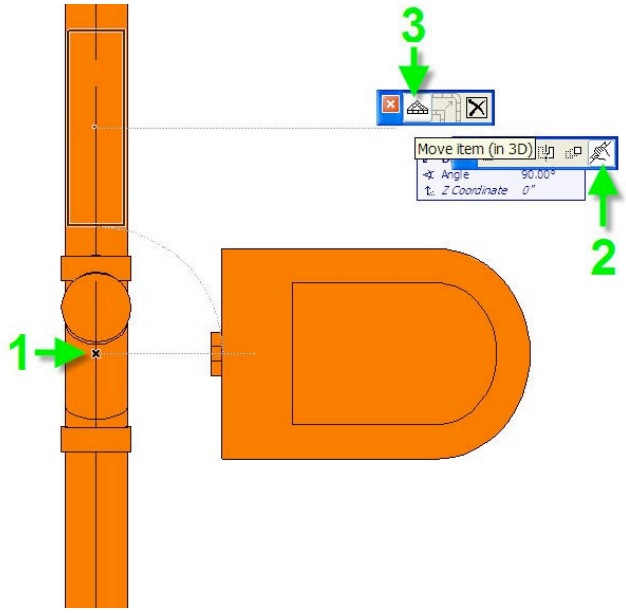


Figure 126 – Select the Control Point and Editing Function Buttons

8. Next, drag your cursor about the route in the direction that you wish to move the inline object. Press "**M**" on your keyboard to activate the measure command.

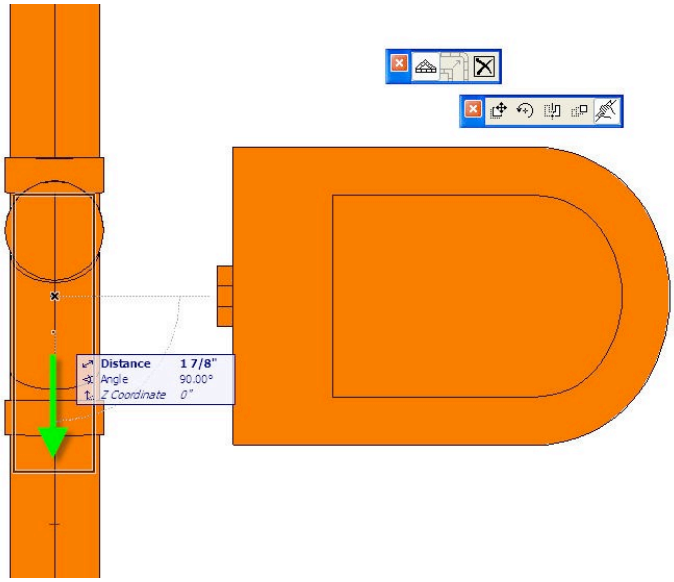


Figure 127 – Drag the Inline Objects Representation

9. After you've pressed the "**M**," select the centerline of the offset connection of the inline object. Drag the ruler representation along the route in the direction the inline needs to move. Hold down the **Shift** key to lock the measurement's direction, as you put the cursor over the point at which you would like to connect.

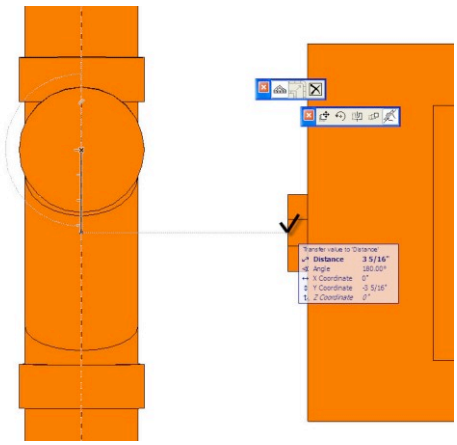


Figure 128 – Measure Tool for Relocation of Inline Objects

10. Select measurement's endpoint with a **left click** and notice the inline object's representation has been shifted into the correct place. The distance of the movement is displayed.

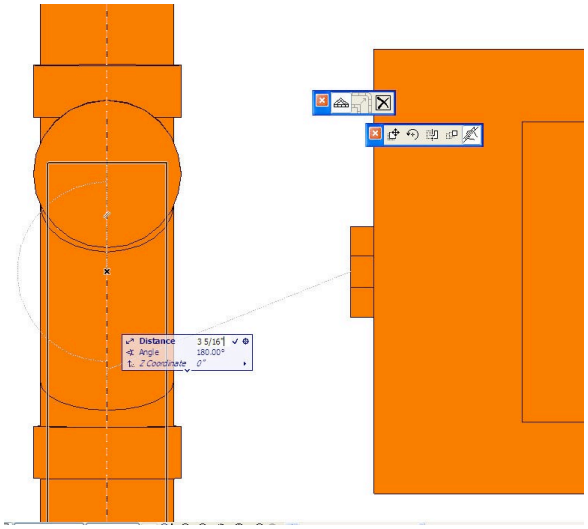


Figure 129 – Inline Representation Shifts into Place

11. Finally, press **Enter** to accept the movement of the inline by the distance and direction displayed, and the objects location will update accordingly.

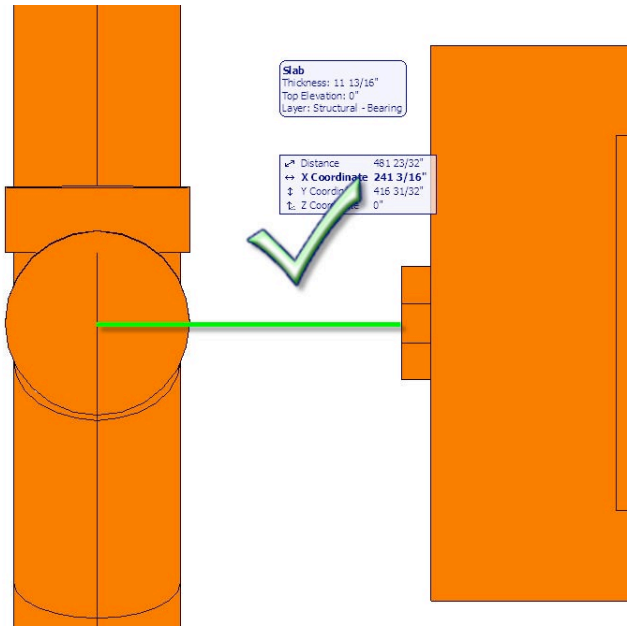


Figure 130 – The Inline Objects Location is Updated

Special Inline Editing Applications for Vertical Risers

In addition to the needs to elevate the position of inline fittings on vertical routes, it is equally important to be able to define the elevation of the connection points of these fittings. With information about the connection heights of fixtures and equipment, Constructor's functionality allows you to quickly place connection fittings at the correct elevations.

HOW TO: ELEVATE INLINE FITTINGS BY THEIR CONNECTION HEIGHT

Once you have an inline fitting in the vertical route, select the route's centerline. Vertical routes on top of horizontal routes require that you use the **tab** key to correctly select the right path. To do this, hover directly over the vertical route and hit the **tab** key until you see either **Pipe** or **Duct** in the **Hover Label**. When you see **Pipe** or **Duct,** select the center point with a **Left Click**. Note: Do not select the center point for the Pipe Straight, Duct Straight, or the Inline Fitting.

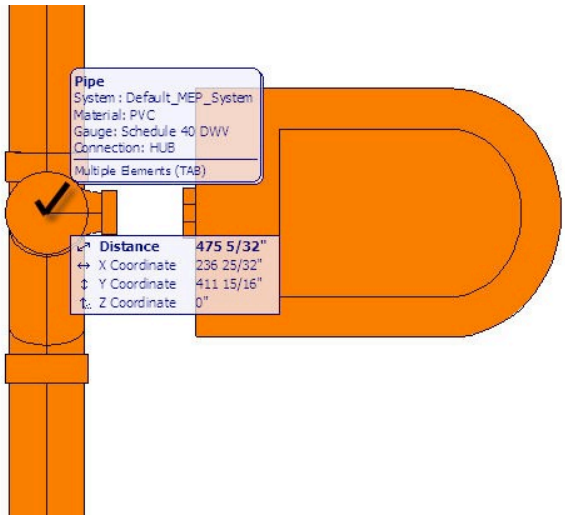


Figure 131 – Selecting the Vertical Path

After selecting the centerline of the vertical route, the vertical projection line will appear with the representation of the inline fitting. Select the mark representing the inline fitting with a **left click**.

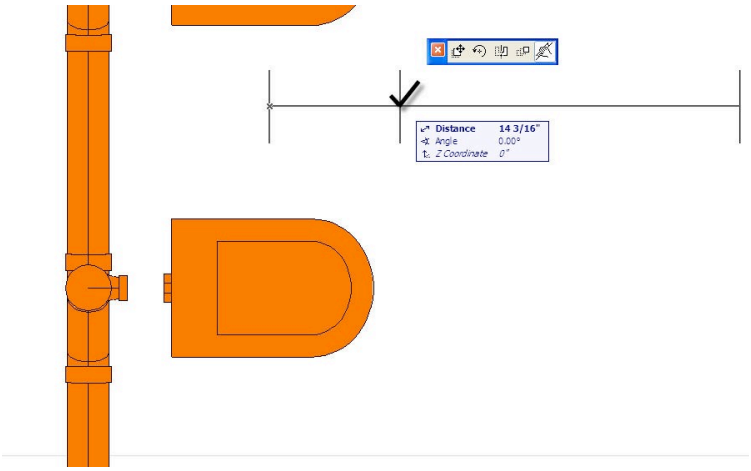


Figure 132 – Selecting the Vertical Inline

You'll notice that you can now drag the inline object's representation about the vertical segment's projection line, and there is a tracker box relaying the object's **Pipe Connection Elevation.** This elevation refers to the height from the current story in which you're modeling.

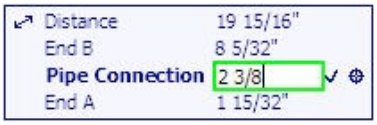


Figure 133 – Changing the Pipe Connection Elevation

Tab down to the **Pipe Connection** setting and enter the value for your connection point's elevation. Press **Enter,** and the inline fitting is adjusted accordingly.

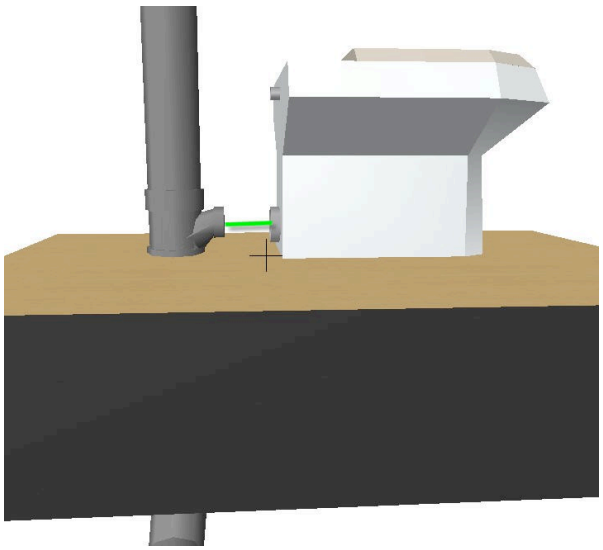


Figure 134 – Result of the Vertical Inline Placement

Deleting an Inline Element

You can delete inline elements from a route without creating a break in the routed element path. The following method describes how to delete elements.

HOW TO: DELETE INLINE ELEMENTS

Click the centerline of the route containing the inline element which you wish to delete and then, click the control point of the inline element.

Choose the "Special editing functions" button from the appearing pet palette and click the "Delete" button ()

Moving an Inline Element in a Vertical Segment

The method of moving is the same as described earlier; only selecting an element in a vertical segment is different.

HOW TO: MOVE AN INLINE ELEMENT IN A VERTICAL SEGMENT

Choose the centerline of a segment. Be sure the centerline and not the element is selected. Click on a control point, where a vertical segment can be found. The projection line will show a mark between the two end marks that represents the inline element.

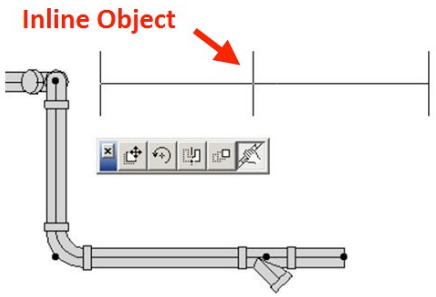


Figure 135 – Select the Representation for the Vertical Inline

To choose the Inline element, click on the element and notice that translation along the projection line becomes possible.

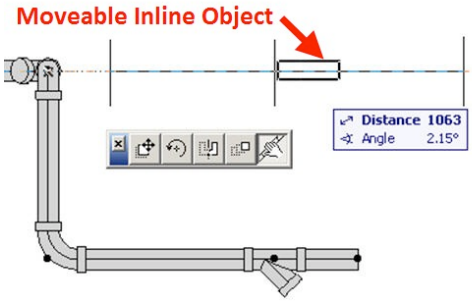


Figure 136 – Translate the Inline about the Projection Line

We can set the distance of move out with the help of tracker. If we press the "**TAB**" button during operation we activate the tracker's values. Those can be modified and by pressing "**ENTER**" we can validate new values.

Auto Router

The MEP Modeler's Auto Routing function allows you to choose from calculated recommendations of paths. Each recommended path is the next shortest route with a maximum number of fittings, set by you. You can use the Auto Router to route from a path type element (pipe or duct) to another path type element; or you can route from a path type to an end type element (equipment or fixtures).

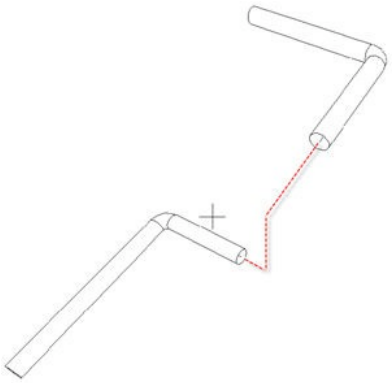


Figure 137 – Auto Router

How To: Use the Auto Router

When you have two items that you wish Auto Router to connect, open the **MEP Modeler Menu** on the Menu Bar and click on **Auto Router**.

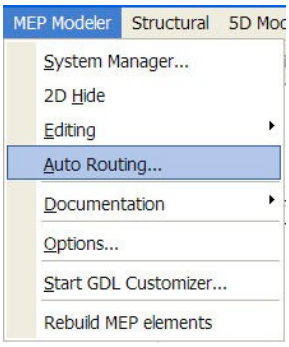


Figure 138 – "Auto Routing" function in the "MEP Modeler" menu.

The Auto Router dialog box will appear on your screen.

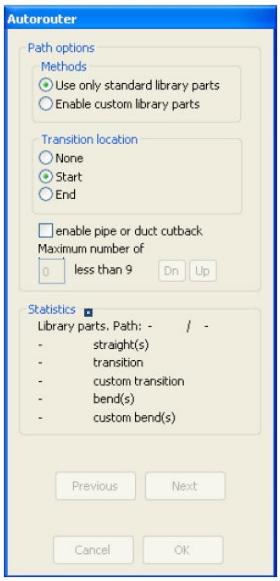


Figure 139 – Auto Router Dialogue Box

Click to select where you would like to start the route. You will see an arrow pointing away from the end point.

Figure 140 – Select the first point you want to connect

Next, select the point that you would like to connect to with a click. You will see the arrow pointing towards the connection.

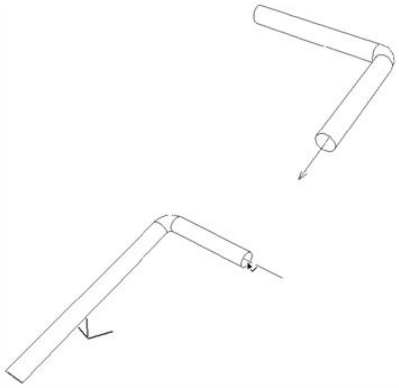


Figure 141 – Select the Second point

The Auto Router will begin to determine the shortest possible path with the fewest number of available bends. Notice that the Path Options within the Auto Router dialog box allow you to modify the calculations of the shortest paths.

The auto router dialog provides the following options:

Methods:

- Use Only Standard Library Parts (This option will allow only those bends that are available within the given routing specification.)
- Enable Custom Library Parts (This will allow custom bend angles to be inserted to achieve the shortest path with the fewest bends.)

Enable pipe or duct cutback: allows the algorithm of the option cutting into the existing route to make the optimum route.

Maximum number of bends: allows you to narrow or expand the options available as you respectively decrease or increase the number of bends.

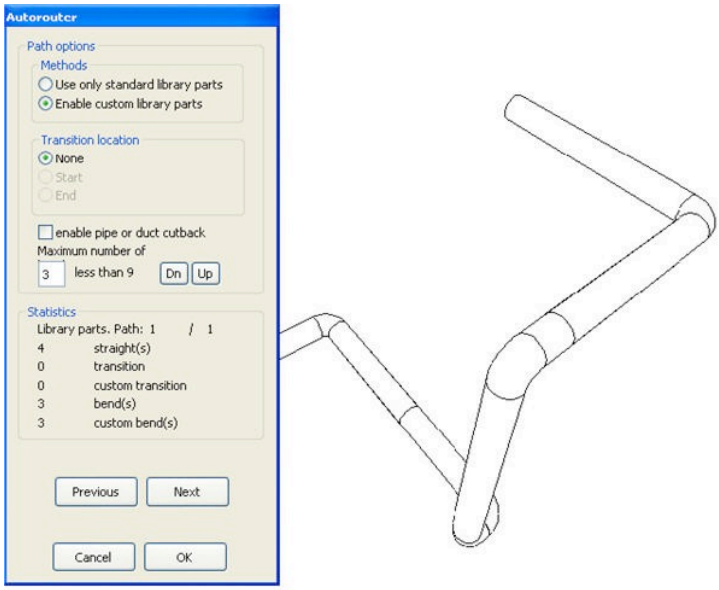


Figure 142 – Auto Router Options

The Auto Router will let you show you a preview of each recommended path in either the 2D or 3D view. Use the Next and Previous buttons to scroll through the recommendations. When you find the recommendation best suited to your needs, select OK.

End Type Objects

End Type Objects (e.g., grilles, diffusers, p-traps and floor drains) are objects that have intelligent connection parameters, which will adjust to the parameters of the route in which you are connecting. Also, if the end type object is placed before a routing connection is made; the routing element will adjust to meet the size of the end type object by using the required transformer.

HOW TO: PLACE AND CUSTOMIZE END TYPE ELEMENTS

To insert an end type fitting to the end of a pipe or duct route, double click on the End Type icon ( ) in the tool box. This action brings up the End Type Settings dialog box. In the top left window of this box, you can browse libraries of objects available for you to insert.

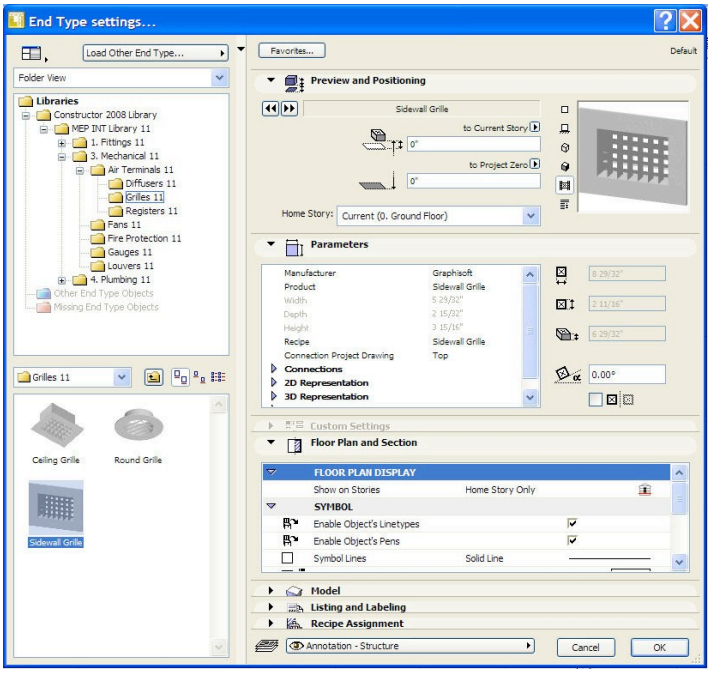
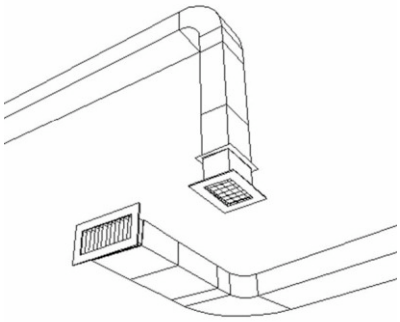


Figure 143 – End Type Settings dialog

After you have selected the correct parameters for the desired End Type Object, select the "OK" button in the bottom right corner of the End Type Settings dialog.

You have three options for the placement of the End Type Object.

1. Enter the Object's elevation in the End Type Settings dialog box, choose OK, and select the XY coordinates in the 2D plan view by clicking. Multiple clicks with this option will place multiple End Type Objects.
2. Select the route ending control point in the 2D plan view by clicking.
3. Select the route ending control point in the 3D view by clicking.



Equipment

Constructor's MEP Modeler has an extensive library of customizable equipment parameters for manufacturer specific products.

HOW TO: PLACE AND CUSTOMIZE EQUIPMENT

To insert equipment, double click on the Equipment icon ( ) in the tool box;

This action opens the "Equipment Settings" dialog. In the top left window of the Equipment Settings dialog box, you can browse the libraries of the equipment available for you to insert.

In the "Parameters" section, you will find a set of parameters that allow you to customize your equipment object. Parameter options are the same for all equipment type objects.

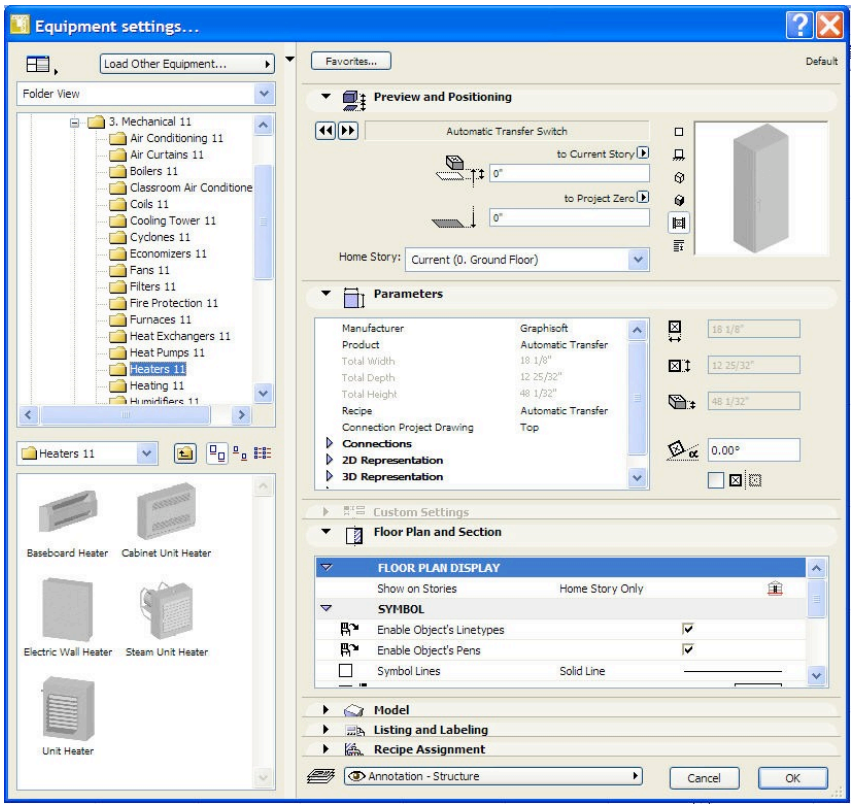


Figure 144 – Parameters for Equipment objects allow you to customize the equipment you need in your project.

Manufacturer

Manufacturers listed in the database can be found here. For every manufacturer there is a "Product" list which is stored is the database. The values for manufacturers' product parameters are locked. There is a "Custom" value in the list of manufacturers. The "Custom" manufacturer can be used for creating products with parameters not provided in the current manufacturers' product lists. Selecting the "Custom" manufacturer will unlock all parameters for editing.

Product

The product list is stored in a database. Here you can also find the custom values, which have the same impact and use as mentioned above.

Connection parameter group

The parameters of all equipment nozzles.

2D representation group

Defines the parameters of the plan view representation.

3D representation group

Defines the parameters for the 3D representation. It is important to know that this is a value which will have a great influence on the size of your model in the future. This is the "3D" value. "Detailed", "Simple" and "Off " Level Of Detail (LOD) values can also be found in this setting.

The Equipment Object in Plan View

If you place equipment with manufacturer-specific parameters into a plan, the parameters are locked and will not be graphically editable. If the placed element has custom parameters, then it is possible to edit it graphically.

Below is an example where the previously pictured pump has been placed with custom parameters. Graphically editable hotspots have a diamond shape and their color differs from the usual hotspots. The figure below displays graphically editable hotspots, the sizes and placement of which are editable.

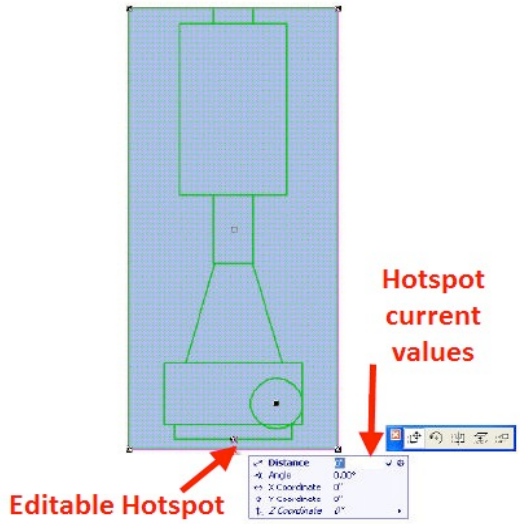


Figure 145 – Editable hotspots of an equipment object.

How To: Edit Equipment Objects

You can see that a pet palette appears when you click on an editable hotspot; at the hotspot, you can find a button for editing the hotspot itself. Choosing this button displays the parameters of the hotspot in the tracker box. The <Tab> key will allow you to edit the values in the Tracker Box. The same object in 3D looks like this:

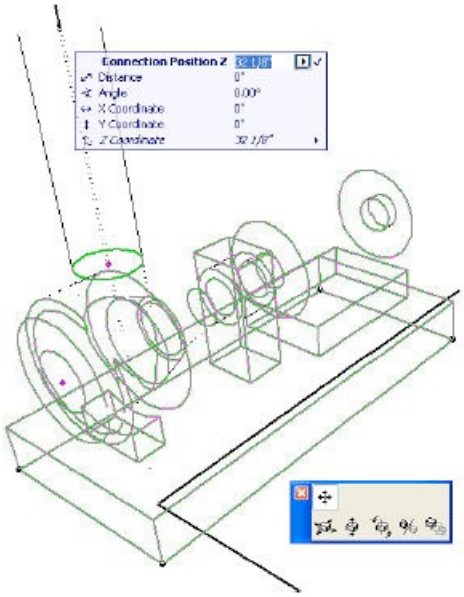


Figure 146 – An equipment object in 3D.

Selected hotspots are moveable; the curved arrow shows the possible directions of the connector's movement. You can set the exact value of the movement in the tracker box.

Polygon Count

The Polygon count feature helps you to identify high levels of polygons in the 3D model, and to specify different levels of detail to elements in the model, thus resulting in higher or lower amounts of polygons.

A polygon is a line in 3D space that defines an edge of a 3D body; the more complex a 3D body is (for example a toilet bowl), the more polygons are required to define it. The larger the amount of polygons in your model, the more demanding it will be from your computer hardware.

You can download the Polygon Count add-on from Graphisoft's website: http://www.graphisoft.com/support/archicad/downloads/goodies11/USA.html.

HOW TO: USE POLYGON COUNT TO MANAGE THE SIZE OF YOUR MODEL

Open the Polycount tool palette by selecting "Polycount" and then "Toggle Palette"

The Polycount tool palette appears; the title bar of the palette shows the number of polygons in the current model.

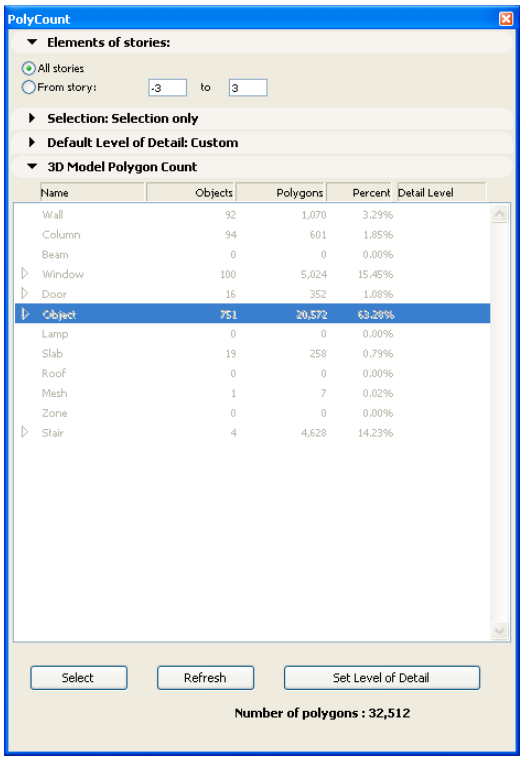


Figure 147 - Polycount tool palette

In the "Elements of stories" tab, the stories to be analyzed can be selected. Choose either "All stories" or a range of stories in the fields appearing when the "From story" option is selected.

The selection can be further refined by choosing "Selection only", after selecting elements in the model using the Selection tool.

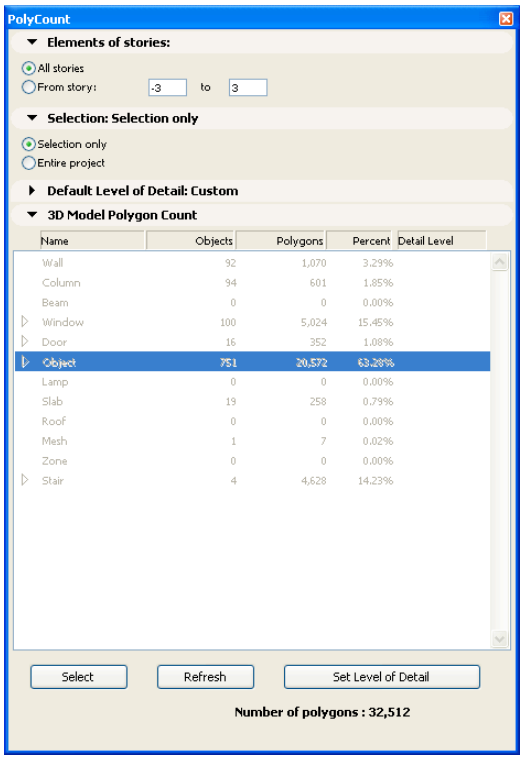


Figure 148 - Consider elements from selection only

The project's default level of detail for 3D elements can be set in the "Default Detail Level Tab" by selecting a preset level from the list.

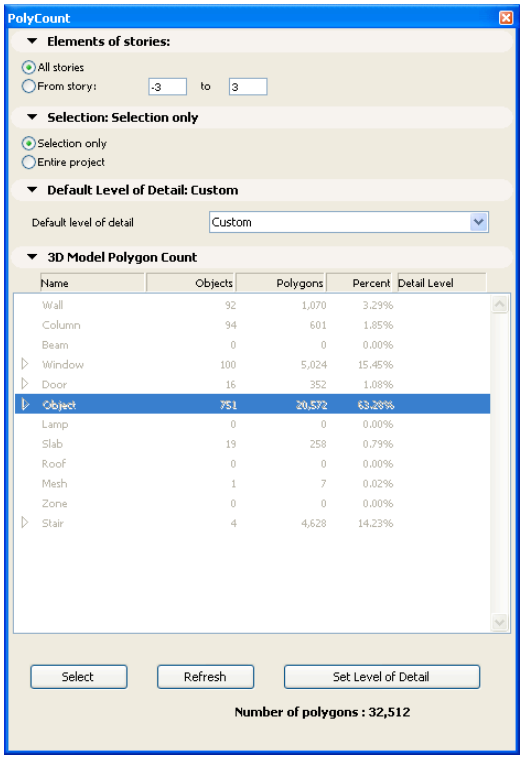


Figure 149 - Default level of detail

The analyzed model level of detail information is displayed on the “3D Model Size of Elements” tab. An overview is given, per element type, of the number of polygons, as well as the percentage of the total amount of polygons in the project.

By clicking the triangle icon (▷), a category can be expanded, thus showing the element definitions in that specific group.

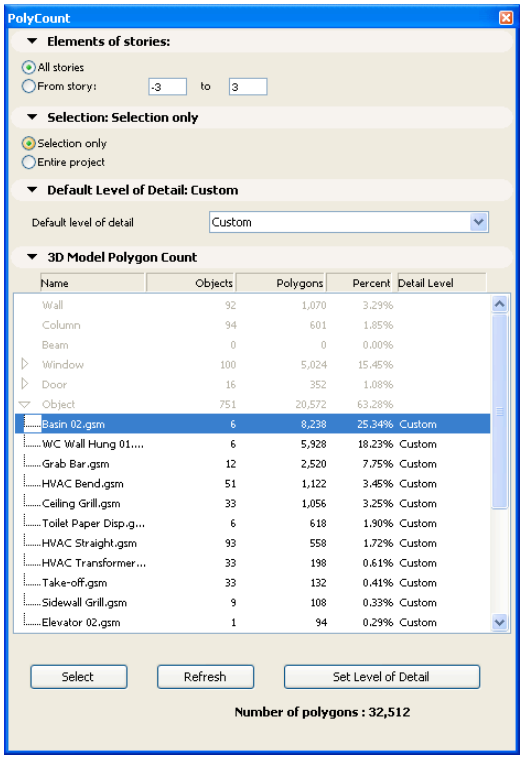


Figure 150 - element definitions in expanded group

The GDL element definitions shown in black font type include a “Level of Detail” parameter, which can be set as desired. Changing the parameter will result in a different number of generated polygons for the selected element definition.

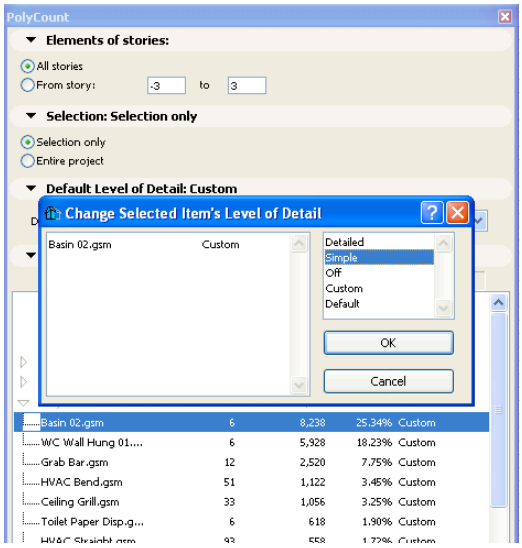


Figure 151 - modifying the level of detail

In this example, the level of detail of the Basin 02.gsm definition is changed from Detailed to Simple.

The result of the setting is calculated after confirming the setting by selecting OK – in this case, the amount of polygons was reduced from 31,224 to 20,640 – a 34% reduction - for the Basin 02.gsm element definitions in the model.

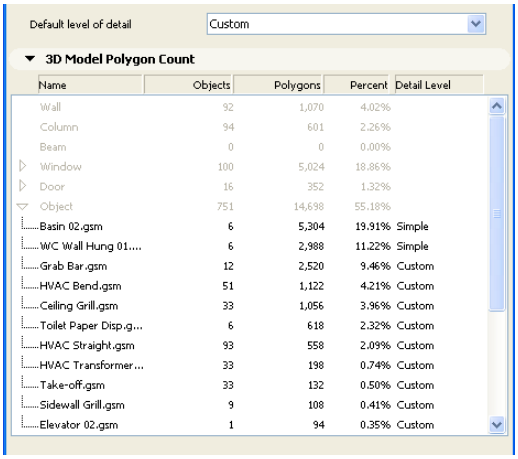


Figure 152 - new status of polygon count in the project

By locating erroneous polygon numbers and repeating the steps as described above, the model can be optimized for enhanced 3D performance.

Coordinating Trades

One of the direct benefits of building a Virtual Construction model is that you can build the project in the computer before you have to build it in reality. This offers great opportunities to find problems that may exist due to possible lacking coordination between trades involved in the project.

To optimally benefit from your modeling effort, we suggest that you build your model in the same order as in reality. This will provide you with insight where in the process problems may occur and takes in account the logical structure of the building.

2D Design plans (architectural, structural, mechanical, electrical and plumbing), are mostly distributed digitally. The digital design information can be imported into your construction model: this will help you to quickly build your model by "tracing" the 2D design information with 3D elements that you defined in the Content Plan.

You can import 2D drawings and use them as overlay by using Constructor's "ghosting" technique.

HOW TO: IMPORT 2D DRAWINGS AND USE THEM AS "GHOST"

To efficiently manage 2D drawing information that you import and use as overlay, it is required that you setup your story structure in such a way that it can hold this information without bothering you during your modeling work. For instructions

on how to setup a good story structure, see "How To: Define your Story Structure".

Make sure that the story in which you want to insert the 2D design information is the active story.

Then, select from the "File" menu "External Content" > "Place External Drawing".

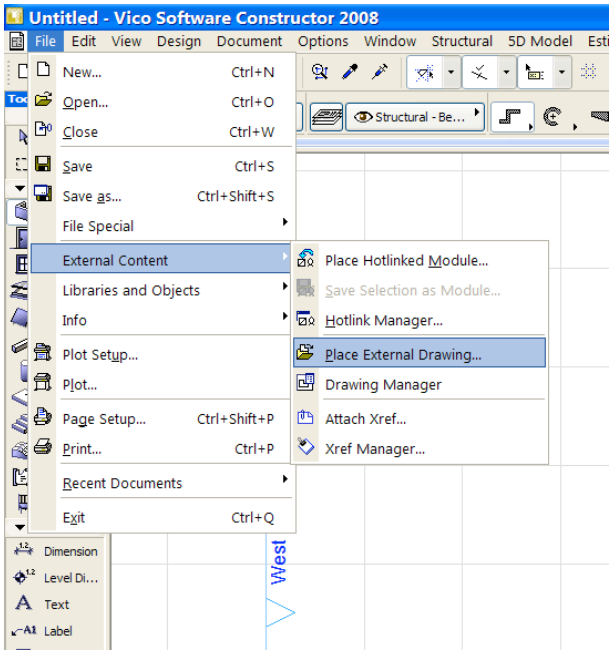


Figure 153 – Placing an external reference through the "External Content" menu.

Constructor will ask you to specify path and name of the file that you would like to insert into the model.

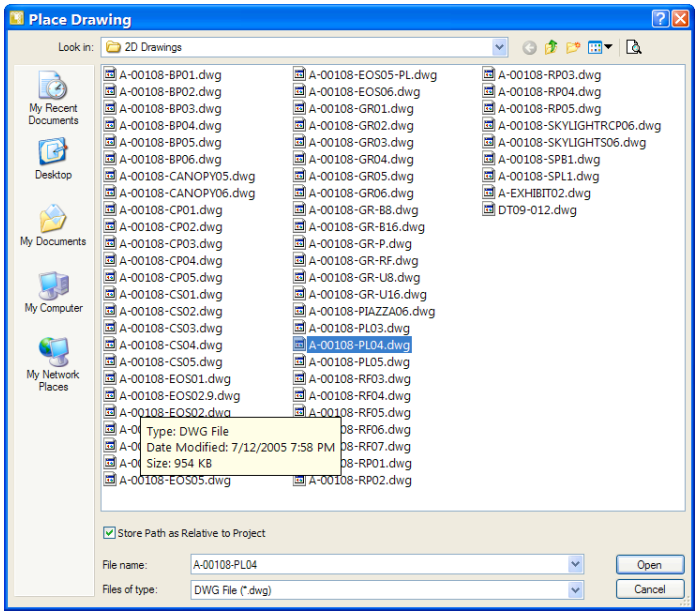


Figure 154 – Selection of the 2D drawing file to be inserted in the model.

After selecting the file, you will be asked to specify how units of the 2D file should be translated.

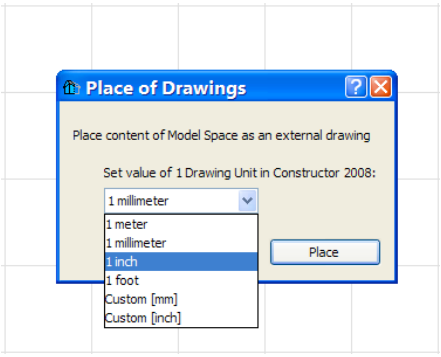


Figure 155 – Selection of the unit system of the file to be inserted in the model

After selecting the appropriate unit system, Constructor will display a "placement cursor" in the model space, which allows you to position the 2D design content in your model. After placement, you can always move the content to the desired location using standard Constructor functions like move, scale and rotate.

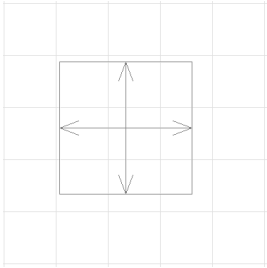


Figure 156 – Placement of the design content is identified with the "placement cursor".

By importing 2D design information from all trades involved (or all information that is available), you can start modeling on top of the provided trade specific plans. With the "Virtual Tracing" technology, you can easily compare your modeled elements to the 2D design information using advanced comparison tools. For instructions on using the "Virtual Tracing" tools, please refer to the ArchiCAD reference manual that can be found in the "Help" menu.

Managing Constructability Issues

While building your Virtual Building model, we recommend documenting any "constructability issues" that you may find. Constructability issues are problems that exist in the set of 2D design information due to insufficient coordination between trades; building a Virtual Building model will undoubtedly reveal these problems.

By keeping track of all the issues that you find while modeling, you will create a highly valuable set of information based on which your project team can better prepare for the construction phase.

The best way to keep track of all issues that you find is by maintaining a Constructability Report. The report can be used to track and follow up on found

issues. Constructability issues can be good input for Requests For Information (RFI's) and may even result in Change Orders (CO's). An important advantage of the Constructability Report is that it visually explains to the (extended) project team where problems exist in the project.

How To: Maintain a Constructability Report

Maintaining a Constructability Report is best done using a spreadsheet application, in which you can save and organize found constructability issues.

We recommend setting up your spreadsheet as follows.

1. Set up trade specific tabs, so you can easily find the issues that are related to "clashes" between two specific trades. Examples: Architectural/Structural, Structural/Mechanical, Mechanical/Mechanical.

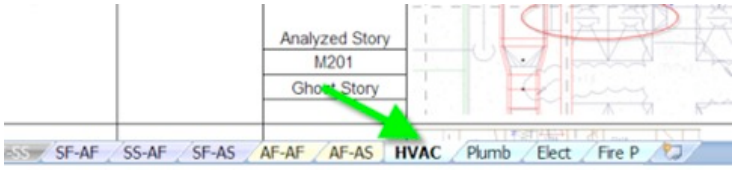


Figure 157 – Trade specific Categories on tab pages in your spreadsheet.

2. Define columns that include the information you need to follow up on the found issue; most important is a unique identifier for each issue, which will make it easier to include and refer to issues in RFI's and CO's.

3. Include screenshots of the model and overlaid 2D design information! Make use of the building model that you are creating by providing visual feedback. With markup tools, you can create annotated feedback to design partners in the project team, which makes it easier to find and resolve the problems found.

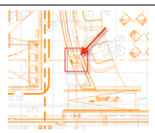
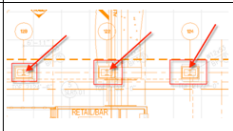
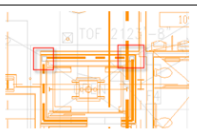
Number	Problem Description	Location	Grid Ref	name of compared plans		Screenshot
				Analyzed Story	Ghost Story	
SF/AF01-001	The Arcitectural columns are not matching form the Stru. plans	Arch Lvl 1	D-118	ALR 201.01	SLR 201.01	
SF/AF01-002	The Arcitectural columns are not matching form the Stru. plans	Arch Lvl 1	A-120,122, 124	ALR 201.01	SLR 201.01	
SF/AF01-003	The HSS Columns are missing in the Architectural part	Elevator Area	E-D /115-116	ALR 201.01	SLR 201.01	

Figure 158 – Typical Constructability Report layout.

Using the Model for Site Surveying

Defining and Saving Site Surveying Points

Constructor 2008 contains functionality with which you can place virtual survey points in your model, and later publish these points for use in a Total Station.

This allows you to really "Build to Design", as the points in your virtual building model are projected to the site with a Total Station device.

HOW TO: PLACE SURVEY POINTS IN YOUR MODEL

To start placing survey points in your model, select "Show Site Survey Palette" from the "Site Surveying" menu item.

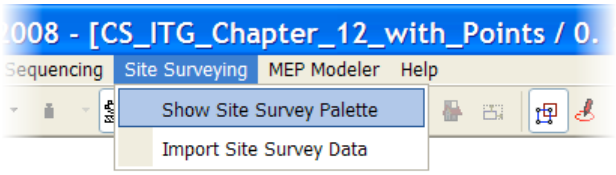


Figure 159 – Opening the Site Survey Palette from the "Site Surveying" menu item.

Constructor will open the palette, which allows you to add site surveying information to your model.

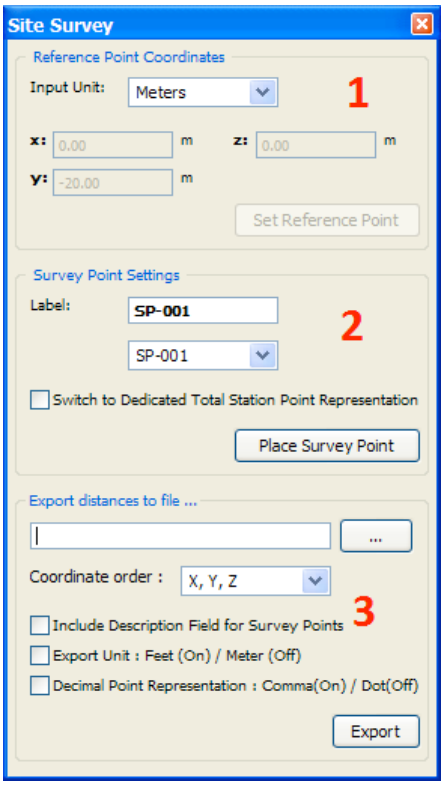


Figure 160 - The Site Survey palette

The “Reference Point Coordinates” settings (**1**) allow you to define the initial position and unit system for the Reference Point, which will become the origin point for all site survey points to be added.

Using the “Survey Point Settings” (**2**), you can define labels for your survey points and switch to the dedicated object for the Total Station (points measured on site) if desired. The “Place Survey Point” button activates the “Survey Point” tool and allows you to place points in your model.

In “Export distances to file” (**3**), you specify a file name and path in your system for the site surveying data to be exported to. You can change the order of the coordinates, include or exclude a description and change settings for the exported distances. With the “Export” button, you will save all survey point information in your model to the specified file with the defined settings.

First, define X, Y and Z for your Reference Point. You can always move and/or rotate the point later.

Show the “Coordinates” palette from the “Window > Palettes > Coordinates” menu item to find out where you want to place the Reference point. The Reference point is a point that is typically taken from, or measured from, the local coordinate system, used to layout the dimensions of the site.

Next, place points in your model. Change the desired label on the Site Survey palette if needed and click the “Place Survey Point” button.

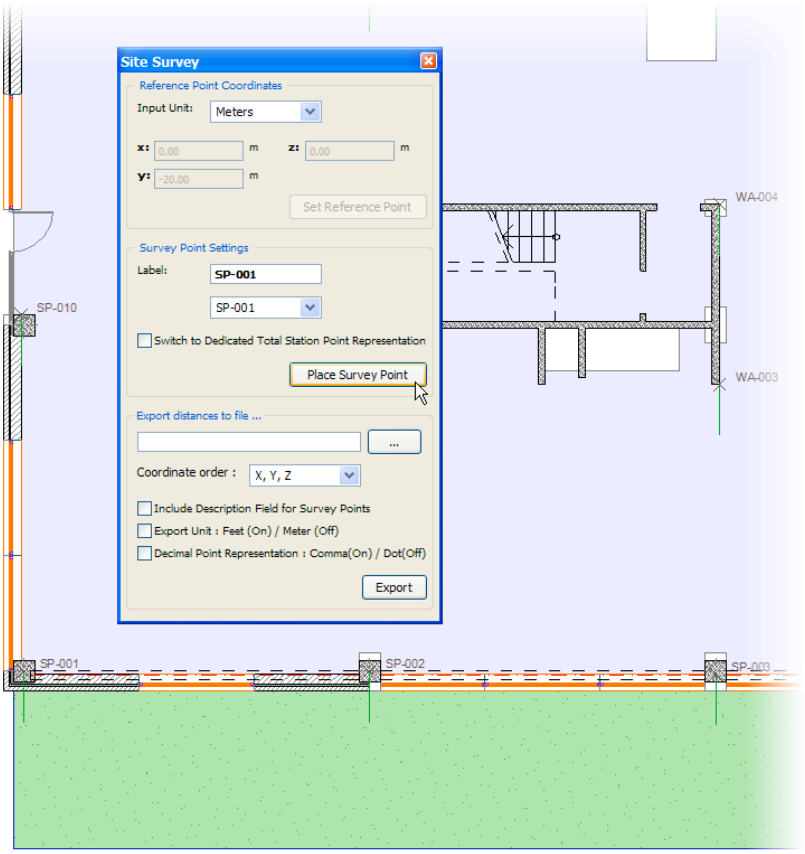


Figure 161 – Placing Survey Points in the model by clicking the “Place Survey Point” button.

After you have placed the points in your model that you need for your site surveying work, you are ready to save the information to .CSV data file that can be opened with Microsoft Excel.

How To: Export Site Surveying Data

When you are ready to export your site surveying data, first specify name and system path for the file to be saved.

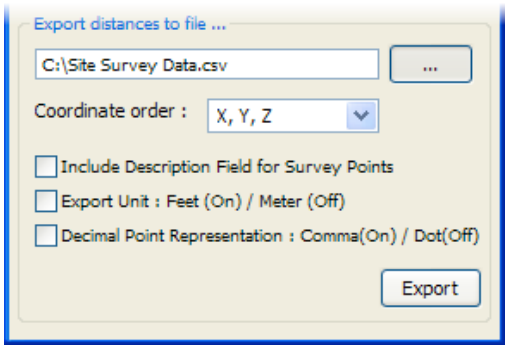


Figure 162 – Settings for Site Surveying data export.

Next, decide if you want to include point descriptions in the output. Point descriptions can be defined by opening the settings of a Site Survey point and editing the "Survey Point Information" in the "Parameters" tab.

You also need to set the units in which you want to save your surveying data. Selecting the box means that the export will be in Feet, leaving it unselected means that the export will be in Meters.

Lastly, define the decimal point representation, which is important for compatibility with the Total Station device that you will use.

Click the "Export" button to save the information in your model to the specified file.

Importing Site Surveying Data

Comparing "As Built" to "As Designed" is enabled by importing the points measured on site back into the Constructor model.

How To: Import Site Surveying Data

From the "Site Surveying" menu item, select "Import Site Survey Data".

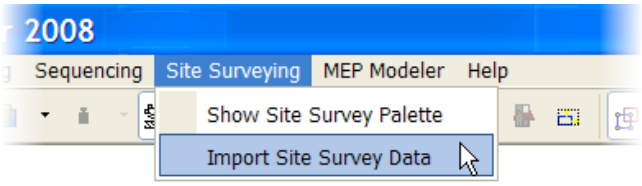


Figure 163 – Importing Site Survey Data.

Constructor opens the “Import Site Survey Data” dialog box, which allows you to either start importing directly with the default settings, or to configure the import settings.

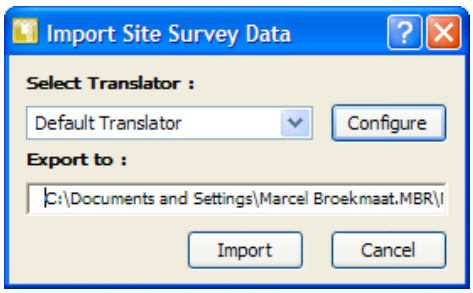


Figure 164 – “Import Site Survey Data” dialog box.

Click the “Configure” button to make adjustments to the site survey data translator.

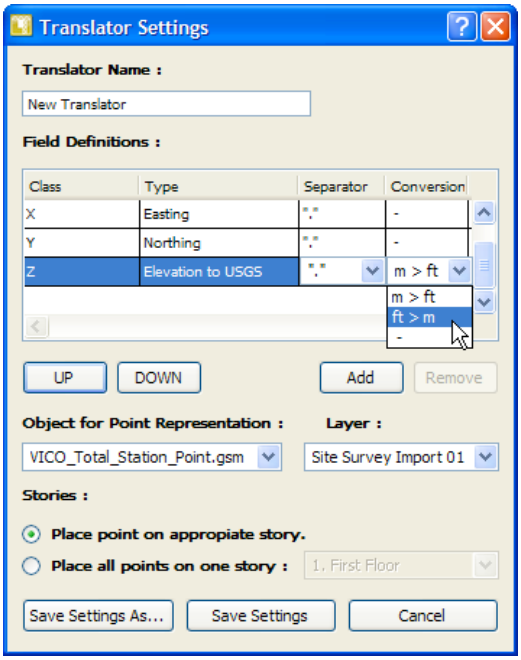


Figure 165 – Translator Settings dialog box.

You can either make changes to the default translator, or you may decide to create a new translator. You can make changes to the order in which site surveying data is measured by the Total Station on site (select a coordinate X, Y, or Z and click the “UP” or “DOWN” button), and you can also specify the GDL object that will be used to represent points measured on site. With the “Layer” option you can select the layer on which the new points will be placed and the “Stories” setting allows you to specify how the points should be added to the model (on the appropriate story or all points on one dedicated story).

Click the “Save Settings” button to save the changes to an existing translator or the “Save Settings As” button to create a new one.

Next, click the “Import” button and specify where in your system Constructor can find the file with site surveying information from the Total Station.

Click “Open” to import the data and place the points in your model. You can now compare “As Designed” to “As Built”.

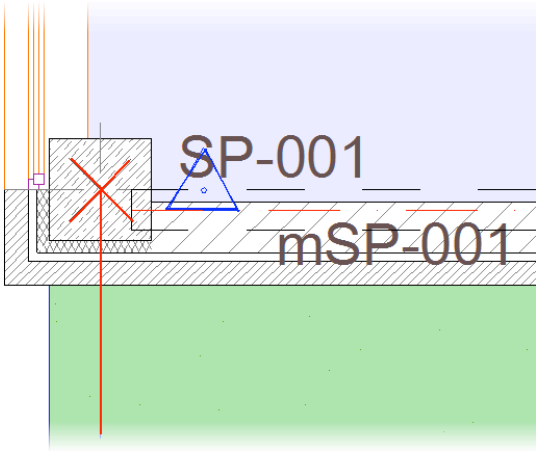


Figure 166 – Comparing “As Designed” to “As Built” with the Site Surveying tool.

Assigning Recipes

As explained in section 1, An Introduction to Recipes, Methods and Resources, Recipes are used to “tag” elements in your Constructor model with estimating and scheduling information.

Your Recipe knowledge base information is maintained in the Standards Library; where it can be accessed from both Constructor and Estimator. When you tag an element with a Recipe in Constructor, the contents of the Recipe (Methods and Resources) will automatically be copied to your project in Estimator.

When you tag an element in your Constructor model, the quantities that can be extracted from that element are saved with the Recipe in your Estimator database. In Estimator, the extracted quantities are used to calculate costs and labor on the Method and Resource levels. Because all quantities are saved by model location, you can create model based estimates and schedules.

You can tag elements in your model with Recipes in two ways:

- **Automatically**, using Favorites (as explained in “How To: Define a Favorite”)
- **Manually**, by selecting elements and subsequently assigning a Recipe to the selected elements.

When you prepare a set of Favorites to build your model with and also include a Recipe assignment in your Favorite definitions, Recipes will be tagged to model elements as you build your model. Using this approach, you will create estimating and scheduling input while creating the model. We recommend using Favorites, created based on your Content Plan, as much as possible, as it results in the most efficient and accurate use of Constructor.

Assigning Recipes to Elements Manually

You may decide to tag elements in your model manually, for example when:

- there are elements in the model for which you did not define a Favorite
- there are elements in the model for which the required Recipe was not (yet) available and has to be created in Estimator
- you want to change the currently assigned Recipe.

In the manual Recipe assignment process, you will first select one or more elements, open the element settings and select the Recipe you want to associate with the selected element(s).

You will first need to select the elements you want to assign Recipes to. The most efficient way of assigning Recipes is by selecting groups of elements that should be tagged with the same Recipe.

A Good way to find the desired groups of elements is by selecting with the **Find and Select** tool based on:

- Layer
- ID
- Fill / Composite

You will experience the advantages of maintaining a Content Plan when defining the search criteria: you can easily look up all information regarding Layer, ID and Fill/Composite in your Content Plan!

Constructor contains two powerful search tools that help you to find the elements that you want to assign Recipes to. The first tool, "Recipe Link Checker", is also used to perform quality and completeness checks on your model, explained in the section "Checking Recipe Links."

How To: Use "Recipe Link Checker" to Assign Recipes

Start Recipe Link Checker from the Estimating menu in Constructor.

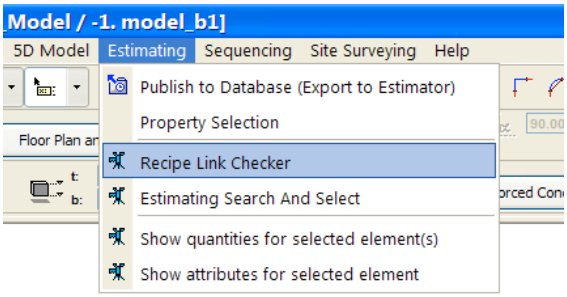


Figure 167 – Recipe Link Checker in Estimating menu.

Recipe Link Checker will list all elements that don't have a Recipe assigned to them.

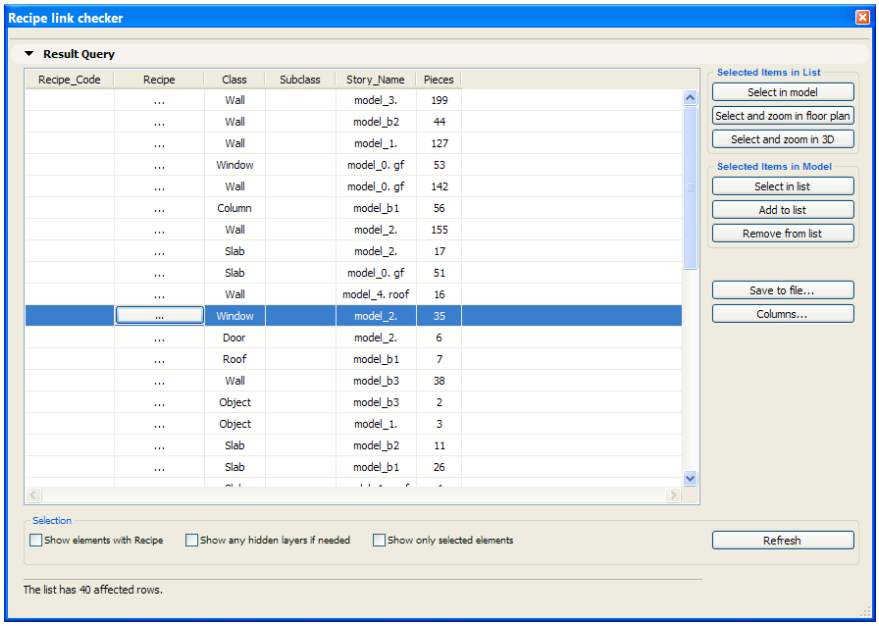


Figure 168 – Recipe Link Checker enlists all elements in the model without a Recipe. The granularity of the list is defined by the columns displayed.

Select the elements that you want to assign a Recipe to from the list and click the ... button to open the Recipe assignment dialog.

In the Recipe assignment dialog, Constructor enlists all available Recipes, categorized by cost estimating classification, available for the type of element of the items selected in the Recipe Link Checker results.

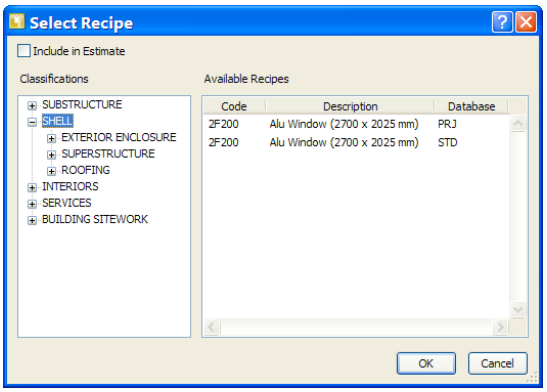


Figure 169 – Recipe selection dialog from the Recipe Link Checker.

Select a classification in the left window, then select a Recipe and click OK to assign a Recipe.

To search elements based on the ID that you assigned to them, you can use the "Find & Select" tool.

HOW TO: SELECT ELEMENTS WITH "FIND & SELECT"

Start the "Find and Select" function from the "Edit" menu in Constructor.

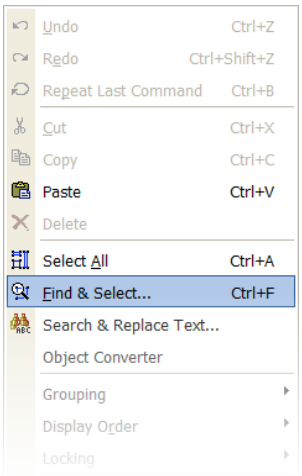


Figure 170 - "Find & Select" in "Edit" menu

Constructor opens the “Find & Select” dialog, in which you can define the criteria based on which you want to search the model for the elements you want to include in your selection; in this case, the ID that you defined for specific “Window” elements.

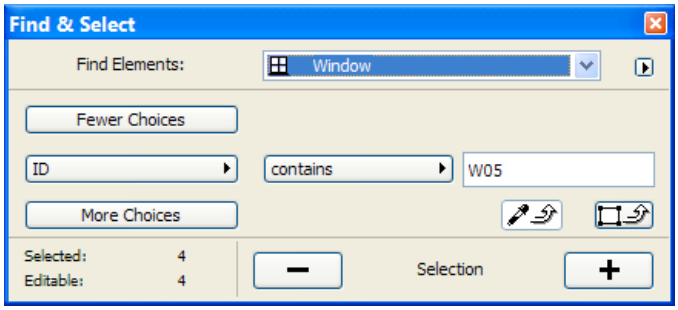


Figure 171 - "Find & Select" dialog

Define your search criteria by adding filters to your query. Add criteria by clicking the “More Choices” button; click the created new search criterion button (“ID” in the example above) to specify the property. Enter the ID text string that you want to search for (“W05” in the example above) to specify the ID of Window elements that you want to select – refer to your Content Plan for the required property value.

After setting up the query, which may exist of a combination of properties (for example: Layer in addition to the specified ID), click the “+” button to select elements that meet the conditions on the **currently active floor**, which helps you to select elements on a specific location.

If you want to select all elements that meet the specified conditions in the whole model, switch to 3D view and make sure that all floors are active. Then click the “+” button and all required elements in the model will be selected.

After you have selected the elements that you want to assign a Recipe with the “Find and Select” tool, you need to open the properties of these elements to specify *which* Recipe should be associated with the selection.

Important to check before you open the settings of your selection is whether the selected elements are of the same element type. Recipes are defined for a specific element type, which assures that the quantities, required for the Recipe can be extracted. When your selection contains element of different types, some elements will not be assigned the selected Recipe! To learn how you can change the element type of a Recipe, see "How To: Change the element type of a Recipe" in chapter 3.

HOW TO: ASSIGN A RECIPE TO SELECTED ELEMENT(S)

With the required elements in the model selected, right click and select "Selection Settings". This will open the "Selection Settings" dialog that contains all properties of the selected elements.

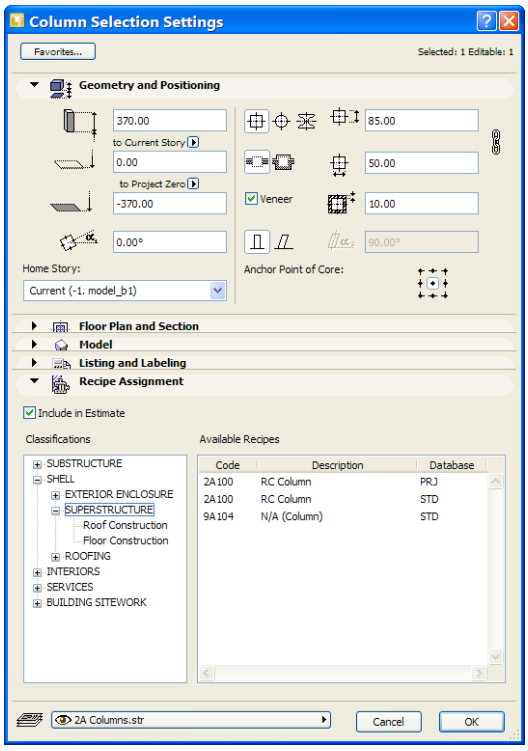


Figure 172 - Selection Settings dialog

In the "Estimating" section, select the Recipe classification to which the selected elements belong (for example: "Shell > Superstructure"). This will result in a listing of all available Recipes for this classification.

Select the desired Recipe (again, referring to your Content Plan) and click "OK" to confirm your settings.

After assigning a Recipe to elements in your model, you can check the quantities that will be extracted from the elements with the "Quantities of the selected element(s)" function.

HOW TO: CHECK QUANTITIES OF ELEMENTS

With you're the elements in the model selected, choose the function "Show quantities for selected element(s)" from the "Estimating" menu.

Constructor opens the "Quantities for selected elements" dialog.

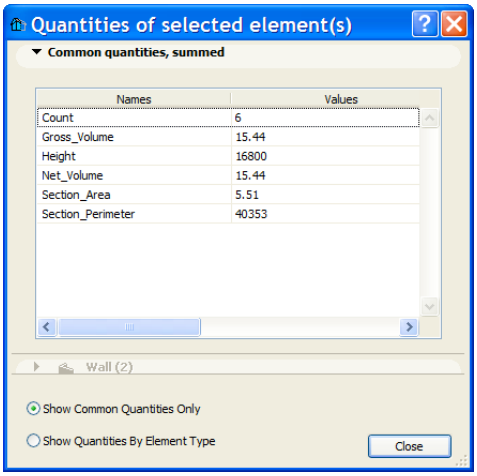


Figure 173 - Quantities of selected elements

In case you want to analyze the quantities of elements of more than one element type, the function gives you two options:

1. Show only the common quantity types – this will show the quantities that all selected elements have in common and will add them up where applicable – this is the default view.
2. Show quantities by element type – this mode will show all quantities of the selected elements, categorized by element type.

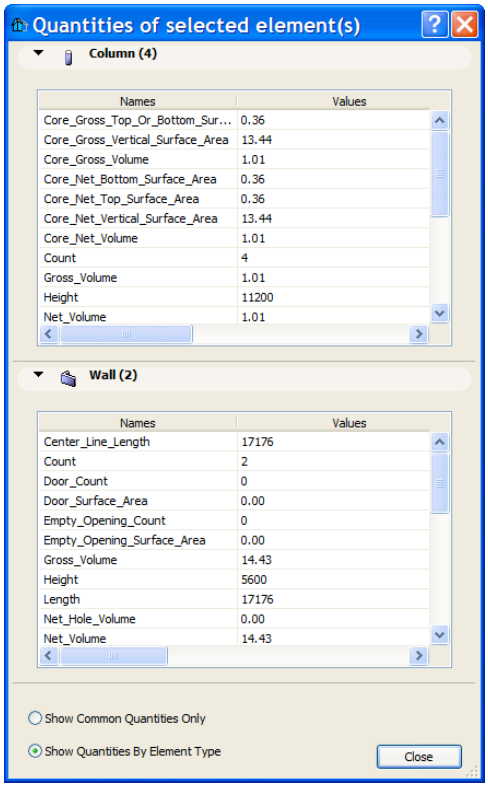


Figure 174 - Quantities of selected elements by element type

Checking Recipe Links

When you are using your Constructor model for estimating and scheduling purposes, you want to make sure that everything that is included in the model will also be included in your estimates and schedules.

Quantities from a model element are only published to the Estimator database when a Recipe has been assigned to it. This means that before you publish the model based quantities into the database, you need to check if all elements in the model have been tagged with a Recipe.

For this purpose, Constructor contains the Recipe Link Checker. This tool helps you find those elements in the model that *don't* have a Recipe assignment. While analyzing the completeness of the model, you can assign a Recipe directly from the Recipe Link Checker.

Recipe Link Checker will also help you to change existing Recipe assignments. The basic use of Recipe Link Checker has already been explained in the "How To: Use "Recipe Link Checker" to Assign Recipes" section; the section below describes the tool in more detail.

HOW TO: CHECK AND MANAGE RECIPE LINKS

From the "Estimating" menu, select "Recipe Link Checker".

Constructor opens the Recipe Link Checker dialog.

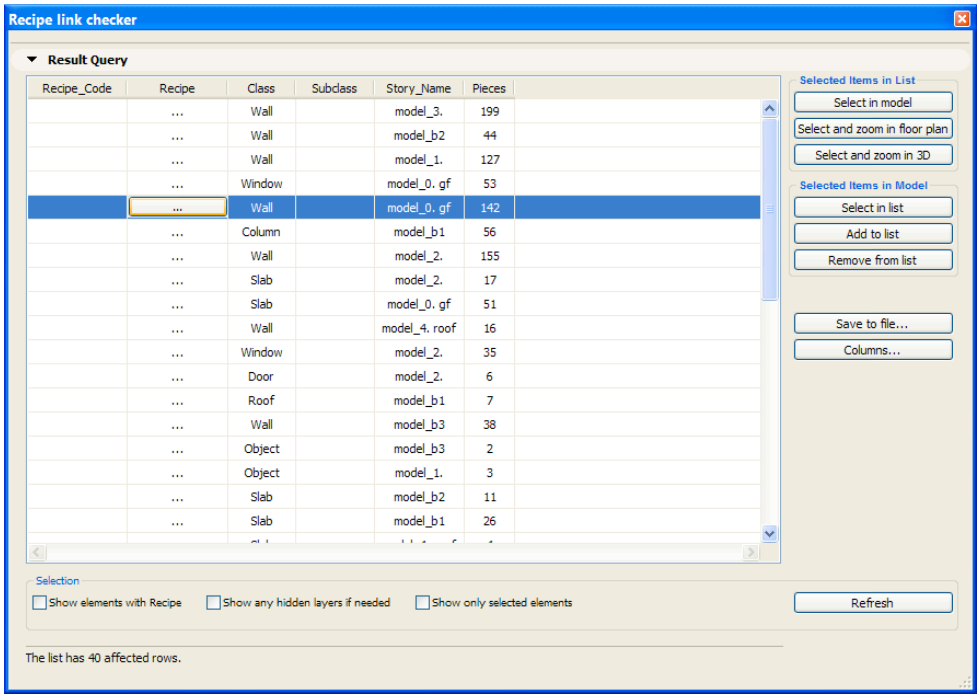


Figure 175 - Recipe Link Checker tool

In the “Result Query” section, you will find all elements in your model that do not have a Recipe assigned, yet. When you hover over the three dots in the “Recipe” column, a button will appear. Clicking this button will open the Recipe selection dialog, which allows you to assign a Recipe for the selected element.

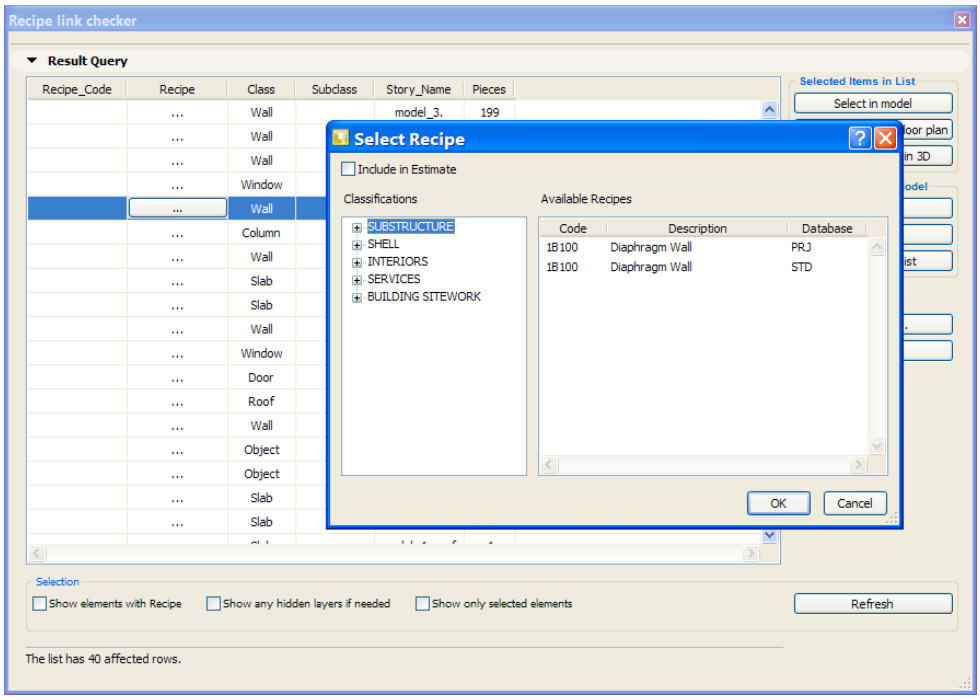


Figure 176 - Recipe Link Checker: assigning a Recipe

After selecting a Recipe and confirming it by clicking “OK”, the element will be removed from the “Result Query” list when you click the “Refresh” button.

The Recipe Link Checker offers several functions to help you to check the completeness of your model; they are available through buttons to the right side of the dialog.

Select in Model	Selects the elements that you selected in the Recipe Link Checker "Result Query" in the 3D model.
Select and zoom in floor plan	Selects the elements that you selected in the "Result Query" in the 2D floor plan and zooms to these elements. If the elements, selected in the "Results Query" are on more than one floor level, you will get the option to either continue (elements on the lowest floor level will be selected only) or to abort the operation.
Select and zoom in 3D	Selects the elements that you selected in the "Result Query" in the 2D floor plan and zooms to these elements.
Select in list	Selects items in the "Results Query" list that area associated with the current selection of elements in the model.
Add to list	Adds items, associated to the current selection of elements in the model, to the "Result Query" list.
Remove from list	Removes items, associated to the current selection of elements in the model, from the "Result Query" list.
Save to file …	Saves the current list of items in the "Result Query" list to a text file.
Columns …	Let you specify which properties you want to see in the "Result Query" area.
Refresh	Refreshes the "Result Query" based on the current state of Recipe assignments and model selections.

With the "Columns …" button, you can customize the way that the search results are organized. When you open click it, Constructor will open the "Columns" settings dialog. From all available properties and quantities in the Constructor system, you can now select which properties and quantities you want to include in the "Result Query" dialog. Click "Add to Selected" or "Remove from Selected" to define the collection of properties that you want to see for each element in the list. Adding a column to the "Selected Properties" means that your Result Query list will be refined – be aware that this could result in a long list of unique items!

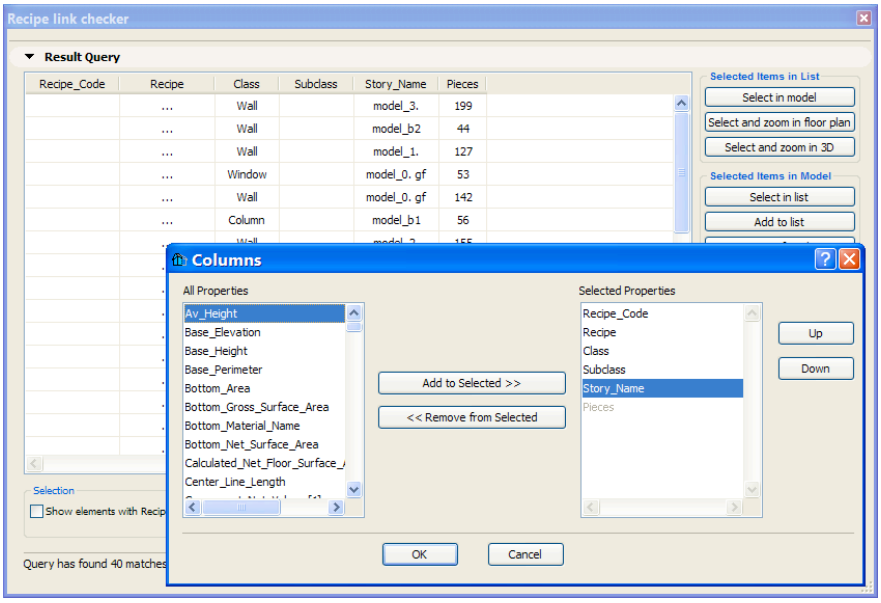


Figure 177 – Defining the columns that are displayed in the "Result Query"; adding more columns will make the list more detailed.

If you have set up your content plan by naming Layers after the Recipe you want to assign to elements on it, you can add the "Layer" property to the "Result Query" dialog; this provides you with a fast and accurate way to assign Recipes to your modeled elements.

The Recipe Link Checker can also help you to make changes to existing Recipe assignments. The tool allows you to include linked elements and to show only elements within a selection marquee.

HOW TO: CHECK CURRENT RECIPE LINKS AND ELEMENTS WITHIN A BOUNDARY

To show elements that *do* have a Recipe assigned to them in the "Result Query", simply select the "Show elements with Recipe" option; this will result in showing only elements that have a Recipe assigned.

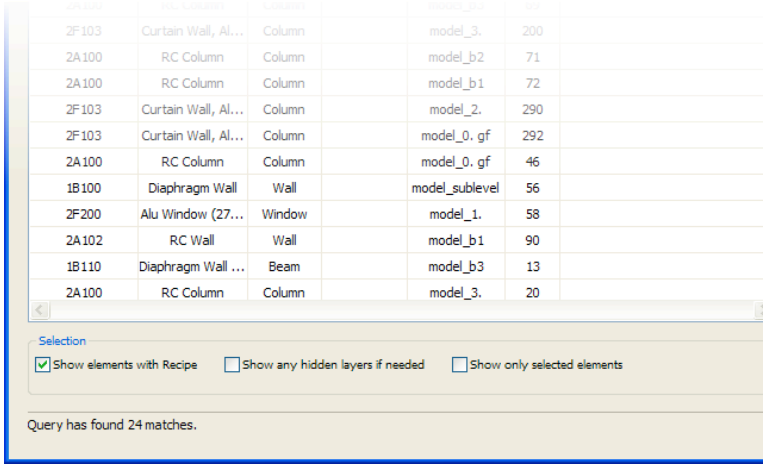
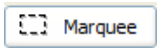


Figure 178 – Toggles in Recipe Link Checker let you change the content in the Result Query panel.

The “Show any hidden layers if needed” option automatically changes the Layer setting of elements that are hidden to “shown”.

To restrict your search to an area within a boundary or to a vertical section of your project, you can use Constructor’s “Marquee” tool.

First, define a selection boundary with the “Marquee” tool: 

.

To define a boundary over multiple stories, use the “Thick Marquee” option from the Info box. The marquee that you define will be used by Recipe Link Checker to filter out the selected elements.

To only enlist the elements from within the boundary that you defined by means of the marquee, switch “Selected elements only” on.

If you want to analyze also the elements in the selection that have a Recipe assigned to them, select the option: “Show elements with a Recipe”.

While you are working on your model and have Recipes assigned to 3D elements in it, you may want to check what the quantities are of elements with certain properties are. For example: you want to know what the total volume of all elements is that have a Recipe assigned to them which is related to “Concrete”. Or: you want to search for all concrete Walls with a thickness of 300mm/1ft and assign a different Recipe to it.

For this purpose, Constructor has the “Estimating Search and Select” tool: with the tool, you can define your own queries to search the model with.

HOW TO: USE ESTIMATING SEARCH AND SELECT TO QUERY YOUR MODEL

Start the “Estimating Search and Select” tool from the Estimating menu item.

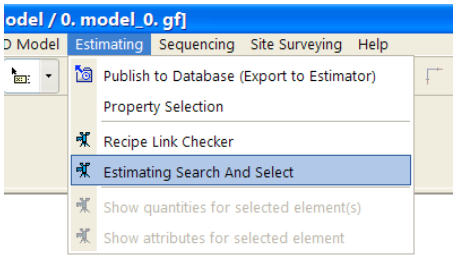


Figure 179 – “Estimating Search and Select” from the Estimating menu item.

You are presented an “empty” Estimating Search and Select dialog. No query has been defined and there are no results, yet.

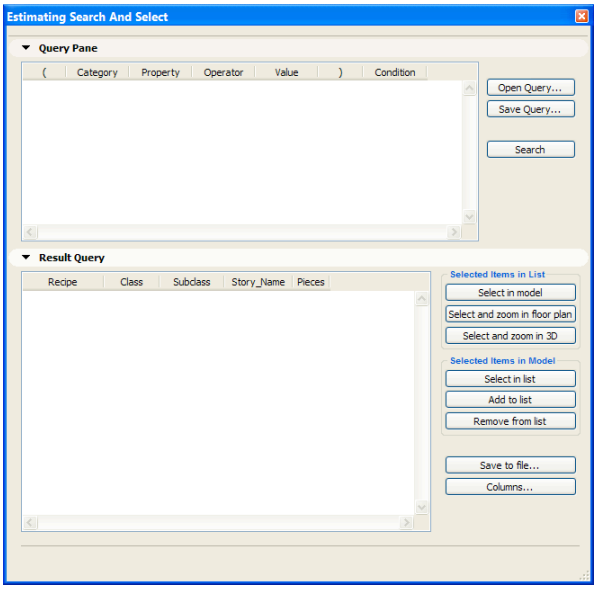


Figure 180 – "Empty" Query Pane and Result Query.

In the "Query Pane", you can define your own query, based on which the tool will scan the model for elements that match the defined criteria. To start defining the query, right click in the empty white area. Select the "Insert" command in the context menu.

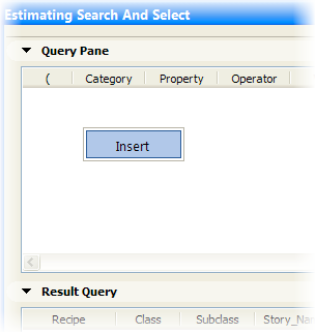


Figure 181 – Insert a new query by right clicking in the Query Pane.

An empty line with the text "Please Select" appears. Click the line to reveal properties with which you can define your query.

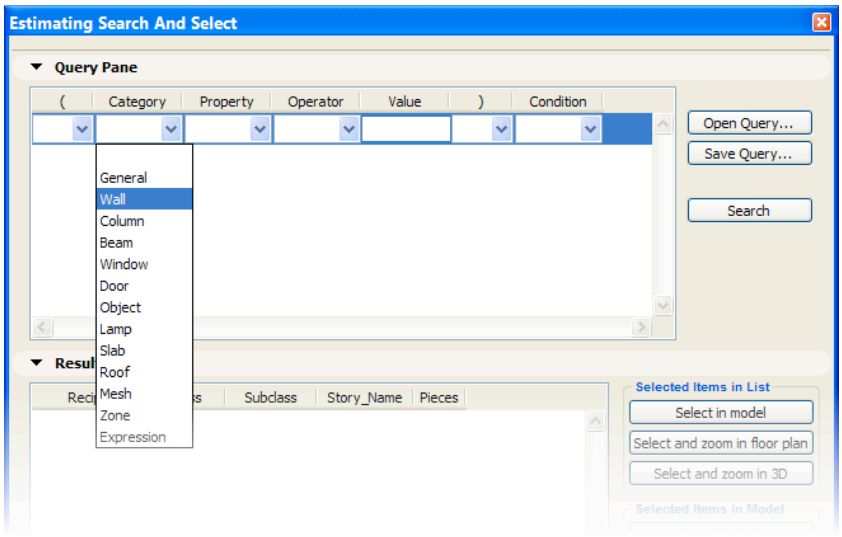


Figure 182 – Defining a query by selecting from predefined categories and properties.

For each of the fields (Category, Property, Operator, Value and Condition), you can select a predefined value or you can specify a value.

"(" and ")"

Parentheses are used for combined logical conditions. Add these if you want to combine to "AND" bound conditions.

For example*, you want to search the model for:

(Walls that have a Recipe with Concrete in the name AND are higher than 3m / 10ft)

OR

(*Slabs that have a Recipe with Concrete in the name AND have a thickness larger than 300mm / 1ft*)

Category

All properties are stored in categories to make it easier for you to find the property you want to use in the query. "General" contains the properties to search for Recipes, Methods and Resources, associated with model elements.

Operator

Defines the condition that has to be met to be included in the query result. Contains all logical expressions (=, >=, <= and <>) as well as text search functionality ("contains …").

Value

The value for the defined condition. For example: in Walls that are higher than 3m / 10ft, the value is 3m / 10ft.

Condition

Defines how the next line will be used in relation to the current line. If the next line should search *within* the results of the current line, you use "AND", if the next line should search throughout the model, you use "OR".

*) The given example would be defined as follows:

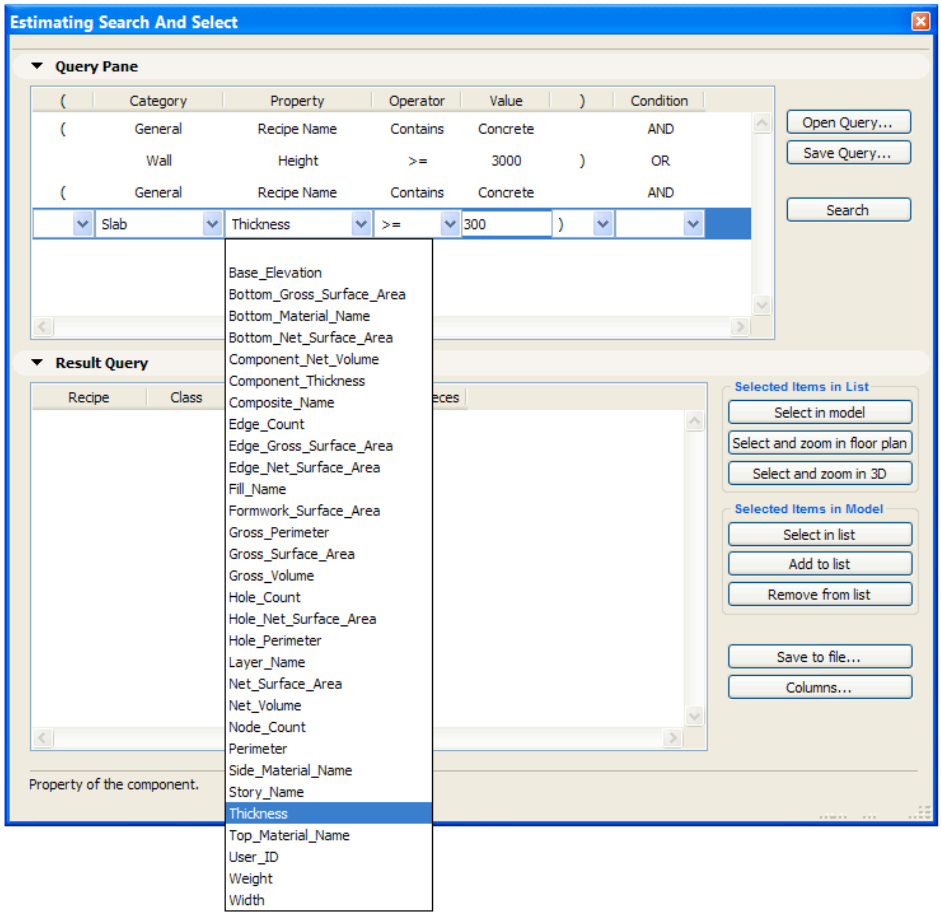


Figure 183 – Example query.

After completion of the definition, you can run the query by clicking the "Search" button. Results are displayed in the "Result Query" pane. Functionality provided by the buttons to the right of the "Result Query" pane is described in the "How To: Check and Manage Recipe Links" section.

If you would like to save a query, you can click the "Save Query …" button: your query can be saved as a file and can be reused at any time, in any other project by clicking the "Open Query" button.

Mastered Process Steps

After finishing this section, you will have mastered the use of favorites, building a model that includes architectural, structural and building systems and managing trades and constructability issues with the model. In the next section, you will learn how to use the model for estimating purposes.

3: Estimate

This section will explain how you start an estimating project, how you can contain required project specific content and use the Constructor model with that content. Next, you will be explained how to create estimates and reports with the defined estimating content.

Starting an Estimator Project

You can find all projects that exist in your Projects database in Estimator's main application window. In the "Projects" tab projects can be opened and organized.

HOW TO: OPEN YOUR ESTIMATOR PROJECT

To start working on your estimate, open the "Projects" tab in the main application window.

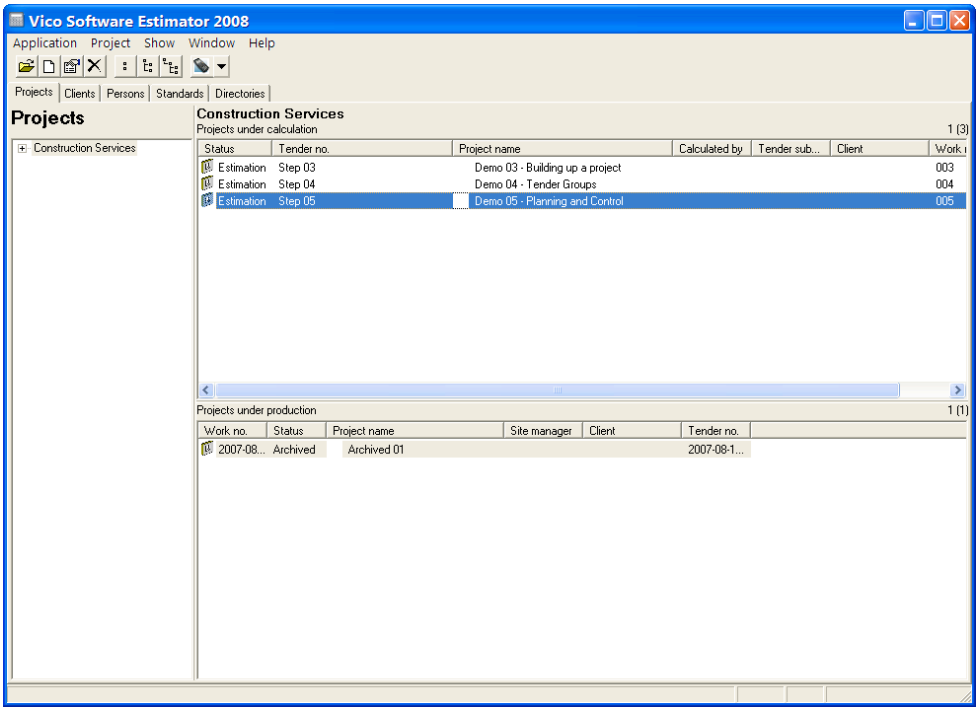


Figure 184 - Estimator main application window on "Projects" tab

Projects in your database are organized by status and department.

Project *status* is defined in the project properties (right-click and select "Properties" to open a project's properties). Projects can be filed either under "Projects under Calculation" or "Projects under Production". Only projects for which the status is set to "Under construction" are filed under the latter.

Department is also set in project properties. If you need to add additional department names, go to the "Directories" tab and add new department names in the "Department" tab.

To open your project, double click on the desired project or right click and select "open".

To learn how you can create a new project in the Estimator database, go to "How To: Create a New Project".

Estimator's 3 Main Modes

When you have opened your project, you will be presented Estimator's 3 main modes:

- **Cost**
- **Tender**
- **Cost Tracking**

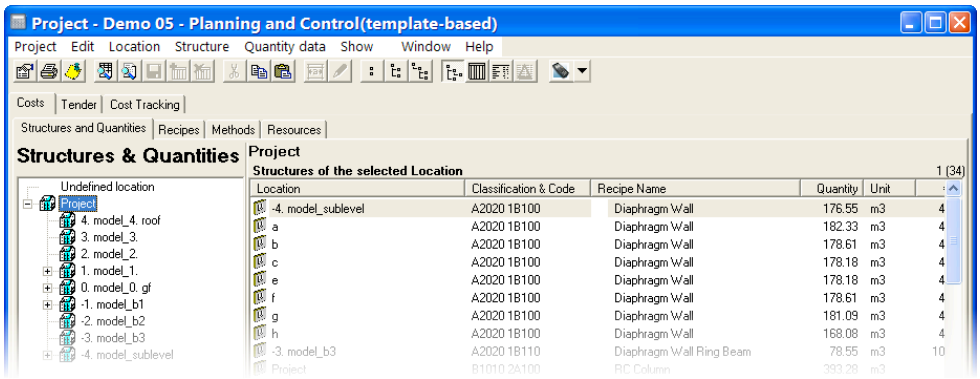


Figure 185 – Estimator's 3 Main modes are accessible through Tabs in the project dialog.

Most of the time, you will work in **Cost** mode. This mode views on all Recipe, Method and Resource data. In Cost mode, you define and modify estimating content. Cost reports on several levels of detail are also generated from Cost mode.

Tender mode provides tools with which you can define profit and risk margins and divide these over custom cost groups, so they become an integrated (hidden) part of the cost estimate. When you update your cost estimate in Cost mode, your reports in Tender mode are automatically updated, taking defined profit and risk margin divisions into account. Generated Tender reports can include key figures (for example "cost per surface area unit").

Costs Tracking allows you to keep track of actual costs in your project. Actuals can be entered by cost type: labor, material, equipment, sub contracted work and other. Actual cost information is used by Constructor when you publish a 5D Presenter model to generate *Earned Value Analysis* graphs.

Cost Mode

Cost mode contains 4 views on your estimating data:

- Structures and Quantities
- Recipes

- Methods
- Resources

The **Structures and Quantities** view is showing all Recipes and their quantities in your project by location. A Structure is defined as the sum of all quantities associated with a Recipe on a location in your project. Locations are defined in Constructor's Work Breakdown Structure; by default the WBS exists of all floor levels that you defined in your Constructor model.

In **Recipes** view, you get an overview of totals per Recipe in your project. Quantities and costs, associated with Recipes on all locations of the project are added up. The result is a cost overview by **element type**, where each Recipe represents an element type in your project.

Method view provides you with an overview of totals for all Methods in the project, by adding up quantities and costs per Method. From Method view, you can generate a report by **work type**, with each Method representing an activity or trade in your project.

The elements on the lowest level of the Virtual Construction cost structure, Resources, are filtered out in the **Resource** view. Resource view provides you with totals for all defined types of labor, material, equipment and sub contracted work throughout your project.

Tender Mode

Tender mode contains 3 views which help you to define and divide risk and profit margins and to manage bid packages:

- Tender Calculation
- Unit Price Calculation
- Bid Packages

In **Tender Calculation** view, you can define cost groups as you want to include them in cost reports for the owner or other outside communication. From Tender Calculation, you can generate cost reports based on the desired grouping, which include – in a non visible way – your defined profit and risk margins.

Unit Price Calculation view provides you with functions to *divide* the profit and risk margins that you defined for the project over the cost groups that you defined in Tender Calculation view.

Bid Package view gives you the opportunity to define bid package folders and to drag and drop the Methods in the project to these folders, thus giving you an overview of activities per work package. After grouping Methods, you can also enter and compare quotes and subsequently select the quote of the subcontractor that won the bid. This will then override the existing price in your cost report.

Cost Tracking Mode

Cost Tracking mode includes a worksheet in you can keep track of actual costs by entering milestone dates and actual costs per cost type on these dates.

Defining Project Estimating Content

When you start working on a new project, you can check – with your Content Plan – which Recipes you will need to be able to tag all elements in the model of your project. Additionally, you will need to check which cost elements will not have any elements in the 3D model from which quantities can be extracted.

At the beginning of the work on your project's estimate, you will start adding the needed Recipes for your project from the Standards database, by copying an *instance* of standard Recipes into your project.

***Instance**: a copy of the original Recipe definition in your project. Modifying the Recipe in your project does not affect the Recipe in the Standards database. You can always go back to the original Recipe definition by copying it again from the Standards.*

HOW TO: COPY RECIPES FROM THE STANDARDS DATABASE

There are two ways to copy Recipes from your Standards Database into your project.

First Method

In "Recipes" mode in your Estimator project, right click in the Recipes area to show the context menu.

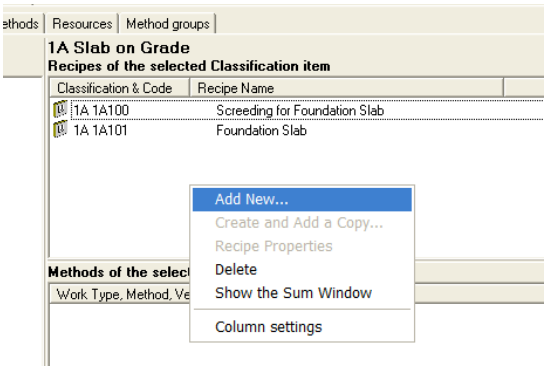


Figure 186 - Context menu in Recipes section of "Recipes" view

Select "Add New";

Estimator will show the "New Recipe" dialog.

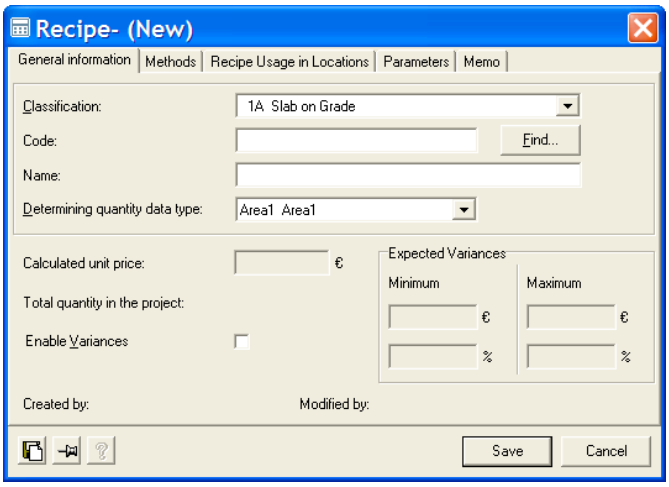


Figure 187 - "New Recipe" dialog

Click the “Find” button to start browsing your Standards database – Estimator will open the “Find” dialog.

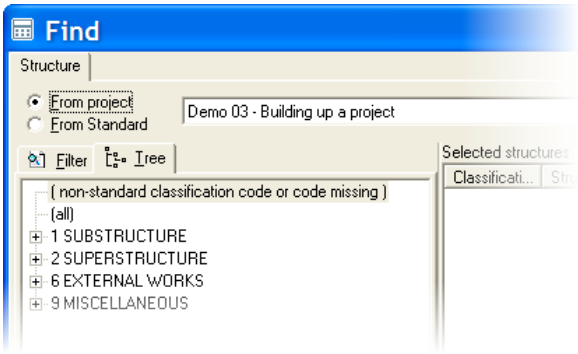


Figure 188 - "Find" dialog

Select the “From Standard” radio button to open your collection of Recipes in the Standards database. Select the classification from which you want to add a Recipe to your project; selecting a classification will show the available Recipes.

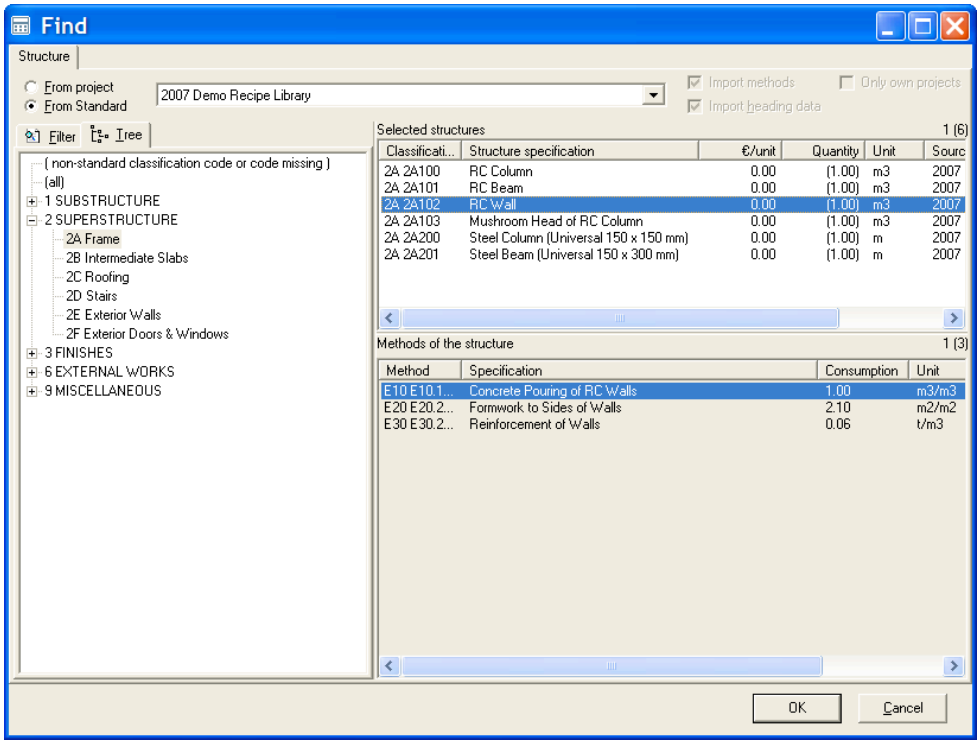


Figure 189 - "Find" dialog - classifications to the left and available Recipes to the right. The bottom window shows the Methods of the selected Recipe; Methods (and Resources) are imported with the selected Recipe.

Second Method

When you want to copy multiple Recipes from the Standards database at once, we recommend using the "Side by Side" method. With this method, you align your Standard Recipes side by side with your project, which allows you to drag and drop the desired Recipes from the Library into your project.

In the main application window, go to the "Standards" tab. Open the Recipe Standards Library.

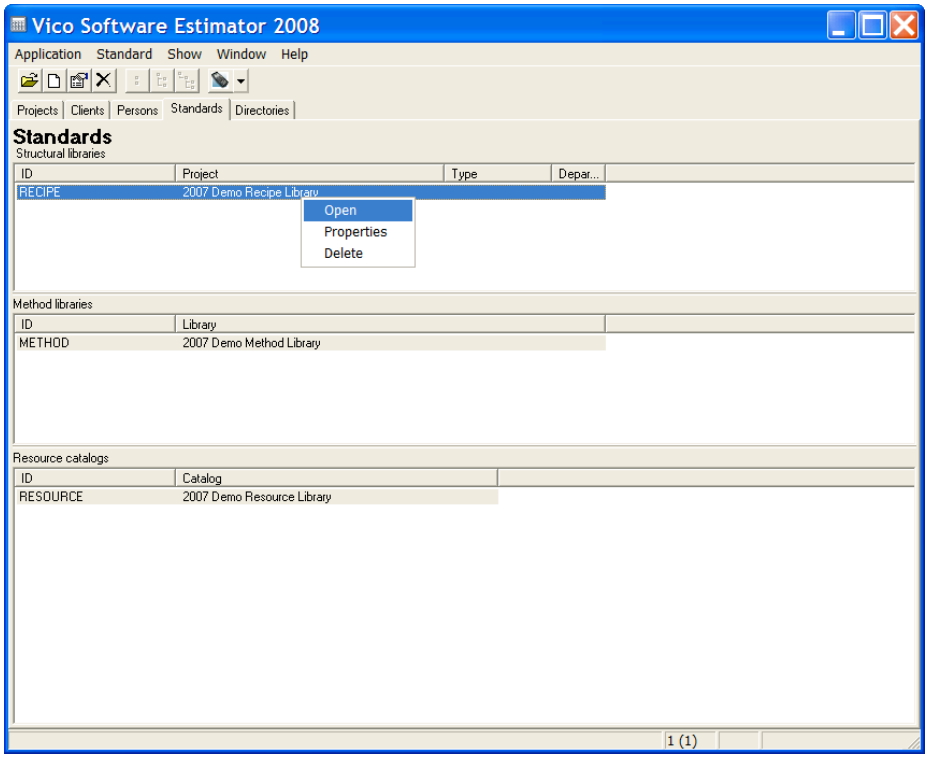


Figure 190 - Standards section of Estimator's main application window

The Recipes catalog will open. Next, align the Recipes catalog window and your project window in such a way that you can see them side by side; resize the windows if needed.

If your project window is hidden, click “Window” in the menu bar and select the project that you are working in; this will bring the project window on top of the other windows.

You should see the project window and the Recipes catalog like in the example below:

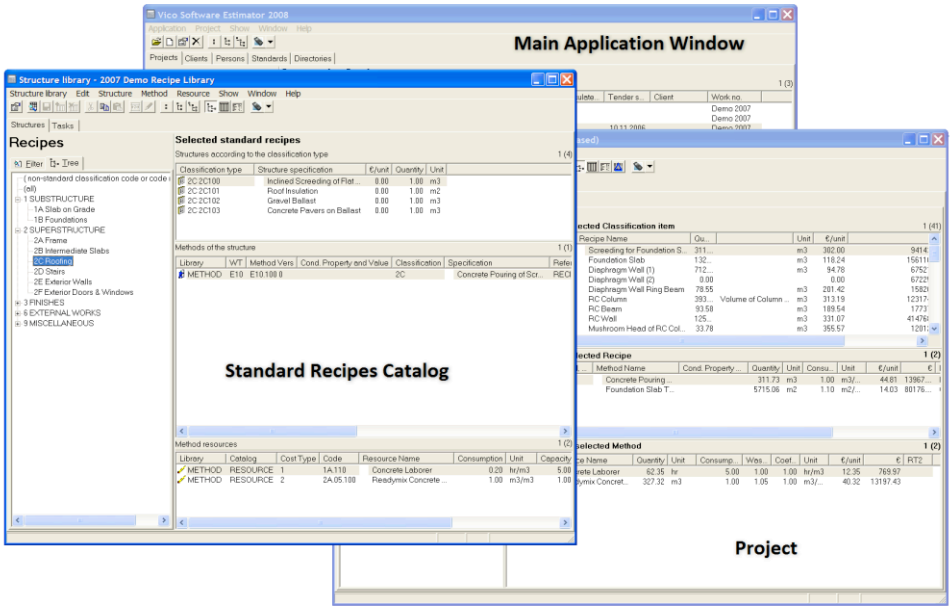


Figure 191 - Estimator windows aligned side by side

With your Estimator Standard Recipes catalog and project window aligned side by side, you can drag and drop Recipes from the catalog into your project, providing you a way to quickly populate your project with the Recipes you need.

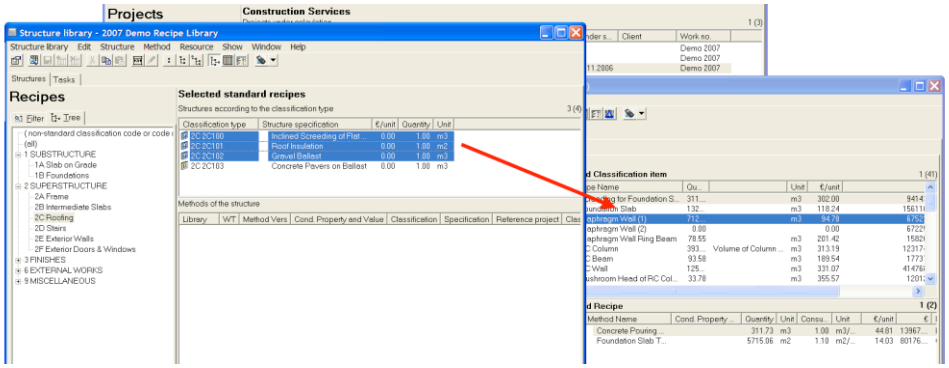


Figure 192 – Drag and Drop the Recipes you need from the Standard Recipes Catalog into your project.

In most projects – especially the first projects that you estimate with your Estimator database – you will find that additional Recipes are needed to calculate costs for your project. In this case, you can define a new Recipe in the Project database.

How To: Create a new Recipe in your project

In your project, make sure that the "Recipes" view is the active view. In the "Recipes of the selected Classification item" area, right click to open the context menu and select **Add New…**

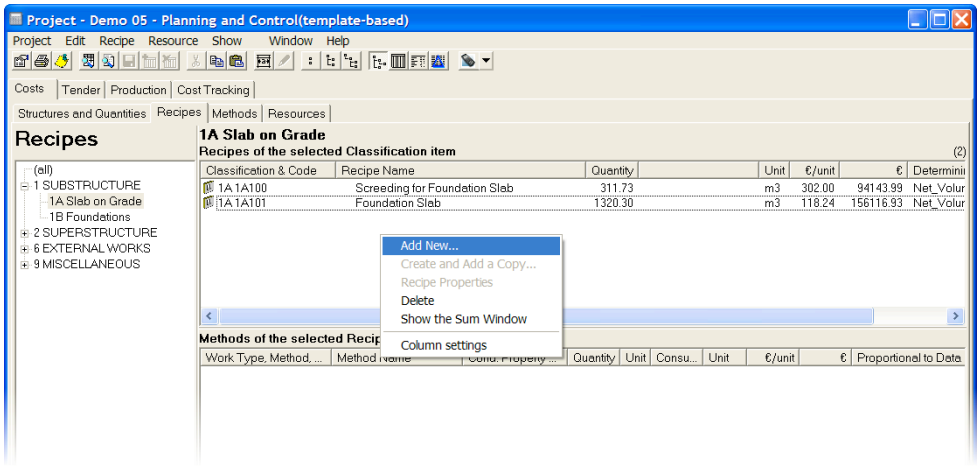


Figure 193 – Recipes View; right click to start adding a new Recipe

Estimator opens the "New Recipe" dialog. Refer to "How To: Create a New Recipe" for information on the meaning of the data entry fields.

After entering the required information, click "Save" to add the new Recipe to your project. A new, but still **empty** Recipe is added to your project.

Empty Recipes *can* already be linked to elements in your Constructor model. By using this approach, it is already possible to extract quantities from the model. You may decide to define the cost estimating layers (Methods and Resources) in a later phase.

One step is left for the Recipe to become available in Constructor, though. You need to specify the **element type** to which you want to assign your new Recipe. By specifying the element type in the Recipe, Constructor can filter out those Recipes that are applicable to the select element(s) in the 3D model.

How To: Define the Model Element Type for a Recipe

Re-open the new Recipe that you just created. Estimator will show the Recipe properties dialog.

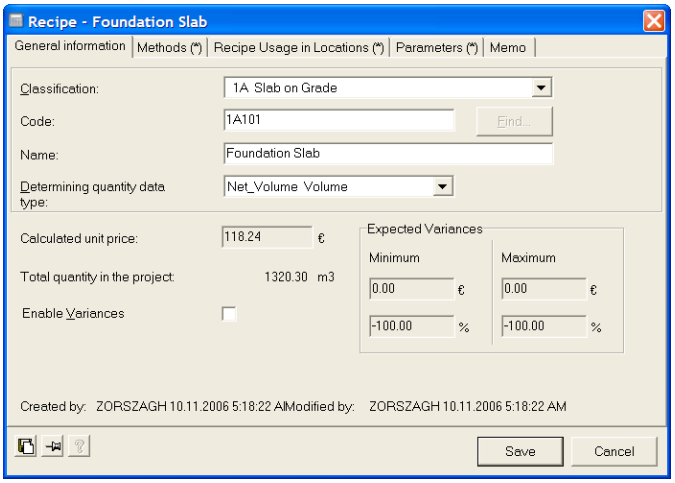


Figure 194 – Recipe properties dialog

Select the “Parameters” tab. You will see an empty list of parameters defined for the Recipe. You will always have to define at least one parameter, which is the parameter that defines the element type with which the Recipe can be used.

To define this parameter, click the “Add” button. Estimator shows the “new structural parameter” dialog.

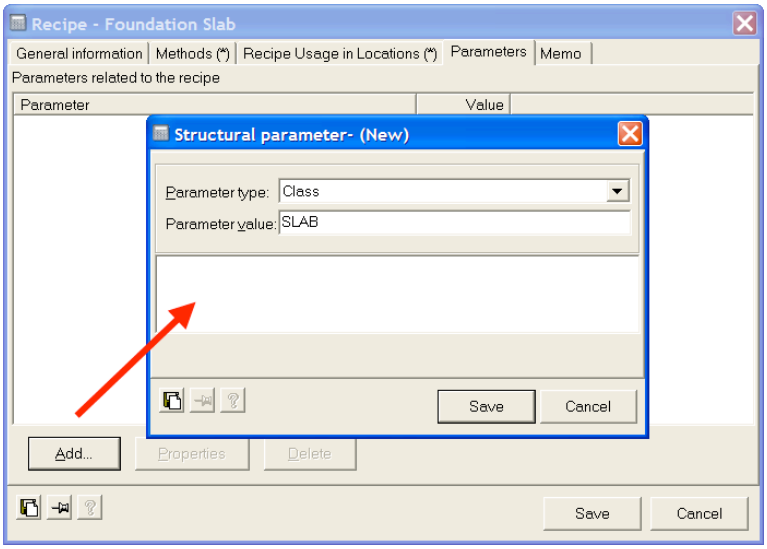


Figure 195 – Click “Add” to define a new parameter and select “Class” as parameter type

Select “Class” as parameter type you want to add and type the name of the element type you want to use the Recipe with in the “Parameter value” field.

Available classes are:

Element Type	Class Value
Wall	WALL
Slab	SLAB
Column	COLUMN
Beam	BEAM
Door	DOOR
Window	WINDOW
Roof	ROOF
Object	OBJECT
Zone	ZONE
Mesh	MESH

After writing the value for the desired element type, click “Save” to save the new parameter and “Save” again to save the Recipe. You can now find the Recipe in the list of available Recipes under the specified classification when you open element settings in Constructor.

Recipes associated with “Object” element types provide a feature that lets you take full advantage of the custom properties that can be defined for *GDL objects*; elements defined with Graphisoft’s Geometric Definition Language.

GDL objects can be used to define custom geometry and can be assigned parameters and properties like “height”, “width” or “number of treads”. All this data can be fed into your estimate by using the “Write” parameter.

HOW TO: USE GDL OBJECT PROPERTIES AND PARAMETERS IN YOUR ESTIMATE

To find which parameters and properties are available in a GDL object from which you would like to extract this information for estimating and scheduling purposes, you have to open the GDL object in Constructor.

You can open a GDL object’s definition by selecting it and subsequently pressing <Ctrl> + <Shift> + <O>. The following dialog will appear when opening a steel column object:

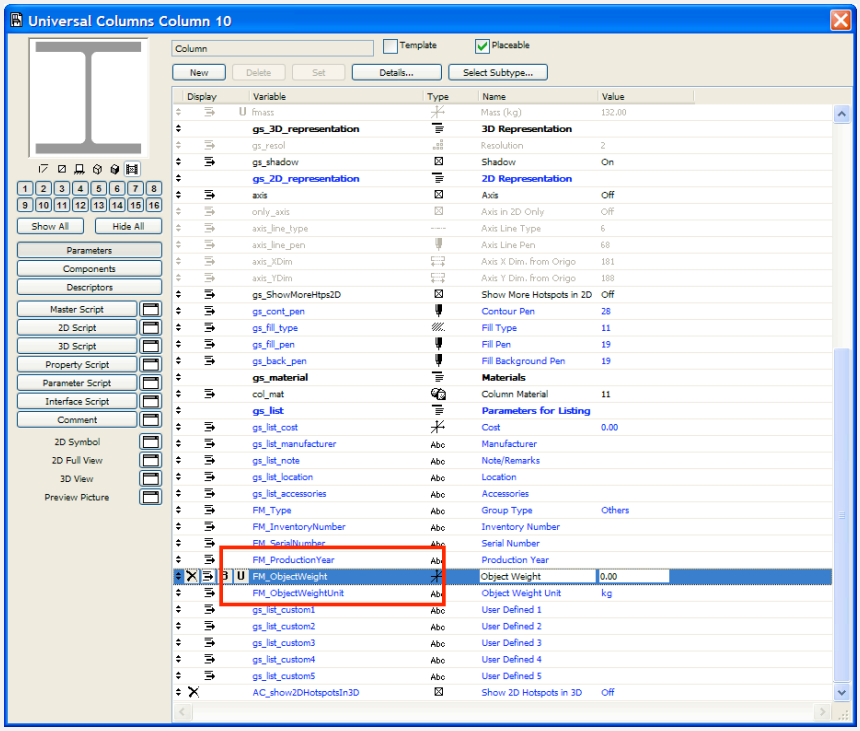


Figure 196 – GDL Object definition dialog “FM_ObjectWeight” is a property that could be usedfor estimating and scheduling purposes

The parameters and properties of the GDL object are listed; when you know which properties and/or parameters you would like to use for estimating and scheduling, go back to Estimator.

Open the Recipe properties dialog properties for which you would like to use the GDL property; then go to the “Parameters” tab.

Select “Add” to add a new parameter to the Recipe.

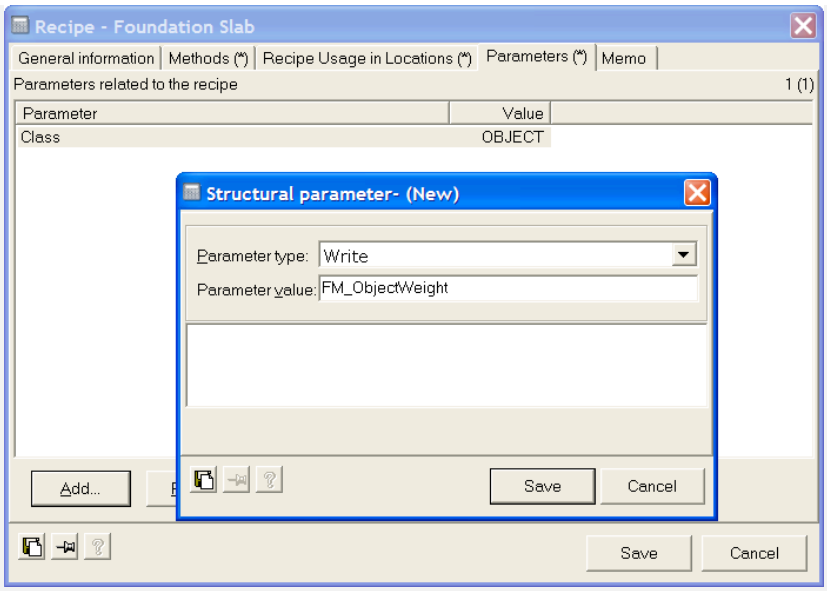


Figure 197 – Add a "Write" parameter to a Recipe to extract property and parameter values from GDL objects

Select "Write" as the type of the new parameter you are adding. The parameter value should be the name of the GDL property you want to use.

Click "Save" and "Save" again to make the changes to your Recipe.

Note: the name of the GDL parameter has to be included in the "Quantity List" of the classification to which the Recipe belongs.

The Quantity List is Estimator's mechanism for managing the properties and quantities that are imported from the Constructor model into the database. Not all quantities are needed for all classifications of your cost breakdown. For example, Window quantities will not be needed for cost items related to the foundations of your project.

You can define which quantities are imported for each of the classifications used in your Recipes database.

HOW TO: ADD A NEW QUANTITY TYPE TO A RECIPE CLASS

To add a new property that you would like to include in the model based data publish and import procedure, go to the "Recipes" tab in your project. (Or, if you want to define it as a standard, go to the "Recipe Library" in your Standards.)

Right click on the classification of which you want to define the new property that should be included.

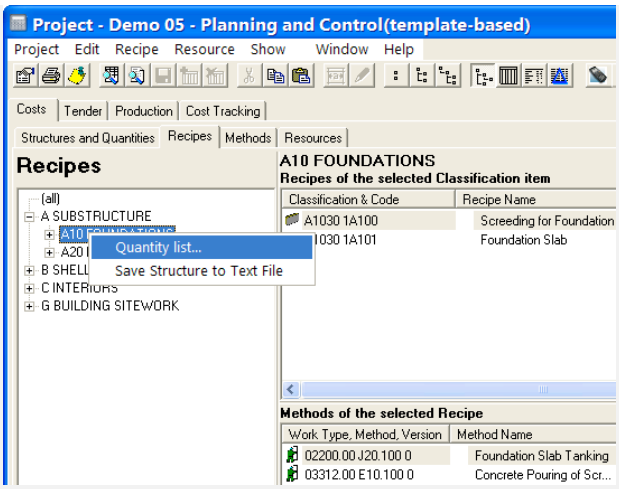


Figure 198 – Right-click on a Classification to Make New Quantity Available for It.

Estimator will display the list of quantities and properties that are currently associated with the classification.

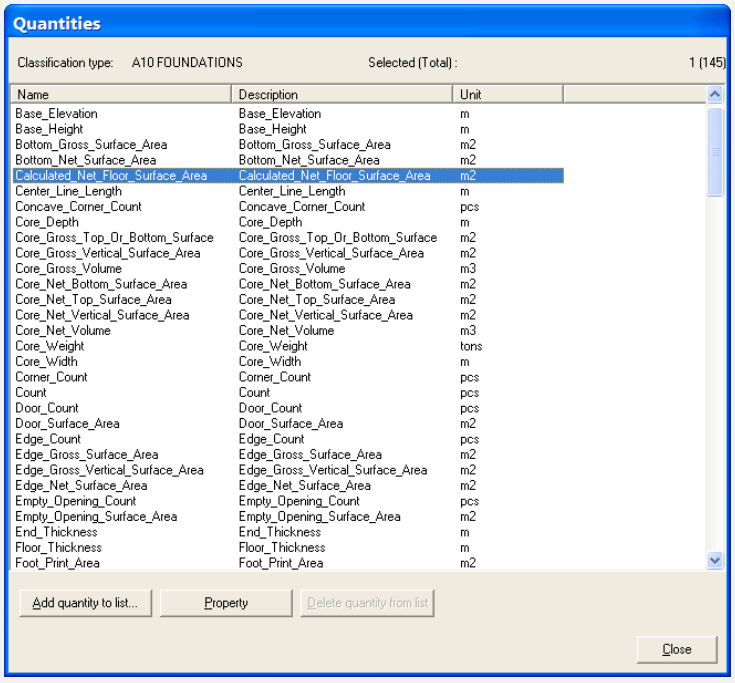


Figure 199 – The List Of Properties And Quantities, Currently Associated With the Selected Classification.

To add a new quantity, click “Add quantity to list”. Estimator opens the “Quantity assignment” dialog.

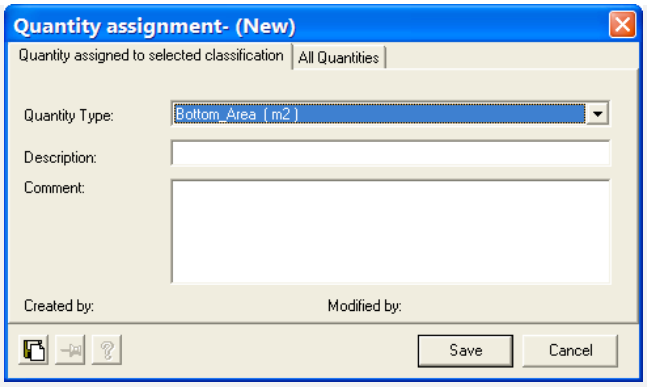


Figure 200 – Quantity assignment dialog.

The Quantity Assignment dialog has two tabs: the first tab (Quantity assigned to selected classification) contains quantities that have been defined for the selected classification, but are currently not in use. The reason for this can be that the quantity could not be extracted from the Constructor model. You can add a quantity from this list to the selected classification, which makes it available in all Recipes that belong to it. In this case, you would have to enter the quantities manually.

The second tab (All Quantities) contains all of the quantities, defined in the Estimator database.

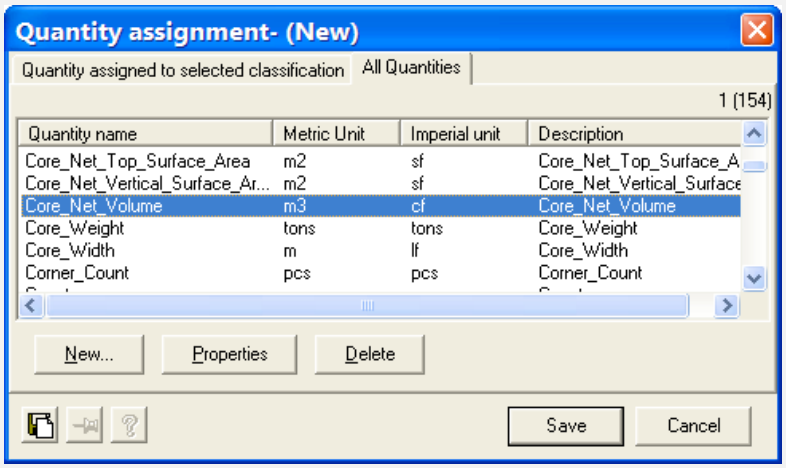


Figure 201 – The "All Quantities" Tab Contains All of the Quantities Defined in the Estimator Database.

When you select any of the listed quantities, it will become available for use in the Recipe(s) that belong to the selected classification.

An example scenario:

You define a "Column" Recipe that you assigned to the "Foundations" classification. You want to use its "Core_Net_Volume" property to calculate cost per unit of the element. While defining the Recipe, you find that the "Core_Net_Volume" property is not available in the Recipe's "Determining Quantity" field.

Adding the property to the "Foundations" classification will solve this problem. After adding the property, you will be able to select the property from the list in the "Determining Quantity" field. The quantity will also become available for use in any underlying Methods and Resources.

If case you would like to use a quantity or property that does not exist in the Estimator database, as would be the case with GDL parameters, you can click the "New" button to add the GDL parameter as a new property to the Estimator database.

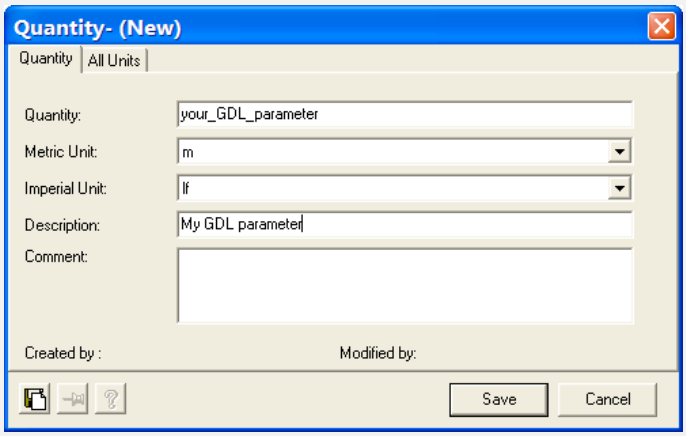


Figure 202 – Define a New Quantity in the Database if it Does Not Yet Exist. This Will Be The Case If You Want To Use GDL Parameters.

To find the name of the GDL parameter, open the GDL object from which you would like to extract the quantity and look for the GDL variable. See also: "How To: Use GDL Object Properties and Parameters in your Estimate".

Copy Methods and Resources from the Standards Database

When you create a new Recipe, it is initially empty: it does not contain any Methods or Resources. As with all Recipes, you can also copy Methods and Resources from the Standard database into your project, resulting into new instances that you can freely edit without touching the valuable content in your Standards database.

When you copy Methods and Resources into your project by adding content to a new Recipe, you will have to specify the Consumption, which forms the link between Recipes and Methods and Methods and Resources, as explained in "An Introduction to Recipes, Methods and Resources".

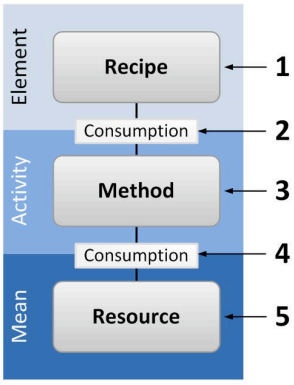
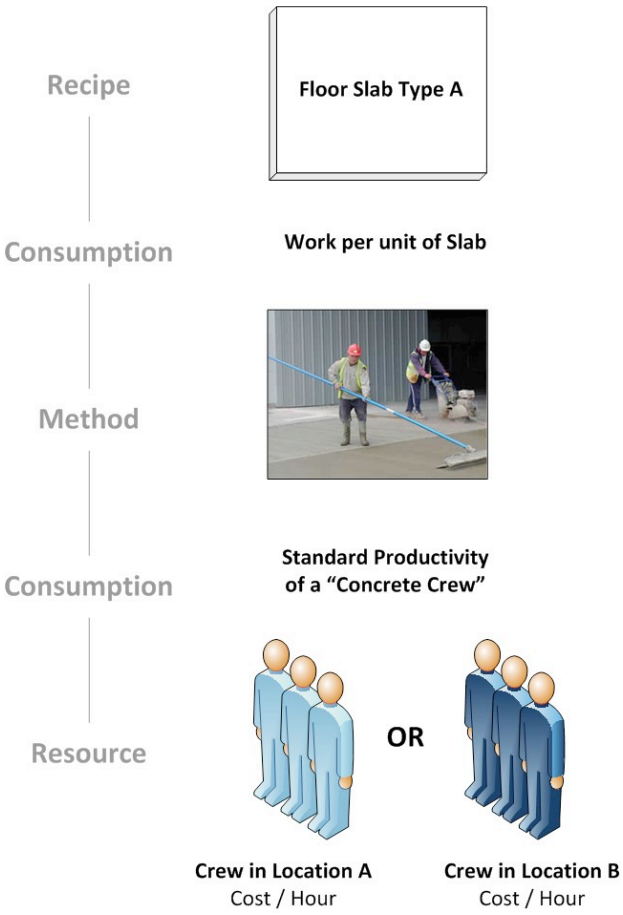


Figure 203 - Recipe Data Structure, #2 and #4 represent consumption factors

The consumption link makes it possible to use the same Resource (or Method) more than once in your project. For example: you can use the same "Rebar" Resource for a column and a wall – the differing *amount* of Resource that is needed for the column is defined in the consumption: a column typically "consumes" more rebar than a wall.



The Consumption factor can also be used to reflect a productivity rate.

For example: if you know that one crew can produce "x" sf or m2 of concrete floor slab per week, "x" is the consumption factor shown in the Recipe structure diagram as #4: the consumption of Resource for a unit of Method is in this example: "Casting Concrete".

By setting up the consumption this way, you can simply change Resource definitions to calculate the costs associated with this crew in different areas.

When you copy a Method from the Standards database, Resources that are defined for the Method (including the consumption of Resource for the Method) are automatically included during the copy operation.

HOW TO: COPY A METHOD FROM THE STANDARDS DATABASE

To start including Methods and Resources in a Recipe, open the Recipe by double-clicking it or by right-clicking and selecting "Recipe Properties".

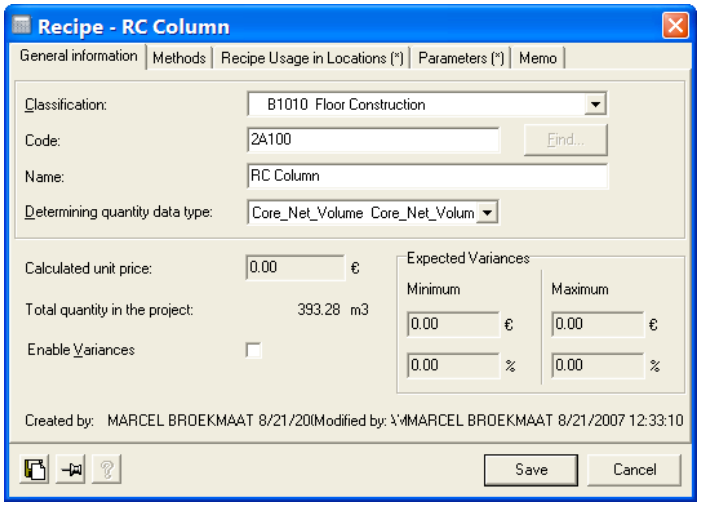


Figure 204 –The Recipe Properties dialog.

Select the "Methods" tab to view the currently included Methods – for any new Recipe, this will be empty.

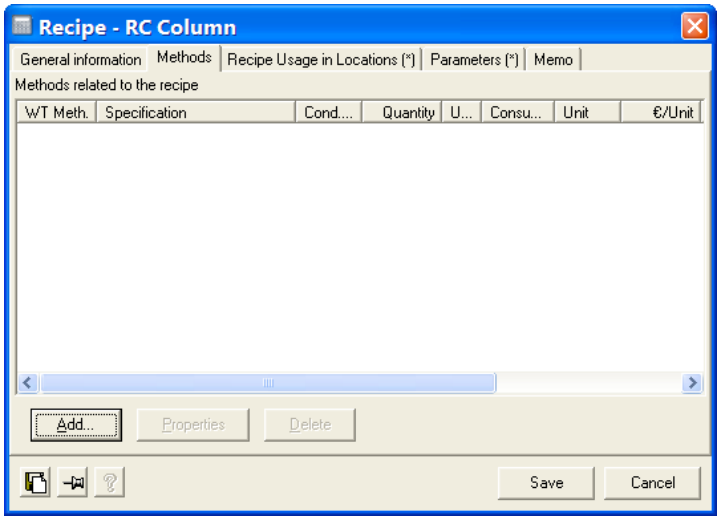


Figure 205 – The Methods Tab in a new Recipe does Initially not contain any Methods.

To include a Method, click the "Add" button. Estimator opens the "Method of Recipe" dialog.

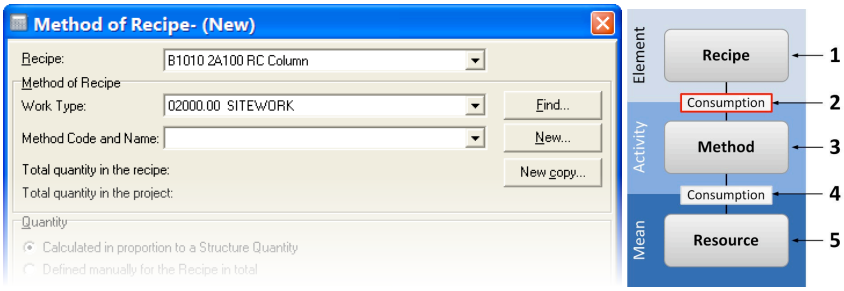


Figure 206 – The Method of Recipe dialog. To add a Method from a Project or from the Library, click "Find"; to define a new Method, click "New".

Click the "Find" button to open Estimator's content browser.

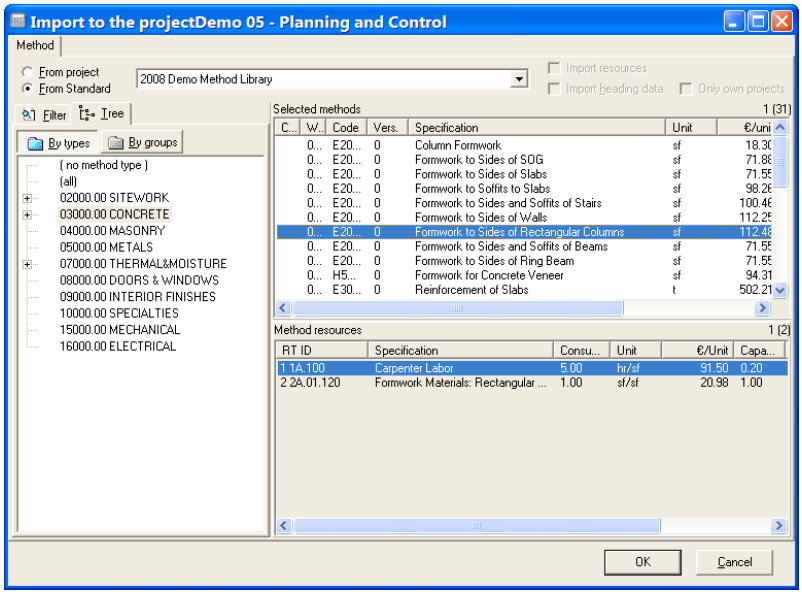
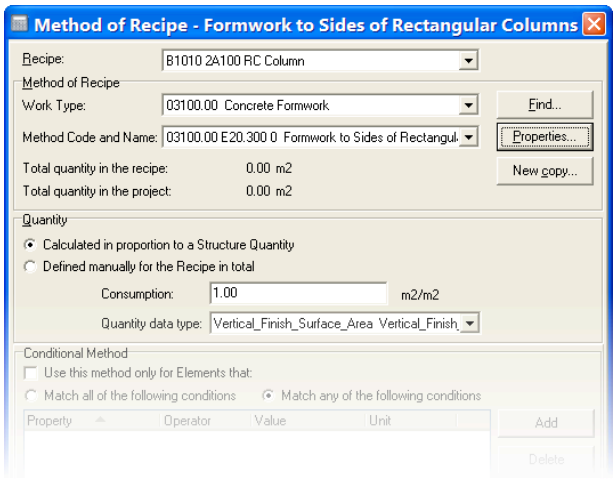


Figure 207 – Browsing Method content in your database.

You can look for the Method you want to include in your new Recipe in either the Standard database, or in an earlier project. You can select any of your previous projects from the drop down list.

After selecting the Method you want to add to your Recipe, click "OK". The Method *plus* Resources will be copied to the Recipe in your project. You will return to the "Method of Recipe" dialog, where you can now define the consumption. (How many units of Method are required for one unit of Recipe?)



As explained in an earlier section, the consumption that exists between Recipes and Methods makes it possible to reuse Methods. If needed, change the unit of the Method by opening the Method properties by clicking the "Properties" button.

Similar to copying Recipes, and outlined in "How To: Copy Recipes from the Standards Database", an alternative to opening the properties of a Recipe to include Methods is to use the "drag and drop" approach. This helps you to quickly add several Methods to a Recipe.

After adding Methods to your Recipe, you may have to include new or additional Resources into each of the Methods. You can do this by opening the properties of the Method and browsing the collection of Resources in your Standards database or earlier projects.

HOW TO: ADD A RESOURCE FROM THE STANDARD DATABASE

Open the Method to which you want to add a Resource from the "Recipes" tab or from the "Methods" tab. Double-click or right click and select "Method Properties".

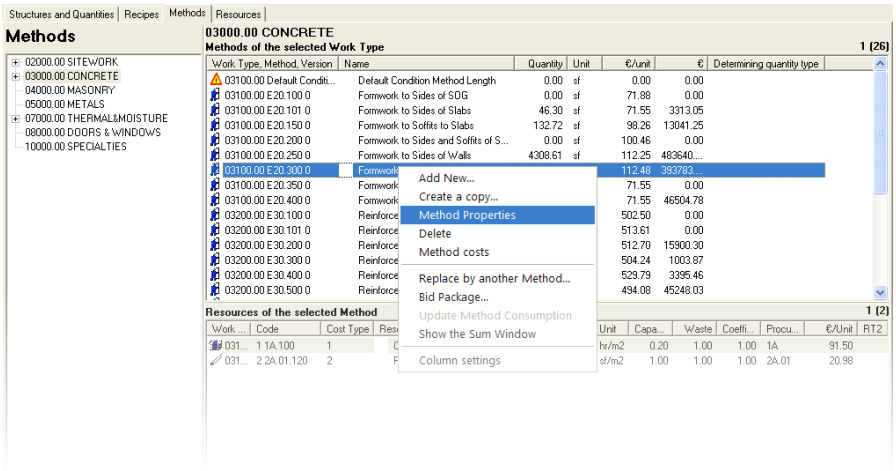


Figure 208 – Open Method Properties either from the "Recipes" or the "Methods" tab.

After Estimator has opened the Method properties, go to any "Resources" tab to show the Resources that are currently included in the selected Method.

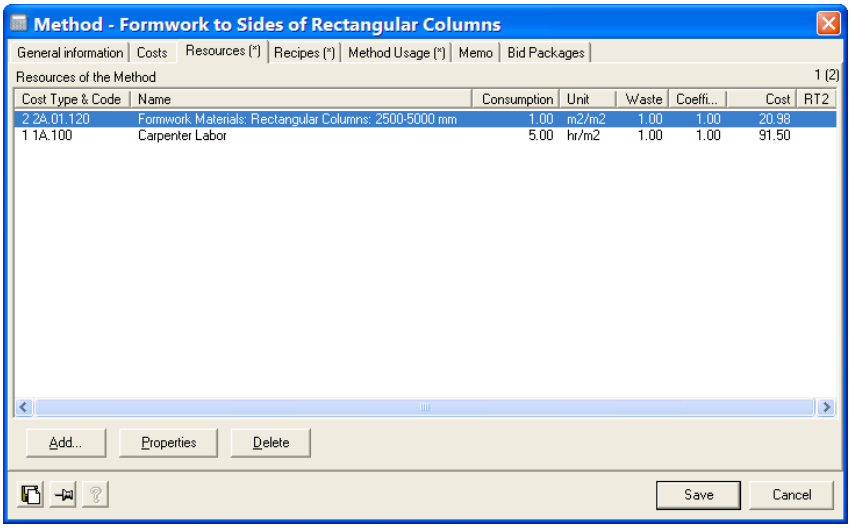


Figure 209 – The Resources tab in the Method properties dialog.

To add a new Resource to the Method, click the "Add" button. Estimator will open the "Resource of the Method" dialog.

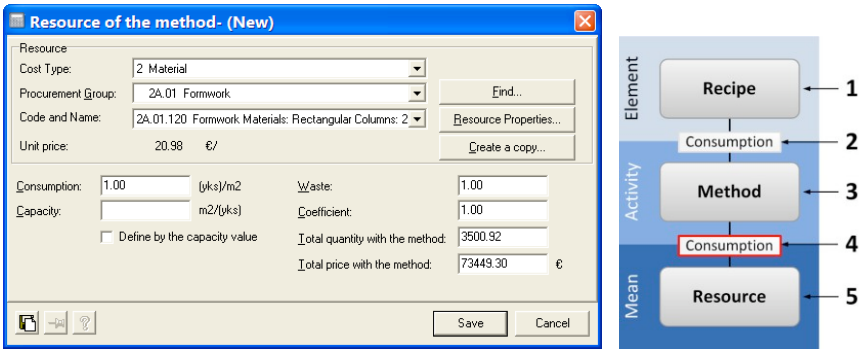


Figure 210 – The Resource of the Method dialog.

Click the "Find" button to open Estimator's content browser to look for the desired Resource in the Standard Library or earlier projects.

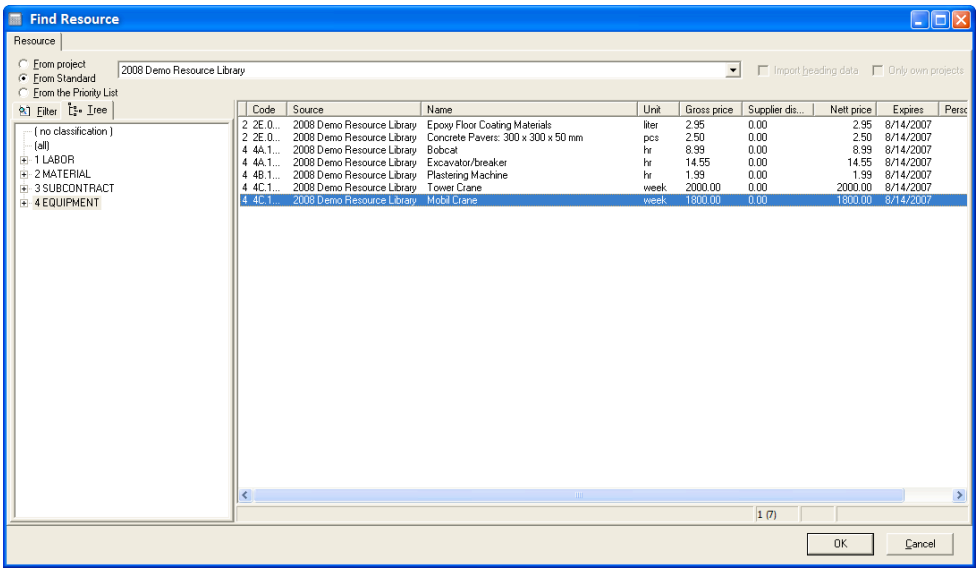


Figure 211 – The Content browser: you can look for desired Resources in projects, the Standards library and/or the "Priority List", the list of library references defined in the Project's properties. The "Expires" column shows the validity of a Resource definition, notifying you when a price definition is outdated.

Select the desired Resource and click the "OK" button. The Resource will be copied (if not yet present in the project) to the project database. Estimator will return to the "Resource of the Method" dialog.

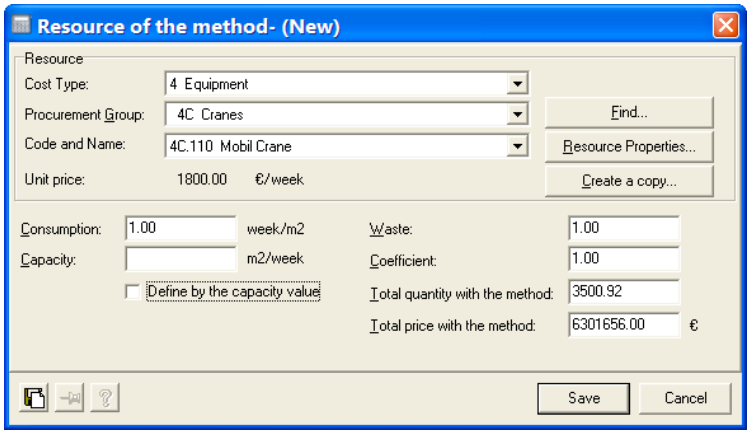


Figure 212 – Estimator re-opens the "Resource of the Method" dialog after selecting any desired Resources.

In the Resource of the Method dialog, you now need to specify how much of the selected Resource will be used per unit of Method in which it is included. In this example, we will change the consumption of the mobile crane, expressed in number of weeks per m^2 / sf of formwork in such a way that it reflects the complexity and the typical production rate of the formwork for the column Method.

Click "Save" to complete adding the Resource to your Method.

When you need to add many Resources to your project, we recommend that you use the "Drag and Drop" approach, explained in the "How To: Copy Recipes from the Standards Database" section.

Sometimes you may not be able to find the Resource that you need to define the cost at the Method level. In such cases, you can define a "cost per unit" or a "total cost" in the Method definition.

HOW TO: DEFINE COST ON THE METHOD LEVEL

To define cost at the Method level, open the Method properties and select the "Cost" tab.

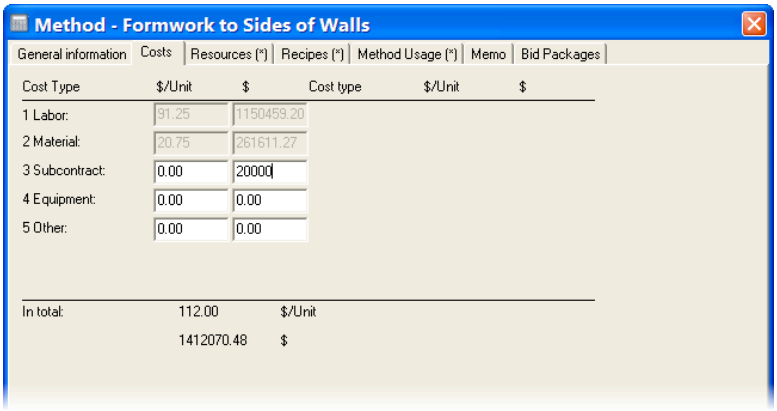


Figure 213 – Entering cost data at the Method level.

You can specify a unit price or a total price for each of the cost types.

Costs defined here will *not* include the project's social security rate, when specifying "Labor" cost types.

You will also *not* be able to save this cost information back into the Standards database, as only the costs of Resources can be saved to the Standards database.

〈

As mentioned in a previous section, you can assign a "validity date" to a Resource definition. This date will help you ensure that the estimate that you are creating uses up-to-date price information.

When Resource prices are outdated, they are displayed in the Estimator user interface with a different icon in the "Resources" view:


A Resource from a Resource catalogue.


An unused Resource or a Resource that is only used with one Method. The Resource is defined in the Standards database.


A Resource from a Resource catalogue for which the price is out-of-date.


A project specific Resource (does not exist in the "Standards" database).


An unused, project-specific Resource.


A project-specific Resource that is outdated.


A Resource that is used by more than one Methods.

When imported from the Standards database, Resources always keep their relationship with the Standard database. Once you have copied Resources from the Standards database to the project and you update resource prices in the Standards database, you can automatically update the prices in the project from the Resource database.

〉 **HOW TO: UPDATE RESOURCE PRICES IN THE STANDARDS DATABASE AND YOUR PROJECT**

One of the many strengths of Vico Estimator is that you can centrally maintain your Resource library, allowing you to perform price updates in the library instead of updating them manually for all the projects you are working on.

To update the price information of your Resources, open the desired library in Estimator's "Standards" tab in the main application window.

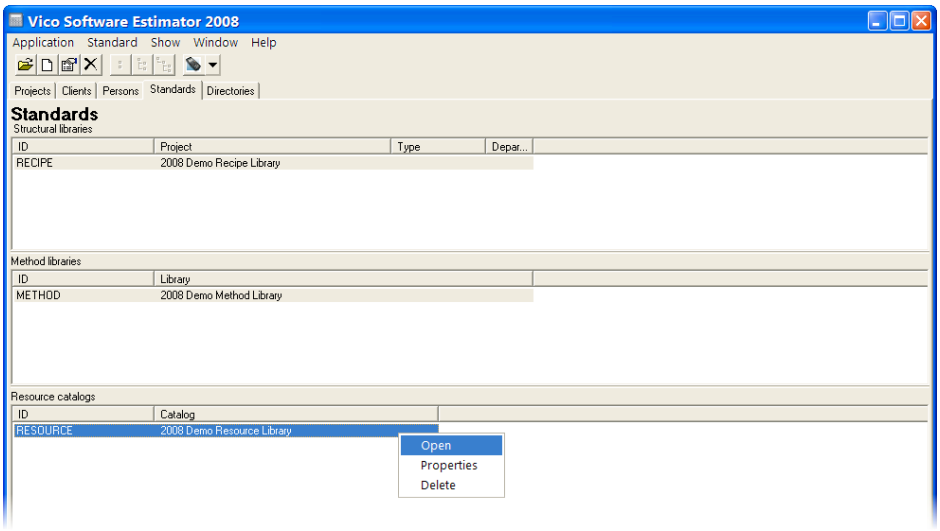


Figure 214 – Estimator's main application window – open the Resource library in which you want to update price information.

In the library, open the Resource for which you want to update price info by double-clicking it or by right-clicking and selecting "Resource Properties".

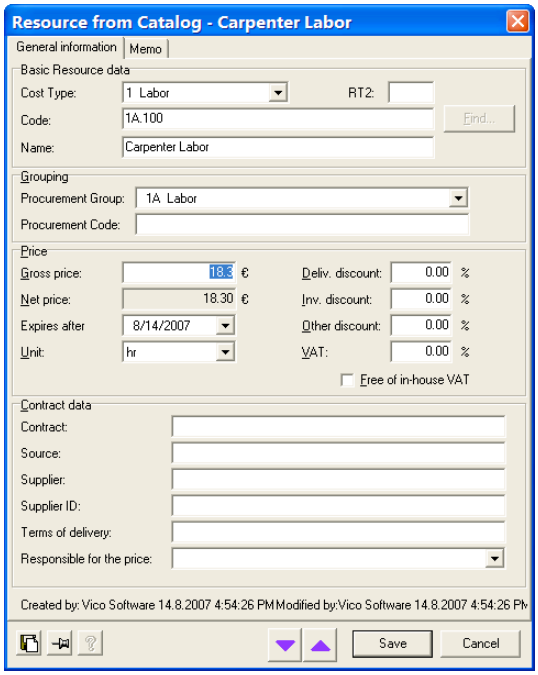


Figure 215 – Resource Properties; modifying "Gross Price" and the "Expirers after" values to update your Resource definition.

In the "Resource from Catalog" dialog, you can change the price and discount information for the Resource. You can also redefine the validity date by changing the value in the "Expires after" field.

After making the required changes, click "Save" to close the dialog, or use the arrow keys to go to the previous or next Resource definition. Using the arrow keys will save the current changes.

TIP: if you need to update many Resources at once, consider using the "Table View" in the Resource Standards.

Click the "Table View" button in the toolbar () to activate the table view.

Estimator shows the "Set data filter for Table View" dialog box, where you can specify sub selections of the Resources you want to edit.

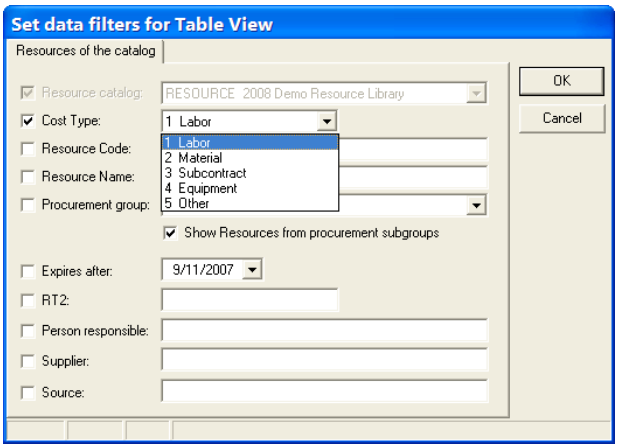


Figure 216 – "Set Data filter for Table View" dialog box: only the result of the filter will be displayed in the table view.

After confirming your settings by clicking "OK", Estimator will open the Table view. You can now edit your Resource price information as if you were working in a spreadsheet.

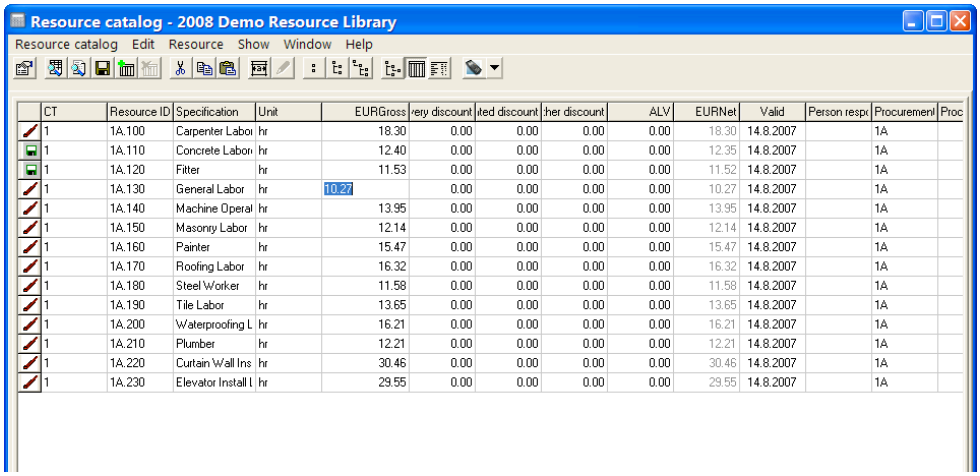


Figure 217 – Updating Resource information in the table view.

Save changes by clicking the  button.

You can further speed up updating work by copying and pasting Resource information from your price sources into a spreadsheet and matching the spreadsheet columns to Estimator Table views columns. From your spreadsheet application, you can then copy and paste to Estimator's table view. Do not forget to click the "Save" button after completing the paste operation to save pasted information into your Resource library.

Once you have completed updating your collection of Resources in the Standards database, you can quickly update your project from Estimator's Resource view.

In the Resource view, select "Update from Catalog" to start pulling in the updated information from your Resources Standards database.

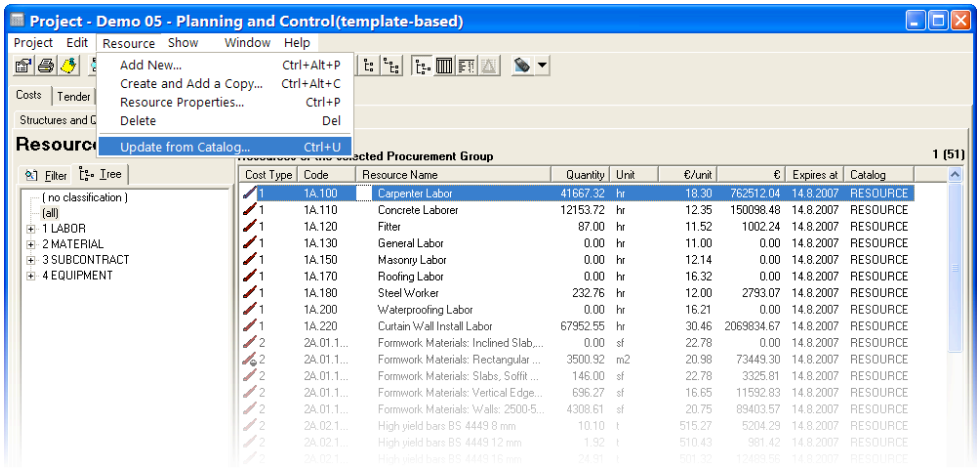


Figure 218 – In the Resources View, the Resource updating function is started from the "Resource" menu item.

Estimator will present you with 3 options:

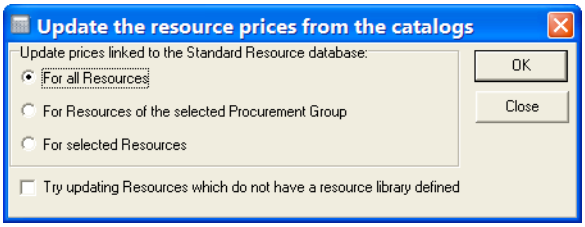


Figure 219 – Resource updating options.

For all Resources — Compares – for *all* Resources in your project – the time stamps of the Resource updates that exist in the project to those in the Standards database and automatically replaces all older versions with the newer versions.

For Resources of the selected Procurement Group — Only updates the Resources of the currently selected Resource classification tree on the left side of the "Resources" view (for example: "Labor").

For Selected Resources — Only updates the Resources that are currently selected in the "Resources" view (individual Resources).

Try updating Resources which do not have a Resource library defined.

Some Resources will be taken from other projects and may have been project-specific Resource in those projects. In such cases, no Library is defined for the Resource, but the Resource may still exist in the Library. This option checks for the existence of corresponding Library items and subsequently updates the prices if a matching item is found.

Click "OK" to start the updating process. Estimator displays the list of Resources that will be updated.

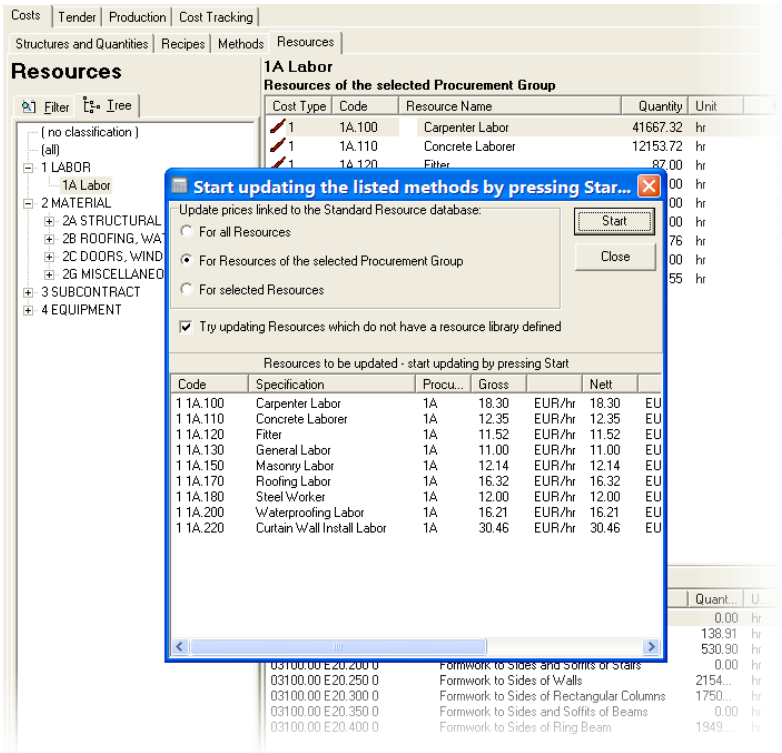


Figure 220 – The listed Resources will be updated during the process.

When you click "Start", the actual update of the listed Resources will begin; the newer Resources information will be written to the project database.

Conditional Methods

To reduce the number of Methods that you need in a project, Vico Estimator 2008 has "Conditional Methods".

Using Conditional Methods, several similar Methods can be defined in one Recipe. By analyzing the properties of elements in the model, it can be decided in which Conditional Method quantities will be saved.

An example would be the hardware on a Door element. Identical doors often require different hardware. The cost for these slightly different configurations

can be calculated using different Recipes, or – more effectively – by defining Conditional Methods.

A set of Conditional Methods in a door Recipe could be:

- IF the door's color is RED, it means that the hardware is "Brass", and thus the quantities should be saved in the "Install Brass Hardware" Method.
- IF, however the door's color is BLUE, it means that the hardware is "Stainless Steel", and thus the quantities should be saved in the "Install Stainless Steel Hardware" Method.
- IF the door has a color other than RED or BLUE, the quantities are saved in the DEFAULT Conditional Method, so no quantities are lost.

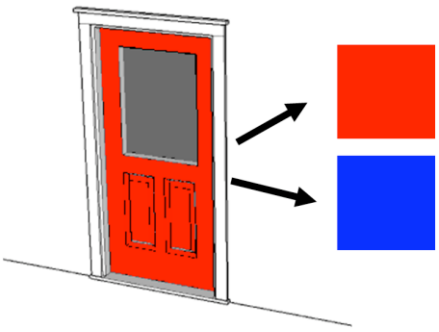


Figure 221 – An example use case for Conditional Methods: the Door's "Color" property determines in which "Hardware" Method its quantities will be saved.

You can define a Conditional Method for any Recipe in your database. All standard properties (you can find them in the "VC 2008 Quantities and Properties" document) can be used. Additionally, you can use the properties and parameters of GDL objects to define conditions.

You need to define in the Constructor model which properties you want to use to define conditions with in your Estimator project.

HOW TO: SELECT PROPERTIES FOR CONDITIONAL METHODS

In Constructor's Estimating menu, open the "Properties Selection" function from the Estimating menu.

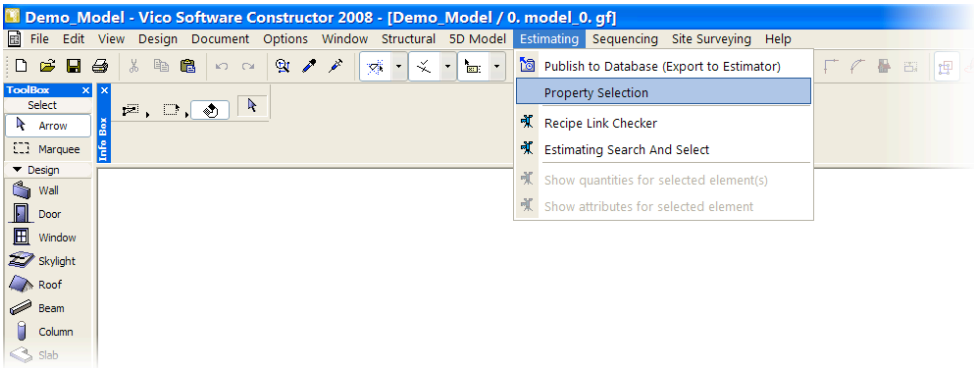


Figure 222 – Starting the Property Selection for Conditional Methods from the Constructor menu bar.

Constructor opens the "Export Properties to Estimator" selection dialog box.

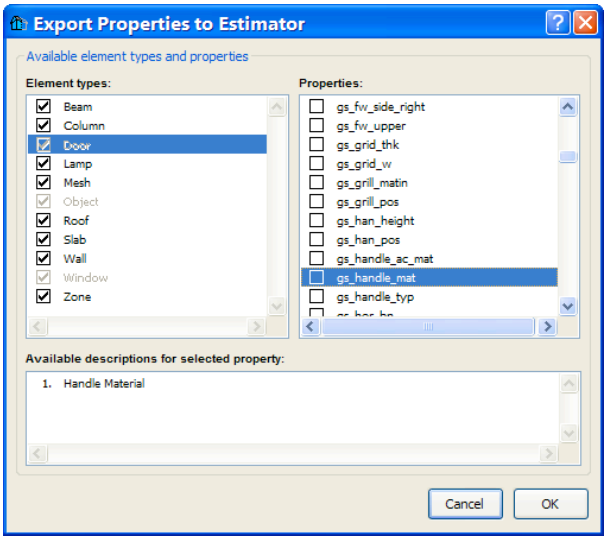
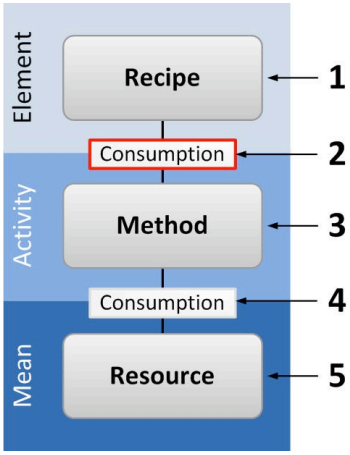


Figure 223 – Selection of properties to be published to the Estimator database to be used in Conditional Methods.

All quantities and properties for Beam, Column, Lamp, Mesh, Roof, Slab, Wall, and Zone elements are selected to be published to the Estimator database by default. You can manually select which parameters from Doors, Windows, and Objects you want to include. In the example above, the "gs_handle_mat" parameter is selected to be included.

With the properties and quantities, published from Constructor, you can define any conditions in the "Method of the Recipe" link of the Recipe structure.

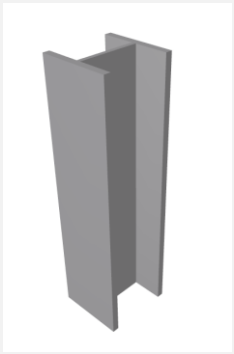


If you define a condition in "Method of the Recipe", the defined consumption ("how many units of Method are needed for one unit of Recipe") is only used when the defined condition is matched by a linked element's property.

To change a Method into a Conditional Method, you need to open the “Method of the Recipe” dialog box by double-clicking on a Method in the Recipes view in Estimator.

HOW TO: DEFINE A CONDITIONAL METHOD

To explain the “Conditional Methods” functionality, we will use the example of a steel column. The column is modeled with an “Object” element type which has a “Manufacturer” parameter.



The steel in your project may be purchased from several manufacturers; however, you probably do not want to assign specific Recipes to every single element in order to simplify the modeling work. Instead, we will use the “Manufacturer” property of the column Object to determine the costs that will be associated with it.

For this example, we are using two manufacturers: Vico Steel Inc. and SteelCon. We set the manufacturer for each object that we place in the model in the “Object Selection Settings” dialog, accessible through the context menu or by pressing the “Ctrl + T” key combination.

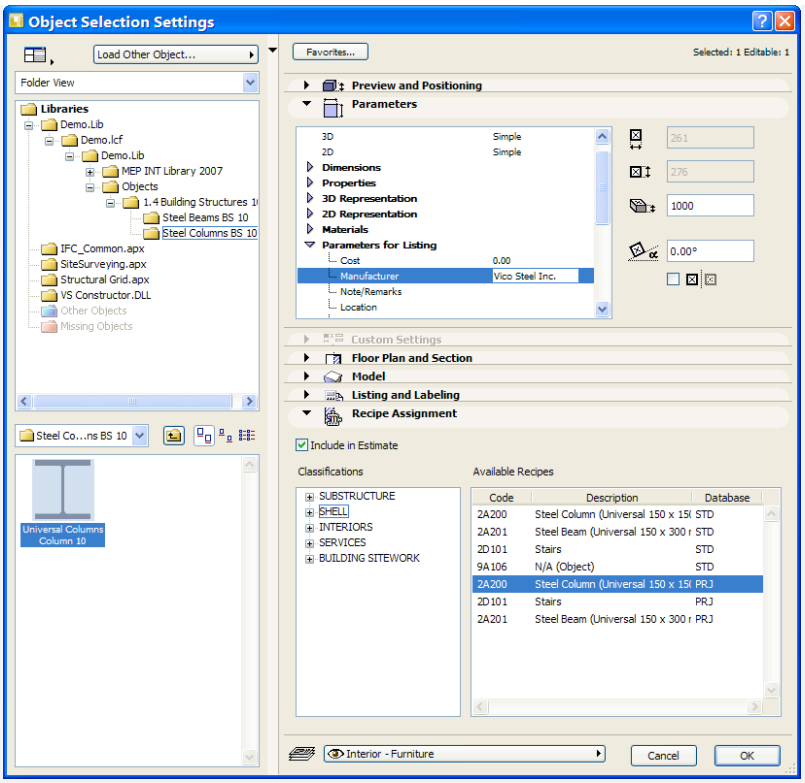


Figure 224 – The settings for steel column Object; the "Manufacturer" field is defined and will be used in a Conditional Method.

Note that steel members manufactured by Vico Steel Inc. and SteelCon can both be assigned the *same* Recipe.

To make the "Manufacturer" parameter available for use in the Conditional Methods we want to define, we need to add the parameter to the set of information that is written into the Estimator database.

First, look up the name of the GDL parameter by opening the Object definition. Select the Object and press "Ctrl + Shift + O". In the list of Object parameters, look for the "Manufacturer" description.

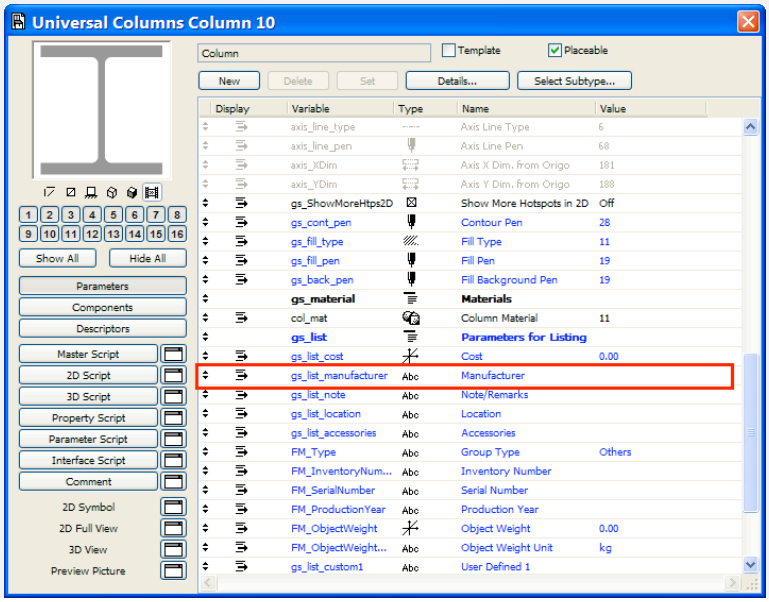


Figure 225 – Open the GDL object's properties by pressing "Ctrl + Shift + O".

In the list of GDL parameters, you can find the name of the "Manufacturer" variable: "gs_list_manufacturer".

To make this variable available to Conditional Methods, start the "Property Selection" function from the Estimating menu.

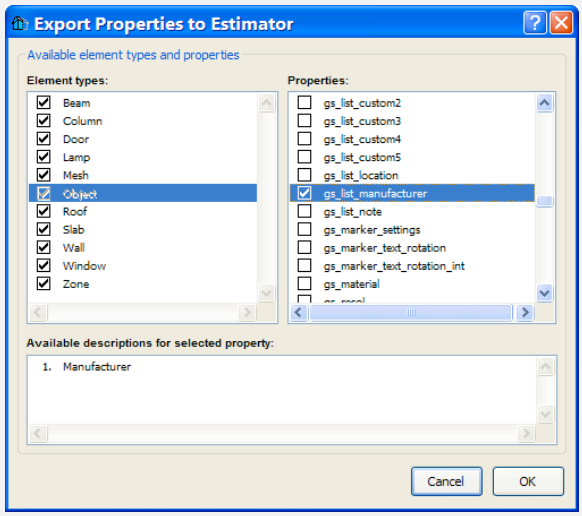


Figure 226 – Property Selection dialog.

Look for the "gs_list_manufacturer" property under the "Object" element type and check the box. From now on, the property will be made available in Estimator after synchronization with the Estimator database.

To synchronize selected properties with the Estimator database, select "Synchronize with Estimator Database" from the 5D Model menu.

Before starting this procedure, you will be presented with the "Property Selection" dialog again – click "OK" to proceed.

In Estimator, you can now change a Method into a Conditional Method by selecting the "Use this Method only for Elements that:" option.

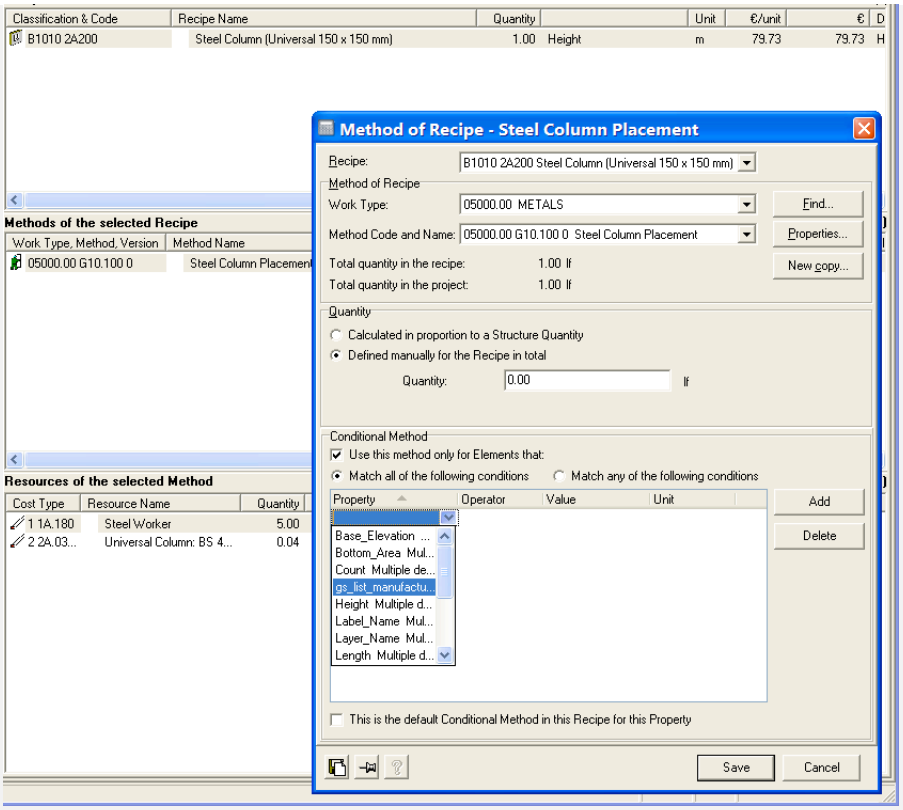


Figure 227 – Creating a Conditional Method by selecting the "Use this Method only for Elements that:" option.

Next, select one of the options: "Match *all* of the following conditions" or "Match *any* of the following conditions".

All means that you further specify the element with each line that you add (for example: all elements that are "Red" and which have a height of 2m / 7ft).

Any means that you are widening your search with each line that you add (for example: all elements that are "Red" or "Blue").

Click the "Add" button to add a new condition; select the property that you want to base your condition on from the list of available properties. In this example, we have selected the "gs_list_manufacturer" property that we set in the Constructor model.

Specify the "Operator" (in this case "=") and the "Value" for the condition. In this first Method, we only want to include quantities from Objects that have the "Manufacturer" property set to "Vico Steel Inc.".

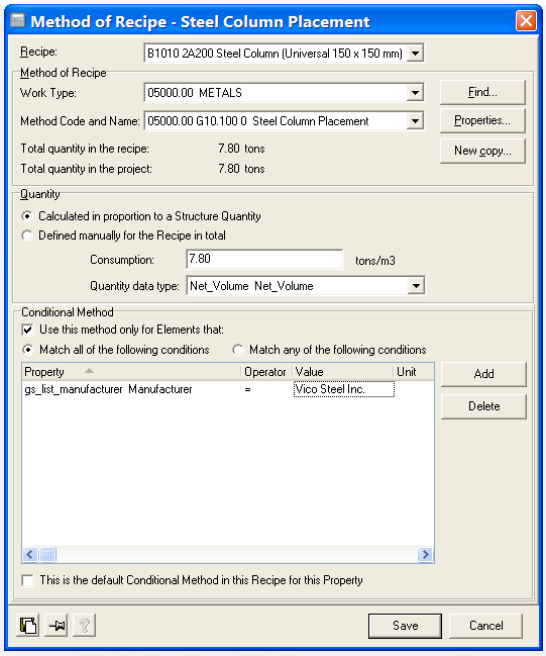


Figure 228 – The "Method of Recipe" settings dialog box with a Conditional Method defined.

After completing the definition, click "Save" to add the changes to the database.

To create the second Conditional Method (the one for "SteelCon" objects), we will create a copy of the first "Vico Steel Inc." Conditional Method. To do this, go to the "Methods" view, look for the Method you just created, right-click and select "Create a Copy".

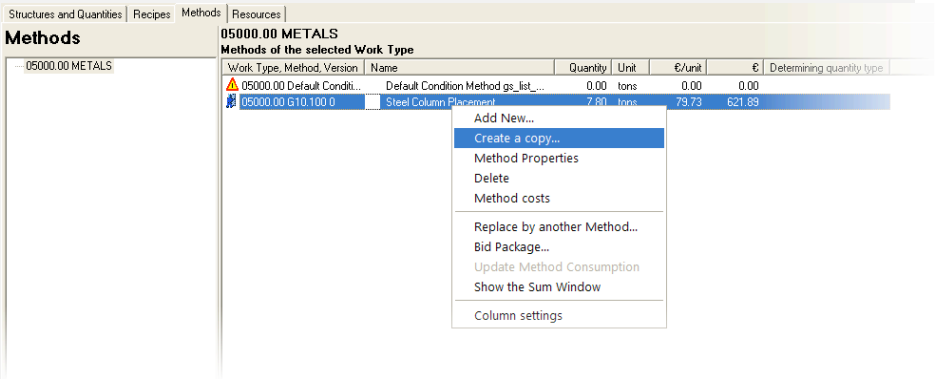


Figure 229 – Create a copy of the "Vico Steel Inc" Method by right clicking and selecting "Create a copy …"

Open the new copy and rename it so you can recognize it in future. We now have two Methods for steel placement: one for "Vico Steel Inc." (for which we already defined the condition) and one for "SteelCon".

Add the new "SteelCon" Method to your Recipe in "Recipes" view by right-clicking in the "Methods of the Selected Recipe" area and selecting "Find and add Method".

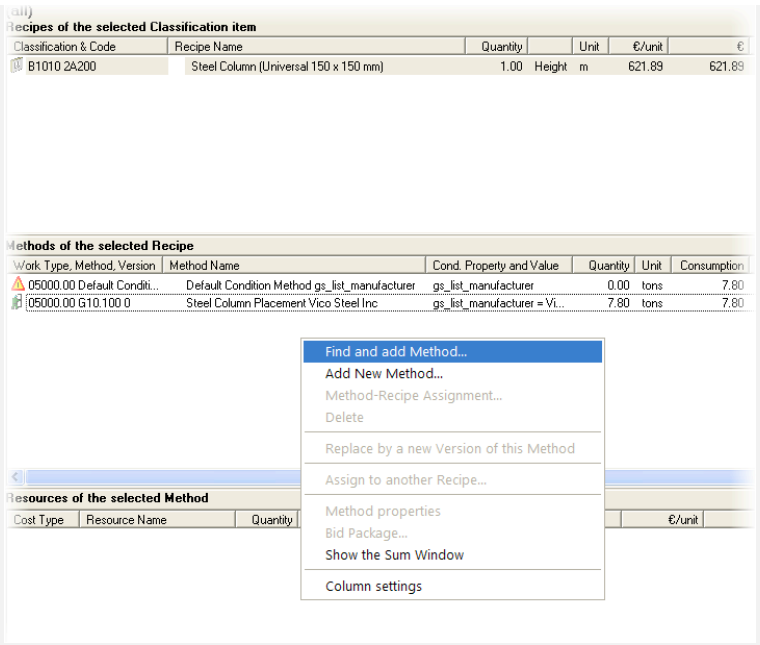


Figure 230 – Adding the new "SteelCon" Method to the Column Recipe by right clicking and selecting "Find and add Method …"

Look for the new Method in the **Project**, select it and click "OK".

Your new Method does not yet have any conditions defined. To define the condition for the "SteelCon" Method as well, follow the same procedure as above.

After completing the second Conditional Method, you should see the following in the "Methods of the Selected Recipe" pane.

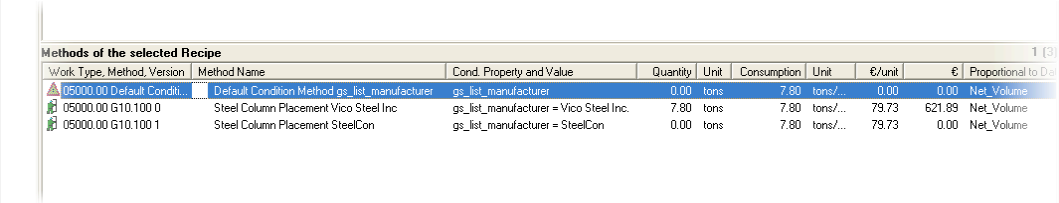


Figure 231 – The list of Methods after completion: two manufacturer-specific Methods and one "default" conditional Method.

The "Default Conditional Method" is used when no value or a value different from "Vico Steel Inc." or "SteelCon" has been defined for the "Manufacturer" property in a Constructor Object.

The next time that you publish quantities from Constructor into the Estimator database, the quantities of elements with the same Recipe will be divided over Methods based on the conditions you defined.

Defining / Modifying Project Estimating Content

When you are working on an estimating project, you may want to re-use a Recipe, Method, or Resource that you already defined in your project. For example, when you need a new Recipe for an "office space" that is similar to one you created earlier.

For this purpose, you can simply create a copy of an already existing Recipe, Method, or Resource in your project and modify it as needed.

HOW TO: COPY AND MODIFY PROJECT ESTIMATING CONTENT

To copy an existing Recipe in your project database, go to the "Recipes" view and select the Recipe you want to duplicate.

Right-click and select "Create and Add a Copy".

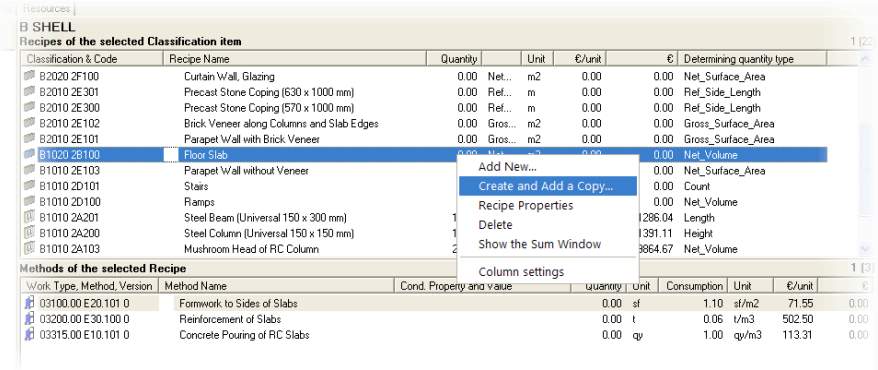


Figure 232 – Selecting the Recipe you want to duplicate and selecting "Create and Add a Copy …"

Estimator will duplicate the selected Recipe and will include all the Methods and Resources that existed in the original. When Estimator automatically opens the new Recipe, you will see that the Recipe code has a "_1" extension.

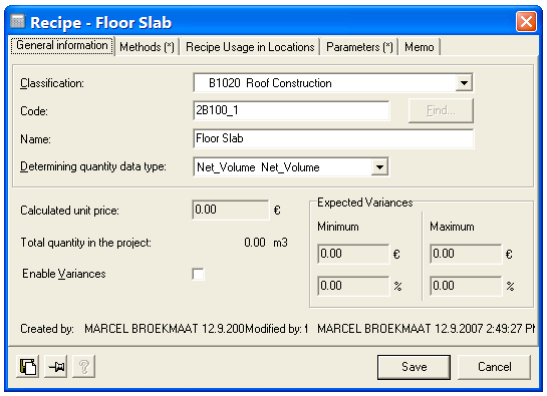


Figure 233 – The duplicated Recipe is automatically opened.

You can edit the new Recipe's code and consumption rate (Recipe-Method) as desired for the new Recipe. You can also change the element type with which the Recipe should be associated by changing the "Class" parameter.

To copy a Method, go to the "Methods" view. Select the Method you want to duplicate, right click and select "Create a copy".

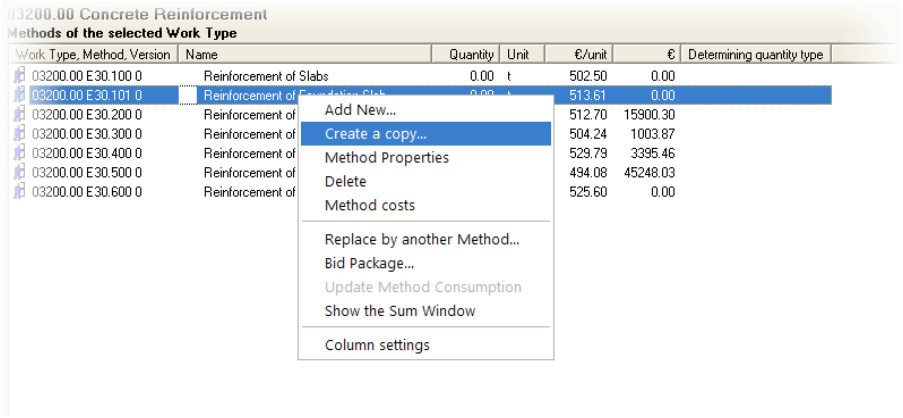


Figure 234 – Adding a copy of an existing Method to your database by using the "Create a copy" function.

After completing of the copy operation, the Method, including its Resource(s) is included, is duplicated. You will see the new Method appearing with an "alternative" number that is one higher than the original.

Work Type, Method, Version	Name	Quantity	Unit	€/unit	€	Determining quantity type
03200.00 E30.100 0	Reinforcement of Slabs	0.00	t	502.50	0.00	
03200.00 E30.101 0	Reinforcement of Foundation Slab	0.00	t	513.61	0.00	
03200.00 E30.101 1	Reinforcement of Foundation Slab	0.00	t	513.61	0.00	
03200.00 E30.200 0	Reinforcement of Walls	31.01	t	512.70	15900.30	
03200.00 E30.300 0	Reinforcement of Columns	1.99	t	504.24	1003.87	
03200.00 E30.400 0	Reinforcement of Beams	6.41	t	529.79	3395.46	
03200.00 E30.500 0	Reinforcement of Diaphragm Walls	91.58	t	494.08	45248.03	
03200.00 E30.600 0	Reinforcement of Stairs	0.00	t	525.60	0.00	

Figure 235 – The results of a Method copy operation – the "alternative" number is one higher than the original.

When you want to copy a Resource, go to the "Resources" tab, select the Resource you want to copy and select the "Create and Add a Copy" function.

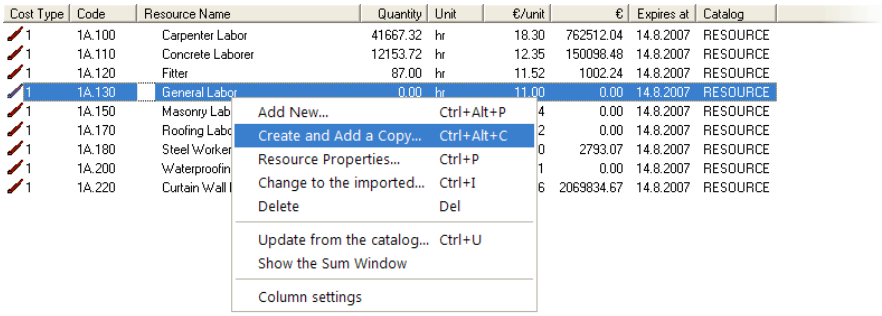


Figure 236 – Creating a copy of a Resource in the "Resources" view.

Estimator creates a copy of the selected Resource and adds a suffix to the Resource code to make it unique in the project.

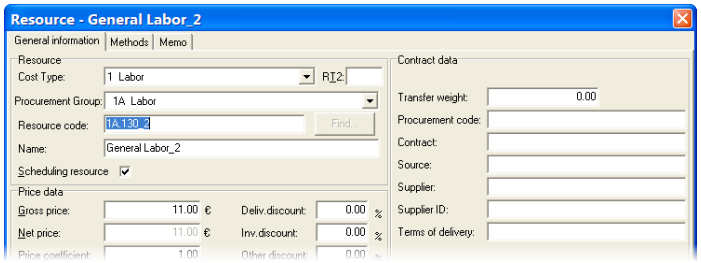


Figure 237 – The duplicate of a Resource: a suffix is automatically created by Estimator to make it unique to the project.

You can now include the new Resource in the Method(s) for which you need it, after making any required modifications to the description and price.

Reusing Project Estimating Content

If have defined new Recipes, Methods and/or Resources a project that will be valuable for later projects, you can copy the new Recipe, Method or Resource to the Standards database at any time. The following section shows how to copy a Recipe to the Standards database. You can copy Methods and Resources by following the same procedure.

HOW TO: COPY YOUR NEW RECIPE TO THE STANDARDS DATABASE

Open the "Recipes" view in your project; also open the "Recipes" library from the "Standards" section of the Estimator main screen.

Align both dialog boxes (the "Recipes" view in your project and the "Recipes Library") side-by-side, so you have them both visible on your screen.

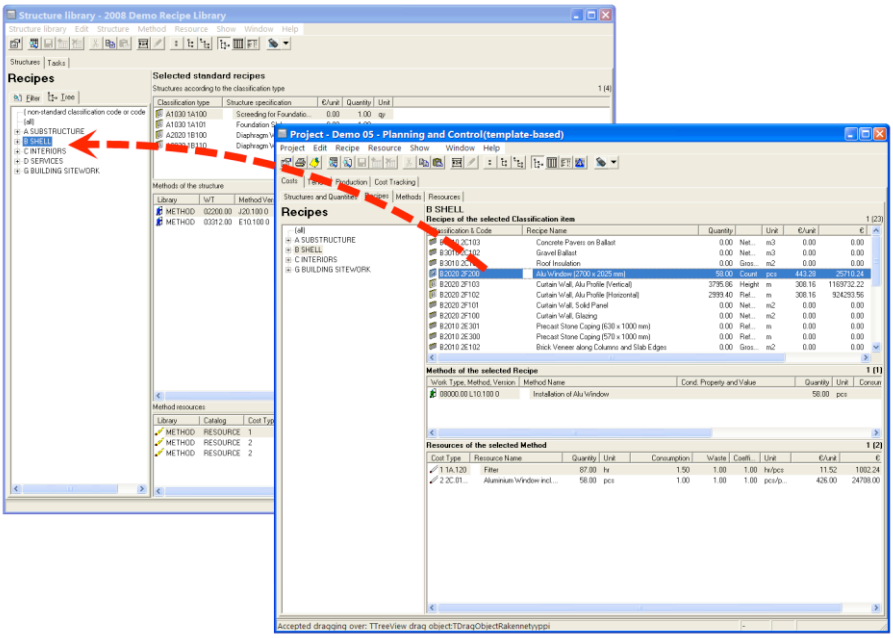


Figure 238 – Aligning the "Project" and "Standard" side-by-side to drag and drop a Recipe from Project to Standards.

After aligning the two dialog boxes, you can simply drag and drop the recipe you want to copy from your project to the Standards. Estimator will ask you to confirm the "copy to database" operation; when accepting, your Recipe data are added to the Standards.

All Recipes that you copy to the Standards database are immediately available for use in other projects.

Use of Model Based Quantities

Publishing Model Quantities to the Estimator Database

When you have completed your building model in Constructor and checked all elements to be sure that all elements will be included in your estimate, you can publish the quantities extracted from modeled elements to the Estimator database.

Before you start the "publish" procedure, you should define which WBS Option Set you want to use for Estimator's Location structure. All quantities are saved by Recipe and by Location, which makes it possible to generate location based cost reports. You need to decide which version of the WBS you want to use for that purpose.

HOW TO: SELECT THE WBS OPTION SET TO BE USED FOR ESTIMATING

First, if your WBS Manager is not active in Constructor, activate it from the "5D Model" menu.

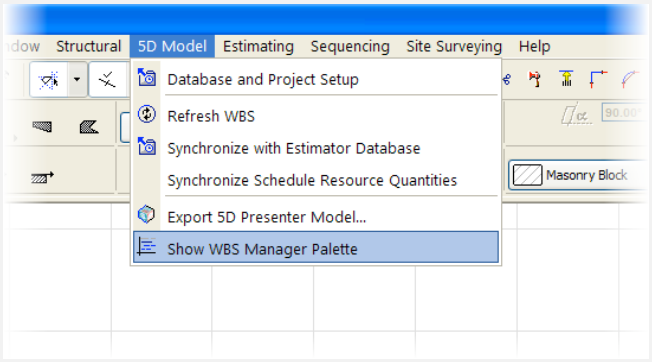


Figure 239 – Selecting the "Show WBS Manager Palette" to display the WBS Manager in the Constructor User Interface.

Click on the ... button and select "Properties".

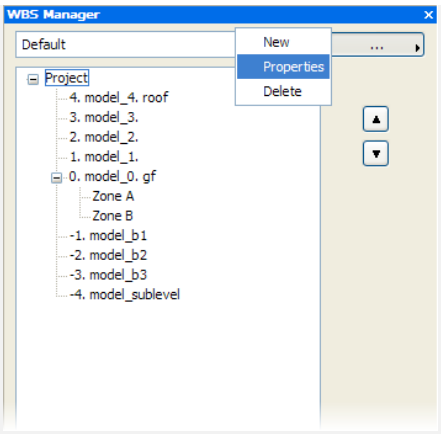


Figure 240 – Opening the properties of a WBS Option Set to define the structure you want to use as location structure in your estimate.

Constructor opens the properties of the currently active Option Set.

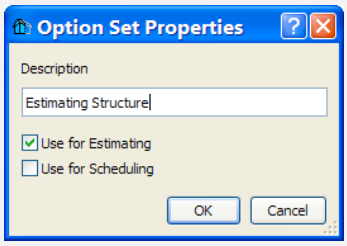


Figure 241 – Option Set Properties dialog.

In the Option Set Properties dialog, you can rename the option set and select for which purposes it will be used. Select "Use for Estimating" and optionally "Use for Scheduling".

You can learn more about Work Breakdown Structures and Option Sets in the "Virtual Construction in the Planning Phase" section of this guide.

To publish your quantities from the Constructor model into the Estimator database, select "Publish to Database (Export to Estimator)" from the "Estimating menu in Constructor.

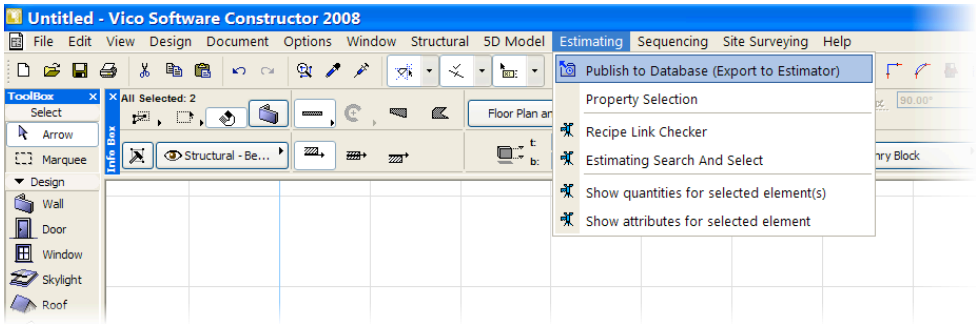


Figure 242 – Publishing your model's quantities to the Estimator database to generate your estimate.

Constructor will display the following message when it finds elements in the model that have been assigned Recipes from the Standard database:

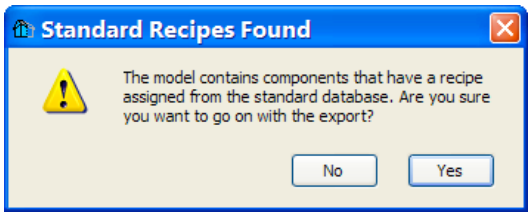


Figure 243 – The notification shown when Constructor finds elements that have a Recipe assigned from the "Standards" database.

When you have assigned Recipes from the Standards database to elements in your model (you can check this in the Recipe assignment: STD represents "Standard" and PRJ represents "Project"), the Recipes from the Standards database will be copied to your project during the export procedure, resulting in new Recipes being placed into your project.

HOW TO: SAVE MODEL BASED QUANTITIES IN YOUR PROJECT

After you have started the "Publish to Database" function from the Estimating menu (and decided to proceed if you have Recipes from the Standards database assigned), you will be presented the following Publish to Database Options dialog:

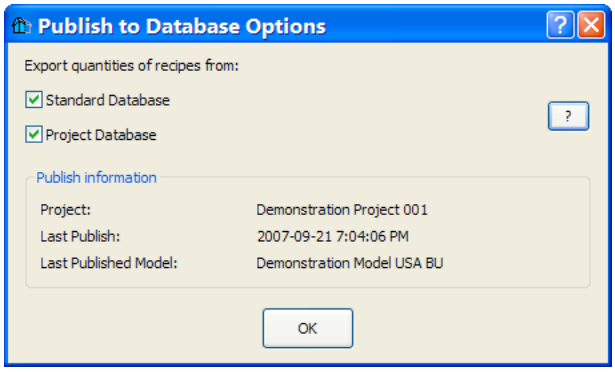


Figure 244 – The Publish to Database Options dialog

With the "Publish to Database Options", you can manage which Recipe data sources will be used to populate your Estimate's collection of cost and quantity data.

If you select "Standard Database" and leave "Project Database" unchecked, only the quantities for Recipes from the Standards database will be saved in your Estimator project.

When you only select "Project Database" and leave "Standard Database" unchecked, only quantities for Recipes that already exist in the Estimator project will be saved in your project.

Note: If you select both "Standard Database" and "Project Database" options, Quantities for Recipes that exist in both Project *and* Standard will be saved with the Project version of the Recipe!

Clicking the "OK" button starts the "publish to database" procedure. Constructor will display a progress meter to inform you of the progress of the model-geometry-based calculations. Geometry-based calculations include the automatic splitting of element quantities, as defined in the Work Breakdown Structure (see chapter 5).

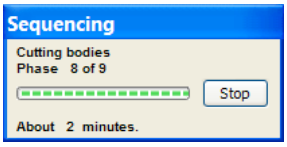


Figure 245 – Progress of calculation of model based quantities

Importing Model Quantities in Estimator

Once the "Publish to Database" operation has been completed in Constructor, the calculated model based quantities, which were saved by Recipe and by Location defined by the active WBS, can be used for estimating purposes.

Publishing quantities and importing quantities are always two separate steps in Vico's Virtual Construction systems. The "2-step" approach makes it possible to let two disciplines (in this case: "Engineer" and "Estimator") work in parallel, without directly affecting each other's work. The Engineer can publish a new version of model based quantities to the Estimator's project without directly affecting the current version of the project estimate.

Figure 246 – Vico's Two Step Process: publish data from Constructor into a temporary location in the database and then import it when you need it.

How To: Import Model Based Quantity Data

Start Estimator and open the Estimator project that you are working on from Estimator's main application window. (See: How To: Open your Estimator project.)

If you already had Estimator open on your computer, use the key combination <Ctrl + F5> to refresh the information in Estimator from the temporary location. Alternatively, use the "Refresh from Database" function from the "Show" menu.

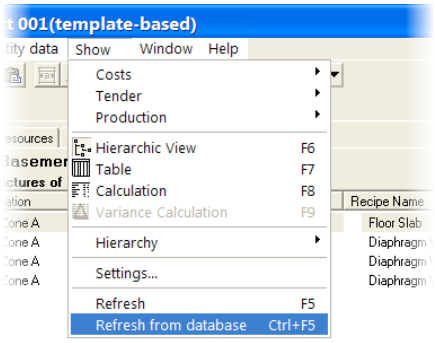


Figure 247 – "Refresh from Database" to get the latest data from the temporary location in the database.

In your Estimator project, select “Import Model data…” from the “Project” menu.

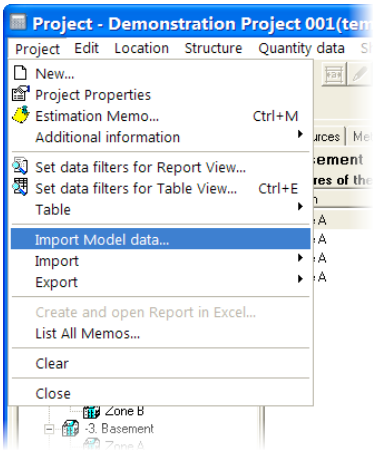


Figure 248 – Using the “Import Model data…” function to start importing model based quantity data from the temporary save location.

Estimator will display the “Building Model Import” dialog, in which you can define the import parameters.

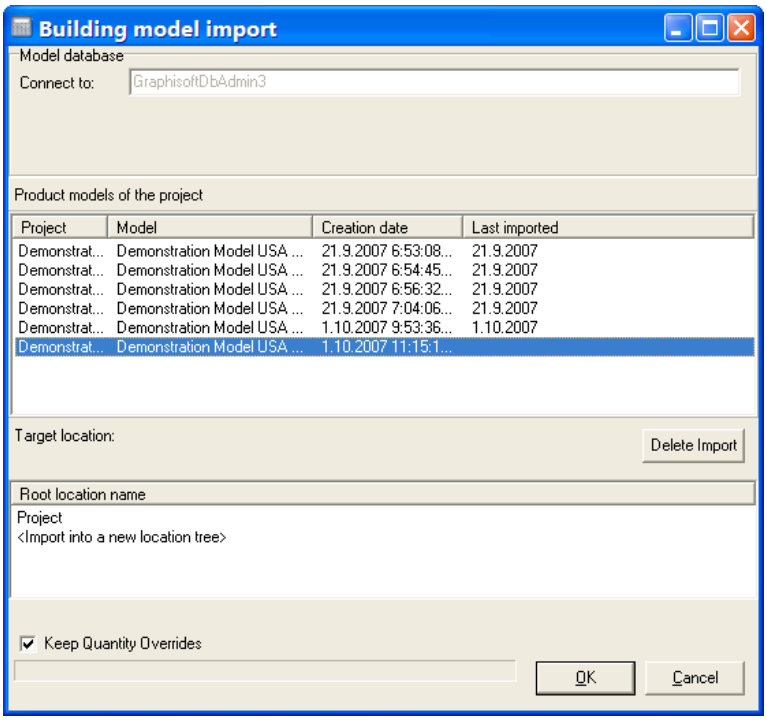


Figure 249 – The Building Model Import dialog in an Estimator project.

The Building Model Import dialog provides you with the following information and options:

Connect to:	A read-only field that shows you the name of the database from which the published quantity data are read.
Product models of the project	A list of published versions of quantity data from Constructor model(s) linked to the

	Estimator project. Each “publish” operation results in a new version in the list. Versions that have not been imported into the estimate do not have a date for “Last imported”: this provides a good way to check if your estimate is up to date with the model.
Delete Import	With this button, you can remove versions from the “temporary location” in your database. When you import quantity data, older versions are saved in the temporary location, which will increase the size of the database on your system, or on your network.
Target Location	Model based quantities are saved by Recipe and by Location. You can import the new dataset into a new Location (this will *add* quantities to your project) or override/merge the new quantities with the previously imported version by selecting one of the existing location structures. The Estimator location structure equals the Work Breakdown Structure selected in Constructor. (See: How To: Select the WBS Option Set to be used for Estimating.)
Keep Quantity Overrides	Save changes that you made in Estimator’s spreadsheet view by applying overrides to model based quantities by checking this option.

Click the “OK” button to start importing the quantities published from your Constructor model.

Estimator will save the model based information to your Estimate. After completion, you can analyze the quantities by Location (in the Structures and Quantities view) and by Recipe, Method and Resource.

An Estimate in the Early Design Phase

When you are working on a project in the early design phase, the amount of information that you typically have available is limited.

Your collection of input information on which to base your estimate will most probably consist of a combination of low detail plans and sketches, plus “key figures” – project variables, such as “total floor area” and “number of stories”.

With this limited set of information, you can already create a valuable estimate that has the potential to be refined in later phases when more detailed information becomes available.

Estimator has a number of features that help you perform estimates in the early design phase:

- Cost Ranges
- Manually Defined Quantities
- Use of Zone based quantity input

Cost Ranges

When only limited information is available for your project under design, you will most probably find it difficult to define exact unit prices for Recipes in your project. Quite imaginably, you may think in ranges of unit costs, rather than a specific price.

Vico Estimator provides support for this approach by means of its "Cost Range" feature. With Cost Ranges, you can specify a *minimum* and a *maximum* expected price for a Recipe or, alternatively, a plus or minus percentage from a knowledge base number.

HOW TO: DEFINE COST RANGES FOR YOUR ESTIMATING RECIPES

In order to define a cost range for a Recipe in your project, open the Recipe by double-clicking it, or by right-clicking and selecting "Recipe Properties".

In the Recipe's properties dialog, check the "Enable Variances" box to enable the "Expected Variances" input fields.

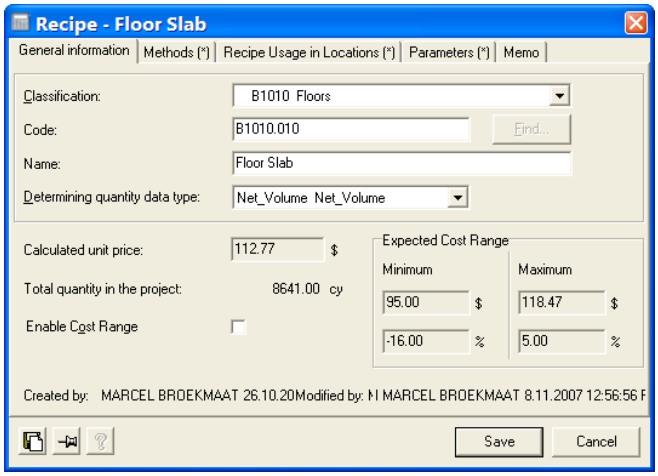


Figure 250 – The Recipe properties dialog box with the Cost Range activation checkbox.

After you have activated cost ranges for the Recipe, Estimator allows you to define "Minimum" and "Maximum" values for the unit price of the selected Recipe.

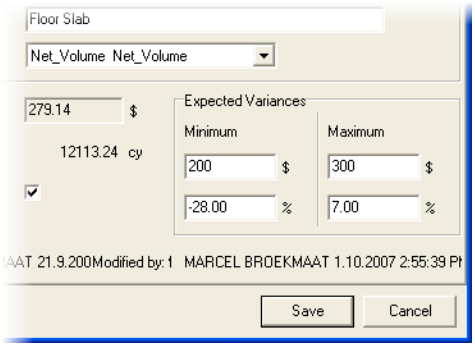


Figure 251 – Entering minimum and maximum values for the selected Recipe.

You can define minimum and maximum either as a price value or as a percentage deviation from the price that you imported from your knowledge database (the Standards).

When you have completed entering the expected price range, click "Save" to apply your changes.

Note that the Recipe for which you just defined a cost range now appears in the Recipe list with a delta (Δ) icon!

Classification & Code	Recipe Name	Quantity	
Δ 2B 2B100	Floor Slab	12113.24	Net_Volume
2C 2C101	Flat Roof Waterproofing and Insulation	5037.29	Net_Surface_Area
2A 2A100	RC Column	368.00	Count
2A 2A102	RC Wall	1252.73	Net_Volume
2F 2F102	Curtain Wall, Alu Profile (Horizontal)	4302.48	Ref_Side_Length
2F 2F103	Curtain Wall, Alu Profile (Vertical)	4003.06	Height
2C 2C103	Concrete Pavers on Ballast	0.00	Net_Volume
2E 2E100	Exterior Wall with Brick Veneer	1249.11	Net_Surface_Area
1B 1B101	Diaphragm Wall Secondary Panel	1064.40	Net_Volume

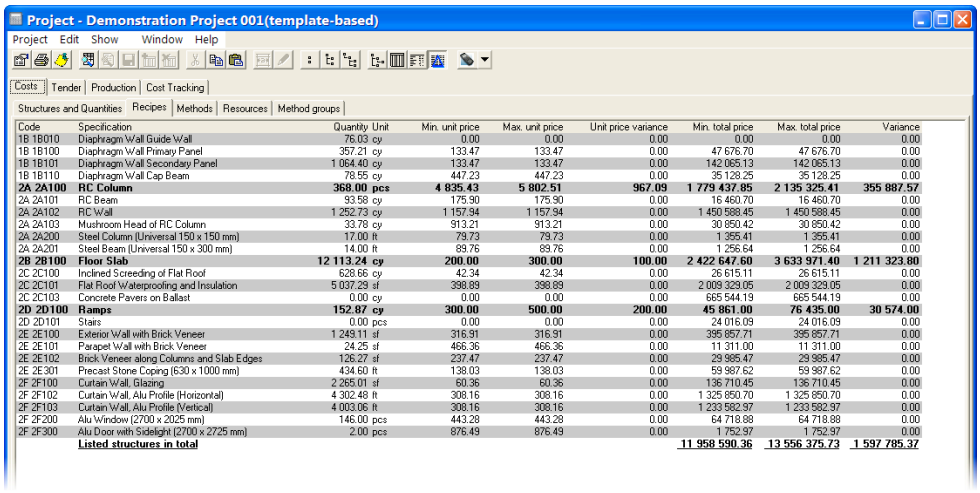
Figure 252 – Cost Ranges applied to the "Floor Slab" Recipe. Notice the (Δ) symbol next to the classification code field. Method and Resource information is grayed out to indicate that they are not used in the current calculation of the "Floor Slab" Recipe.

Estimator's Cost Range report provides you with the required insight into where the largest variance in the project exists by means of the Cost Range Calculation view, which is available from the Recipes view in the Cost mode.

To activate the Cost Range Calculation view, while in "Recipes" view, click the  button on the toolbar, or press F9.

HOW TO: USE ESTIMATOR'S COST RANGE CALCULATION VIEW

From "Recipes" view when in Estimator's "Cost" mode, press the F9 button or click the  button on the toolbar. Estimator will open the Cost Range Calculation view.



Code	Specification	Quantity	Unit	Min. unit price	Max. unit price	Unit price variance	Min. total price	Max. total price	Variance
1B 1B010	Diaphragm Wall Guide Wall	76.03	cy	0.00	0.00	0.00	0.00	0.00	0.00
1B 1B100	Diaphragm Wall Primary Panel	357.21	cy	133.47	133.47	0.00	47 676.70	47 676.70	0.00
1B 1B101	Diaphragm Wall Secondaiy Panel	1 064.40	cy	133.47	133.47	0.00	142 065.13	142 065.13	0.00
1B 1B110	Diaphragm Wall Cap Beam	78.55	cy	447.23	447.23	0.00	35 128.25	35 128.25	0.00
2A 2A100	**RC Column**	**368.00**	**pcs**	**4 835.43**	**5 802.51**	**967.09**	**1 779 437.85**	**2 135 325.41**	**355 887.57**
2A 2A101	RC Beam	93.58	cy	175.90	175.90	0.00	16 460.70	16 460.70	0.00
2A 2A102	RC Wall	1 252.73	cy	1 157.94	1 157.94	0.00	1 450 588.45	1 450 588.45	0.00
2A 2A103	Mushroom Head of RC Column	33.78	cy	913.21	913.21	0.00	30 850.42	30 850.42	0.00
2A 2A200	Steel Column (Universal 150 x 150 mm)	17.00	ft	79.73	79.73	0.00	1 355.41	1 355.41	0.00
2A 2A201	Steel Beam (Universal 150 x 300 mm)	14.00	ft	89.76	89.76	0.00	1 256.64	1 256.64	0.00
2B 2B100	**Floor Slab**	**12 113.24**	**cy**	**200.00**	**300.00**	**100.00**	**2 422 647.60**	**3 633 971.40**	**1 211 323.80**
2C 2C100	Inclined Screeding of Flat Roof	628.66	cy	42.34	42.34	0.00	26 615.11	26 615.11	0.00
2C 2C101	Flat Roof Waterproofing and Insulation	5 037.29	sf	398.89	398.89	0.00	2 009 329.05	2 009 329.05	0.00
2C 2C103	Concrete Pavers on Ballast	0.00	cy	0.00	0.00	0.00	665 544.19	665 544.19	0.00
2D 2D100	**Ramps**	**152.87**	**cy**	**300.00**	**500.00**	**200.00**	**45 861.00**	**76 435.00**	**30 574.00**
2D 2D101	Stairs	0.00	pcs	0.00	0.00	0.00	24 016.09	24 016.09	0.00
2E 2E100	Exterior Wall with Brick Veneer	1 249.11	sf	316.91	316.91	0.00	395 857.71	395 857.71	0.00
2E 2E101	Parapet Wall with Brick Veneer	24.25	sf	466.36	466.36	0.00	11 311.00	11 311.00	0.00
2E 2E102	Brick Veneer along Columns and Slab Edges	126.27	sf	237.47	237.47	0.00	29 985.47	29 985.47	0.00
2E 2E301	Precast Stone Coping (630 x 1000 mm)	434.60	ft	138.03	138.03	0.00	59 987.62	59 987.62	0.00
2F 2F100	Curtain Wall, Glazing	2 265.01	sf	60.36	60.36	0.00	136 710.45	136 710.45	0.00
2F 2F102	Curtain Wall, Alu Profile (Horizontal)	4 302.48	ft	308.16	308.16	0.00	1 325 850.70	1 325 850.70	0.00
2F 2F103	Curtain Wall, Alu Profile (Vertical)	4 003.06	ft	308.16	308.16	0.00	1 233 582.97	1 233 582.97	0.00
2F 2F200	Alu Window (2700 x 2025 mm)	146.00	pcs	443.28	443.28	0.00	64 718.88	64 718.88	0.00
2F 2F300	Alu Door with Sidelight (2700 x 2725 mm)	2.00	pcs	876.49	876.49	0.00	1 752.97	1 752.97	0.00
	Listed structures in total						**11 958 590.36**	**13 556 375.73**	**1 597 785.37**

Figure 253 – Estimator's Cost Range Calculation view. Recipes for which Cost Ranges have been defined are shown in BOLD font type.

To identify where the largest variance between maximum and minimum cost exists in the project, simply click one of the headers (for example "Min. total price", "Max. total price" or "Variance") to sort the Recipe information based on that criterion. If you click the "Variance" header, Recipes with the largest variance will appear at the top of the list: these Recipes will have the largest cost risk associated with them.

For all Cost Range enabled counts, if you have a model link, cost ranges will automatically be updated every time you import a new version of the model based quantities. This will provide you with greater insight into which areas of the project require your attention: cost line items with a large variance will be a considerable risk to your project's cost.

Defining Quantities Manually

Most likely, a certain amount of the estimating input data you need to calculate your project's cost cannot be obtained from the model you build in Constructor. This applies especially in the early design phases, when this will be true for *most* of the quantities you need.

With Vico Estimator, you can define quantities for Recipes that do not have Constructor model based quantity data input and get an overview of which quantities you have defined manually, and for which Recipes. The "Structures and Quantities" view allows you to create new "Locations" that help you to separate "modeled" from "non-modeled" quantities and also to manage the non-modeled quantities.

The "Structures and Quantities" view provides you with a powerful tool to set up and maintain a structured set of quantities.

To start entering manually defined quantities in your estimate, you will first need to set up the location (and possibly sub-locations) to which you want to assign manually defined quantities.

How To: Define a New Location in "Structures and Quantities"

To create a new location, go to the "Structures and Quantities" tab in Estimator's "Cost" mode.

First, define a new "Location Type" for your Estimator project, to enable separating location types later. To do this, select "Additional Information > Location Types" from the "Project" menu.

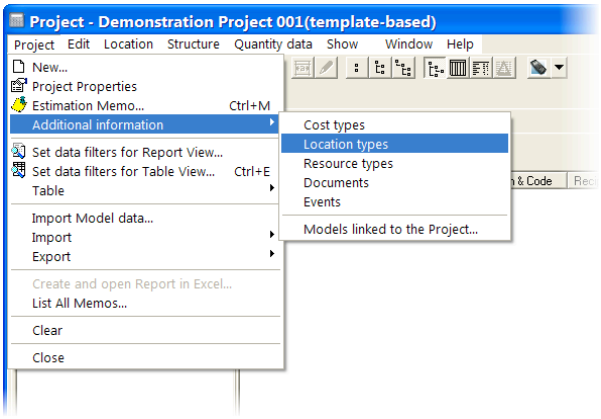


Figure 254 – Adding a new Location Type from the "Additional Information > Location Types" menu.

Estimator will display an overview of location types that currently exist in your project.

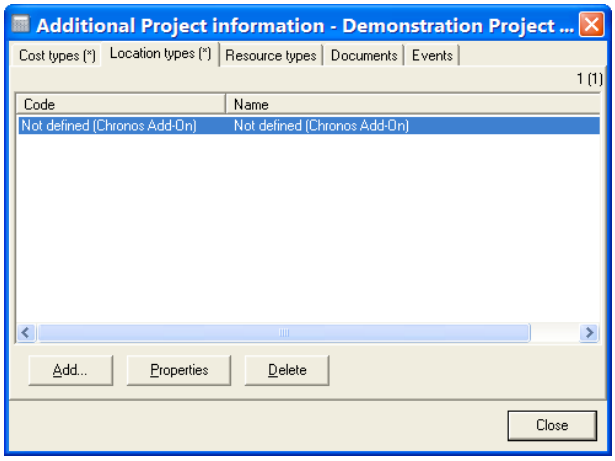


Figure 255 – An overview of the currently existing location types in the Estimator project.

When you open the overview after importing a version of model based quantities, you will see one "Not defined (Chronos Add-On)" location type. This location type is automatically generated by the Model Data Import module.

To add a new location type, click "Add"; Estimator opens the "New Location Type" dialog.

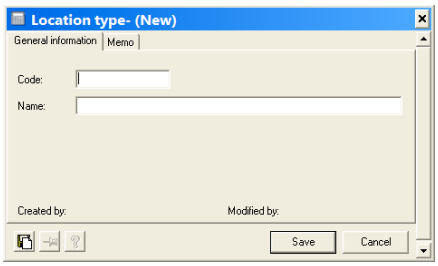


Figure 256 – The New Location Type dialog; enter Code and Name to define the new location type.

Enter a code (for example "99") and a name (for example "Non Modeled") and save the new Location type. You can now define new locations as "Non Modeled" Locations.

Now, in "Structures and Quantities", right click and select "New" in the tree view window to the left side of your Estimator project screen.

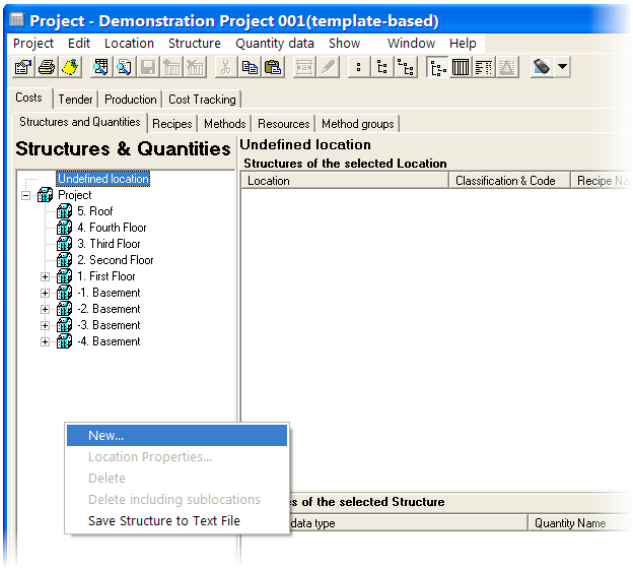


Figure 257 – Adding a new location by right-clicking and selecting "New"

Estimator will open the "Location" dialog box.

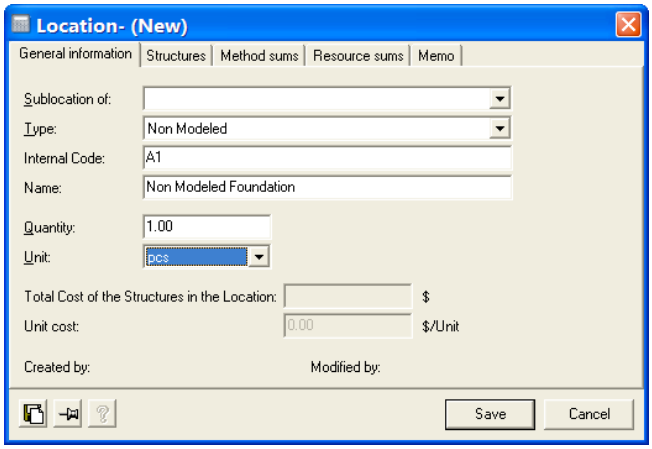


Figure 258 – The Location dialog.

Specify the *type* of the new location by selecting the location type that you defined earlier (in the example: “Non Modeled”). Also give the new location a name and a main quantity. The main quantity will be used when you want to generate a location based cost report. Costs for the location will be divided by the specified quantity and unit.

Click “Save” to save the new location to your project.

After you have set up Locations to which you can assign quantity input for your estimating Recipes, you can start defining these quantities in the “Recipes” view.

In the early design phase, the Recipes that you will use will typically be on a much higher abstraction level than when your project is in the detailed design or bidding phase.

Examples of often used-Recipes in this phase: “General Requirements”, “Concrete” and “Finishes”. The quantity type for this type of Recipes is mostly *surface area* or *volume*.

HOW TO: DEFINE NON MODEL BASED QUANTITY INPUT FOR A RECIPE

In the “Recipes” view, add a new Recipe, or copy a Recipe from the Standards database.

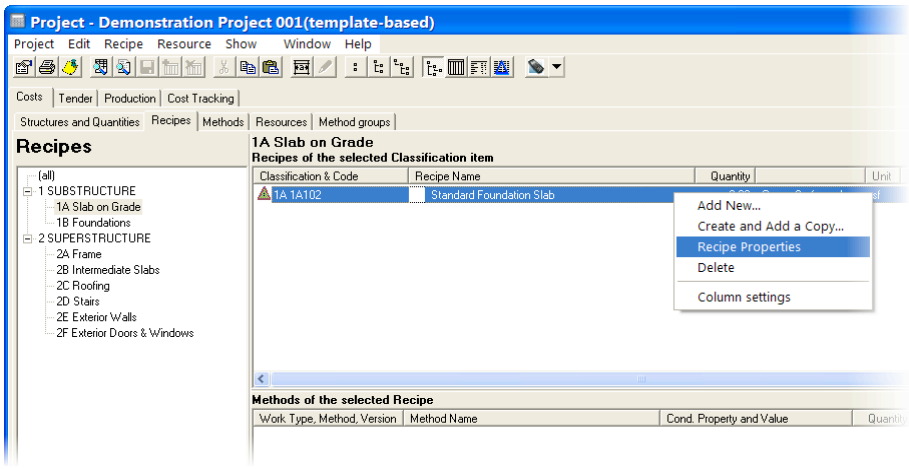


Figure 259 – A new Recipe created in the project, without any quantities.

Open the Recipe properties dialog box and select the “Recipe Usage in Locations” tab.

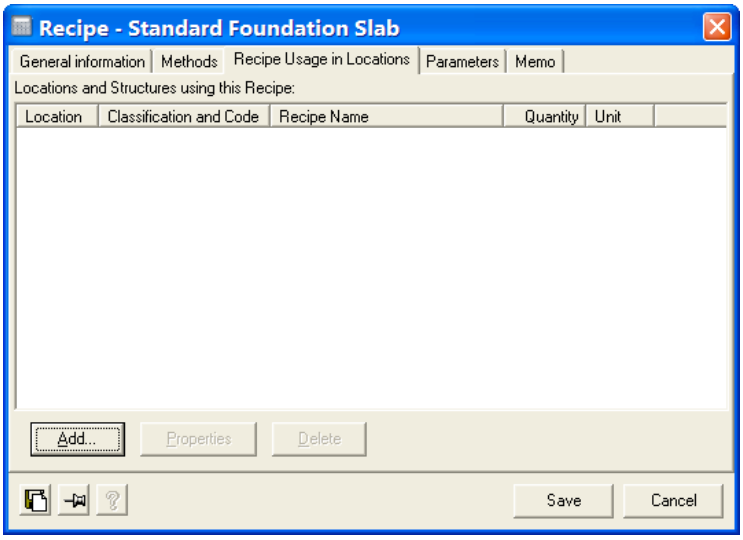


Figure 260 – Recipe Usage in Locations tab of Recipe properties.

No quantities have been defined for the new Recipe, so the list of Locations in which the Recipe is used is empty.

Click "Add" to start assigning a quantity to the new Recipe. Estimator will open the "New Structure" dialog.

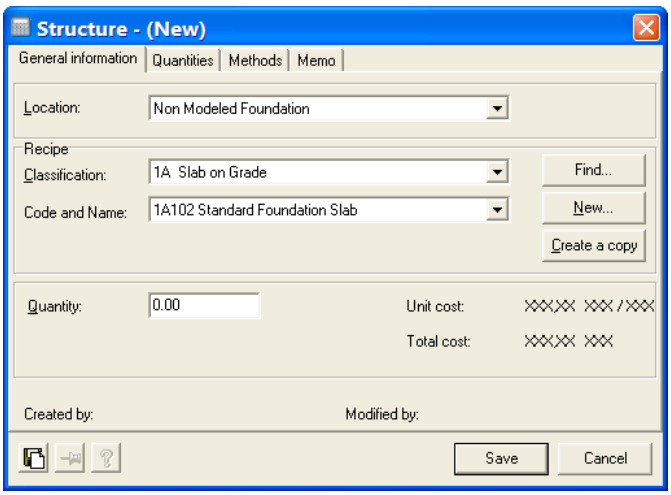


Figure 261 – The "New Structure" dialog of a Recipe.

In the "Location" field, you can specify with which location the new quantity should be associated. In this example, we are using the "Non Modeled Foundation" location that we defined earlier.

The "Recipe" area displays the information of the Recipe that you are currently editing.

Click "Save" to add the new Recipe, plus Location combination to the database.

Re-open the added location properties (double click on the location or select and click "Properties"). Select the "Quantities" tab to start defining one or more quantities associated with the "Non Modeled Foundation" location.

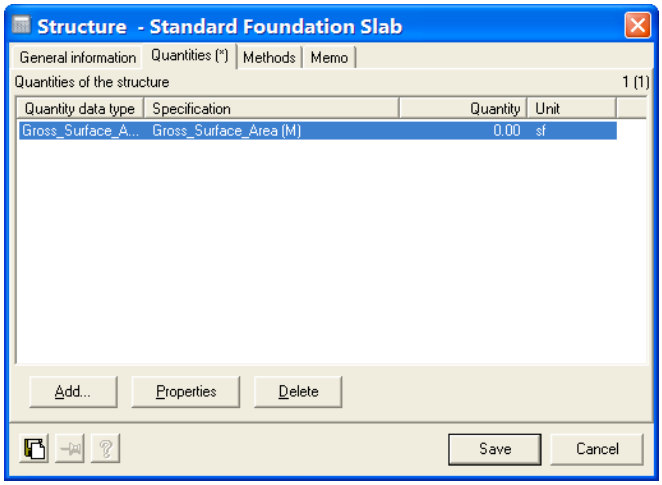


Figure 262 – Quantities defined for the selected Recipe on the "Non Modeled Foundation" Location.

By default, Estimator adds the quantity type that is set as "determining quantity" in the Recipe properties. The quantity is still 0. Select the quantity and click "Properties" to change the value.

Estimator opens the "Quantity Properties" dialog – you can now input a quantity for the variable that you defined.

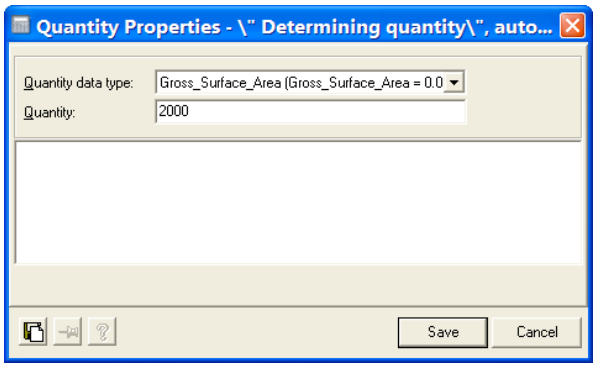


Figure 263 – The Quantity Properties dialog; enter a value in the "Quantity" entry field and it will be associated with the newly defined "Non Modeled Foundation" location.

Click "Save" in all the dialogs boxes until you are back in the "Recipes" view: you will then see that the Recipe has a quantity assigned to it.

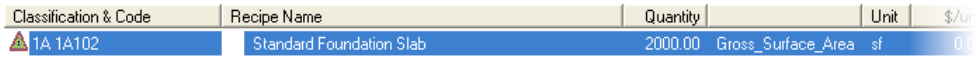


Figure 264 – The result: The Recipe now has a quantity, assigned to the "Non Modeled Foundation" location.

To also define a unit cost for your new Recipe, add Methods, or define a Cost Range.

If a Method that you include in your new Recipe requires a different quantity data type (for example: volume), you can add that quantity by following the same

procedure: open the Recipe properties and the “Non Modeled Foundation” location; then “Add” a new quantity. Open the quantity and specify the value.

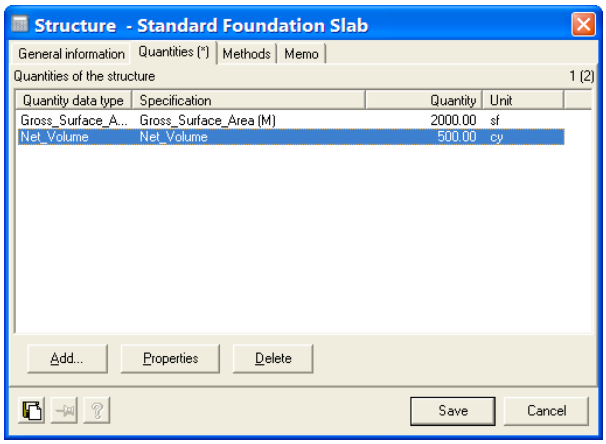


Figure 265 – The “Net_Volume” quantity added to the “Non Modeled Foundation” location.

Return to the “Structures and Quantities” tab to get an overview of all the Recipes in the “Non Modeled Foundation” location, including any quantities defined in that location.

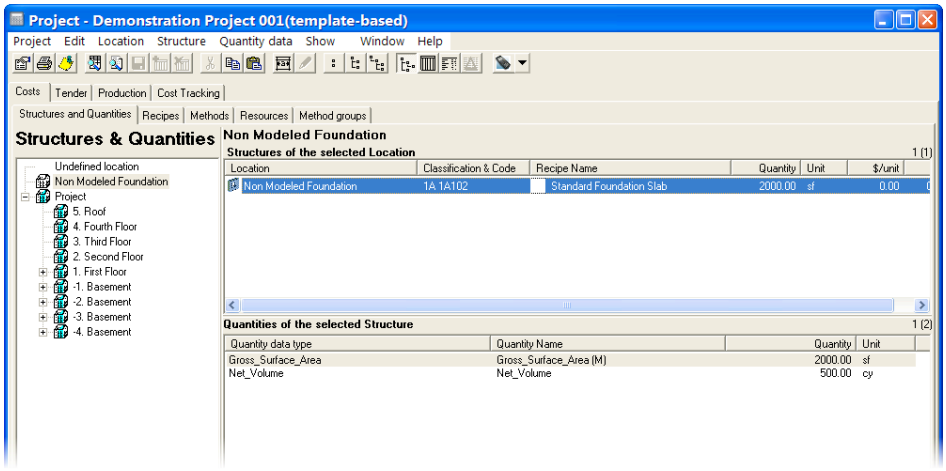


Figure 266 – The Result: one new Recipe (“Standard Foundation Slab”) added to a new Location, “Non Modeled Foundation”. At the Location, two quantities have been defined: “Gross Surface Area” and “Net Volume”.

Use of Zones

As already explained in the introduction of this section, a significant part of the quantity data input, used in the early design phase, will be of the “surface area” type.

This kind of information – plus more detailed quantities – can be extracted easily from the Constructor “Zone” element type. Zones are easy to model by simply defining the boundaries of the distinguishable rooms in your project (for example: office spaces and corridors).

Defining zone boundaries is done in the 2D view, which allows you to use the Constructor model to “digitize” your preliminary 2D plans.

By creating Recipes for the Zone element type, you can create a Constructor model based estimate in very short time.

How To: Use Zone Based Model Input for Estimating Purposes

To learn how to model zones, please refer to page 217 of the ArchiCAD 11 Reference Guide, accessible through Constructor’s “Help” menu.

In order to build an estimate based on zones, we recommend that you create a content plan with zone types that can be recognized in your project. For each zone type, you will define a category with its own specific color, so you will be able to recognize each zone type easily in the Constructor model.

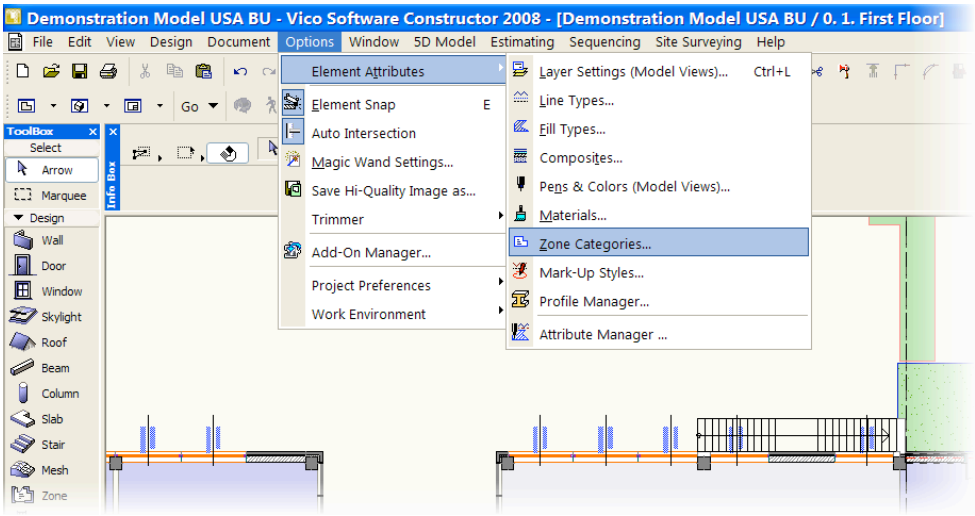


Figure 267 – After defining the list of zone types in your project, you can define them in your Constructor project through the “Element Attributes” > “Zone Categories” settings in the “Options” menu.

An example:

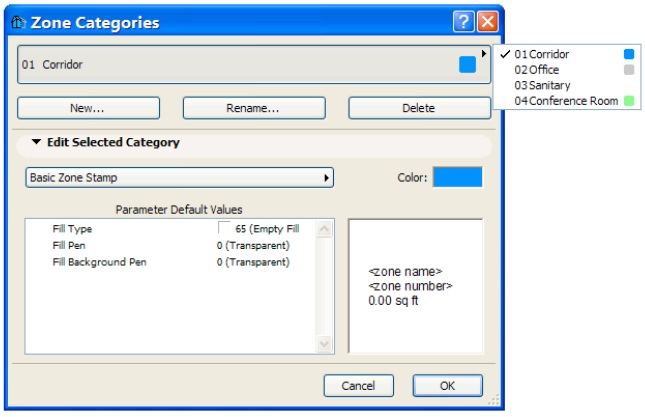


Figure 268 – Example list of zone categories in your project.

For each of the defined Zone categories, you can now create a Recipe in the Estimator project. The "Class" parameter should be set to "Zone" (See: "How To: Define the Model Element Type for a Recipe" for instructions).

You can define the cost of each of the defined zones (Corridor, Office and Conference Room) as a Cost Range, or you can define the cost by adding cost elements for each of the Zones.

An example of a "Zone-Based Recipe" is shown in the table below. When you define a unit price (For example, cost per sf/m2 or per unit) for each of the trades that will be required, you can calculate all the cost based on the simple zone geometry that you define in Constructor.

Classification	Code	Description	Quantity	Unit	Cost Per Unit	Cost	
C10	C10.001	Conference Room	900	sf/m2	1074.71111	967,240.00	
03	03300	Cast-In-Place Concrete	900	sf/m2	400.00	360,000.00	Methods
03	03360	Concrete Finishes	900	sf/m2	120.00	108,000.00	
03	03500	Cementitious Decks & Toppings	900	sf/m2	80.00	72,000.00	
06	06410	Custom Cabinets	900	sf/m2	2.50	2,250.00	
07	07810	Fireproofing	900	sf/m2	140.00	126,000.00	
08	08010	Install Doors/Frames/Hardware	900	sf/m2	0.83	750.00	
08	08700	Finish Hardware	900	sf/m2	20.00	18,000.00	
08	08800	Glass & Glazing	900	sf/m2	3.89	3,500.00	
09	09250	Drywall / Gypsum Board	900	sf/m2	30.00	27,000.00	
09	09300	Tile	900	sf/m2	100.00	90,000.00	
09	09510	Acoustical Ceilings	900	sf/m2	80.00	72,000.00	
09	09900	Painting	900	sf/m2	65.00	58,500.00	
10	10750	Telephone Specialties	900	sf/m2	0.27	240.00	
10	10800	Toilet & Bath Accessories	900	sf/m2	0.67	600.00	
15	15400	Plumbing	900	sf/m2	1.56	1,400.00	
15	15700	HVAC & Controls	900	sf/m2	30.00	27,000.00	
0.00	03300	Cast-In-Place Concrete	900	sf/m2	400.00	360,000.00	Resources
0.00	03360	Concrete Finishes	900	sf/m2	120.00	108,000.00	
0.00	03500	Cementitious Decks & Toppings	900	sf/m2	80.00	72,000.00	
0.00	06410	Custom Cabinets	5	pcs	450.00	2,250.00	
0.00	07810	Fireproofing	900	sf/m2	140.00	126,000.00	
0.00	08010	Install Doors/Frames/Hardware	5	pcs	150.00	750.00	
0.00	08700	Finish Hardware	900	sf/m2	20.00	18,000.00	
0.00	08800	Glass & Glazing	1	ls	3,500.00	3,500.00	
0.00	09250	Drywall / Gypsum Board	900	sf/m2	30.00	27,000.00	
0.00	09300	Tile	900	sf/m2	100.00	90,000.00	
0.00	09510	Acoustical Ceilings	900	sf/m2	80.00	72,000.00	
0.00	09900	Painting	900	sf/m2	65.00	58,500.00	
0.00	10750	Telephone Specialties	3	pcs	80.00	240.00	
0.00	10800	Toilet & Bath Accessories	4	pcs	150.00	600.00	
0.00	15400	Plumbing	4	pcs	350.00	1,400.00	
0.00	15700	HVAC & Controls	900	sf/m2	30.00	27,000.00	

Figure 269 – Example Zone Based Recipe structure: "Methods" are used to specify trades that are required, "Resources" are used to define unit prices. All quantities are extracted from the "Zone" element to which the Recipe is linked. With "Resource of the Method" consumption, you can convert surface areas into different units (for example: pcs/area).

Using Estimator for Quantity Take-Off

You can use Estimator to create accurate model-based quantity take-offs, that contain all the quantities that are automatically extracted from the model that you linked to your Estimator project.

Estimator's "Structures and Quantities" tab allows you to view all your model based quantity data in Spreadsheet View. From this view, you can easily copy and paste model-based quantities.

HOW TO: USE ESTIMATOR FOR MODEL BASED QUANTITY TAKE-OFF

Open your project in the "Structures and Quantities" tab.

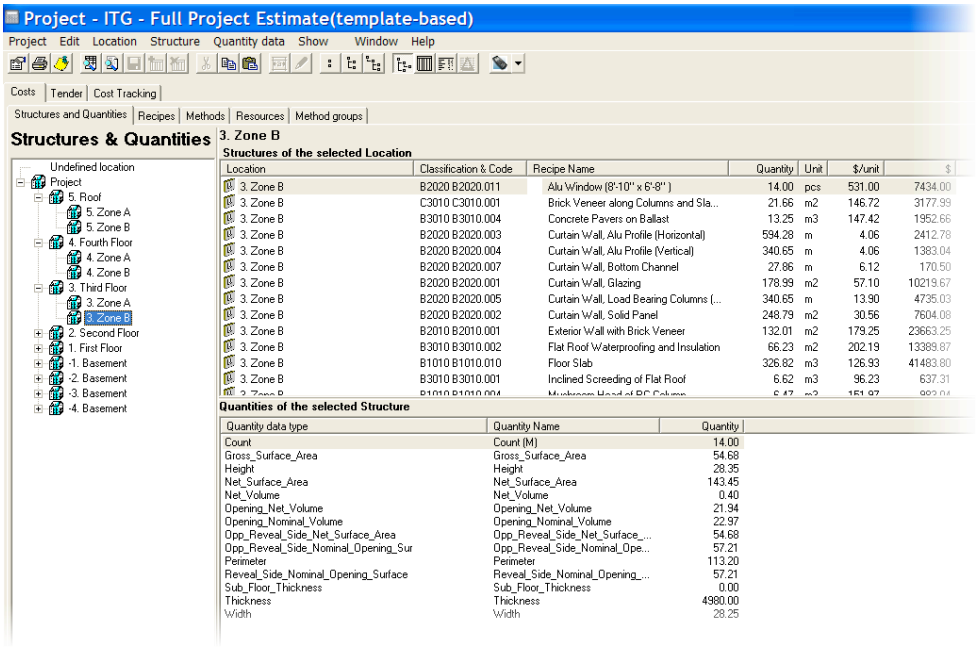


Figure 270 – The Structures and Quantities tab in your project

Now click the "Spreadsheet View" button () in the toolbar to generate an overview of all quantities (by Location) extracted from the model you linked.

Estimator presents you with a settings dialog, in which you can select which Locations, Recipes and/or Classification you would like to include in the Spreadsheet View.

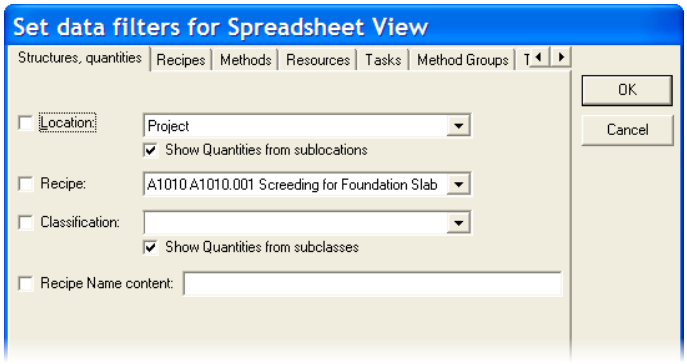
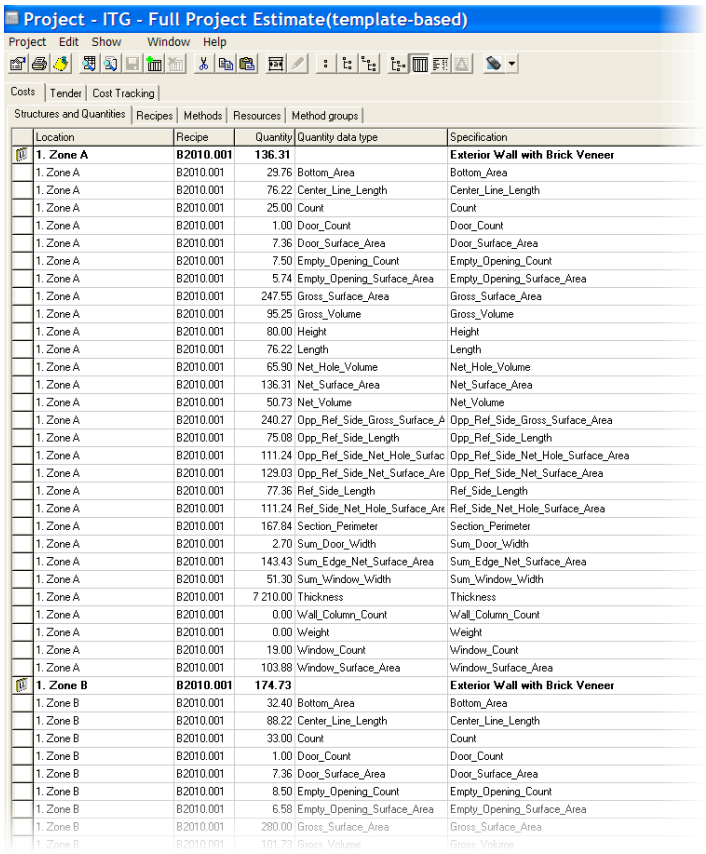


Figure 271 – The Data Filters for Spreadsheet View dialog box.

Click "OK" to confirm your settings. Estimator shows all model-based quantity take-off data by Location.



Location	Recipe	Quantity	Quantity data type	Specification
1. Zone A	**B2010.001**	**136.31**		**Exterior Wall with Brick Veneer**
1. Zone A	B2010.001	29.76	Bottom_Area	Bottom_Area
1. Zone A	B2010.001	76.22	Center_Line_Length	Center_Line_Length
1. Zone A	B2010.001	25.00	Count	Count
1. Zone A	B2010.001	1.00	Door_Count	Door_Count
1. Zone A	B2010.001	7.36	Door_Surface_Area	Door_Surface_Area
1. Zone A	B2010.001	7.50	Empty_Opening_Count	Empty_Opening_Count
1. Zone A	B2010.001	5.74	Empty_Opening_Surface_Area	Empty_Opening_Surface_Area
1. Zone A	B2010.001	247.55	Gross_Surface_Area	Gross_Surface_Area
1. Zone A	B2010.001	95.25	Gross_Volume	Gross_Volume
1. Zone A	B2010.001	80.00	Height	Height
1. Zone A	B2010.001	76.22	Length	Length
1. Zone A	B2010.001	65.90	Net_Hole_Volume	Net_Hole_Volume
1. Zone A	B2010.001	136.31	Net_Surface_Area	Net_Surface_Area
1. Zone A	B2010.001	50.73	Net_Volume	Net_Volume
1. Zone A	B2010.001	240.27	Opp_Ref_Side_Gross_Surface_A	Opp_Ref_Side_Gross_Surface_Area
1. Zone A	B2010.001	75.08	Opp_Ref_Side_Length	Opp_Ref_Side_Length
1. Zone A	B2010.001	111.24	Opp_Ref_Side_Net_Hole_Surfac	Opp_Ref_Side_Net_Hole_Surface_Area
1. Zone A	B2010.001	129.03	Opp_Ref_Side_Net_Surface_Are	Opp_Ref_Side_Net_Surface_Area
1. Zone A	B2010.001	77.36	Ref_Side_Length	Ref_Side_Length
1. Zone A	B2010.001	111.24	Ref_Side_Net_Hole_Surface_Are	Ref_Side_Net_Hole_Surface_Area
1. Zone A	B2010.001	167.84	Section_Perimeter	Section_Perimeter
1. Zone A	B2010.001	2.70	Sum_Door_Width	Sum_Door_Width
1. Zone A	B2010.001	143.43	Sum_Edge_Net_Surface_Area	Sum_Edge_Net_Surface_Area
1. Zone A	B2010.001	51.30	Sum_Window_Width	Sum_Window_Width
1. Zone A	B2010.001	7 210.00	Thickness	Thickness
1. Zone A	B2010.001	0.00	Wall_Column_Count	Wall_Column_Count
1. Zone A	B2010.001	0.00	Weight	Weight
1. Zone A	B2010.001	19.00	Window_Count	Window_Count
1. Zone A	B2010.001	103.88	Window_Surface_Area	Window_Surface_Area
1. Zone B	**B2010.001**	**174.73**		**Exterior Wall with Brick Veneer**
1. Zone B	B2010.001	32.40	Bottom_Area	Bottom_Area
1. Zone B	B2010.001	88.22	Center_Line_Length	Center_Line_Length
1. Zone B	B2010.001	33.00	Count	Count
1. Zone B	B2010.001	1.00	Door_Count	Door_Count
1. Zone B	B2010.001	7.36	Door_Surface_Area	Door_Surface_Area
1. Zone B	B2010.001	8.50	Empty_Opening_Count	Empty_Opening_Count
1. Zone B	B2010.001	6.58	Empty_Opening_Surface_Area	Empty_Opening_Surface_Area
1. Zone B	B2010.001	280.00	Gross_Surface_Area	Gross_Surface_Area
1. Zone B	B2010.001	101.73	Gross_Volume	Gross_Volume

Figure 272 – Model-based quantity take-off from "Structures and Quantities" in Spreadsheet View.

An Estimate in the Detailed Design Phase

Evolution of the Early Design Phase Estimate

In the early phases of your project, the cost information that you create is characterized by the amount of variance that will exist in the calculated costs. In Estimator, you will reflect this by using *Cost Ranges* and by using mainly Zone elements from the Constructor model: these low level of detail elements will provide you with the required quantities in this phase.

As the project design evolves over time, and more specific design information becomes available, you will be able to increase the specification level.

The higher specification level in the Constructor model (for example: you will add Column elements to a Zone in your model) will allow you to use more detailed Recipes.

For each element that you add to the model, you can replace a Zone based "surface area" cost with an Element based cost. Trades are no longer defined per sub system ("Cast in place concrete"), but per element ("Cast in place concrete for columns"). Quantities that can be extracted from the element level will be

more accurate. This allows you to gradually increase the level of accuracy of your estimate as the project design evolves.

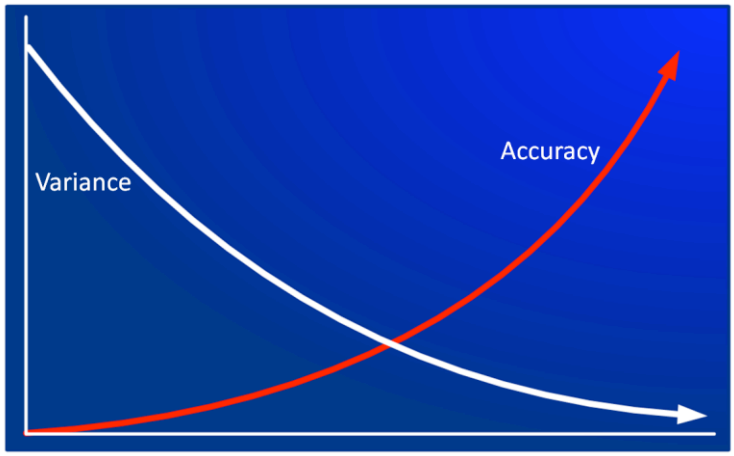


Figure 273 – Increasing levels of accuracy, due to higher specification levels, reduces variances in your cost estimate.

HOW TO: REPLACE ZONE BASED COSTS WITH ELEMENT BASED COSTS

The example, given in figure 181, can be translated into the following Recipe in Estimator:

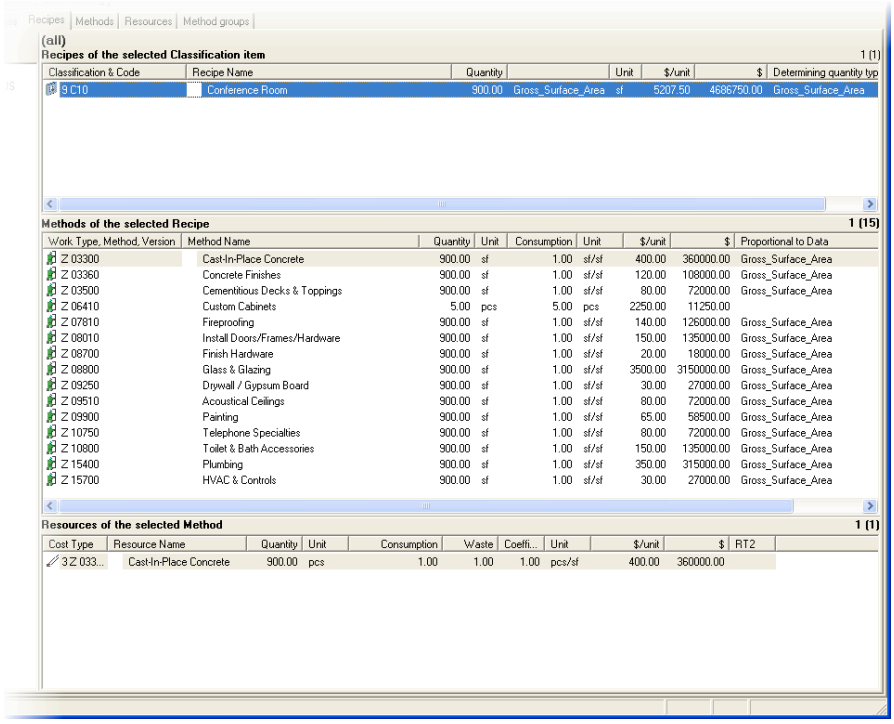


Figure 274 – An example Zone based Recipe in Estimator.

As soon as the available design information allows you to add all "Cast-In-Place Concrete" related elements to your 3D model, you can start assigning Recipes to these elements.

When you import the quantities and Recipes associated with the cast-in-place concrete elements, the cost allocation in your “Conference Room” Recipe should be removed. More detailed element based information can now replace the “cost per sqft/m2 assumption” that you included in your Recipe.

To do this, simply remove the “Cast-In-Place Concrete” Method from your “Conference Room” Recipe. The related costs will no longer be included in your estimate.

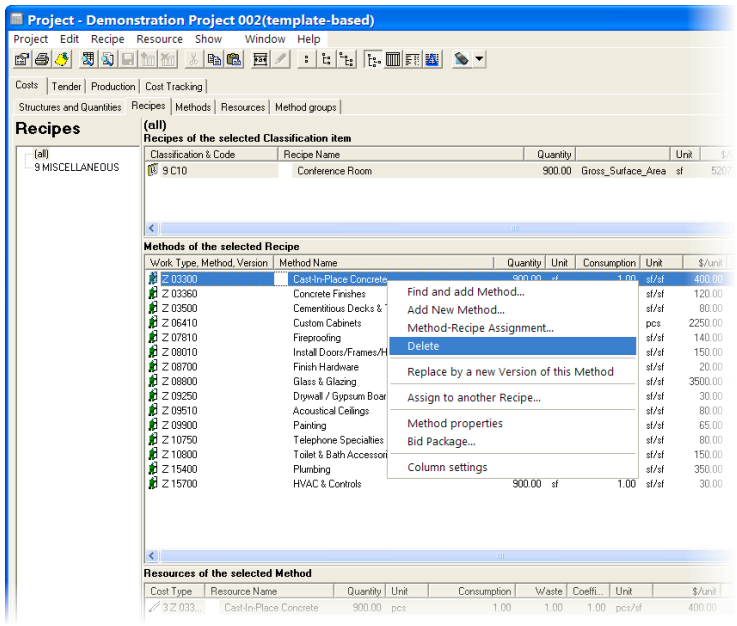


Figure 275 – Delete an allowance for a trade in your zone based Recipe once you include element based Recipes that replace the early phase cost estimate.

Element Based Recipes

Element based Recipes are Recipes that are assigned to actual building components, such as Slabs, Walls and Columns.

All quantities that are available for elements in your model can be used for estimating purposes. You can easily check which quantities will be available for an element by using the “Show Quantities of Selected Element(s)” function from the “Estimating” menu.

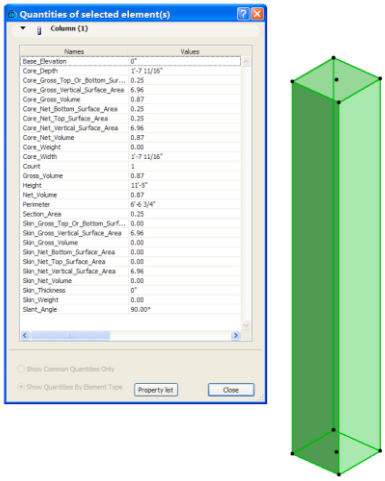


Figure 276 – Quickly checking which quantities are available for elements in your model with "Show Quantities of Selected Element(s)"

When you define an element based Recipe, you can use any of the available quantities at the Method level, regardless of the quantity type that you used on the Recipe level as a determining quantity.

Because of the large collection of available quantities for building element types, you will be able to extract more specific quantities for estimating purposes, thus making your estimate more accurate as more element based Recipes replace zone or key figure estimates.

By adding more elements and element based Recipes to your project, you will also be able to generate more detailed input for your model-based schedule, because more detailed Method information can be extracted from your model. For more information on this topic see chapter 5: "Sequence".

Alternative Use of the Recipe/Method/Resource Structure

Typically, data on the Resource level in Estimator is organized in such a way that you can generate cost reports based on a standard classification system. Examples are CSI in the US, BCIS in the UK and TALO in Finland.

There is, however, an alternative use for the Resource level, which is a classification based on your standard Bid Package structure.

Instead of adopting any of the (local) standards for categorized cost reports, you may want to consider grouping Resources (i.e. labor, material, equipment and sub contracted work) by Bid Package.

HOW TO: CLASSIFY RESOURCES BY BID PACKAGE

To define your company's standard Bid Package codes and names, go to the "Directories" tab in Estimator's main application window.

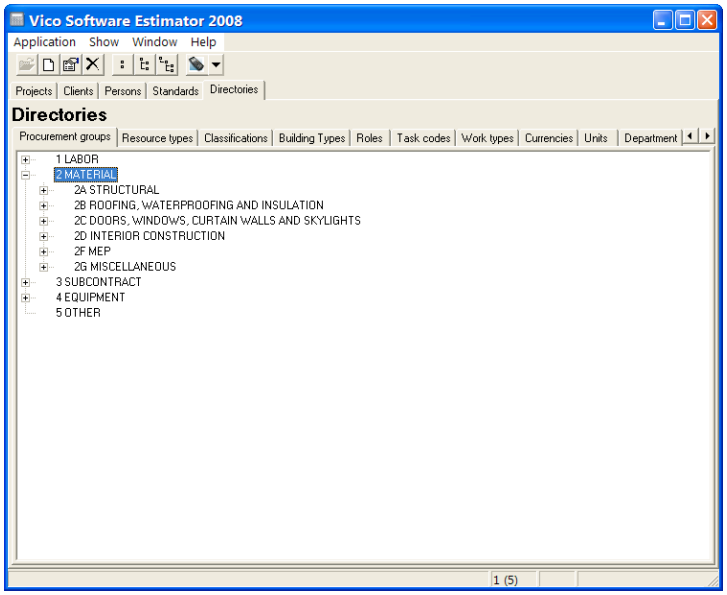


Figure 277 – The "Directories" tab in Estimator with the "Procurement Groups" tab opened.

Resource classifications are called "Procurement Groups" in Estimator, due to the nature of Resources: Resources are typically things you need to buy for your project in order to be able to perform the activities defined at the Method level.

You can make modifications in the structure that is presented to you on the "Procurement Groups" tab. By adding and/or removing standard groups, you can adjust the classification structure in such a way that it reflects your company's Bid Package structure.

To add a new group, right-click in the white area on the "Procurement Groups" tab and select "New".

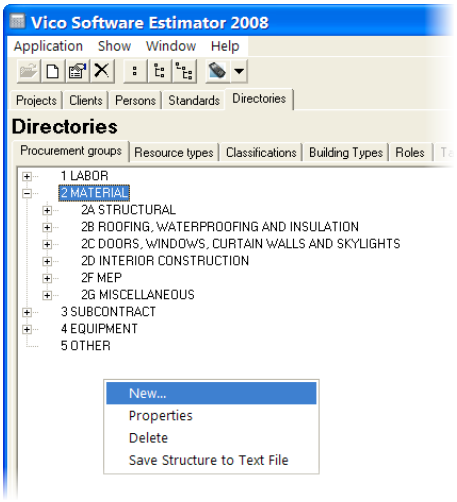


Figure 278 – Right-click and select "New" to add a new procurement group.

Estimator will open the "New Procurement Groups" dialog box.

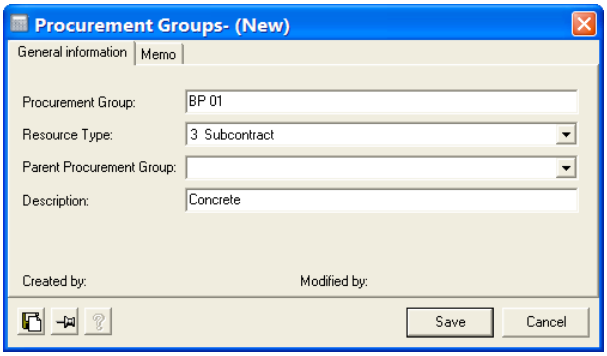


Figure 279 – The "New Procurement Groups" dialog.

Enter the required information:

Procurement Group: The code for the new group that you want to define. If defining a Bid Package: the Bid Package code.

Resource Type: The type of Resources that the new group will mainly contain. In the case of Bid Packages this will typically be "Material" or "Sub Contract"

Parent Procurement Group:	If the new group is part of a higher level group, specify what that higher level group is here.
Description:	The name of the new procurement group.

Click "Save" to save and apply the new group. You will now be able to assign Resources to the new classification (which *could* be a Bid Package) and generate Resource level reports based on it.

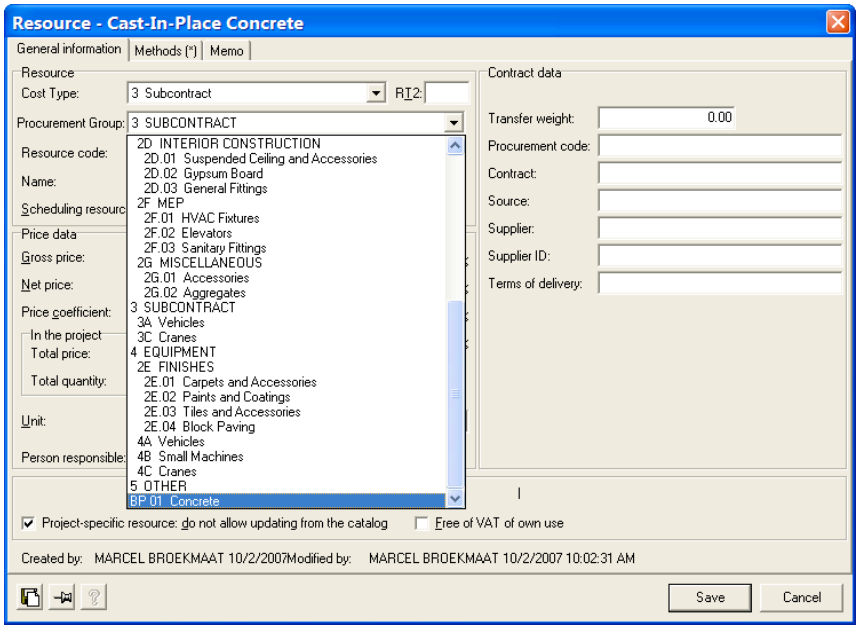


Figure 280 – Changing the Resource grouping assignment in the "Resource Properties" dialog. The newly defined procurement group is available in the list directly after saving it in "Directories".

Interactive Editing in the "Spreadsheet Mode"

In addition to the standard "Hierarchy" mode, Estimator contains a "Spreadsheet" mode, which allows you to interactively manage and edit large amounts of data in one view.

Each view (Structures and Quantities, Recipes, Methods, and Resources) has its own Spreadsheet mode, which can be activated using the "Spreadsheet mode" button () on the toolbar.

How To: Use the Spreadsheet Mode in the Structures and Quantities View

When you activate the spreadsheet mode in Structures and Quantities view, you will be presented with a "Filter Settings" dialog, in which you can define what subset of location based estimating data you want to show in the spreadsheet mode.

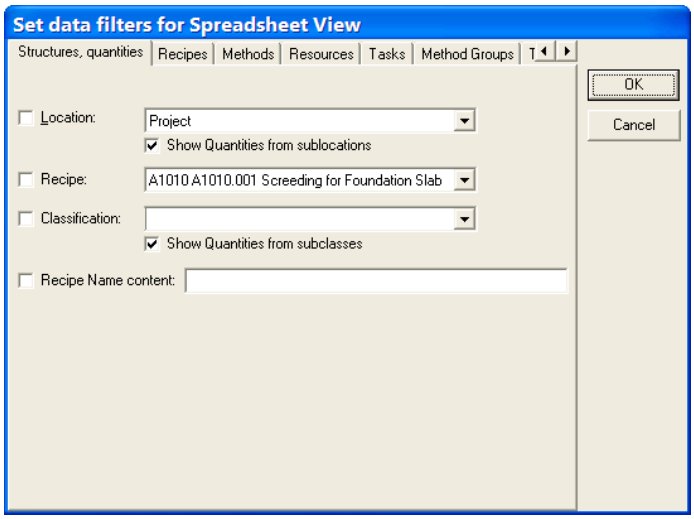


Figure 281 – The "Set Data Filter" dialog when entering the Spreadsheet mode.

You can filter out estimating data by Location, Recipe or Recipe classification. Alternatively, you can search for certain key words that will be used to filter out the required data.

Click "OK" to activate the filter and show the resulting dataset in the spreadsheet mode.

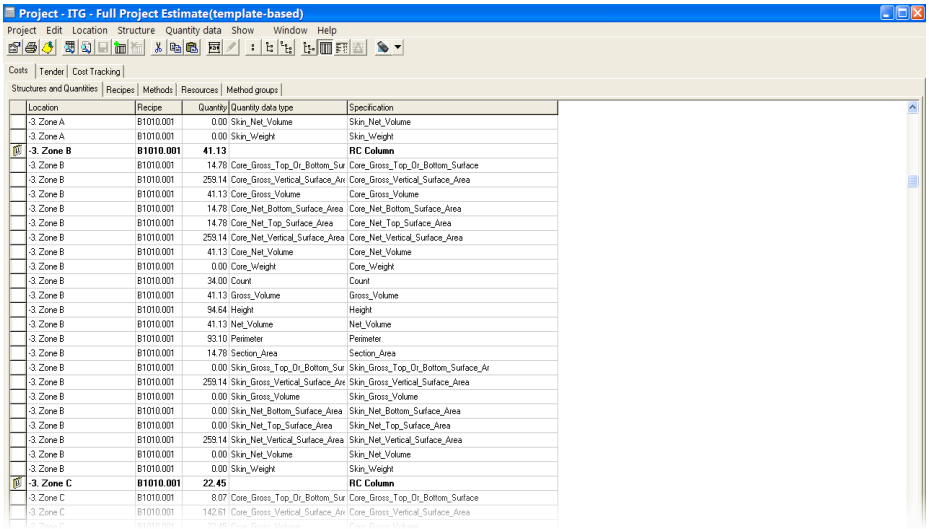


Figure 282 – Spreadsheet mode in "Structures and Quantities" view.

The Spreadsheet mode in the "Structures and Quantities" view gives you an overview of all the Locations you have either defined or imported from a model, and shows you the quantities that were defined or extracted for each of those locations.

The Spreadsheet Mode in Recipes View

When you open the Recipes view and activate the Spreadsheet mode, the – optionally filtered – collection of Recipes will be listed. You can easily make

changes to large amounts of Recipes quickly and save your changes without having to open the property dialogs boxes.

How To: Use the Spreadsheet Mode in the Recipes View

In the Recipes view, click on the "Spreadsheet Mode" button in the toolbar. You will be presented the following data filter screen:

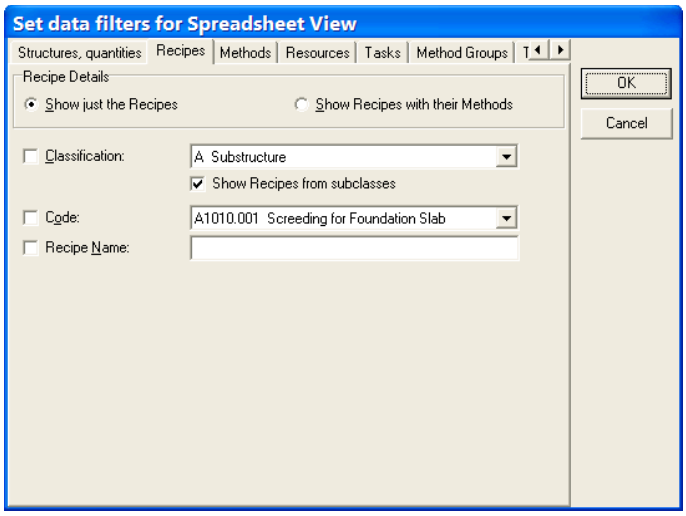
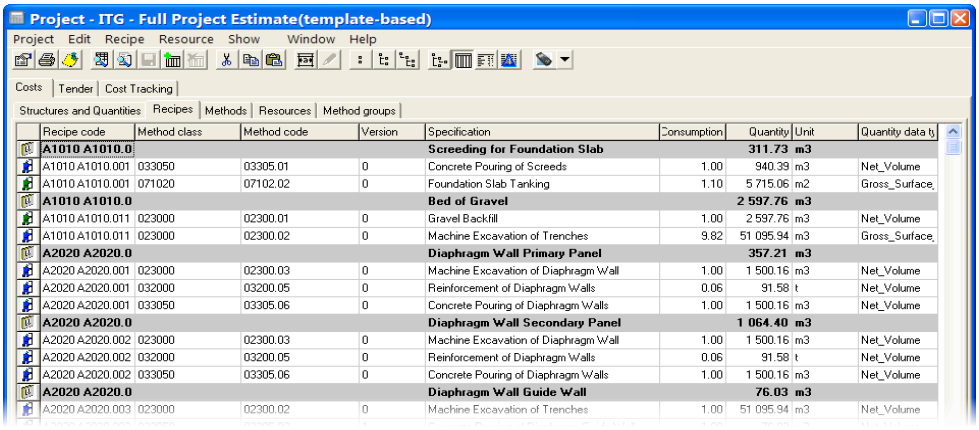


Figure 283 – Filter Settings for "Recipes View" in the spreadsheet mode.

You can decide to either include or exclude Methods for each of the Recipes. You can filter by classification, Recipe code and/or Recipe name.

After clicking the "OK" button, Estimator will show the collection of Recipes (in this case *with* their Methods) in the spreadsheet view.



Recipe code	Method class	Method code	Version	Specification	Consumption	Quantity	Unit	Quantity data ty
A1010 A1010.0				**Screeding for Foundation Slab**		**311.73**	**m3**	
A1010 A1010.001	033050	03305.01	0	Concrete Pouring of Screeds	1.00	940.39	m3	Net_Volume
A1010 A1010.001	071020	07102.02	0	Foundation Slab Tanking	1.10	5 715.06	m2	Gross_Surface_
A1010 A1010.0				**Bed of Gravel**		**2 597.76**	**m3**	
A1010 A1010.011	023000	02300.01	0	Gravel Backfill	1.00	2 597.76	m3	Net_Volume
A1010 A1010.011	023000	02300.02	0	Machine Excavation of Trenches	9.82	51 095.94	m3	Gross_Surface_
A2020 A2020.0				**Diaphragm Wall Primary Panel**		**357.21**	**m3**	
A2020 A2020.001	023000	02300.03	0	Machine Excavation of Diaphragm Wall	1.00	1 500.16	m3	Net_Volume
A2020 A2020.001	032000	03200.05	0	Reinforcement of Diaphragm Walls	0.06	91.58	t	Net_Volume
A2020 A2020.001	033050	03305.06	0	Concrete Pouring of Diaphragm Walls	1.00	1 500.16	m3	Net_Volume
A2020 A2020.0				**Diaphragm Wall Secondary Panel**		**1 064.40**	**m3**	
A2020 A2020.002	023000	02300.03	0	Machine Excavation of Diaphragm Wall	1.00	1 500.16	m3	Net_Volume
A2020 A2020.002	032000	03200.05	0	Reinforcement of Diaphragm Walls	0.06	91.58	t	Net_Volume
A2020 A2020.002	033050	03305.06	0	Concrete Pouring of Diaphragm Walls	1.00	1 500.16	m3	Net_Volume
A2020 A2020.0				**Diaphragm Wall Guide Wall**		**76.03**	**m3**	
A2020 A2020.003	023000	02300.02	0	Machine Excavation of Trenches	1.00	51 095.94	m3	Net_Volume

Figure 284 – Recipes in the spreadsheet mode.

In the spreadsheet mode, you can now easily change Recipe names, codes and/or consumption factors for the included Methods.

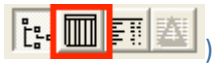
To save your changes, press <Ctrl>+<S>, or click the "Save" button ( ).

The Spreadsheet Mode in Methods View

The Spreadsheet mode in the Methods view can be considered the most powerful, because of the central position of Methods in the Estimator system.

In the Methods view, the spreadsheet mode features 10 additional columns that give you an overview of unit cost and total cost for each of the cost types. In one glance, you can see how costs included in the Recipe, are divided over several types: labor, material, equipment and sub contracted work.

HOW TO: USE THE SPREADSHEET MODE IN THE METHODS VIEW

In the Methods view, click the "Spreadsheet View" button ().

Estimator will open the Spreadsheet view Data Filter dialog, in which you can specify what Method content should be included in the view.

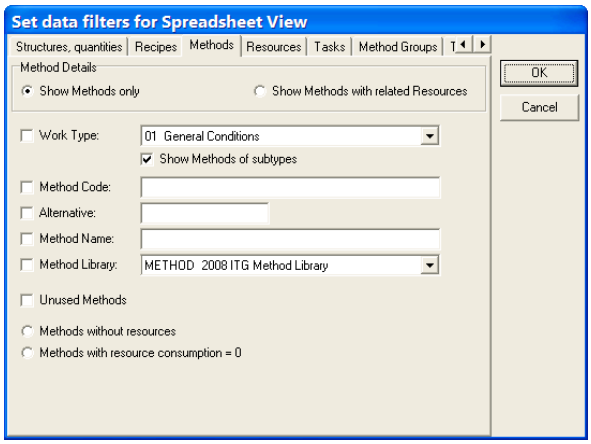


Figure 285 – Spreadsheet mode filter settings for Methods.

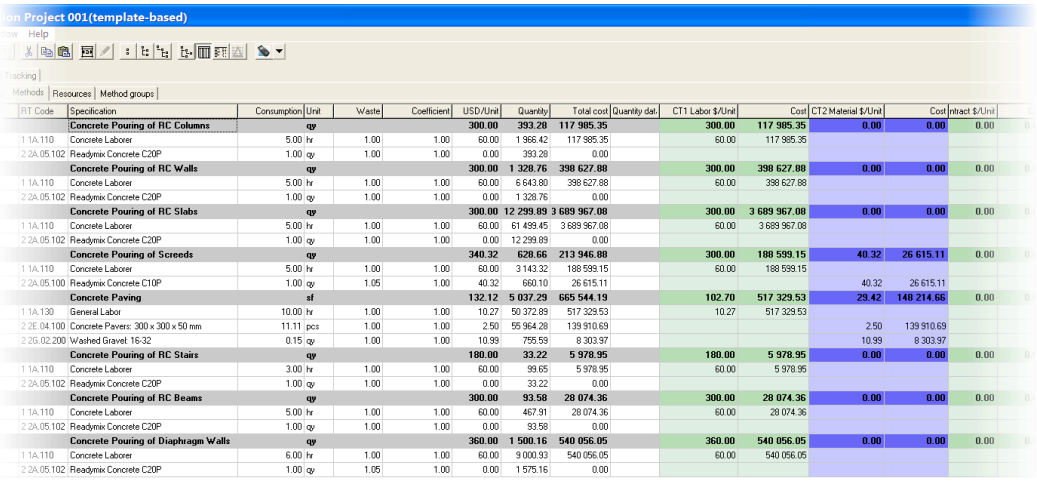
You can decide to show your Methods either with or without the related Resources with the "Method Details" radio buttons.

Filters that you may want to apply:

Work Type:	A Method classification that you want to filter out; you can decide to either include or exclude any underlying classifications with the "Show Methods of subtypes" toggle.
Method Code:	Includes Methods that match the specified code.
Alternative:	Only includes those Methods that have an "Alternative" number that matches the entered number.
Method Name:	Searches for Methods with names that match, or partially match, the specified name. Use the '*' symbol as wildcards; for example: *concrete* includes all Methods with "Concrete" in their description.
Method Library:	Only includes Methods taken from the specified

	library. Only applies if you are using more than one Method library to read from in your project.
Unused Methods:	Shows only the Methods that are not used in your project. This may occur when you have copied a collection of Methods from your library to be included in later-defined Recipes.
Methods without Resources:	Only shows those Methods that do not have a Resource included. Cost can only have been defined at the Method level in this case, or the Method costs are 0.
Methods with Resource consumption = 0	Shows all the Methods that do include Resources, but for which the Resource consumption has been set to 0, meaning that no Resource cost will be included in the Method.

Click "OK" to apply your filter(s) and display the Methods in the Spreadsheet mode.



on Project 001(template-based)

Help

Tracking

Methods | Resources | Method groups

RT Code	Specification	Consumption	Unit	Waste	Coefficient	USD/Unit	Quantity	Total cost	Quantity def.	CT1 Labor $/Unit	Cost	CT2 Material $/Unit	Cost	ntract $/Unit	
	Concrete Pouring of RC Columns		**qy**			**300.00**	**393.28**	**117 985.35**		**300.00**	**117 985.35**	**0.00**	**0.00**	0.00	
1 1A.110	Concrete Laborer	5.00	hr	1.00	1.00	60.00	1 966.42	117 985.35		60.00	117 985.35				
2 2A.05.102	Readymix Concrete C20P	1.00	qy	1.00	1.00	0.00	393.28	0.00							
	Concrete Pouring of RC Walls		**qy**			**300.00**	**1 328.76**	**398 627.88**		**300.00**	**398 627.88**	**0.00**	**0.00**	0.00	
1 1A.110	Concrete Laborer	5.00	hr	1.00	1.00	60.00	6 643.80	398 627.88		60.00	398 627.88				
2 2A.05.102	Readymix Concrete C20P	1.00	qy	1.00	1.00	0.00	1 328.76	0.00							
	Concrete Pouring of RC Slabs		**qy**			**300.00**	**12 299.89**	**3 689 967.08**		**300.00**	**3 689 967.08**	**0.00**	**0.00**	0.00	
1 1A.110	Concrete Laborer	5.00	hr	1.00	1.00	60.00	61 499.45	3 689 967.08		60.00	3 689 967.08				
2 2A.05.102	Readymix Concrete C20P	1.00	qy	1.00	1.00	0.00	12 299.89	0.00							
	Concrete Pouring of Screeds		**qy**			**340.32**	**628.66**	**213 946.88**		**300.00**	**188 599.15**	**40.32**	**26 615.11**	0.00	
1 1A.110	Concrete Laborer	5.00	hr	1.00	1.00	60.00	3 143.32	188 599.15		60.00	188 599.15				
2 2A.05.100	Readymix Concrete C10P	1.00	qy	1.05	1.00	40.32	660.10	26 615.11				40.32	26 615.11		
	Concrete Paving		**sf**			**132.12**	**5 037.29**	**665 544.19**		**102.70**	**517 329.53**	**29.42**	**148 214.66**	0.00	
1 1A.130	General Labor	10.00	hr	1.00	1.00	10.27	50 372.89	517 329.53		10.27	517 329.53				
2 2E.04.100	Concrete Pavers: 300 x 300 x 50 mm	11.11	pcs	1.00	1.00	2.50	55 964.28	139 910.69				2.50	139 910.69		
2 2G.02.200	Washed Gravel 16-32	0.15	qy	1.00	1.00	10.99	755.59	8 303.97				10.99	8 303.97		
	Concrete Pouring of RC Stairs		**qy**			**180.00**	**33.22**	**5 978.95**		**180.00**	**5 978.95**	**0.00**	**0.00**	0.00	
1 1A.110	Concrete Laborer	3.00	hr	1.00	1.00	60.00	99.65	5 978.95		60.00	5 978.95				
2 2A.05.102	Readymix Concrete C20P	1.00	qy	1.00	1.00	0.00	33.22	0.00							
	Concrete Pouring of RC Beams		**qy**			**300.00**	**93.58**	**28 074.36**		**300.00**	**28 074.36**	**0.00**	**0.00**	0.00	
1 1A.110	Concrete Laborer	5.00	hr	1.00	1.00	60.00	467.91	28 074.36		60.00	28 074.36				
2 2A.05.102	Readymix Concrete C20P	1.00	qy	1.00	1.00	0.00	93.58	0.00							
	Concrete Pouring of Diaphragm Walls		**qy**			**360.00**	**1 500.16**	**540 056.05**		**360.00**	**540 056.05**	**0.00**	**0.00**	0.00	
1 1A.110	Concrete Laborer	6.00	hr	1.00	1.00	60.00	9 000.93	540 056.05		60.00	540 056.05				
2 2A.05.102	Readymix Concrete C20P	1.00	qy	1.05	1.00	0.00	1 575.16	0.00							

Figure 286 – Result of query in Methods spreadsheet view. The colored columns to the right of your screen provide a good overview of cost divisions per Method.

To change any of the values in the spreadsheet, press F2 or double-click with your mouse. You can save the total cost for a Resource, unit cost for a Resource, and also quantities for a Resource. Press <Ctrl>+<S> to commit your changes.

Any overrides will be preserved if you select the "Keep Quantity Overrides" option in the model import dialog when importing updated model based quantities. (See: "How To: Import Model Based Quantity Data")

The Spreadsheet Mode in the Resources View

The Resources view can also be viewed in the spreadsheet mode; its main purpose is to enable quick updates of price information for Resources in either your project or in the Standards database.

Refer to "How To: Update Resource prices in the Standards and your Project" for instructions on how to use the Spreadsheet view at the Resource level.

Reporting

With Estimator's several views of your cost estimating data, you can generate cost estimating reports at different levels of detail. This allows you to create location-based, element-based, activity-based and resources/means based-cost reports.

Reporting filters allow you to specify sub selections of information and for integration with the Microsoft© Excel© software helps you to generate reporting content that can be edited and distributed using spreadsheets.

If applicable, you can define a 'social security rate' for your projects, which will automatically be included as an additional cost for "Labor" resources. See: "How To: Create a new Project" for more information on where to define the social security rate for your project.

To start creating cost reports, first decide what kind of report you want to generate; select the appropriate view in the Cost mode and start the "Report View". The available reports in Estimator's views:

View	Report	Classification
Cost Mode		
Structures and Quantities	Location-based Cost Report	Model Locations, Manual Locations
Recipes	Element-based Cost Report	Recipe Classification
Methods	Activity-based Cost Report	Method Classification ("Work Types")
Resources	Resource / Means-based Cost Report	Resource Classification ("Procurement Groups")
Tender Mode		
Tender Calculation	Tender / Bid Report	Tender Groups
Unit Price Calculation	Detailed Tender / Bid Report (Includes Methods)	Tender Groups

To start generating a cost report from any view, select "Set data filters for Report View …" to start the reporting function.

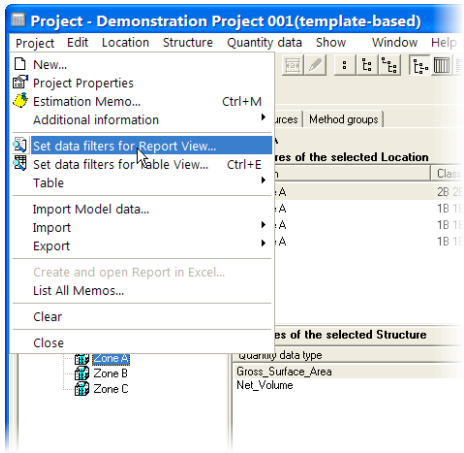


Figure 287 – Selecting "Set data filters for Report View …" to start generating a report.

After generating a report, you can always go back to either the "Hierarchy" mode by pressing the  button, or to the "Spreadsheet" mode by pressing the  button.

When you are in the "Report" mode, you can save the currently displayed report as an Excel spreadsheet by selecting "Create and open Report in Excel …"

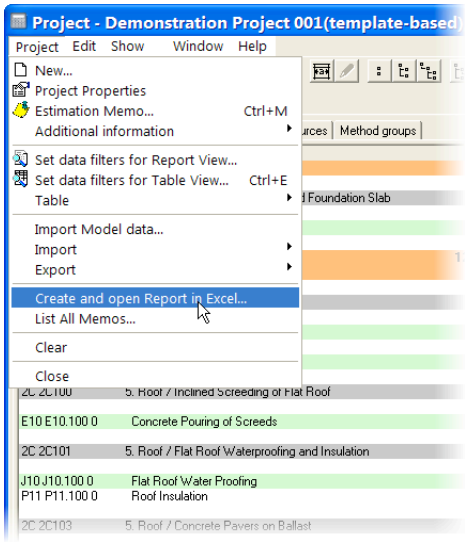


Figure 288 – Selecting "Create and open Report in Excel …" to save your report as an Excel spreadsheet.

Location Based Cost Reports

With location based cost reports, generated from the "Structures and Quantities" view in the Cost mode, you can generate an overview of your project costs by the locations that were extracted from your Constructor model and by the locations that you manually defined for the project.

How To: Generate a Location Based Cost Report

Select the "Structures and Quantities" tab in Cost mode and start the reporting function by selecting "Set data filters for Report View" from the "Project" menu.

Estimator will show the following dialog:

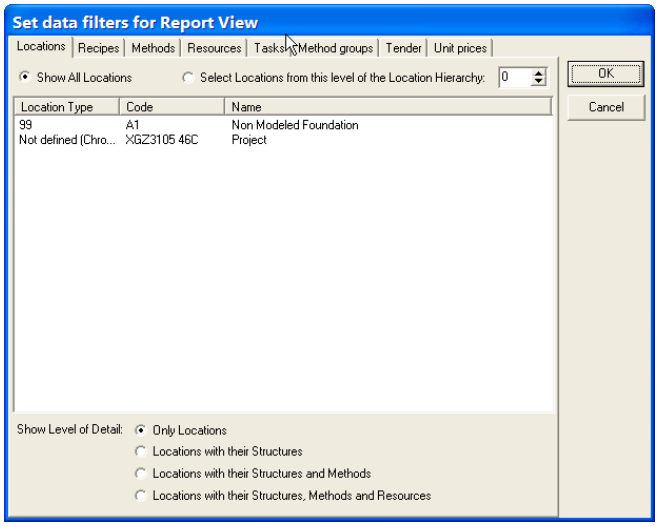


Figure 289 – The "Data Filter" for Location-based report.

You can decide to select all locations to be included in your report, or make a sub selection. When you decide to make a sub selection of the locations to be included, you are given the option to select from which level you would like to select the desired locations.

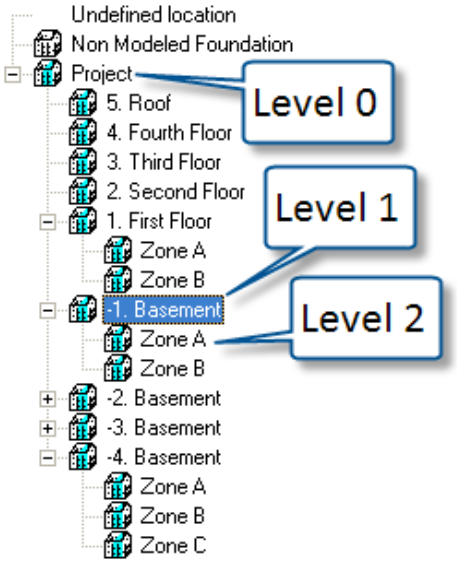


Figure 290 – The Levels in Estimator's Location structure.

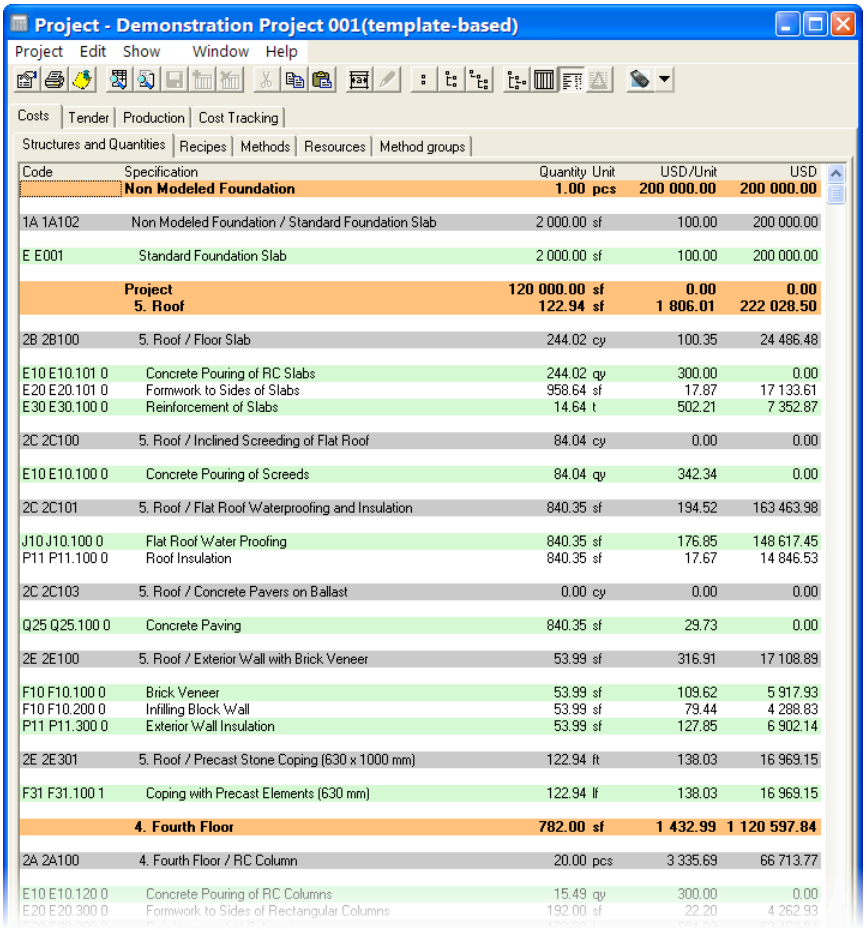
Select the appropriate level and then select the location(s) that you want to include in your report. If you want to include more than one location from the level you selected, hold down the <Ctrl> key in between selections.

The "Show Level of Detail" setting allows you to define the 'depth' of your cost estimating data. "Only Locations" will result in a report that only shows the total

cost for each location. “Locations with their Structures” will also include all Recipes for the selected locations.

If you want to add more detail, you may decide to also include Methods and/or Resources.

Click the “OK” button to apply the filter and generate the report.



Code	Specification	Quantity	Unit	USD/Unit	USD
	Non Modeled Foundation	**1.00**	**pcs**	**200 000.00**	**200 000.00**
1A 1A102	Non Modeled Foundation / Standard Foundation Slab	2 000.00	sf	100.00	200 000.00
E E001	Standard Foundation Slab	2 000.00	sf	100.00	200 000.00
	Project	**120 000.00**	**sf**	**0.00**	**0.00**
	5. Roof	**122.94**	**sf**	**1 806.01**	**222 028.50**
2B 2B100	5. Roof / Floor Slab	244.02	cy	100.35	24 486.48
E10 E10.101 0	Concrete Pouring of RC Slabs	244.02	qy	300.00	0.00
E20 E20.101 0	Formwork to Sides of Slabs	958.64	sf	17.87	17 133.61
E30 E30.100 0	Reinforcement of Slabs	14.64	t	502.21	7 352.87
2C 2C100	5. Roof / Inclined Screeding of Flat Roof	84.04	cy	0.00	0.00
E10 E10.100 0	Concrete Pouring of Screeds	84.04	qy	342.34	0.00
2C 2C101	5. Roof / Flat Roof Waterproofing and Insulation	840.35	sf	194.52	163 463.98
J10 J10.100 0	Flat Roof Water Proofing	840.35	sf	176.85	148 617.45
P11 P11.100 0	Roof Insulation	840.35	sf	17.67	14 846.53
2C 2C103	5. Roof / Concrete Pavers on Ballast	0.00	cy	0.00	0.00
Q25 Q25.100 0	Concrete Paving	840.35	sf	29.73	0.00
2E 2E100	5. Roof / Exterior Wall with Brick Veneer	53.99	sf	316.91	17 108.89
F10 F10.100 0	Brick Veneer	53.99	sf	109.62	5 917.93
F10 F10.200 0	Infilling Block Wall	53.99	sf	79.44	4 288.83
P11 P11.300 0	Exterior Wall Insulation	53.99	sf	127.85	6 902.14
2E 2E301	5. Roof / Precast Stone Coping (630 x 1000 mm)	122.94	ft	138.03	16 969.15
F31 F31.100 1	Coping with Precast Elements (630 mm)	122.94	lf	138.03	16 969.15
	4. Fourth Floor	**782.00**	**sf**	**1 432.99**	**1 120 597.84**
2A 2A100	4. Fourth Floor / RC Column	20.00	pcs	3 335.69	66 713.77
E10 E10.120 0	Concrete Pouring of RC Columns	15.49	qy	300.00	0.00
E20 E20.300 0	Formwork to Sides of Rectangular Columns	192.00	sf	22.20	4 262.93

Figure 291 – The results of a Location Based cost report.

Element Based Cost Report

Element based cost reports are generated from the “Recipes” view in the Cost mode. Cost data are categorized using the classification system that you have defined for your Recipe content.

HOW TO: GENERATE AN ELEMENT BASED COST REPORT

Select the “Recipes” tab in the Cost mode and “Set data filters for Report View” from the “Project” menu.

Estimator opens the report filter settings for Recipes:

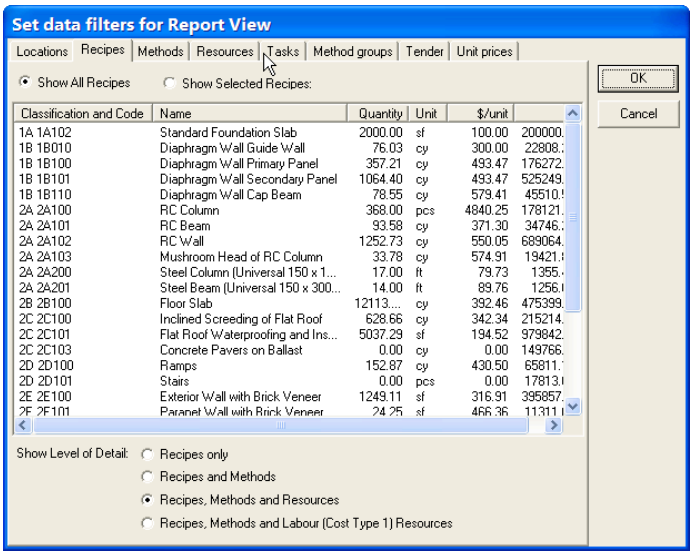


Figure 292 – Data filter settings for Recipes reports.

In the filter settings, you can select which Recipes you want to include. Either select all, or select the desired Recipes in the list. Hold the <Ctrl> key to select multiple items.

With the "Show Level of Detail" setting, you can define how much information should be included for each Recipe.

If you select the "Recipes, Methods and Labor (Cost Type 1) Resources, only the Resources of the "Labor" cost type will be included in your report.

Click the "OK" button to generate your report. When you have Recipes with Cost Ranges enabled, you will see a warning message: resolve this by activating the "Cost Range" mode in the Recipes view.

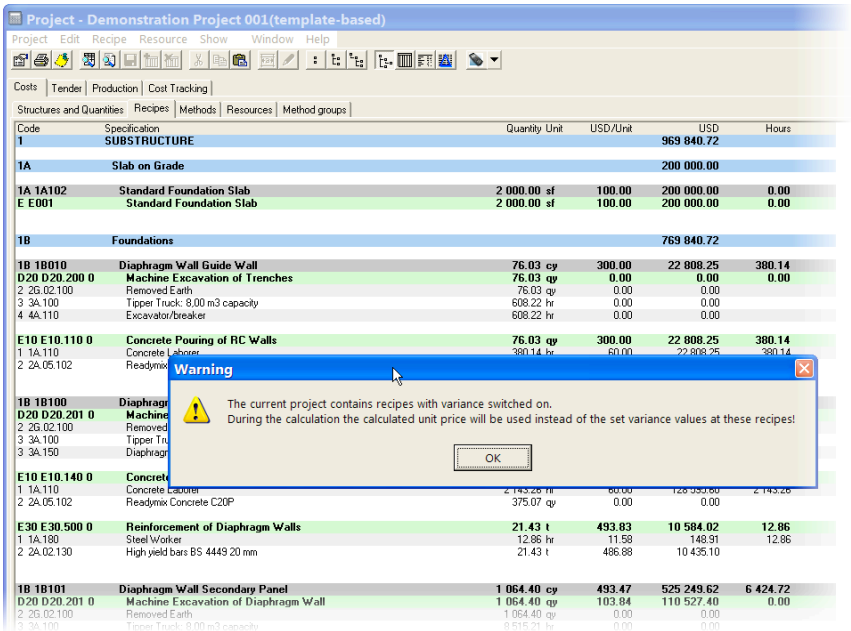


Figure 293 – An element-based cost report generated from the Recipes view.

Activity Based Cost Reports

Methods contain cost information for the activities that need to be performed to build an element defined by a Recipe. The activity-based cost report that you can generate from the Methods view collects all Methods from all Recipes and totals the quantities of identical Methods used in different Recipes.

HOW TO: GENERATE AN ACTIVITY BASED COST REPORT

Select the "Methods" view in the Cost mode and select the "Set data filters for Report View…" function from the "Project" menu.

The following dialog will be displayed:

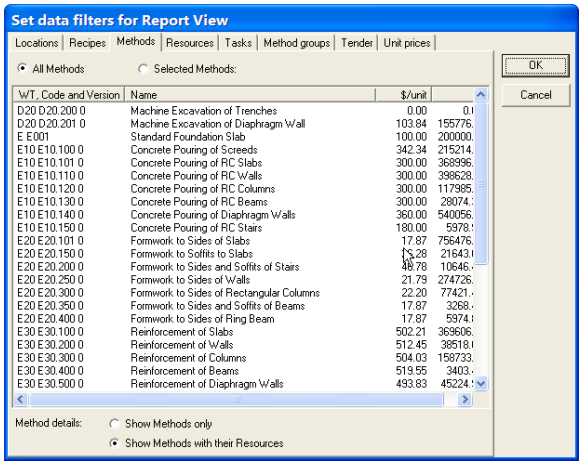


Figure 294 – Report filter settings for an activity based cost report.

Select either "All Methods" or a set of individual Methods, holding the <Ctrl> key in case of multiple selections.

Next, select the level of detail: show only Methods, or include the Resources for each Method as well.

After setting up your filter, click "OK" to generate your report.

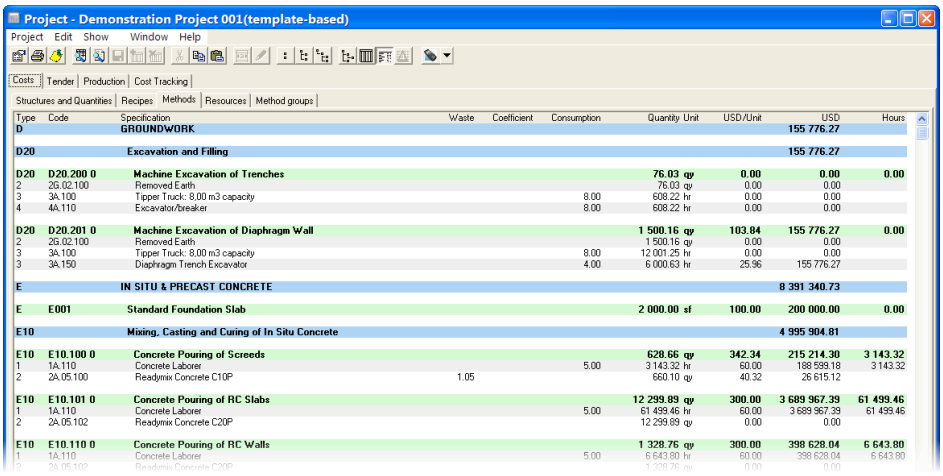


Figure 295 – An activity-based cost report: the blue lines reflect classifications, the green lines are Methods.

Means Cost Reports

From the "Resources" view in Estimator, you can generate an overview of the means that you need to purchase in order to build the project you are working on.

As described in the earlier sections, Resources are categorized in "Cost Types" (labor, material, equipment, sub contracted work, and other) and "Procurement Group" classifications. Both classifications can be used to generate the report that you need.

HOW TO: GENERATE MEANS COST REPORTS

Select the "Resources" view from the Cost Mode. Start the reporting function from "Project > Set data filters for Report View…".

Estimator shows the following dialog box:

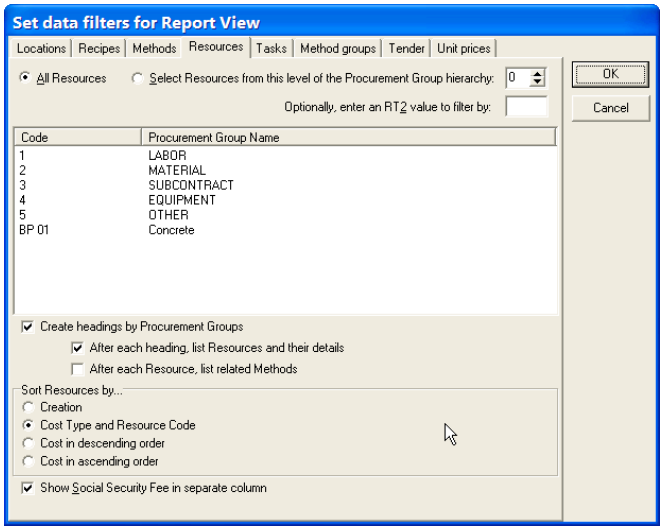


Figure 296 – The Resource report filters dialog.

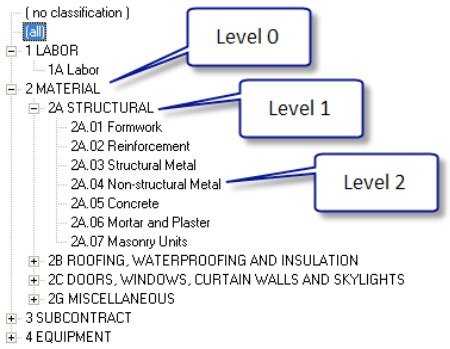
The Resources filter dialog provides you with the following settings.

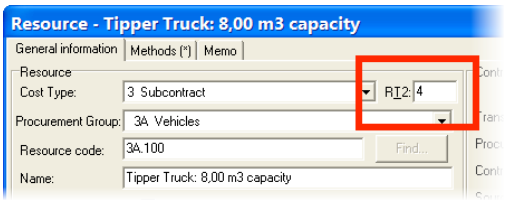
All Resources

Include all Resources in the entire project in your report.

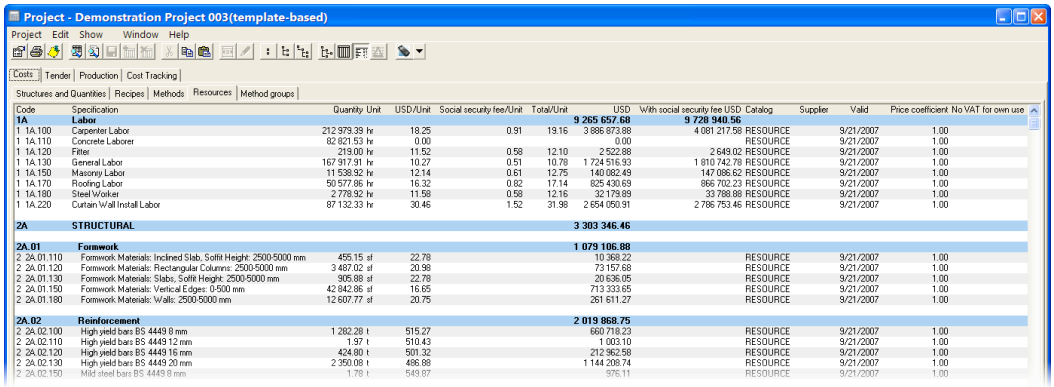
Select Resources from this level of the Procurement Group hierarchy

Select the level of the classification system from which you want to select Resource groups:



Enter RT2 Filter	Some Resources have an alternative Resource type assigned. For example, this may be the case when a Resource includes “Sub Contracted Work”, but also “Equipment”. 
Create headings by procurement group	Adds a header for each Resource classification and shows the sum of all the included Resources.
After each heading, list Resources and their details	Includes the actual Resources. To shorten your report, leave this option unchecked.
After each Resource, list related Methods	Allows you to analyze for which activities (Methods) a Resource is required by listing the Methods in which it is used.
Sorting Options:	*By creation date* – sort by the date on which a Resource was defined; *By cost type and Resource code* – groups the same cost types (e.g. labor, cost, and material) and then sorts by the Resource code; *Cost in descending/ascending order* – sorts by the total cost associated with the Resource.
Show Social Security Fee in separate column	Includes the calculated value for any social security fees, applied to “labor” type resources in a separate column. Only applies when a “Social Security Rate” has been defined in the project properties.

Click “OK” to apply your settings and generate the report.



Code	Specification	Quantity	Unit	USD/Unit	Social security fee/Unit	Total/Unit	USD	With social security fee USD	Catalog	Supplier	Valid	Price coefficient	No VAT for own use
1A	Labor						9 265 657.68	9 728 940.56					
1 1A.100	Carpenter Labor	212 979.39	hr	18.25	0.91	19.16	3 886 873.88	4 081 217.56	RESOURCE		9/21/2007	1.00	
1 1A.110	Concrete Laborer	82 821.53	hr	0.00			0.00		RESOURCE		9/21/2007	1.00	
1 1A.120	Fitter	219.00	hr	11.52	0.58	12.10	2 522.88	2 649.02	RESOURCE		9/21/2007	1.00	
1 1A.130	General Labor	167 917.91	hr	10.27	0.51	10.78	1 724 516.93	1 810 742.79	RESOURCE		9/21/2007	1.00	
1 1A.150	Masonry Labor	11 538.92	hr	12.14	0.61	12.75	140 082.49	147 086.62	RESOURCE		9/21/2007	1.00	
1 1A.170	Roofing Labor	50 577.86	hr	16.32	0.82	17.14	825 430.69	866 702.23	RESOURCE		9/21/2007	1.00	
1 1A.180	Steel Worker	2 778.92	hr	11.58	0.58	12.16	32 179.89	33 788.88	RESOURCE		9/21/2007	1.00	
1 1A.220	Curtain Wall Install Labor	87 132.33	hr	30.46	1.52	31.98	2 654 050.91	2 786 753.46	RESOURCE		9/21/2007	1.00	
2A	STRUCTURAL						3 303 346.46						
2A.01	Formwork						1 079 106.88						
2 2A.01.110	Formwork Materials: Inclined Slab, Soffit Height: 2500-5000 mm	455.15	sf	22.78			10 368.22		RESOURCE		9/21/2007	1.00	
2 2A.01.120	Formwork Materials: Rectangular Columns: 2500-5000 mm	3 487.02	sf	20.98			73 157.68		RESOURCE		9/21/2007	1.00	
2 2A.01.130	Formwork Materials: Slabs, Soffit Height: 2500-5000 mm	905.88	sf	22.78			20 636.05		RESOURCE		9/21/2007	1.00	
2 2A.01.150	Formwork Materials: Vertical Edges: 0-500 mm	42 842.86	sf	16.65			713 333.65		RESOURCE		9/21/2007	1.00	
2 2A.01.180	Formwork Materials: Walls: 2500-5000 mm	12 607.77	sf	20.75			261 611.27		RESOURCE		9/21/2007	1.00	
2A.02	Reinforcement						2 019 868.75						
2 2A.02.100	High yield bars BS 4449 8 mm	1 282.28	t	515.27			660 718.23		RESOURCE		9/21/2007	1.00	
2 2A.02.110	High yield bars BS 4449 12 mm	1.97	t	510.43			1 003.10		RESOURCE		9/21/2007	1.00	
2 2A.02.120	High yield bars BS 4449 16 mm	424.80	t	501.32			212 962.58		RESOURCE		9/21/2007	1.00	
2 2A.02.130	High yield bars BS 4449 20 mm	2 350.08	t	496.88			1 144 208.74		RESOURCE		9/21/2007	1.00	
2 2A.02.150	Mild steel bars BS 4449 8 mm	1.78	t	549.87			976.11		RESOURCE		9/21/2007	1.00	

Figure 297 – A means-based cost report; a social security fee is displayed in a separate column for "labor" cost type Resources. The blue lines indicate "Procurement Group" classifications.

Tendering (Bidding)

This chapter will familiarize you with the processes implemented in Vico Estimator to create a tender (or: *bid*) document. Estimator's "Tender" mode will help you to receive and compare bids from sub contractors and also to generate your own bid documents that include profit and risk margins.

Bidding and Sub Contracting

Vico Estimator contains functionality for defining and comparing Bid Packages, which helps you to analyze and select incoming proposals from sub contractors and suppliers.

Estimator's bid functionality can be found in the "Tender" mode; select the "Bid Packages" tab to start defining and comparing quotes from sub contractors and suppliers, based on your cost estimating content.

HOW TO: DEFINE AND POPULATE A BID PACKAGE

Select "Bid Packages" in Estimator's "Tender" mode.

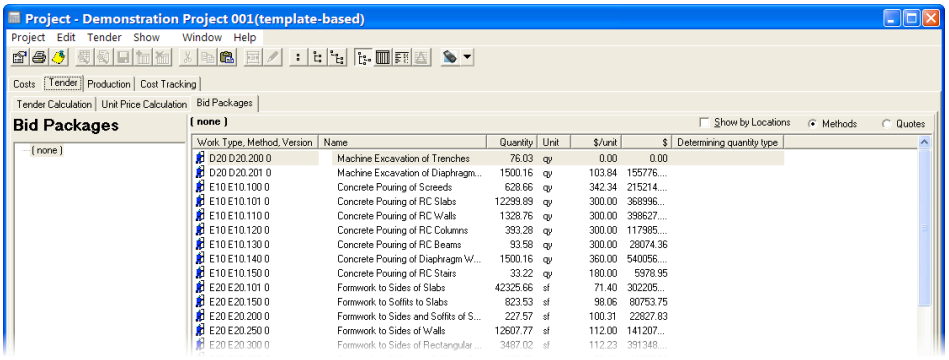


Figure 298 – The "Bid Packages" view in the "Tender" mode.

To create a new Bid Package, right click in the white area to the left side of your screen.

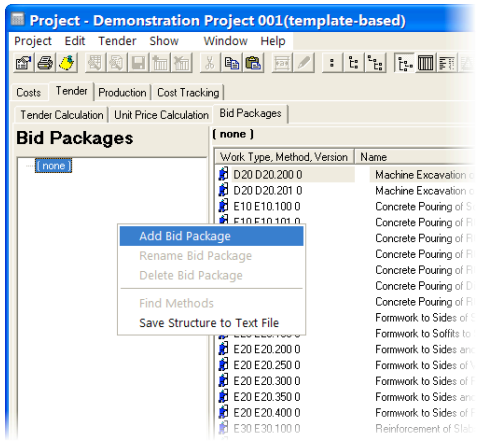


Figure 299 – Adding a new Bid Package by right-clicking in the area to the left of your screen.

Estimator will open the "New Bid Package" dialog box:

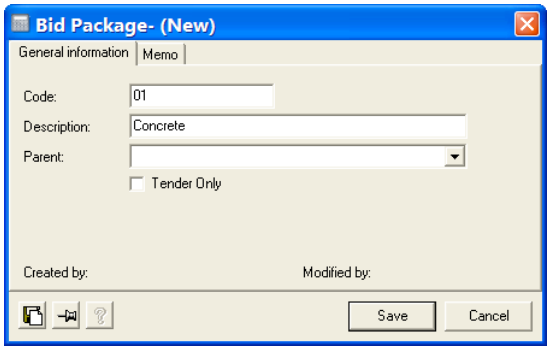


Figure 300 – The "New Bid Package" dialog box.

Enter a code and a description for the new Bid Package. If the new Bid Package should be part of another Bid Package, select the group to which it should belong in the "Parent" field.

The "Tender Only" checkbox is used for integration with ERP systems and has no further use inside the Estimator application.

Click "Save" to add the new Bid Package.

You now have to create a new "Bid Package" folder; you can include Methods in the Bid Package by dragging and dropping Methods from the right window into the folder.

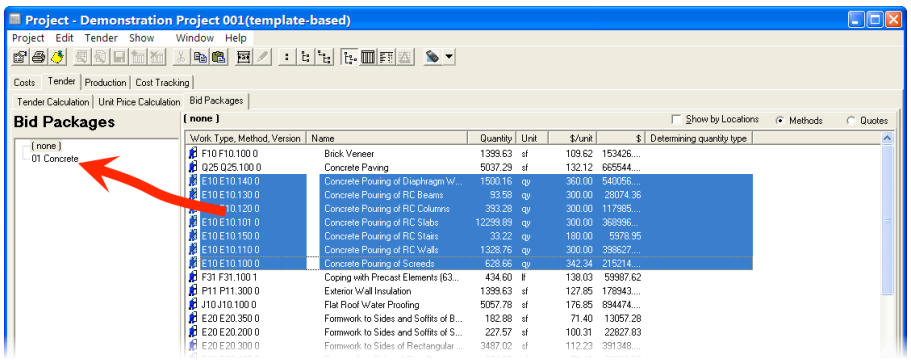


Figure 301 – Dragging and Dropping (a selection of) Methods into your Bid Package folder.

Use the “Show by Locations” toggle to list the Methods by Location, which makes it possible to assign Methods to Bid Packages by Location. This will turn out to be especially useful in the case of higher buildings, where materials and subcontracted work tend to be more expensive on higher floors.

Another way to include Methods in your Bid Package is to perform a “Find” operation. Right-click on the Bid Package and select “Find Methods”.

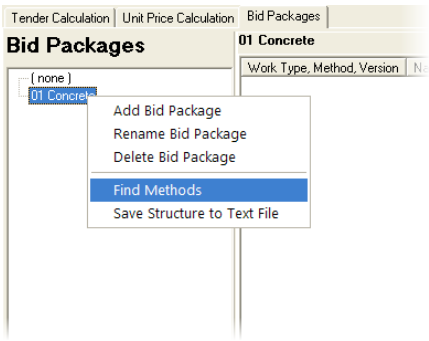


Figure 302 – Right-clicking and select “Find Methods” to search for Methods.

Estimator opens the “Import” dialog, which allows you to search the project for the Methods you want to include in the selected Bid Package.

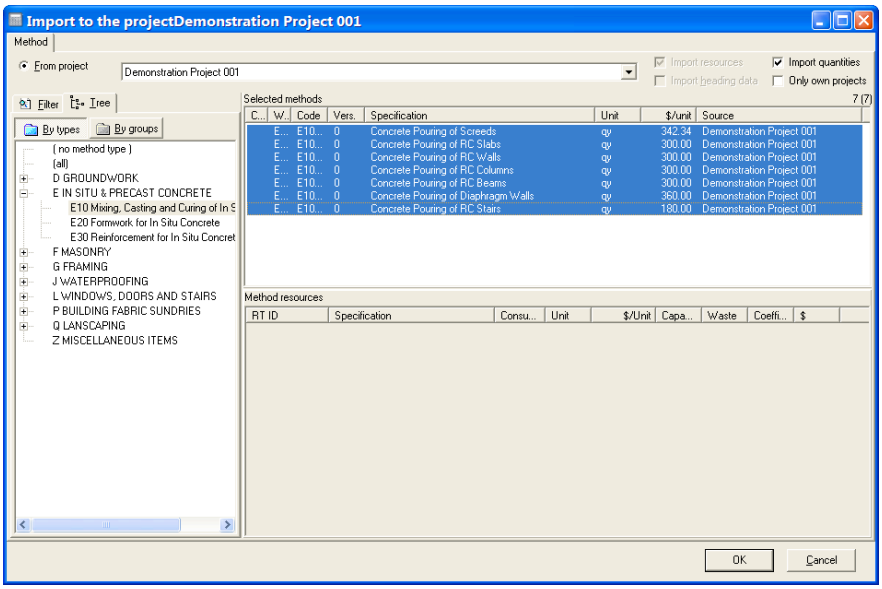


Figure 303 – The “Find Methods” dialog.

In the “Find Methods” dialog, select the Work Type (Method classification) in which the Methods that you want to include in the Bid Package are located.

Alternatively, you can select the “Filter” tab, to search the project for Methods based on criteria that you define.

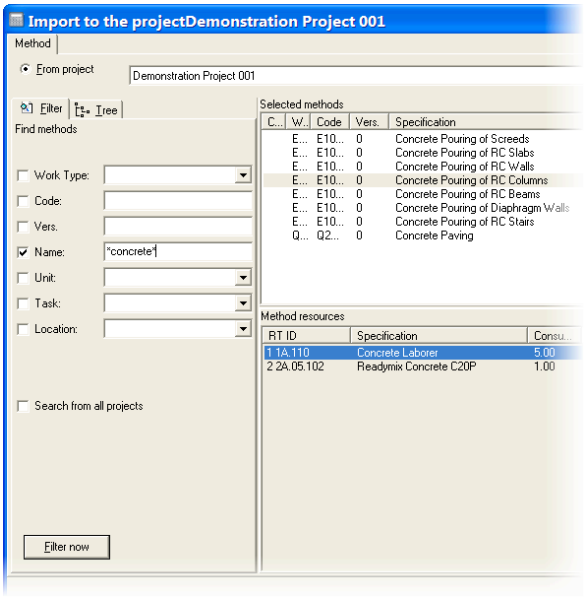


Figure 304 – Using the "Filter" tab to search for Methods using filter criteria. Use the '*' symbol as wildcard keys; click "Filter now" to perform the search action.

After you have found and selected the Methods you want to include in your Bid Package, click "OK".

Once you have included Methods in your Bid Packages, you can start entering quotes that you have received from sub contractors and suppliers in the "Quotes" view.

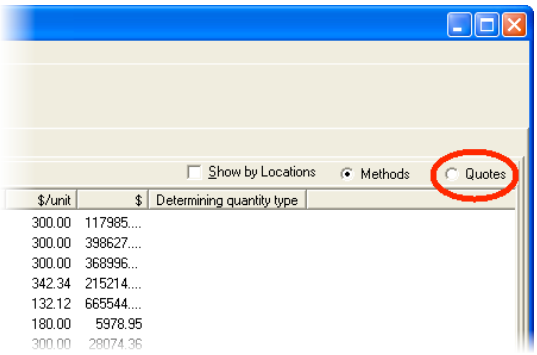


Figure 305 – Changing to the "Quotes" view by selecting the "Quotes" toggle.

How To: Enter, Compare and Select Received Quote Information

Select the "Quotes" mode in "Bid Packages"; Estimator will display your Bid Package information in the "Quotes" view.

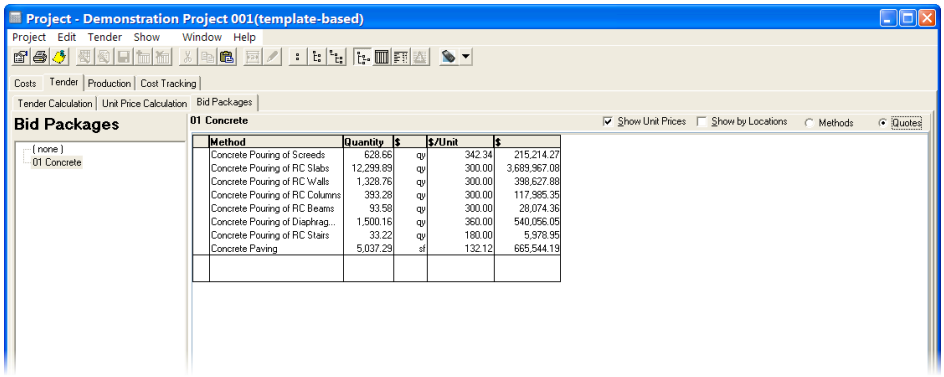


Figure 306 – The "Quotes" view of "Bid Packages".

To add a new quote, right click right next to the Methods that are included in the Bid Package. Select "Insert Quote" to add a new column.

You can now enter the quote information received from a sub contractor or supplier in each of the cells.

For each quote, add a new "Quote", by right-clicking and selecting "Insert Quote".

Method	Quantity	$	$/Unit	$	Example 1		Example 2	
Concrete Pouring of Screeds	628.66	qy	342.34	215,214.27	342.00	215,000.00	0.00	-
Concrete Pouring of RC Slabs	12,299.89	qy	300.00	3,689,967.08	300.82	3,700,000.00	0.00	-
Concrete Pouring of RC Walls	1,328.76	qy	300.00	398,627.88	285.98	380,000.00	0.00	-
Concrete Pouring of RC Columns	393.28	qy	300.00	117,985.35	292.41	115,000.00	0.00	-
Concrete Pouring of RC Beams	93.58	qy	300.00	28,074.36	299.21	28,000.00	0.00	-
Concrete Pouring of Diaphrag...	1,500.16	qy	360.00	540,056.05	359.96	540,000.00	0.00	-
Concrete Pouring of RC Stairs	33.22	qy	180.00	5,978.95	174.59	5,800.00	0.00	-
Concrete Paving	5,037.29	sf	132.12	665,544.19	131.02	660,000.00	0.00	-
Total Price						**5,643,800.00**		**5,400,000.00**
Total for the Selected						**0.00**		**5,400,000.00**

Figure 307 – Entering Bid information by inserting Quotes.

You can either enter the quoted price for all individual Methods in your Bid Package, or you can define the total Price for the package.

Estimator allows you to compare all quoted prices side-by-side. After you make your decision, you can mark the quote you want to award by checking the box right next to an item or next to a total price of a Bid Package.

After selecting a quoted price, the original Method cost, as defined in "Cost" mode, is overridden by the quote price.

Bid Packages are included in all Recipe, Method and Resource reports when you choose to include them by clicking "Yes" in the "Do you want to include Bid Package information" box.

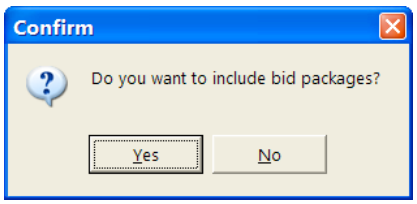


Figure 308 – When generating a cost report, you will be given the option to include Bid Package information.

After generating the cost report, your awarded Bid Packages will be listed at the bottom of your report:

2	2B.01.151	XPS Insulation Board: 50 mm	2.00	10 074.58 sf	8.32	83 820.48	
P11	P11.300 0	Exterior Wall Insulation		1 399.63 sf	127.85	178 943.06	16 795.59
1	1A.130	General Labor	12.00	16 795.59 hr	10.27	172 490.76	16 795.59
2	2B.01.100	Rock Wool Insulation: 60 mm		1 399.63 sf	4.61	6 452.31	
Z		MISCELLANEOUS ITEMS				0.00	
Z	Z001	Number		368.00 pcs	0.00	0.00	0.00
	Bid Packages						
01		Concrete				5 400 000.00	
E10	E10.100 0	Concrete Pouring of Screeds		628.66 qy		0.00	3 143.32
1	1A.110	Concrete Laborer	5.00	3 143.32 hr			3 143.32
2	2A.05.100	Readymix Concrete C10P	1.05	660.10 qy			
E10	E10.101 0	Concrete Pouring of RC Slabs		12 299.89 qy		0.00	61 499.45
1	1A.110	Concrete Laborer	5.00	61 499.45 hr			61 499.45
2	2A.05.102	Readymix Concrete C20P		12 299.89 qy			
E10	E10.110 0	Concrete Pouring of RC Walls		1 328.76 qy		0.00	6 643.80
1	1A.110	Concrete Laborer	5.00	6 643.80 hr			6 643.80
2	2A.05.102	Readymix Concrete C20P		1 328.76 qy			
E10	E10.120 0	Concrete Pouring of RC Columns		393.28 qy		0.00	1 966.42
1	1A.110	Concrete Laborer	5.00	1 966.42 hr			1 966.42
2	2A.05.102	Readymix Concrete C20P		393.28 qy			
E10	E10.130 0	Concrete Pouring of RC Beams		93.58 qy		0.00	467.91
1	1A.110	Concrete Laborer	5.00	467.91 hr			467.91
2	2A.05.102	Readymix Concrete C20P		93.58 qy			
E10	E10.140 0	Concrete Pouring of Diaphragm Walls		1 500.16 qy		0.00	9 000.93
1	1A.110	Concrete Laborer	6.00	9 000.93 hr			9 000.93
2	2A.05.102	Readymix Concrete C20P	1.05	1 575.16 qy			
E10	E10.150 0	Concrete Pouring of RC Stairs		33.22 qy		0.00	99.65
1	1A.110	Concrete Laborer	3.00	99.65 hr			99.65
2	2A.05.102	Readymix Concrete C20P		33.22 qy			
Q25	Q25.100 0	Concrete Paving		5 037.29 sf		0.00	50 372.89
1	1A.130	General Labor	10.00	50 372.89 hr			50 372.89
2	2E.04.100	Concrete Pavers: 300 x 300 x 50 mm	11.11	55 964.28 pcs			
2	2G.02.200	Washed Gravel: 16-32	0.15	755.59 qy			
		Listed methods in total				12 438 732.82	615 536.09
		Contains a social security charge of 0.00		14 229 970.41		0.00	615 536.09

Figure 309 – A Method based cost report with Bid Packages and the awarded Bid Price listed at the bottom of the report.

Tender Groups

Tender Groups are the headers that you will see in the Tender report that you will create at the end of the Tender documentation process.

Tender Groups can be created on several classification systems available in the project.

HOW TO: DEFINE TENDER GROUPS

In the "Tender" mode, select the "Tender Calculation" tab.

To define Tender Groups based on a classification system, click "Tender Groups" and "Create Tender Groups automatically"

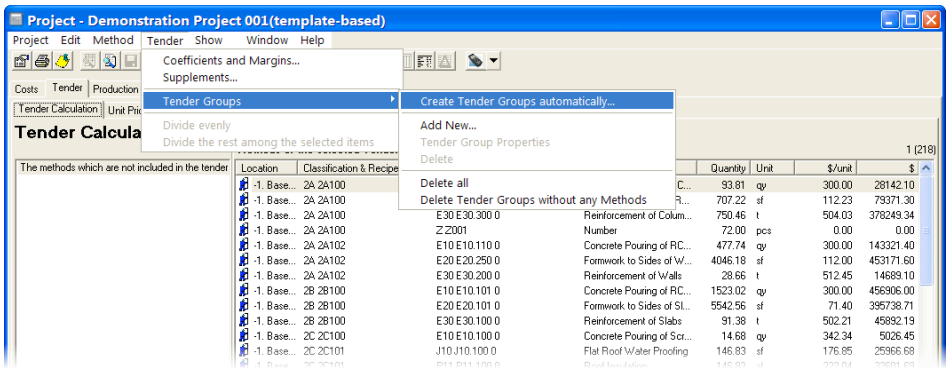


Figure 310 – Automatically creating "Tender Groups" based on a classification system.

Estimator will present the following options:

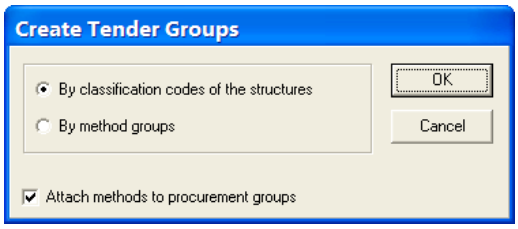


Figure 311 – The options for automatic creation of Tender Groups

Choose which classification system should be used to generate the chapters of the Tender document:

- Classification codes of the structures will result in a Recipe-classification-based Tender report
- Method Groups will result in a very detailed Tender report, based on the Method classification system.

The optional "**Attach Method to procurement groups**" will automatically create procurement groups for use in a procurement system.

When completed, the resulting Tender grouping will appear in a tree view on the left side of the interface. When you select any of the chapters, the included Methods will be shown in the main window.

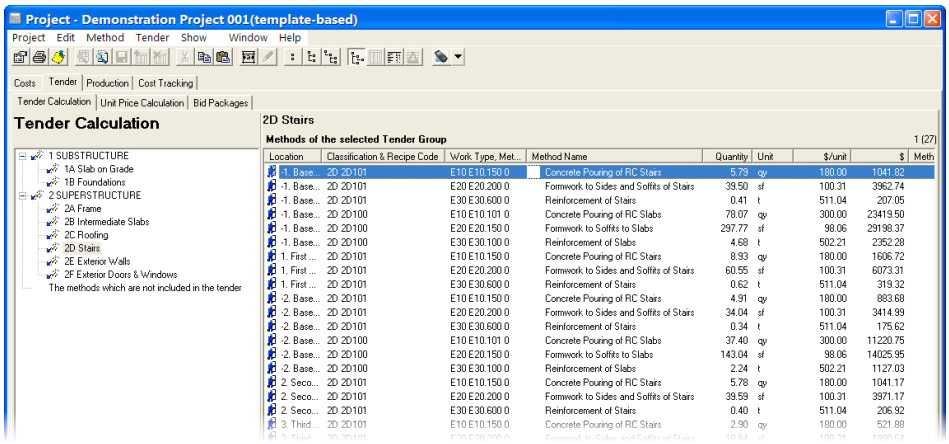


Figure 312 – The results of generating Tender Groups based on "Classification code of the structures".

You can manually edit the created Tender groups by using the "Add new" function from the Tender menu.

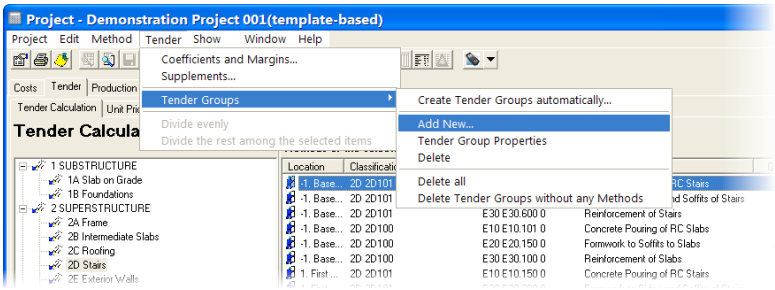


Figure 313 – Inserting a new Tender Group by selecting the "Add New" option from the "Tender" menu.

After you have defined the properties for the new group, it will appear in the tree view. You can add Methods from other Tender groups to the new group by dragging and dropping them into the tree structure.

Defining Profit and Risk Margins

The cost that you calculate and report in the "Cost" mode is the cost that your company has to pay for the Resources it is buying from sub contractors and suppliers. The total cost for the project is thus the "cost price", and does not contain any margin for risk and/or profit. These margins can be added and divided over your "Tender Groups" in Tender mode.

HOW TO: ADD COEFFICIENTS AND MARGINS

Click on Tender and "Coefficients and Margins" when you are in the Tender mode.

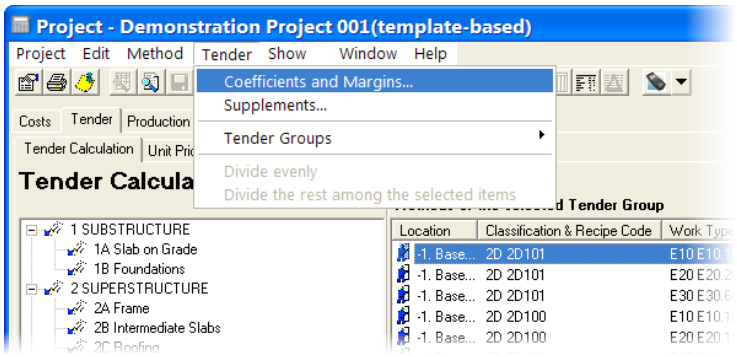


Figure 314 – Coefficients and Margins in the "Tender" menu.

Estimator will open the "Coefficients and Margins" dialog:

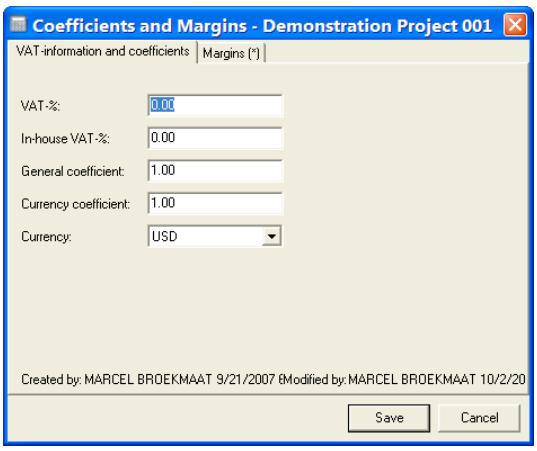


Figure 315 – The Coefficients and Margins Dialog; VAT information and coefficients.

In the first tab, "Coefficients and Margins", you can define the percentage of VAT that needs to be included in your bid price. In-house VAT is a value that applies only to those Resources that were marked as applicable to this VAT. In-house VAT is a tax form that is in use in some European countries.

The General coefficient can be used to assign an overall complexity factor to the project. If the sum of all costs does not, in your opinion, reflect the cost of the complexity of the project that should be accounted for, you can change this factor to a value larger than 1.0.

The currency coefficient allows you convert the Tender document into a currency other than the one that was used for the cost estimate. The currency field allows you to select the required currency for the Tender document.

When you click the "Margins" tab, the following dialog box will appear:

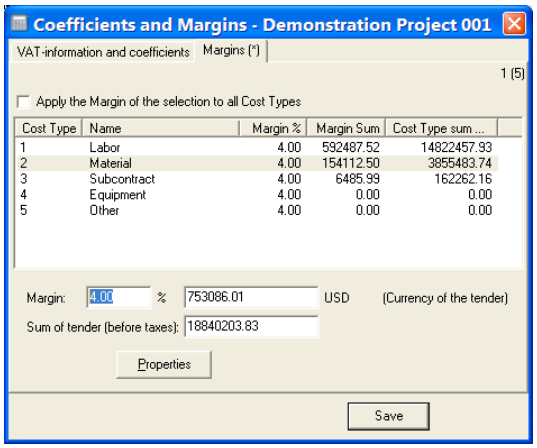


Figure 316 – The Coefficients and Margins dialog; Margins

For each Resource type (Work, Material, Subcontracted work, Equipment and Other) you can specify what the profit margin for that Resource type should be. By ticking "Apply the Margin of the selection to all Cost Types", you can open one Resource type and apply the margin properties to the other Resource types in one single operation.

Click "Properties" to define the Resource type margin:

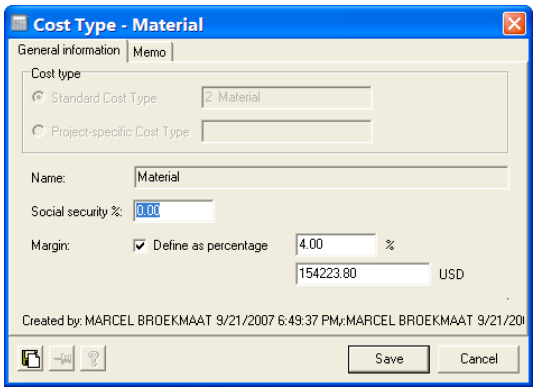


Figure 317 – Resource Type-specific margins.

The selected Cost type is shown in the top section of the dialog box, with its name underneath. In European countries, companies have to pay a social security fee on top of the costs of labor; the percentage that is applicable can be defined in this dialog box.

The profit margin that you wish to assign to a Resource type (in this example: "Work") can be entered as a percentage of the total cost of that Resource type or as an exact value. Simply tick the "Define as percentage" box to enable or disable this option.

Once you have completed and saved the settings for all the Resource types, Estimator will assign the Margins and Coefficients to all Methods and Resources in the project, thus calculating the commercial cost price of the project.

To add compensation for risk or overhead costs to the Tender calculation, you can use the "Supplements" function in Estimator's Tender mode.

HOW TO: ADD SUPPLEMENTARY COSTS

Start "Supplements" from the Tender menu:

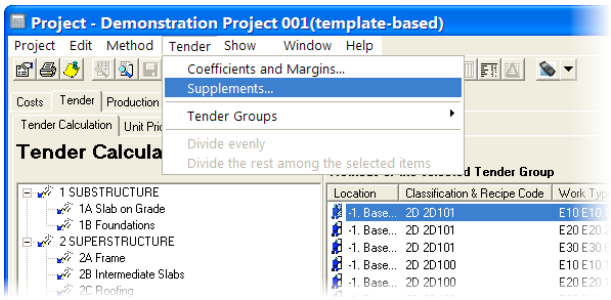


Figure 318 – "Supplements …" in the "Tender" menu item.

Estimator will show the following dialog:

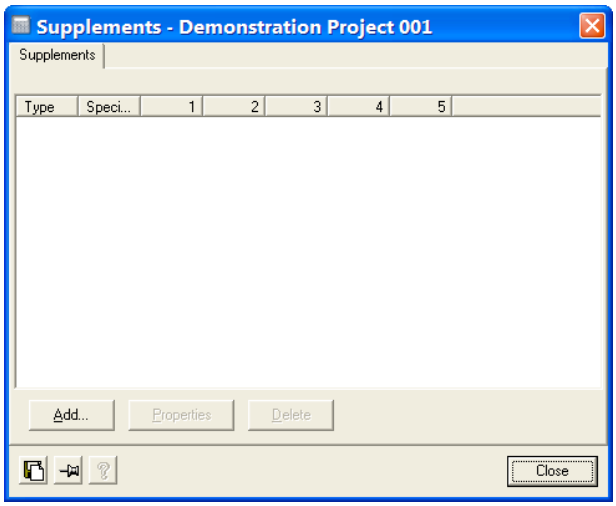


Figure 319 – Supplements for project costs; initially no supplementary costs have been defined.

To add a supplement to the Tender calculation, click the "Add" button.

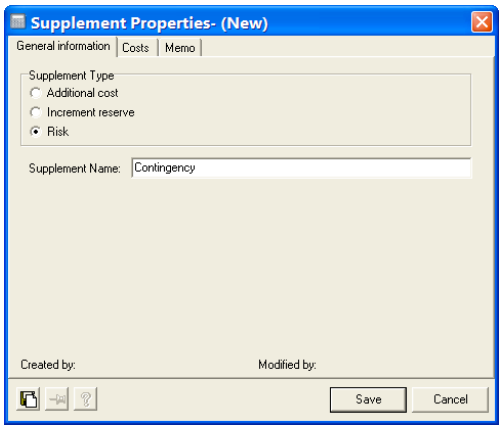


Figure 320 – "New Supplement" dialog.

Define the type of Supplement and give it a name. Open the "Costs" tab to define which cost value you want to assign to the Supplement.

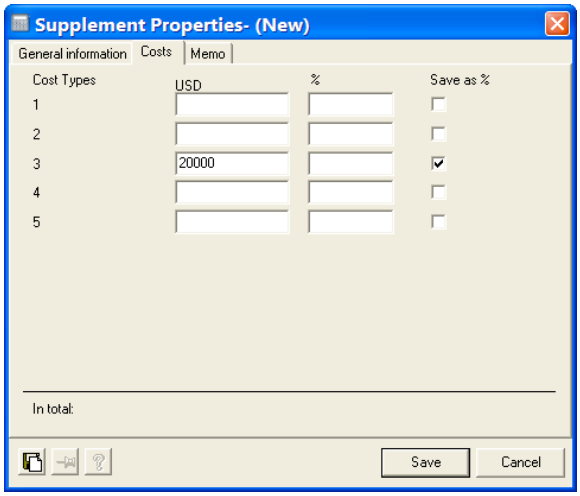


Figure 321 – Defining the supplement by entering a value for the relevant cost type.

In the example above, we defined a supplement to compensate for the risk of an increase of costs in the Resource type "Equipment", which could include, for example, the cost of insurance to the project.

The value of the supplement is $20,000, which in this case we saved as a percentage; this means that if the cost of "Other" Resources increases in an updated version of the project's estimate, the supplement will be increased automatically.

By default, Estimator divides the additionally defined costs (Margins and Supplements) equally over all cost entities in the project.

Estimator gives you the possibility to manually divide the margins and supplements over the Tender groups that you defined for the project.

HOW TO: DIVIDE MARGINS AND SUPPLEMENTS

Open the "Unit Price Calculation" tab in the "Tender" mode.

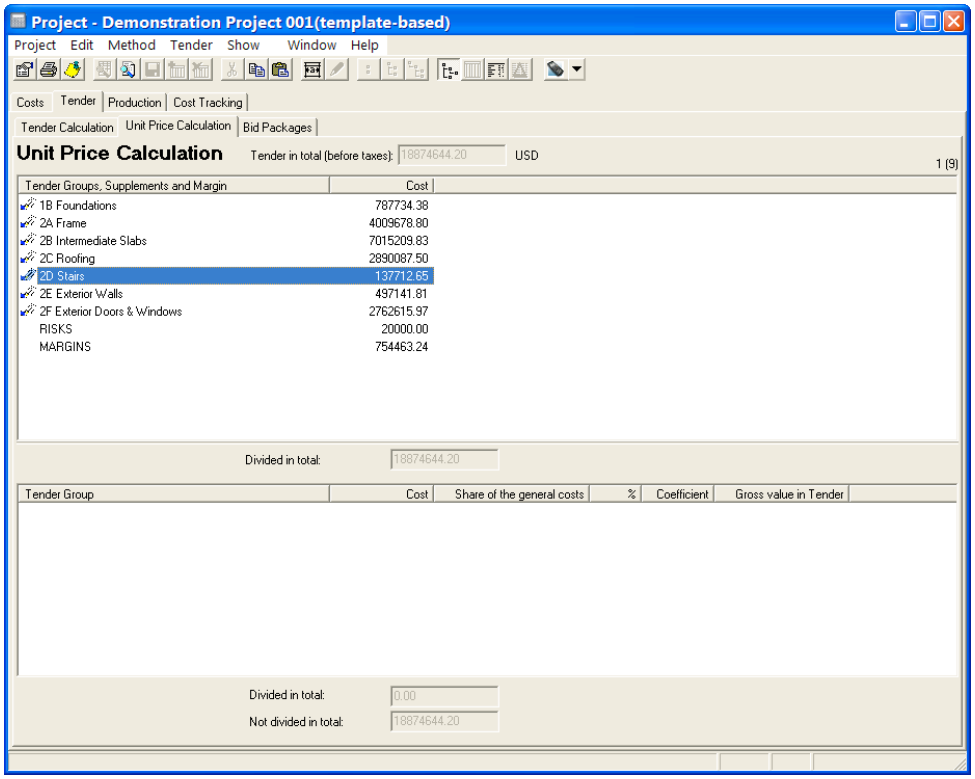


Figure 322 – The "Unit Price Calculation" view in the Tender mode.

Estimator shows all Tender Groups, the costs included in the Tender groups (the sum of all the costs included in Methods and Resources), and also information about the share of the margins and supplements that you defined to the project. The sum of all the supplements (in this case of the "Risks" type) and margins is shown in the top window.

By default, Estimator equally divides the supplements and margins over the project's Tender Groups, but you may want to refine that by increasing the share for one Tender group and decreasing for another.

To make changes to the default division, open the properties of a Tender Group by double clicking or right clicking and selecting "Tender Group Properties".

The following dialog box will be shown by Estimator:

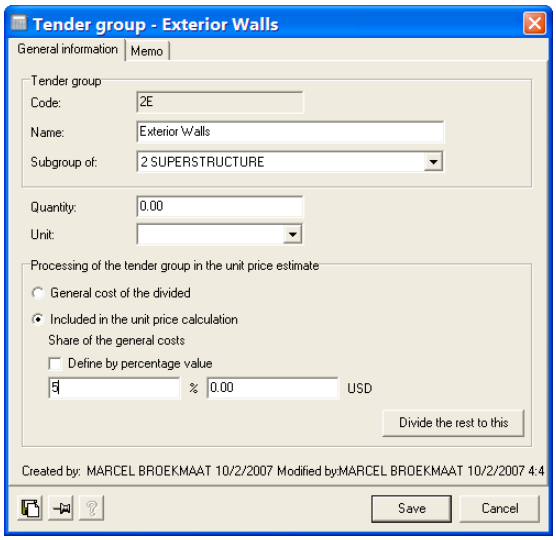


Figure 323 – Tender Group division of Margins and Supplements.

You can define a percentage or an exact value as share of the supplements and margins that should be assigned to the selected Tender group.

By selecting "General cost of the divided", the remaining part of the non-divided supplements and margins will be assigned to the selected Tender group.

You can exclude a Tender group from the division of supplements and margins by right-clicking on a group and selecting: "Remove from Unit price calculation". In this case, no margins and supplements are assigned to the selected group.

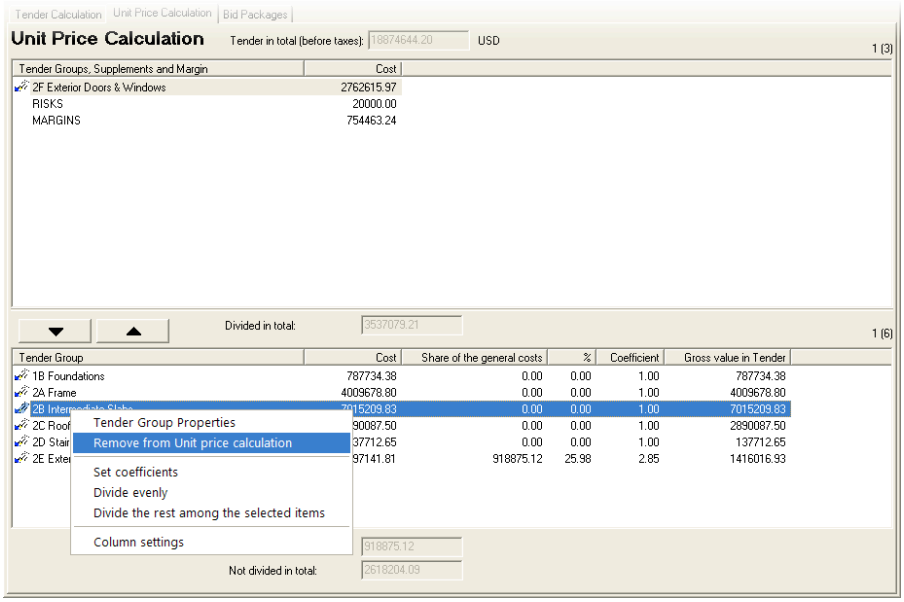


Figure 324 – Included and Excluded Tender Groups for margin and supplement division.

After you have completed adding margins and supplements to the calculated cost price of the project, you are ready to generate a Tender report.

How To: Generate a Tender (Bid) Report

Select the “Tender” tab on the Estimator screen and select “Project” at the top of the screen and select “Set data filters for Report View”.

Estimator will display the “Report Data Filters” dialog.

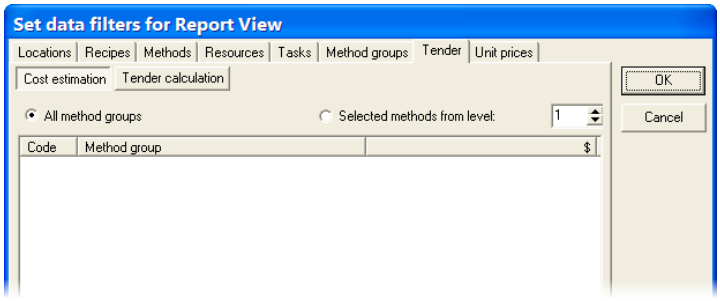


Figure 325 – Report Data Filters dialog.

Click the “Tender Calculation” button.

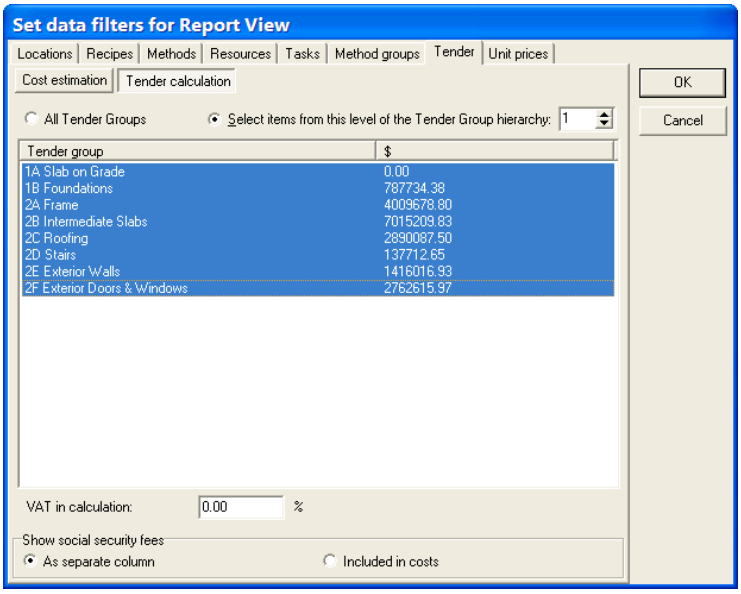
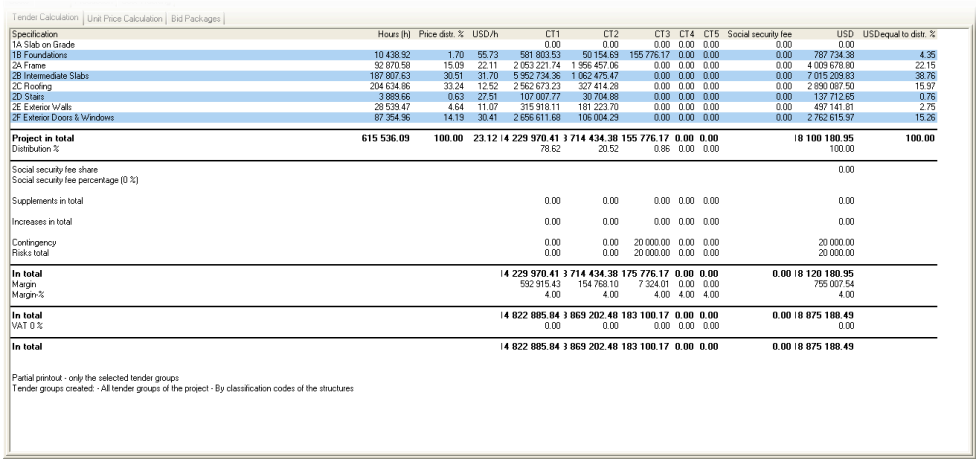


Figure 326 – Tender Calculation Report settings.

Select either “All Tender Groups” or manually select items from the desired level from the Tender Groups structure. Items that are selected will be included in your report.

Click “OK” to generate your report.



Tender Calculation | Unit Price Calculation | Bid Packages |

Specification	Hours (h)	Price distr. %	USD/h	CT1	CT2	CT3	CT4	CT5	Social security fee	USD	USDequal to distr. %
1A Slab on Grade				0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1B Foundations	10 438.92	1.70	55.73	581 803.53	50 154.69	155 776.17	0.00	0.00	0.00	787 734.38	4.35
2A Frame	92 870.58	15.09	22.11	2 053 221.74	1 956 457.06	0.00	0.00	0.00	0.00	4 009 678.80	22.15
2B Intermediate Slabs	187 807.53	30.51	31.70	5 952 734.36	1 062 475.47	0.00	0.00	0.00	0.00	7 015 209.83	38.76
2C Roofing	204 634.86	33.24	12.52	2 562 673.23	327 414.29	0.00	0.00	0.00	0.00	2 890 087.50	15.97
2D Stairs	3 889.66	0.63	27.51	107 007.77	30 704.88	0.00	0.00	0.00	0.00	137 712.65	0.76
2E Exterior Walls	28 539.47	4.64	11.07	315 918.11	181 223.70	0.00	0.00	0.00	0.00	497 141.81	2.75
2F Exterior Doors & Windows	87 354.96	14.19	30.41	2 656 611.68	106 004.29	0.00	0.00	0.00	0.00	2 762 615.97	15.26
Project in total	**615 536.09**	**100.00**	**23.12**	**14 229 970.41**	**3 714 434.38**	**155 776.17**	**0.00**	**0.00**		**18 100 180.95**	**100.00**
Distribution %				78.62	20.52	0.86	0.00	0.00		100.00	
Social security fee share										0.00	
Social security fee percentage (0 %)											
Supplements in total				0.00	0.00	0.00	0.00	0.00		0.00	
Increases in total				0.00	0.00	0.00	0.00	0.00		0.00	
Contingency				0.00	0.00	20 000.00	0.00	0.00		20 000.00	
Risks total				0.00	0.00	20 000.00	0.00	0.00		20 000.00	
In total				**14 229 970.41**	**3 714 434.38**	**175 776.17**	**0.00**	**0.00**	**0.00**	**18 120 180.95**	
Margin				592 915.43	154 768.10	7 324.01	0.00	0.00		755 007.54	
Margin-%				4.00	4.00	4.00	4.00	4.00		4.00	
In total				**14 822 885.84**	**3 869 202.48**	**183 100.17**	**0.00**	**0.00**	**0.00**	**18 875 188.49**	
VAT 0 %				0.00	0.00	0.00	0.00	0.00		0.00	
In total				**14 822 885.84**	**3 869 202.48**	**183 100.17**	**0.00**	**0.00**	**0.00**	**18 875 188.49**	

Partial printout - only the selected tender groups
Tender groups created: - All tender groups of the project - By classification codes of the structures

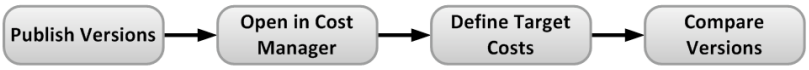
Figure 327 – A Tender (*Bid*) report; the report includes the margins for profit and risk as defined in Tender calculation and divided in "Unit Price Calculation".

Mastered Process Steps

After completion of this section, you can start an estimating project; you can include required project specific content and use the Constructor model with that content. You have also mastered the creation of estimates and reports with the defined estimating content.

4: Manage Costs and Budget

In this section, you will be shown how to publish cost estimating versions from Estimator and how to open them in Cost Manager to analyze variance. You will also learn how to define Target Costs and how to compare your estimates with them.



You can manage the cost and budget of your project with Vico's Cost Manager application: a visual tool for analyzing and communicating a project's cost and the changes that occur to the cost and budget during design and construction.

Project cost estimates and budgets can be imported from Estimator or Microsoft Excel. When used with Estimator, data are automatically formatted correctly to work in the Cost Manager environment. An easy-to-use wizard is provided to import data from existing Microsoft Excel spreadsheets.

After importing cost versions into Cost Manager, the next step is to define a structure for the budget and target costs for each section.

For example, the top level of the structure could be the "project" with a budget of 300m $/€/£. The second level of the structure could be the major systems of the building: structure, shell, interiors, services, etc. Each of these subsystems will have its own target budgets. The structure can have as much or as little detail as the project requires.

After defining Target costs, you can compare imported cost estimating versions against defined targets to check if your project is still on track.

Publish a Version from Estimator

Publishing a version of a cost estimate from Estimator to Cost Manager means creating a snapshot of all the cost estimating information that is included in your estimate at that moment: quantities, Locations, Recipes, Methods and Resources are all saved into an "Intermediate Data Set" (IDS).

The exported IDS file is given a date tag to allow Cost Manager to place the version into a timeline later.

HOW TO: PUBLISH A COST ESTIMATING VERSION TO COST MANAGER

Once you have reached a milestone in your estimate, select the "Export to Cost Manager" function from the "Project" menu.

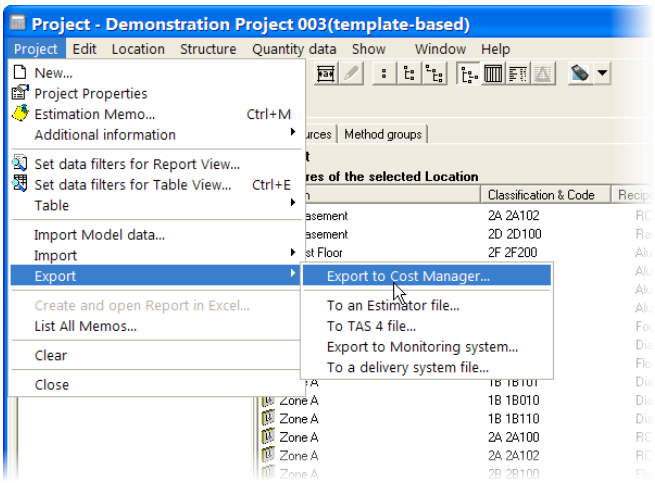


Figure 328 – Exporting an IDS file for use in Cost Manager.

Estimator will start creating the snapshot, and may find that there are Bid Packages in your estimate. Possible awarded quote prices will not be included in your IDS file, due to the fact that lump sum subcontracted prices cannot be traced back to their original Methods and Resources. Therefore, the following message will appear:

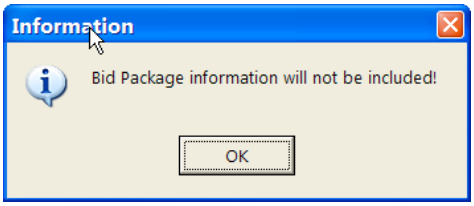


Figure 329 – Awarded quotes will not be part of the export to the Cost Manager IDS file.

Click OK – Estimator will continue and will ask you to specify the file name and path for the .IDS file.

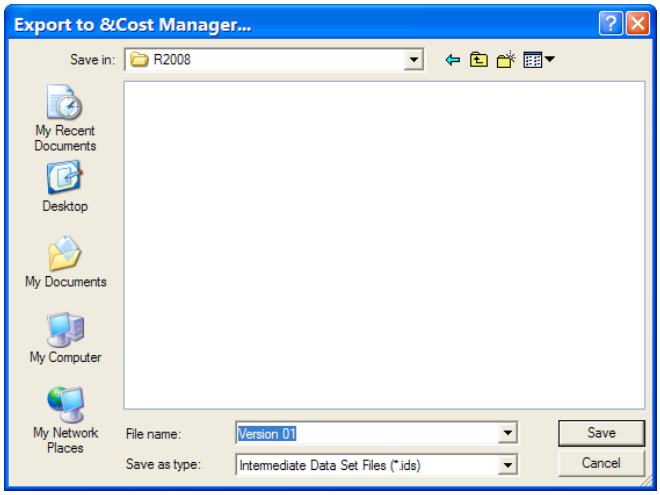


Figure 330 – Specifying path and name for the .IDS file.

Estimator will write the snapshot of the estimating data to the specified location, from where you can import it in Cost Manager.

Importing Estimating Versions in Cost Manager

When you have published one or more snapshots of your estimating data as .IDS files, you can start importing cost estimating data into a Cost Manager project.

You can find Vico Cost Manager in the Vico Software programs folder. After starting the application, you will see an introduction screen with typical steps in the program. By clicking on a step, a demonstration video is started, which will explain step-by-step how you can use the software.

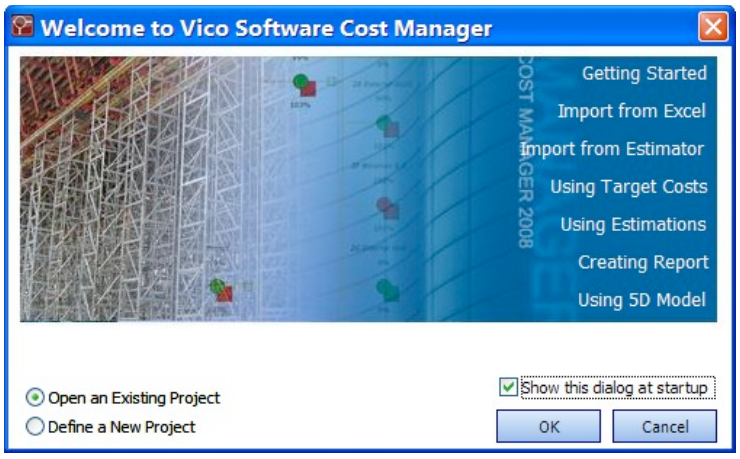


Figure 331 – The Cost Manager welcome screen. Topics to the right contain demonstration videos.

After selecting "Define a New Project" and clicking "OK" you can start importing your exported cost estimating versions from Estimator.

How To: Import Cost Estimating Versions from Estimator

In your new Cost Manager project, click on the "Estimator Import" function in the "1 – Project" section of the workflow panel to the left of your screen.

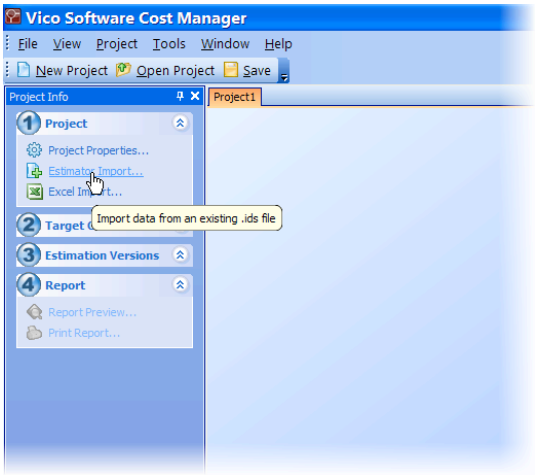


Figure 332 – Importing data from Estimator

Cost Manager will ask you to specify where it can find the .IDS file that you want to import. Point to the .IDS file that you published from your Estimator project; click “Open”.

Estimator will display the “Import Estimation Version” dialog.

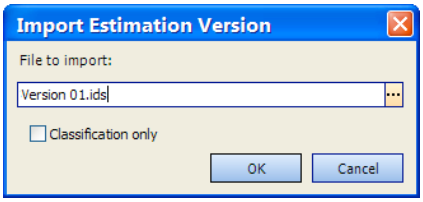


Figure 333 – The import Estimation dialog.

If you only want to import your Estimator project’s classification structure (the Recipe classification structure), select the “Classification only” checkbox. In this case, no estimating data will be imported, but only the cost breakdown structure provided by the Estimator project’s classification system. You would typically do this if you would like to define Target Costs (see next section) before importing versions of your project’s cost estimate.

Click “OK” to start importing.

Notice that after importing, your estimating version is placed on the workflow panel to the left of your screen in the “3 – Versions” section.

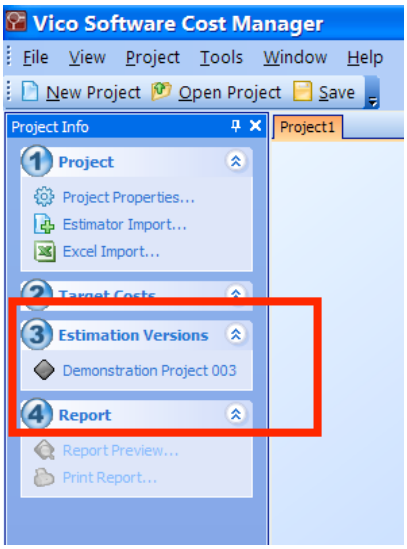


Figure 334 – A version has been imported and added to the list of “Versions”.

Also, after importing a version you will see a “tick” on the timeline at the bottom of your screen. This is the same version, but placed on a timeline which will later provide you with an overview of the versions published from Estimator into Cost Manager.

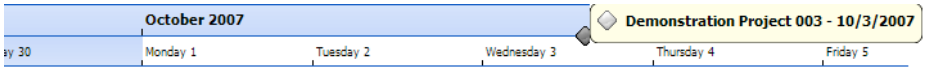


Figure 335 – An imported version appears automatically on the timeline, reflecting the date on which it was generated. Hover over the version to view its properties.

In the Cost Explorer area, you will see that your estimate's Recipe classification structure appeared after completing the "import from Estimator" process.

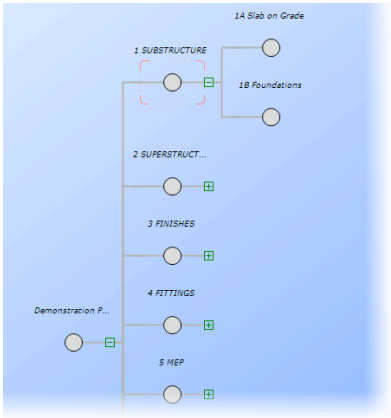


Figure 336 – The Cost Explorer cost breakdown structure, adopted from the Recipe classification in your Estimator project.

To import additional versions, repeat the steps above and select newer .IDS files. You will see that with every imported file, a new "tick" appears on the timeline.

You can change the name of a cost estimating version by right-clicking on the version in the workflow panel and selecting "Properties".

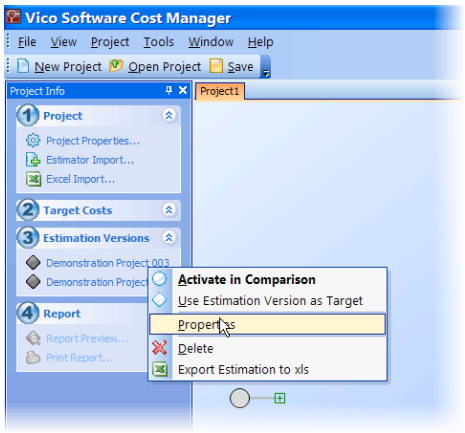


Figure 337 – Changing the name of an estimation version by right-clicking and selecting "Properties".

The properties of the version will be presented in a dialog; change the name of your imported version as desired.

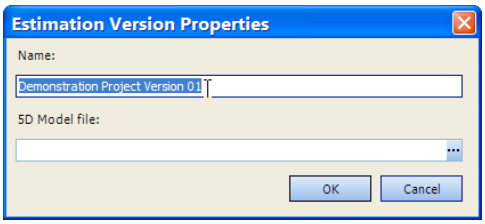


Figure 338 – Estimation Version Properties

Defining Target Costs

Cost Manager's "Target Costing" concept allows you to define targets (or budgets) for your project and for the main systems in your project.

The main systems have automatically been imported into your project by means of the Recipe classification structure. You can use the "Target Cost Editor" to define targeted costs for known or all parts of the classification.

HOW TO: DEFINE TARGET COSTS

After importing at least one cost estimation version (or a version using the "Classification only" setting), right-click on the "2 – Target Costs" header in the workflow panel.

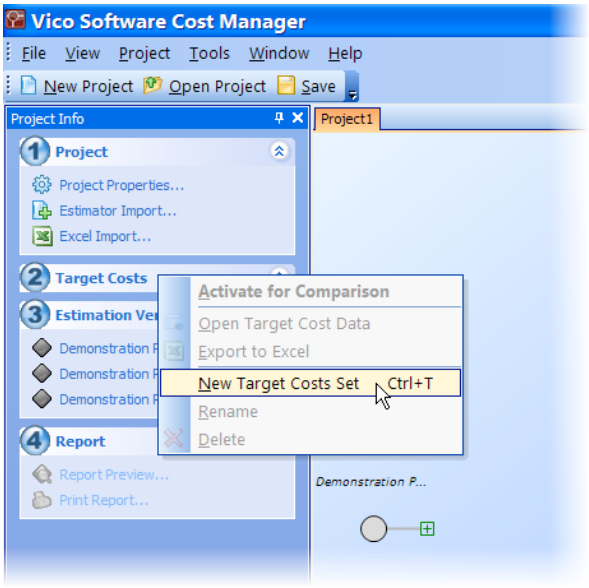


Figure 339 – Right-clicking on the "2 – Target Costs" header in the workflow panel to create a new target costs set.

Cost Manager will open your new target costs set on the right side of your screen, in the "Target Cost Editor".

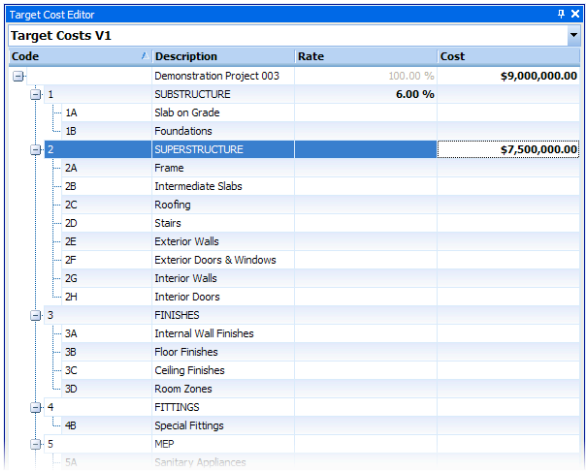


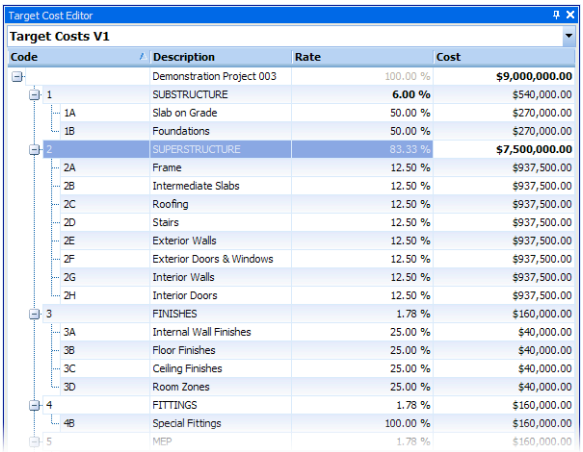
Figure 340 – The Target Cost Editor in Cost Manager.

Enter your project's total budget on the upper most line in the Target Cost Editor. Next, specify allocations from this budget to sub divisions of your project's cost.

You do not need to enter *all* values; just enter those values that you can allocate with the project information that you have at that moment.

Cost allocations can be defined as a cost value (in the "Cost" column) or as a percentage from the project budget that you defined in the top line (in the "Rate" column).

When you have entered all "known" values in the Target Cost Editor, click outside the editor (for example in the "Cost Explorer" area) and Cost Manager will calculate the remaining items.



Code	Description	Rate	Cost
	Demonstration Project 003	100.00 %	**$9,000,000.00**
1	SUBSTRUCTURE	**6.00 %**	$540,000.00
1A	Slab on Grade	50.00 %	$270,000.00
1B	Foundations	50.00 %	$270,000.00
2	SUPERSTRUCTURE	83.33 %	**$7,500,000.00**
2A	Frame	12.50 %	$937,500.00
2B	Intermediate Slabs	12.50 %	$937,500.00
2C	Roofing	12.50 %	$937,500.00
2D	Stairs	12.50 %	$937,500.00
2E	Exterior Walls	12.50 %	$937,500.00
2F	Exterior Doors & Windows	12.50 %	$937,500.00
2G	Interior Walls	12.50 %	$937,500.00
2H	Interior Doors	12.50 %	$937,500.00
3	FINISHES	1.78 %	$160,000.00
3A	Internal Wall Finishes	25.00 %	$40,000.00
3B	Floor Finishes	25.00 %	$40,000.00
3C	Ceiling Finishes	25.00 %	$40,000.00
3D	Room Zones	25.00 %	$40,000.00
4	FITTINGS	1.78 %	$160,000.00
4B	Special Fittings	100.00 %	$160,000.00
5	MEP	1.78 %	$160,000.00

Figure 341 – Cost Manager calculates "unknown" values automatically.

Note: if you enter "non-closing" values (for example, when the sum of the entered percentages is higher than 100%), Cost Manager will change the representation of calculated values into a red color.

Note that on the timeline, your target costs set will also appear as a new "tick". Target costs are represented by a "diamond" shape.

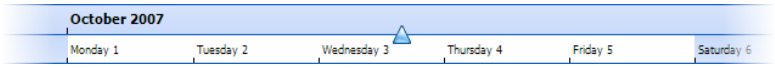


Figure 342 – A new Target Costs set, placed on the project's timeline.

Comparing Versions

After completing your target cost set, you can compare an imported cost estimation version against your target costs, to see if your project is within the targeted budget.

HOW TO: COMPARE AN ESTIMATION VERSION TO DEFINED TARGETS

In order to start the comparison "cost estimation version" to "target costs", you need to activate both target costs and the cost estimation version from either the workflow panel or the timeline.

To activate the target costs from the workflow panel, right-click on the defined target costs set.

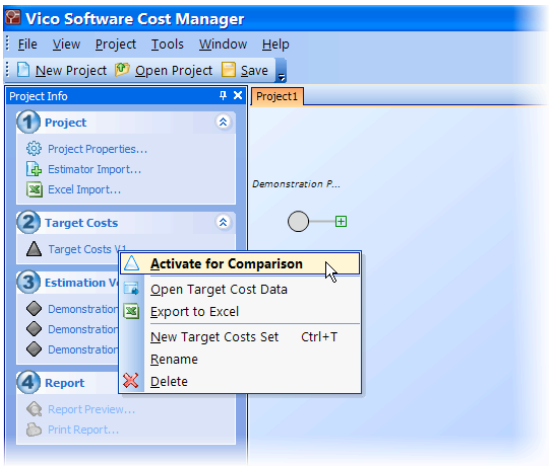


Figure 343 – Right-clicking on a Target Costs Set to activate it.

Select "Activate for Comparison": from this moment onward, your "Target Costs V1" will be used in the comparison.

Next, activate an estimation version by right-clicking on an estimation version. Again, select "Activate in Comparison".

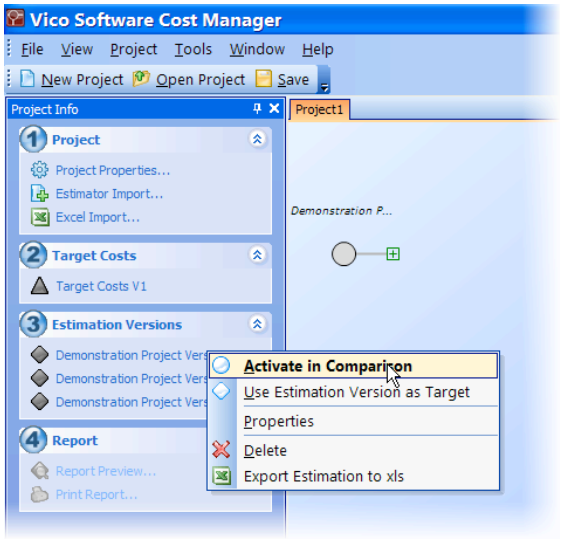


Figure 344 – Activating an Estimation version by right-clicking and selecting "Activate in Comparison".

Note: you can do the same by right-clicking on any of the target cost sets or estimation versions on the project timeline. Select "Activate in Comparison" to activate the version you want to analyze.

After activating both the target and cost estimation version, you will see that the tree structure in the Cost Explorer of Cost Manager is colored: the costs are now being compared to the targets.

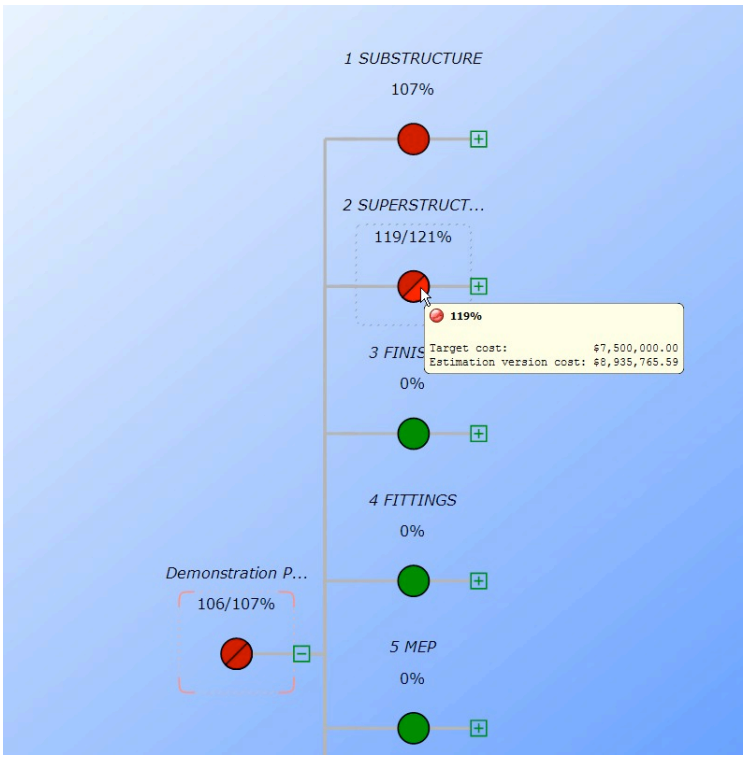


Figure 345 – The Cost Explorer area in Cost Manager. Colors indicate the current status of the project costs compared to the set target.

The colored circles represent the status of costs (Recipes) associated with Recipe classifications. Targets are defined in your target costs set; if a circle is red, it means that the items in that classification overrun the set target. If a circle is green, your project's costs in that classification are within your set target. To zoom in or out, use the <Shift> key on your keyboard plus the scroll wheel on your mouse.

If a circle is split diagonally, it means that one or more Recipes in that classification (thus in the project) have a cost range. To learn how to define a cost range for a Recipe, see "How To: Define Cost Ranges for your Estimating Recipes".

When you hover over a circle with your cursor, Cost Manager will display the target costs and the cost that is included in that particular classification in your estimate.

You can also select a circle and analyze the numbers in the "Target Cost Monitor".

Target Cost Monitor

Title	10/3/2007	10/4/2007	Older
Project Cost	$9,000,000.00	$9,515,685.38 $9,623,238.04	
Cost of Selected	$540,000.00	$579,919.79	

Figure 346 – The Target Cost Monitor dialog contains information about the selected classification represented by a circle in the Cost Explorer.

When you have imported two or more estimation versions into your Cost Manager project, you can also compare two versions side-by-side.

Side-by-side comparison will help you to analyze changes in quantities and costs between two versions. At the same time, both versions are compared to the defined target costs.

HOW TO: COMPARE TWO VERSIONS OF COST ESTIMATIONS SIDE BY SIDE

With one estimation version and the target costs set active, follow the same procedure to activate a second cost estimation version: right click on the version you want to add to the comparison and select “Activate in Comparison”.

You will see that a second shape is introduced in the Cost Explorer area: after activating a second version, the circle shape represents the newer version of the activated pair, the square represent the older.

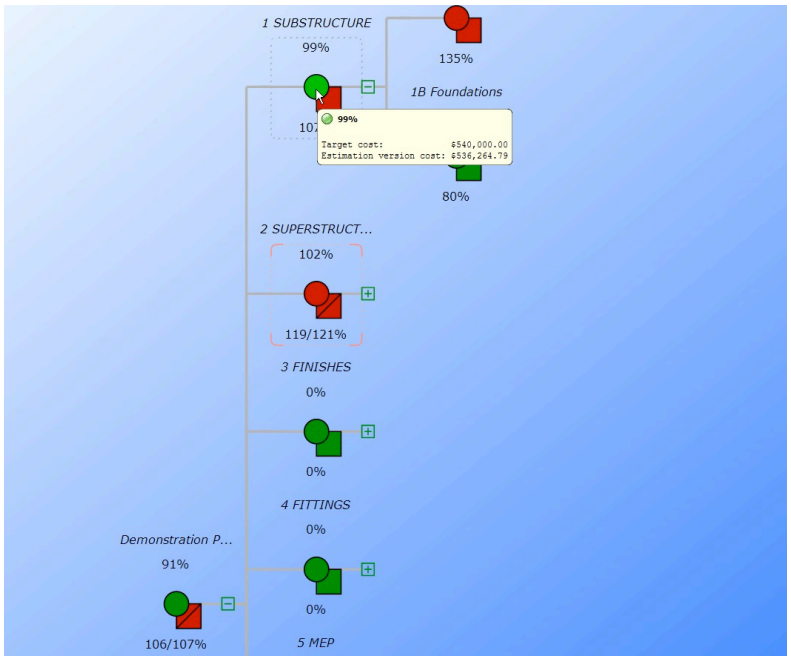


Figure 347 – Side-by-Side comparison of two estimation versions.

You can quickly see where changes in your cost estimate have occurred from the previous version to the current, indicated by color changes and percentages in the Cost Explorer tree. A typical change will be that cost ranges applied in the early design phases will be replaced by calculated Recipe costs. This will be reflected by solid circles in the newer versions and split squares in the older versions.

If you want to compare the actual change of estimating content side by side, open the Project Data Panel on the right side of the Cost Manager screen.

Code	Name	10/11/2007	10/4/2007	Difference	?
1A101	Foundation Slab	$321,198.68	$363,198.68	-$42,000.00	▼
1B110	Diaphragm Wall Cap Beam	$17,432.05	$17,514.53	-$82.47	▼
1B100	Diaphragm Wall Primary Panel	$49,559.50	$49,934.57	-$375.07	▼
1B101	Diaphragm Wall Secondary Panel	$147,675.41	$148,793.03	-$1,117.62	▼
1B010	Diaphragm Wall Guide Wall	$399.14	$478.97	-$79.83	▼
2A102	RC Wall	$311,564.15	$312,879.52	-$1,315.37	▼
2A100	RC Column	$1,663,608.68	$1,664,021.63	-$412.95	▼
2A101	RC Beam	$7,046.62	$7,144.88	-$98.26	▼
2A103	Mushroom Head of RC Column	$9,195.79	$9,231.27	-$35.47	▼
2A200	Steel Column (Universal 150 x...	$3,798.27	$3,798.27		▶
2A201	Steel Beam (Universal 150 x 3...	$6,573.87	$6,573.87		▶
2B100	Floor Slab	$1,148,446.73	$1,161,165.64	-$12,718.91	▼
2C100	Inclined Screeding of Flat Roof	$29,915.59	$30,575.69	-$660.10	▼
2C101	Flat Roof Waterproofing and I...	$1,021,206.55	$1,021,206.55		▶
2C103	Concrete Pavers on Ballast	$153,646.67	$1,459,643.34 $1,567,196.00	-$1,305,996.	▼
2D100	Ramps	$20,266.28	$20,426.80	-$160.51	▼
2D101	Stairs	$11,905.95	$11,958.26	-$52.32	▼
2E100	Exterior Wall with Brick Veneer	$246,761.44	$246,761.44		▶
2E102	Brick Veneer along Columns a...	$14,606.89	$14,606.89		▶
2E301	Precast Stone Coping (630 x ...	$62,625.68	$62,625.68		▶
2E101	Parapet Wall with Brick Veneer	$8,583.28	$8,583.28		▶
2F200	Alu Window (2700 x 2025 mm)	$63,962.02	$63,962.02		▶
2F300	Alu Door with Sidelight (2700 ...	$1,754.82	$1,754.82		▶
2F103	Curtain Wall, Alu Profile (Verti...	$1,294,549.57	$1,294,549.57		▶
2F100	Curtain Wall, Glazing	$142,919.75	$142,919.75		▶
2F102	Curtain Wall, Alu Profile (Horiz...	$1,391,376.42	$1,391,376.42		▶

Figure 348 – The Project Data Panel contains all Recipe, Method, and Resource cost information from your Estimator project.

The Project Data Panel shows all Recipes listed with their values for the most recent version (the circle) and the older version (the square). Any differences are listed in the "Difference" column and an icon indicates how the total has cost changed from the older to the newer version. You can sort the list of Recipes by clicking any column header.

During the export to Cost Manager from Estimator, you exported a full snapshot of all estimating data. The Project Data panel contains all the information from your Estimator project, so you can drill down to Recipe quantities by location and Method and Resource level to analyze what is causing a cost change between the older and the newer versions.

To open more detailed Recipe information, click the ⊞ symbol.

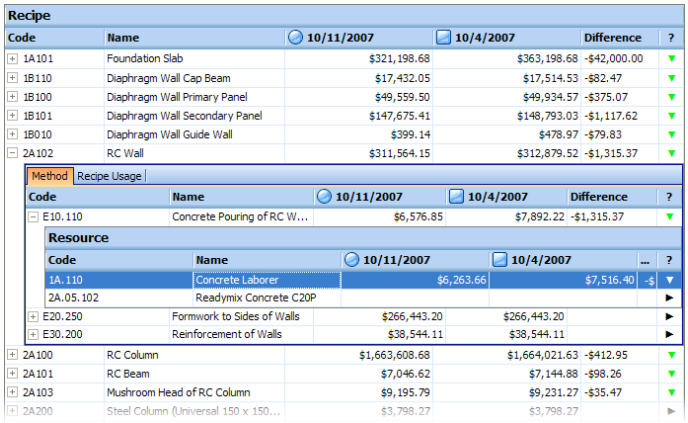


Figure 349 – By clicking the ⊞ symbol, more detailed Recipe information can be revealed.

The first level that you will access is the Method level, which shows all the Methods in the Recipe plus the changes in costs.

Clicking the ⊞ symbol again will show the Resources included in the Method. In the example above, you can see that the price decrease was caused by a changed price for the "Concrete Laborer".

When you want to add a comment to a Recipe as a reminder for the cause of the change in the costs, right-click on a version and select "Insert Comment".

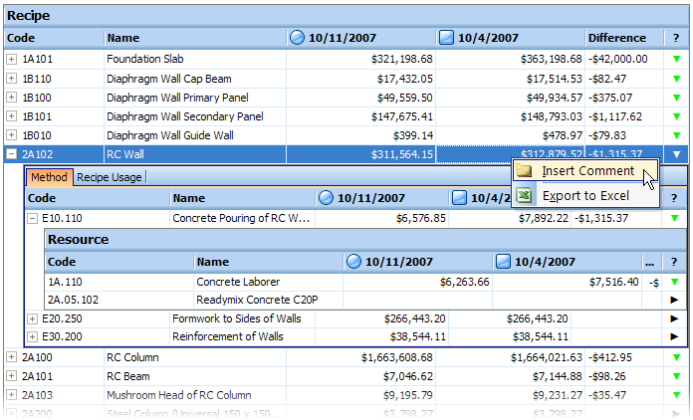


Figure 350 – Right-clicking on a version and selecting "Insert Comment" to save a reminder for the found cause of the cost change.

Enter your comment and click "OK" to save it. Next time you hover over the version, your comment (identified by a red corner in the cell), will appear.

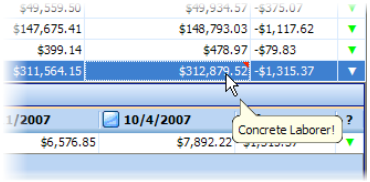


Figure 351 – Your comment appears when you hover over the cell with your cursor.

In addition to Methods and Resources, you can also analyze quantity changes. To analyze quantities, after expanding the information in a Recipe with the ⊞ symbol, select the "Recipe Usage" tab.

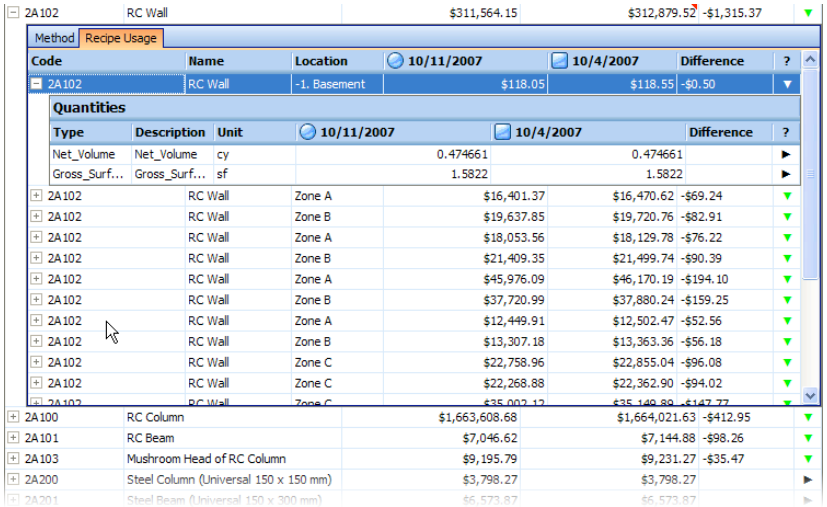


Figure 352 – The Recipe Usage tab in the Project Data Panel.

The first level of the "Recipe Usage" tab contains information regarding the locations on which the Recipe has been assigned to elements. When you click the ⊞ symbol one more time, you will see the quantities that were saved with the Recipe at that specific location.

When you have based your estimate on a Constructor model by extracting quantities and Locations from it, you will be able to visualize where quantities and cost variances occur in your project by using the Cost Manager to 5D Presenter integration.

With this integration, you can select an item in the Project Data Panel and highlight the associated 3D geometry in 5D Presenter.

How To: Visualize Cost and Quantity Variance in the 5D Presenter Model

To use your building model to visualize where in your project cost and quantity variances occur, you will first need to ensure that you have a 5D Presenter model that was generated from the version of the Constructor model that you used to extract quantities from.

To generate a 5D Presenter model, open your model in Constructor and select "Export 5D Presenter Model" from the "5D Model" menu item.

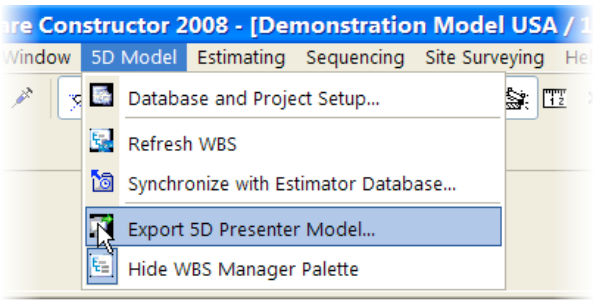


Figure 353 – Generating a 5D Presenter model with the "Export 5D Presenter Model…" function from the "5D Model" menu in Constructor.

Constructor will ask you to specify a file name and path on your system to where you should save the new .5DM file. Click "Save" to start generating a 5D model from your Constructor model.

Note that sequencing information is optional but not required to generate a 5D Presenter model!

When Constructor has finished creating the 5D Presenter model of your building model, go back to Cost Manager to associate the .5DM file with one or more of your cost estimation versions.

In Cost Manager, right-click on a cost estimation version and select "Properties".

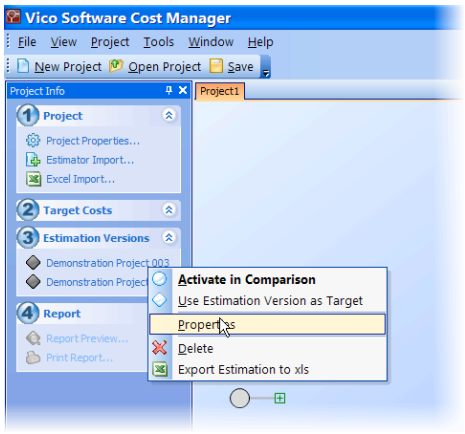


Figure 354 – Opening the properties of a cost estimation version to associate a 5D Presenter file with it.

The properties of the version will be presented in a dialog. To associate a 5D Presenter file with the selected estimation version, specify a file name and path by browsing to the location where you saved the .5DM file from Constructor.

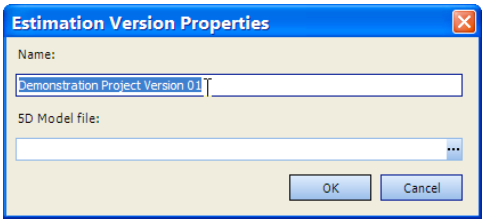


Figure 355 – Estimation Version Properties; using the "browse" button (…) to specify where you saved the .5DM file generated from your Constructor model.

Confirm the estimation version to .5DM file link by clicking the "OK" button.

Now, when you identify a change between the version you just assigned the 5D Presenter model to and another (newer or older) version, right-click on the version in the "Recipe Usage" section and select "Show in 5D Presenter" to show *where* those changes occur.

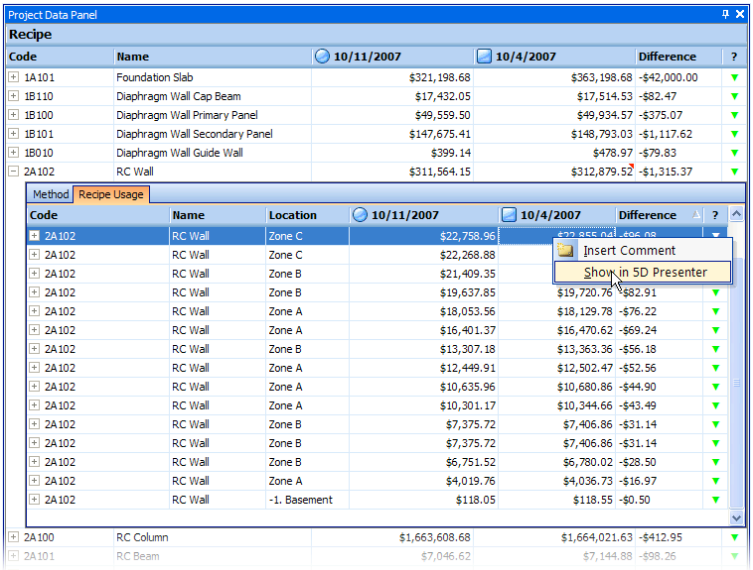


Figure 356 – in the "Recipe Usage" tab, clicking on a version and selecting "Show in 5D Presenter" to reveal related building elements in the associated 5D Presenter model.

5D Presenter will start up and will show the related building elements highlighted and will make the other elements translucent, thus allowing you to see where those building elements are in the project.

Cost Manager and Microsoft Excel

Instead of using estimating data input from Estimator, you can also use Cost Manager as a stand-alone application. In this case, you can prepare cost plans in Microsoft Excel and import those into the Cost Manager tool.

Identical to using cost information from Estimator, you can compare Excel cost plans against a target and analyze variances between two versions.

Cost Manager includes an Excel spreadsheet import wizard, which will help you to import cost and cost grouping from your cost plans.

HOW TO: IMPORT EXCEL COST PLANS INTO COST MANAGER

From the workflow panel, select “Excel Import”.

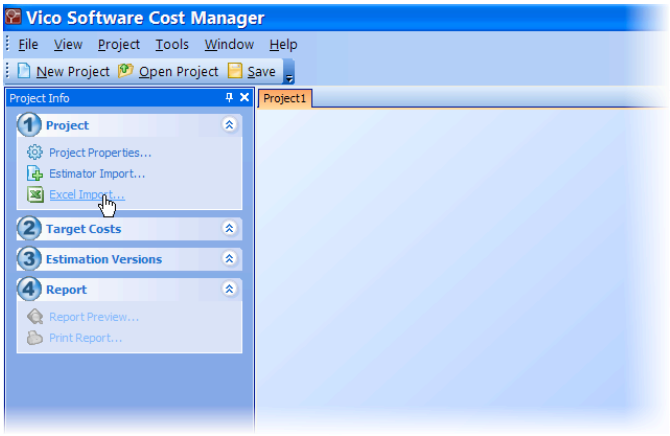


Figure 357 – Selecting “Excel Import…” from the workflow panel to import Excel cost plan data.

Cost Manager will start the Excel import wizard, which helps you to step-by-step select the required cells and columns with cost data from your spreadsheet.

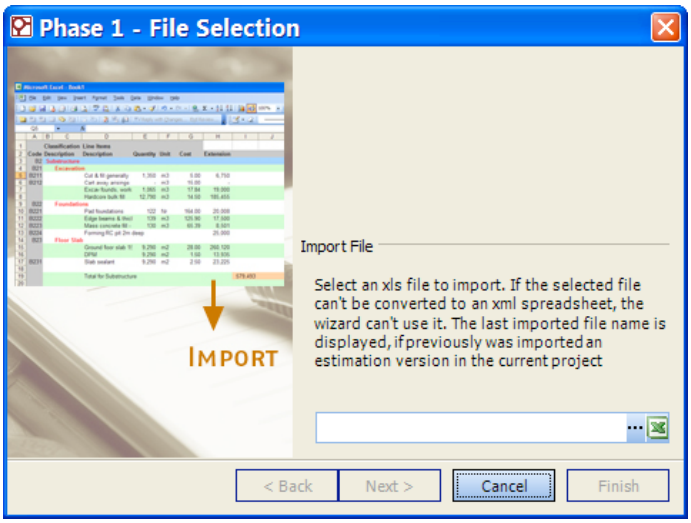


Figure 358 – The Cost Manager Excel Import Wizard.

Follow the steps of the wizard to complete the import; refer to the instruction video included in Cost Manager’s “Welcome Screen” (press the <F1> button) to get further information on the use of Cost Manager with Excel based data.

Mastered Process Steps

You have now mastered publishing cost estimating versions from Estimator and opening them in Cost Manager to analyze variances. You can also define Target Costs and compare your estimates against them.

Virtual Construction in the Planning Phase

In the planning phase of a project, you can use the Virtual Construction suite to define your project breakdown structure, analyze several scenarios for how to sequence the project, create your schedule using Flowline™ based scheduling techniques and simulate the plans for communication and analysis purposes.

In the planning phase, you will use Constructor's WBS Manager and scheduling connectivity, Control's Flowline based scheduling techniques (or, if desired, another scheduling application) and the simulation and navigation features of 5D Presenter.

5: Sequence

This "Sequence" section provides you with instructions on how to update your set of model information from your estimate, how to define a Work Breakdown Structure for your project, and how to use both to prepare Tasks for your scheduling work.

Vico Constructor's sequencing functionality allows you to visually define construction zones and a Work Breakdown Structure (WBS) for your project. The interaction with your building model matches the way you would mark up drawings with construction zones: you define boundaries on the 2D plan, which indicates that everything included belongs to a phase or stage in your project's schedule.

However, instead of taking off quantities manually for these zones, you can benefit from Constructor's intelligence, delivered by the link to the Estimator database through Recipes.

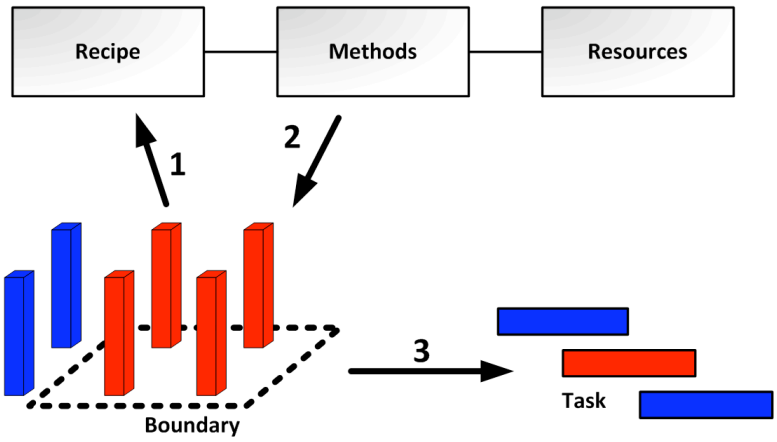


Figure 359 – Vico Constructor's sequencing concept.

In the Design phase, while creating your model and linking it to Recipes in your knowledge database (1), you have added *construction* information to your

model. The Recipe information that you associated with your model elements includes Methods and Resources; the Methods define the *activities* that are required to build the element defined by the Recipe.

The Method information (2) is now used in Constructor: you will group similar Methods ("rebar for concrete beam", "rebar for concrete slab", etc.) into Tasks (3).

Using (1) and (2), quantities for each individual element, or even *parts* of elements (for example: walls and slabs), can be calculated. This gives you the freedom to group elements in any way you want for your schedule. You group elements by simply drawing a boundary. Additionally, Constructor supports more advanced grouping by means of filters.

With the automated connections (1), (2) and (3), you can let Constructor generate the input that is required for your scheduling system, which is described in chapter 6.

Refreshing Database Information

When you start working on your project's construction sequence, you will make use of the Methods from the Estimator database, which give you the *activities* that you will group into Task definitions.

In order to get or update the Method information that was calculated in Estimator into the Constructor model you will need refresh this information every time that you make a change in your Estimator project.

As explained in the "Recipe Data Structure" section, Method quantities are calculated by means of a consumption rate "Method of the Recipe". The consumption rate reflects how many units of Method are needed to build one unit of Recipe. The Method can use any of the quantities that are saved for the Recipe after extracting them from your Constructor model.

Every time you change the consumption "Method of the Recipe", or one or more Methods *in* a Recipe, you will need to synchronize the information in your Constructor model with the information in your Estimator project.

HOW TO: SYNCHRONIZE A CONSTRUCTOR MODEL WITH THE ESTIMATOR PROJECT

To bring your Constructor model up to date with the information in your Estimator project, start the "Synchronize with Estimator Database" function from the "5D Model" menu item.

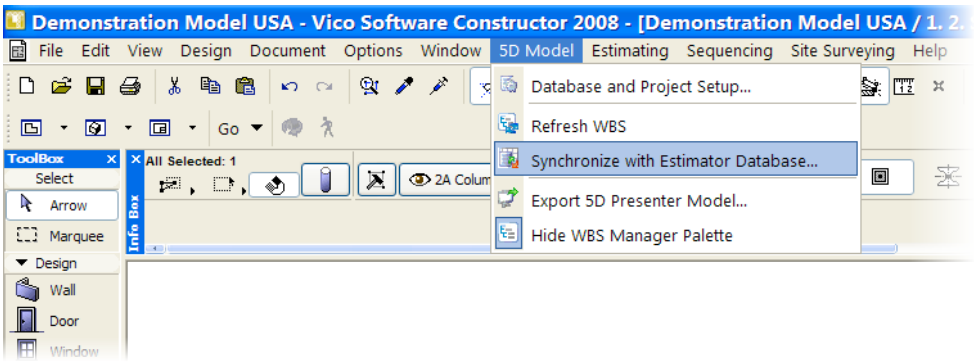


Figure 360 – Synchronizing your model with the information in your database with the "Synchronize with Estimator Database " function.

The synchronization function serves two goals: it reads all data from the Estimator project and saves it in your Constructor project and it writes the attributes of GDL elements to your Estimator project for use in Conditional Methods (see: "Conditional Methods").

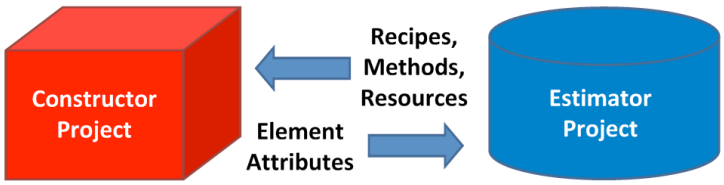


Figure 361 – Synchronization with the Estimator database.

After starting the "Synchronize with Estimator Database" function, Constructor will open the following dialog, in which you can specify the Element attributes (for Windows, Doors and Objects) that you want to write to the Estimator database:

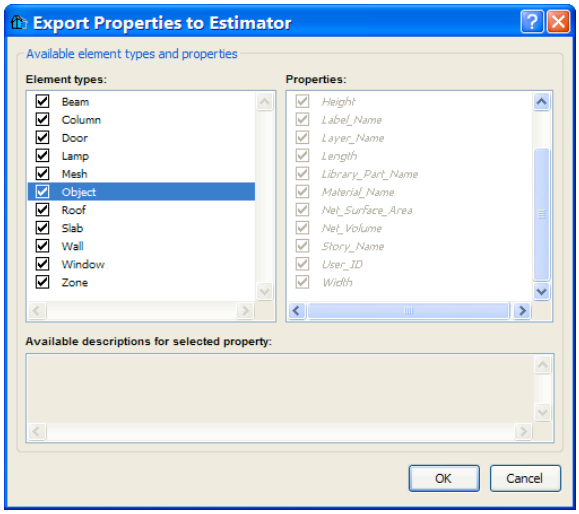


Figure 362 – The selection screen for Window, Door and Object element type attributes to be written into the Estimator project database. The dialog also provides an overview of quantities and properties of other elements that will be written to your Estimator project when performing a "Publish to Database" operation.

Click OK to continue – Constructor will update its collection of Recipe, Method and Resource information.

Work Breakdown Structures

The WBS Manager Palette

You can organize the data in your Constructor model by using "Work Breakdown Structures" (WBS's). A WBS consists of a tree structure with one or more levels that reflect the logical structure of your project.

The nodes in the WBS represent "Locations" that you will use for Estimating and Scheduling purposes.

When you publish your model quantities to the Estimator project, the tree structure in the "Structures and Quantities" view of Cost mode matches the WBS in Constructor.

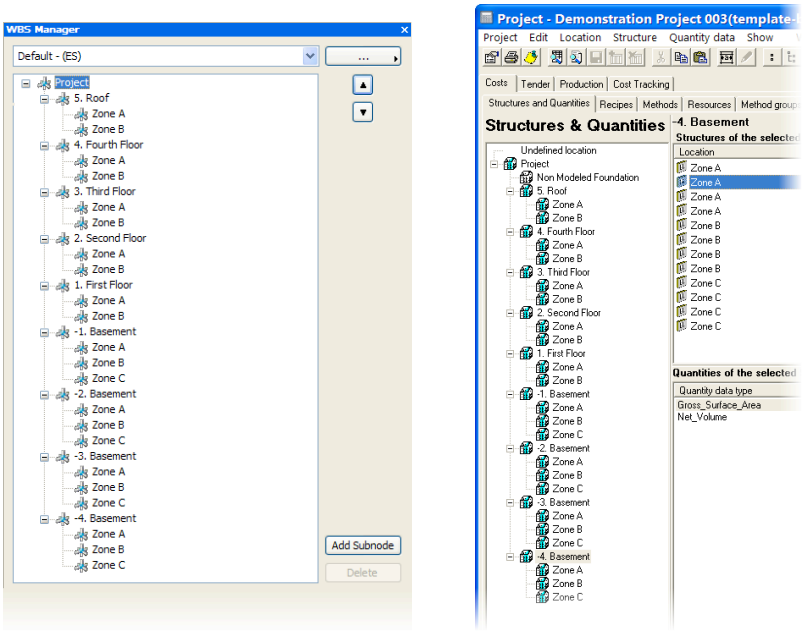


Figure 363 – The WBS, defined in Constructor, is imported into Estimator's "Structures and Quantities".

The connection to Vico Control (as well as third party scheduling applications) is also based on the WBS you define in Constructor. In this case, the WBS provides the *Location structure* for the Location-based schedule that you are creating with Control and the *outline* of schedules you create in third party scheduling applications.

The default WBS is generated automatically and contains a subdivision of your project data by floor level, as defined in your Constructor model.

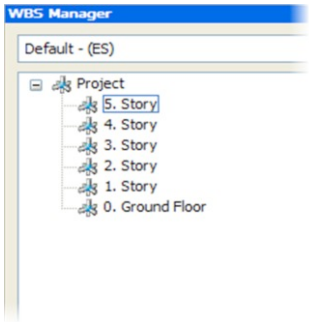


Figure 364 – The default WBS contains the floor levels defined in your model.

You can use *Filters* and *Locations* to refine or replace the default WBS. For even more flexibility, Constructor offers you functionality to save multiple WBS-s. You can do this by defining options; after defining multiple options, you can specify which option you want to use for estimating and scheduling purposes, or perform "what-if?" scenarios.

HOW TO: OPEN AND USE BASIC FUNCTIONS OF THE WBS MANAGER PALETTE

To show the WBS Manager palette in Constructor, select "Show WBS Manager Palette" from the "5D Model" menu item.

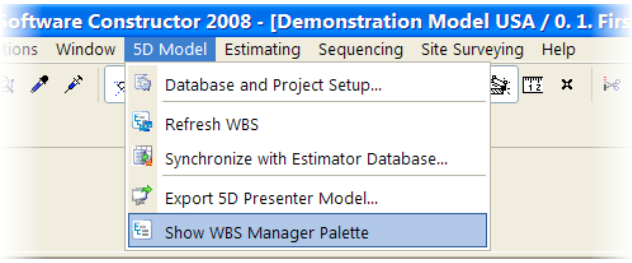


Figure 365 – "Show WBS Manager Palette" in the "5D Model" menu.

The WBS Manager palette will open on the right side of your screen.

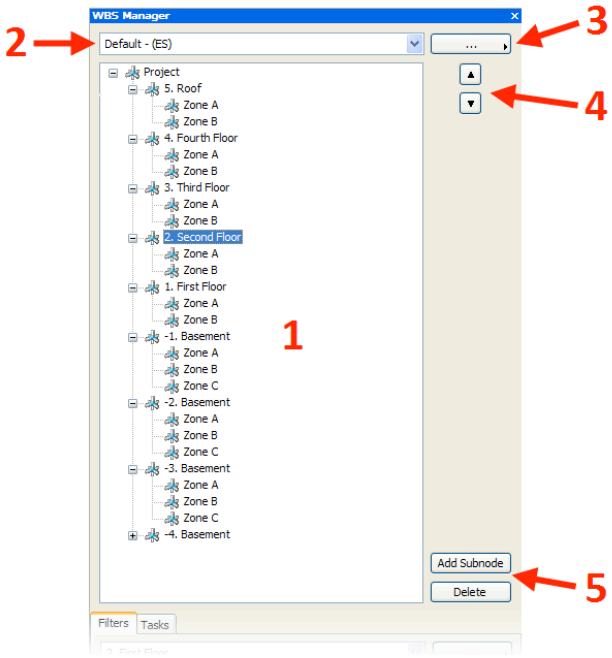


Figure 366 – The upper half of the WBS Manager palette.

The upper half of the WBS Manager palette shows the currently active Work Breakdown Structure (**1**). The WBS contains *Locations* ("5. Roof", "1. First Floor", "Zone A", etc.) that all contain collections of *elements*, or *parts of elements* in your model.

Each Location can have one or more *options*; only one option can be active at a time. Once you have defined several options for one or more Locations, you can save a collection of active options; the currently selected collection of active Locations is displayed in the "Option Set" field (**2**).

Initially, you will only have one option for each of the Locations and only one option set, which will be called "Default". You can define which option set you want to use for Estimating and which one for Scheduling. The option set field indicates for which purpose the currently activated option set is used.

(E) = Estimating

(S) = Scheduling

(ES) = Estimating AND Scheduling (also used as the Default setting)

The option set button (**3**) reveals the operations available for the currently selected option set:

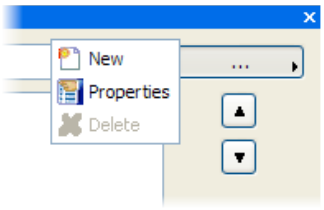


Figure 367 – Operations available for the currently selected option set.

With “New” you can create a new option set, which saves the currently activated options. “Properties” allows you to name and set the function (Estimating, Scheduling) of the option set. “Delete” removes the currently selected option set from your project.

The arrow buttons (**4**) allow you to re-arrange the Locations in your WBS. If you want to move Locations higher or lower in the hierarchy (typically used for scheduling purposes), you can select the Location and press either the “up” or “down” button.

If you want to add an additional level to a selected Location (for example: a “Zone C” to “Floor 2”), use the “Add Subnode” (**5**) button. Constructor will place a new, unnamed Location in your WBS under the selected Location.

Locations

Locations in the WBS represent a set of criteria, based on which elements or tasks are included in that Location.

For example, the Default WBS contains the following Locations and filters:

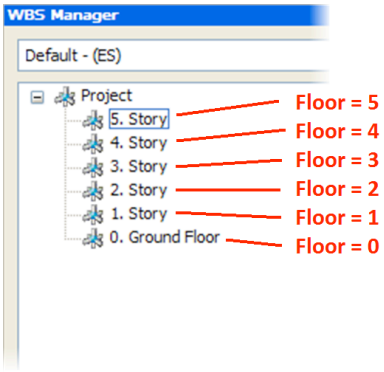


Figure 368 – Constructor’s Default WBS with criteria.

Each Location in the Default WBS has a “Floor Filter” assigned to it. Location “5. Story” has a Floor Filter that specifies that only the elements and tasks on the fifth floor of the model should be included; Location “4. Story” has a Floor Filter that specifies that only elements on the fourth floor of the model should be included.

Each Location in your WBS can have one or more *options*. When you define an option for a Location, it means that you can include a different *filter* for the selected Location, or change the parameters for the existing filter.

For example: if you want to find the optimal division of your project in the horizontal sense, you may want to define an option that splits the floor in two and an option that divides the floor into three pieces. By using option sets, you can then publish them to the scheduling application to analyze the pros and cons of both options, without losing your work.

How To: Define an Option for a Location

To define an option, right-click on a Location in your WBS.

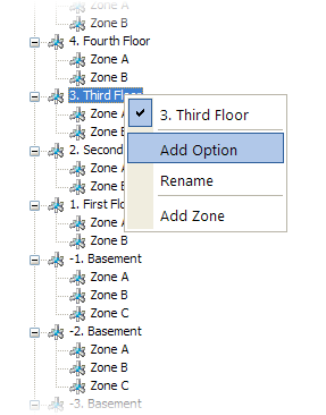


Figure 369 – Right clicking on a Location in your WBS to add an option.

Select "Add Option"; Constructor will replace the "3. Third Floor" Location with a new, empty Location.

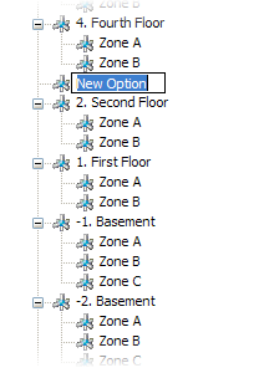


Figure 370 – After selecting "Add Option", Constructor replaces the existing location and places a new Location at the same position in the WBS.

You can now enter any name for the new Location (for example: 3. Third Floor Option) and start defining the filter criteria for the elements and tasks to be included.

If you want to rename an existing Location, right-click on the Location and select "Rename".

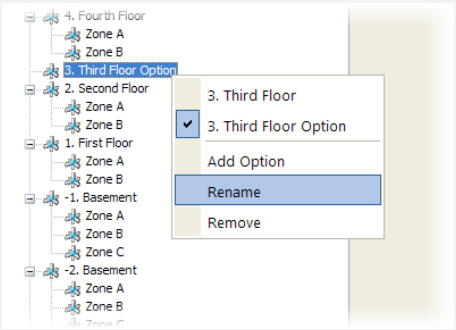


Figure 371 – Select "Rename" from the context menu after right-clicking to change the name of a Location. Note that the original "3. Third Floor" option is saved, but currently inactive in the WBS.

To find the optimal solution for your construction sequence, you probably need to examine a considerable number of combinations of the options in your WBS. Questions you may want to answer with this tool are "**What** would happen to my schedule **if** I divide the second floor into two Zones and the third floor in three Zones?" or "**What** would the duration of my project be **if** I first finish side A and then side B?"

Support for answering this type of questions, so called "what-if" scenarios, is provided by means of *option sets*. Each new option set is a copy of the currently active option set. All changes you make when you start working on it are saved; at any moment, you can easily restore your previous option set.

How To: Define and Use Option Sets

To make a copy of your current option set and start working in a new option set, click the property set function button and select "New".

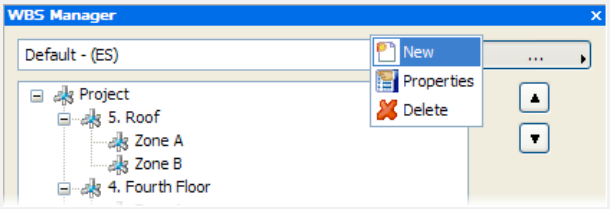


Figure 372 – Selecting "New" from the option set function button to create a new option set.

Constructor will capture the currently active options, as defined by the "Default" option set, and will create a new option set based on these. You can define the properties for the new option set in the "New Option Set" dialog:

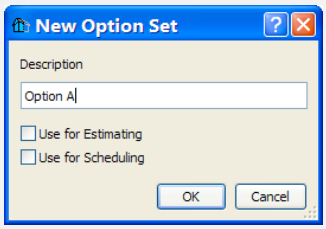


Figure 373 - Properties for the new option set.

Enter a name for the new option set. If you already know that you want to use it for estimating, scheduling, or both, select the corresponding check boxes.

Click "OK" to save your new option set.

You can switch back to the original "Default" option set by selecting it from the option set selection box at the top of the WBS Manager palette.

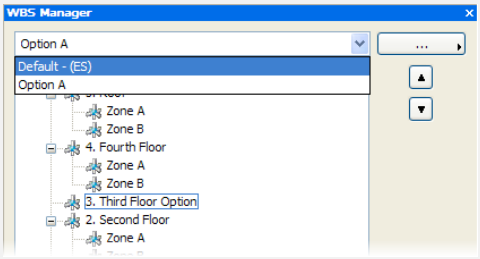


Figure 374 – Going back to the "Default" option set by using the option set selection box.

You can make changes in the “Default” set (for example: change “3. Third Floor Option” back to “3. Third Floor”) and then go back to your “Option A” option set. You will see that the third floor Location is still set to “3. Third Floor Option”.

From the first level of your WBS, you can quickly add new Construction Zones: boundaries that represent phases in the construction sequence. You can add a new “Construction Zone” sub Location by right-clicking on a first level Location (for example “3. Third Floor Option”) in your WBS. *This function is only available when no filters other than “Floor Filters” have been defined for the Location.*

HOW TO: ADD A CONSTRUCTION ZONE SUB LOCATION TO YOUR WBS

In your WBS, right-click on a floor level Location (for example the “3. Third Floor Option” Location from the previous example).

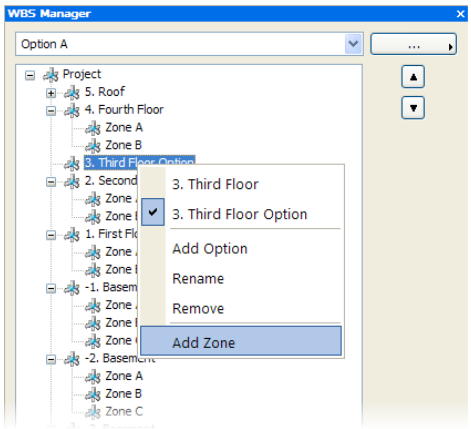


Figure 375 – Right-clicking a floor level Location in your WBS to add a Construction Zone to it.

Select “Add Zone”; Constructor will automatically create a sub Location for the selected Location and will ask you to define a name for it:

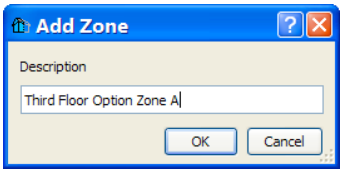


Figure 376 – The new Zone description dialog.

Enter the desired name for the new Zone and click “OK” to add it to the WBS.

Constructor will now change the cursor in the model space to a pencil: this allows you to define the boundary of the construction Zone you just created.

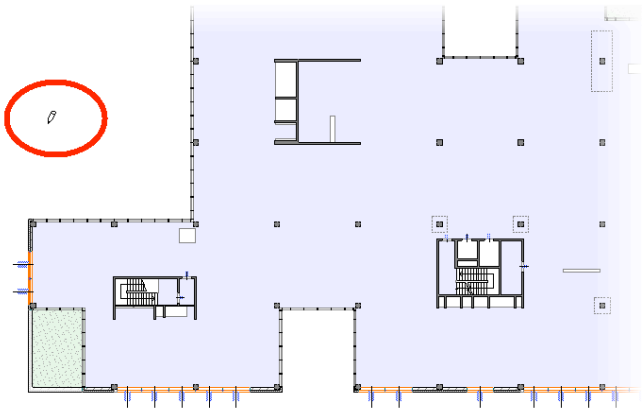


Figure 377 – After defining the name of the new construction Zone, the cursor will change into a pencil in the model space, which allows you to draw a boundary.

Define the boundaries of your new construction Zone: click once to start the boundary, and then click once for each desired intermediate point. Finish your boundary definition by returning to the start point and clicking one last time on that point.

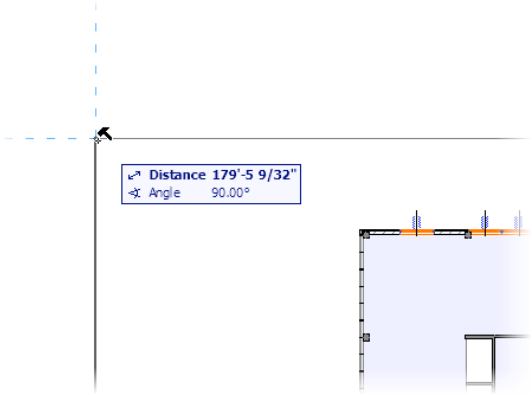


Figure 378 – Returning to the start point (the cursor changes into a "hammer"). Click one last time to finish your boundary.

A visual representation of your new construction Zone will now appear in the model:

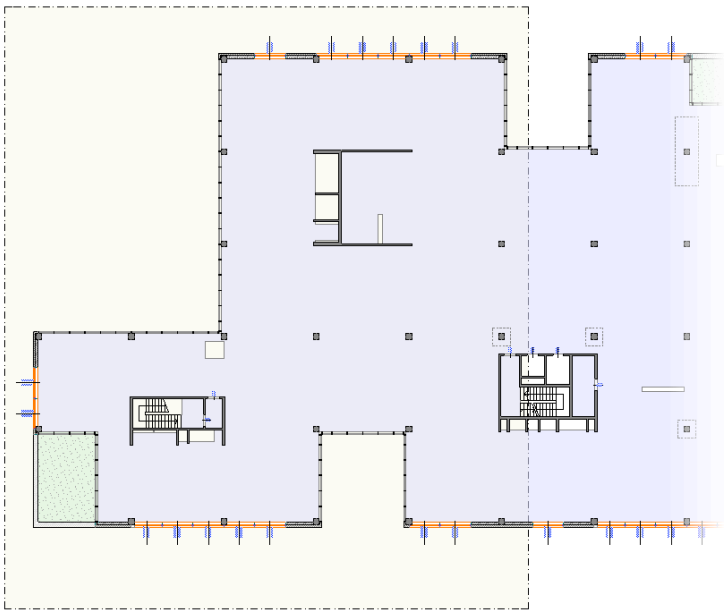


Figure 379 – A completed construction Zone.

All elements in the Zone you just added, plus all associated Tasks, will, from this moment, be included in the "Third Floor Option Zone A" Location.

By repeating this step (remembering to select the "3. Third Floor Option" level Location!), you can refine your WBS by adding construction Zones that reflect the intended sequence of your project's construction.

All Zone boundaries in your project's model are shown with the same representation settings. If you want to change the representation of your zones in the project by modifying the fill color, pattern or line type, you can use the "Zone Boundary Representation…" function from the "Sequencing" menu.

HOW TO: CHANGE THE REPRESENTATION OF ZONE BOUNDARIES IN YOUR PROJECT

To change the fill and line settings of the construction Zone boundaries in your project, select "Zone Boundary Representation" from the "Sequencing" menu.

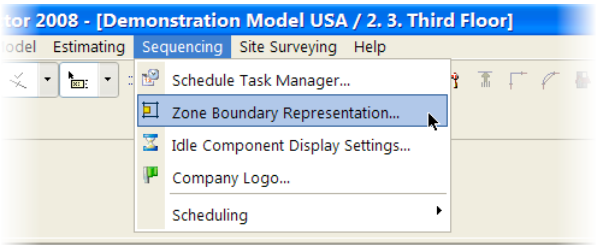


Figure 380 – The Zone Boundary representation settings can be accessed through the "Zone Boundary Representation" item in the "Sequencing" menu.

Constructor will present the "Zone Boundary Representation" settings dialog:

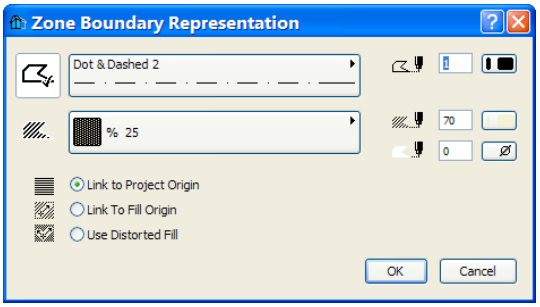


Figure 381 – The Zone Boundary Representation settings.

You can change the line type and fill type, as well as line color and fill color for your construction Zone boundary representations. Click "OK" to apply your changes: this will update all construction Zones in your project.

Filters

As described in the first section of this chapter, Constructor will automatically generate a WBS based on Floor Filters, reflecting the stories in your Constructor model.

In addition to Floor Filters, Constructor's WBS Manager contains six more filters, bringing the total of available filters to define the content of Locations in your WBS to **seven**:

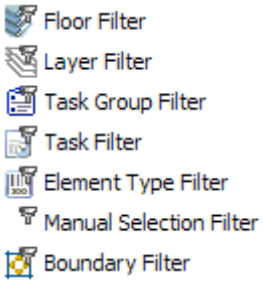


Figure 382 – Constructor's collection of filters.

Filter Name	Description
Floor Filter	Allows you to select from a list the floor or floors, defined in the model, from which you want to include elements or tasks.
Layer Filter	Lets you select from the list of layers in the model those layers that contain elements that you want to include in the Location.
Task Group Filter	Tasks can be grouped into "Task Groups". This filter enables you to select one or more groups from the list of task groups from which you want to include tasks in the selected Location. (For example: all "Concrete" work.)
Task Filter	Allows you to select from the list of defined Tasks in the project those Tasks you want to include in the selected Location.
Element Type Filter	Helps you to filter out specific element type(s) for the selected Location. (For example: only "Walls" and "Slabs")
Manual Selection Filter	If there are individual elements for which you do not want to define a filter, you can manually select them to be included in the selected Location. (For example: distant elevator shaft walls.)
Boundary Filter	Lets you define "construction Zones" on a floor using a boundary. (For example: Floor 3 is subdivided in Zone A and Zone B.)

All of the filters are available in the “Filters” tab in the bottom half of the “WBS Manager” palette.

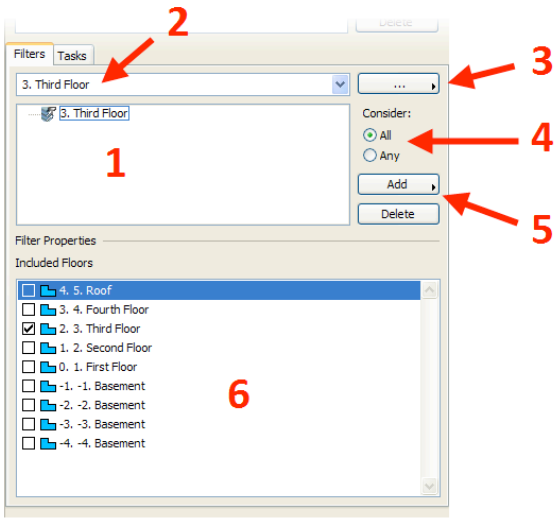


Figure 383 – The “Filters” tab in the WBS Manager palette contains the functionality to assign elements and Tasks to Locations in your WBS.

The filter list (**1**) shows the list of filters that are currently applied to the selected Location in the WBS. You can apply as many filters to a WBS Location as you need. For example: you could define two construction Zones, “Zone A” and “Zone B” and include them both in one Location.

The collection of filters that you define for a Location is saved as a “Filter Set”. Filter sets are unique collections of filters that you can give a name. All available filter sets in the project can be accessed through the “Filter Selection” box (**2**). You can reuse filter sets as often as you need them – for example, if you want to apply the same “Zone A” definition to 20 stories in your project. When you change the content of “Zone A” on one story, it will automatically be updated for all the other stories.

With the “Filter Set Function Button” (**3**), you can create a new filter set, delete the currently selected set, or rename the currently selected set.

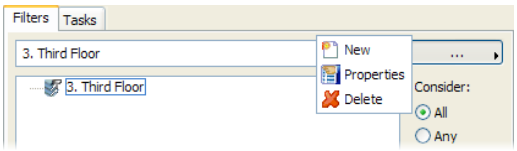


Figure 384 – Using the Filter Set Function Button to create, edit or delete a filter set.

You can define the relationship between filters that you define in a filter set by using the “Consider” toggle (**4**). If you set it to “All”, elements and/or tasks need to match all the defined criteria to be included in the Location. For example: it must be on the third floor AND it must be a Wall element type.

If you set the toggle to “Any”, one or more of the defined filters has to match the criteria to be included in the Location. For example: the element must be on the third floor OR it must be a Wall element type.

With the “Add” and “Delete” buttons, you can add or remove filters from your filter set. Clicking the “Add” button reveals all the available filter types:

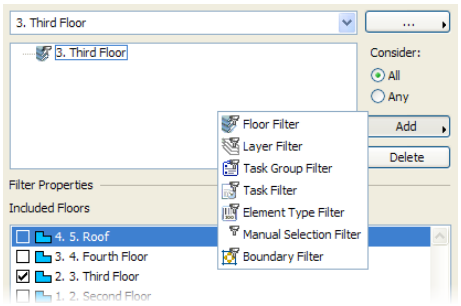


Figure 385 – Clicking the “Add” button on the “Filters” tab shows a selection menu from which you can select the new filter you want to use in your filter set.

If the filter that you select involves selecting items from a list, the list of available items is presented in the bottom list window of the “Filters” tab (**6**). This is the case for all filters, except for the “Manual Selection Filter”, and the “Boundary Filter”.

To start including elements and Tasks in a Location of your WBS, you first need to define a Filter Set.

HOW TO: DEFINE A NEW FILTER SET FOR A LOCATION

To start defining a new filter set, first select the Location to which you want to assign the new filter set in the WBS section of the WBS Manager:

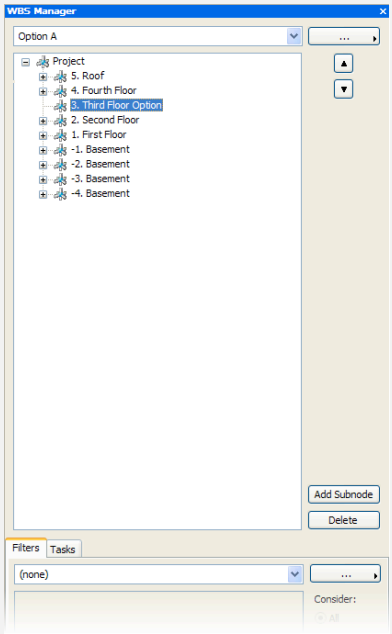


Figure 386 – Selecting a Location to which to assign the new filter set.

Next, click the filter set function button and select “New”.

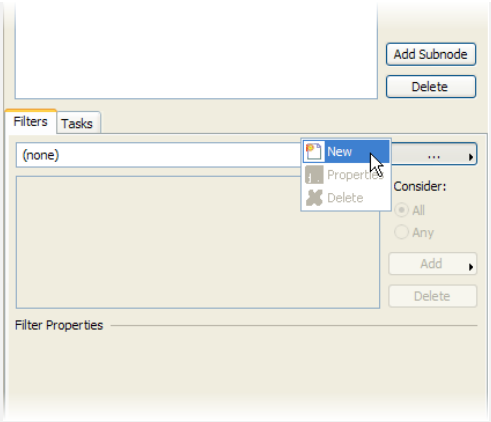


Figure 387 – Selecting "New" after clicking the filter set function button.

Constructor creates a new filter set and will ask you to name it:

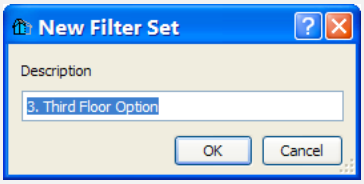


Figure 388 – The new filter set name dialog.

Enter a name, or just accept the default name (adopted from the selected Location) and click "OK" to finish the creation of the new filter set.

Constructor adds the new filter set and automatically assigns it to the selected Location. You will see that the list of filters in your filter set is initially empty:

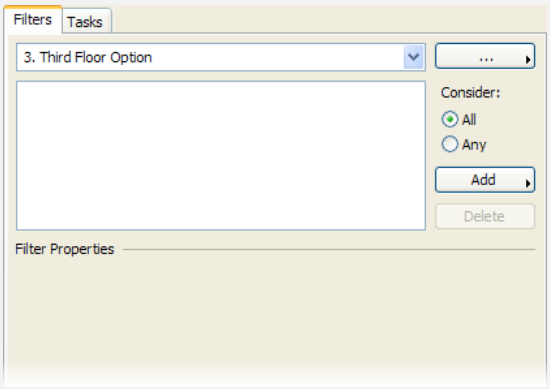


Figure 389 – The filter set that you created is initially empty: it does not yet contain any of the seven available filters.

When you add a new filter set to a Location that you selected in the WBS, it doesn't contain any filters. This would mean that all the elements and tasks that exist on the higher level (in this case: "Project"), would also be included in the "Third Floor Option" Location.

To add filters to your filter set, you can select one or more of the filters available through the "Add" button on the "Filters" tab.

How To: Define a Selection List Filter (Floor, Layer, Task, Element Type)

To add a new filter to your filter set, click the "Add" button in the "Filters" tab.

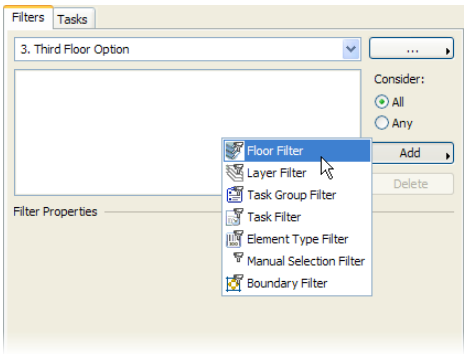


Figure 390 – clicking the "Add" button in the "Filters" tab to add a new filter to your filter set.

Select any of the following filters to get a list of items in the model that you can select from:

- Floor Filter
- Layer Filter
- Task Group Filter
- Task Filter
- Element Type Filter

As a first filter, we will add a "Floor Filter", to include all elements and tasks from the third floor into the "3. Third Floor Option" Location.

Select "Floor Filter" from the list of available filters. Constructor will create a new Floor Filter in your filter set.

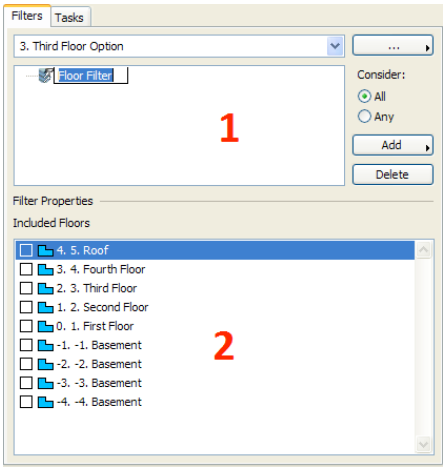


Figure 391 – A new "Floor Filter" is added to the filter set.

The new filter is created in the filter list (**1**). Constructor automatically specifies a default name for all new filters you add by adopting the name of the type of the filter name; in this case "Floor Filter". You can change the default name, or leave it as it is.

The "Filter Properties" area (**2**) of the Filters panel contains all the available items from which you can select to specify your new filter. In this case, the Filter Properties area contains a list of floors in your model.

Select the floor or floors that you want to include in the filter set (and thus in the selected Location).

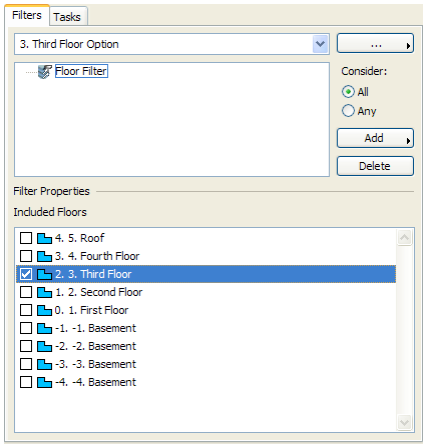


Figure 392 – Selecting from which floor(s) you want to include elements and tasks in the filter set.

Now that you have defined one filter for your "3. Third Floor Option" filter set, only elements and tasks from the third floor will be included in the Location to which you have assigned it to.

You can further refine the set of elements and tasks that will be included in the Location of the WBS by adding additional filters.

When you add an "Element Type" filter, you can select from a list which elements you would like to include in your filter set:

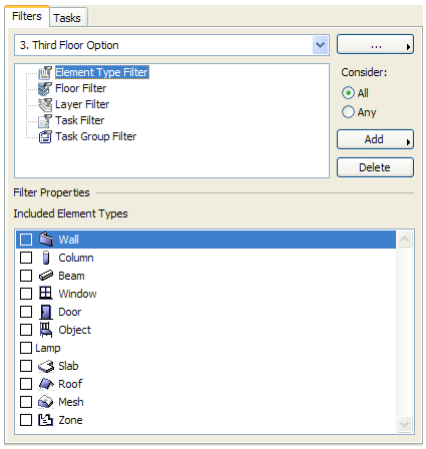


Figure 393 – The "Element Type" filter.

With "Layer" filters, you can specify which Constructor model layer you want to include – or *exclude* – from your filter set:

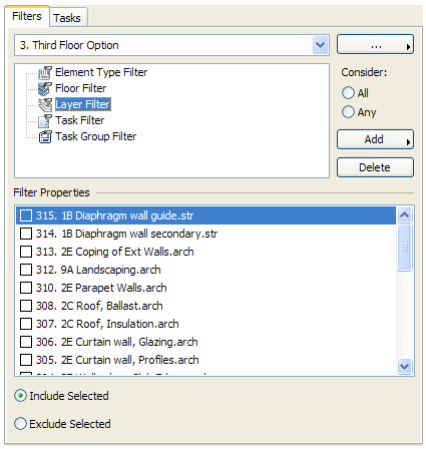


Figure 394 – The "Layer" filter; select which layers you want to include or exclude from your filter set.

"Task" filters allow you to select from a list of tasks in your project which tasks you want to include in the current filter set (and thus the Location in the WBS to which it is assigned). To learn more about "Tasks", see chapter "6: Schedule".

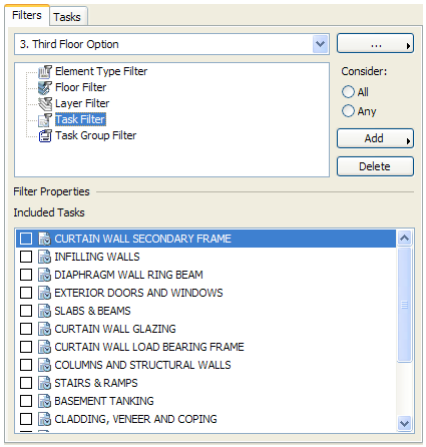


Figure 395 – With a "Task" filter, you can specify which tasks you want to include in your filter set.

Tasks can be grouped into "Task Groups" (see "6: Schedule"). You can also specify which group of Tasks you want to include in your filter set, thus Location in the WBS, to which it is assigned:

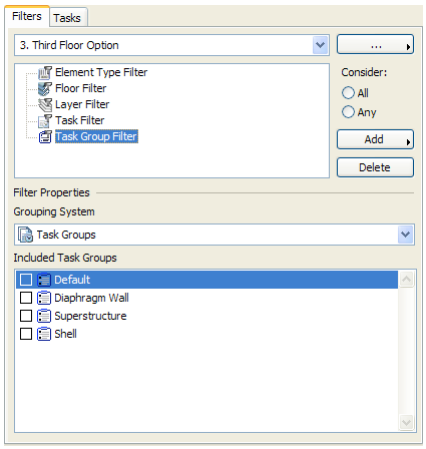


Figure 396 – The "Task Group" filter.

After adding the filters that you need to specify which elements and tasks should be included by the filter set, you need to decide *how* the filters should be considered by Constructor.

There are two options:

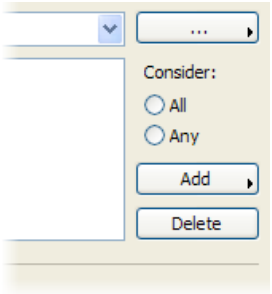


Figure 397 – The "Consider" settings in "Filters" tab.

When you select "All", each element and/or task has to match *all* of the filter criteria that you defined in the filter set by all filters included.

For example:

An element has to be on "**Floor 3**"
AND
it must be a "**Wall**"
AND
it must be on layer "**Structural**".

By using the "All" option in combination with several filters, you can quickly narrow down the amount of elements and tasks that will be placed on the Location to which the filter set is assigned.

When you use the "Any" option, you *widen* the collection of elements and tasks that will be included.

For example:

An element may be on "**Floor 3**"
OR
it may be a "**Wall**"

OR
it may be saved on layer "**Structural**"

By combining several types of filters and the "Consider" settings, you will be able to create any type of WBS you need for your projects.

The "Selection List" filters, described in the previous "How To" section offer you filter functionality that is based on the properties of elements and tasks in your project.

Boundary Filters

In order to define construction Zones and – with that – a construction sequence, Constructor allows you to define construction Zone *boundaries* with "Boundary Filters".

In the "How To: Add a Construction Zone Sub Location to your WBS" section, the quick way to define a construction Zone in your WBS has already been explained. While performing the "Add Zone" operation, however, Constructor automatically created a "Boundary Filter" in the background: by adding a Zone to a Location, you automatically:

- Created a new sub Location;
- Added a new filter set and assign that to the new sub Location;
- Added a "Boundary Filter" to the new filter set;
- Defined the boundary (boundary definition in the model space).

You can add as many boundary filters to a Location as you need. So, if you want to define "Zone C" as a collection of two or three areas in your project, you simply add three boundary filters to a filter set.

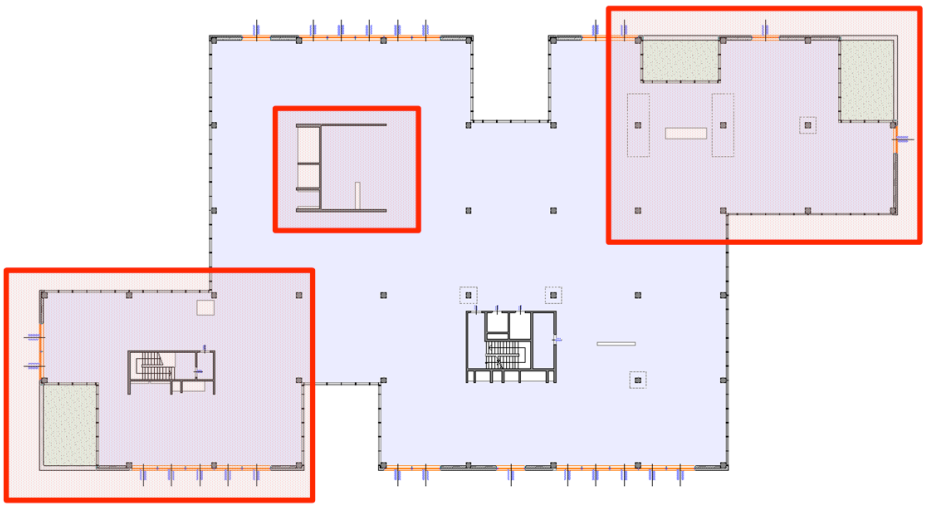


Figure 398 – By combining several "Boundary Filters" by setting the "Consider" option to "Any", you can specify multiple areas in your project under one Location in your WBS. A "Zone C" could, thereby, consist of three Zones in a floor plan.

Boundary filters offer unique functionality that avoids element splitting operations. When multi-spanning model elements (walls, slabs, beams), are located in more than one construction Zone, Constructor will automatically calculate the quantities for those elements in each of the Zones, **without any splitting operations**.

This "non-destructive element splitting" enables you to define and perform as many "what-if?" scenarios for construction Zoning as you need, without having to worry about the model geometry and correct quantities.

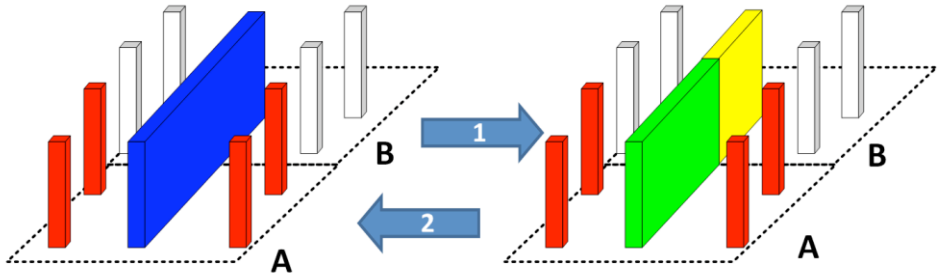


Figure 399 – Non-Destructive Element Splitting allows you to define Zone construction zone boundaries without splitting elements.

In the image above, the blue wall is spanning construction Zones "A" and "B". When you perform a "Refresh WBS" operation (automatically executed when publishing to an estimate or schedule), Constructor automatically calculates the quantities of the wall in Zone A and B (**1**). After completing the "Refresh" operation, the original state of the wall is restored (**2**).

Boundary filter settings define how Constructor handles multi Zone-spanning elements. You can specify in the boundary settings if an element has to be split to extract quantities (as in the scenario described above); if it should only include whole elements (for example, in the case of precast elements), or whether it should be automatically assigned to the Zone in which the majority of the element is located.

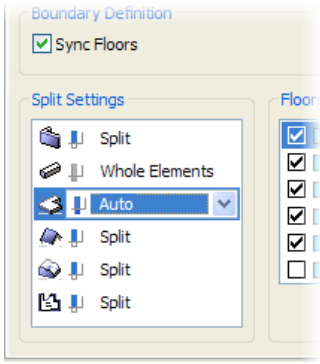


Figure 400 – Boundary behavior can be defined with "Split Settings" per element type.

How To: Define a Boundary Filter

To define a "Boundary Filter", first select the Location of the WBS in which you want to create the construction Zone, or create a new sub Location in the WBS.

To add a new sub Location, click the "Add Subnode" button, with the Location in which you want to create the new sub Location pre-selected:

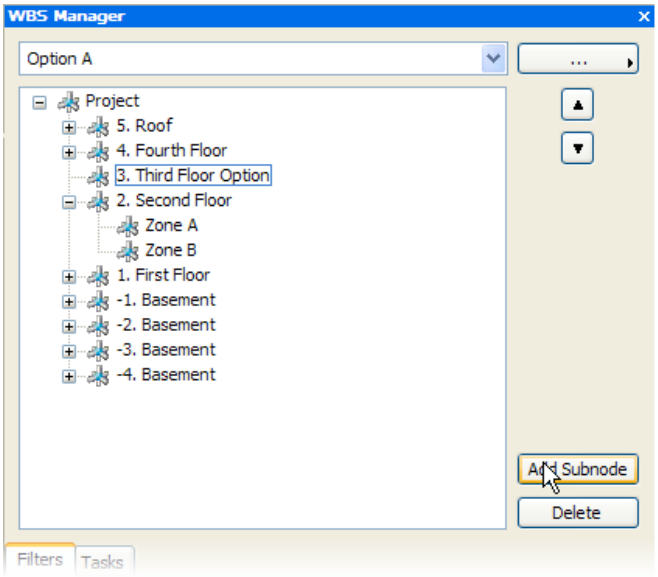


Figure 401 – Defining construction Zones on the "Third Floor", by selecting the third floor Location and clicking "Add Subnode".

Constructor will add the new Location to your WBS – you should change the name into the desired name.

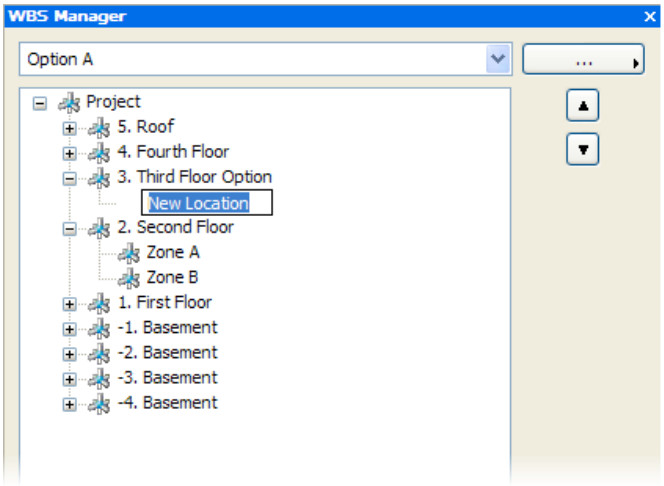


Figure 402 – A new Location is added underneath the selected Location.

In the new Location, create a new filter set with the new Location selected:

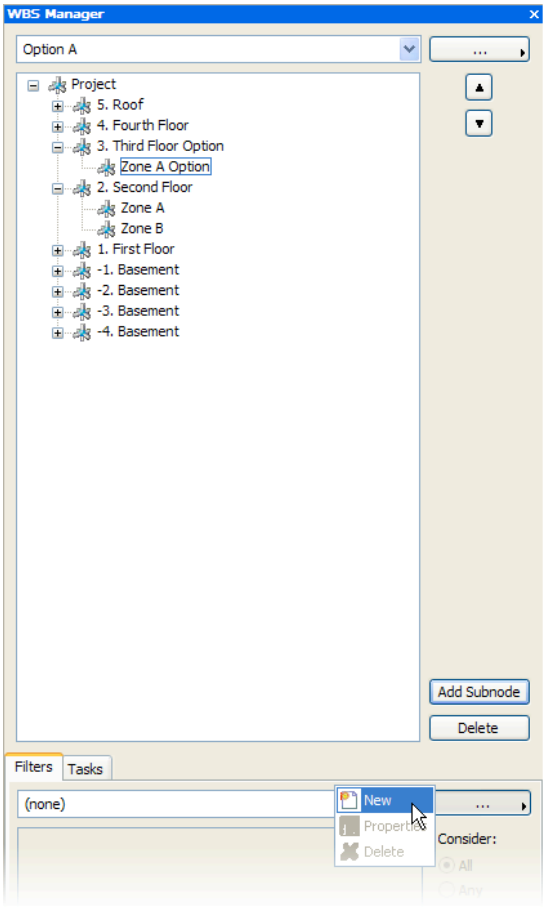


Figure 403 – With the new Location selected, click "New" in the filter set function button.

In the new filter set, you can add a filter. Select "Boundary Filter" from the "Add" button on the "Filters" panel.

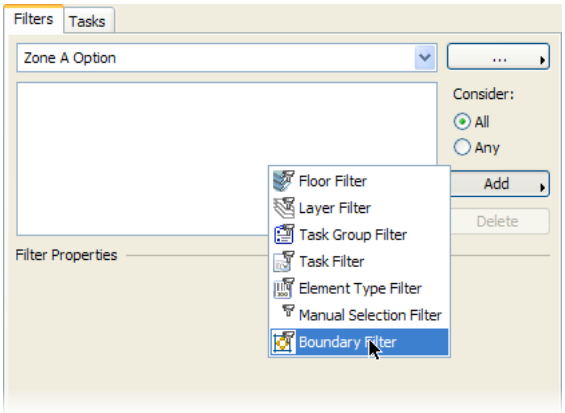


Figure 404 – Adding a "Boundary Filter" to the filter set you created for the new Location "Zone A Option".

Accept the default name; Constructor now displays the settings for your new boundary filter in the "Filter Properties" area:

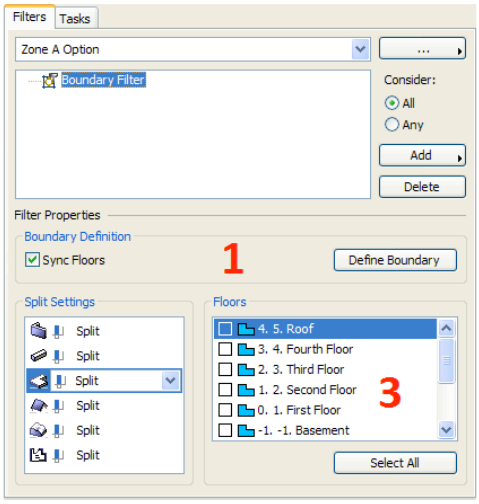


Figure 405 – The properties of the new Boundary Filter.

With the "Boundary Definition"(**1**), you can define the boundary of your construction Zone. The "Sync Floors" option will keep the boundaries synchronized if you apply the "Zone A Option" filter set to more than one floor – this will be especially useful if you define Zones for high-rise buildings with an iterative construction sequence.

The "Split Settings" section (**2**) allows you to specify how multi-Zone spanning elements, such as walls, beams and slabs, should be treated.

You have three options:

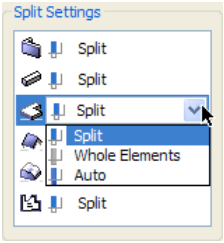


Figure 406 – The Split Settings for Boundary Filter.

Split automatically splits the element when quantities are calculated during the "Refresh WBS" operation;

Whole Elements only includes entire elements. If an element falls in two boundaries, it will stay on the higher Location in the WBS (in our example: the third floor).

Auto will automatically include the element in the Zone boundary in which the majority of the element (>50%) is located.

The "Floors" section (**3**) gives you an overview on which floors of your model the Boundary Filter is used. When you apply the filter set to more than one story, several floors will be selected automatically.

To define the boundary of your new construction Zone, click the “Define Boundary” button.

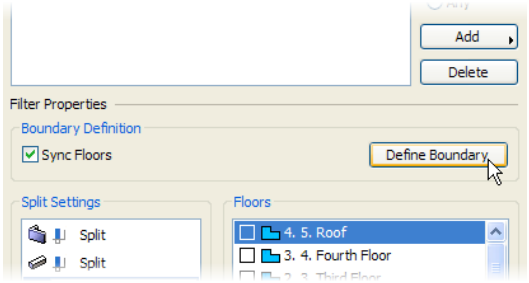


Figure 407 – Starting to define the boundary of your Boundary Filter by clicking the “Define Boundary” button.

Constructor will change the cursor in the model space into a “pencil”. Click to start defining your Zone boundary.

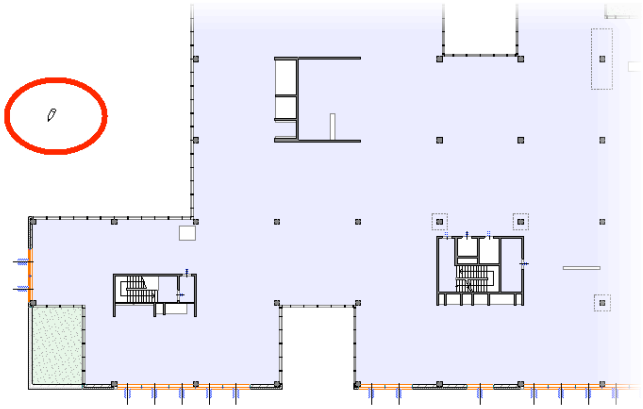


Figure 408 – After clicking “Define Boundary”, Constructor changes your cursor into a “pencil” in the model space. Click to define your boundary.

Define your construction Zone by defining the boundary; click on each desired intermediate point.

Finish your boundary definition by clicking on the start point: your cursor changes into a “hammer” when it is positioned over the start point.

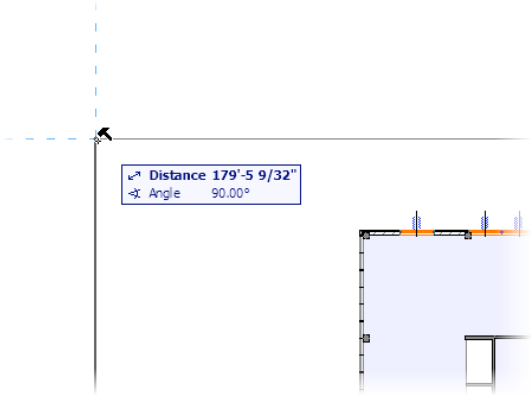


Figure 409 – Finishing your boundary definition by clicking on the start point; the cursor is changed into a hammer when positioned over the start point.

Your boundary definition has been completed – after the next "WBS Refresh" operation, all elements and tasks within the boundary will be added to the "Zone A Option" Location.

You can always edit the defined boundaries. Double-click on the "Boundary Filter" item in the "Filter Properties" tab; this will select the associated boundary definition in the model.

You can then edit the selected boundary by changing its size, adding additional points or by moving it.

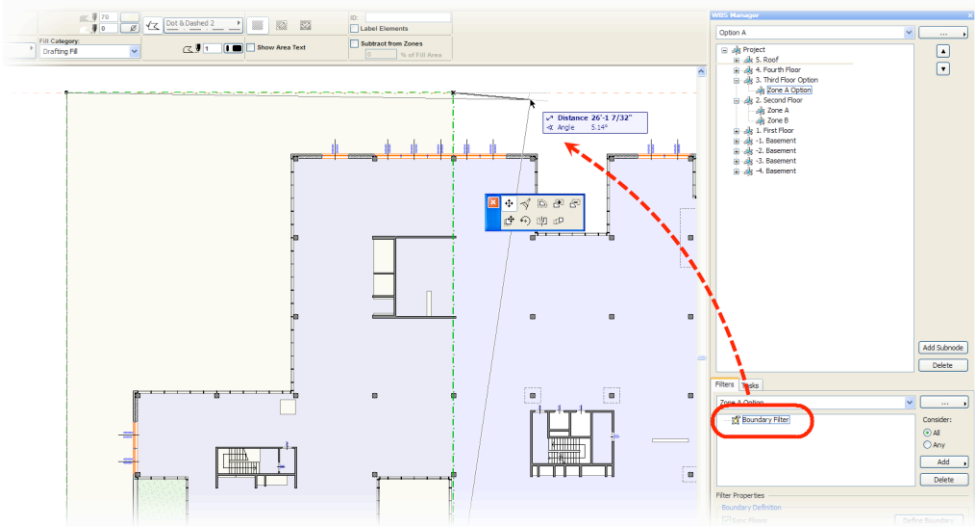


Figure 410 – Editing a defined boundary by double-clicking the Boundary Filter. After Constructor has selected the boundary definition, you can change its size or shape or move it.

You can combine several construction Zones in one Location by adding more than one Boundary Filter to one filter set.

How To: Combine Multiple Construction Zones

In order to define an additional construction Zone, select "Boundary Filter" from the "Add" function button.

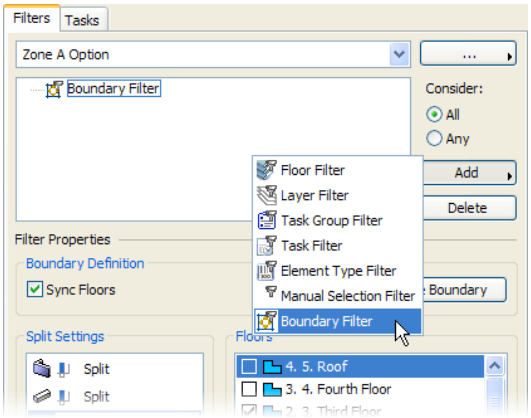


Figure 411 – Adding additional Boundary Filters to define next Zones.

With the new Boundary Filter, repeat the steps defined in "How To: Define a Boundary Filter".

After completing the second Boundary Filter, ensure that you change the "Consider" setting to "Any", to include elements and tasks from both Zones!

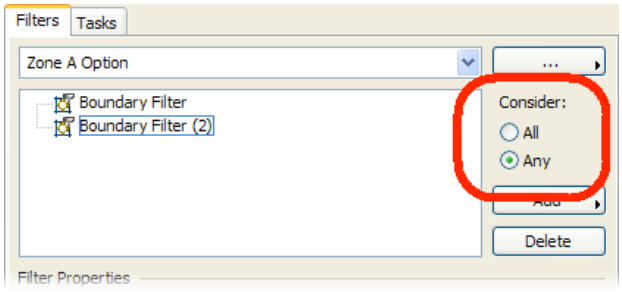


Figure 412 – Ensuring that you change the "Consider" setting to "Any" to include elements and tasks from both Zones in the Location that the filter set is assigned to!

Manual Selection Filters

In some cases, it will be easier to manually select the elements and Tasks to include into a Location in your WBS.

In such cases, you can include a "Manual Selection Filter" in a filter set.

HOW TO: DEFINE A MANUAL SELECTION FILTER

In a filter set, click the "Add" button and select "Manual Selection Filter".

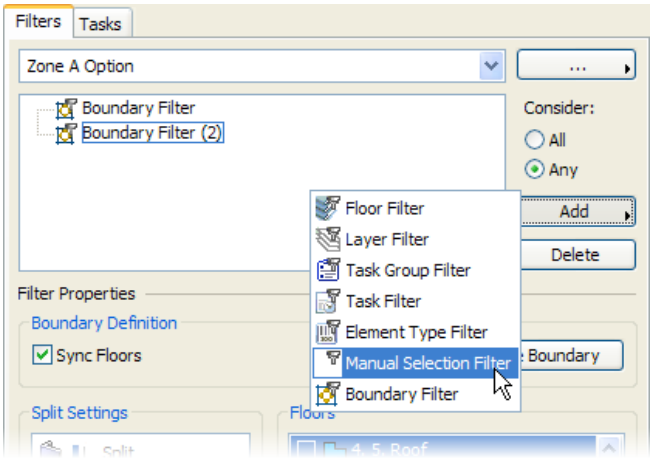


Figure 413 – Selecting the "Manual Selection Filter" from the "Add" button on the "Filters" panel to enable the manual selection of elements.

Constructor will show the properties of the Manual Selection Filter in the "Properties" section of the "Filters" panel.

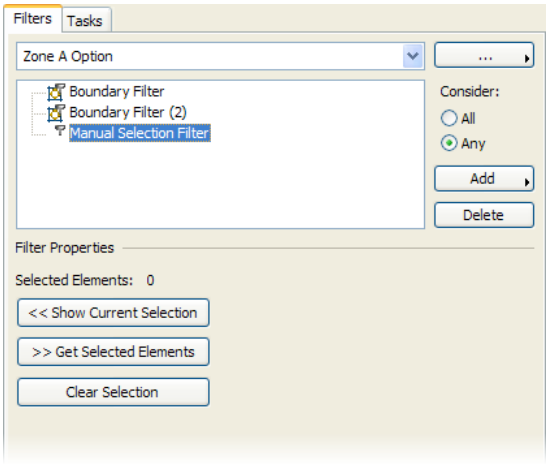


Figure 414 – Manual Selection Filter properties.

In the Filter Properties area, you can see how many elements are currently selected for the Manual Selection Filter.

"<< Show Current Selection" will highlight the current selection in your model; ">> Get Selected Elements" will add the elements that you have selected in your model to the selection set of the Manual Selection Filter.

If you want to reset your collection of selected elements, press the "Clear Selection" button.

Refreshing the WBS

After you have defined one or several Locations and sub Locations in your WBS, and also defined filter sets with filters for each of those Locations, you can check the result of your work by refreshing your WBS.

During a "refresh" operation, Constructor will execute the "Non Destructive Element Splitting" operation and it will automatically place the activities, associated with elements on each of the Locations, in your WBS.

HOW TO: PERFORM A WBS REFRESH OPERATION

You can find the "Refresh WBS" in the "5D Model" menu item. Select it to start regenerating your project's WBS with the currently selected option set.

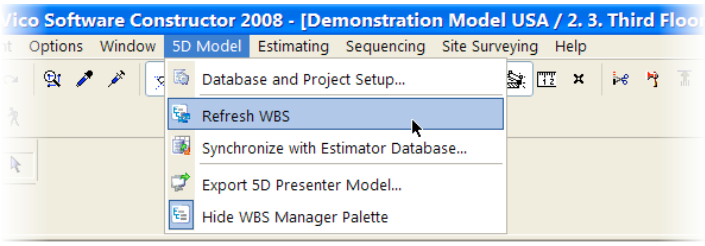


Figure 415 – The "Refresh WBS" function in "5D Model" menu.

Constructor will start the calculation process and will display a progress bar, informing you of the current status.

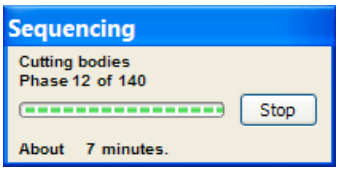


Figure 416 – The WBS Refresh progress bar; Constructor will execute the element splitting and calculation processes and will place resulting quantities on all Locations in your WBS.

Schedule Task Preparation

Each element in your model, as well as the entities in your Estimator project that reflect non-modeled quantities, contains one or more Methods. Methods reflect the activities that have to be performed in order to build the element that was described by the Recipe.

Collecting all the Methods for all the Recipes on all the Locations in your project would provide you with a starting point for a schedule, but this would most probably be far too detailed. The scheduling of individual elements is not a typical approach for construction projects.

Therefore, Constructor allows you to group *similar* Methods into *Tasks*. Tasks are groups of activities (Methods) that *can* be scheduled.

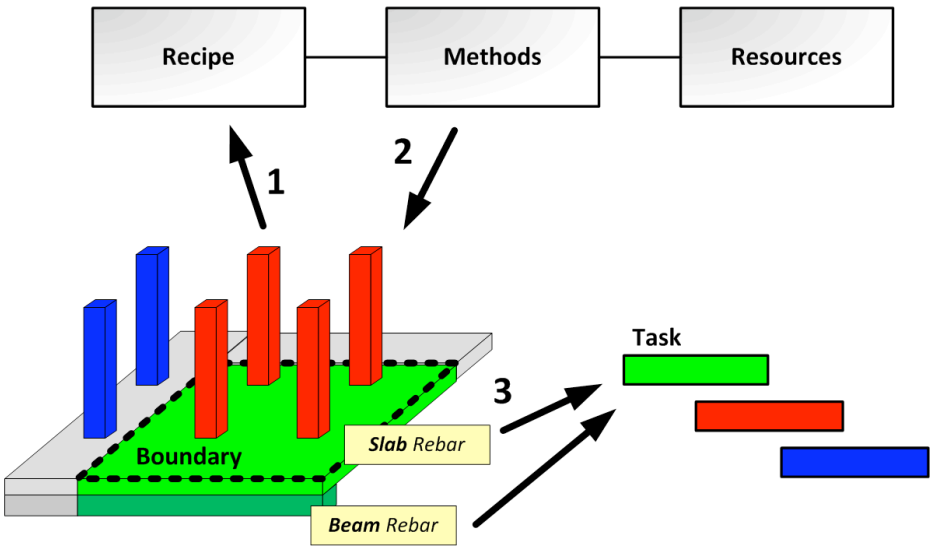


Figure 417 – Method – Task mapping concept of Constructor.

As an example, in the diagram above, both the Beam and Slab elements require “Rebar” activities, defined as Methods in the Recipe that was assigned to the elements. The quantities for both Methods have been calculated in the Estimator database; both Slab Rebar and Beam Rebar can now be mapped to one task: “Rebar”.

Method – Task Mapping

You can map Methods to Tasks of your project with Constructor's "Schedule Task Manager".

HOW TO: DEFINE TASKS AND MAP METHODS TO TASKS

To start mapping Methods to Tasks, open the Schedule Task Manager from the "Sequencing" menu item:

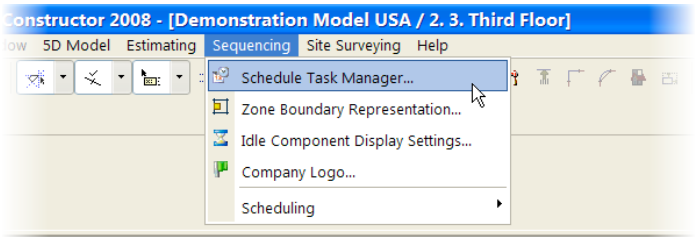


Figure 418 – Starting the "Schedule Task Manager" from the "Sequencing" menu.

Constructor will open the Schedule Task Manager and you will be presented with the following User Interface:

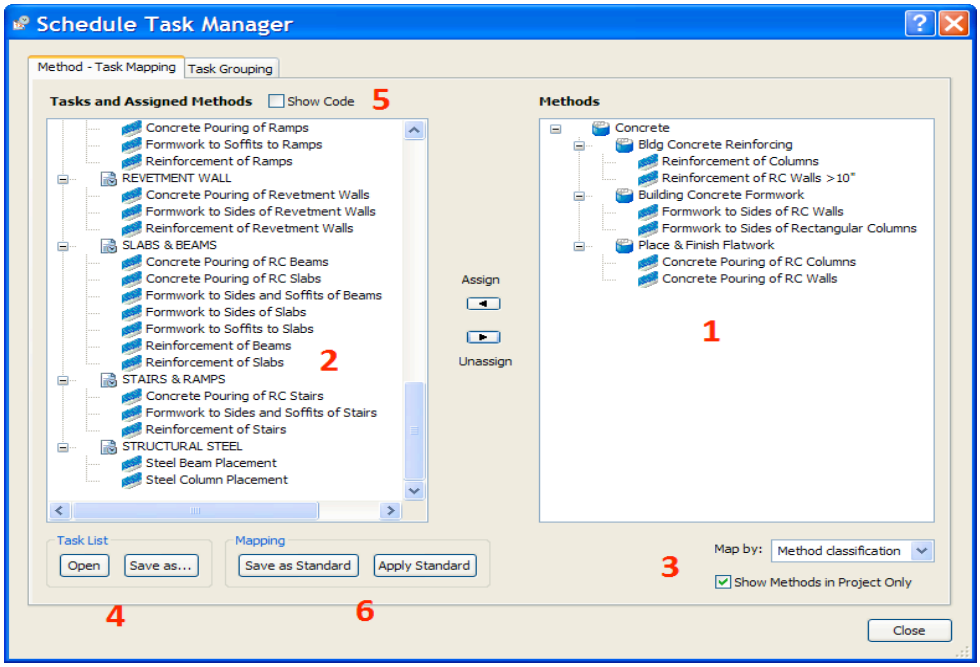


Figure 419 – The Schedule Task Manager User Interface.

In the Schedule Task Manager, you can see the Methods that were included in your project by means of a Recipe link in the "Methods" list (**1**). These are the Methods that you will have to assign to Tasks. Methods are by default listed by Method classification ("Work Type"). The list of Tasks in your project (**2**) is initially empty.

To simplify Method – Task mapping, the Schedule Task Manager has two options for the way that your Methods are displayed (**3**).

The "Task List" functions (**4**) contain functionality for saving task lists for later use.

With the “Show Code” (**5**) toggle, you can show or hide the Method and Task codes.

Right-click in the “Tasks and Assigned Methods” area to define a new task:

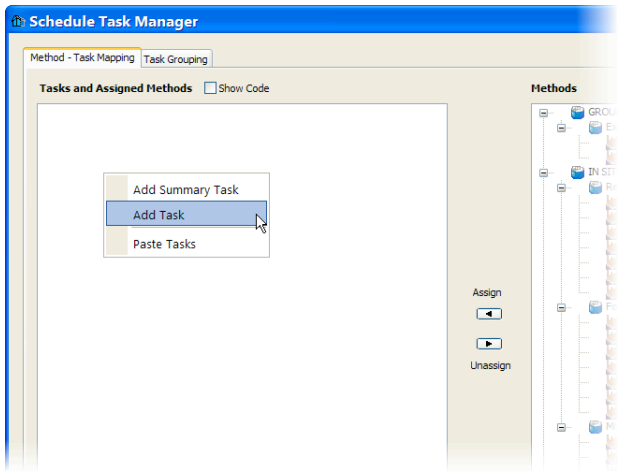


Figure 420 – Right-clicking in the “Tasks and Assigned Methods” area to define a new Task.

Constructor will ask you to define a name and a code for the new Task.

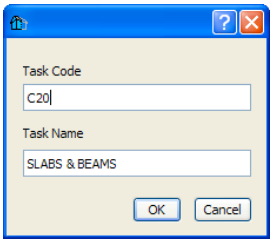


Figure 421 – Entering a code and a name for the new Task.

Click “OK” to save the new Task to the project. You will now be able to map Methods to this new Task.

To map Methods, select the Methods that you want to assign to a Task in the “Methods” list to the right side of the Schedule Task Manager dialog.

Next, select the Task to which you want to assign the selected Methods, and click the “Assign” button (<).

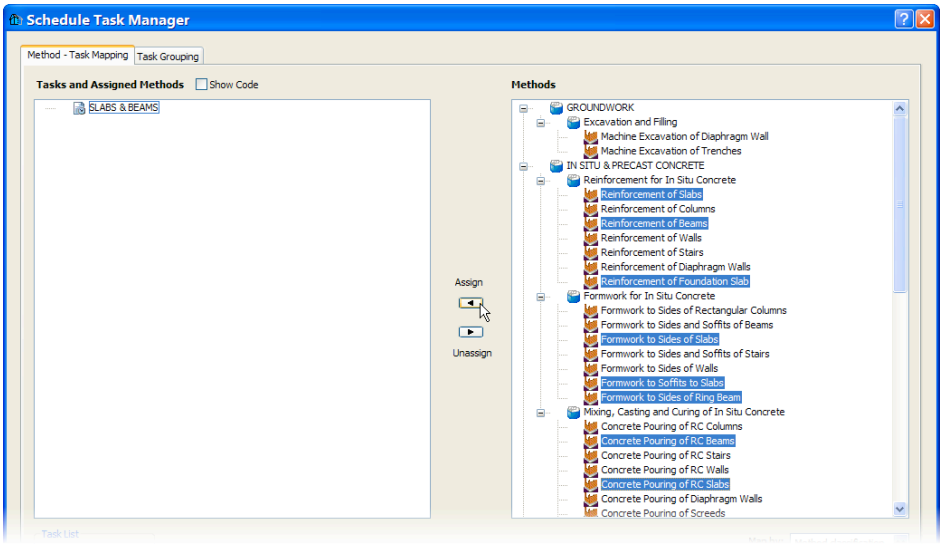


Figure 422 – Selecting Methods you want to assign to a Task. Select the Task and click the "Assign" button.

Constructor will move the Methods from "Methods" section to the "Tasks and Assigned Methods" section.

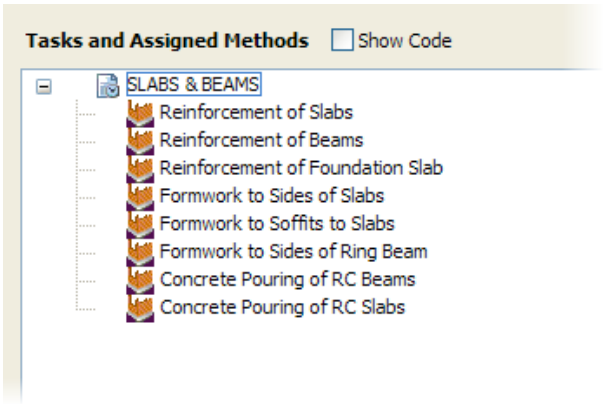


Figure 423 – The results of assigning Methods to a Task: Methods are moved from the "Methods" list to the Task definition.

You can select how you want your collection of Methods to be displayed. You can choose to display them as a list, or in a structure by Method classification (Work Type).

To change the way that your Methods appear, use the "Map By" setting in the bottom right corner of Schedule Task Manager.

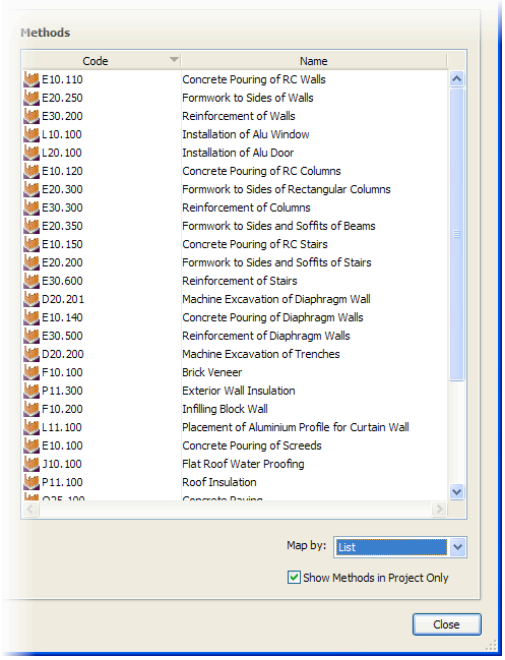


Figure 424 – Using the "Map by" setting to change how your collection of Methods is listed.

A good way to check if you have assigned all the Methods in your project to Tasks is by enabling the "Show Methods in Project Only" option:

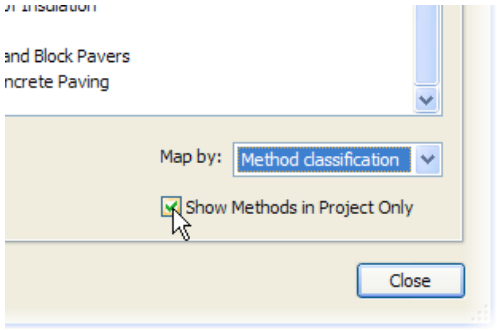


Figure 425 – The "Show Methods in Project Only" option only shows the Methods that are in use by Recipes assigned to elements in your project.

Define all Tasks that you have identified for the project and map Methods to these Tasks, as described.

When you have mapped all the Methods to a Task, the "Methods" list will be empty and all the Tasks will contain one or more Methods.

Note that this is only the case if you have selected the "Show Methods in Project Only" option!

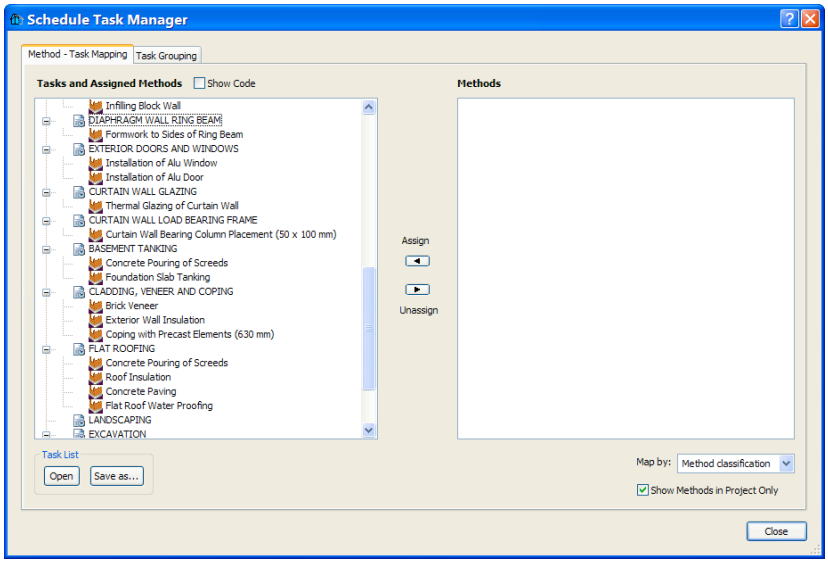


Figure 426 – The "Methods" list is empty: all Methods have been assigned to a Task.

To allow the matching of standard Task naming and structuring guidelines for scheduling, you can create "Summary Tasks". A summary task can contain multiple tasks or other summary tasks. Summary Tasks make it possible to define a hierarchical task structure for your project.

HOW TO: CREATE A SUMMARY TASK

To create a summary task, right-click in the "Tasks and Assigned Methods" area, and select "Add Summary Task".

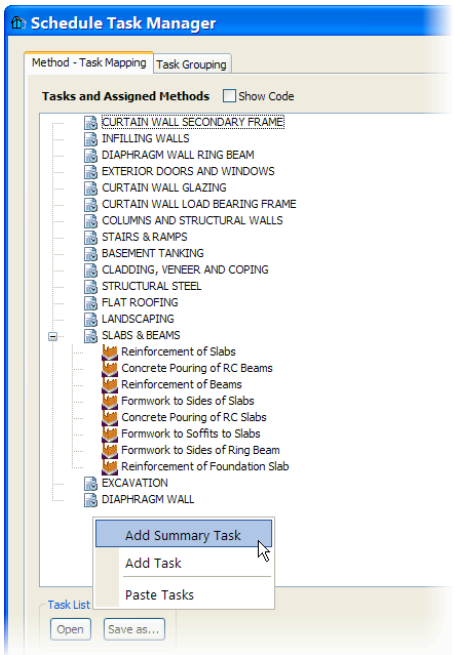


Figure 427 – Right-clicking in the "Tasks and Assigned Methods" area and selecting "Add Summary Task".

Constructor will ask you to define a code and a name for the new summary task.

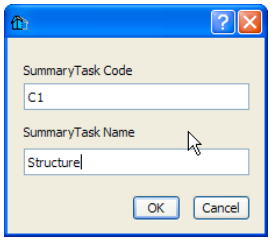


Figure 428 – Defining a code and a name for the new Summary Task.

Click "OK" to add the summary task to your project. You can now include already defined Tasks (including Methods) in the summary task. To do this, select the Tasks you want to include and drag and drop them into your new summary task.

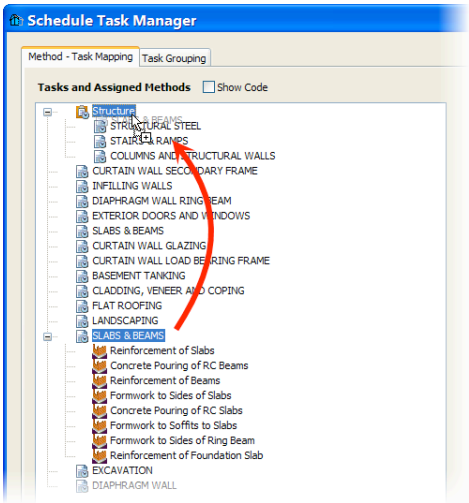


Figure 429 – Selecting the Tasks you want to include in a Summary Task and dragging them to the desired Summary Task.

To reveal the codes that you have entered for Tasks and Summary Tasks, as well as the Method codes, select the "Show Code" checkbox.

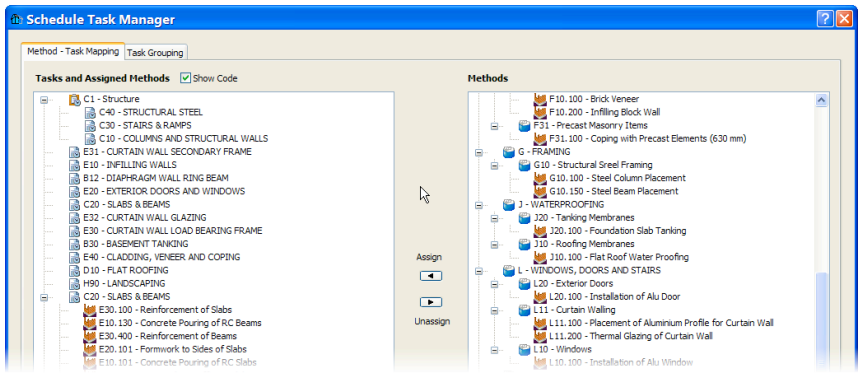


Figure 430 – "Show Code" reveals the codes for Tasks, Summary Tasks, and Methods.

Schedule Tasks in the WBS

When you have defined your Tasks in the "Schedule Task Manager", Constructor can place the Location and quantities in the WBS through the elements and the element filters that you defined.

When you open the WBS Manager and select the "Tasks" tab, you will see for all Locations in your WBS which Tasks will have to be carried out at that Location.

Quantities are calculated for all elements with Recipe links; the quantities of elements that are partially included in Zones are calculated during the "Refresh WBS" operation.

You can check the included quantities by expanding a Task: you will see all the included Methods, *plus* their quantities.

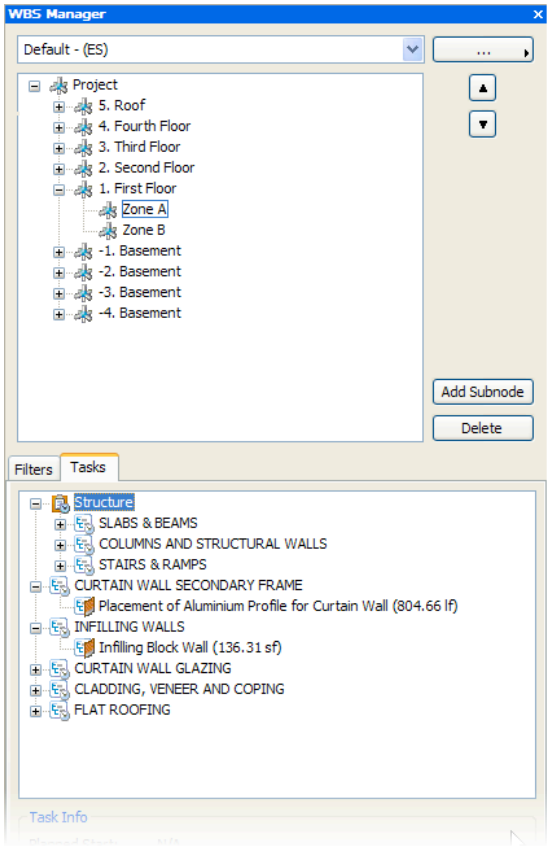


Figure 431 – The "Tasks" tab on the WBS Manager palette shows which Tasks are included in each of the Locations. When you expand a Task, any included Methods, with their quantities are displayed.

Using the Methods in Tasks, you can analyze which elements in your 3D Model are associated with it. This function allows you to visually check your sequence before you publish your work to a scheduling application.

How To: Check Task/Method Quantities in the Model

Expand the Task to show the Methods that are included in it. When you double-click on a Method, the elements, associated with the Method will be selected in the Model space.

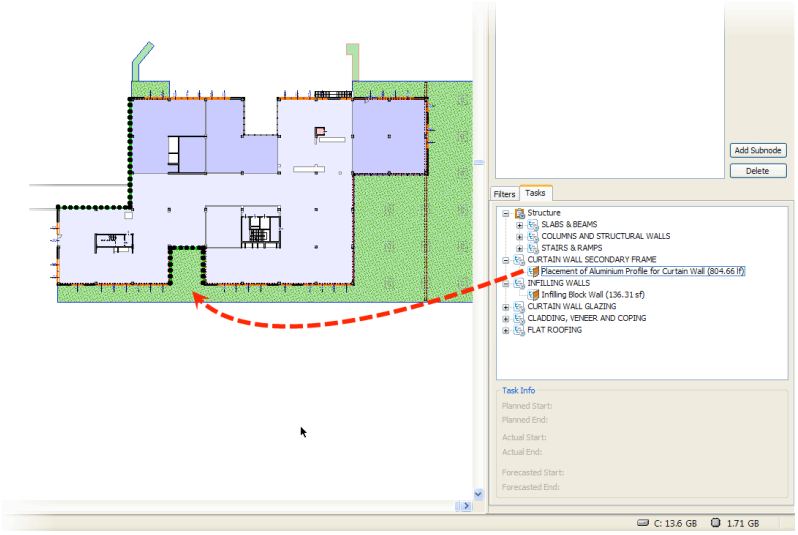


Figure 432 – Double-clicking on a Method in a Task to highlight the associated elements in the model.

When elements in the model related to the selected Method have been highlighted, press <F5> to show these elements in 3D – this allows you to visually check the elements and quantities of your Task.

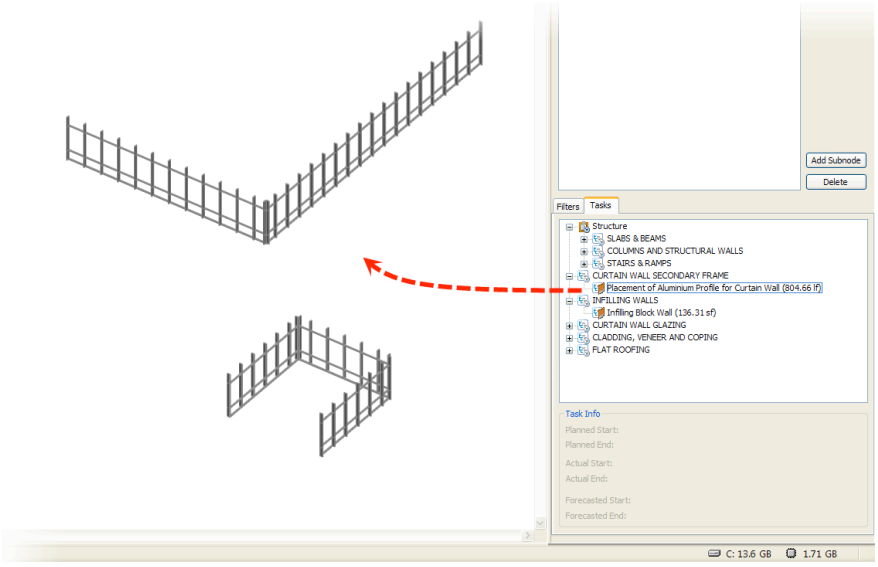


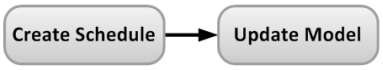
Figure 433 – With elements highlighted, press <F5> to isolate these elements in 3D.

Mastered Process Steps

You now know how to update your set of model information from your estimate, how to define a Work Breakdown Structure for your project and how to use both to prepare Tasks for your scheduling work.

6: Schedule

This section will explain how you can use model based data to create schedules and subsequently update your model with data from the designed schedule.



When you have completed setting up one or several Work Breakdown Structures, and have also mapped the Methods calculated in the Estimator database to Task and Summary Task definitions, you can publish your work into one of the supported scheduling applications.

Vico Constructor is integrated with the following scheduling software:

- Vico Control 2008
- Microsoft Project©
- Primavera P3© versions 4 and 5

Publishing to a scheduling application is done through the "Scheduling" function from the "Sequencing" menu.

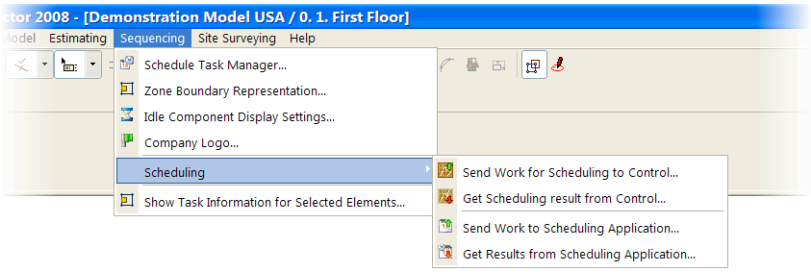


Figure 434 – Sending and receiving schedule information from scheduling applications with the "Scheduling" function in the "Sequencing" menu.

Constructor's scheduling connection consists of two phases:

Figure 435 – Constructor's two-phase connection with scheduling applications.

In the first phase (**1**), you send your model based schedule input (WBS, Tasks, Quantities) to the scheduling application that you want to use. In the scheduling application, you can use this input to design a schedule for your project.

After completing your schedule, you *get* the resulting schedule data from the scheduling application (**2**). This is done either by reading data from the scheduling application's database or by reading the scheduling file.

Constructor offers connectivity with three scheduling applications. To work with Vico Control, select "Send Work for Scheduling to Control" and "Get Scheduling result from Control".

When you want to use your model based schedule input in Primavera© or MS Project, select "Send Work to Scheduling Application". Constructor will present a dialog box, in which you can select to which scheduling application you would like to write.

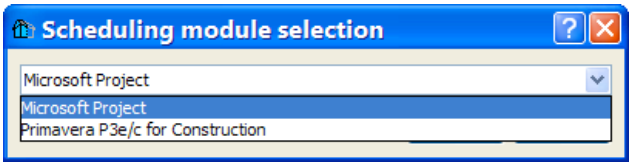


Figure 436 – After selecting "Send Work to Scheduling Application" or "Get Results from Scheduling Application", you will be presented with a selection dialog for the scheduling software you want to use.

Scheduling with Vico Control

When you choose to select the Vico Control software to design and optimize your schedule with, you will optimally take advantage of the Location based information that you have created with your model.

Using Constructor model based input for your schedule in Control means that you transfer all the construction knowledge data that you have added to your project in Constructor (quantities, Locations, construction Zones) and Estimator (Recipes, Methods/*Activities* and Resources/*Means*).

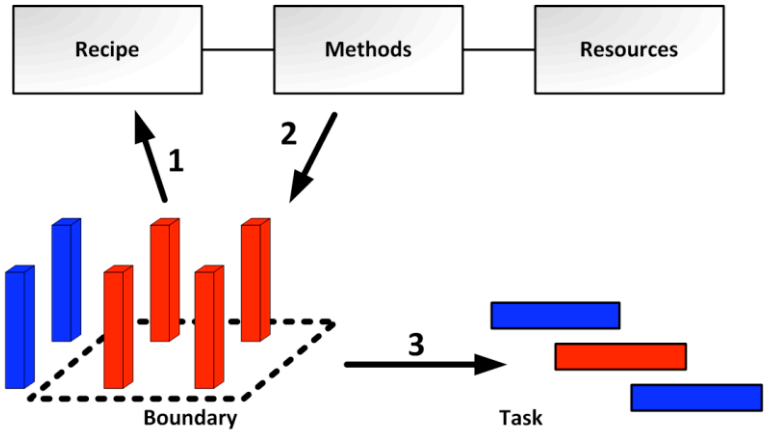


Figure 437 – When scheduling with Control, quantities, Locations and construction Zones (1) and Recipes, Methods and Resources (2) are included in the Tasks (3) transferred with the schedule data.

Using Model Based Construction Information in Control

With the information available in Constructor and Estimator, you can create a schedule by applying production factors (*Crews*) to Tasks in Control. Instead of defining start and end constraints, you can *calculate* and optimize your schedule, using Control's Flowline technology.

HOW TO: SEND MODEL BASED SCHEDULE INFORMATION TO CONTROL

Before sending your Constructor model based construction information to Control, make sure that you have:

1. Published model based information to Estimator to calculate the use of Methods and Resources (See: "How To: Save Model Based Quantities in your Project" and "How To: Import Model Based Quantity Data") ;
2. Assigned Methods to Tasks with Constructor's "Schedule Task Manager" (See: "How To: Define Tasks and Map Methods to Tasks");
3. Defined the Location structure you want to base your schedule on (See: "How To: Add a Construction Zone Sub Location to your WBS").

Next, select "Send Work for Scheduling to Control" from the "Sequencing" menu.

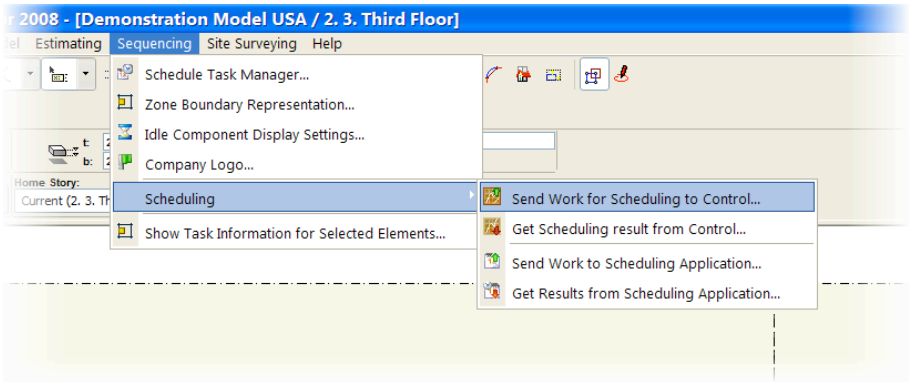


Figure 438 – Selecting "Send Work for Scheduling to Control" to transfer your project data to a Control schedule.

Constructor will refresh the project's WBS; after completing that operation, you will be asked to specify a filename and path for the data package that you are about to save for use in Control.

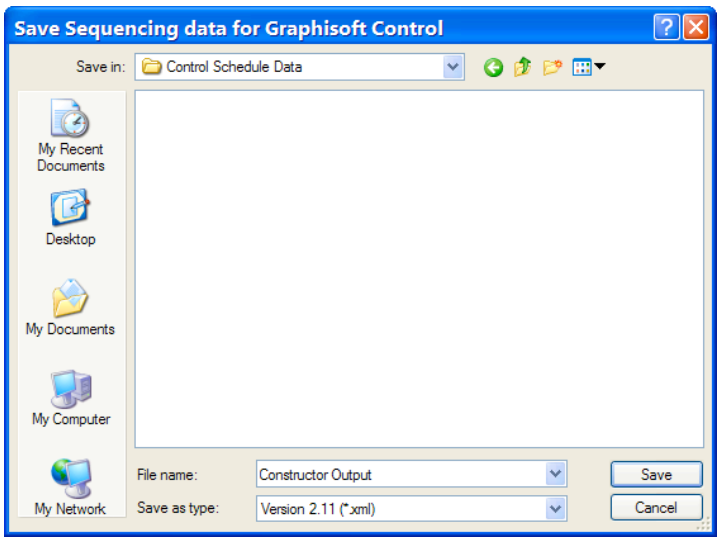


Figure 439 – Specifying a name and path for the Control data transfer file.

Constructor will save all Location, construction Zone, Recipe, Method and Resources plus associated quantities into a file that can be opened in Control.

The data that you publish from Constructor into the data package provide you with an initial schedule in Control. To use the saved data, you need to start a new project in Control.

How To: Start a New Project in Control and Open your Constructor Data

Start Vico Control; you can find Control in the "Vico Software" folder of the "Programs" directory in your Windows Start menu.

Control will show the following dialog:

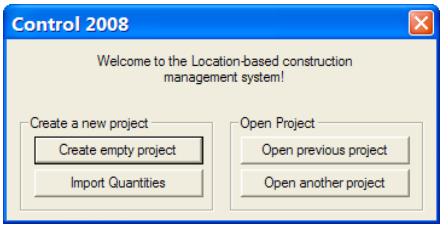


Figure 440 – Startup options in Control.

Select "Create empty project"; Control will open the "Project Settings: new project" dialog.

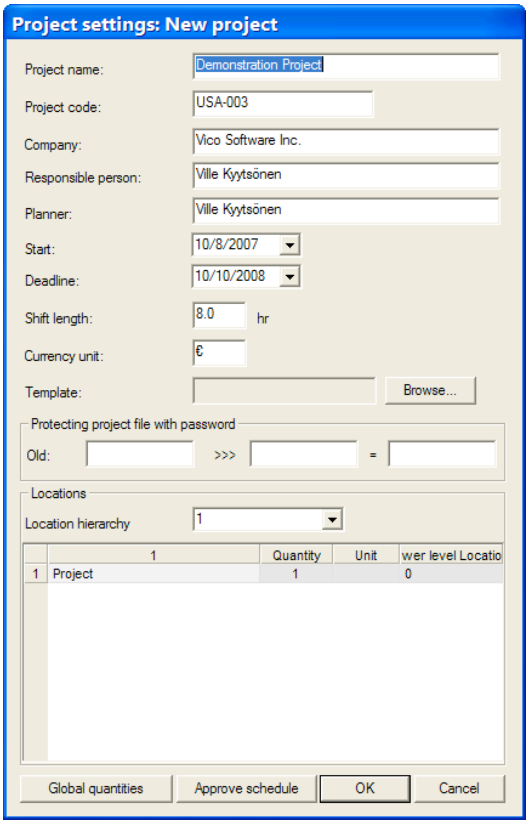


Figure 441 – The Control new project settings.

Enter the required information and click “OK”. The project you have created is empty: it only contains one Location (“Project”) and no Tasks.

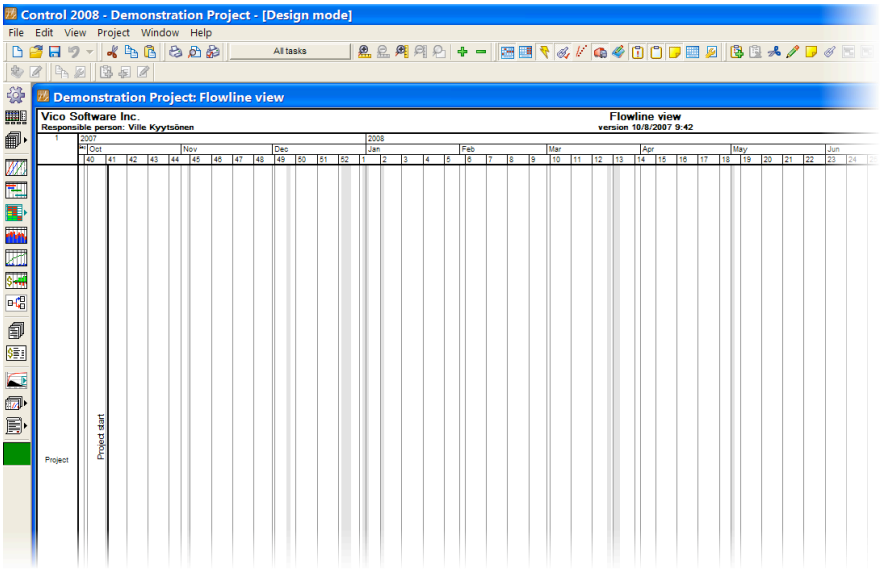


Figure 442 – A new, empty project in Control.

To start using the project data you saved from Constructor, select “Import” from the “Importing and exporting” item in the “File” menu.

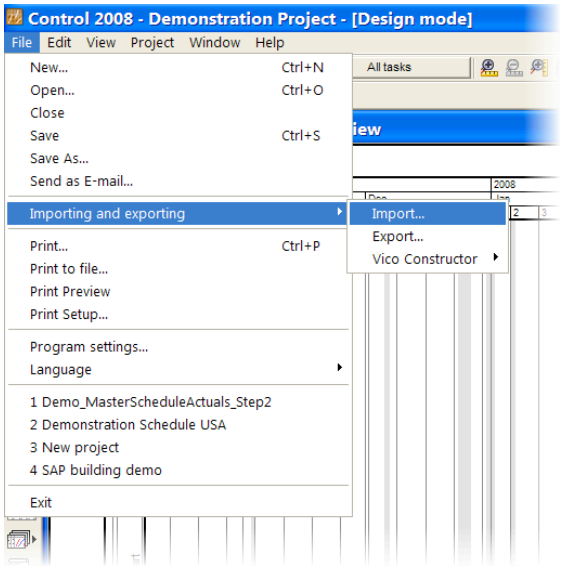


Figure 443 – The "Import…" function allows you to bring in the saved construction information.

Control shows an overview of the supported data types; select "XML file" and click "Next >>".

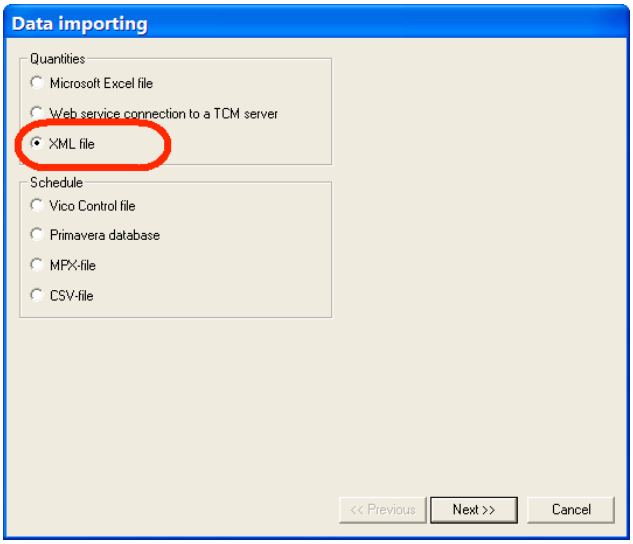


Figure 444 – Selecting "XML file" to start importing your Constructor data.

In the next dialog, Control will ask you which cost types and code intervals it should import. Select all (default setting) and click "Next >>". Leave the "Map Locations by name" option unchecked – you will only use this option when you have made changes to the WBS in your project.

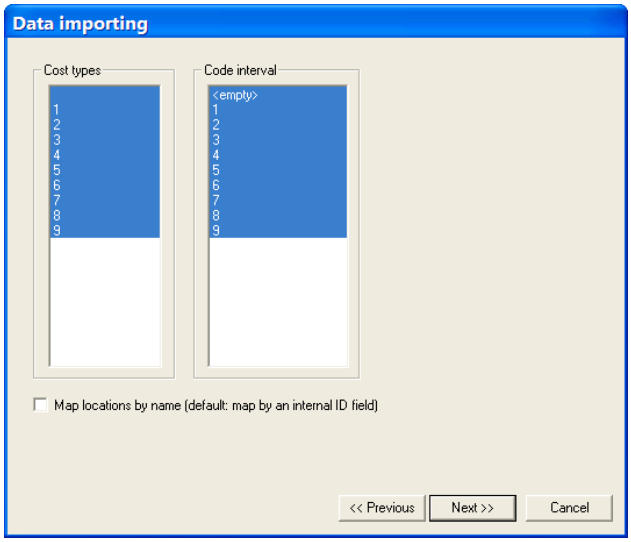


Figure 445 – Selecting all Cost types and Code intervals.

Next, specify where you saved your construction information generated from Constructor and Estimator:

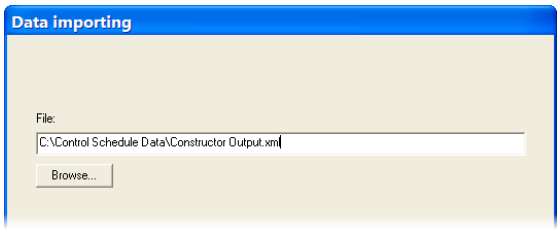


Figure 446 – Specifying the name and Location of the file with construction information.

Click "Next" to continue – specify the lowest level of the Constructor WBS that you would like to import. You will typically accept the default (lowest) level in the WBS:

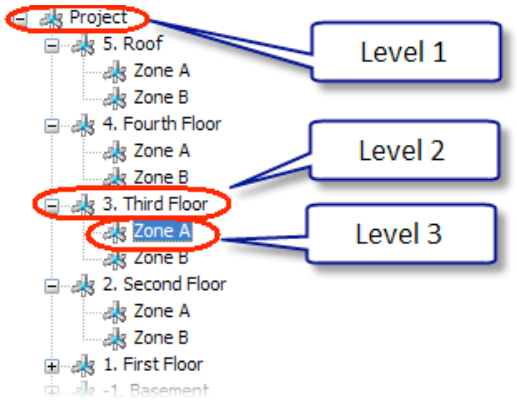


Figure 447 – The Constructor WBS hierarchy levels.

An exception may be the case when you have defined Element filters or Task filters within a construction Zone. These filters would be on "Level 4" and would not be useful as a scheduling Location. In this case, you would select "Level 3" instead of the default "Level 4".

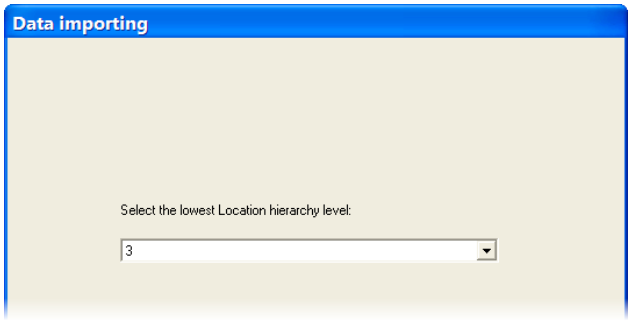


Figure 448 – Hierarchy selection setting.

Click "Next" to continue; Control will list all unidentified quantities: i.e. the quantities in your Constructor data file that cannot be placed in the Location and Task system of the Control project. When working with a Constructor dataset, this list will typically be empty.

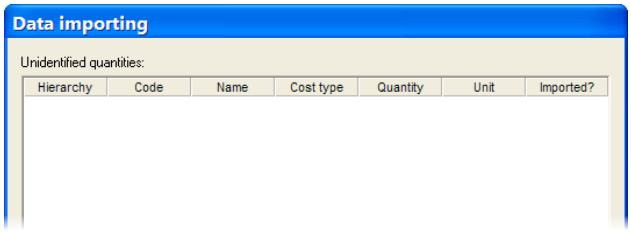


Figure 449 – The list of unidentified quantities in the imported data file.

Click "Next"; Control will now show you the list of quantities that changed from the previous import to the current import. Because this is your first import, the list will be empty.

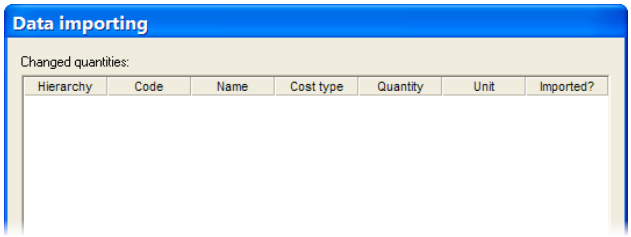


Figure 450 – The list of changed quantities in the current dataset.

Click "Next" to proceed – Control will now show the list of *new* quantities that will be added to your project. This list contains all the Task, Method and Resource quantities; they are saved by Location and will be saved in the structure that you defined in your Constructor project.

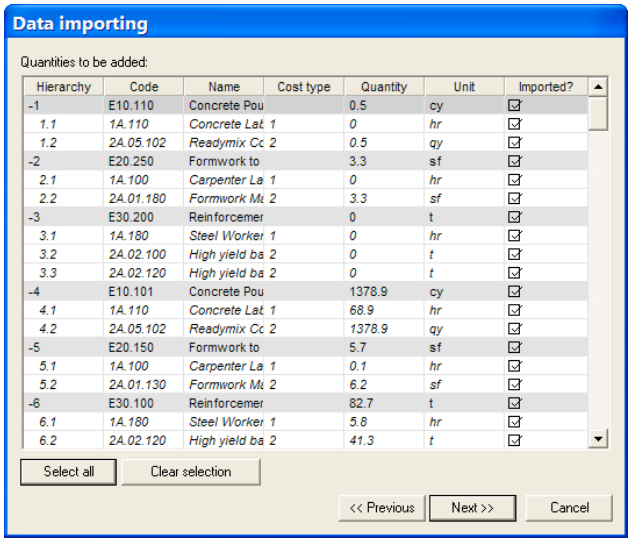


Figure 451 – The quantities from Constructor and Estimator data that will be imported into your Control project.

After clicking "Next", Control will show you the quantities that are about to removed, because they do not exist in the dataset to be imported. This dialog will be empty during the first import.

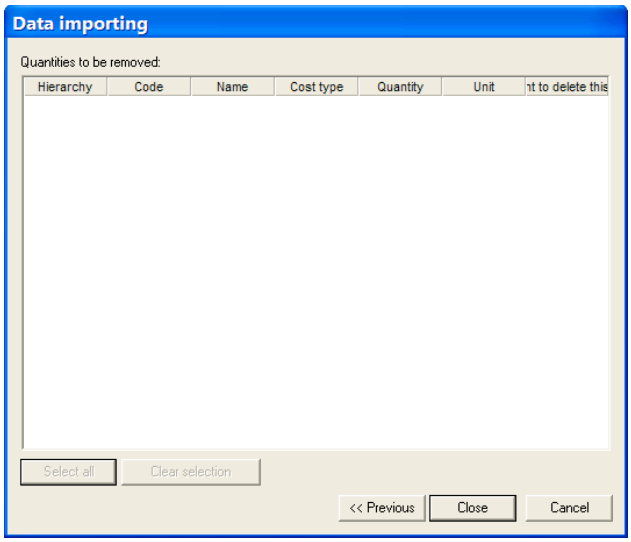


Figure 452 – The quantities that will be removed from the project.

Click the "Close" button to complete the import of model based information. Control will now give an overview of Resource data from Estimator that will be imported into your Control project. Remove the checkmark in the "Apply" column to skip a Resource.

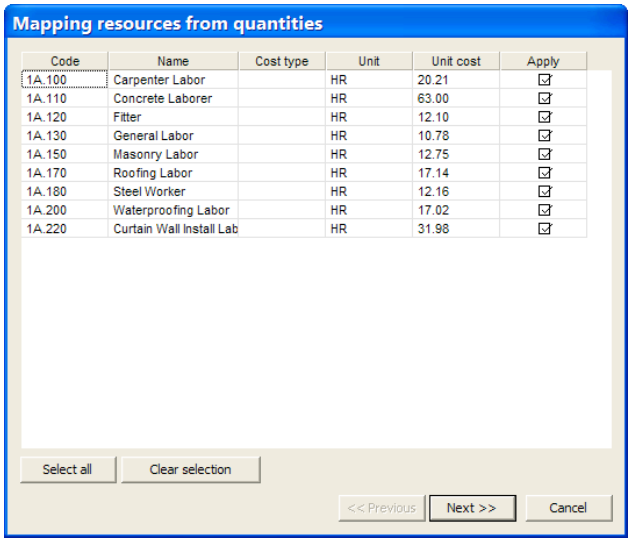


Figure 453 – An overview of the Resource data from Estimator, imported into your Control project.

After clicking "Next", Control provides an overview of the Tasks that will be added to your project from the Constructor data file. Remove the checkmark in the "Apply column" to skip a Task.

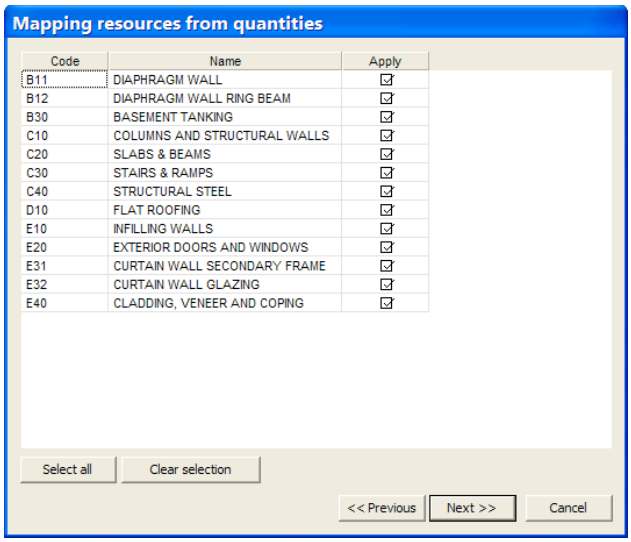


Figure 454 – An overview of the Tasks to be added into your project.

Click "Next" to continue to the end of the import procedure. Click "Close" to return to your project.

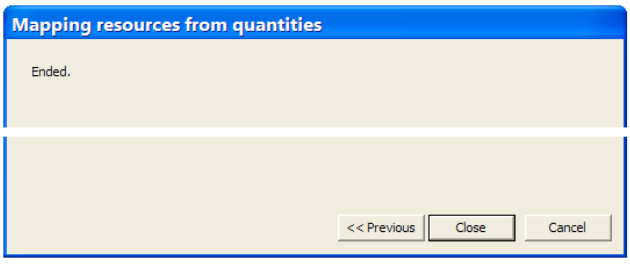


Figure 455 – Ending the data import process.

After the import process, your project has a Location structure that matches the WBS that you defined in Constructor (**1**).

Your project now also contains the Tasks that you defined in Constructor's "Schedule Task Manager" (**2**).

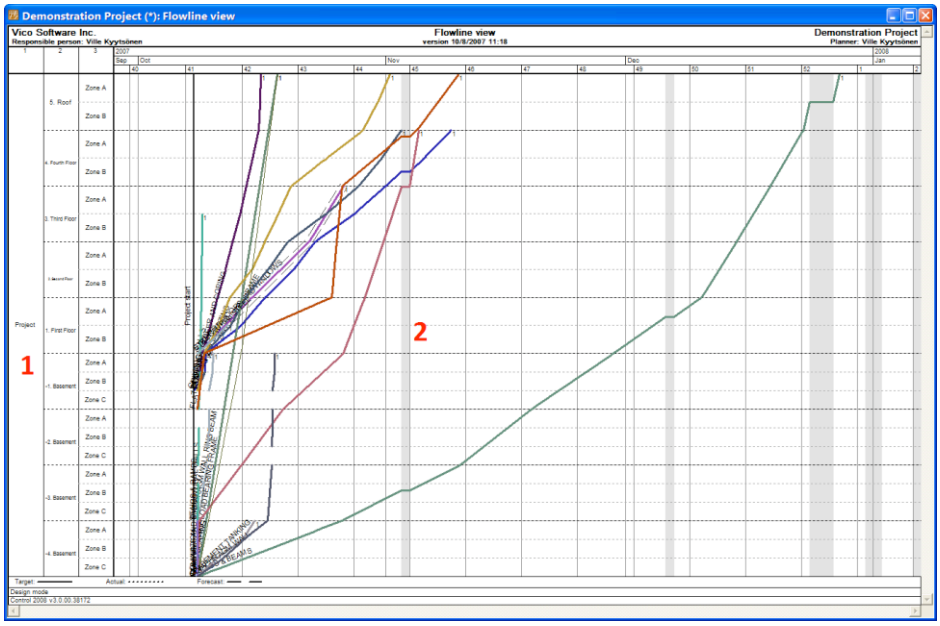


Figure 456 – A Control project in the "Flowline" view after importing construction information from Constructor and Estimator.

The initial durations of the Tasks in your schedule are derived from the total amount of man hours for "Labor" resources in your Estimator project.

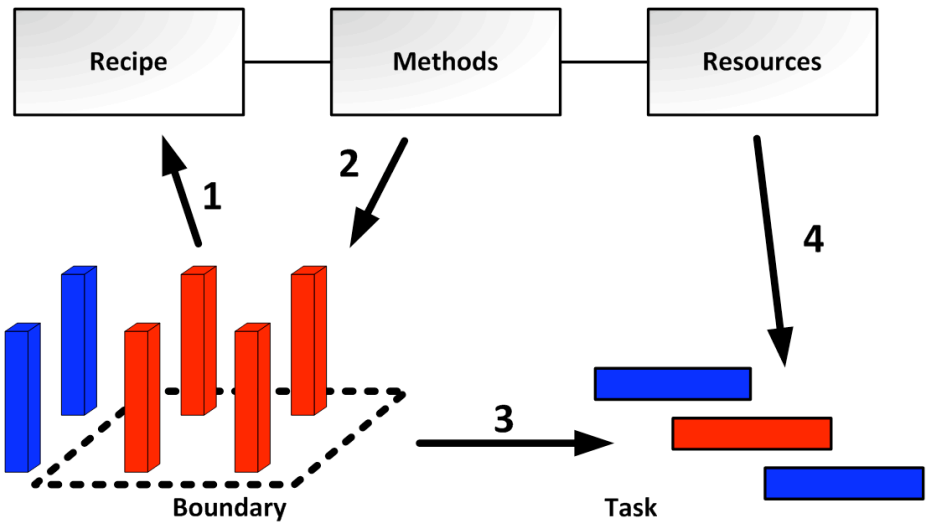


Figure 457 – Vico's scheduling integration concept.

In addition to the Methods that you assigned to Tasks, during the import of the construction information from Constructor and Estimator, Resource quantities

(**4**) are also imported into your Control project. The quantities of Resource type "1" (Labor), which are typically units of labor hours, are automatically used in imported Tasks to determine the default duration.

Refer to chapters 2 and 3 ("Basic" and "Advanced" planning) in the Control manual to learn how you can use the imported model based construction information to generate a schedule.

Control's graphic representation of the schedule, which uses Flowline technology, as well as built in risk analysis, will help you define and optimize your schedule.

After completing your schedule in Control, you can add the created project schedule data to the collection of construction information in your Constructor model.

How To: Add Schedule Data to your Constructor Model

After you have completed your schedule, you can add the schedule information to your Constructor model by publishing the defined scheduled dates for your schedule Tasks to Constructor.

Your Control schedule information is transferred by means of an XML data file; select "Export" from "Importing and exporting" in Control's "File" menu.

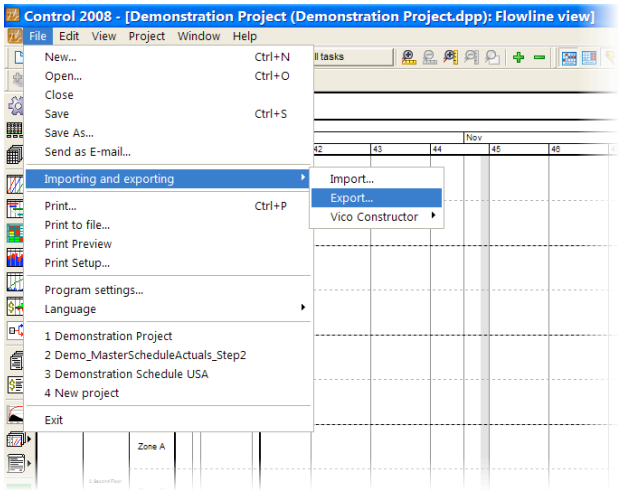


Figure 458 – The "Export…" function in Control's "Importing and exporting…" menu item.

Control will open the "Data exporting" dialog.

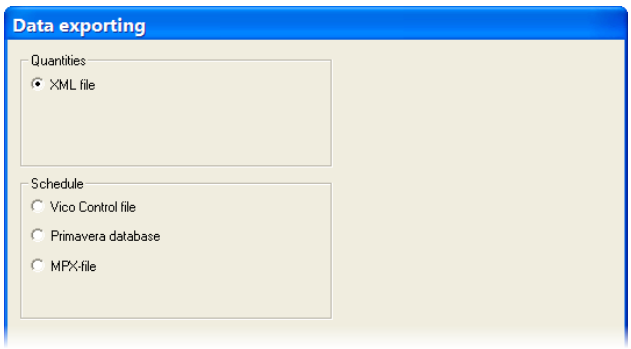


Figure 459 – The "Data exporting" dialog.

Select “XML file” and click the “Next” button.

Control will show the cost type and code interval selection dialog. Keep the default selection (all) and click “Next”. En**sure to select the “Copy timings to the lowest hierarchy level” setting: this will ensure that the Tasks will appear on all sub Locations in your WBS.**

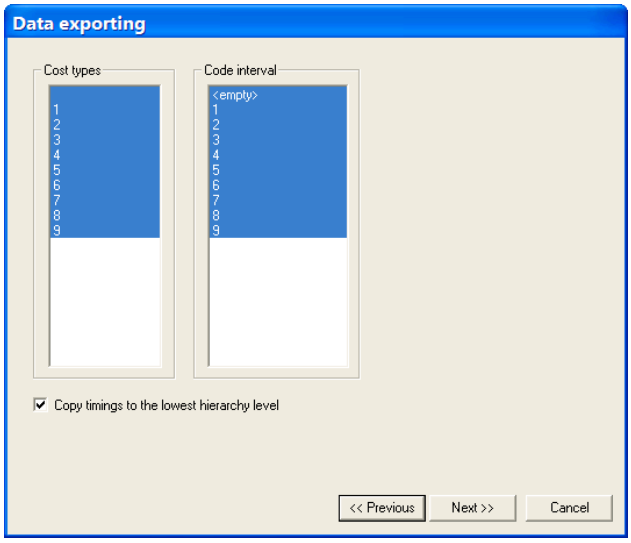


Figure 460 – The Cost Type and code interval selection dialog.

Click “Next” to continue; Control asks you to specify the name and path of the data file to be generated.

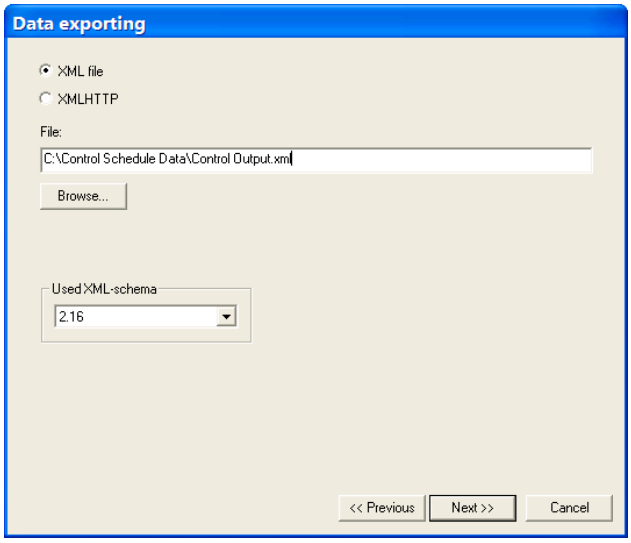


Figure 461 – The Name, path and version of data file to be generated.

Select “XML file” and specify the path in your system where you would like to save the schedule data. Retain the default XML-schema setting. Click “Next” to continue. Control will extract all the schedule data and will save it into the specified XML file. After completing the operation, Control will display a “Data exported successfully” message; close this message to complete your schedule data publish operation.

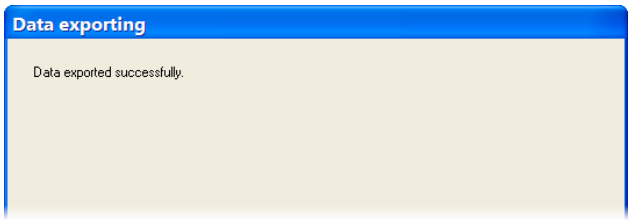


Figure 462 – Data export completed; click "Close" to return to your schedule.

The second part of the process to add schedule data to your Constructor model is to import the information saved in the Control XML file into Constructor.

From the "Sequencing" menu, select "Get Scheduling result from Control":

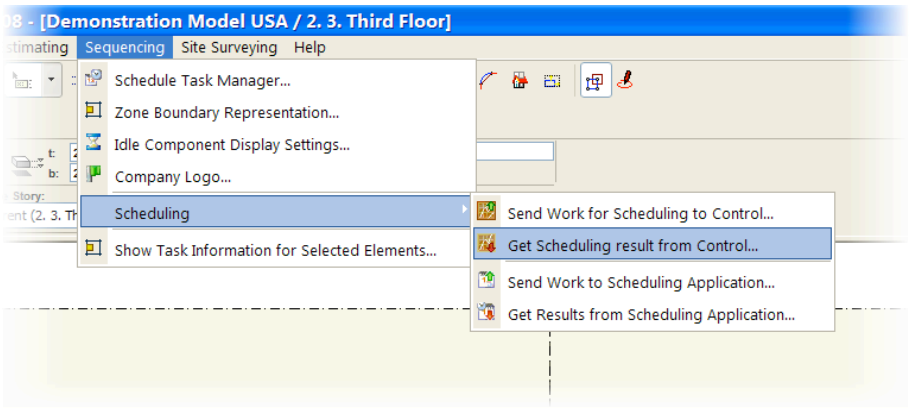


Figure 463 – The "Get Scheduling result from Control" function in the "Sequencing" menu.

Constructor asks for the name and path of the XML file you created in Control.

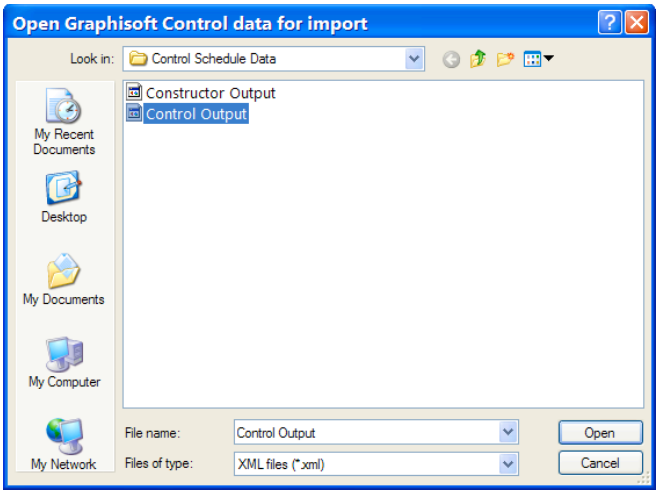


Figure 464 – Specifying the name and path of the generated XML file.

Click "Open" to start adding the schedule data to your Constructor model. Constructor will show which of the schedule Tasks in Constructor have been assigned a "Start" and "End" date by means of your scheduling work in Control. Click "Accept" to include the information in your model.

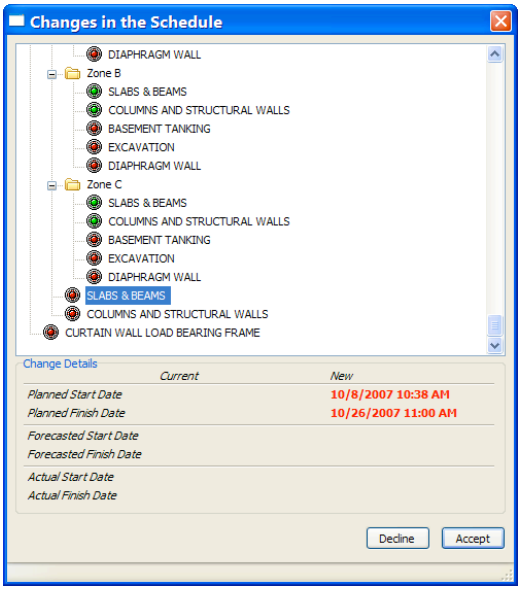


Figure 465 – An overview of the changes in your Constructor model's Task information.

Constructor processes the newly added Task information. After completion, you can see the updated Task information by selecting any of the Tasks in the "WBS Manager" palette:

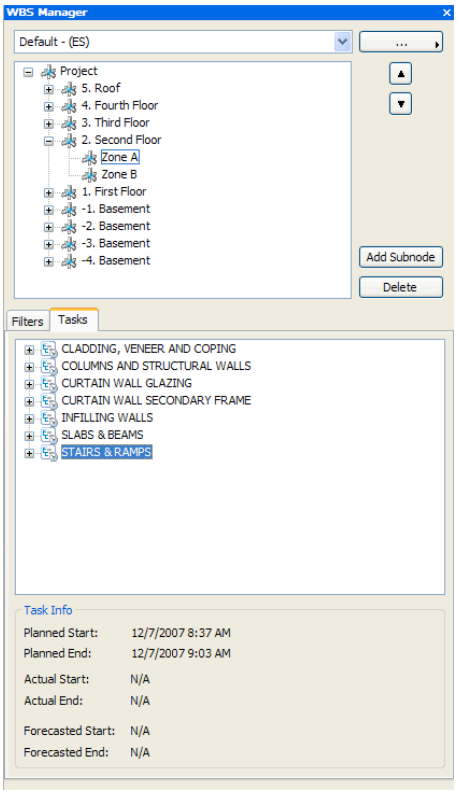


Figure 466 – Task information added to the model becomes visible when you select a Task.

Updates

Your model, and the WBS (including any options) in your model, are very likely to change over time, along with the insight that you gain into your project. You may also want to check alternative sequencing scenarios for your project (for example: a division into three construction zones instead of two).

To perform quick updates and "what-if?" scenarios, follow the following steps.

HOW TO: UPDATE CONSTRUCTION INFORMATION IN CONTROL

To update the model based construction information in your Control schedule, select "Send work for Scheduling to Control" from Constructor's "Sequencing" menu.

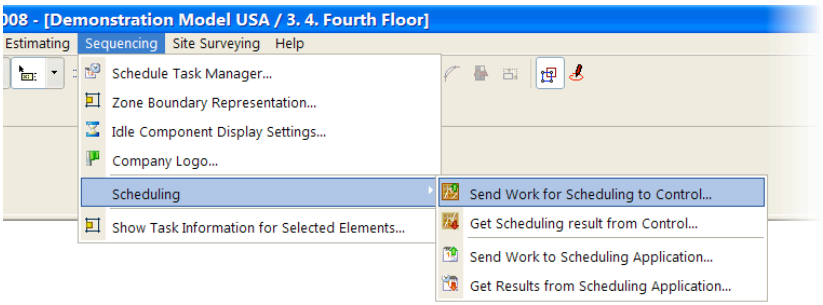


Figure 467 – "Send Work for Scheduling to Control" in Constructor's "Sequencing" menu.

When Constructor asks you to provide name and path for the XML file to which to save your model's data, select the same XML file name and path you used during your initial publish operation.

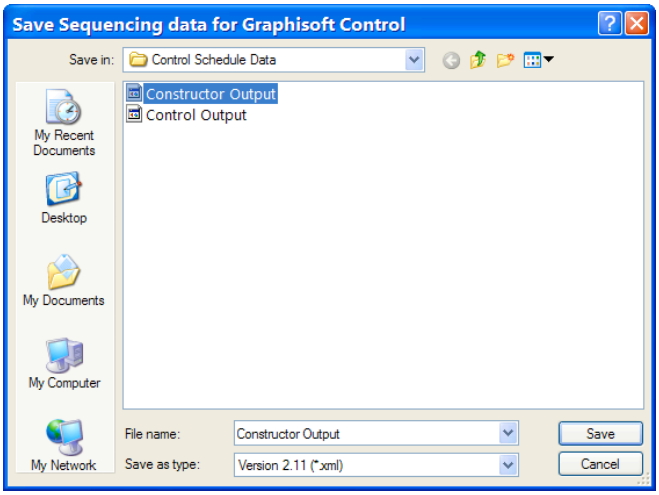


Figure 468 – Selecting the same file to write your model data to.

Next, in Control, select "Import changes" from the "Vico Constructor" item in Control's "File" menu.

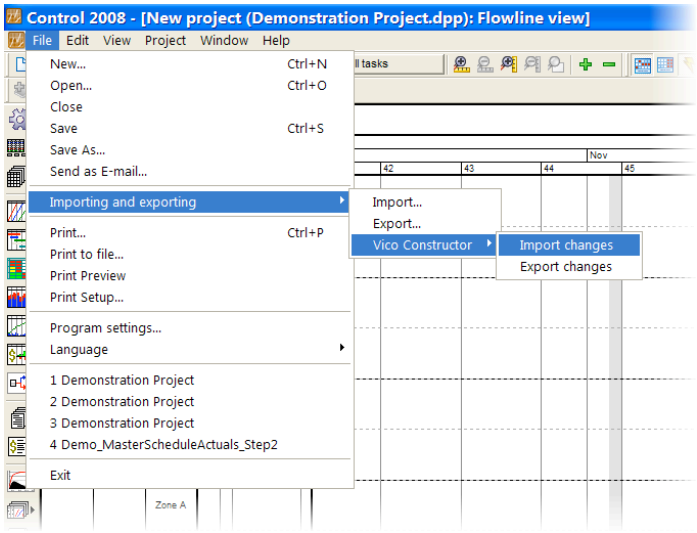


Figure 469 – The "Import Changes" function in Control.

Control will automatically open the XML file from which it imported the initial schedule data, and will update the schedule.

Note: Before you import a new WBS with additional Location levels, you must change the "Location Precision" of the associated Tasks in Control!

After you have updated your schedule based on the new model data, you can send the updated schedule data back to Constructor with a similar operation.

How To: Update Schedule Data in the Constructor Model

In Control, Select "Export changes" from Control's "Vico Constructor" item in the "File" menu.

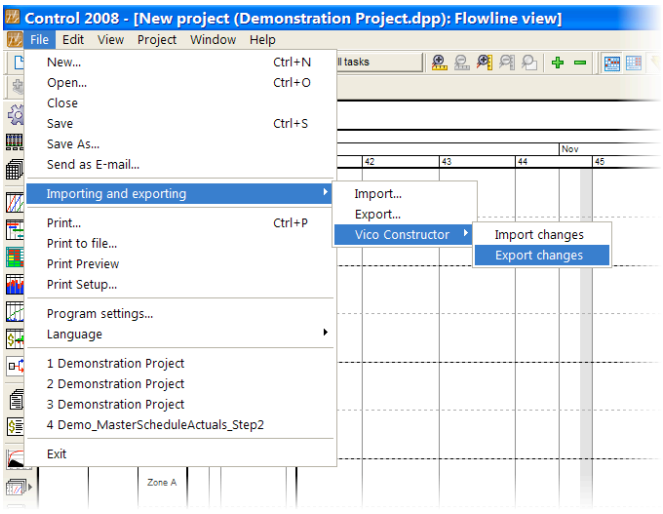


Figure 470 – The "Export changes" function in Control.

Control will now automatically write the updated schedule information to the same file as used during the first export to Constructor.

Use the "Get Scheduling Result from Control" function to add the updated schedule data to your model.

Scheduling with Microsoft Project

Using Vico Constructor's MS Project integration functionality, you can quickly create an outline for your project's schedule based on the WBS that you defined in Constructor.

When you publish your WBS into Project, all Locations, plus included summary Tasks and Tasks, are saved to an MS Project file. Task durations are not defined. When you select MS Project to create your project schedule, all scheduling work has to be done in the scheduling software.

How To: Save WBS and Task Information to an MS Project File

Before publishing your Constructor model's WBS information into an MS Project file, ensure that the order of the Locations in your WBS reflects the Location order that you want to see in your schedule.

Then, from the "Sequencing" menu in Constructor, select "Send Work to Scheduling Application".

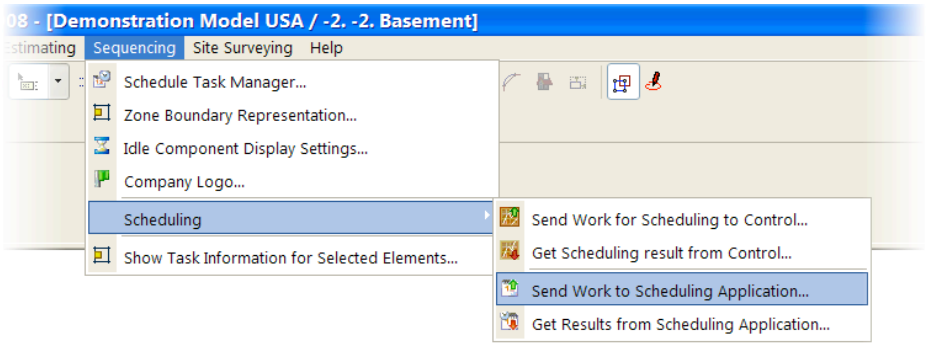


Figure 471 – The "Send Work to Scheduling Application…" function in Constructor.

Constructor will present you with the available applications to publish schedule information to. Select "Microsoft Project".

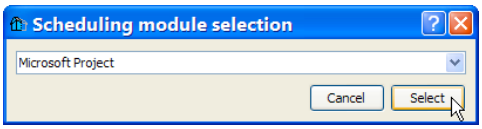


Figure 472 – Selecting "Microsoft Project" from the scheduling software options.

After Constructor has processed the WBS and Task information in your model, specify a name and path for the Project MPP file that Constructor will generate.

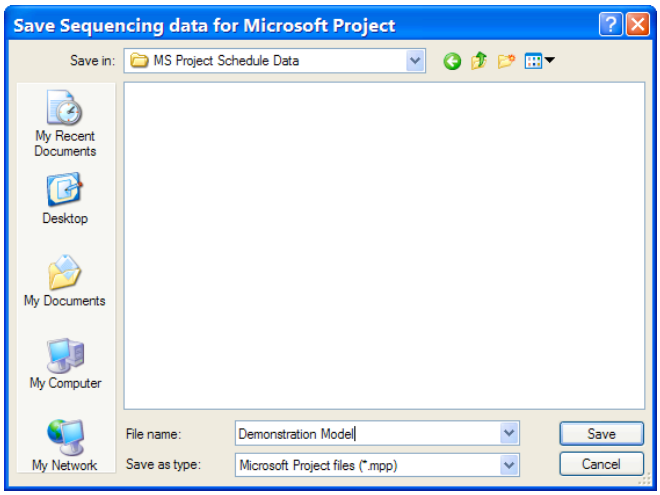


Figure 473 – Specifying a name and path for the MS Project file.

After processing all the Task information, Constructor launches MS Project and opens the generated file. The file contains the outline of the schedule, as defined by the WBS plus all Tasks.

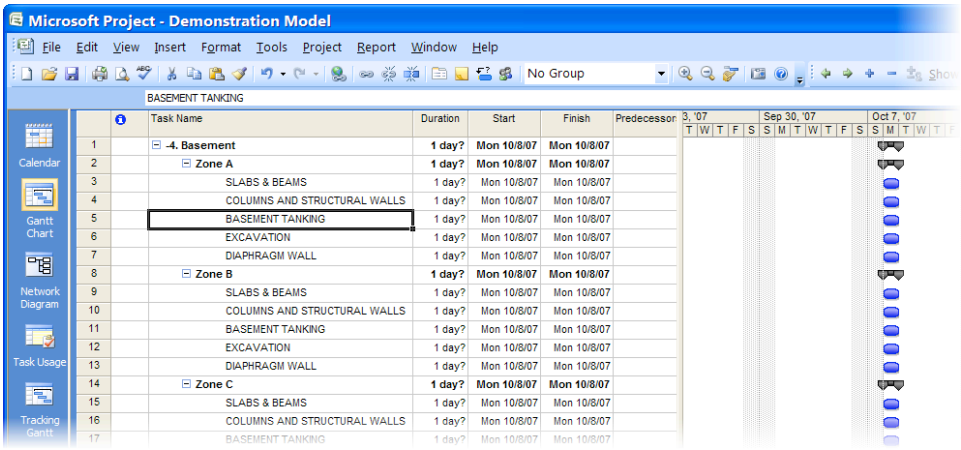


Figure 474 – A generated schedule in MS Project.

You can now start your scheduling work, based on the framework created in Constructor, by assigning durations and Task relationships.

After completing your scheduling work in MS Project, you can update your model with the defined Task start and end dates. To import MS Project information, open the schedule file from Constructor.

How To: Import MS Project Schedule Data into Constructor

After saving your schedule in MS Project, select “Get Results from Scheduling Application”.

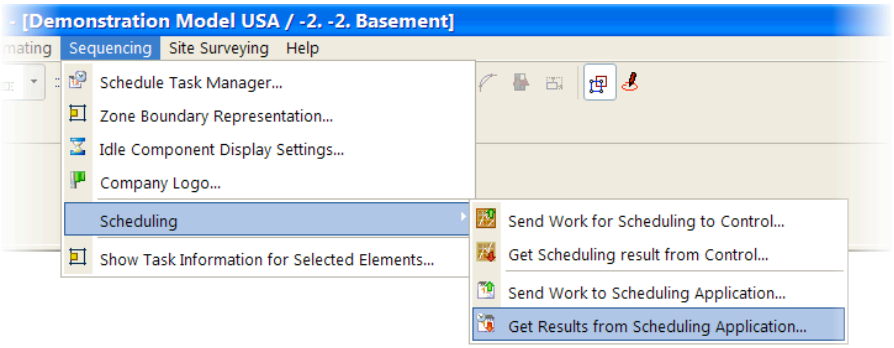


Figure 475 – Selecting "Get Results from Scheduling Application" to start the import from MS Project.

Select "MS Project" from the next selection dialog:

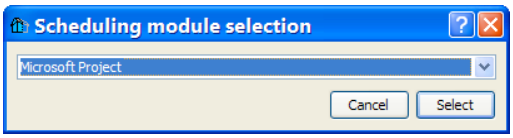


Figure 476 – Scheduling application selection.

Next, Constructor asks you to specify where the MS Project MPP file is located on your system. Locate it, then click OK to start the import procedure.

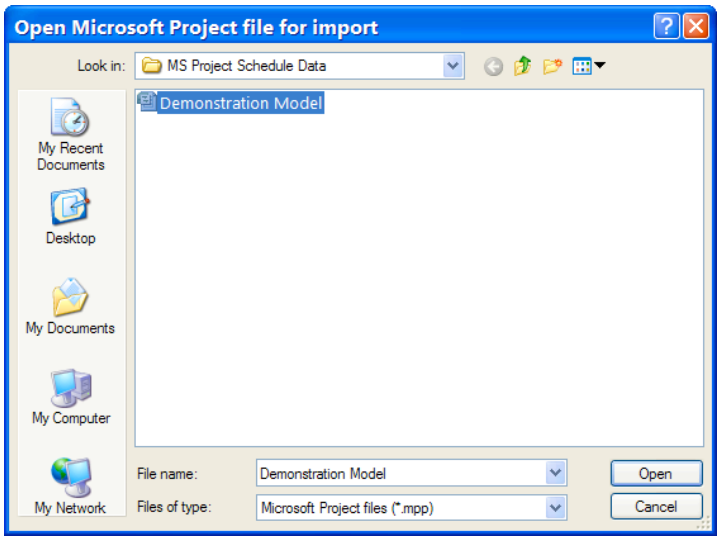


Figure 477 – Locating your MS Project schedule file.

Constructor shows which Tasks have updated start- and/or end dates – click "Accept" to import the changes into your model.

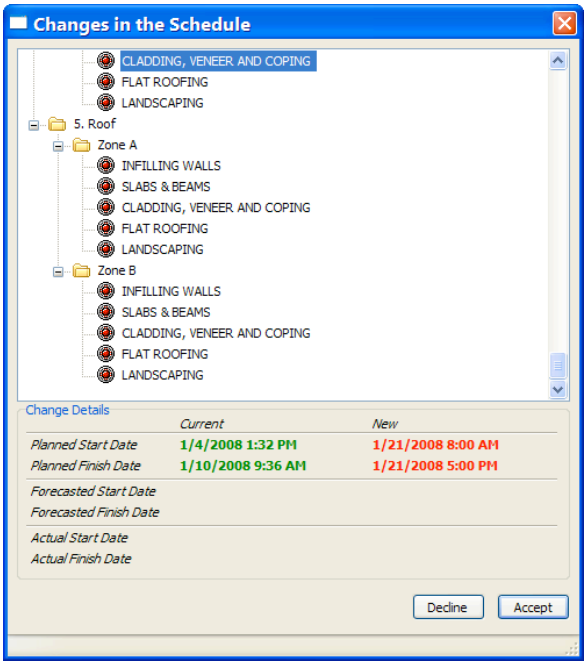


Figure 478 – An overview of the changes in the imported schedule data.

Scheduling with Primavera

Constructor's integration with Primavera© allows you to quickly generate an outline for your project's schedule based on the WBS that you defined in Constructor.

When you publish your WBS into Primavera, all Locations, plus the included summary Tasks and Tasks, are saved into the Primavera database. Task durations are not defined: when you choose to create your project schedule in Primavera, all scheduling work has to be done inside the application.

How To: Save WBS and Task Information to a Primavera

From Constructor's "Sequencing" menu, select "Send Work to Scheduling Application".

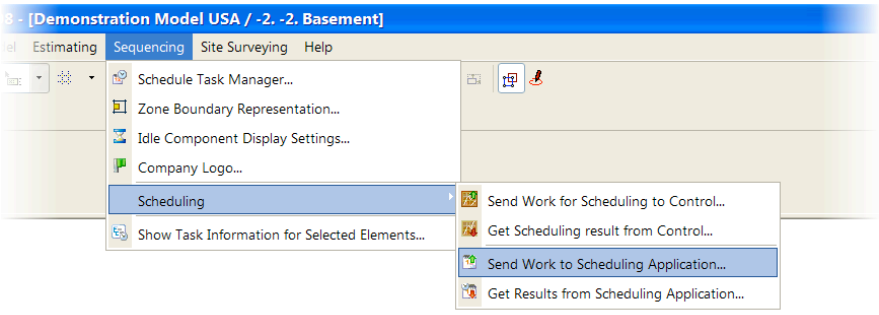


Figure 479 – Selecting "Send Work to Scheduling Application" to start publishing your WBS and Task information into the Primavera database.

From the available options that Constructor presents, select “Primavera P3e/c for Construction”.

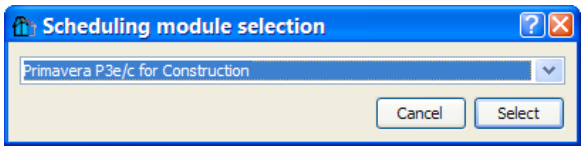


Figure 480 – The Scheduling module selection dialog box; select “Primavera P3e/c for Construction”

Constructor will start refreshing the WBS. At the end of this process, you are asked to select an existing project or to create a new one in the Primavera database, where the model based construction information should be written.

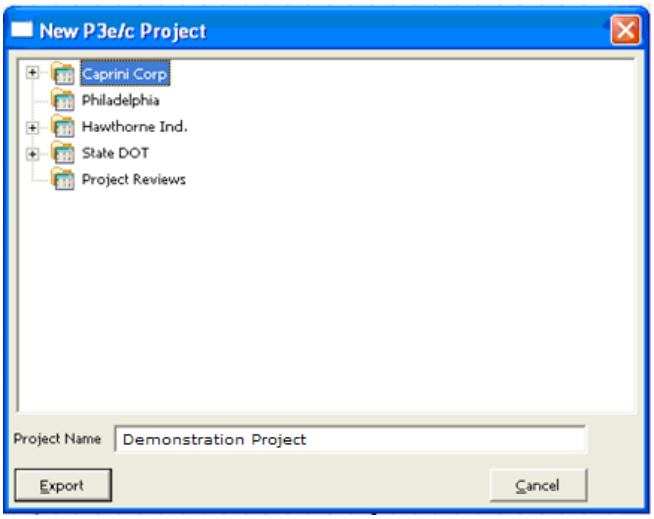


Figure 481 – Creating a new project in the Primavera database.

Create a new project by entering a name, or select an existing project in the database and click the “Export” button. Constructor will now write your project WBS and Task information to the Primavera project.

Constructor will display a progress bar, informing you of the current status of the export procedure.

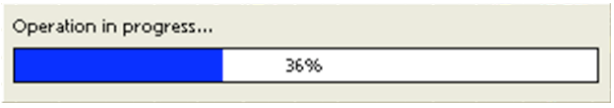


Figure 482 – Constructor shows a progress bar to inform you of the current status of the export procedure.

After completion of the export to Primavera, you can open the project schedule from the Primavera database. You will see the list of Tasks, organized by the WBS levels that you defined with the WBS Manager.

With the Constructor WBS and Tasks in Primavera, you can design your project’s construction schedule by defining the durations and constraints. As soon as you have completed the schedule, you can bring the schedule information back into

the Constructor model by using the “Get Results from Scheduling Application” option.

How To: Import Primavera Schedule Data into Constructor

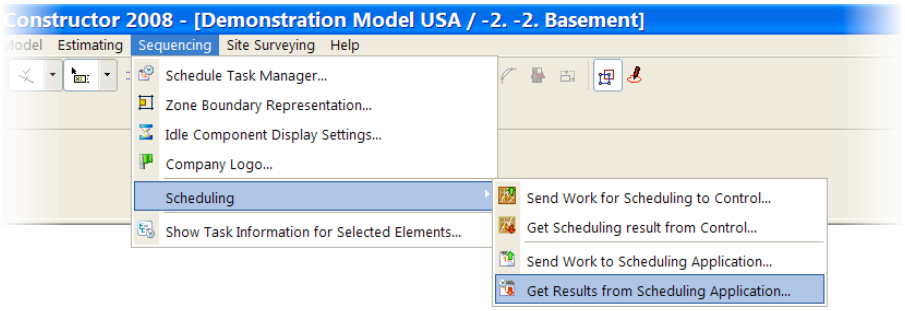


Figure 483 – Selecting “Get Results from Scheduling Application” to add your Primavera schedule data to the Constructor project.

From the “Options” dialog, select “Primavera P3/e for Construction”.

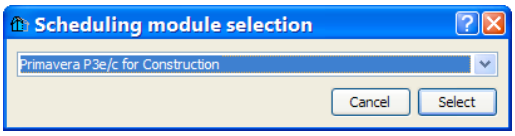


Figure 484 – Selecting “Primavera P3e/c for Construction” from the “Scheduling module selection” dialog.

From the list of available projects in the Primavera database, select the project from which you want to import schedule information.

Constructor will process the information, and will give you an overview of changes that will be included in the project by importing the Primavera schedule data.

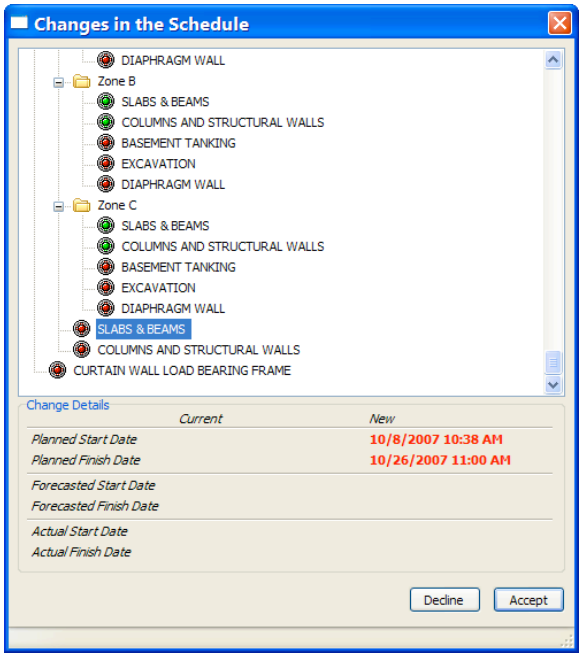


Figure 485 – An overview of the changes that will be added to your project by importing Primavera schedule information.

Click "Accept" to apply the changes and import the Primavera schedule data.

Requirements for Primavera Installation on your System

For Primavera to work with Constructor, you need to ensure that you have Primavera's Software Development Kit (SDK) installed on your system. The SDK contains important connectivity modules that Constructor will use to connect to your database of projects. Primavera's SDK is included in the installer of the Primavera software.

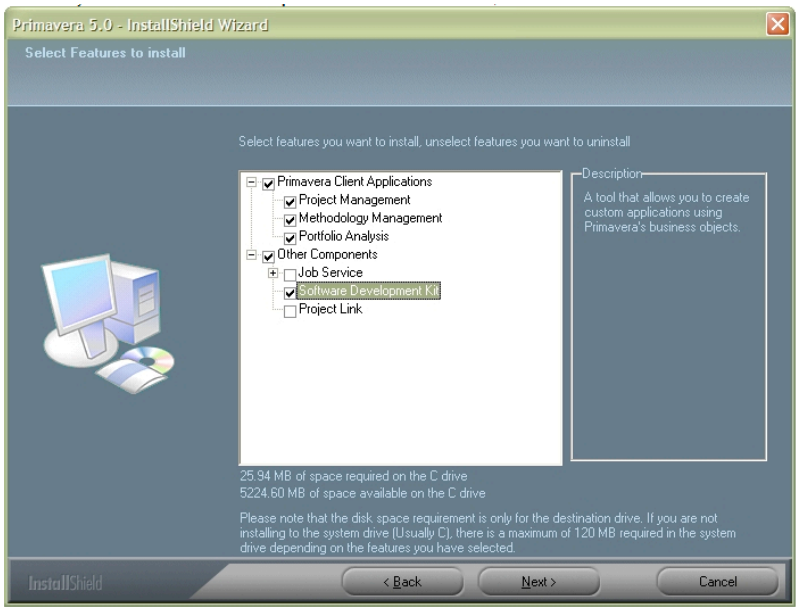


Figure 486 – Ensuring that you install Primavera's Software Development Kit on your computer.

Schedule Data in the Constructor Model

Schedule data that you have added to your Constructor model can be checked and analyzed in two ways:

- With the WBS Manager;
- With the "Show Task Information for Selected Elements" function.

In the WBS Manager's "Tasks" tab, you can see all the Tasks, related to the Location in the WBS.

HOW TO: SHOW TASK INFORMATION WITH WBS MANAGER

In the WBS Manager palette, click on the "Tasks" palette.

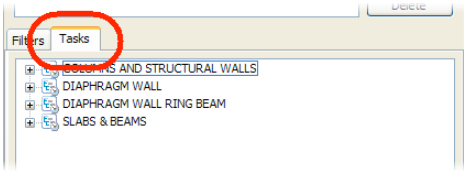


Figure 487 – Clicking the "Tasks" tab in WBS Manager to reveal the Task information of the selected Location.

Select a Location in the WBS and then select a Task in the "Tasks" tab. Constructor will show all the Task information included in your Constructor file.

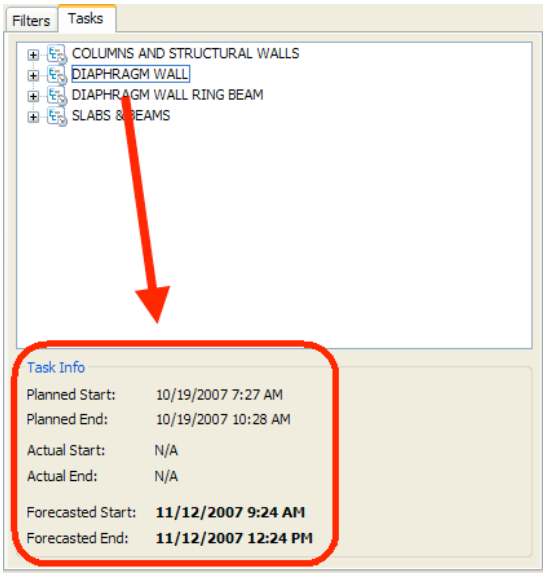


Figure 488 – Constructor displays Task information saved in your model when selecting a Location and then a Task in that Location.

The "Show Task Information for Selected Elements" function allows you to select one or more elements in the model and reveal the Task or Tasks that are associated with it, including planned, actual, and forecast information.

HOW TO: SHOW TASK INFORMATION FOR SELECTED ELEMENTS

In the Constructor model, select the elements in which you are interested.

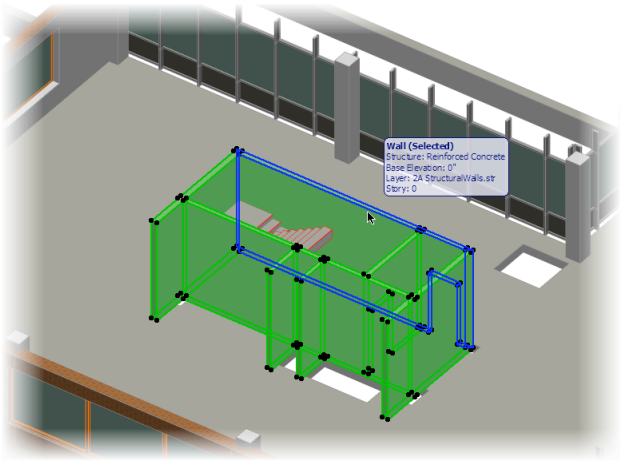


Figure 489 – Selecting elements in the model from which you require schedule information.

Next, select the "Show Task Information for Selected Elements" function from the "Sequencing" menu.

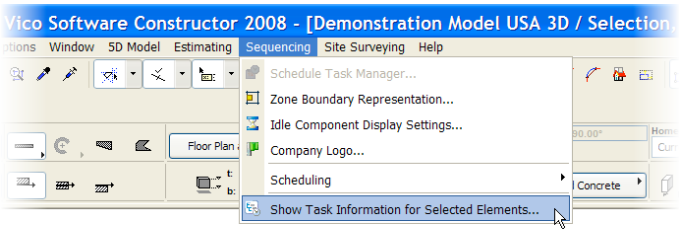


Figure 490 – "Show Task Information for Selected Elements" in the "Sequencing" menu.

Constructor will display the "Task Information" dialog, which includes information on all Tasks that are associated with the selected elements, including planned, actual, and forecast dates.

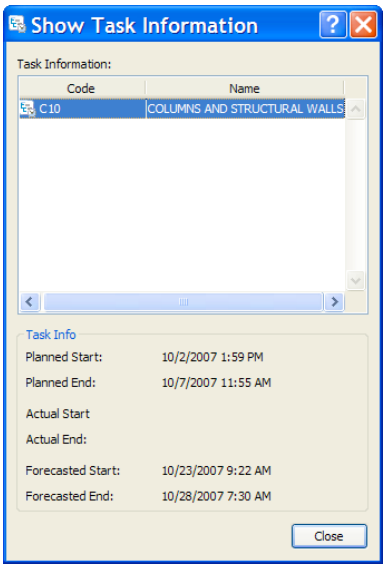


Figure 491 – Task Information of selected elements.

Mastered Process Steps

After studying the information in this section, you can now use model based data to create schedules and update your model with data from the designed schedule. You will use this information to generate the 5D Presenter model.

7: Simulate

From this section, you can learn how to generate a 5D Presenter model, and also how to exploit it to explore your project and simulate the construction schedule you designed.

After step 6, your Constructor model contains virtual building elements, which are linked to estimating and schedule information. Reaching step 7 means that you have completed the "planning phase" construction model.

All information that you have captured in your model can be published into a format that can be viewed with Vico's 5D Presenter: 3D for building elements, 4D for the time information that is associated with it and 5D for the cost that has been calculated for each element in the Estimator project.

5D Presenter is a free application; it can be downloaded from Vico's website and – together with the 5D Presenter model that you are about to create – be distributed amongst your project team's members.

Creating a 5D Presenter file

When you create a 5D Presenter file, Constructor generates a copy of your project model geometry in "viewer" format. The viewer format allows you to explore your project in a virtual reality environment, using several navigational modes. During the creation of the 5D Presenter file, Constructor also includes all Recipe, Method, Resource and Task information.

With the time information in the 5D model, you can play a simulation of your project schedule. During the simulation, 5D Presenter shows the building elements in your model with colors or textures that represent groups of similar Tasks. When Tasks occur during the simulation, associated building elements are shown in a color or texture that can be predefined in Constructor for groups of Tasks (for example: "Concrete").

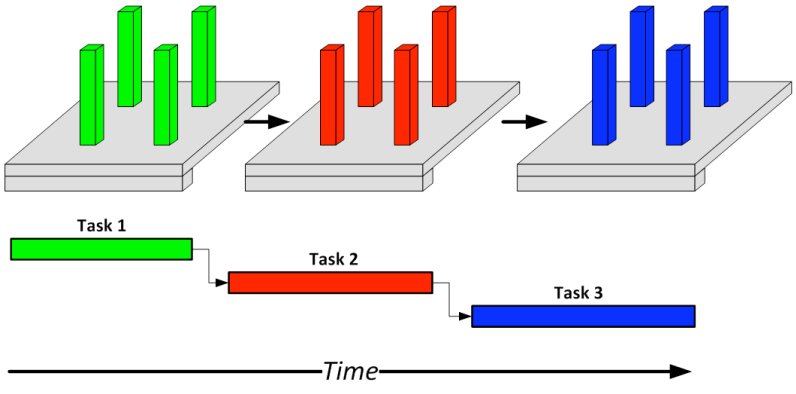


Figure 492 – The 5D Presenter Schedule Simulation concept. Each Task related to the columns in the image is included in a different representation group. When the tasks occur during the simulation, the color of the columns will change.

Task representation is defined using “Task Groups”. Each Task in your project belongs to a Task Group and each Task Group has its own representation settings for simulation purposes.

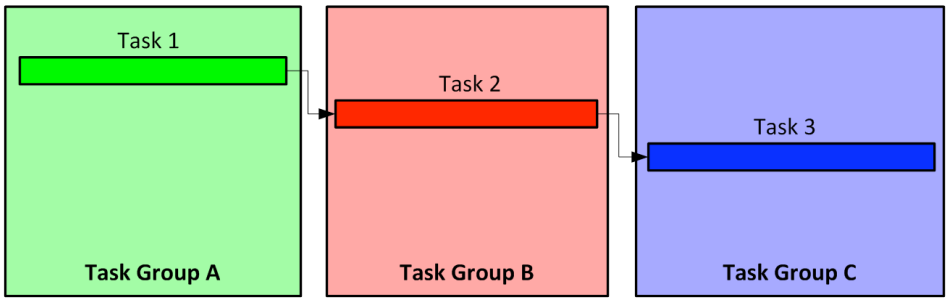


Figure 493 – Each Task belongs to a “Task Group”. For each Task Group, representation settings for schedule simulation purposes can be defined.

HOW TO: DEFINE TASK REPRESENTATION SETTINGS

To define representation settings for Tasks (Task Groups) in your project, open “Schedule Task Manager” from Constructor’s “Sequencing” menu.

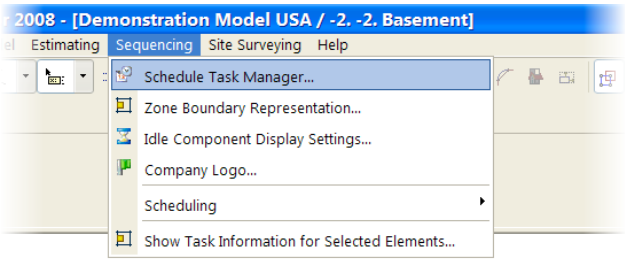


Figure 494 – Starting "Schedule Task Manager" from the “Sequencing” menu.

In the Schedule Task Manager, select the “Task Grouping” tab.

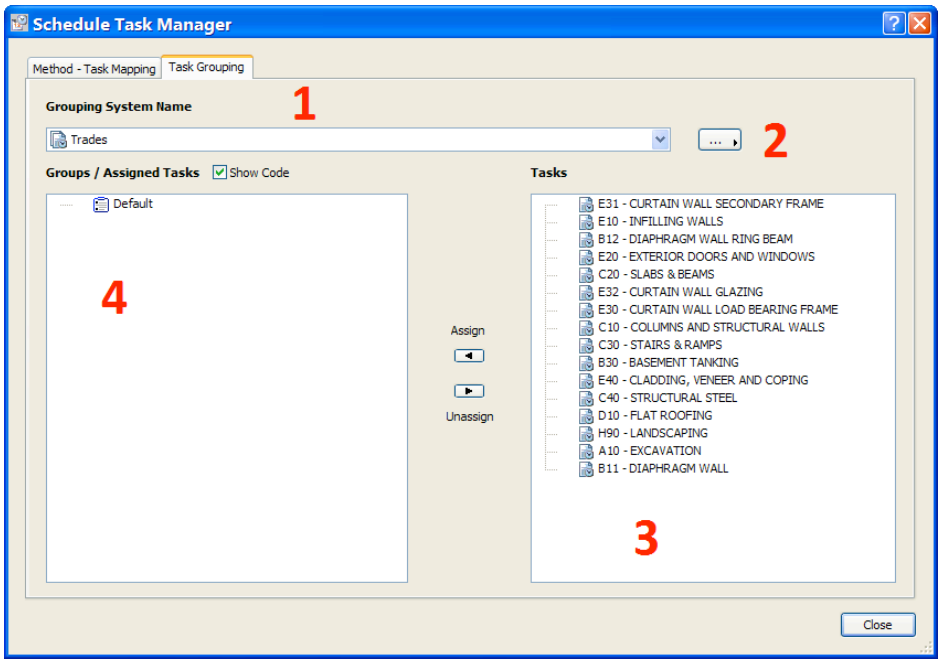


Figure 495 – The "Task Grouping" tab in the "Schedule Task Manager".

The Schedule Task Manager allows you to define several grouping systems for representational purposes. The currently selected grouping system is shown in the "Grouping System Name" field (**1**).

The Grouping Systems function button (**2**) contains the functions to create new Grouping systems, change the properties of an existing grouping system, or to delete a grouping system.

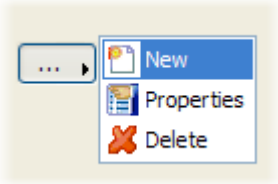


Figure 496 – The grouping System function button.

The "Tasks" area (**3**) contains a list of Tasks that you have defined for your project. In a representation Grouping System, each of the defined Tasks has to be assigned to a Task Group, in order to give each Task a representation during the 5D Presenter simulation.

The Groups/Assigned Tasks area (**4**) contains the list of Task Groups that you define in the currently activated Grouping System.

First, create a new Grouping System by selecting "New" from the Grouping System function button.

Constructor will open the properties for the new Grouping System:

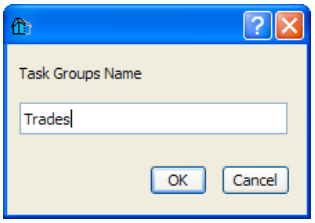


Figure 497 – The properties of the new Grouping System.

Click “OK” to save the new Grouping System.

You can now create Task Groups by right-clicking in the “Groups / Assigned Tasks” area.

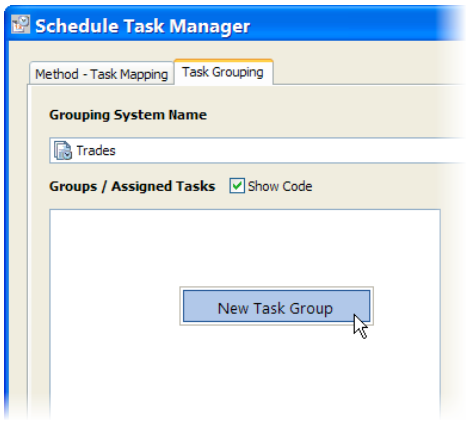


Figure 498 – Adding a new Task Group to the “Trades” Grouping System.

Enter a name for the new Task Group and click “OK” to save it.

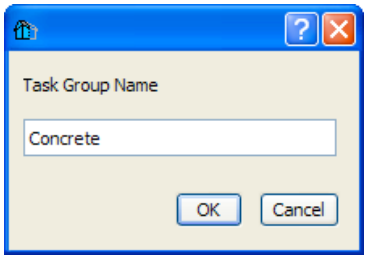


Figure 499 – New Task Group Properties.

Add as many Task Groups to the Grouping System as you need for representational purposes. Remember: you can always add additional Grouping Systems if you want to define additional “views” on your simulation.

After defining your set of Task Groups, map your collection of Tasks to any of the Task Groups. To do this, select a Task Group in the left window and any Tasks to be mapped in the right window. Then, click the “Assign” button to assign the selected Task(s) to the selected Task Group.

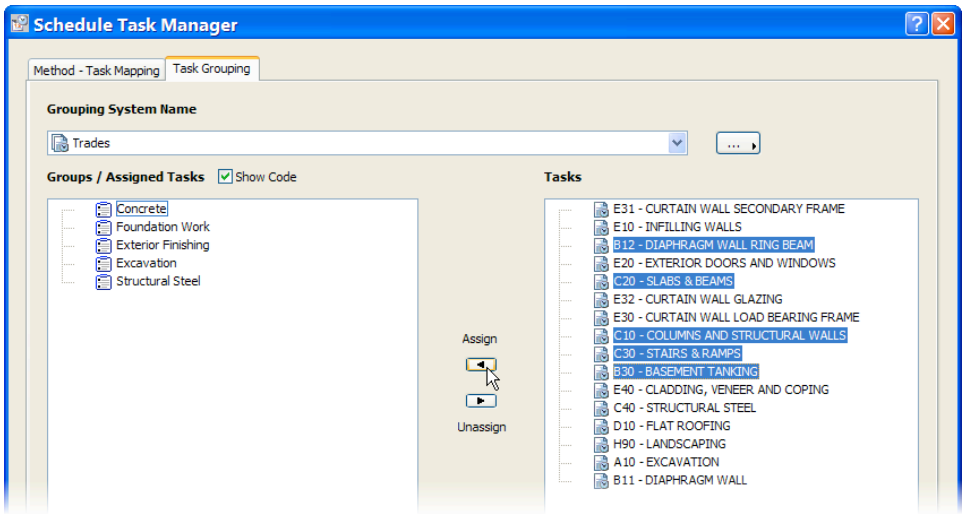


Figure 500 – Clicking the "Assign" button to include Tasks in a Task Group.

When you have defined Task Groups and assigned Tasks to each of them, you can define how the groups should be represented in the schedule simulation in 5D Presenter.

To define Task Group representation settings, right-click on a Task Group and select "Representation Settings".

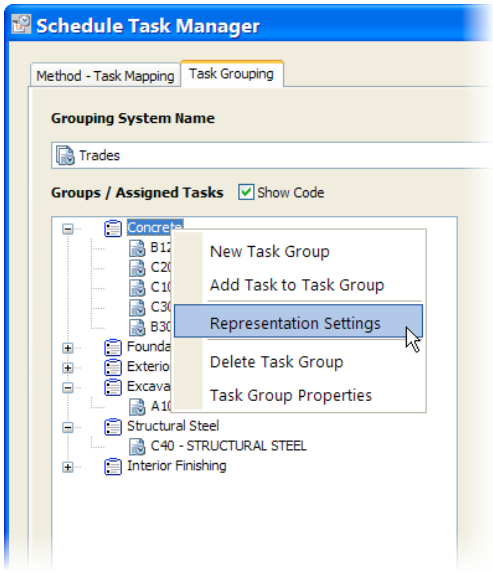


Figure 501 – Right-clicking to select "Representation Settings" to define simulation representation of elements associated with Tasks.

Constructor will open the representation settings of the selected Task Group.

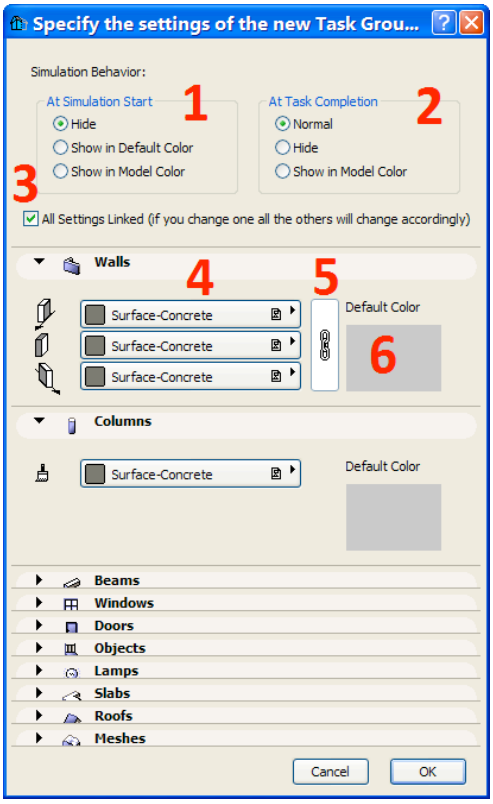


Figure 502 – The representation settings for Task Groups.

The representation settings dialog allows you to define how the elements associated with any of the Tasks in the Task Group should be shown at the beginning of the simulation (**1**) and at the end of the simulation (**2**).

Elements that will be **demolished** throughout the project should be shown, either in the "Default" color or in the "Model" color. These elements will be "Hidden" at Task completion.

Tasks that are **temporary** (for example: a crane) will be "hidden" at the beginning of the simulation and "hidden" at the end of the simulation. These elements will only be visible for the duration of the associated Task(s).

Regular construction elements will be "hidden" at the beginning of the simulation, and will be shown with either their default "Normal" color, or with the "Model" color.

You can specify simulation colors and textures for all element types individually. If you want to apply the settings of one element to all elements, select the "All settings linked" option (**3**).

Each element has its own set of surface areas for which you can specify the color that should be shown during simulation playback. You can specify a color or a texture for each individual surface (**4**), or you can link them, so that one setting automatically updates all other surfaces (**5**).

The "Default Color" (**6**) refers to the status as specified in (**1**) and (**2**) – when you select that an element is shown in "Default" color at the beginning of the simulation, or "Normal" at the end of the simulation, that is the color that you will see displayed.

You should specify the behavior and color and/or texture for each of the elements. The quickest way is to use the "All Settings Linked" setting in combination with linked surface color settings.

Click "OK" to apply the settings to the Task Group definition. Repeat this process for all your Task Groups in order to complete the settings for a Grouping System.

Constructor allows you to define more than one grouping system. For example: you may want to group your Tasks by "Trade", but also by "Phase".

HOW TO: CREATE MULTIPLE TASK GROUPING SYSTEMS

If you want to use several views of your simulation, for example, one for internal use and one for use in your communications to your customer, you can create an additional Task Grouping System.

In the Schedule Task Manager, select the "Task Grouping" tab and select "New" from the Task Grouping System function button. This will add a new Task Grouping System to the project.

Enter a name for the new Task Grouping System (for example: "Customer") and click "OK".

You can now switch between the two Task Grouping systems by using the Task Grouping System combo:

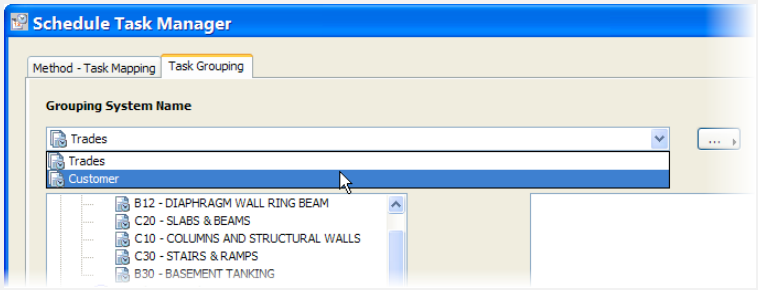


Figure 503 – Switching between Task Grouping Systems; each system has its own set of representation settings. You can switch between them in your 5D Presenter simulation.

In addition to the element representation settings that are used during the occurrence of related Tasks in your simulation, you can define how elements that are in between two Tasks should be shown. You can define these settings in the "Idle Component Display Settings".

HOW TO: DEFINE "IDLE COMPONENT" SETTINGS

From the "Sequencing" menu, select "Idle Component Display Settings".

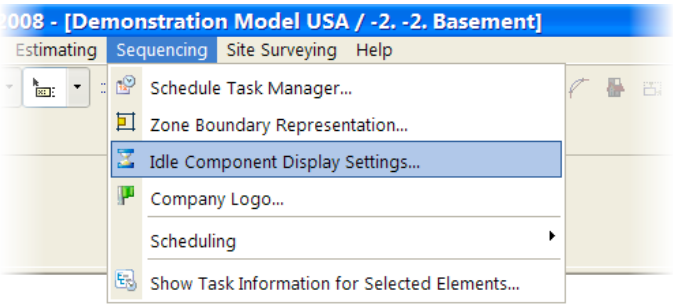


Figure 504 – Idle Component Display Settings menu item.

Constructor will show the "Idle Component Display Settings" dialog, in which you can specify a material, a default color (used when no material is defined for an element), and an opacity factor. Changing the opacity factor to a value lower than 100% means that the element will become translucent in between Tasks, until the completion of the element (i.e. the end of the last related Task).

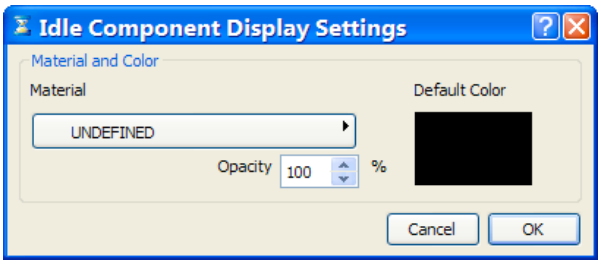


Figure 505 – The Idle Component Display Settings dialog.

When you want to include a company logo or project logo in the model space of your simulation, you are able to include an image file in your project model.

How To: Include a Logo into your 5D Presenter Model

From the "Sequencing" menu, select "Company Logo".

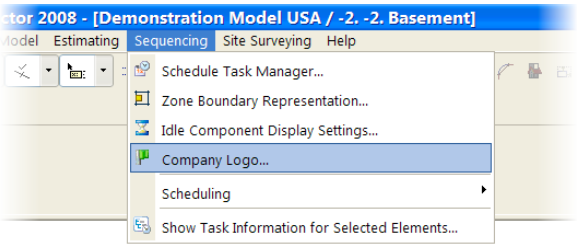


Figure 506 – Company Logo settings in the "Sequencing" menu.

Constructor will open the "Company Logo" dialog. To include a logo, click the "Load" button and specify the file name and Location of the logo want to insert (JPEG, PNG or BMP). Click "Clear" to remove the logo and "Close" to confirm your settings.

Figure 507 – The Company Logo settings dialog.

Your logo will appear in the lower right corner of the model space in your simulation.

After defining the representation settings for the Task Groups in one or more Task Grouping Systems, you are ready to generate a 5D Presenter model. You can find the function with which to create the 5D Presenter model in the "5D Model" menu.

How To: Create a 5D Presenter Model

From Constructor's "5D Model" menu, select "Export 5D Presenter Model"

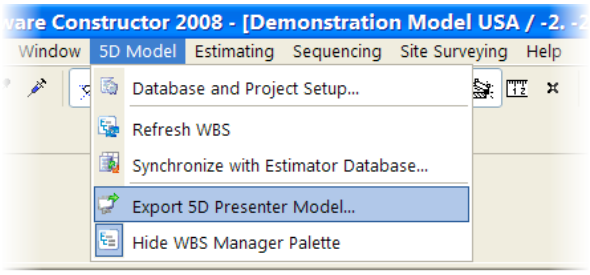


Figure 508 – "Export 5D Presenter Model…" in "5D Model" menu.

Constructor opens a file dialog, in which you should specify a name and a path for the 5D Presenter (5DM) file that Constructor is about to generate.

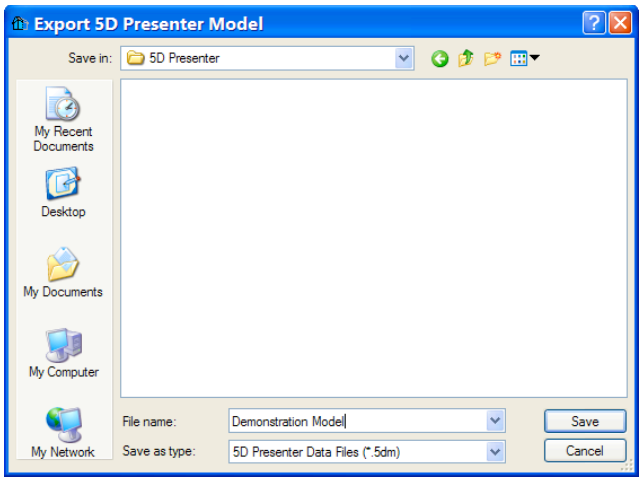


Figure 509 – The "Export 5D Presenter Mode" file dialog.

Specify a path and enter a name for the file and click “Save”. Constructor will now start collecting all the available scheduling and estimating data, to be combined into a single 5D Presenter file.

After completion, you can open your 5D model in 5D Presenter.

Exploring the Model in 5D Presenter

5D Presenter is Vico’s free application with which you can open the 5DM file that includes all estimating and scheduling information for your project.

You can find the 5D Presenter application in the “Vico Software” folder under “Programs” in the Windows “Start” menu.

HOW TO: VIEW A 5D PRESENTER MODEL

In 5D Presenter, select “Open” from the “File” menu.

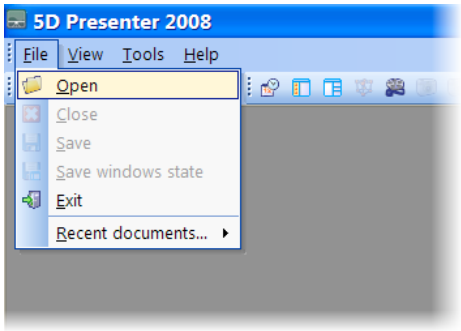


Figure 510 – Using the “Open” function from the “File” menu to open your 5D Presenter model.

Browse to the Location on your system where you saved the .5DM file, and click “Open” to open it in 5D Presenter.

5D Presenter loads the model and will indicate when the model has been loaded in the “status bar” in the bottom of your screen.

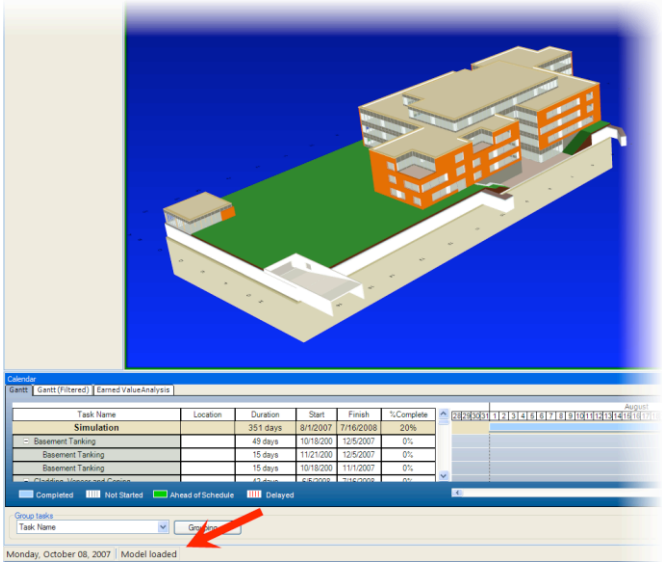


Figure 511 – The Model loading status bar.

You can now start navigating through the model. 5D Presenter has the following navigational modes, which can be found on the toolbar:

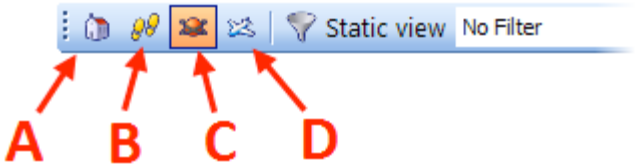


Figure 512 – Navigational Modes in 5D Presenter.

A: "Home"

The "home" button brings you back to the "Default" position of your model. You can always get back to this position by either clicking the "home" button or by pressing the spacebar on your keyboard.

B: "Walk Mode"

"Walk" mode allows you to explore your project as if you were walking in it.

When in Walk mode, your view is at a height of 180cm/6ft above the nearest horizontal surface.

The Walk mode has gravity – this means that your position is always maintained at 180cm/6ft above the nearest horizontal surface. Gravity also helps you to walk up a stairway in the model to bring you to the next floor level.

The Walk mode also has collision detection, which gives the navigation mode a realistic feel: walls, doors and windows will stop your movement.

Keys for the use of the Walk mode:

Action	Keys
Move Forward	The “Up” arrow key *(or the “w” key)*
Move Backward	The “Down” arrow key *(or the “s” key)*
Strafe / Slide	The “Left” or “Right” arrow key *(or the “a” and “d” keys)*

Note: when the <Ctrl> button is held while moving forward, backward or sideward, collision detection is temporarily switched off. This allows you to go through walls, doors and windows.

Action	Keys
Move Upward	The <Shift> key, plus the “Up” arrow key *(or the <Shift> key plus the “q” key)*
Move Downward	The <Shift> key, plus the “Down” arrow key *(or the <Shift> key plus the “z” key)*

Note: To “jump” onto a higher surface, move upward and subsequently press the “forward” button.

Action	Keys
Increase moving speed	The “r” key
Decrease moving speed	The “v” key
Look around	Mouse left-click and movement
Keyboard:	
- Turn Left	The “j” key
- Turn Right	The “l” key
- Turn Up	The “o” key
- Turn Down	The “k” key
Temporary zoom	The mouse scroll wheel or the “+” and “-“ keys

C: Orbit Mode

The Orbit mode lets you rotate the model as if it was in your hand, allowing you to view it from any position and angle.

Keys for the use of the Orbit mode:

Action	Keys
Look around	Mouse left-click and movement
Keyboard:	
- Turn Left	The “j” key
- Turn Right	The “l” key
- Turn Up	The “o” key
- Turn Down	The “k” key
Pan	The mouse middle button click and move
Keyboard:	
- Move Downward	The <Ctrl> key, plus “down” key
- Move Upward	The <Ctrl> key, plus “up” key

D: Fly Mode

In the Fly mode, you can freely move through the model environment at any altitude you want. Gravity and collision detection are disabled.

Keys for the use of the Fly mode:

Action	Keys
Move forward	The “Up” arrow key
Move backward	The “Down” arrow key
Move sideward	The “Left” or “Right” arrow key
Move upward	The “I” key or the middle mouse button click and movement
Move downward	The “k” key, or the middle mouse button click and movement
Look around	Mouse left-click and movement
Keyboard:	
- Turn Left	The <Ctrl> key, plus “Left” key
- Turn Right	The <Ctrl> key, plus “Right” key
- Turn Up	The <Ctrl> key, plus “Up” key
- Turn Down	The <Ctrl> key, plus “Down” key
Zoom	The “-“ and “+” keys

In addition to the navigational tools, 5D Presenter also provides functionality to dynamically define sections over your model.

How To: Dynamically Define Sections over the Model

To activate dynamic sectioning, click the "Sections" button on the toolbar.

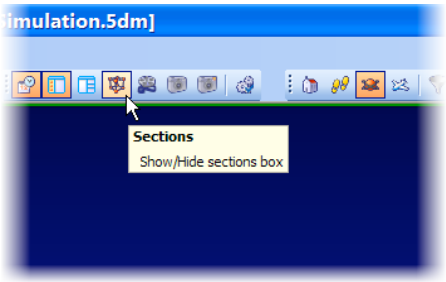


Figure 513 – The "Sections" button on the toolbar.

5D Presenter will show the section bounding box, which has spheres on each of the corners. Grab and drag a sphere to adjust the size of the six cutting planes.

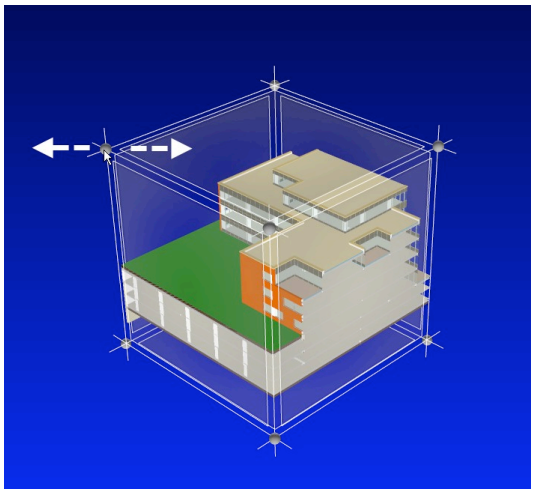


Figure 514 – Grabbing and dragging a sphere to adjust the size of the section bounding box.

To further refine the size and position of your section, click on any of the six sides of the bounding box to select a cutting plane. Then drag the selected cutting plane to the desired position.

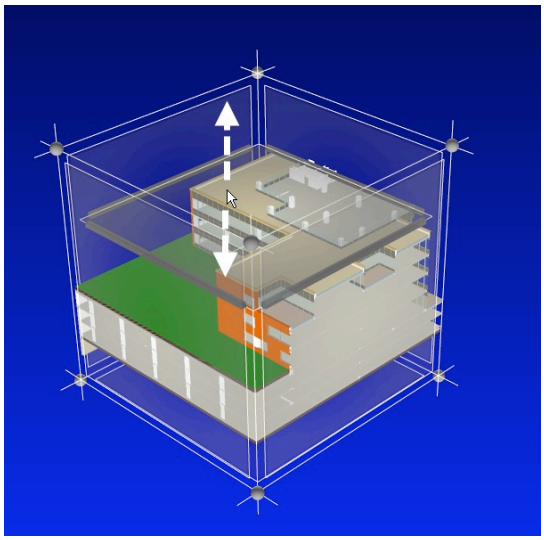


Figure 515 – Selecting a cutting plane and dragging it to the desired position.

You can change the angle of a cutting plane by selecting an edge, and dragging the edge in the desired direction / angle.

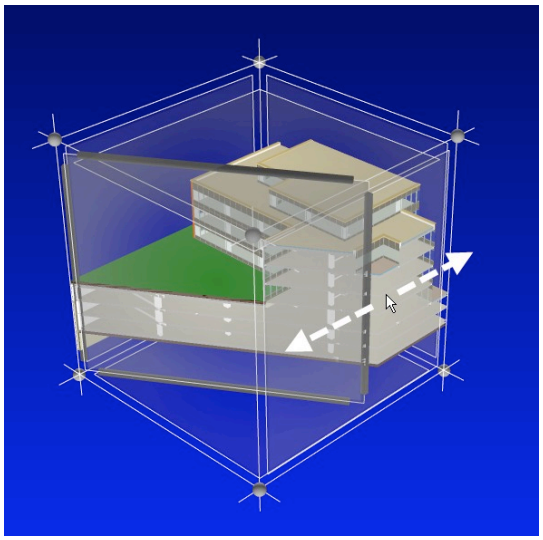


Figure 516 – Selecting a plane edge and dragging it to the desired direction / angle.

When you are satisfied with the cut over the model generated with the six available planes, hide the bounding box by clicking the “Sections” button again.

You can go back to the original “cube” bounding box at any moment by grabbing one of the spheres and dragging it over a short distance.

Simulating a Construction Schedule

The schedule information that you included in your Constructor model was published into the 5D Presenter model, including the Task Group representation settings that you defined in Constructor’s “Schedule Task Manager”.

This enables you to play back an interactive simulation of your construction project, as it was planned in the schedule application and defined in Constructor.

You can view and operate the construction simulation with the “Calendar” panel, which you will find in the bottom of your 5D Presenter application. If the Calendar panel is not visible, you can activate it from the toolbar:

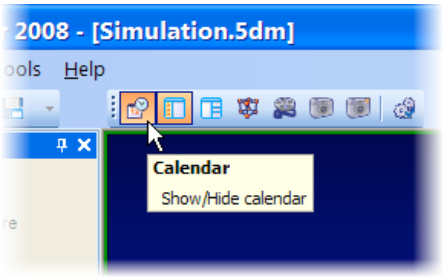


Figure 517 – Showing / Hiding the Calendar panel.

Playback of the Construction Simulation

The Calendar panel contains all schedule data, as well as tools to play back your simulation.

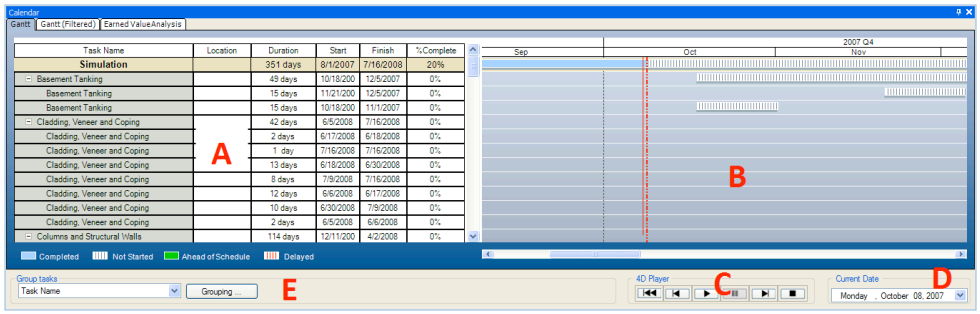


Figure 518 – The “Calendar” panel in 5D Presenter.

All scheduling information (Tasks, Locations, start and end dates, as well as completion information) is listed in the “Tasks” section (**A**).

A graphical representation of your schedule is shown in the “Gantt Chart” area (**B**). Bars in the Gantt chart provide you with information regarding the status of each Task, once you project is in progress.

The “VCR” controls (**C**) allow you to play your construction simulation, pause it, and navigate steps forward or backward in time.

With the current date selector (**D**) you can jump to the date in your project that you are particularly interested in.

The “Task Grouping” settings (**E**) allow you to change the list of Tasks (**A**).

HOW TO: PLAY BACK A CONSTRUCTION SIMULATION

With your 5D Presenter file open, click on the “play” button on your Calendar palette.

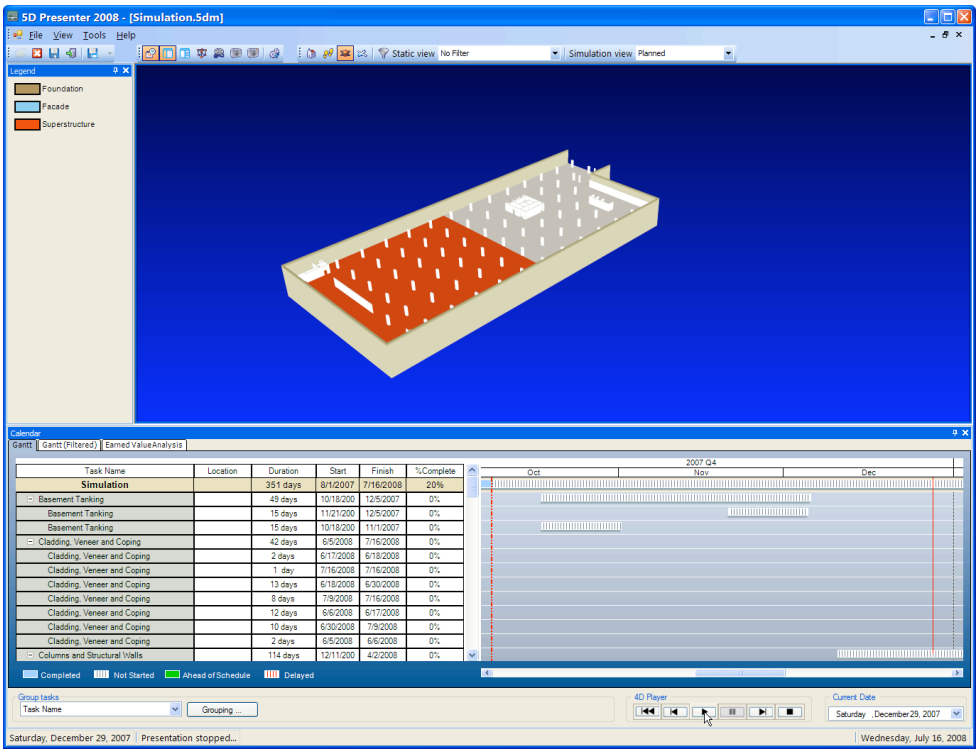


Figure 519 – Clicking the "play" button to start playback of a construction simulation.

Constructor will start running the simulation, showing elements in the color of the Task Group that associated Tasks belong to.

Pause at any desired point to closely analyze a certain status. You can also rotate the model at any moment, or use any other navigational mode to further explore your project.

You can change the scale of your timeline by clicking and dragging with your mouse to the left or right.

Use the "Current Date" selector to jump forward or backward in your schedule.

You can select the Task Group System that you want to view in your simulation from the "Display Settings". You defined one or more Task Group Systems in Constructor's "Schedule Task Manager" when you created Task Groups, and specified the "Task Group representation settings".

HOW TO: USE THE "DISPLAY SETTINGS" PALETTE

From the toolbar, activate the "Display Settings" palette.

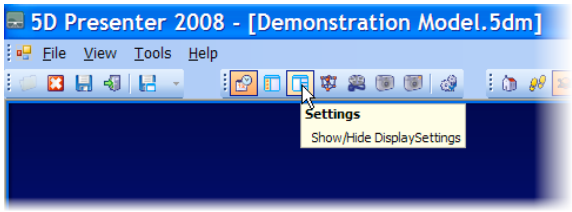


Figure 520 – Activating the "Display Settings" palette from the toolbar.

Alternatively, you can activate the palette from the “Tools” > “Display Panel” menu item.

5D Presenter will open the “Display Settings” palette, which allows you to set the 5D Presenter model content and representation settings.

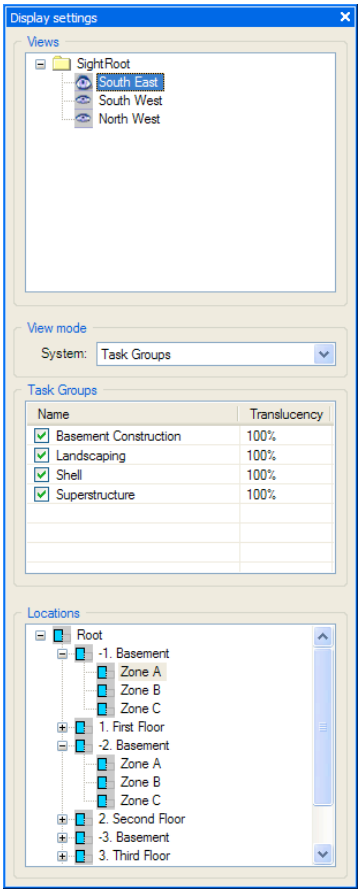


Figure 521 – The “Display Settings” palette.

The Display Settings palette contains four sections:

- Views
- View Mode
- Task Groups
- Locations

You can select the **Task Group System** in which you want to view the construction simulation in the “*View Mode*” section. Select the “System” that you want to apply from the list of available Task Group Systems, as defined in Constructor’s Schedule Task Manager.

The “*Views*” section allows you to save views of your 5D Presenter model: when your model is viewed in a certain position that you would like to save for later use, right-click on a folder in the “Views” section and select “Save Current View As”.

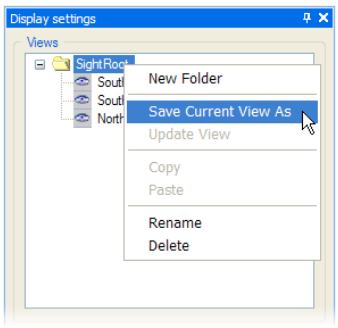


Figure 522 – Right-clicking on a folder in the "Views" list to save a view of your model for later use. Create new folders to organize views.

5D Presenter will add a new – unnamed – view to your collection of saved views. Enter a name to recognize it later. You can always right-click and select "rename" to change the name at a later stage.

The "*Task Groups*" section lists the collection of Task Groups that you defined in Constructor's Schedule Task Manager.

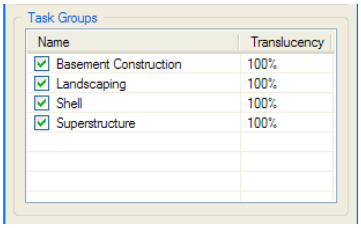


Figure 523 – The "Task Groups" section of the Display Settings palette.

In 5D Presenter, you can specify if each of the Task Groups will be visible during the construction simulation. You can also change the translucency of each of the task groups during the simulation. For example, you can change the translucency of the "Shell" Task Group to a lower percentage (20%) to be able to see the activities that are going on inside of the building. The translucency settings are saved by view!

The "*Locations*" section of the Display Settings palette reflects all Locations that you defined with the WBS Manager in your Constructor model.

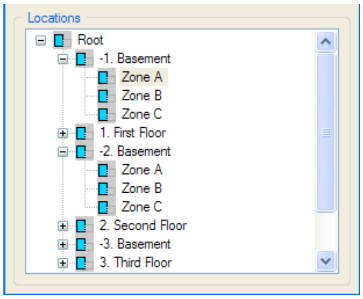


Figure 524 – The "Locations" section in Display Settings palette.

You can specify whether 5D Presenter should show or hide included elements in the current view for each of the Locations.

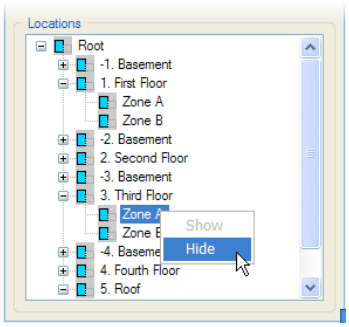


Figure 525 – Right-click on a Location to show or hide it in the currently selected view.

All view settings that you define in the Display Settings palette can be saved to your 5D Presenter file by clicking the "Save" button on the toolbar, or by selecting "File" > "Save" from the menu.

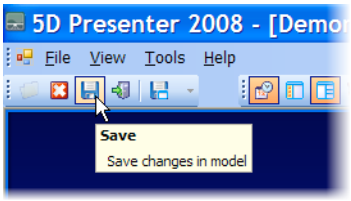


Figure 526 – Clicking the "Save" button on the toolbar to save your settings.

The schedule data that is saved in the 5D Presenter model allows you to interactively check the properties of elements and tasks in your model. 5D Presenter can show you which Recipes are associated with an element and also which elements belong to a specific bar in the Gantt chart.

How To: Show 5D Information in the Presenter Model

To find out which elements in your model are associated with a Task in your schedule, right-click on a Gantt chart bar and select "Highlight Included Elements".

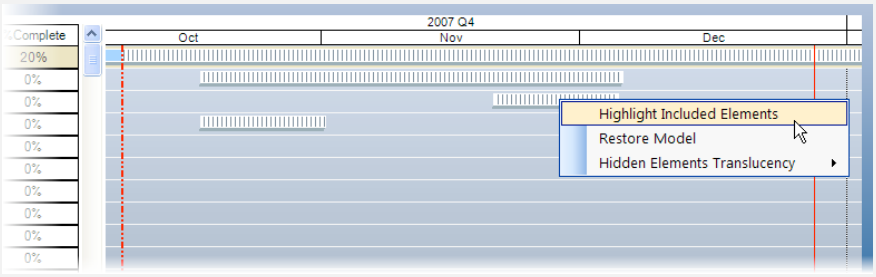


Figure 527 – Right- clicking on a Task and select "Highlight Included Elements" to show related elements in the 3D model.

5D Presenter will render all non-related translucent and highlight elements that are included in the selected Task.

You can alter the level of translucency by changing the percentage value in "Hidden Elements Translucency".

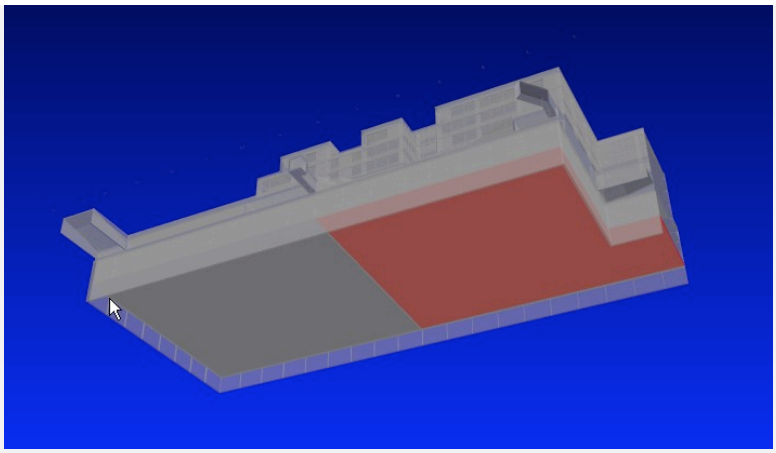


Figure 528 – Elements included in Task are highlighted in the – further translucent – model.

To reveal the estimating and scheduling information of a particular element in your model, simply right-click on the element. This will show a balloon with information related to your selection.

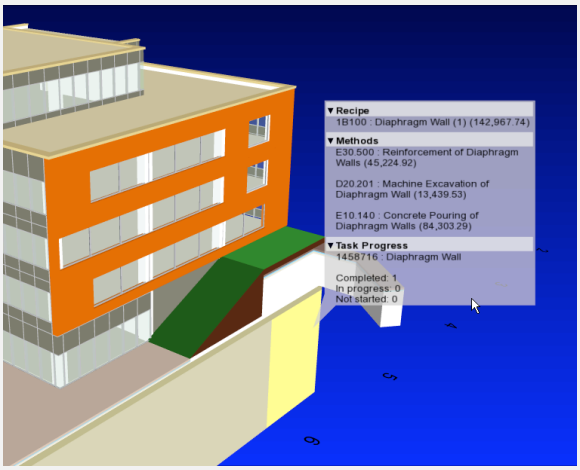


Figure 529 – Right-clicking on an element to reveal the estimating and scheduling properties.

Creating Snapshots from your Simulation

5D Presenter contains functionality to automatically generate a sequence of snapshots from your construction simulation. This allows you to create a set of images that present the planned status of your project in a specified time interval.

HOW TO: CREATE SNAPSHOTS FROM YOUR SIMULATION

Before you start creating snapshots of your 5D Presenter model, you need to set up the settings for the images you are about to create. To do this, open the "Snapshot Palette" from the toolbar or from the "Tools" menu.

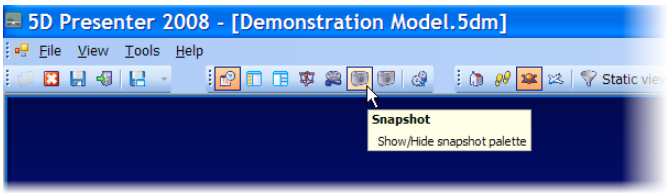


Figure 530 – The Snapshot Palette control in the toolbar.

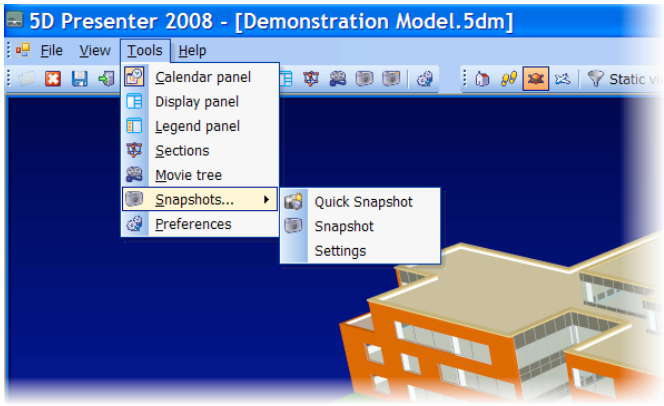


Figure 531 – The Snapshot settings from the "Tools" menu.

After opening the "Snapshots" palette, you can specify the settings for the images and image sequences you want to create from your 5D Presenter model.

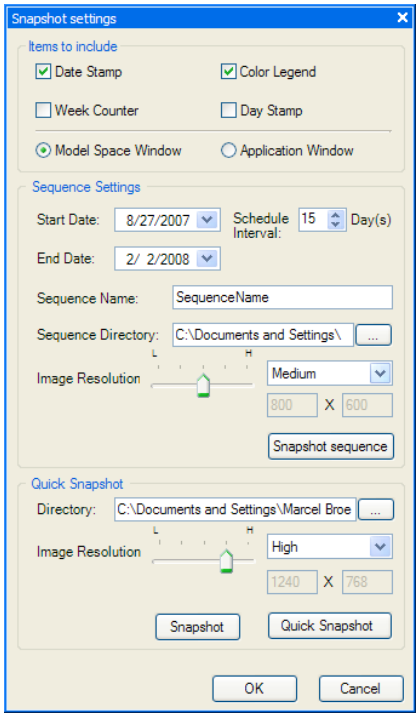


Figure 532 – The "Snapshot Settings" palette.

The "Items to include" contains the following settings:

Date Stamp Includes the current date in the simulation. The date stamp will be displayed in the upper left corner of the

	movie you generate.
Week Counter	Includes the current week as a number from the specified start date (defined in “User Preferences” > “Display” > “Week Counter”).
Color Legend	Includes a key to the color codes in the generated movie, as defined in Constructor’s Task Group representation settings. The legend will be displayed in the lower left corner of the movie.
Day Stamp	Includes the current day as a number from the specified start date of your project (defined in “User Preferences” > “Display” > “Week Counter”).
Model Space Window / Application Window	A toggle that defines the scope of the image(s) you create. If you select “Model Space Window”, only the information that you see within the border of the model space will be included. Selecting “Application Window” will create images that also include the user interface elements.

With “Sequence Settings”, you can define how your automatic snapshot sequences should be generated:

Start Date	The start date of the snapshot sequence you want to generate. This can be any date in your project schedule.
End Date	The end date of the snapshot sequence. This can be any date after the Start Date.
Schedule Interval	The time that should be taken by 5D Presenter from one snapshot to the next. “15 days” means that a snapshot is taken of your construction simulation every 15 days between the Start – and End date.
Sequence Name	The name of the image files that 5D Presenter will generate. The name that you provide will be used as a prefix for the image file names. Image files will be named in the following format: <SequenceName><Date> Example: “SequenceName -2007-10-11.BMP”.
Sequence Directory	The path on your system where the sequence of image files (.BMP) will be saved; specify a folder.
Image Resolution	This sets the dimensions for the images you are creating. The larger the resolution, the higher the quality. The file size of the image file will increase when enlarging the resolution.

The “Snapshot Sequence” button will start generating a sequence of images taken based on the defined “Sequence Settings”, and the currently activated representation.

You can also create single snapshots – “Quick Snapshots” from your 5D Presenter model, by using the “Quick Snapshot” button on the toolbar.

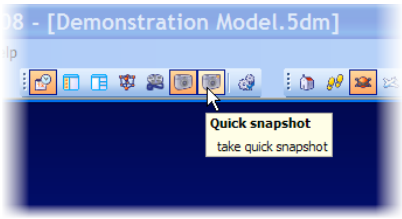


Figure 533 – The “Quick Snapshot” button on the toolbar.

Clicking the “Quick Snapshot” button will result in *one* single snapshot of the 5D Presenter model in its current state (date/representation).

You can define the settings of these quick snapshots in the lower half of the “Snapshot Settings” palette.

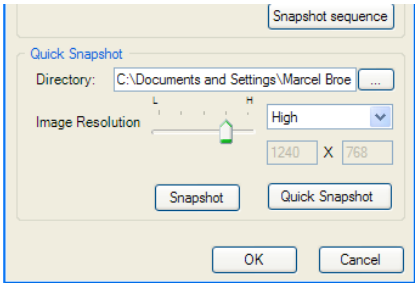


Figure 534 – The “Quick Snapshot” settings on “Snapshot Settings” palette.

Directory	The path on your system where quick snapshot image files (.BMP) will be saved; specify a folder.
Image Resolution	This sets the dimensions of the images you create. The higher the resolution, the better the quality. The file size of the image will increase when raising the resolution.

The “Snapshot” button on the settings palette will create an image (.BMP) of the current state of the model, and will show a file dialog, in which you can specify name and path for the image taken.

The “Quick Snapshot” button has the same function as the “Quick Snapshot” button on the toolbar: it generates an image of the current state of the model without asking you for a file name. The created image will be saved in the folder specified in the “Directory” setting. The image file will be named after your 5D Presenter (5DM) file. Subsequently generated images will be given an incremental number suffix. (For example: Demonstration Model1.BMP).

Generating Movies from your Simulation

The construction simulation that you created by publishing your Constructor model with schedule information to a 5D Presenter file can be saved as an .AVI movie file. You can use this movie file to distribute it among team members, or to send it to a customer/owner.

How To: Generate Movie Files from your Simulation

To create a movie, use the “Movie Tree” function.

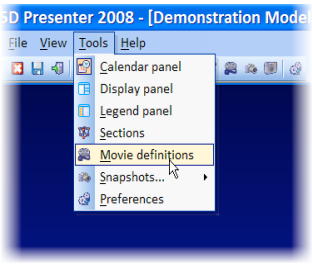


Figure 535 – Starting the “Movie definitions” function to specify new movie settings.

In the Movie tree dialog, you can specify movie settings; you can later select any of the presets to generate movies from your simulation. Use the Movie tree dialog as a folder on your system to organize presets: You can create sub folders, move presets, and rename movie presets.

To define a new movie, click on the “New” button in the Movie tree dialog.

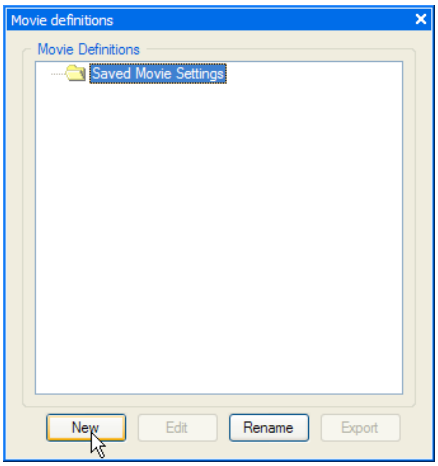


Figure 536 – Clicking “New” to add a new movie preset.

5D Presenter will open the settings for the new movie preset.

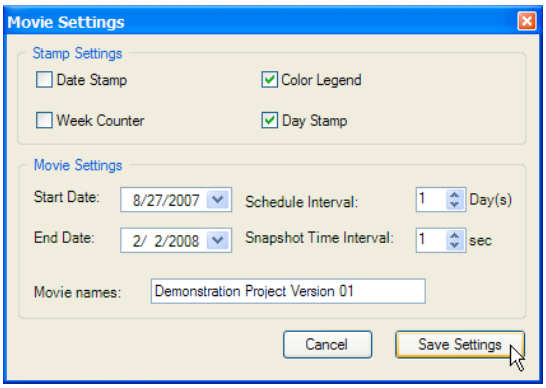


Figure 537 – New Movie preset settings.

In the settings, you can specify what you would like to see in the movie to be generated with “Stamp Settings”:

Date Stamp	This includes the current date in the simulation. The date stamp will be displayed in the upper left corner of the movie you generate.
Week Counter	Includes the current week as a number from the specified start date (as defined in “User Preferences” > “Display” > “Week Counter”).
Color Legend	Includes a key to the color codes, as defined in Constructor’s Task Group representation settings, in the generated movie. The legend will be displayed in the lower left corner of the movie.
Day Stamp	Includes the current day as a number from the specified start date of your project (as defined in “User Preferences” > “Display” > “Week Counter”).

With “Movie Settings”, you can specify simulation settings:

Start Date	The date on which the movie you generate will start. Select any date during your project.
End Date	The date on which the movie you generate will stop. Select any date after the Start Date.
Schedule Interval	The number of days between steps in the simulation. 5D Presenter will generate schedule “snapshots” for the simulation. The Schedule Interval determines how much time there will be between each of these snapshots.
Snapshot Time Interval	Determines how long each generated snapshot will be displayed during the simulation. An interval of 1 second for a 1-day period interval means that each day in your project will be shown for 1 second in the schedule simulation movie that you generate.

With “Movie name” you can define the name of the preset; it will appear under this name in the Movie settings.

Click “Save Settings” to save your preset into the Movie tree.

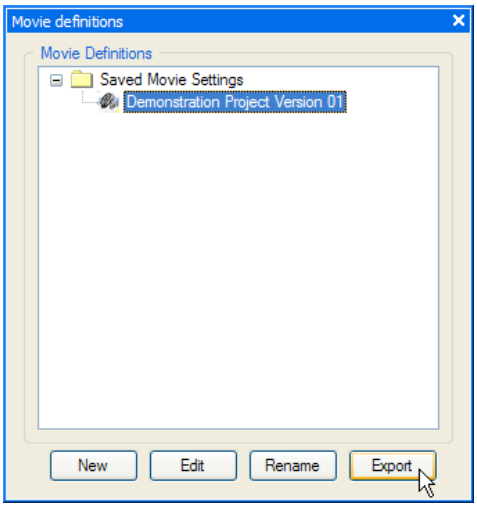


Figure 538 – The new movie preset in the Movie tree dialog.

When you are ready to create a movie file from your simulation, select your preset and click “Export”. 5D Presenter will open the “Export Movie” dialog.

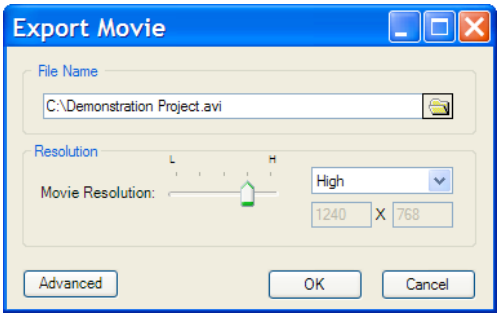


Figure 539 – “Export Movie” dialog.

Specify a name and path for the AVI file that you want to generate in the “File Name” settings.

In the “Resolution” settings, specify what the dimensions of the movie you are about to generate should be. The higher the resolution, the better the quality of your movie, but the file size and time to generate the movie will increase as well.

By default, 5D Presenter uses the “Cinepak by Radius” codec to generate your movie; if you would like to change this setting, click on the “Advanced button.

The advanced settings will allow you to select any of the available codecs on your system.

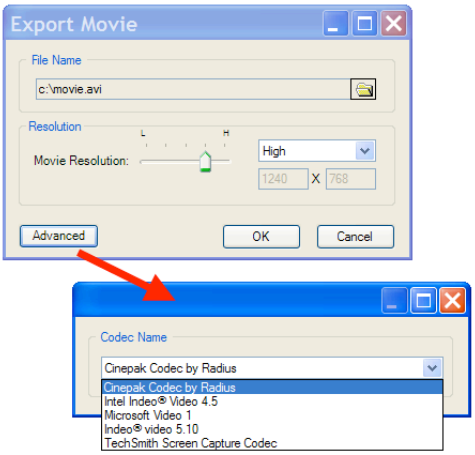


Figure 540 – Video Codec selection can be found under the "Advanced" button.

5D Presenter Application Settings

You can customize the way that your 5D model is presented to you through the "Preferences" function in the "Tools" menu.

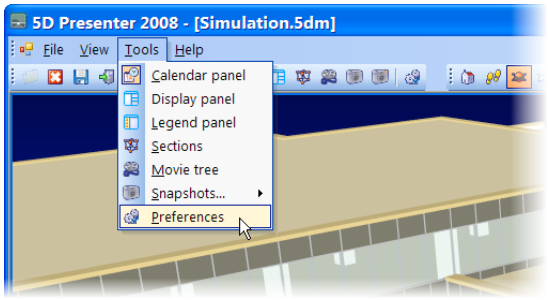


Figure 541 – Changing the way 5D Presenter appears and behaves with the application "Preferences"

HOW TO: CHANGE 5D PRESENTER SETTINGS

Open the "Preferences" dialog from 5D Presenter's "Tools" menu.

The Preferences dialog exists of three tabs: "Display", "5D Settings", and "EVA Settings".

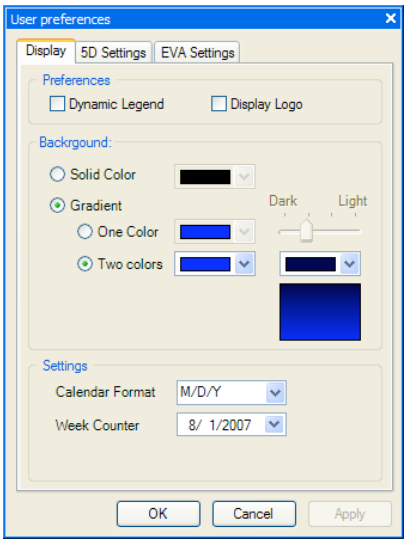


Figure 542 – 5D Presenter Display Settings.

In Display Settings, you can define how 5D Presenter appears on your screen.

Preferences	
Dynamic Legend	Shows or hides a dynamic legend of the Task Group colors that are currently active in your project in the model space.
Display Logo	In Constructor, you can specify which logo image should be included in your 5D Presenter file ("Sequencing" > "Company Logo") With this setting, you can decide to show or hide it.
Background	
Solid Color	Generates a solid-colored background of the specified color.
Gradient	Generates a smooth transition between one color and "dark", or between two specified colors for the background of your model.
Settings	
Calendar Format	Sets the date representation for use with your construction simulation.
Week Counter	Sets the start date for 5D Presenter's week counter.

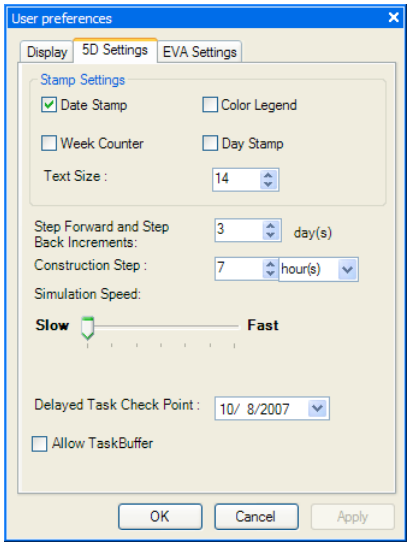


Figure 543 – 5D Settings

Stamp Settings	
Date Stamp	Shows the current date in the simulation in the top left corner of the model space.
Week Counter	Shows the week number in the top left corner of the model space during the simulation.
Color Legend	Shows a key to the active Task Group colors in the model during playback of the construction simulation.
Day Stamp	Shows the day number in the top left corner during playback of the simulation.
Step Forward and Step Backward Increments	The number of days that the simulation steps backward or forward when clicking the “step back” or “step forward” buttons.
Construction Step	The accuracy of the simulation. When set to 7 hours, a new view of the project is generated for every 7 hours of the project’s schedule.
Simulation Speed	The speed in which the generated views (as specified in “construction step” setting) are presented during the simulation.
Delayed Task Checkpoint	Default value: system date; used for actual progress and delay calculation plus representation.

Mastered Process Steps

At the end of this section, you know how to generate a 5D Presenter model, and how to exploit it to explore your project and simulate the construction schedule you designed.

Virtual Construction in the Production Phase

In the production phase of a project, you can use your Virtual Construction model to track, communicate, and manage the execution of your plans. By collecting "actual" cost and time information, you can further increase the amount of information in your project model.

Vico's products allow you to compare the project data created in the "design" and "planning" phases – the "targets" – to collected actual data. The target data compared to the actual data will provide you with a powerful decision-making framework.

Each time you add new "actual" cost and time information to the set of construction information in Constructor, Control and/or Estimator, the "Current" status of the project will be updated.

"Target", "Current" and "Actual" are the three states in which your project and parts of your project will be throughout construction. These three information states are supported in Vico's Virtual Construction suite.

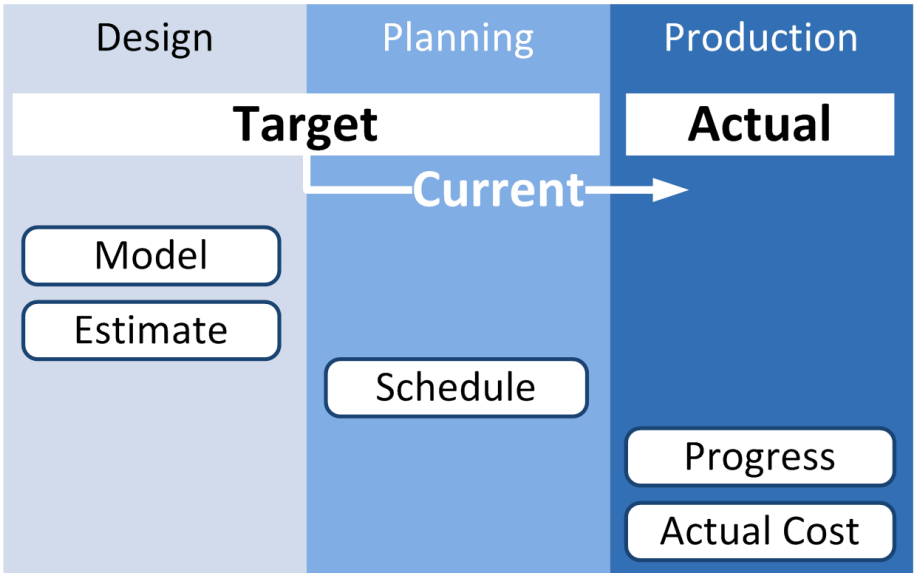


Figure 544 – The construction information that you created throughout the "Design" and "Planning" phase is the "Target" for your project. Throughout the "Production" phase, "Target" information is replaced by "Actual" information. "Actual" information is used to calculate and visualize the "Current" status of your project.

8: Control

This section will explain how you can use Control and Estimator to track actual cost and project progress.

Vico's project controlling functions are available in Control and Estimator. Schedule progress is tracked in Control's "Control Chart", and actual costs can be entered in Estimator's "Cost Tracking" mode.

Project Progress Control

The name of Vico's "Control" software refers to its powerful scheduling and project progress tracking functionality, which helps you to *control* your project. Project progress information is used to calculate the expected remaining durations of your project, based on the production rates that have been achieved so far in your project. In Control, the "target" state is the schedule, the "actual" state is maintained by means of the "Control Chart", and the "current" state is continuously calculated based on the actual production rates and presented to you as Task completion forecasts.

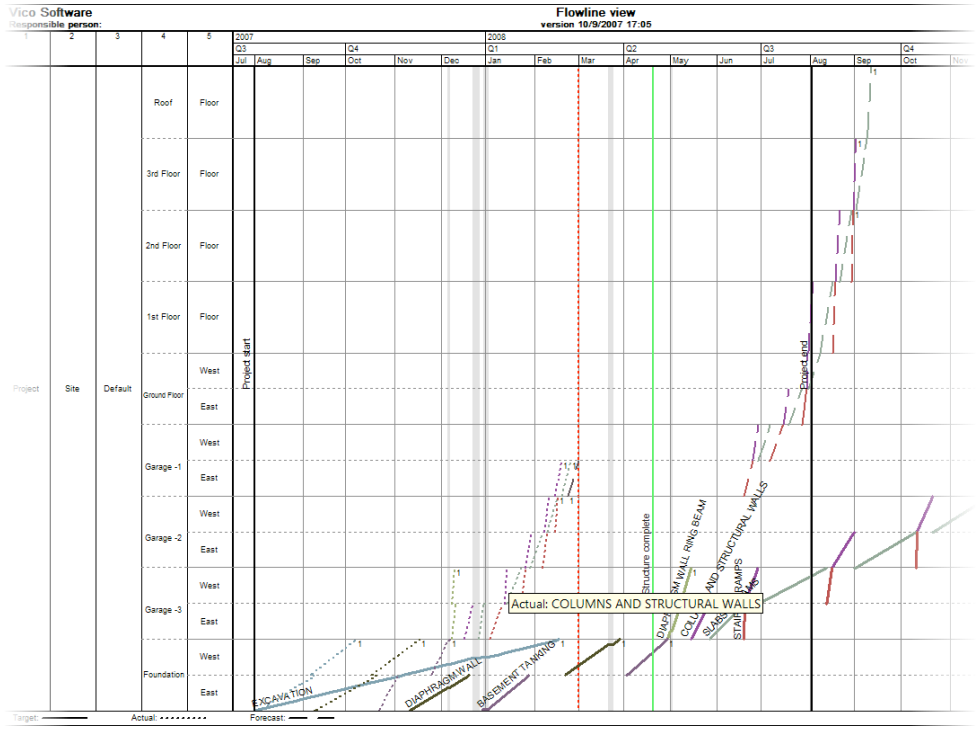


Figure 545 – Target, Current and Actual in the Control schedule in the "Flowline" view. Solid lines show your project planning, dotted lines represent the actual progress of the project and dashed lines reflect Control's forecast based on entered actual progress of the project.

Control Chart

You can track the actual progress of your project in Vico Control's "Control Chart". The Control Chart provides an overview of all the Locations in your

project. This is the same Location structure as the structure used for the schedule, which is the same as the structure you defined in Constructor's WBS Manager.

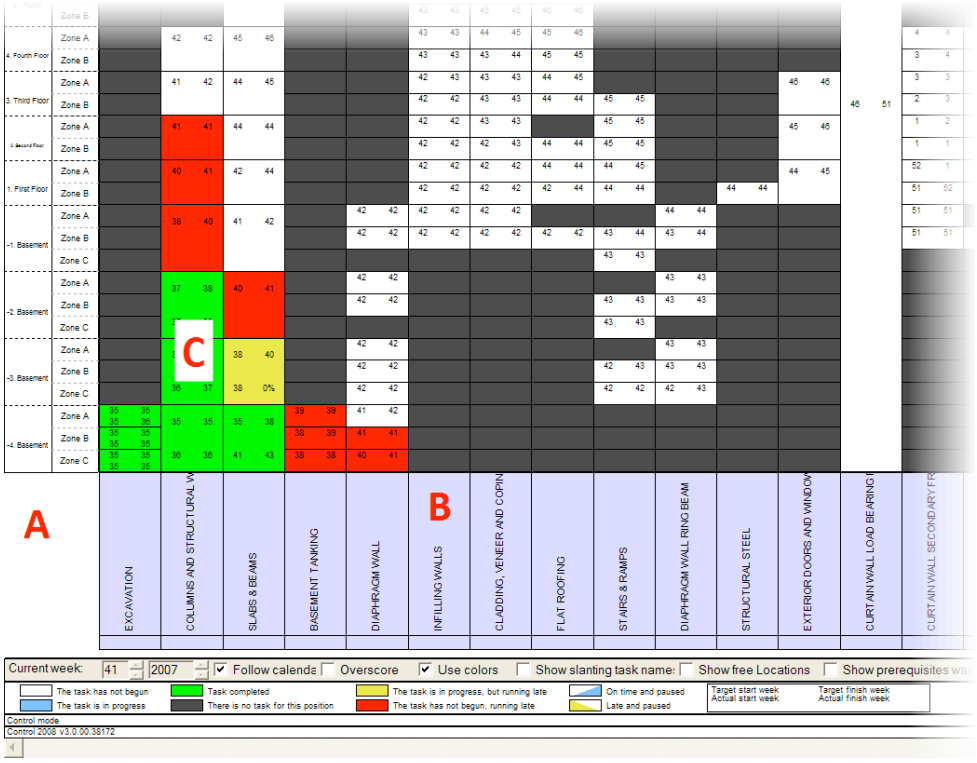


Figure 546 – The Control Chart in Vico Control.

An overview of the Control Chart:

The Location structure, defined by the structure that you defined in Constructor's WBS Manager, appears to the left side of the Control Chart (**A**).

Tasks, defined in Constructor's "Schedule Task Manager" and scheduled in Control, appear on the horizontal axis (**B**).

Each "cell" that is generated at the crossing of a Task with a Location is a progress tracking unit (**C**). The cells have four fields:

Target Start	Target Finish
Actual Start	Actual Finish

Figure 547 – The Content of Control Chart Cells.

Tasks on Locations that are not yet under construction, only have Target Start and Target Finish dates. As soon as construction starts, a Location gets an Actual Start value. At completion, the Actual Finish information can also be entered.

When a Task on a Location has not yet started, but the current date is after the "Target Start" date, the color of a cell turns red.

When the "Actual Start" date is later than the "Target Start" and the Task on a Location has not yet been finished, the color of a cell turns yellow.

When a Task on a Location has been completed, the color of the cell will change to green.

With this color coding, you can easily see which Tasks and Locations are running late and are thus becoming a risk for project completion.

Data entered in the Control Chart are used to calculate production forecasts for each of the Tasks in your schedule.

All the information that you enter in the Control Mode is included in the data transfer when you want to update your Constructor model with "Actual" information.

To learn more about the use of the "Control" mode in Vico Control, refer to the Control User Guide in chapters 5 and 6, "Basic" and "Advanced" use of Control functions.

Sending Work to the Constructor Model

As soon as you want to prepare an updated version of your 5D Presenter construction simulation, for example, to prepare for a team meeting; you should publish the collected "Actual" and calculated "Current" project status information to Constructor.

HOW TO: SEND "ACTUAL" AND "CURRENT" DATA TO CONSTRUCTOR

In Control, select "Export Changes" from the "Vico Constructor" importing and exporting menu in Control's "File" menu.

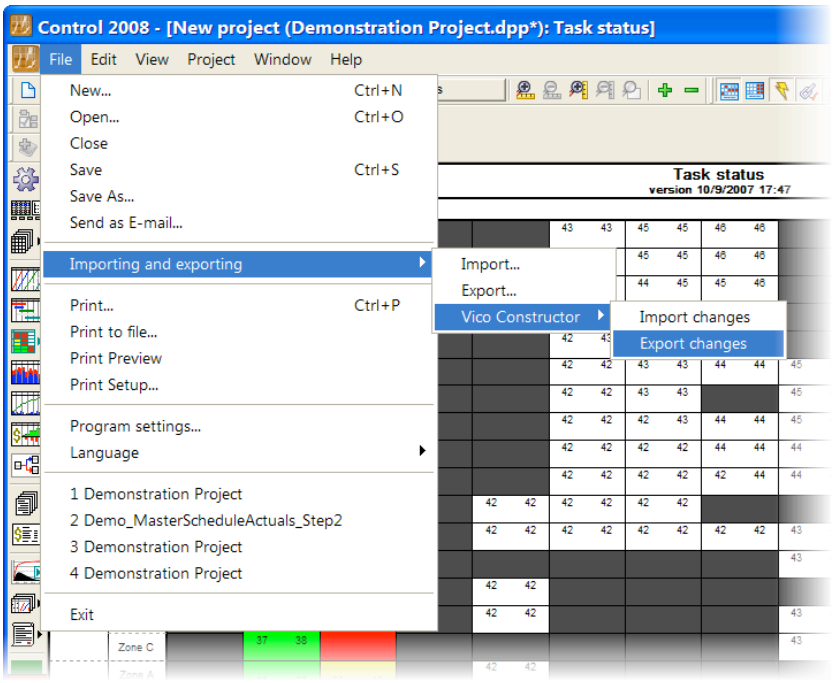


Figure 548 – Selecting "Export Changes" to send up-to-date project data to Constructor.

Control will send the "Actual" and "Current" project data, including schedule ("Target") data to the Control output file that you used earlier to transfer only schedule data from Control to Constructor.

If you want to save the new data in a different XML data package than the one you used earlier, follow the steps explained in: "How To: Add Schedule Data to your Constructor Model".

After Control has completed saving the collected project information to the XML data package, open Constructor.

In Constructor, select "Get Scheduling result from Control" from the "Sequencing" menu.

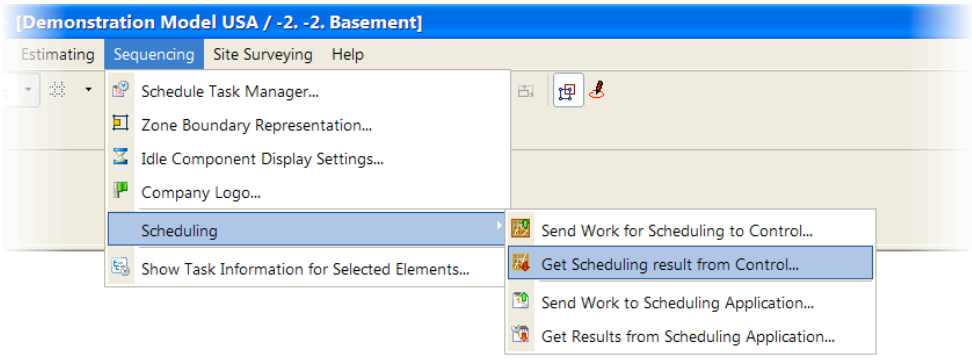


Figure 549 – Selecting "Get Scheduling result from Control" to open the XML data package with "Actual" and "Current" project information.

After selecting the XML data file, Constructor will present an overview of changes that are about to be added to the model.

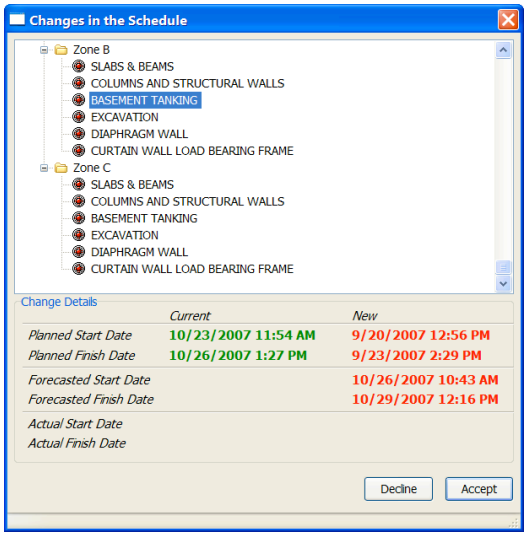


Figure 550 – An overview of changes, included in the Control data package.

The "New" column contains new information received from the updated Control data. In addition to the "Planned" data, you will also see that "Forecasted" and "Actual" information is added to the Tasks in your Constructor model.

After completing the "Get Scheduling Results" operation, your model not only contains the planned schedule data, but also the current actual status. You can check in the WBS Manager palette to see which Tasks are in production:

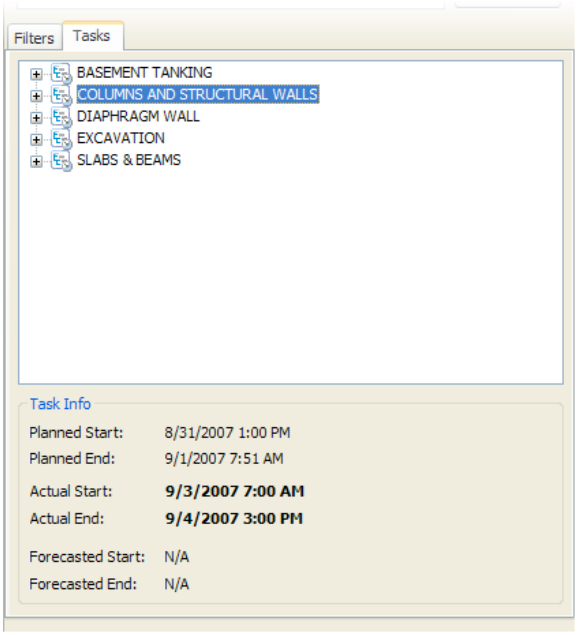


Figure 551 – Selecting a Task in the WBS Manager palette to view the updated information from Control.

Cost Tracking

By tracking costs, you will record the actual expenses of the Tasks, performed in your project. Cost tracking will add the "Actual" values of the costs to your construction information. Cost tracking information is used by Constructor and 5D Presenter to generate Earned Value Analysis curves.

Cost Tracking in Estimator

In addition to "Cost" and "Tender", Estimator contains a third mode: "Cost Tracking". Cost Tracking in Estimator allows you to define cost tracking milestone dates, and enter actual costs per cost type (labor, material, equipment, and sub contracted work).

HOW TO: ENTER ACTUAL COSTS IN THE "COST TRACKING" MODE

Select the "Cost Tracking" mode in Estimator.

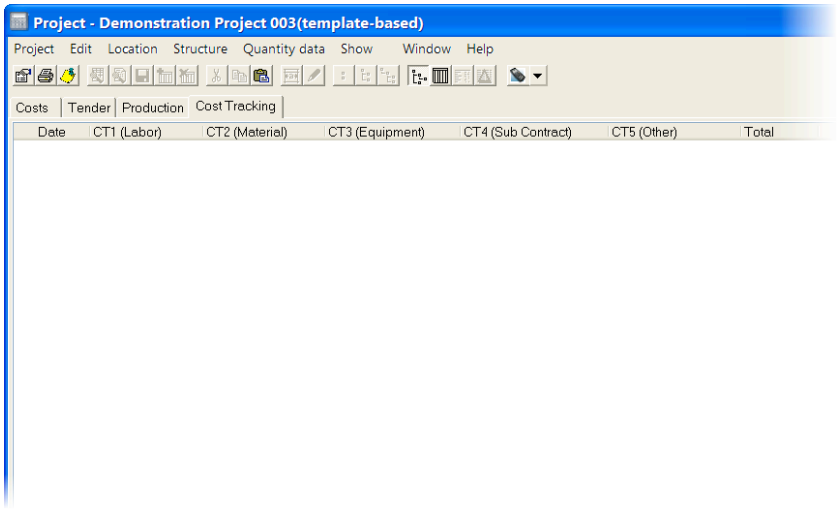


Figure 552 – The "Cost Tracking" mode in Estimator.

To define a date – a "milestone" – for which you want to enter *cumulative* actual costs per cost type so far, right-click in the empty area of "Cost Tracking".

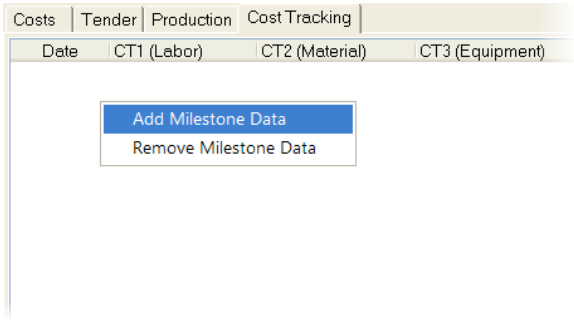


Figure 553 – Right-clicking in the "Cost Tracking" window to add a new Milestone date.

Estimator will add a new line to the Cost Tracking window. Change the date to the report date by clicking the arrow button.

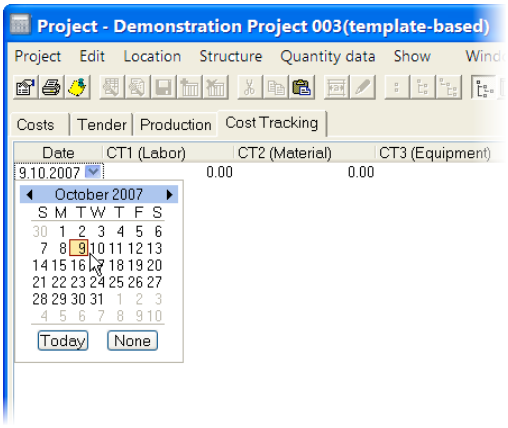


Figure 554 – Changing the report date by clicking the arrow button.

You can now enter the total cumulative costs per cost type for the date you defined.

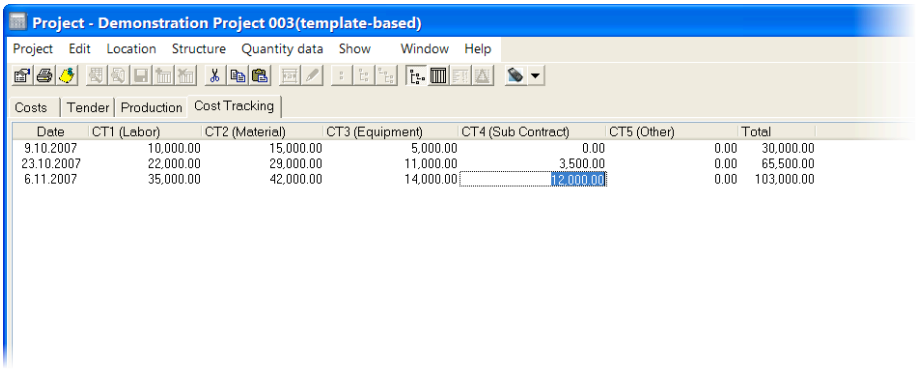


Figure 555 – Entering the *cumulative* cost of each of the cost types for the defined project milestone.

All information that you entered is immediately available for use in your Constructor model.

Refreshing Information in Constructor

To add "Actual" cost information to your Constructor model, use the "Synchronize with Estimator Database" function.

HOW TO: ADD "ACTUAL" COST DATA TO THE CONSTRUCTOR MODEL

In Constructor, select "Synchronize with Estimator Database" from the "5D Model" menu.

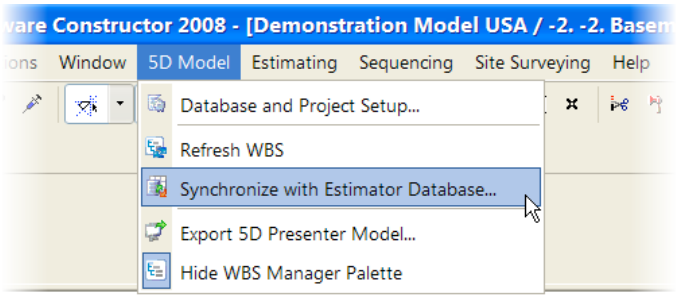


Figure 556 – Selecting "Synchronize with Estimator Database" to add the entered Cost Tracking data to your model.

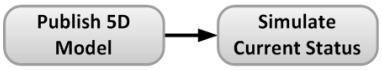
Click "OK" to accept the Constructor properties to be written to the database to complete the synchronization operation.

Mastered Process Steps

After reading this section, you know how to use Control and Estimator to track the actual cost and project progress.

9: Simulate

In this section, you will be shown how to generate a "production phase" 5D model. You will also be shown how to exploit this model to simulate and analyze the status of your project.



The "Actual" and "Current" information that you have collected in your schedule (Control Chart) and estimate (Cost Tracking), is included in the .5DM file when you publish a new version of your construction information from Constructor.

Generate 5D Presenter Model

In order to include all "as built" information in your 5D Presenter model, you should ensure that the model includes the most recent information.

Do this by:

- Importing the latest Control data package

  and

- Refreshing the information from the database in Constructor.

After updating your Constructor model, you can publish a new 5D Presenter model.

HOW TO: PUBLISH A 5D PRESENTER MODEL

To generate a new 5D Presenter file that includes actual cost and time information, select "Export 5D Presenter Model" from the "5D Model" menu.

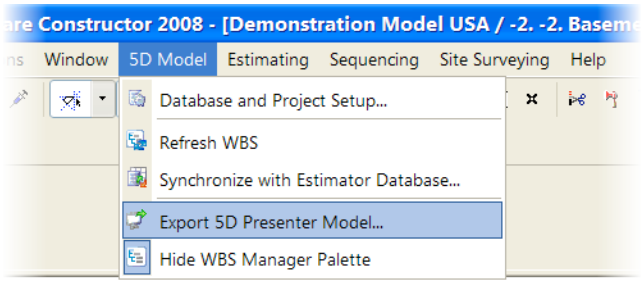


Figure 557 – Selecting "Export 5D Presenter Model" to generate a new 5D Presenter file.

Specify a name and a path for the 5D Presenter file; Constructor will collect the available information and include it into the new 5DM file.

Using 5D Presenter to Analyze Project Status

By using the 5D Presenter model with "Actual" and "Current" cost and progress information that you generated from Constructor, you can visually analyze your project's status.

5D Presenter includes functionality to query your model for elements that are related to Tasks that are running late and for simulating your project's schedule in "Actual" and "Current" (Forecast) mode.

How To: Visually Analyze Project Progress

Your 5D Presenter includes the schedule of your project in the "Calendar" palette. When used with Control, the Calendar palette will reflect the current status of your project.

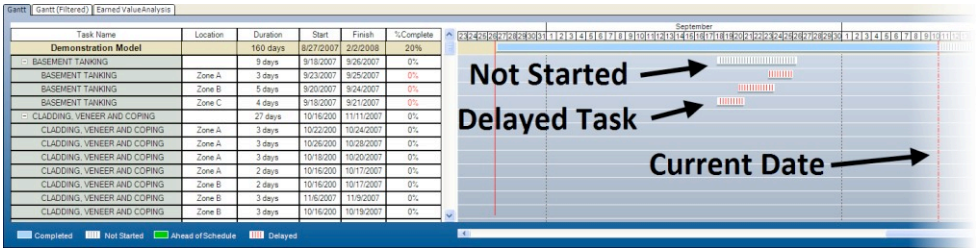


Figure 558 – The "Calendar" palette reflects the current state of your project.

From the color and pattern of the bars in the Calendar's Gantt chart, you can see which tasks have been completed, those that did not start, those ahead of schedule or those delayed.

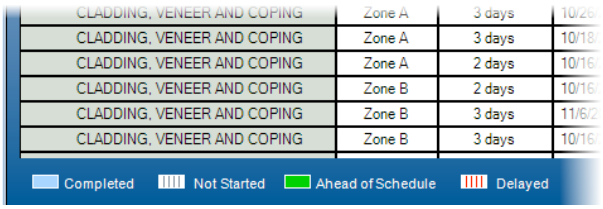


Figure 559 – Key to Gantt bar color codes.

With the "Static View Mode" setting in the toolbar, you can query the model to find out which elements are related to Tasks that are currently delayed and did not start, and Tasks that have started, but are delayed.

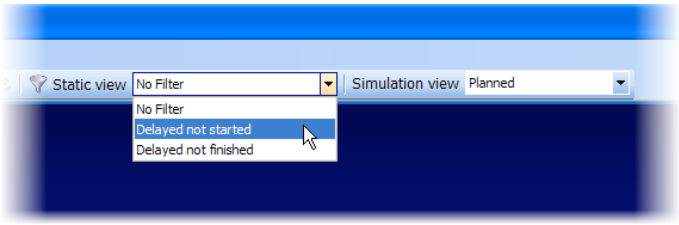


Figure 560 – The Static View Filter

The Static view capabilities are only available when you are not playing back your construction simulation, hence the name "static".

When you query the model for items that are "Delayed not finished", 5D Presenter will highlight those elements in the color that corresponds to the status in the Control Chart:

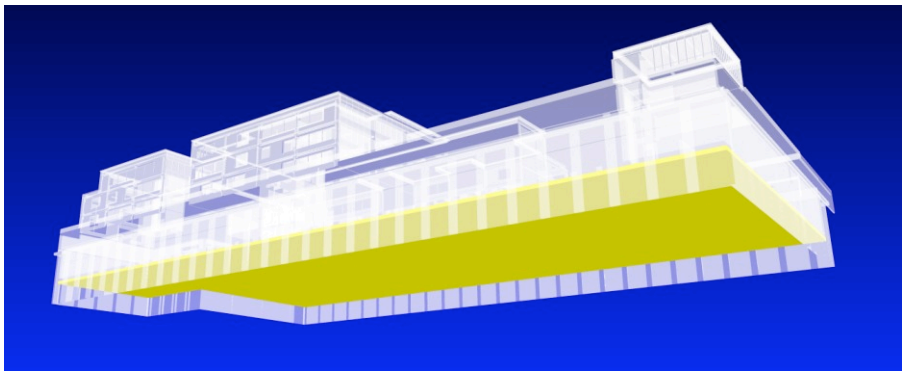


Figure 561 – The results of applying a "Delayed not finished" filter.

All "other" elements are set to be shown in the translucent mode, allowing you to clearly view which elements are related to Tasks that are currently delayed.

With Control's actual progress and current forecast for future completion rates of Tasks in your schedule, you can simulate your project in "Actual Completion" and "Actual Completion in Progress" mode. These modes allow you to visually analyze what the remainder of your project will look like if the current production rate continues.

How To: Simulate Actual and Forecast Production

In the 5D Presenter toolbar, you can select three modes for simulating your construction schedule: "Planned", "Actual Completion", and "Actual Completion in Progress".

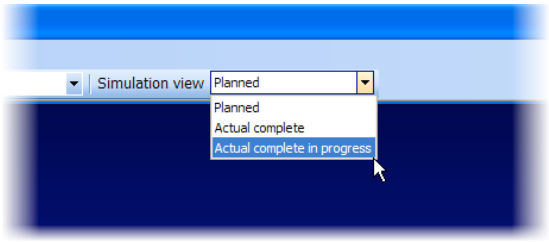


Figure 562 – The "Simulation View" selector in the toolbar.

When you change the simulation view to "Actual Complete", your simulation will show only what has actually been completed in the project: only elements associated with "completed" Tasks are shown.

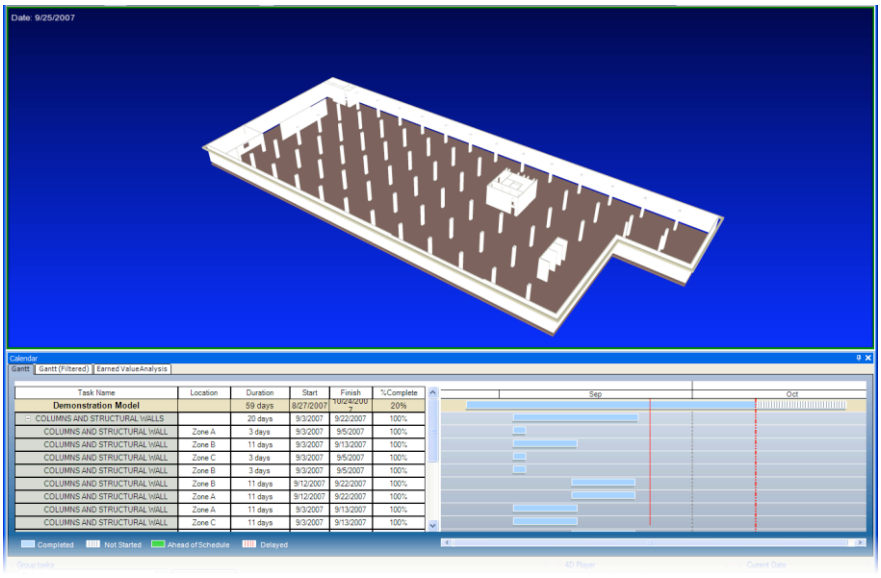


Figure 563 – A construction simulation in "Actual Complete" mode.

When you switch simulation mode to "Actual Complete in Progress", Control's forecast information (delayed Tasks and planned Tasks) are also included in the simulation. This mode will reflect the "Current" status of your project.

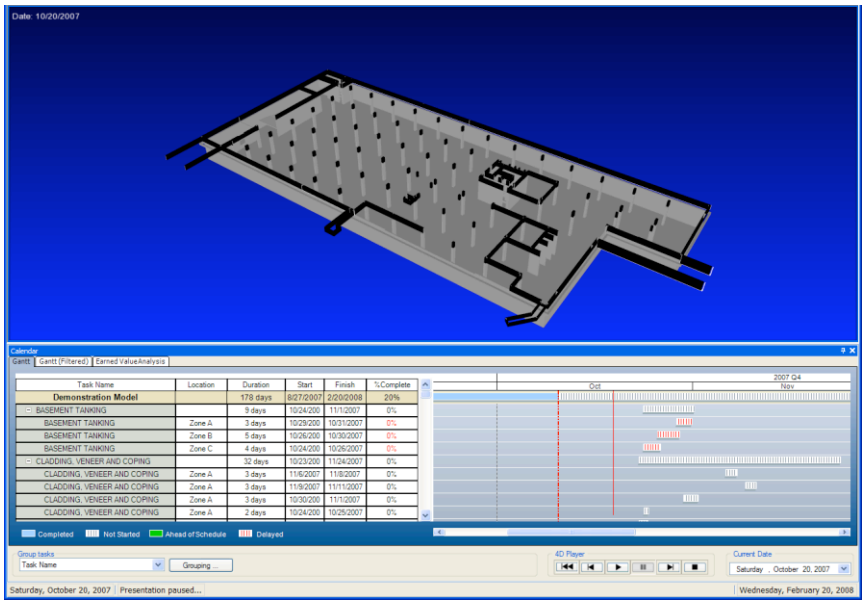


Figure 564 – A construction simulation in "Actual Complete in Progress" mode. Note that all bars in the Gantt chart area after the dateline are either "not started" or "delayed".

Mastered Process Steps

After completing this section, you can generate a "production phase" 5D model. You have also learned how to use this model to simulate and analyze the status of your project.

10: Manage

This last section will explain to you how the production phase 5D Presenter model can be used for Earned Value Analysis.

In addition to the actual progress of your project and forecast information for future production rates, the 5D Presenter model that you can generate in the production phase also includes "actual cost" information.

Task completion and forecast information, together with the actual cost information, gives 5D Presenter the input required for generating "Earned Value Analysis" curves.

5D Presenter automatically generates the five curves required for applying the Earned Value methodology.

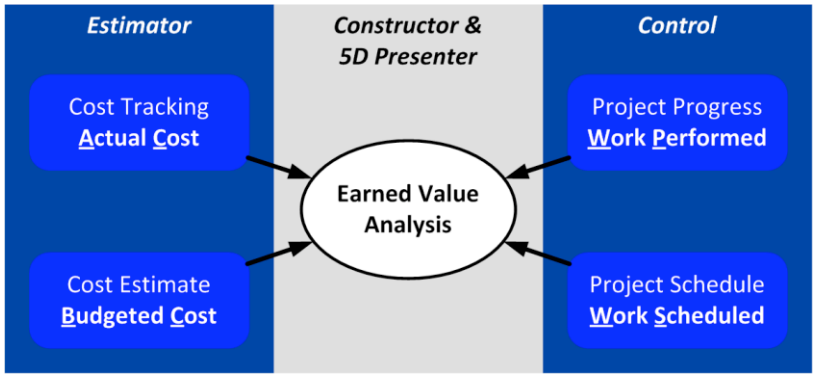


Figure 565 – Vico's applications generate the required input for Earned Value Analysis.

You define a project's **Budgeted Cost** in Estimator when doing the cost estimate. **Work Scheduled** is defined in Control, when you are designing your project's schedule.

As soon as production starts, you keep track of the actual progress in the Control Chart, which provides you with **Work Performed** information. Lastly, Cost Tracking by cost type in Estimator results in **Actual Cost** data.

Information from these four sources is combined by Constructor and published to a 5D Presenter file. 5D Presenter uses this information to automatically generate EVA curves.

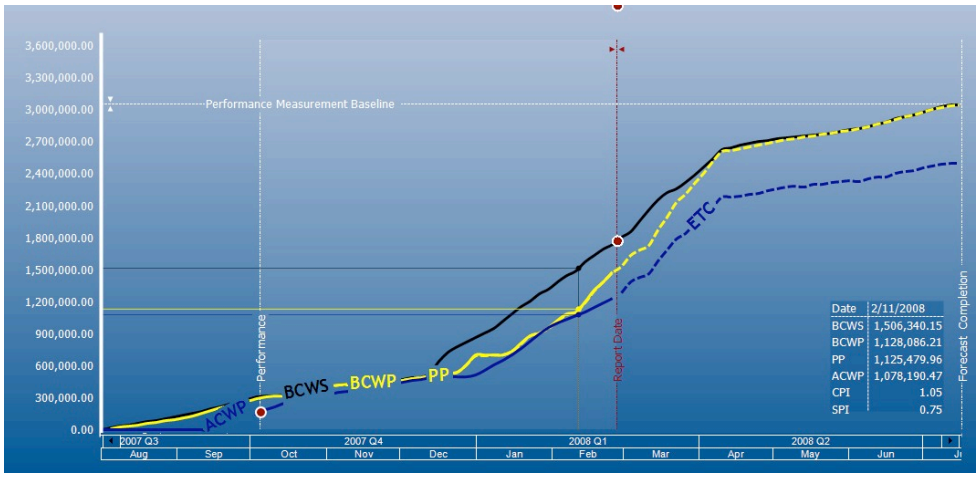


Figure 566 – EVA curves in 5D Presenter.

The curves that 5D Presenter automatically generates are:

BCWS Budgeted Cost of Work Scheduled (the *Plan*)

BCWP Budgeted Cost of Work Performed (the *Progress*)

ACWP Actual Cost of Work Performed (the *Cost*)

PP Projected Performance (the *Forecasted Progress*)

ETC Estimate to Complete (the *Forecasted Cost*)

Both Projected Performance curve and Estimate to Complete curve are calculated based on the current forecast information from Control, which is based on the actual production rates that have been achieved in your project to date.

In addition to the generated curves, 5D Presenter also calculates and displays values for performance indicators.

CPI Cost Performance Indicator – indicates whether your costs exceed the budgeted cost at any point in time (value larger than 1)

SPI Schedule Performance Indicator – indicates whether your actual production rate is higher or lower than planned (i.e. lower production rates result in values less than 1)

The graphical Earned Value Analysis information is available in 5D Presenter's "Calendar" palette and will help you to "read" your project's performance.

How To: Analyze Project Performance with EVA

In 5D Presenter, select the "Earned Value Analysis" tab in the "Calendar" palette.

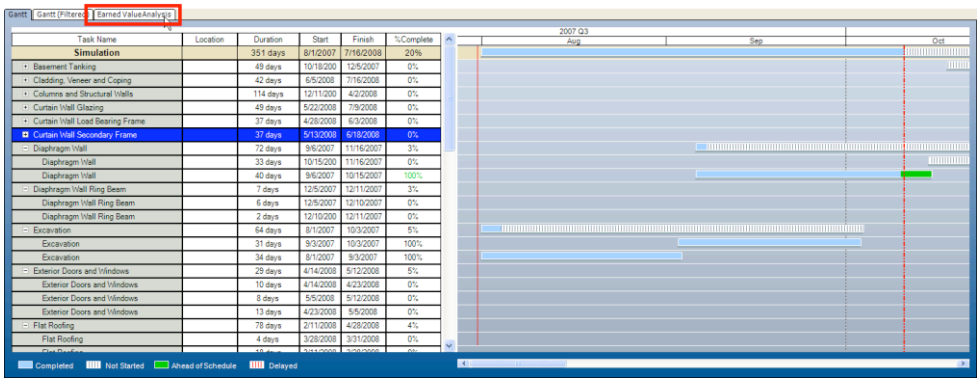


Figure 567 – Selecting the "Earned Value Analysis" tab in the "Calendar" palette.

5D Presenter will generate the available EVA curves. When no "Actual Cost" information is available from Estimator, the ACWP curve omitted. If no "Work Performed" information is available from the Control Chart, the BCWP curve is omitted.

The Earned Value Analysis tab contains several functions to allow you to analyze your project's EVA data.

To read values from the curves, move your cursor along the timeline; three dots in the curves will show you where you are on the curve and vertical and horizontal lines will help you to read the date (vertical line) and cost values (horizontal lines).

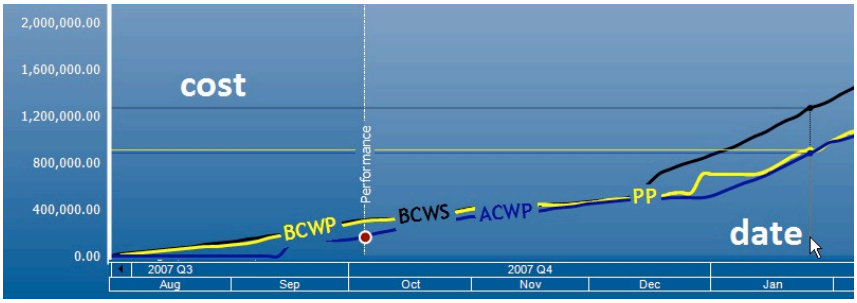


Figure 568 – Horizontal (cost) and vertical (date) lines help you to read from the curves.

You can also read values for the EVA curves of the current location of your cursor in the lower left corner of the graph.

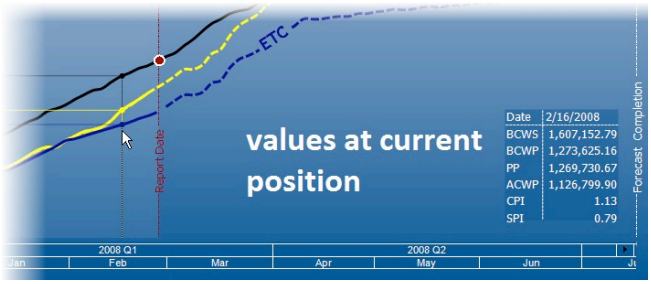


Figure 569 – The values of all curves are displayed for the current position of the cursor in the graph.

If you want to zoom into a time interval of interest, click the calendar and drag your cursor left or right to zoom in or out. While zooming, the vertical (cost) axis will adjust itself to show the interval of cost that is covered by the curves at the current zoom factor.

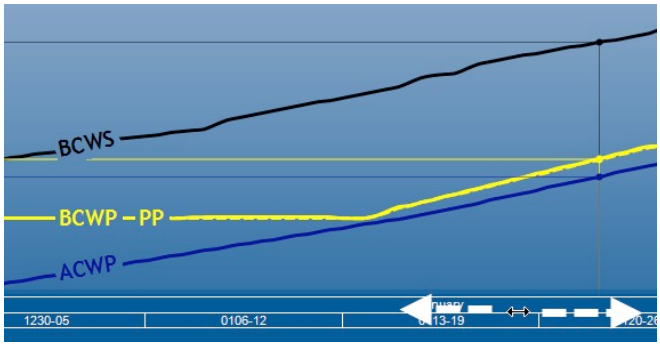


Figure 570 – Changing the scale of your timeline by clicking and dragging your cursor.

The EVA tab options bar allows you to change the appearance and content of the generated curves.

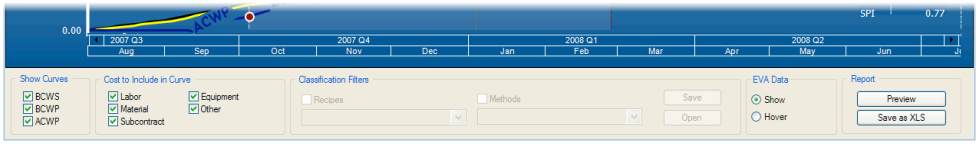


Figure 571 – The EVA Options bar.

With "Show Curves", you can decide which of the generated curves you want to show.

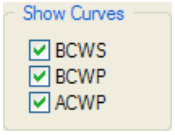


Figure 572 – The "Show Curves" settings.

By checking the box next to the curve names, you can either show or hide them. In order to use the "Classification Filters", the "ACWP" must be hidden, because Actual Cost information cannot be filtered by Recipe or Method Classification.

The "Cost to Include in Curve" setting allows you to specify which of the available cost types you want to include in the calculation of each of the curves.

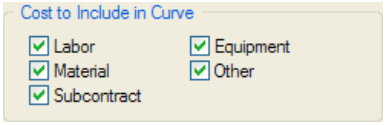


Figure 573 – "Cost to Include in Curve" setting.

When you remove a check mark from a cost type, curves will be recalculated after a small delay, which allows you to select or unselect additional cost types.

You can focus on a certain cost group derived from your estimate's cost structure by selecting specific Recipe and/or Method classifications.

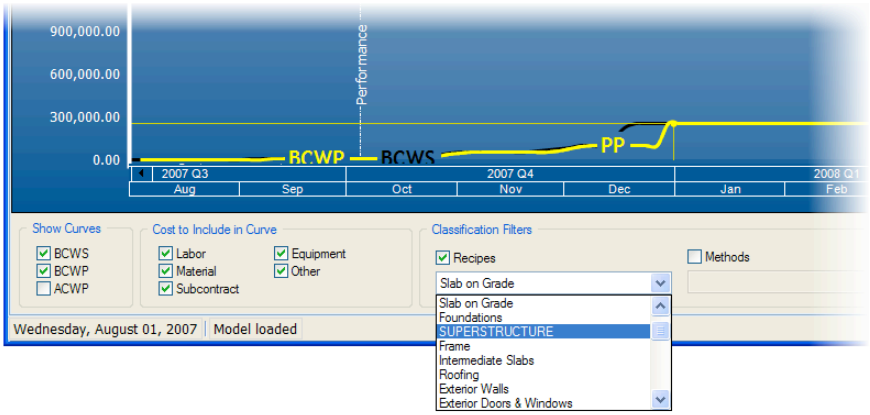


Figure 574 – Selecting a Recipe classification filter based on element cost groups.

With Recipe filtering on, you can further refine your filter by also activating the "Methods" filter.

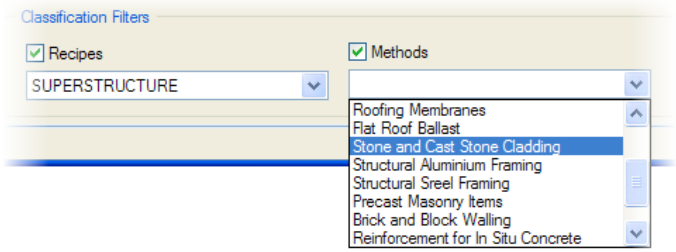


Figure 575 – Refining your cost filter with Methods.

The list of Methods displayed contains the collection of Methods that are associated with one or more Recipes in the selected Recipe classification.

Alternatively, you can filter solely on an activity based classification by selecting only the "Methods" filter.

You can save and restore filter combinations with the "Save" and "Open" buttons.

With the "EVA Data" setting, you can specify how you would like to display the calculated values of the EVA Data in the graph area. Select "Show" to show the values as labels as you are moving your cursor along the curve. Select "Hover" to continuously show the calculated values in the lower left corner of the graph area.

Figure 576 – The EVA Data display settings.

The "Report" functions allow you to generate reports from the EVA information in 5D Presenter.

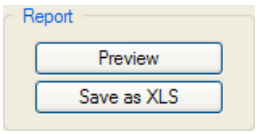


Figure 577 – EVA Reporting functions.

Click “Preview” to generate a preview of the report; click “Save as XLS” to generate an Excel spreadsheet that contains the calculated EVA values.

The “Earned Value Analysis” curves provide a powerful summary of all the data that you have added to your set of construction information, saved as a model in Constructor, a cost estimate in Estimator and a schedule in Control.

Mastered Process Steps

You now know how to create a production phase 5D Presenter file and how you can exploit it for Earned Value Analysis, which is the final step in Vico’s Virtual Construction process.

Using the functionality from Vico’s suite of Virtual Construction products described in this guide, or a subset of it, will help you to improve your documentation, communication and analysis of your project by **Integrating Construction**!

Process Summary and How To: Sections

After studying the 10 chapters and the "How To: …" sections in each chapter, you will have mastered Vico's Virtual Construction process. Quickly refer to any of the "How To" sections by using the Virtual Construction process flow chart and the table below.