CostX 4.10

TRAINING COURSEWARE

ESSENTIALS

&

ADVANCED

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costX 4.1

INTRODUCTORY TRAINING EXERCISE

ASSOCIATED DATASET

Sample Template File

- Concept Stage Training Template.exf

Sample Drawing Files

- House – Raster JPEG.jpg
- House – Vector PDF.pdf
- House – DWG.dwg
- EcoHomes 3D.dwf
- EcoHomes 2D Views.dwf

Sample Rate Library File

- Elemental Template Rates.exf

Constants Library File

- Steel Constants.csv

Excel® Workbook File

- Residential Workbook.xls

Report Logo File

- CostX.wmf

Manuals

- CostX® Introductory Manual
- CostX® Advanced Manual
- Digital Drawing File Optimisation

exactal precision estimating

The costX Family of Products

CostX®

CostX® is Exactal's premium product. More companies are using CostX® for their complete estimating solution and receiving strong returns on their investment. CostX® is a powerful project costing tool that enables estimators to use the most advanced on-screen measurement system while embracing BIM to deliver better results to clients. It can reduce take off time by up to 80%.

CostX® 2D

CostX® 2D does not support 3D/BIM drawings or allow for auto-revisioning, but still contains Exactal's world-leading on-screen 2D takeoff and integrated workbook. If your company does not receive 3D/BIM drawings but still wants to take advantage of the faster, smarter and more accurate estimating solution on the market, CostX® 2D is the best choice for you.

CostX® Takeoff 2D

CostX® Takeoff 2D is Exactal's most basic product but still allows you to use the world-leading on-screen 2D takeoff, meaning you can measure areas, lengths and counts in a few clicks. If you have only used manual measurement and Excel® before and want to start off with something simple, CostX® Takeoff 2D may be the best choice for you.

FEATURES	CostX®	CostX® 2D	CostX® Takeoff 2D
BIM models/3D drawings	•		
2D drawings (incl PDFs)	•	•	•
Auto Revisioning	•		
Workbooks	•	•	
Subcontractor Comparison	•	•	

CostXL

CostXL allows you to link CostX® data directly into your Excel® spreadsheets

CostX® Live

CostX® Live gives you access to live CostX® data on the go through the web.

FREE

CostX® Viewer

CostX® Viewer makes it easy to freely share your CostX® projects with anyone.

Call us now for a **FREE** demonstration of our estimating solutions.

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A DIMENSIONEERING COMPANY

Contents

Introduction

This document in conjunction with the Introduction to CostX® manual, aims to inform and demonstrate the principles of measurement using CostX® and how basic elemental cost plans can be produced. The exercises are based around the use of example files and templates which have been developed for demonstration and training purposes only. Actual implementation of the software and templates will depend on users own resources and specific reporting requirements.

Save the Associated Dataset files to a location on your computer or network that may be accessed during the training exercise and work through each module sequentially. Complete all sections before moving on as each subsequent module relies on data established in previous exercises.

Throughout this document you will see **(PFC 5-1)** references. These identify the relevant Process Flow Charts related to that particular section of the training, copies of which can be found on the www.exactal.com website.

At its core, CostX® comprises two complementary and fully integrated modules (**PFC 1-2)**:

- The Dimension View where drawing files can be viewed and, without the use of CAD software or any previous experience of CAD, detailed and accurate dimensions can be quickly taken from 2D images, PDF or CAD drawings, or generated automatically from 3D CAD models.

- The Costing View: a spread sheet based workbook within which cost plans, estimates and schedules of quantities etc.; are developed. It is possible to import previous documents to use as a template, access rate libraries, enter codes for sorting and generate reports.

Refer to the CostX® help files by pressing the F1 key, or by clicking the Help icon  in the top right hand corner of the screen for a full explanation on how to use and implement functions. Alternatively refer to the Introduction to CostX® manual for quick references.

Formatting Conventions Used

Following are the formatting conventions used throughout this training exercise.

Bold Font	Direction for User
[Bold Font]	Anything fixed in CostX® for example button name, right click options, field names, etc.
{ Bold Font }	Anything which a user can change, for example drawing name, dimension group name, model map name, workbook name.
"**Bold Font**"	Anything a user has to enter, for example building name, workbook name, dimension group name.

Module 1: Getting Started

In Module 1 you will learn how to open CostX®, create a new Project and create a new Building associated with that Project, add and prepare a variety of common two dimensional drawing file formats for measurement (by scaling or calibration), and compare one drawing with another.

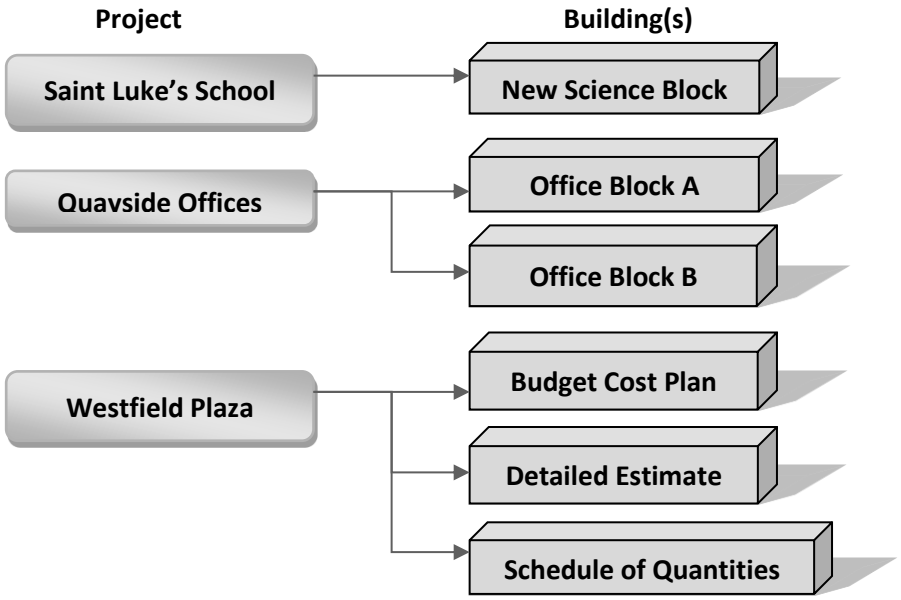
Opening CostX (PFC 1-1)

1.1. When CostX® is installed an icon is placed on the **[Desktop]** of the computer. **Double click** on this **[icon]** to open CostX®. Alternatively, **click** on the **[Start button]** at the bottom left of the screen, then click on **[All Programs > Exactal > CostX®]**. If prompted, enter your user name and password then click OK.

CostX® will open with the Select Building window active on screen. This allows the user to select an existing Building to open, either from a list of the most Recent Buildings worked with, or from a list of All Buildings in the database. There are also buttons to add a new Building to an existing Project, or to create a new Project.

Creating a New Project (PFC 1-3)

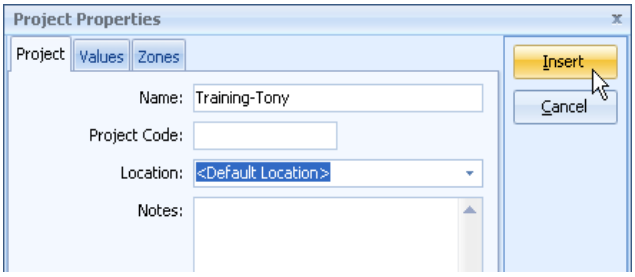
This section explains how to create a new project. CostX® utilises a two level hierarchy of Projects and Buildings. Once a Project has been established, all CostX® activities take place within a Building file. A Project can contain any number of Building files which may be used to differentiate various components of the Project, to separate the work into different cost centres, or to break the work up into specific stages. Therefore, to start a new Cost Plan, Estimate or Schedule in CostX® you must first create a Project file for the Building files to be saved in.



1.2. **Click** on the **[New Project]** button at the right of the **[Select Building]** window. An empty **[Project Properties]** window will open.

1.3. **Enter** a **[Name:]** for your Project of "**Training-" followed by your name**.

1.4. Use the drop-down menu in the **[Location:]** field to select **<Default Location>** then **click [Insert]**. Your new Project has now been created.



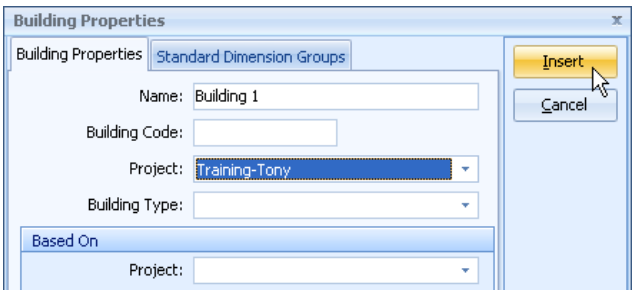
Creating a New Building (PFC 1-4)

Once a Project has been created, a Building can be added to that Project to enable you to start work.

1.5. **Click** on the **[New Building]** button at the right of the **[Select Building]** window.

1.6. In the **[Building Properties]** window, in the **[Name:]** field enter "**Building 1"**.

1.7. In the **[Project:]** field use the drop-down menu to select the '**Training-Your Name**' project that was recently created.

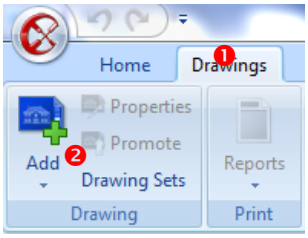


1.8. Ignore the Based On section for now and **click [Insert]**. This will create a new Building called 'Building 1' and attach it to the Project called 'Training-Your Name'. The CostX® display will open in the Dimension View ready for you to add drawings.

Adding and Calibrating Drawings (PFC 2-1)

There are several types/formats of drawings which can be added in CostX®. Once a Building has been created, the drawings can be added. In this exercise we will add three different types of drawings. For more information refer to the CostX® Advanced Manual Section 2.

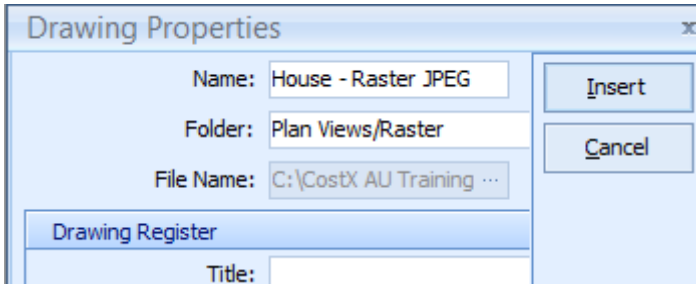
Raster Drawings



1.9. **Click** on the **[Drawings]** ribbon at the top of the screen ❶ (see right) to open the drawings ribbon menu. **Click** on the **[Add]** button❷. If the drop-down menu appears select Add Drawing.

1.10. Browse for the training data set and **select** the **{ House – Raster JPEG.jpeg }** file. **Click [Open]** button.

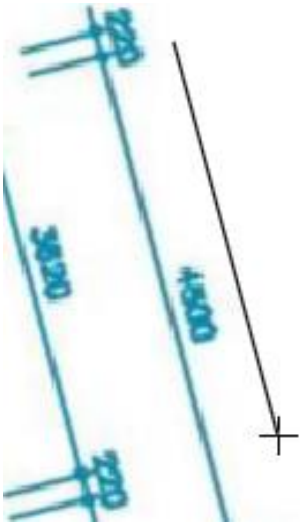
1.11. In the **[Drawing Properties]** window, **enter** "**Plan Views/Raster**" in the **[Folder:]** field. Do not amend anything else (leave the scale at 1:1) and **click [Insert]** button to add the drawing.



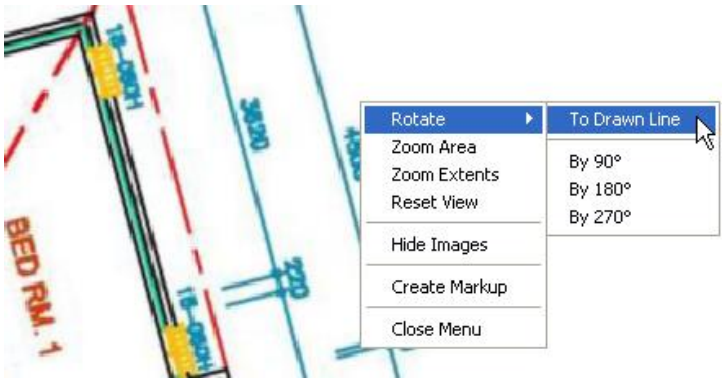
Rolling the mouse wheel forward and back zooms in and out of the drawing, whilst holding down the mouse wheel and dragging the cursor moves (pans) the drawing around.

After adding a drawing, the drawing can be rotated, calibrated or scaled as given in this section.

1.12. To rotate the drawing, **move the cursor to the top right of the drawing** and roll the mouse wheel forward to **zoom in**.



1.13. **Click** the **right mouse button** and hover over **Rotate** to open the sub-menu then **click** on **To Drawn Line**. The cursor will change to a cross-hair.

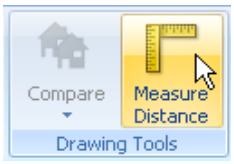


1.14. **Choose a line on the drawing** to use as a basis for establishing a new horizontal orientation.

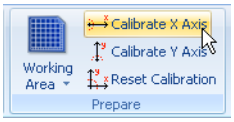
1.15. **Position the cursor** cross-hair on or near **to one end** of this line and **click once**. **Drag the cursor** to draw a line parallel to it then **click again** and the drawing will snap (rotate) to the chosen orientation.

> *If you cannot see the orientation line as you draw it may be white. Click the 'White' background button, and then recommence the Rotate to Drawn Line process for the line to show in black.*

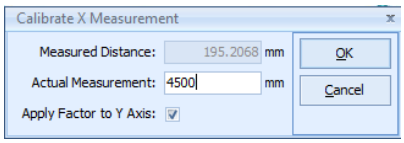
1.16. **Click** the **[Measure Distance]** button in the ribbon (or press the M key) then **click once at one end of a known dimension**. Move the cursor across the dimension to **check the drawing scale**. In this example, the drawing is not at 1:1 and the scale therefore needs to be identified and the drawing properties amended to reflect the correct scale.



1.17. **Click** the **[Measure Distance]** button again (or press the M key) to turn off this feature then **click** on the **[Calibrate X Axis]** button to open calibration mode.

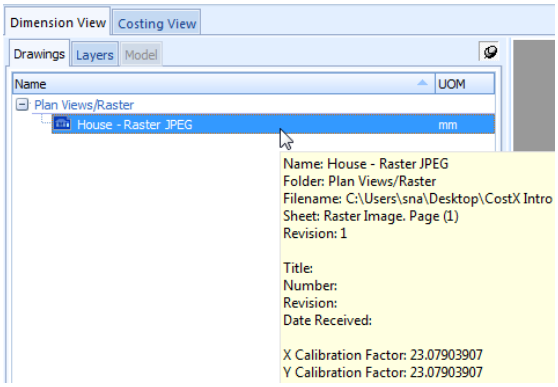


1.18. **Position the cursor** cross-hairs **at one end of** a known or figured horizontal dimension **line**. **Click once** then **position the curser** cross-hairs at the other end of the dimension line and **click again**. The **[Calibrate X Measurement]** window] will open.



1.19. **Overwrite** the figure in the **[Actual Measurement:]** field with the known dimension using the stated Base UOM: (Unit of Measurement), in this case **4500mm**, then **click [OK]** button.

1.20. CostX® will automatically calculate the X-axis scale and will also apply it to the Y-axis. To see the scale (calibration factor), **move the cursor over the drawing title** to open an information box. In this instance the scale is an irregular figure because the drawing is an image file.



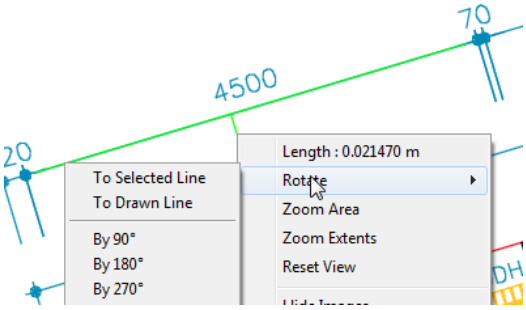
1.21. **Click** the [**Measure Distance]** button (or press the M key) and **verify** the drawing **calibration factor**.

PDF Drawings

1.22. Now **add** the drawing **{ House – Vector PDF.pdf }**. In the **[Drawing Properties]** window, **enter** "**Plan Views/Vector**" in the **[Folder:]** field. Do not amend anything else (leave the scale at 1:1) and **click [Insert]** button to add the drawing.

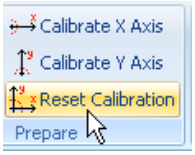
> *Note that on this drawing, lines will highlight in green as the cursor is moved over them and the green highlighting connects to the cursor. This is called the 'Sticky Cursor'.*

1.23. To re-orientate this drawing, **choose a line** to use as a basis for establishing a new horizontal orientation then **move the cursor over it** so it highlights in green. **Click** the **right mouse button**, hover over **Rotate** and **click** on **To Selected Line**. The drawing will snap (rotate) to the chosen orientation.



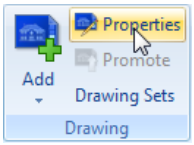
1.24. **Check the scale**, note that on a vector file such as this pdf, Measure Distance allows you to snap to points; the snap feature can be deactivated by holding down the B Key (alternatively using the Snap button in the Dimensions ribbon). The drawing will need to be calibrated.

1.25. **Calibrate**, and note that with this drawing the calibration returns a value of (or very close to) 1:200. Therefore rather than leaving the scale as calibrated, the actual scale of 1:200 can be entered as follows.



1.26. **Click** the **[Reset Calibration]** button to zero the calibrated factor.

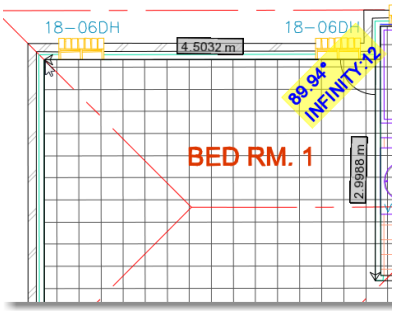
1.27. Open the Drawing Properties window by either **double clicking** on the **drawing title**, or by clicking on the Properties button on the Drawings ribbon menu.



1.28. In the Drawing Properties, amend the **[Horizontal Scale:]** and **[Vertical Scale:]** to **1:200** and **click [Update]** button.

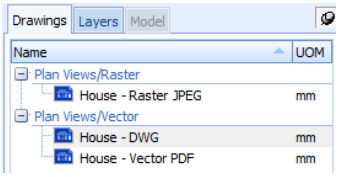
1.29. **Verify the scale** using the **[Measure Distance]** button or the M key.

1.30. You can **use Measure Distance** for continuous segments while **holding down the Ctrl key**, this function will allow you to display distances between segments as well as the angle between measured segments.

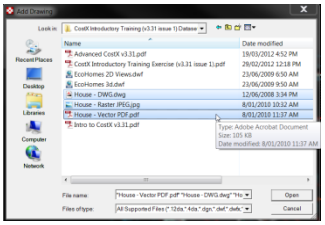


DWG Drawings

1.31. Now **add** the CAD drawing { **House - DWG.dwg }**. In the **[Drawing Properties]** window, **select or enter "Plan Views/Vector".** Leave the scale at 1:1 and click **[Insert].** Note that the drawing is automatically orientated. Check the scale and note that it is correct at 1:1 which is a CAD standard.



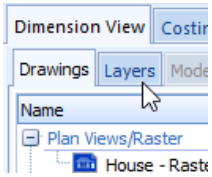
You should now have three different file types of the same drawing loaded into CostX® – a raster image, a vector PDF and a DWG file. These are the most common file types that you are likely to encounter.



The Add Drawing Button can also be used to add multiple drawings simultaneously. Once the Add Drawing button is selected, multiple drawings in the File Open Dialog Box may be selected using the CTRL key to select multiple individual drawings or the Shift key to select groups of drawings

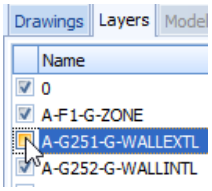
Working with Layers (PFC 2-2)

CAD, and some vector PDF, drawings are drafted using multiple layers of information. CostX® gives the user the ability to hide unwanted layers from view. This removes clutter from the drawing and allows the user to show only those layers which are relevant to the required measurement. It also simplifies the measurement process by avoiding the sticky cursor sometimes being attracted to the wrong lines.



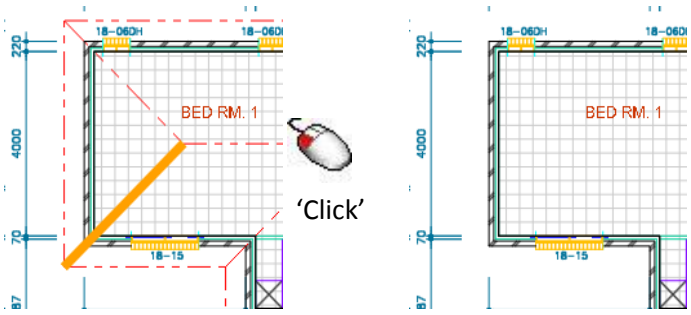
1.32. **Click** on the **{ House – DWG }** drawing title to open it.

1.33. **Click** on the **[Layers]** tab above the list of drawings. The list will change to show the drawing's layers.

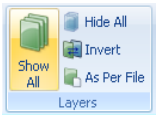


Each layer may be switched on or off by using the tick boxes adjacent to the name, however, the name often does not enable its content to be readily identified, so the easier method is as follows.

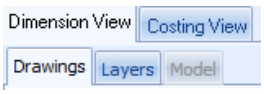
1.34. Ensuring that you still have the Layers tab open, **hover the cursor over the drawing lines** and items will highlight orange. **Clicking the highlighted object** will remove this layer from view. Holding the **[Shift]** key will highlight all associated objects in the layer.



1.35. To reinstate all of the layers **click** the **[Show All]** button on the Drawings ribbon menu.

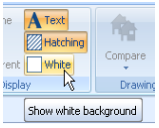


1.36. **Click** the **[Drawings]** button above the list of layers to revert back to measurement mode. You cannot measure whilst the Layers tab is open.



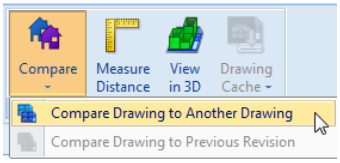
Layers are always available on DWG drawings but with vector PDF drawings are dependent upon the settings used by the designer when exporting the PDF from the CAD program. Hence you may receive vector PDF drawings either with or without layers. As the designer is able to control the settings to include layers, always try to obtain drawings with layers as there are significant advantages. Image files such as raster PDF or JPEG files do not have layers.

Another useful feature is the ability to switch the background from black to white, and vice versa. To do this click on the Show White Background button.



Drawing Comparison (PFC 2-3)

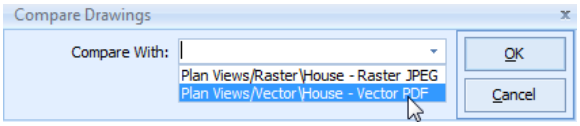
CostX® affords the user the ability to compare one drawing with another or, if further revisions of the same drawing have been added, to compare a current drawing with an earlier iteration.



1.37. Ensure that the **{ House – DWG }** drawing is open.

1.38. **Click** the **[Compare]** button on the Drawings ribbon menu and then **click [Compare Drawing to Another Drawing]**.

1.39. **Open** the drop-down menu in the [**Compare With:]** field and **select** the **{ Plan View/Vector\House – Vector PDF }** drawing before clicking OK.

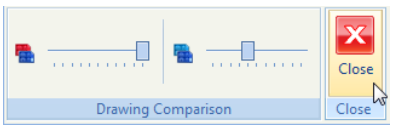


The screen will show two images, one red and one green, overlaying each other. The red is the House – DWG drawing that was open initially, and the green is the House – Vector PDF drawing that was selected for comparison.

1.40. Use the mouse scroll wheel to **zoom in** or out accordingly then use the following functions to **reposition the green image** to overlay the red one below.

Holding down the left mouse button and dragging the cursor moves the green image. The intensity of the two images can be altered by adjusting the position of the sliding controls in the ribbon menu. Having reviewed the differences between the selected drawings

1.41. **Click** the **[Close]** button to return to the Dimension



Module 2: Introduction to Measuring and Workbook

In CostX®, Dimensions are measured from drawings and placed into Dimension Groups, which are themselves collected together in Dimension Group Folders. Once established, Dimension Groups can be held in templates or libraries ready for use on future jobs, with new Dimension Groups being created as needed. In Module 2, we shall add Dimension Groups and use various techniques applicable to the differing drawing types to measure areas lengths and counts. We shall then create a new workbook containing live-links to these Dimension Groups, learn how to use multiple Dimension Groups to build-up quantities, and build-up rates.

Measuring – Point Mode (Raster)

- ***Areas*** - click once on a corner of the area to be measured then move the mouse to the next corner and click again. Continue to click the cursor at each corner to enclose the area then at the last corner, before returning to the start, press enter.
- ***Lengths*** – click on the end of a length to be measured. Hold the Ctrl key and move the mouse to the end of the length then click to capture it. Keep holding the Ctrl key to add further lengths to the first, or release the Ctrl key to start a new length.
- ***Counts*** – click on the item to register a count.

Measuring Areas – Line Mode (Vector)

- ***Standard*** – click on perimeter of area to define its borders, click once at every change of direction and press enter or right click to complete the area.
- ***Quickpoint*** – press and hold the Shift key to measure a rectangular area.
- ***Quickpoint Combining Areas*** (for irregular-shaped area) – press and hold Shift key to measure area 1, press and hold Control key (do not release Shift key) and click to measure adjacent area(s) – the areas will be combined.
- ***Polyline*** – press and hold L key whilst holding the cursor over the perimeter of an area. If a polyline is available, the area will be highlighted blue. Click once to capture the area.

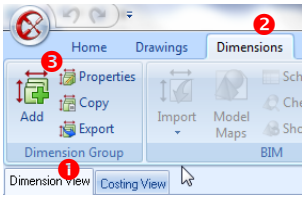
Measuring Lengths – Line Mode (Vector)

- ***Standard*** – click on lines to measure the length of the item.
- ***Combining Lengths*** - press and hold Control key to measure the length of combined items, click once at every change of direction.
- ***Trimming Lengths*** –use of the right mouse menu to *trim start/end* at intersections of lengths measured using *Combining Lengths.*
- ***Polyline*** – press and hold L key whilst holding cursor over a line. If a polyline is available, the full perimeter of an area will be captured with a single click.

Measuring Counts – Line Mode (Vector)

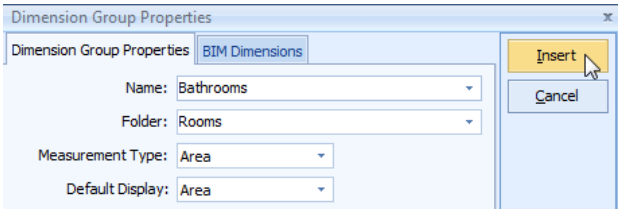
- ***Standard*** – click on the item to register a count.
- ***Blocks*** – press and hold Shift key to highlight the item as a drawing block (object – usually but not always doors, sanitary fixtures, etc.) then click.
- ***Multiple Counts*** – press and hold Shift and Control keys, then click to count all like *Blocks*.

Adding Dimension Groups (PFC 2-4)



2.1. To add a Dimension Group first ensure that the Dimension View is open❶. **Click** on the **[Dimensions]** ribbon ❷ at the top of the screen to open the ribbon menu then click the **[Add]** button❸.

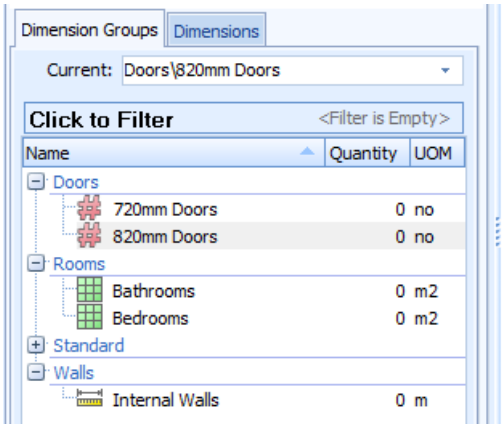
2.2. In the **[Dimension Group Properties]** window **enter** a **[Name:]** of "**Bathrooms**" and a **[Folder:]** of "**Rooms**". **Select** a **[Measurement Type:]** and **[Default Display:]** of **Area** from the drop-down menu then **click [Insert]**.



2.3. Repeat this process to **create** another **Dimension Group** named **{ Bedrooms }** in the same Rooms folder, again with a **[Measurement Type]** and **[Default Display:]** of **Area**.

2.4. **Create** another **Dimension Group** named **{ Internal Walls }** in a **folder** called **{ Walls }**, with a **[Measurement Type]** and **[Default Display:]** of **Length**.

2.5. **Create** two further **Dimension Groups** called **{ 720mm Doors }**, and **{ 820mm Doors }**, in a **folder** called **{ Doors }** with a **[Measurement Type]** and **[Default Display:]** of **Count**.



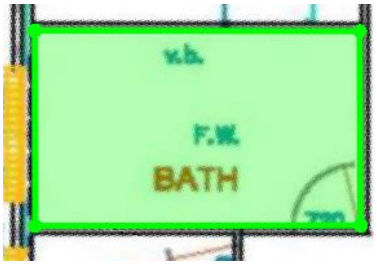
Measuring Areas (PFC 2-5)

From Raster JPEG Drawing

2.6. **Click** on the **{ House – Raster JPEG** } drawing name to open the drawing. **Click** on the **{ Bathrooms }** dimension group to highlight it.

2.7. **Move the mouse over the drawing** and roll the mouse wheel forward to **zoom into the bathroom**.

2.8. **Place** the mouse **cursor** over a **corner of the room** and **click** to commence measurement. A green dot will appear. **Release** the **mouse click** and **move** to the **adjacent corner** of the room then **click again**. A green line will follow the cursor. **Click** on the **next corner**, and then the fourth corner to enclose three sides of the room area. **Press Enter** and the area will automatically complete, the area measured will be highlighted and the quantity will appear in the Bathrooms dimension group.



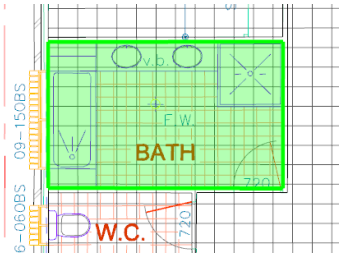
Note that once the area has been completed, the enclosing lines may be moved (hover cursor over the line, hold left click and drag) or the location of the click points may be adjusted (hover cursor over the click point, hold left click and drag). By use of these features, areas may be measured quickly, and then "cleaned up" afterwards. The drawing title will now be highlighted in bold, denoting that measurements in the selected dimension group have been taken from it.

From Vector PDF Drawing

2.9. Now **click** on the **{ House – Vector PDF }** drawing name to open that drawing

2.10. **Zoom** into the **bathroom**. Ensure that the Bathrooms dimension group remains selected.

2.11. To measure the area on a vector drawing **attach** the **sticky cursor to** the inside face of one of the **walls** and **click**. A part or all of the length of the wall will be highlighted. Attach the sticky cursor to a part of the next adjoining wall and click. **Repeat for the remaining walls** then **press Enter** from keyboard to complete the area.



Note that you do not need to highlight the entire length of each wall and that if you accidentally click on the wrong line, pressing the Ctrl and Z keys together will undo the last click.

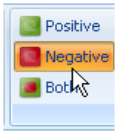
From DWG Drawing

2.12. Next **open** the **{ House – DWG }** drawing and **zoom into** the **bathroom**.

2.13. Ensure that the Bathrooms dimension group is still selected. **Attach** the **sticky cursor to** the inside face of one of the **walls** but before clicking **hold down** the **L key** on the keyboard. The room area will be shaded in blue. Whilst it is, **click left mouse button** to capture the area. The dimension group quantity should now be around 24m² and all of the drawing titles will be bold

Alternatively, the room area could have been measured in the same manner as the Vector PDF.

Negative Area Measurements



2.14. It is possible to measure negative areas or deductions in CostX®. **Click** on the **[Negative]** button on the **[Dimensions]** ribbon to show and measure only negative dimensions. **Move the cursor over the drawing** and note that lines now highlight in red.

2.15. **Attach** the **cursor to** the **outside face of** the bathroom **shower** cubicle and **hold down** the **L key** to highlight it all. **Click** the **left mouse button** to capture the area, which will shade red, and reduce the dimension group quantity by 1m².

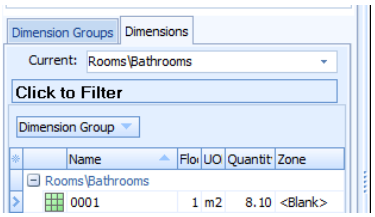
2.16. **Click** on the **[Both]** button on the **[Dimensions]** ribbon to show all dimensions. The Bathroom area will be highlighted green with the shower cubicle area highlighted red denoting positive and negative measurements.

2.17. **Move the cursor over the shower cubicle** so that it highlights blue, **click the right mouse button** and then **click** on **[Delete dimension]** from the menu to clear the deduction.

Current Drawing Filter

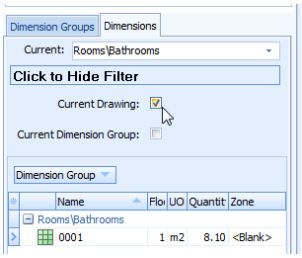
2.18. **Click** on the **[Bedrooms]** dimension group.

2.19. Whilst still in the **{ House – DWG }** drawing zoom into and **attach the sticky cursor to** the inside face of a **wall in Bedroom 1**. **Hold the L key** to highlight the bedroom, you may need to try a few wall locations to highlight the required area, then **click the left mouse button** to measure it.



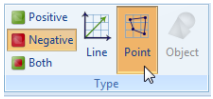
2.20. Next **click** on the **[Dimensions]** tab to show a list of all individual measurements taken for the selected Dimension Group. By default, the list includes Dimensions measured from the current drawing.

2.21. **Click** the **[Click to Filter]** button on the Dimensions Module and **uncheck [Current Drawing]** option to turn this filter off and show all Dimensions for the selected Dimension Group taken from all drawings.



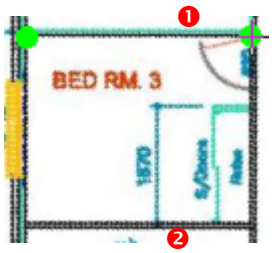
2.22. **Open** each of the **other drawings** and **measure Bedroom 1** using the same methods as before. Note how each individual Dimension is added to the list. **Check** the **[Current Drawing]** option on the Dimensions module menu to turn the filter back on.

A useful feature on Vector PDF and CAD drawings is the option to switch from Vector to Raster Mode using the buttons on the Dimensions ribbon. The cursor will now snap from point to point allowing swift selection of points instead of vector lines. Furthermore, to measure completely Free Hand deselect the button Snap, whilst still in Raster Mode (or hold down the B key to disable Snap temporarily). Now measure Bedroom 3 from the House DWG drawing using this Raster Mode measure.



Measuring Lengths (PFC 2-7)

2.23. **Click** on the **{ Internal Walls }** dimension group.



From Raster JPEG Drawing

2.24. **Open** the **{ House – Raster JPEG }** drawing and **measure Bedroom 3 partition wall** ❶ (see right) as follows.

2.25. **Click** and release the **left mouse button at one end** of the wall. A green dot will appear with a connecting line. **Move the cursor to the other end** of the wall and left mouse **click again**. This highlights a line between the dots, combining them into a length.

2.26. **Repeat** the above **process** to measure the second partition wall ❷ to Bedroom 3.

After the length is taken, each length segment or click point can be relocated in the same manner as with area measurements.

2.27. Next, **measure** the **corridor partition wall** as follows.

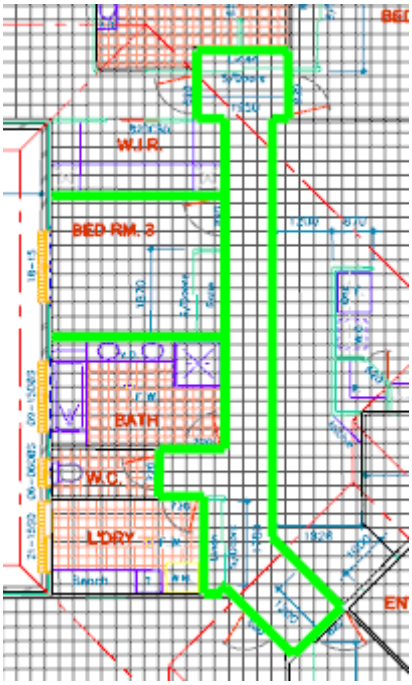
2.28. **Click and release the mouse on a corner** start point which will highlight in green. Now **left click at the next corner**, as above **hold down the Ctrl key** and **move** the cursor to the **next corner**. The cursor will drag a highlight line along with it. **Continue to click and release** on each change in direction of the wall.

Note that you may release the Ctrl key at any time to zoom or pan around the drawing.

From Vector PDF Drawing

2.29. **Open** the **{ House – Vector PDF }** drawing.

2.30. **Measure the Bedroom 3** walls by **attaching the sticky cursor** to each one and **clicking**.



> *You will need to zoom in to select the specific lines to attach to. If you accidentally measure the wrong line, either press the Ctrl and Z keys together to undo the last measurement, as before, or hover over the incorrectly measured green line so that it outlines in blue then click the right mouse button. A menu will open giving you the option to delete just the highlighted length (Delete Dimension), or delete all measurements and start again (Clear All Dimensions).*

2.31. Next, **measure the corridor partition** by clicking on one length of wall. Hold the Ctrl key down and **move the cursor** over the next adjoining wall. **Clicking each adjoining wall** in turn whilst **holding the Ctrl key** combines each length into one measurement spanning openings and steering around changes in direction.

> *Note that you do not have to highlight the entire length of wall when Combining Lengths as CostX® will determine the intersection between changes of direction and fill in the gaps.*

From DWG Drawing

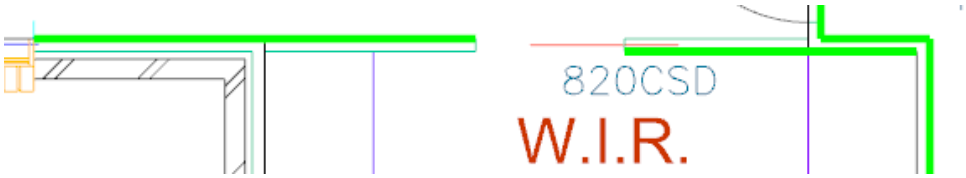
2.32. **Open** the **{ House – DWG }** drawing and **open** the **[Layers]** tab. Remove unnecessary layers to isolate the walls. Then **measure** the **Bedroom 3 walls**, and then the **corridor walls** using the *Combining Lengths* method.

2.33. Next, select and delete the corridor dimension. Then attach the sticky cursor to a section of the corridor wall and without clicking, hold down the L key. When the entire corridor wall highlights in blue, click to capture the length using the *Polyline* method.

Trimming Unwanted Lengths

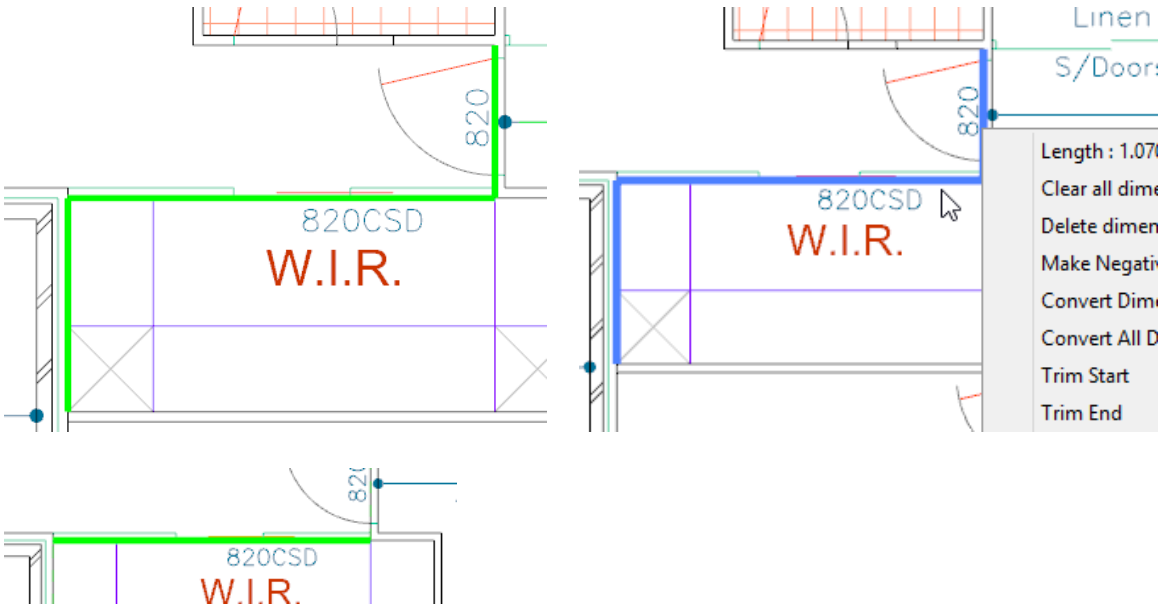
Vector lines sometimes extend beyond the point at which you want to start or end a measurement, in which case it is necessary to "trim" the line. For instance the partition wall between the Walk In Robe (W.I.R) and Bedroom 1 is drawn with various lines that extend beyond the junction with the intersecting walls. Clicking on this line would return a longer length than required. To overcome this the Trim Start/End function can be utilised to terminate the measurement at the junction with the corridor wall.

2.34. We wish to measure the length of the partition between Bedroom 1 and the WIR. If we click on the bedroom side of the partition, the measurement line continues along the external wall. If we click on the WIR side, it continues onto the corridor partition. We want to measure only the section of partition between the junction with the external wall at one end, and the junction with the corridor wall at the other.



2.35. To do this, we **use the *Combining Lengths* method** (Ctrl key) to include the adjoining walls as part of a combined partition length, and then trim off the unwanted sections at the start and/or end of the combined length. For this example we will combine three lengths into a single measurement. **Click** on the inside face of the adjoining external wall, **hold the Ctrl key** and **Click** on the partition and then **Click** on the face of the adjoining corridor wall as shown below.

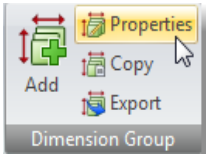
2.36. To remove the extraneous lengths at the start and end of the measurement, **move the cursor over the green measurement line** so that it turns blue. **Click the right mouse button** and **select Trim Start**. Then select the line again, **right click and select Trim End.**



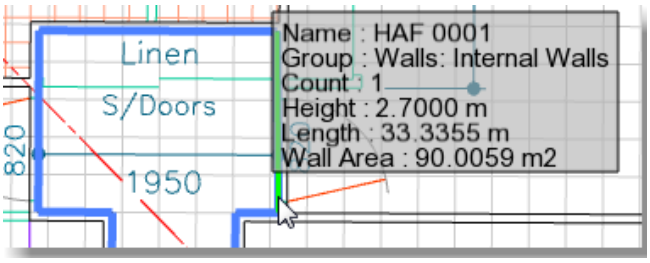
Default Heights

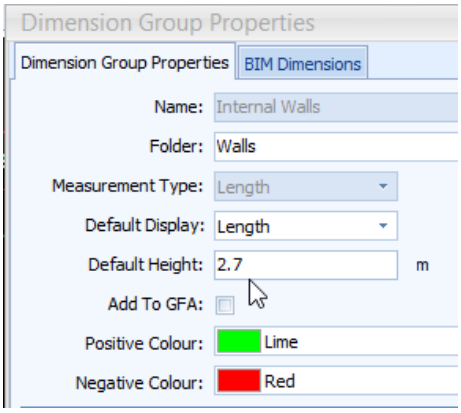
Any measurement done in CostX® can be assigned with a Height. CostX® will utilise this Height to calculate additional quantities including Wall Area and Volume.

2.37. To assign a **[Default Height]** to the **{ Internal Wall }** Length that was measured, **open** the Dimension Group Properties using the **[Properties]** button in the **[Dimensions]** ribbon (ensure the Internal Walls dimension group is selected prior).



2.38. **Type** a height of 2.7m in the **[Default Height]** field and **select [Update]**. When asked "Would you like to apply the new height to all dimensions in this dimension group?" **select yes**, this will assign 2.7m as the height for all length measures taken prior.





If the cursor is brought over the corridor wall dimension a hint box will open to display the Wall Area. Hovering over the dimension group Internal Walls will also display the same data.

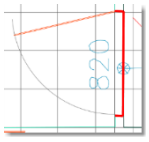
Deductions for Openings

Deductions can now be made for door opening using the Negative function previously covered.

2.39. First **select** the **[Negative]** button on the Dimensions ribbon.

2.40. **Move the cursor** over the **first door opening** and you will notice that the sticky cursor highlights the entire wall face, extending past the reveals of the opening on both sides.

2.41. To overcome this firstly select one reveal line of the opening then use the ***Combining Lengths*** **method (Ctrl key)** to **measure around the opening** as shown.



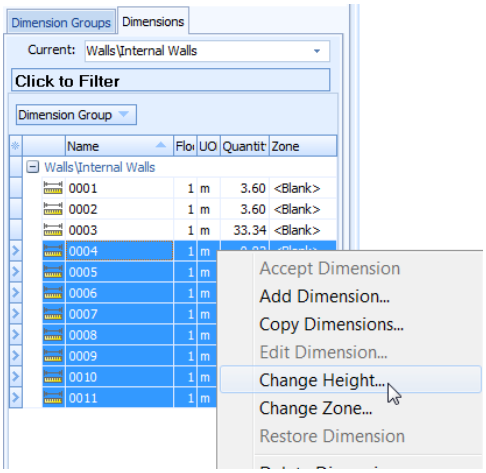
2.42. To remove the extraneous length in the reveals, **move the cursor over the red line** so that it turns blue. **Click** the **right mouse button** and **select [Trim Start] . Repeat this process to [Trim End]** leaving only the door width measured.

An alternative is to use the square bracket '[' and ']' short-cut keys to trim the ends of the length.

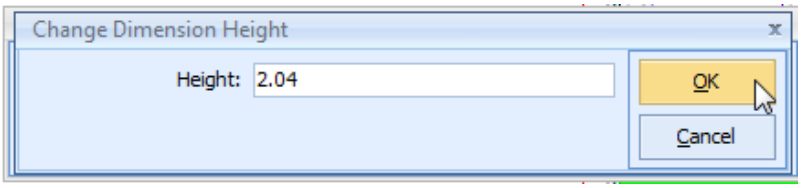
2.43. Once all deductions are complete select the **[Both]** button in the Dimension ribbon, this will show the positive lengths in green and the deducted lengths in red. Note however if you review the individual dimension taken using the Dimension tab all lengths have been given a default height of 2.7m, including all door opening deductions. These need to be amended to deduct only the door height.

2.44. Click the **[Dimension]** tab

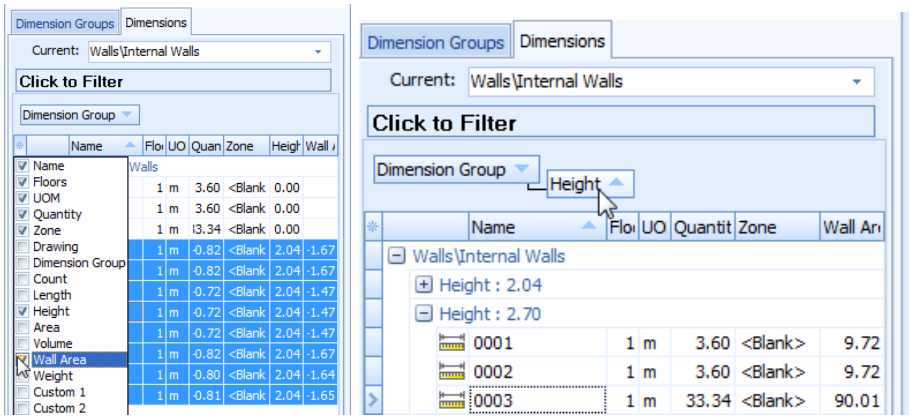
2.45. **Select** the first deduction dimension, then **hold the Shift key** and **select** the last deduction. This will 'multiple select' all deductions. **Right click** and **select [Change Height…]**



2.46. Now change the **[Height]** to **2.04**, this height will now be applied to all door deductions, giving a more accurate Wall Area.

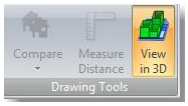


Columns in the Dimensions Window can be customised by selecting the Left Top Customize Button. The columns Names can than be dragged to the section above to Filter:

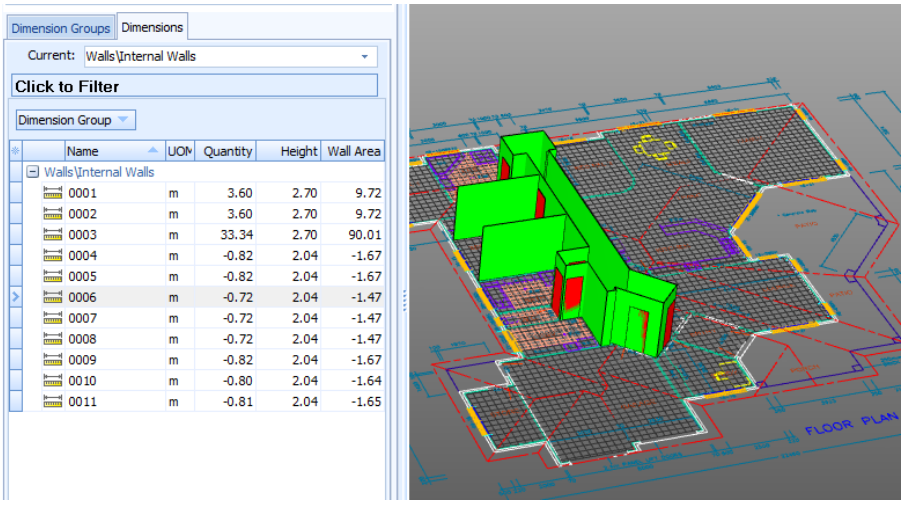


View in 3D for 2D Measurements and deductions

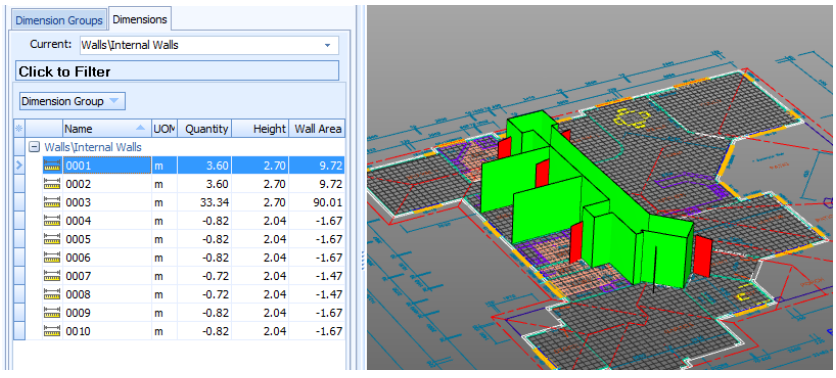
2.47. **Ensure** the **{ Internal Walls }** dimension group is **selected** and that the **[Both]** dimensions button is also selected. **Select [View in 3D]** button in the **[Drawings]** ribbon.



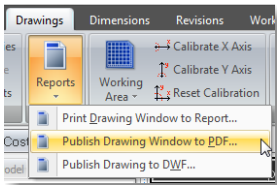
This feature will now display the internal wall measure in a 3 Dimensional view, the red will denote the door opening deductions, note that varying heights incorporated into a measurement will be displayed accordingly in this view.



Note in this example we have taken the time to measure across the doorways, and then trimming out the extraneous measures from the reveals. However, a much simpler solution is to measure the deductions off the door leaf, which would not require any trimming. The resulting net wall area will remain the same, however when the View in 3D function in used, the deducted doors will appear to extend from the wall, hence may not look like the door area has been deducted from the wall area.



2.48. These views can be printed out to a report using the **Reports** button under the **[Drawings]** ribbon.



2.49. **Select** the **[View in 3D]** button to return to normal measure mode.

Measuring Counts (PFC 2-8)

2.50. **Select** the **{ 820mm Doors }** dimension group.

From Raster JPEG Drawing

2.51. **Open** the **{ House – Raster JPEG }** drawing.

2.52. **Click** over each internal and external **820mm wide swinging door**. Each click will register a count and will be denoted by a green dot.

From Vector PDF Drawing

2.53. **Open** the **{ House – Vector PDF }** drawing.

2.54. **Attach** the **sticky cursor to** each internal and external 820mm wide swinging **door leaf** and **click** to count. Each click highlights the door leaf green.

From DWG Drawing

2.55. **Open** the **{ House – DWG }** drawing.

2.56. Find an 820mm wide swinging door and **move the mouse cursor over the door leaf** or swing arc. Without clicking, **hold down the Shift key**. Both the leaf and arc will highlight blue to denote that they are joined in what is called a Block Object within the CAD file. Whilst still holding the Shift key, **click** and the count will register and the entire block will highlight green.

> *(Note that without using the Shift key, if the leaf and the arc had each been clicked in turn, two counts would have registered).*

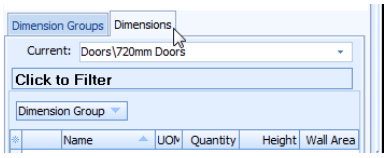
2.57. **Move the cursor over the door** to highlight it blue, **click the right mouse button** and then **click [Delete dimension]**.

2.58. **Hover over the door again** and **hold down the Shift key** to highlight the block object. Without clicking, now also **hold down the Ctrl key**. This will highlight all blocks with the same CAD identifier as that chosen. A single **click** will now count all highlighted blocks at once.

2.59. **Select** the **{ 720mm Doors }** dimension group and **repeat this process** to count all of the 720mm wide doors simultaneously.

Dimension Labels

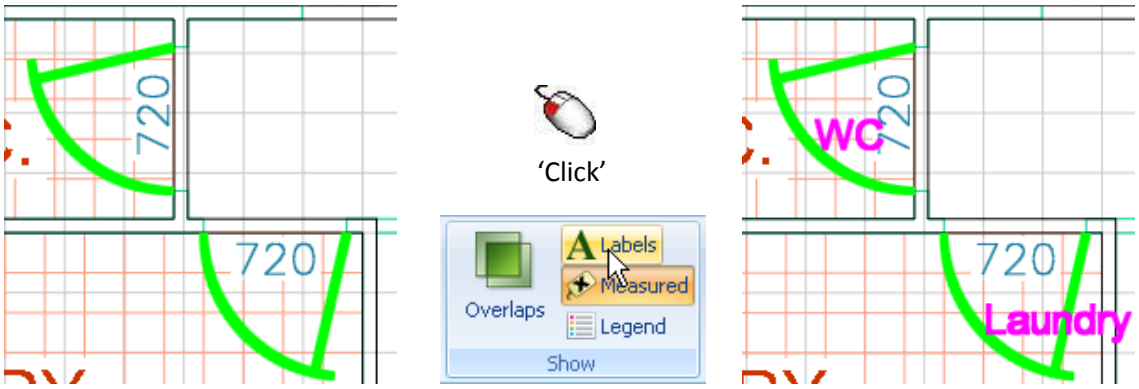
2.60. **Click** on the **[Dimensions]** tab to show a list of all individual measurements taken for the selected Dimension Group.



2.61. **Move the cursor over a measured item** on the drawing. The applicable dimension will highlight grey in the Dimensions list.

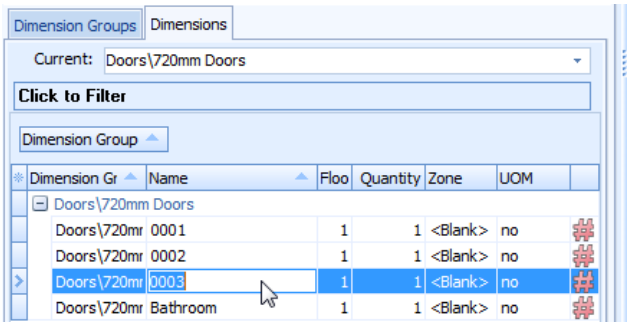
2.62. **Click** on any Dimension in the **[Dimensions]** list to select it. The respective measured item on the drawing will highlight blue.

2.63. Each dimension is automatically labeled with a sequential number. **Click** the **[Labels]** button in the Dimensions ribbon menu to show or hide these on the drawing.



2.64. **Click** on each **Dimension** in the **[Dimensions]** list in turn and **over-type the [Name]** to assign your own description to individual dimensions.

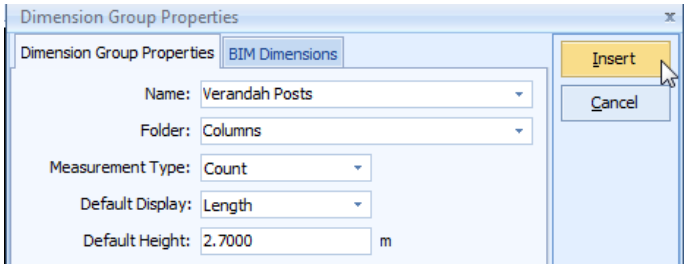
2.65. **Click** the **[Labels]** button again to hide labels from the drawing.



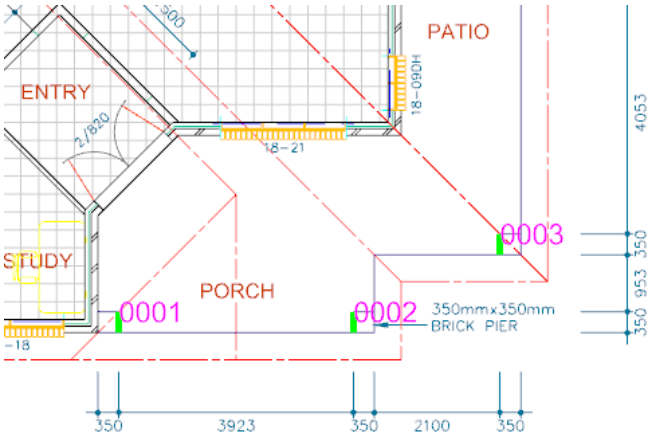
Default Display

In CostX®, Dimension Group properties may be set to display an alternate unit to the unit of measurement. For example, you may be measuring walls by length, but would like the default display of the Dimension Group to be wall area rather than length. In the following example we display a length (height) quantity for an item being measured by count.

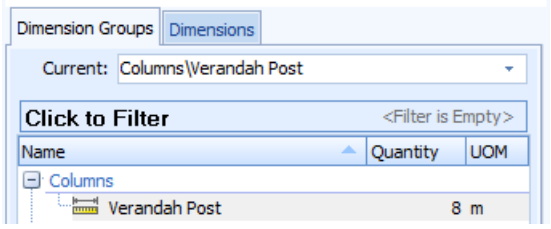
2.66. **Add a Dimension Group** called **{ Verandah Posts }** in a **folder** called **{ Columns }** with a **[Measurement Type]** of **Count** and **[Default Display:]** of **Length**. **Enter** a **[Default Height:]** of **"2.7"**m.



2.67. **Click** on each **vertical posts** located in the Porch and Patio areas to count them.



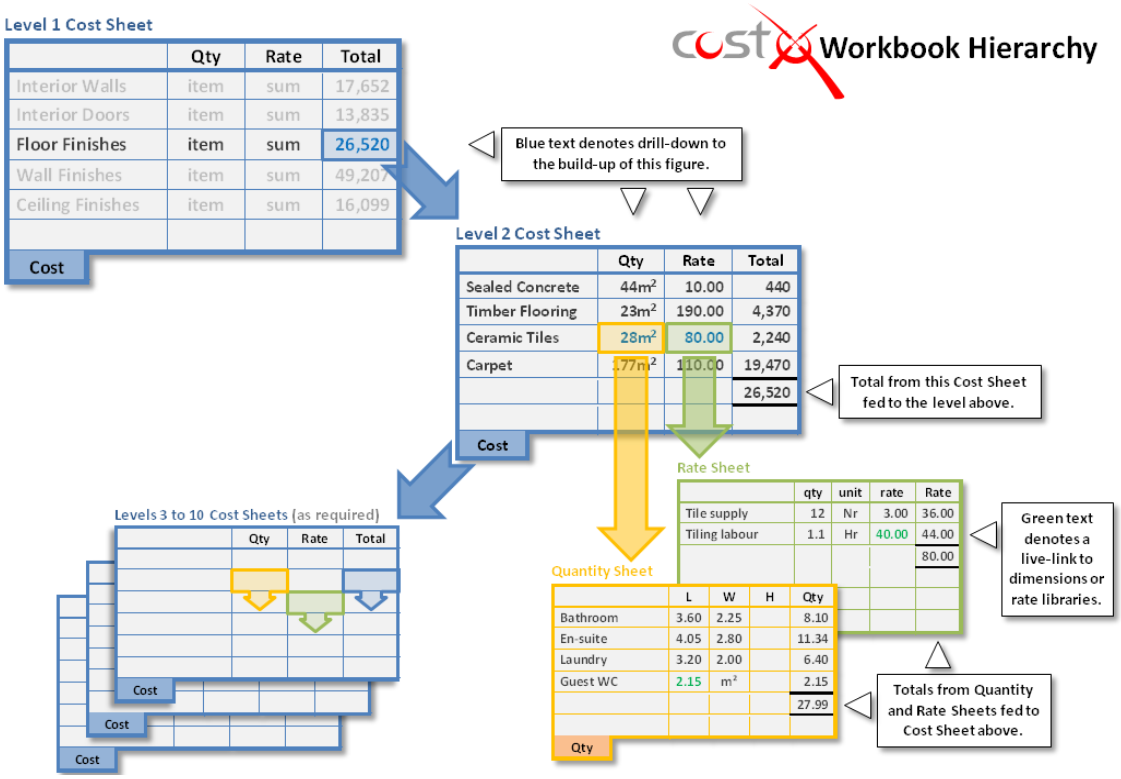
2.68. CostX® will display the total length of these posts instead of the count.



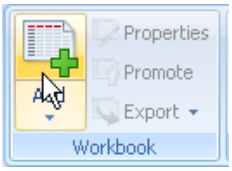
Workbook Overview (PFC 3-1)

Once established, Workbooks in CostX® can be held in templates for copying onto future jobs, or can be copied from previous jobs, complete with any links to Dimension Groups, Rate Libraries, etc. For the purposes of this exercise we shall start with a blank sheet and create a simple workbook linked to the Dimension Groups used in the previous exercises.

CostX® workbooks are hierarchical and comprise of up to ten layers of Cost Sheet build-up, each with their own Quantity and Rate build-up sheets. Within each sheet different text colours exist to identify that additional build-up information exists, or that live-links to Dimension Groups or Rate Libraries exist (see below).



Adding New Workbook



2.69. **Click** on the **[Workbooks]** tab at the top of the screen to open the ribbon menu and the **[Costing View]**. **Click** on the **[Add]** button. If the drop-down menu appears **click** on **[Add Workbook]**.

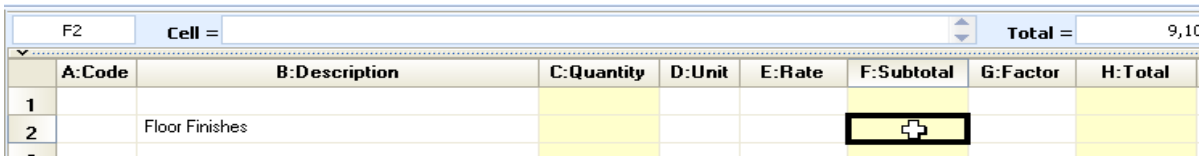
2.70. In the **[Workbook Properties]** window enter a **[Name:]** for your workbook such as "**Estimate**". Note the Based On section at the bottom where prior workbooks to copy can be selected. Ignore this for now and **click [Insert]**.

A blank workbook in spreadsheet format will open with the tab at the bottom called Cost selected. Up to ten layers of cost build-up can be created starting from this top layer (Level 1). In this exercise we shall enter headings at Level 1 of the workbook before drilling-down to Level 2 to enter details relating to those headings.

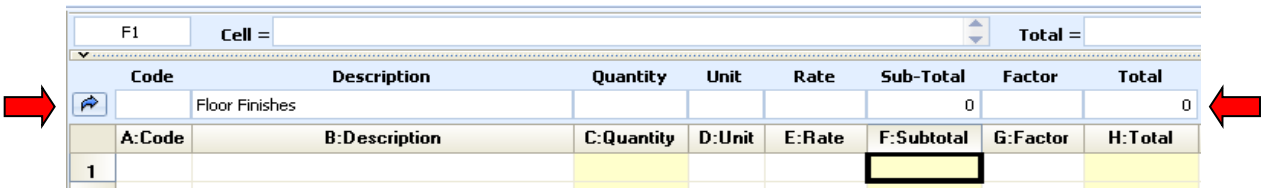
Workbook Hierarchy

2.71. On row 2 of column **[B:Description]** in the workbook, enter a heading of '**Floor Finishes**'.

2.72. **Move the cursor to** column **[F:Subtotal]** of the same row and **double-click** the **left mouse button**.



This will open a blank Level 2 Cost sheet with a row of fields above the column headings (see below). This contains details of the row in Level 1 of the workbook from where we drilled-down, and to which the information entered on this worksheet will be summarised.



2.73. In cell B2 of this worksheet **enter** a heading of '**Carpet**'. Note that this may be made bold and underlined, etc.; by use of the **[Format]** buttons in the ribbon menu.

Dragging and Dropping Dimension Groups into Workbooks (PFC 3-2)

2.74. In the list of Dimension Groups to the left of the workbook, **click** on the ⊞ button to open the Rooms Dimension Group Folder.

2.75. **Click** on the **{ Bedrooms }** dimension group and, **holding** the **left mouse button** down, **drag the mouse cursor** to cell **[B3]** of the workbook. The entire row will highlight. Release the mouse button and an **[Add Quantity]** window will appear.

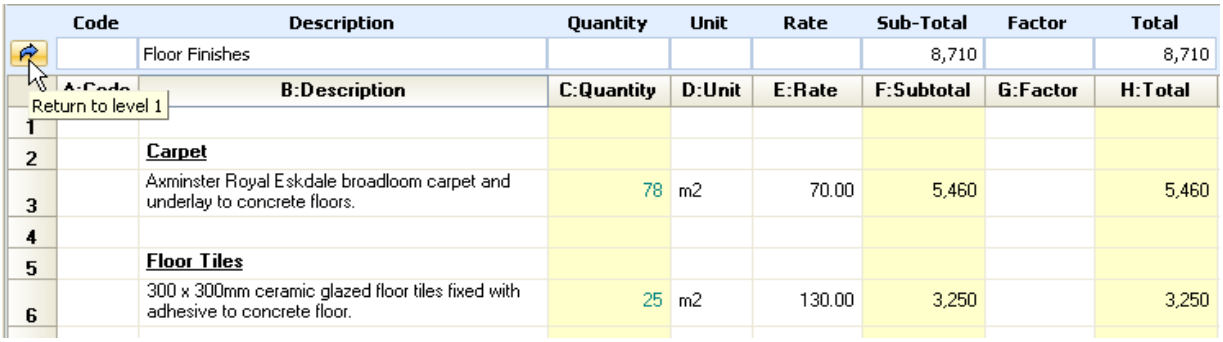
2.76. In the **[Description:]** field over-type the word '**Bedrooms**' with a suitable description of a carpet measurement item. Ensure that the **[Quantity Type:]** field is set to **Area**, and **[Rounding]** set to **0 Decimal Places**, then in the **[Rate:]** field near the bottom **enter** an **appropriate price** per square metre. **Click [Update]**. A priced, measured estimate item will be entered in the workbook.

2.77. **Enter** a heading of '**Floor Tiles**' in cell **B5**.

2.78. **Select** the **{ Bathrooms }** dimension group and drag-and-drop it into cell B6. In the Add Quantity window **enter** a suitable **[Description:]** of floor tile, ensure the **[Quantity Type:]** is set to **Area**, and **[Rounding]** set to **0 Decimal Places**, then **enter** an appropriate **[Rate:]** before **clicking [Update]**.

You should now have a Level 2 worksheet containing two priced estimate items the total of which will be shown in the summary fields for the preceding workbook level above.

2.79. **Click** on the **button** to the left of these fields to 'roll-up' to workbook Level 1.



	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
		Floor Finishes				8,710		8,710
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
1								
2		**Carpet**						
3		Axminster Royal Eskdale broadloom carpet and underlay to concrete floors.	78	m2	70.00	5,460		5,460
4								
5		**Floor Tiles**						
6		300 x 300mm ceramic glazed floor tiles fixed with adhesive to concrete floor.	25	m2	130.00	3,250		3,250

Return to level 1

Level 1 of the workbook will now show a total for Floor Finishes derived from the items measured and priced at Level 2 beneath. The blue text colour in the F:Subtotal field identifies that sub-sheet information exists.

2.80. Now, in cell B3 of the **Level 1** worksheet **enter** a heading of **Ceiling Finishes**. **Double-click** on cell **F3** to drill-down to Level 2, as before.

2.81. In cell B2 of the Level 2 worksheet **enter** a suitable **description** for a plasterboard ceiling.

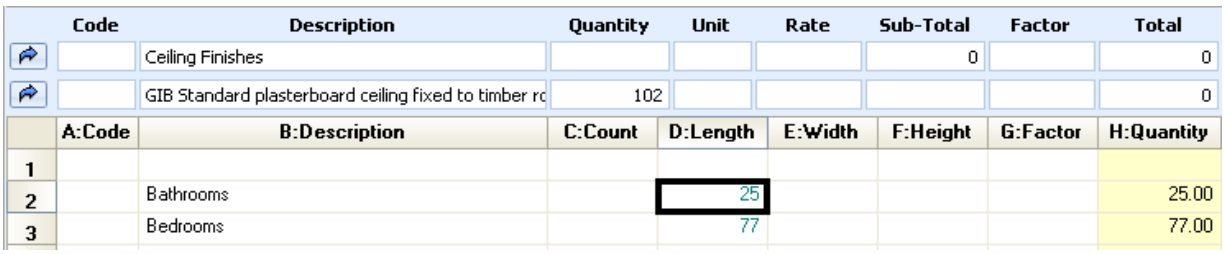
2.82. **Move** the mouse over the **[C:Quantity]** column for this row and **double-click** the left mouse button.

A quantity build-up worksheet (Qty) will open containing columns for count, length, width and height (as opposed to quantity, unit and rate on a Cost sheet). Again a summary row will open above the column headings.

2.83. In the list of Dimension Groups to the left of the workbook, **click** on the **{ Bathrooms }** dimension group to select it then, **holding the Shift key**, **click** on the **{ Bedrooms }** dimension group to select both simultaneously.

(As an alternative, holding the Ctrl key down allows individual non-adjacent Dimension Groups to be selected simultaneously).

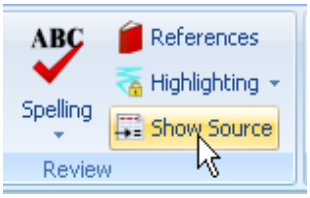
2.84. **Holding the left mouse button down**, **move** the cursor to column **[D:Length**] of the workbook and **release the mouse button**. When the **[Add Quantity]** window appears simply **click [OK]** to drop the Dimension Group information into the workbook. The total quantity for the area of the bathrooms and bedrooms is outlined in the summary fields above the column headings.



	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
		Ceiling Finishes				0		0
		GIB Standard plasterboard ceiling fixed to timber rc	102					0
	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1								
2		Bathrooms		25				25.00
3		Bedrooms		77				77.00

Note that the quantities text is green which denotes 'live-linked' information.

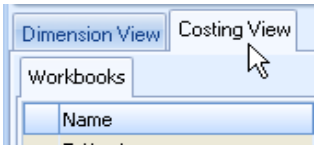
2.85. **Click** on the **[D:Length]** cell for **Bathrooms**. In the ribbon menu **click** the **[Show Source]** button. The Dimension View will open displaying a drawing with the Bathrooms dimension group and associated measured area highlighted.



2.86. Note the area of the Bathrooms dimension group then, using the methods learnt earlier, **measure** the **area of the WC** adjacent to the Bathroom from each drawing.

> *On the Raster JPEG drawing the cursor may attach to the previous bathroom measurement points preventing you from clicking on the WC area. To overcome this, hold the O key (overlap) whilst clicking to start the new area near to the prior measurement, if you find that the new area snaps to an existing point, the Snap button in the Dimensions ribbon can be utilised to override this. Note the new area will cause The Dimension Group quantity to increase.*

2.87. **Click** on the **Costing View** tab to re-open the workbook. Note that the Bathrooms quantity in the workbook has automatically been updated by the live-link to reflect the increased measurement. However this update is only applied to the current sheet in view, to apply the update across the workbook, **select** the **[Recalculate Workbook]** button in the **[Workbooks]** ribbon.



2.88. **Click** on the lower **button** to return to Level 2 of the workbook. The total quantity of measured areas is shown in the C:Quantity column and is blue denoting the existence of drill-down information beneath.

2.89. **Enter** '**m2**' as the unit of measure in the **[D:Unit]** column and then **double-click** in the adjacent **[E:Rate]** column.

> *This opens a Rate sheet where any amount of rate build-up information can be entered, the total of which will be included in the cell that was drilled-down from.*

2.90. **Enter** a rate build-up such as that outlined below then **click** on the lower **button** to return to Level 2 of the workbook. The total rate is shown in blue to advice of drill-down information.

A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include
	Plasterboard supply	1.00	m2	8.20		8.20	8.20
	Labour	0.22	hr	30.00		6.60	6.60

2.91. **Click** on the **button** to return to Level 1 of the workbook which will now contain summary totals for Floor Finishes and Ceiling Finishes.

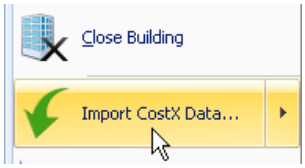
> *Note that in this exercise the same room-related Dimension Groups were used to derive the quantities of both floor and ceiling finishes. This approach leads to economy of measurement where the same Dimension Groups are used repeatedly as opposed to establishing separate Groups for each element. This concept will be explored further in Module 5.*

Module 3: Preparing a GFA Budget

As previously noted, once Dimension Groups and Workbooks have been created and live-linked together they may be used as a template for future jobs. For Module 3, a Building file previously created in CostX® has been exported as a file called Concept Stage Training Template, containing two workbooks and their associated Dimension Groups. We shall now import this template and use it to create a new Building file, add a drawing and use the invert layers function to simplify measurement of the building's GFA (Gross Floor Area). The imported template's workbooks will then automatically update to produce a high level budget estimate based on the GFA measure.

Importing Template Files (PFC 3-5)

3.1. **Click** the **[Main Menu]** button and **select** the option to **[Close Building]**.



3.2. **Click** the **[Main Menu]** button again and **click** on **[Import CostX® Data]**.

3.3. Browse for and **select** the file named '**Concept Stage Training Template.exf**' then **click [Open]**.

3.4. A **[Select Data To Import]** window will open listing the chosen file (Building). **Click** on the **[Select]** button and a second window will appear prompting for a Project to attach the imported Building to. **Highlight** the '**Training-Your Name**' Project that you established earlier and **click [Select]**. A confirmation will appear advising that the import completed. Click OK.

A template Building file with workbooks and Dimension Groups has now been imported and saved into your Project (Note that in the 'live' environment the imported file may have been saved in the <Templates> folder). We shall now import a rate library file that is referenced by those workbooks.

3.5. **Open** the **[Main Menu]** again and **click** on **[Import CostX® Data]**. Browse for and **select** the '**Elemental Template Rates.exf**' file then **click [Open]**. A window will open listing the chosen file (Rate Library). **Click [Select]** and the Library will import straight away without needing to be attached to a Project. An "Import completed" confirmation will appear. **Click [OK]**.

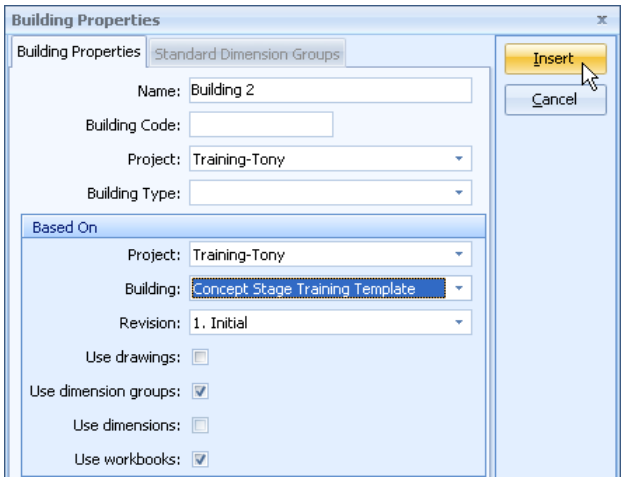
Creating a New Building Based On a Template File (PFC 3-6)

Having imported a template Building file into CostX® we shall now use it to create a new Building.

3.6. **Open** the **[Main Menu]** and click **[New Building]**.

3.7. **Enter** a **[Name:]** of "**Building 2**" and, using the drop-down menu, attach it to the **[Project:]** '**Training-Your Name**'. Do not **click [Insert]** yet.

3.8. In the **Based On** section of the **[Building Properties]** window, use the drop-down menus to **select** the **[Project:] 'Training-Your Name'**, and the **[Building:] Concept Stage Training Template** to copy from. Ensure that the **[Use Dimension Groups:]** and **[Use Workbooks:]** check boxes are ticked then **click [Insert]**. A new Building, based on the imported template, will open containing a set of Dimension Groups and two Workbooks. **Click** on the **[Costing View]** tab to see these.



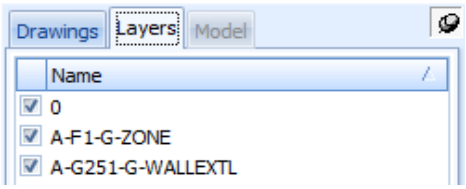
3.9. **Click** on the **[Dimension View]** tab then **Add** the **{ House - DWG.dwg }** drawing.

Inverting Layers

> *In earlier exercises, measurement was simplified by the ability to remove unwanted layers from view, making the drawing less cluttered. This exercise introduces the Invert Layers function. It may be found preferable to work in the Home tab when measuring quantities, as the ribbon contains the most commonly used control buttons.*

The first item to be measured on the Dimension Group list is the FECA (Fully Enclosed Covered Area) which is a component part of the GFA (Gross Floor Area).

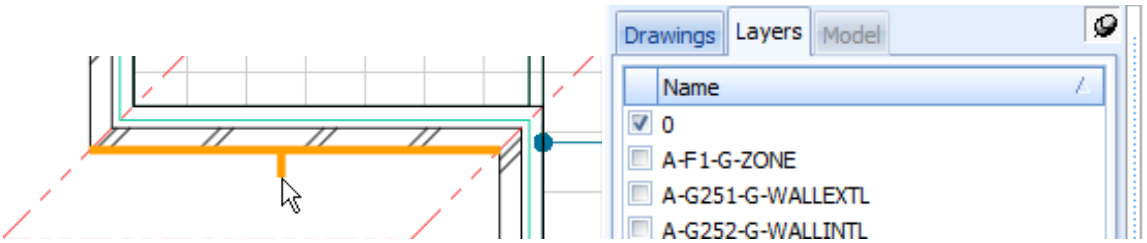
3.10. To optimise the displayed layers to measure the FECA, first **click** the **[Layers]** tab above the list of drawings.



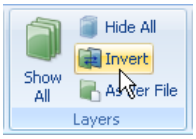
3.11. **Move the cursor** over the drawing and items will highlight orange.

> *Note that if you hold the Shift key when an item is highlighted orange, the entire contents of that layer are highlighted so that you can see the full extent of what will be removed.*

3.12. **Zoom in** as necessary to highlight the face of the external walls then **click** the **left mouse** button to remove the layer (**A-G251-G-WALLEXTL**). **Repeat** this process to remove the external walls hatching (**A-Z005-H-BKWK**), internal walls (**A-G252-G-WALLINTL** and **A-F1-G-ZONE**), windows (**A-G34-G-BKWKWNDW**) and patio (**A-G711-G-SITESURFHARDPATI**) layers.

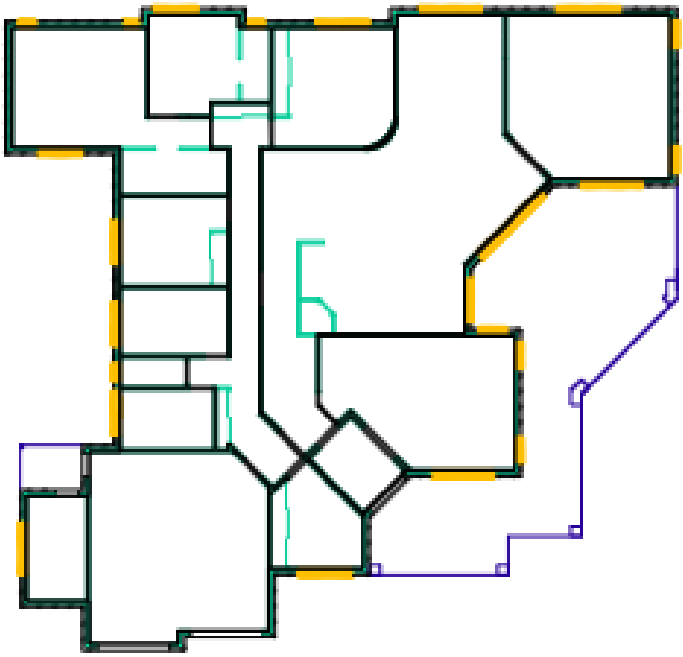


3.13. When the six layers have been removed, **click** the **[Invert Layers]** button on the **[Home] or [Drawings]** ribbon. The layers that were removed will now appear, and those that remained will no longer be shown. The drawing should be as below.



If there are any unwanted layers in view, simply move the mouse over them so that they highlight orange then click the left mouse button to remove the layer. If any layers are missing, click on the Invert Layers button again, move the mouse over the required layer so that it highlights orange and then click to remove it from view. Once all of the required layers have been removed from the view, click the Invert Layers button again to show the removed layers.

3.14. **Click** the **[Drawings]** tab above the list of drawings to revert back to measurement mode. You cannot measure whilst the Layers screen is open.



Each time measurement of a new dimension group commences the optimum screen view can be created by first clicking on the Show All Layers button to reinstate all layers, then repeating the process of hiding and/or inverting selected layers.

GFA Measurement (PFC 2-6)

As seen previously the House - DWG drawing has polylines which can be used to measure quickly.

3.15. In the **{ 00 AREAS (GFA) }** folder **select** the **{ FECA }** (Fully Enclosed Covered Area) dimension group.

3.16. **Move** the cursor towards the inside face of the **exterior wall**. **Hold down** the **L key** and **click** the **left mouse** button (*Polyline* method) to measure the FECA with a single click. Note that the quantity appears in the dimension group.

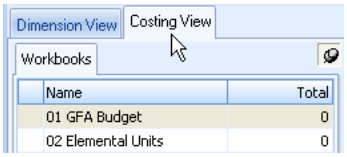
3.17. **Select** the **{ UCA }** (Unenclosed Covered Area) dimension group. In this instance there are no polylines enclosing the patio and porch areas so measurement must be taken by other means.

3.18. To measure the patio and front porch area **click once at every change of direction** around the perimeter to define its borders (*Standard* method) then **press enter** to complete the area.

3.19. **To measure the rear porch** move the mouse cursor over the area then **hold down the Shift key** to define it (*Quickpoint* method). **Click** the **left mouse** button to capture the measurement.

GFA Budget Workbook (PFC 3-4)

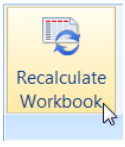
3.20. **Click** the **[Costing View]** tab to switch to the workbooks. **Click** on the **{ 01 GFA Budget }** title to open the workbook which was copied in from the template and has already been setup with live-links to the Dimension Group quantities.



3.21. The rates for each item have been linked to a rate library. To select a rate library **click** on the **[Properties]** button on the **[Workbooks]** ribbon, or **double click** on the workbook name.

3.22. In the **[Workbook Properties]** window use the **[Default Rate Library:]** drop-down menu to select the **{ Elemental Template Rates }** library imported earlier. **Click [Update]**.

3.23. **Click** the **[Recalculate Workbook]** button to update live-links and refresh the workbook.



The 01 GFA Budget workbook, copied from the imported template and live-linked to Dimension Groups copied in from the template, has now been completed based on simple GFA measures.

Module 4: Elemental Unit Measurement

In Module 4 we shall utilise the differing measurement methods and tools learnt already to complete the second, more detailed, 02 Elemental Units workbook that was copied in from our template Building file. We shall also learn how to annotate drawings, apply Default Heights to Dimension Groups, identify duplicate measurements, trim Dimensions, insert manual Dimensions and measure around curves.

Measuring – Point Mode (Raster)

- ***Areas*** - click once on a corner of the area to be measured then move the mouse to the next corner and click again. Continue to click the cursor at each corner to enclose the area then at the last corner, before returning to the start, press enter.
- ***Lengths*** – click on the end of a length to be measured. Hold the Ctrl key and move the mouse to the end of the length then click to capture it. Keep holding the Ctrl key to add further lengths to the first, or release the Ctrl key to start a new length.
- ***Counts*** – click on the item to register a count.

Measuring Areas – Line Mode (Vector)

- ***Standard*** – click on perimeter of area to define its borders, click once at every change of direction and press enter or right click to complete the area.
- ***Quickpoint*** – press and hold the Shift key to measure a rectangular area.
- ***Quickpoint Combining Areas*** (for irregular-shaped area) – press and hold Shift key to measure area 1, press and hold Control key (do not release Shift key) and click to measure adjacent area(s) – the areas will be combined.
- ***Polyline*** – press and hold L key whilst holding the cursor over the perimeter of an area. If a polyline is available, the area will be highlighted blue. Click once to capture the area.

Measuring Lengths – Line Mode (Vector)

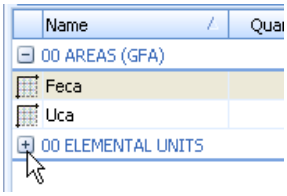
- ***Standard*** – click on lines to measure the length of the item.
- *Combining Lengths* - press and hold Control key to measure the length of combined items, click once at every change of direction.
- ***Trimming Lengths*** –use of the right mouse menu to *trim start/end* at intersections of lengths measured using *Combining Lengths.*
- ***Polyline*** – press and hold L key whilst holding cursor over a line. If a polyline is available, the full perimeter of an area will be captured with a single click.

Measuring Counts – Line Mode (Vector)

- ***Standard*** – click on the item to register a count.
- ***Blocks*** – press and hold Shift key to highlight the item as a drawing block (object – usually but not always doors, sanitary fixtures, etc.) then click.
- ***Multiple Counts*** – press and hold Shift and Control keys, then click to count all like *Blocks*.

Footprint

4.1. **Open** the **[Dimension View]** and expand the **{ 00 ELEMENTAL UNITS }** dimension group folder by clicking the ⊞ button.



4.2. **Select** the **{ 01 Footprint }** dimension group and **use the *Standard* method** to measure the area round the outside face of the exterior wall and patios.

Roof

4.3. **Click** the **[Show All Layers]** button and then **click** on the **[Layers]** tab.

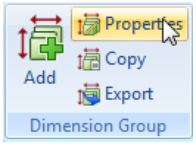
4.4. **Hide** the **Roof layer** (A-Z005-C-SYMBROOFLINE) then **click** on **[Invert Layers]**. **Click** the **[Drawings]** tab.

4.5. **Select** the **{ 05 Roof }** dimension group and **use the *Standard* method** to measure the roof plan area.

Windows

4.6. **Select** the **07 Windows** dimension group.

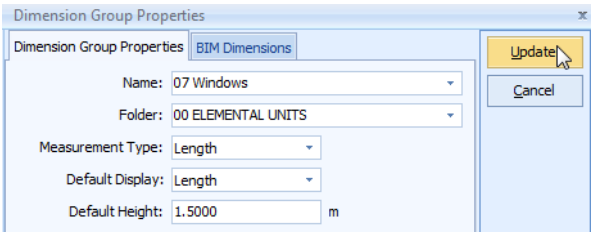
> *Note that because the windows are being measured from a plan, this dimension group requires measurement in m and not m². A default height for the windows can, however, be nominated in the Dimension Group to enable the vertical area to be used in the workbook.*



4.7. On the **[Dimensions]** ribbon menu **click** the **[Properties]** button, or **double click** on the **Dimension Group name** to open the Dimension Group Properties window.

4.8. **Insert** a **[Default Height:]** of **1.50** (m) and **click [Update]**. **Click [Yes]** to warning message

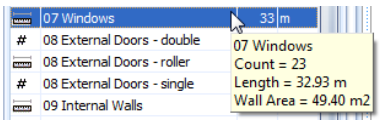
> *If there were varying window heights a separate Dimension Group could be created for each one, noting the height in the name. Use abbreviations and a naming protocol for quality assurance purposes. Remember all Dimension Groups must have a different name.*



4.9. From what you have learnt, **select** the **windows layer** and **invert** so only the windows are shown.

4.10. Use the *Standard* length measurement method to **measure** the **length of each window**.

4.11. **Move** and **hold the cursor** over the **{ 07 Window }** Dimension Group name. An information box opens showing the total length measured, along with the number of windows (Count) and the vertical area (Wall Area).



4.12. It is possible to add notes to a drawing. To do this, **move the cursor** towards a line or object, **click** the **right mouse** button then **select [Create Markup]** from the menu.

4.13. In the **[Add Markup]** window **type** the words, "**All windows measured 1.50m high**" and **click [OK]**.

4.14. A note is now indicated on the drawing. This can be moved around by clicking and dragging either the text or arrow. **Point at the text**, **click** the **right mouse** button and **select [Delete Markup]**.

External Doors – double

4.15. Change the layers to **show the doors and external walls layers only** then **click** on the **[Drawings]** tab.

4.16. **Select** the dimension group called **{ 08 External Doors – double }**.

4.17. **Move** the **cursor** over the **entry double door** and use the *Blocks* method to **count** one of the **doors**. If both are clicked the count will register as two doors.

External Doors - single

4.18. **Repeat** the ***Block* measurement** process for the **{ 08 External Doors – single }** dimension group.

Internal Doors - single

> *In CostX® it is possible to measure all similar block objects by holding the Ctrl key at the same time as the Shift key before clicking the left mouse button.*

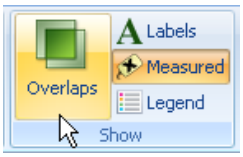
4.19. **Select** the **{ 11 Internal Doors – single }** dimension group and use the *Multiple Counts* method (Shift + Ctrl) to **measure** the **doors**. All doors which are drawn as multiple blocks will be measured.

> *Note that you will need to pick up individual doors which are not typical. Do this by using the Blocks method, or for those that are not a block, simply click on them to register a count.*

Overlaps Feature

You may have noticed that the external doors have now been measured in the Internal Doors dimension group and therefore have been measured twice.

4.20. **Select** the **{ 08 External Doors – double }**, **{ 08 External Doors – single }** and **{ 11 Internal Doors – single }** dimension groups together by highlighting each in turn **whilst holding the Ctrl key**.



4.21. Then on the **[Dimensions]** ribbon **click** the **[Overlaps]** button. This will display any overlapping dimensions in yellow. Ensure this function is turned off before proceeding with further measurement.

4.22. To remove these doors from the Internal Doors dimension group, **select** that **{ 11 Internal Doors – single }** alone and **move the cursor over** each **external door** until it is highlighted blue. **Click** the **right mouse** button and select **[Delete dimension]**.

External Doors – roller

4.23. **Select** the **{ 08 External Doors – roller }** dimension group.

4.24. **Move** the **cursor over** the **garage door openings**.

The Dimension Group has been established to measure the width of the door openings however you will notice that the sticky cursor highlights the entire wall face, extending past the reveals of the opening on both sides.

4.25. To overcome this firstly **select** one **reveal line** of the opening then **use** the ***Combining Lengths* method** (Ctrl key) to **measure around the opening** as shown.

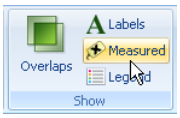
4.26. To remove the extraneous length in the reveals, **move the cursor over the green line** so that it turns blue. **Click** the **right mouse** button and **select [Trim Start]**. **Repeat** this process to **[Trim End]** leaving only the door width measured.

An alternative is to use the square bracket '[' and ']' short-cut keys to trim the ends of the length. Try this for the other garage door.

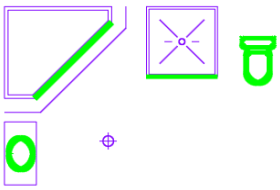
Sanitary Fixtures

4.27. **Select** the **{ 17 Sanitary Fixtures }** dimension group. **Show all layers** then **turn off** the sanitary fittings layer (**A-G4-G-FITT**) and **invert**. Only the fittings layer should be shown.

4.28. **Use the *Multiple Counts*** methods to **count the WC pans**. Then, in the **[Dimensions]** ribbon click the **[Measured Items]** button. The counted WC's become dimmed. **Measure** the **bath**, **basins** and **kitchen sink** noting how each measured item is dimmed enabling measurement by elimination. To show measured items click the button again.



4.29. Not all objects can be selected as blocks (e.g. **shower and spa bath**). For objects that cannot be selected as blocks use the *Standard* count technique and simply **select a line** on that object to measure as a count.

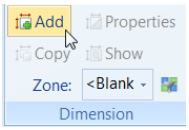


4.30. **Select** the **{ 10 Shower Screens }** dimension Group. **Click** on **each shower** to register a count.

Functional Units

4.31. **Select** the **{ 15 Functional Units }** dimension group.

4.32. As there is nothing to measure for this **click** the **[Add Dimension]** button (see right) on the **[Dimensions]** ribbon.



4.33. In the **[Dimension Properties]** window enter a **[Name:]** of "**Functional Unit**" and a **[Number:]** of 1. **Click [Insert]** to register a manual dimension entry.

Internal Walls

4.34. **Select** the **{ 09 Internal Walls }** dimension group. Use the **[Layers]** tab to **display** the internal wall (**A-F1-G-ZONE and A-G252-G-WALLINTL**) and external wall (**A-G251-G-WALLEXTL**) layers.

> *Although the dimension group has been established with a measurement type of Length, by entering a default height in the Dimension Group Properties the area of walls can be derived from multiplying the length by the height.*

4.35. **Double click** on the **Dimension Group name**, insert a figure of **2.70** (m) in the **[Default Height:]** field and **click [Update]**.

4.36. Remembering to **click** the **[Drawings]** tab first, use the following methods to measure the internal walls, measuring over all door openings (excluding the wardrobe sliders).

4.37. Use the ***Polyline*** **method** to **measure** the **corridor walls** in a single click.

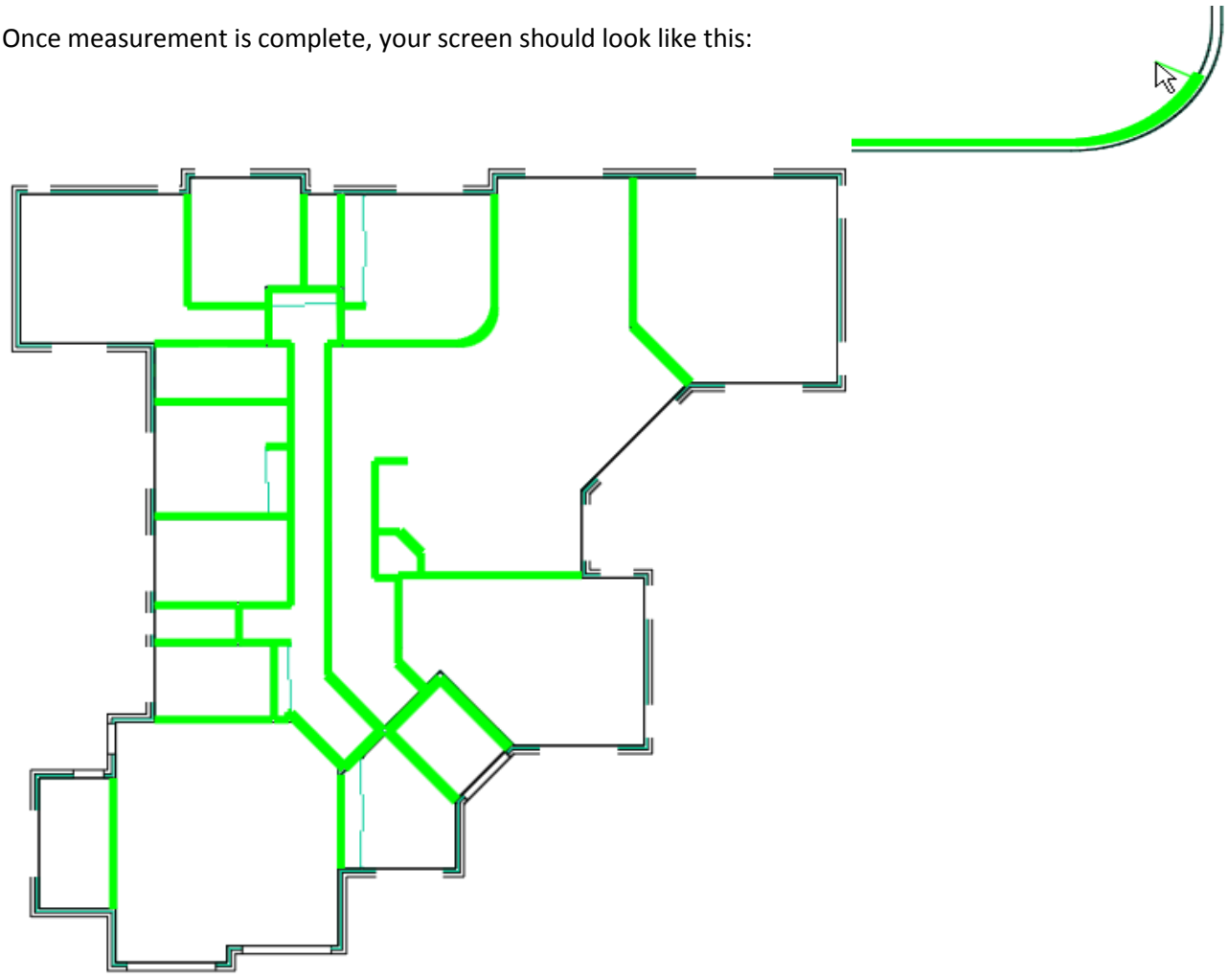
4.38. Use the ***Standard*** **method** to **measure** any single **straight wall lengths** with no openings.

> *Pay attention to which side of the wall you attach the sticky cursor to as the line on one side may extend further than on the other and be careful not to measure the internal skin of the external wall. Click on one side of each wall only. If needed, use the Trimming Lengths feature outlined previously to avoid overlaps.*

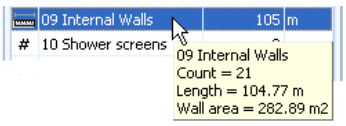
4.39. Use ***Combining Lengths*** measurement (holding the Ctrl key) to **measure** over **walls** with openings, or to combine multiple wall lengths into one measurement.

4.40. To measure the curved wall, **first click** on the **adjacent straight wall**. Then, holding down the **Ctrl** key, **click and drag** the **mouse** cursor **around the curve**. This is effectively using the *Combining Lengths* method to add each curve segment into one length.

Once measurement is complete, your screen should look like this:



4.41. **Move and hold the cursor** over the **{ 09 Internal Walls }** dimension group. An information box will open outlining all of the measured quantities.



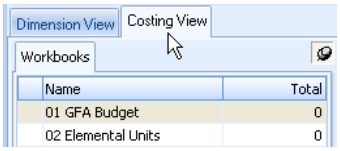
Elemental Units Measurement

Having completed the elemental unit measurement, the 00 Elemental Units folder Dimension Group quantities should look like this. The length of 09 Internal Walls dimension group may vary slightly depending on whether you clicked around the outside or inside face of corners.

00 ELEMENTAL UNITS			
	01 Footprint	374	m2
	05 Roof	408	m2
	07 Windows	33	m
#	08 External Doors - dou	1	no
	08 External Doors - rolle	5	m
#	08 External Doors - sing	2	no
	09 Internal Walls	105	m
#	10 Shower screens	2	no
#	11 Internal Doors - singl	12	no
#	15 Functional Units	1	no
#	17 Sanitary Fixtures	10	no

Elemental Units Workbook (PFC 3-4)

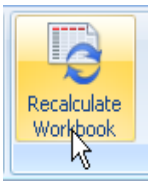
It is not normally necessary, but for the purposes of this exercise ensure all dimension groups have been completed before commencing this section.



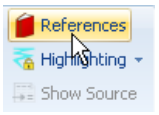
4.42. Firstly **click** the **[Costing View]** tab to switch to the workbooks. **Click** on the **[02 Elemental Units]** title to open the workbook which was copied in from the template and has already been setup with live-links to the Dimension Group quantities.

4.43. The rates for each item have been linked to a rate library. To select a rate library **click** on the **[Properties]** button on the **[Workbooks]** ribbon, or double click on the workbook name.

4.44. In the **[Workbook Properties]** window **open** the drop-down menu for **[Default Rate Library:]** and **select** the **Elemental Template Rates** library imported earlier. **Click [Update]**.



4.45. **Click** the **[Recalculate Workbook]** button to update live-links and refresh the workbook. A warning window will appear advising of invalid Dimension Group references. In this instance Dimension Groups relating to multi storey buildings have been deleted but are still referenced in the Workbook. **Click [OK]** to close the window.



4.46. **Click** on the **[References]** button. A window will appear outlining Unused Dimension Groups (measurements have been taken but not utilised in the Workbook), Used Dimension Groups (giving cell references for each use), Unknown Formula References (formulas that refer to invalid sources) and Zeros (formulas entered that give a result of zero). This information can be copied and pasted into other programs such as Word or Excel®, or into the User columns of the Workbook.

4.47. **Click [OK]** to close the References Report window.

The 02 Elemental Units workbook, copied from the imported template and live-linked to Dimension Groups copied in from the template, has now been completed based on elemental measurements.

Module 5: Detailed Estimate

As noted earlier, measurement in CostX® can be made quicker by re-using the same Dimension Groups for multiple items in the workbook. Instead of having separate Dimension Groups for each type of floor finish, wall finish, ceiling finish, skirting and coving say, you might simply establish Dimension Groups containing a Default Height, based on room type. Then, by clicking around the perimeter of each room you will not only measure its area (floor finish, ceiling finishes), you will also capture the perimeter (skirting, coving), wall area (wall finishes), and even the room volume (air-con). All of this information will be captured by measuring each room once only.

In Module 5 we shall create Dimension Groups based on differing specifications for each room type (as outlined in the square brackets below) and measure each room once. From these single measurements we shall replace the GFA based finishes items within the Elemental Unit workbook with multiple items of different unit of measure then create and use a Rate Library to price them.

Measuring Areas – Line Mode (Vector)

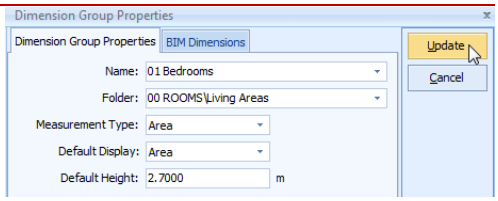
- ***Standard*** – click on perimeter of area to define its borders, click once at every change of direction and press enter or right click to complete the area.
- ***Quickpoint*** – press and hold the Shift key to measure a rectangular area.
- ***Quickpoint Combining Areas*** (for irregular-shaped area) – press and hold Shift key to measure area 1, press and hold Control key (do not release Shift key) and click to measure adjacent area(s) – the areas will be combined.
- ***Polyline*** – press and hold L key whilst holding the cursor over the perimeter of an area. If a polyline is available, the area will be highlighted blue. Click once to capture the area.

Specification Based Dimension Groups

5.1. **Click** the **[Dimension View]** tab and **add** the following new **Dimension Groups** into a new **folder** called "**00 ROOMS**", all with a **[Measurement Type:]** and **[Default Display:]** of **Area** and **[Default Height:]** of **2.70**m. Use the Positive Colour: drop-down menu to select a different colour to shade each measured area.

01 Bedrooms	[carpet, timber skirting, plasterboard walls & ceiling]
02 Living Rooms	[carpet, timber skirting, plasterboard walls & ceiling, plaster coving]
03 Kitchen	[tiled floor, plasterboard walls & ceiling]
04 Corridors	[tiled floor, timber skirting, plasterboard walls & ceiling]
05 Bathrooms / Wet Areas	[tiled floor, tile skirting, moisture-resistant plasterboard walls & ceiling]
06 Garage / Store	[sealed concrete floor, plasterboard walls & ceiling]

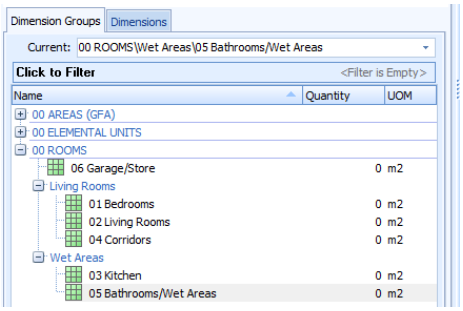
5.2. Once the Dimension Groups have been created, **double-click** the **{ 01 Bedrooms }** Dimension Group to open **{ Dimension Group Properties }** window



5.3. Enter "**\Living Areas**" next to Folder: name as shown and **Click [Update]**. This will create a subfolder **{ Living Areas }** under **00 ROOMS** folder.

5.4. **Repeat** this process the for **{ 02 Living Rooms }** and **{ 04 Corridors }** dimension groups.

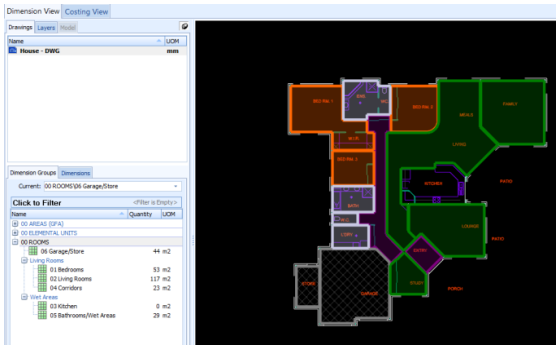
5.5. Similarly create a subfolder called **{ Wet Areas }** for **{ 03 Kitchen }** and **{ 05 Bathrooms/Wet Areas }** Dimension Groups.



5.6. Once the Dimension Groups have been created, **select and invert** the **external walls**, (A-G251-G-WALLEXTL and A-Z005-H-BWK), **internal walls** (A-G252-G-WALLINTL and A-F1-G-ZONE) and **fittings** (A-G4-G-FITT) layers.

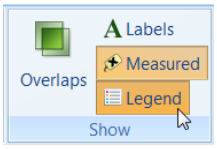
5.7. **Include** the **room name text layer** by **holding** the **T** key whilst highlighting the text. This will make it easier to measure the room areas unimpeded.

5.8. As previously mentioned this drawing has a number of polylines which can be utilised to measure some of the gross room areas. **Measure** the **gross room areas** of **01 Bedrooms and 02 Living Rooms** (i.e. ignoring fittings) using a combination of the *Polyline*, *Standard* and *Quickpoint* methods.

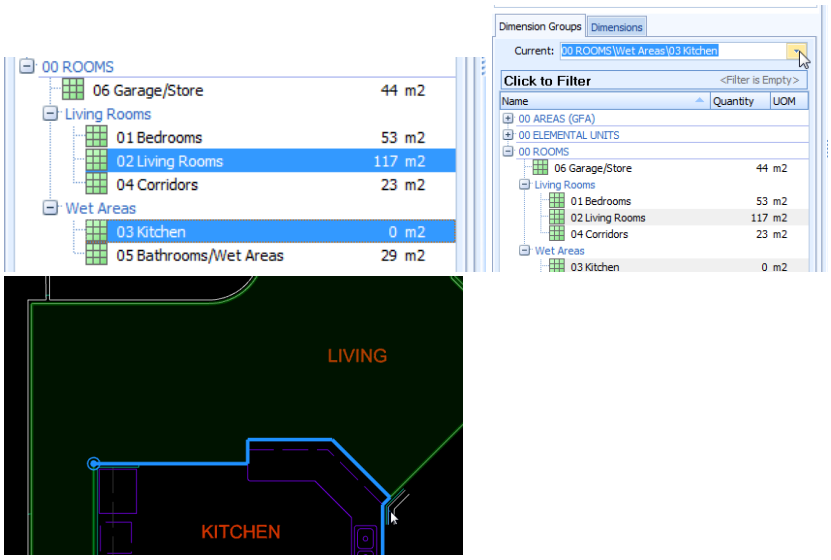


- *You can check progress at any time by clicking on the 00 ROOMS folder name to highlight measurements taken in all Dimension Groups within that folder.*

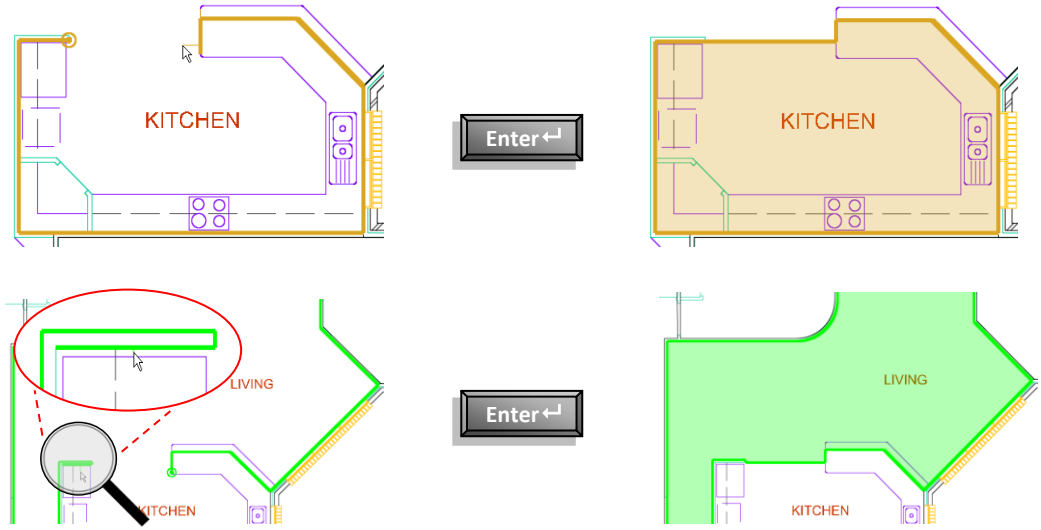
- *This visual check can be accompanied by a Legend accessible via the Dimensions Ribbon, note that the Legend also contain Primary Quantities.*



5.9. Measurements can be made whilst multiple Dimension Groups have been selected, we shall use this function to differentiate the measurement between the Kitchen and Living Area. **Select { 03 Kitchen }** and **{ 02 Living Rooms }** Dimension Groups **using** the **CTRL** key. Note the Dimension Groups Selected will now be Bold, further the Dimension Group to be measured into can be selected from the [**Current:]** Option:



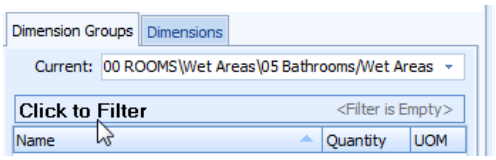
To **measure** the **Kitchen** separately from the Living and Meals area, the ***Standard*** **measurement method** can then be used to delineate the two areas as it can span openings and even use lines pointing the 'wrong' way for alignment (see below). curve.



5.10. Ensure the remaining Areas have been measured to the appropriate dimension groups before continuing.

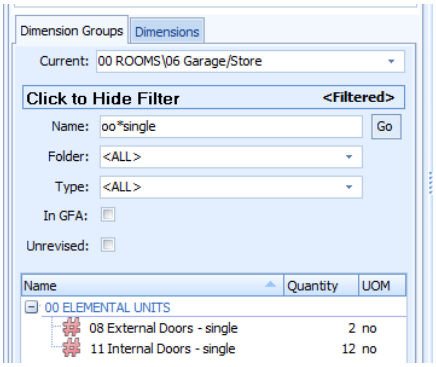
Dimension Group Filter

5.11. On some projects there may be a large number of Dimension Groups. To make them easier to manage, they may be filtered. **Click** on the **[Click to Filter]** function above the Dimension Groups.



5.12. In the **[Name:]** field **type** an individual Dimension Group name and **click [Go]**.

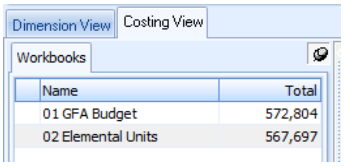
> *Alternatively, star (*) can be used as a wildcard to show a number of Dimension Groups i.e. typing oo*single will return all Dimension Groups with 'oo' and 'single' somewhere in the name. You may need to open folders to see their filtered contents. The Folder: or Type: drop-down menus may also be used to filter by.*



5.13. To re-show all Dimension Groups, **clear** any **filter criteria** then **click [Go]**.

5.14. To hide the filter criteria fields from view **select [Click to Hide Filter]**.

Detailed Estimate



5.15. **Click** the **[Costing View]** tab then **click** on the **{ 02 Elemental Units }** title to open the workbook.

5.16. **Double click** on the **Floor Finishes** element **[F:Subtotal]** cell, or row number heading (13), to drill down to Level 2 in the workbook. This contains an allowance based on GFA which we shall now replace with detailed estimate items derived from the room areas measured previously.

5.17. Firstly, simply **select** the **{ 06 Garage / Store]** dimension group from the **{ 00 ROOMS]** folder and drag and drop it into the **B:Description** cell on any of the spare rows.

5.18. In the **[Add Quantity]** window over-type the **Description:** to read, "**Sealed finish to concrete floor**". **Enter** a suitable **[Rate:]** and **click [Update]** to create an estimate item.

> *Note that the quantity is green denoting a live-link to the Dimension Group.*

5.19. Next, in the **[B:Description]** column, **enter** a suitable **description** for carpet then **double click** on the adjacent **[C:Quantity]** column to open a Qty sheet. Use the Shift or Ctrl keys to **select both** the **{ 01 Bedrooms }** and **{ 02 Living Rooms }** dimension groups and drag-and-drop them simultaneously into the **[D:Length]** column of the Qty sheet. In the **[Add Quantity]** window **click [OK]**.

5.20. **Click** on the **button** to return to the Cost sheet at Level 2 and **enter** a **[D:Unit]** (m^2) and **[E:Rate]** for the carpet to complete the estimate item.

5.21. Using the latter method, **create an estimate** item for floor tiling using the **{ 03 Kitchen }** and **{ 04 Corridors }** and **{ 05 Bathrooms / Wet Areas }** dimension groups in the Qty sheet build-up.

5.22. **Select** the three new floor finishes items in the **[C:Quantity]** column. The total quantity is shown in the bottom right of the screen (≈285m^2), allowing comparison with the FECA dimension group (290m^2 including partition wall footprint).

Deductions for Openings in Workbook

5.23. Next, in column **[B:Description]**, **enter** a **timber skirting** item.

5.24. **Double click** on the **[C:Quantity]** cell.

5.25. From the **{ Living Areas }** subfolder **select** the **{ 01 Bedrooms }**, **{ 02 Living Rooms }** and **{ 04 Corridors }** dimension groups and **drag-and-drop** them into the **[D:Length]** column. When the **{ Add Quantity }** window appears **select** the **{ Length }**: option button and **click [OK]**. The perimeter of each room area measured in those Dimension Groups is inserted into the Qty worksheet.

> *Adjustments for openings can be made based on a combination of quantities from varying Dimension Groups as available. In this example, we shall use the external and internal door counts to delete door openings from the timber skirting length. This will, however, create an over deduction for the bathroom / wet area doors where there are tile skirtings. We shall therefore add these openings back based on the number of rooms of that type.*

5.26. Still in the Qty sheet drag and drop the **{ 08 External Doors – double }** dimension group from the **{ 00 Elemental Units }** folder into the **[C:Count]** column and **click [Update]**. **Enter** the width of the door as a negative value, **-1.80**, in the **[E:Width]** column to create a deduction in the skirting length.

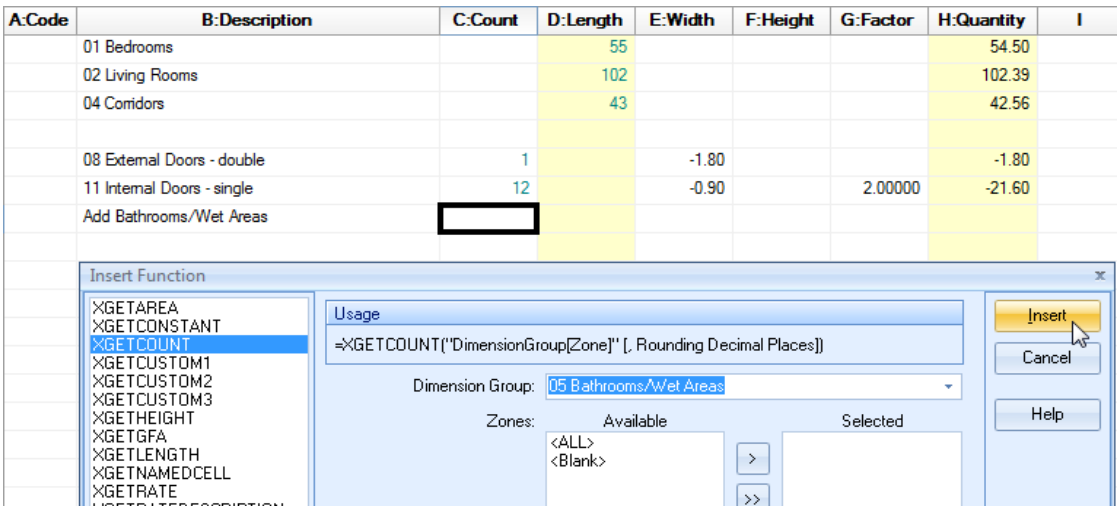
5.27. **Repeat** this process **dragging** the **{ 11 Internal Doors – single }** dimension group into the **[C:Count]** column and **clicking [Update]**. **Enter -0.90** in the **[E:Width]** column. **Enter "2"** in the **[G:Factor]** column to deduct skirting from both sides of the internal door openings.

5.28. In the next row **enter** a **[B:Description]** relating to adding back the Bathroom / Wet Area doors and type a **[E:Width]** of **+0.90**.

5.29. In the **[D:Length]** column **click** on the Function button (or click the right mouse button and select Insert Function).

5.30. In the **[Insert Function]** window **select [XGetCount]** from the list at the left hand side (see below) and then use the **[Dimension Group:]** drop-down menu to **select { 05 Bathrooms / Wet Areas }**. **Click [Insert]**.

5.31. The number of bathrooms (equating to their number of doors) will be entered in the **[D:Length]** column completing the adjustment.



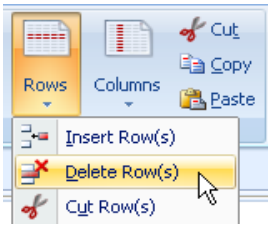
5.32. **Click** on the **button** to return to the Cost sheet at Level 2 and **enter** a **[D:Unit]** (m) and **[E:Rate]** for the timber skirting to complete the estimate item.

5.33. **Repeat** this process to create a **tile skirting** estimate item

> *Enter a B:Description for tile skirting then double click on the C:Quantity cell. Drag-and-drop the 05 Bathrooms / Wet Areas dimension group into the D:Length column using the Quantity Type: of Length to create a linear measure. On a new line enter a E:Width of -0.90 and in column D:Length insert a XGetCount function referring to the 05 Bathrooms / Wet Areas dimension group.*

5.34. Return to the Cost sheet at Level 2 and **enter** a **[D:Unit]** (m) and **[E:Rate]** for tile skirting.

5.35. **Click** on the original **GFA allowance lines**. As these have now been replaced by measured items, **click** the **[Rows]** button in the ribbon and **select [Delete Row(s)]**.



> *Alternatively, holding the Ctrl and Delete keys will delete the rows.*

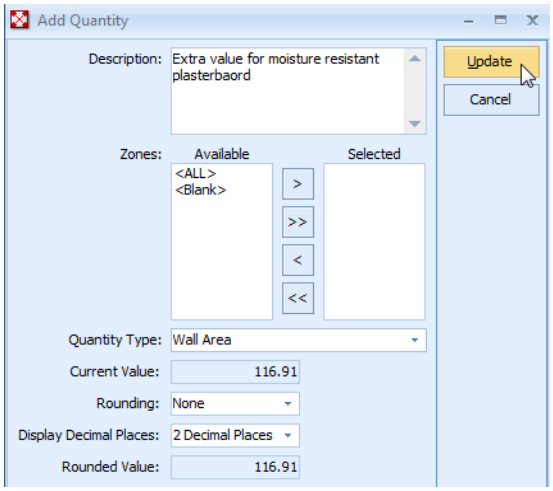
5.36. **Click** on the **button** to return to Level 1 of the workbook.

Estimate with different Quantity Type

5.37. **Double click** on the Wall Finishes element **[F:Subtotal]** cell, or row number heading (12), to drill down to Level 2 in the workbook. This contains a single item based on the external and internal wall areas with deductions for window and door openings.

5.38. **Drag and drop** the **{ 05 Bathrooms / Wet Areas }** dimension group into the **[B:Description]** cell on any of the spare rows.

5.39. In **[Add Quantity]** window, over-type the **[Description:]** to read "**Extra value for moisture resistant plasterboard**." Use the drop-down menu to **select** a **[Quantity Type:]** of **Wall Area**.



Note that the Rounded Value: field displays the result of multiplying the room perimeters by the Default Height and the Rounding: field can be used to set the required rounding.

5.40. **Enter** a **[Rate:]** and **click [Update]**. A new item relating to the Bathroom / Wet Areas wall area (measured over openings) will be entered into the workbook.

It is now possible to see how simple room related Dimension Groups can be used to provide differing measurements in multiple locations throughout the workbook. This 'one-to-many' principle can save a lot of measuring time.

5.41. **Click** on the **button** to return to Level 1 of the workbook.

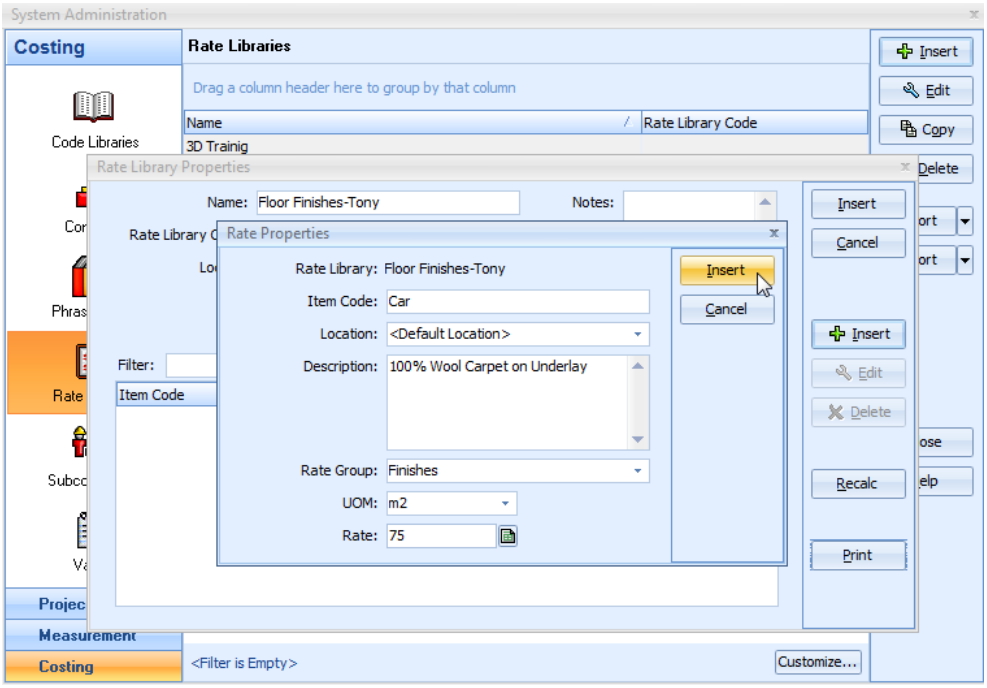
Creating and Using Rate Libraries (PFC 3-3)

5.42. From the **[Main Menu]** open **[System Administration]**. **Click** on the **[Costing]** button at the bottom left then **select** the **[Rate Libraries]** folder. **Click** the Insert button.

5.43. **Enter** a **[Name:]** for your library of **"Floor Finishes-"** followed by your name then **click** the Insert button to add rate library items.

5.44. **Complete** all fields in the **[Rate Properties]** window (see below) then **click** Insert to save your rate library item for carpet floor finish.

Note that the Location: must be the same as for your Project, in this case <Default Location>. Also, clicking the button adjacent to the Rate: field opens a calculation sheet in which items from other rate libraries can be referenced



5.45. In the **[Rate Library Properties]** window **use** the Insert **button** to add further rate items for sealed concrete and ceramic tile floor finishes. Each item must have a unique Item Code:

5.46. Use the ⊞ **button** to view a list of your rate library items then **click** Insert to save the new rate library.

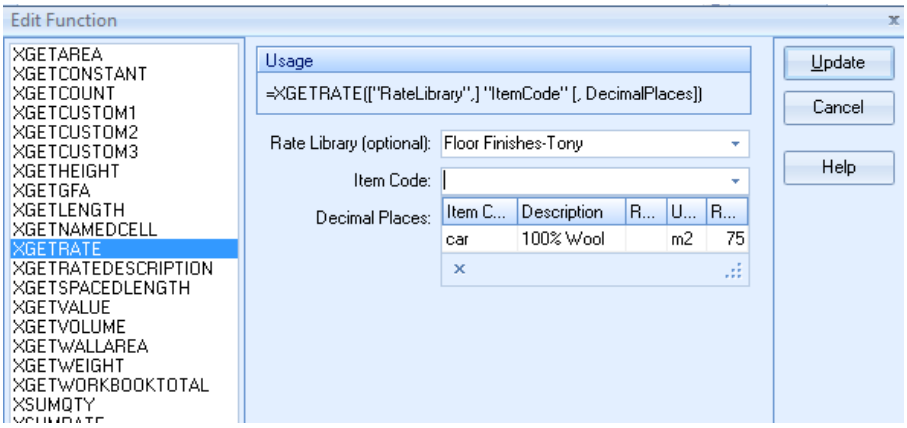
5.47. **Click** the **[Close]** button to exit **[System Administration]**.

Using a Rate Library

5.48. **Double click** on the **Floor Finishes** element **[F:Subtotal]** cell to drill down to workbook Level 2.

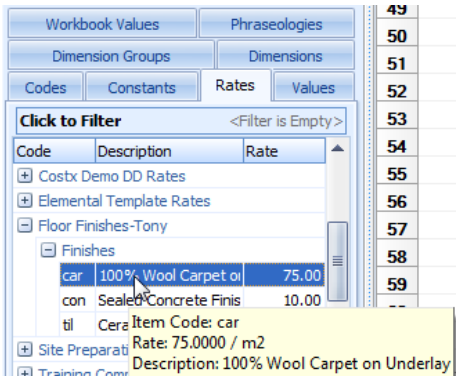
5.49. On a new row **select** a cell in the **[E:Rate]** column. Then, either **click** the **[Function]** button on the Workbooks ribbon or **click the right mouse** button and **select [Insert Function]**.

5.50. In the **[Edit Function]** window **select [XGetRate]** and use the drop-down menus to **choose a library** item from the **'Floor Finishes-Your Name'** library just created. **Click [Update]** and an estimate item complete with Code, Description, Unit of Measure and Rate will be created in the Workbook.



5.51. **Double click** on the **[C:Quantity]** cell to **drag-and-drop** quantities from the **{ 00 ROOMS }** dimension groups as previously then **click** on the **button** to return to Level 2 of the workbook. A priced estimate item, live-linked to Dimension Groups (Qty sheet) and a Rate Library, is completed.

5.52. **Click** on the **[Rates]** tab in the Dimension Group window. Use the **button** to open the 'Floor Finishes-Your Name' rate library then click to **select a rate** in the list. **Drag-and-drop** the rate item into the workbook.



> *Dropping it into the E:Rate column only populates the rate cell, whilst dropping it in the B:Description column creates a complete estimate item (excluding quantity). Note that the E:Rate figure is green, denoting a live link.*

5.53. Click on the E:Rate cell and then click the Show Source button in the Workbooks ribbon menu.

5.54. In the **[Rate Properties]** window **amend** the **Rate:** figure and **click [Update]**.

> *The rate figure in the Rate Library to the left, and in every instance in the Sheet in view, will be revised accordingly, however for the update to be across the Workbook, select the Recalculate Workbook button in the Workbooks ribbon.*

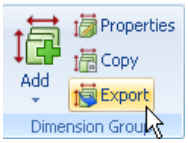
5.55. **Click** on the **button** to return to Level 1 of the workbook.

Module 6: Reports

In Module 6 we shall look at how to export information from CostX® to Excel®, how to generate reports from existing templates and how to create and edit your own report templates. In this we shall look at selecting what data appears on the report and how it is grouped, amending the page layout and adding a logo, and how to preview, save and filter your report.

Exporting Dimensions to Excel® (PFC 4-1)

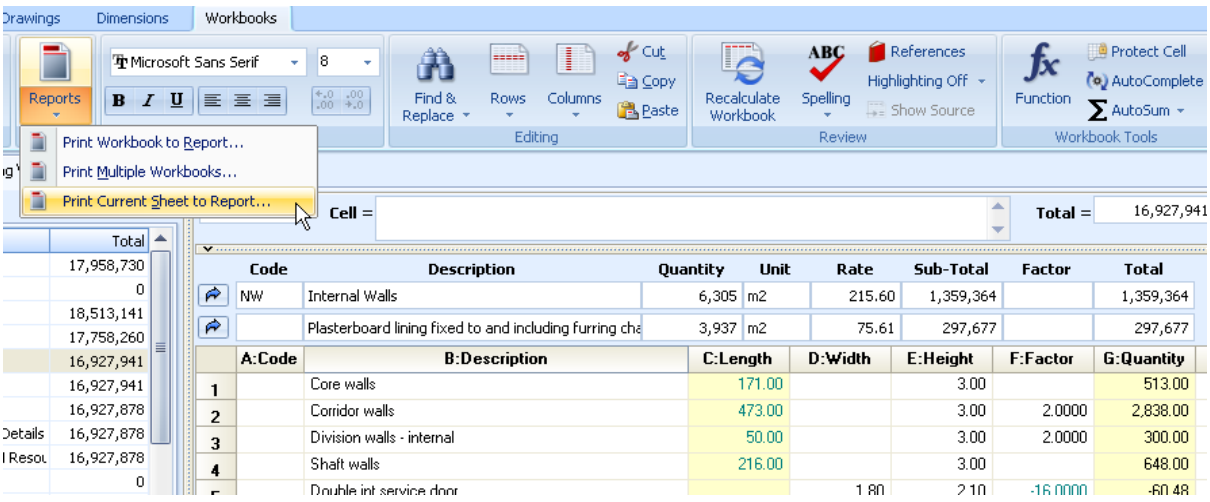
6.1. CostX® can export Dimensions to Excel®. To export Dimensions, use the **[Export]** button on the **[Dimensions]** ribbon. The Dimensions are scheduled drawing by drawing on individual Excel® worksheet tabs, with a separate Summary by Drawing, and overall Summary.



Print Current Sheet to Report (PFC 4-2)

6.2. Sometimes a hard copy of a particular CostX® workbook sheet is required e.g. a copy of a quantity or rate build-up, or a list of dimensions. To obtain this open the required sheet and use the **[Print Current Sheet to Report]** option on the **[Reports]** button drop-down menu.

6.3. In **[Print Current Sheet]** window, **Click [Preview]**.

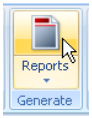


Generating Reports in CostX® (PFC 4-3)

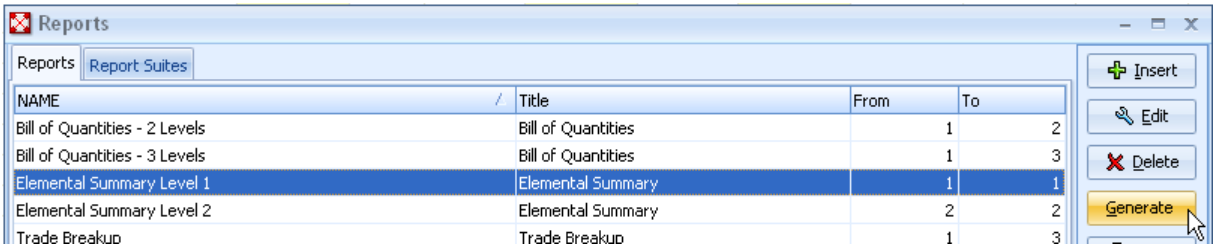
CostX® is supplied with a number of pre-prepared standard report templates which may also be edited to suit each organisation's individual requirements. CostX® has three types of report, namely "Standard", "Custom" and "System". The format and configuration of these reports is managed by two separate and discrete report writers.

The "Standard" Report Writer allows default Standard reports shipped with CostX® to be edited to suit user requirements as described in the following examples. The Custom Report Writer is not addressed in this training exercise. For more information refer to the CostX® Custom Reports Guide.

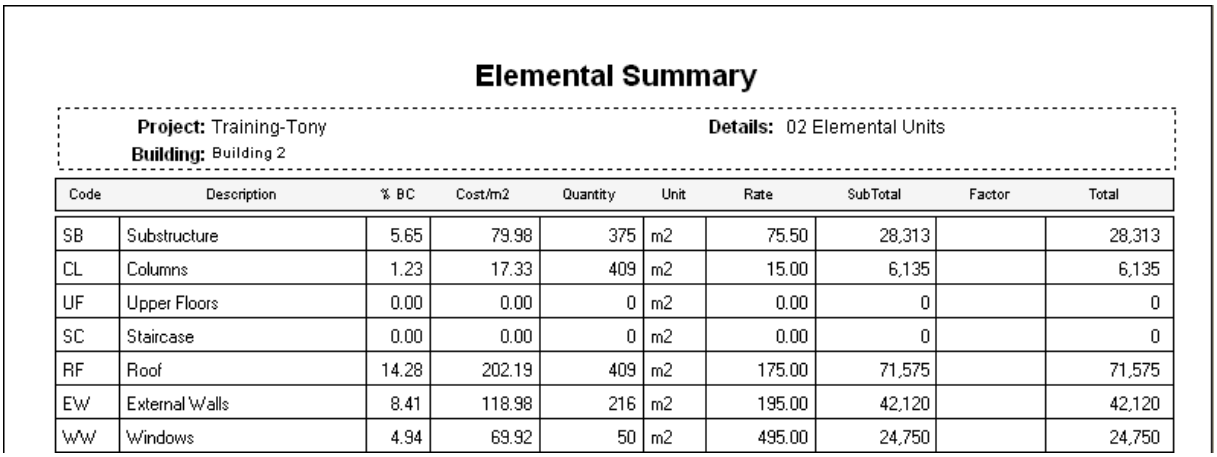
6.4. Ensure that the **{ 02 Elemental Units }** workbook is open then **click** the **[Reports]** button on the **[Workbooks]** ribbon. If the drop-down menu opens **click [Print Workbook to Report]**.



6.5. **Select** the **{ Elemental Summary Level 1 }** report and **click [Generate]**.



6.6. A **[Generate Report]** window will appear allowing certain details to be amended and printer options to be selected. **Click [Preview]** to view the report which should look similar to below.



Elemental Summary

Project: Training-Tony **Details:** 02 Elemental Units
Building: Building 2

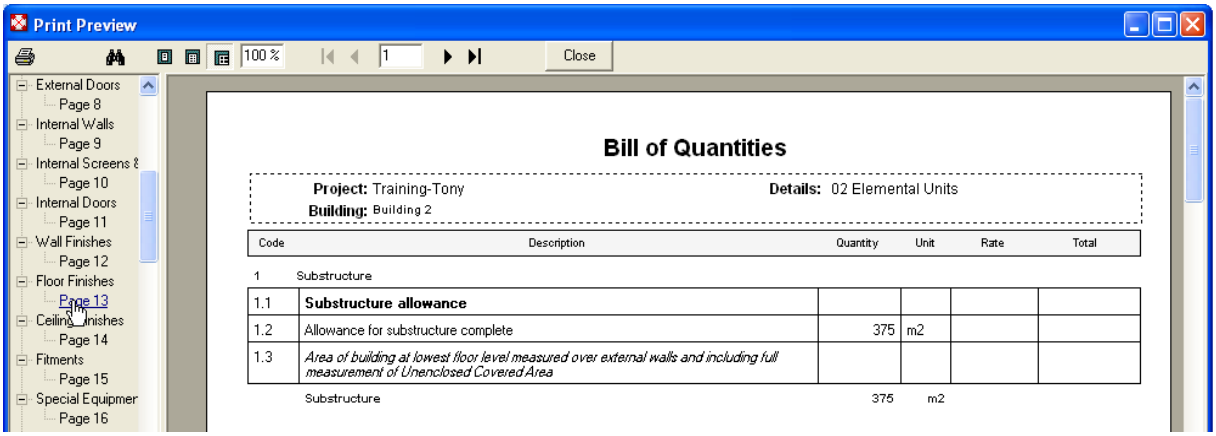
Code	Description	% BC	Cost/m2	Quantity	Unit	Rate	SubTotal	Factor	Total
SB	Substructure	5.65	79.98	375	m2	75.50	28,313		28,313
CL	Columns	1.23	17.33	409	m2	15.00	6,135		6,135
UF	Upper Floors	0.00	0.00	0	m2	0.00	0		0
SC	Staircase	0.00	0.00	0	m2	0.00	0		0
RF	Roof	14.28	202.19	409	m2	175.00	71,575		71,575
EW	External Walls	8.41	118.98	216	m2	195.00	42,120		42,120
WW	Windows	4.94	69.92	50	m2	495.00	24,750		24,750

6.7. **Click** the **[Close]** button to exit from the print preview screen.

6.8. In the **[Reports]** window **click** on the **{ Bill of Quantities – 2 Levels }** report to select it. **Click [Generate]** to open the **[Generate Report]** window, and then **[Preview]** to view the report.

Note the different report layout even though it is derived from the same workbook.

6.9. Use the navigation pane on the left hand side to preview the **Floor Finishes** page.



All of the items entered into the workbook in the previous exercise will be included on the report however no Rates or Totals are shown, despite these being included in the workbook. This is as a result of this particular report having been set to print an un-priced Bill of Quantities.

6.10. **Click [Close]** to exit from the **[Print Preview]** screen, and **[Close]** again to exit from the list of available reports.

Note that by opening the 01 GFA Budget workbook and then clicking the Reports button, a similar process can be followed to generate reports from this workbook.

Copying Reports

When editing reports it is important to maintain the original templates and existing bespoke layouts that may already have been created. It is therefore advocated that the report to be edited is first copied, and any revisions made to the copied version, thereby preserving the original.

6.11. On the **[Workbooks]** ribbon **Click** the **[Reports]** button. If the drop-down menu opens **click** on the **[Print Workbook to Report]** option.

6.12. **Select** the **'Elemental Summary Level 1'** report that was previewed previously then **click** the **[Copy]** button.

6.13. In the **[Insert Report]** window, enter a **[Name:]** of "Elemental Summary-" followed by your name for the new report.

6.14. In the **[Workbook Data]** section, leave the **[From Level:]** as **1**, and use the drop-down arrow to amend the **[To Level:]** selection to **2** and then **click [Next]** to create the copy.

Editing Reports

Having created a copy of the existing report you can now amend this copy, creating a new layout showing the same workbook content in a different format.

6.15. **Click** on your **new report name** to highlight it and then **click** the **[Edit]** button.

6.16. The **[Report Properties]** window will open with the **[Data]** tab selected.

Editing Report Data

This means that information from both levels one and two of the workbook will now appear on the report.

6.17. In the **[Columns]** section there are two fields identifying the columns that are [Available] to be used in the report and those that have been [Selected] to appear. In the **[Selected]** field, **hold down the Ctrl** key and **click** on the **Code, Cost/Unit, Subtotal and Factor columns**. With all four highlighted, **click** on the remove **button** < to exclude them from the list of Selected columns meaning that they will no longer be shown in the report.

6.18. In the **[Available]** field, **click** on the **Autocode** column to highlight it, then **click** on the **add button** > to move it into the **[Selected]** field. **Click** on it again to re-highlight it then use the **Up** button to move it to the top of the list. The **Autocode** column will now be shown in the report, as the first column to the left hand side.

Editing Report Grouping

6.19. **Select** the **[Grouping]** tab at the top and in the **[Grouping]** section, **tick** the option box to show **[One Group/Page:]**

This means that each new group on Level 1 of the workbook (Substructure, Columns, Upper Floors, etc.) will commence printing on a new page.

6.20. Still in the **[Grouping]** section tick the option box adjacent to **[Show Group Number:]** Then, in the **[Numbering]** section at the bottom, use the drop-down menu for **[Group Numbering:]** to select **Letters**.

We have now specified that we wish each group on Level 1 of the workbook (Substructure, Columns, Upper Floors, etc.) to be identified by a letter, and that this should be printed on the report.

Editing the Report Page Layout

6.21. **Select** the **[Page Layout]** tab. This has sections under which the paper size and orientation, and the size of each margin can be set.

6.22. In the **[Grid Lines]** section ensure that the option box to **[Show Vertical Lines:]** is **ticked** then also **tick** the option for **[Full Page Vertical Lines:]**

This specifies that the vertical lines are printed over the full depth of the page, and not just to the bottom of the data shown.

6.23. **Un-tick** the option box for **[Show Horizontal Lines:]** to remove them from the output.

Editing the Report Header

6.24. **Click** on the **[Header]** tab. In the **[Custom Logo]** section, against **[File Name:]** use the browse button to find the CostX®.wmf file in the data set. **Highlight the file** and **click [Open]**.

6.25. Use the drop-down menu to amend the **[Show On:]** setting to **Right**, thereby placing the chosen logo to the right hand side of the report.

6.26. In the **[Layout]** section use the **[Header Layout:]** drop-down menu to choose **Three Column Title Only**. Three fields will open up in the **Report Title** section beneath.

6.27. **Delete** the **text** in the **[Left Title:]** field and replace it with **%WORKBOOK%**. This is a Report Keyword (in this case referring to the workbook name) a list of which can be found in the Help.

6.28. In the **[Centre Title]** field **enter** the Report Keyword **%BUILDING%** which will place the building name in the centre of the report header.

6.29. In the **[Fonts]** section, change the **[Page Header:]** and **[Group Header:]** text sizes to **10pt**.

Editing Column Data

6.30. **Click** on the **[Columns]** tab and open **[Column:]** drop-down the menu at the top. You will notice that the list includes all of the columns selected to appear in the report earlier in this exercise. This tab allows you to control how each of those selected columns are configured to behave.

6.31. **Select** the **[Autocode]** column and note that the **[Column Heading:]** field contains the Report Keyword **%COLUMNHEAD%** taking the column heading from the workbook onto the report.

6.32. **Delete** the **keyword** and **type** in "**Ref.**" as the text to appear in the Autocode column heading.

6.33. In the **[Column Data Options]** section use the **[Code Format:]** drop-down menu to **select <Group>.<Number in Group>** as the preferred **Autocode** option.

6.34. Now, use the **[Column:]** drop-down menu at the top to **select** the **Quantity** column.

6.35. Note that the Column Data Options section now has only two settings to control. **Use** the **[Show Zero As:]** drop-down menu to set your preferred method of displaying zero quantities.

6.36. Now, use the **[Column:]** drop-down menu at the top to **select** the **Rate** column. In the **[Column Data Options]** section **un-tick** the option box for **[Show Column Data:]** This means that, even though rates exist in the workbook they will no longer be shown on the report.

6.37. Use the **[Column:]** drop-down menu at the top to select the **Total** column. In the **[Column Footer Options]** section first **un-tick** the **[Show in Summary]** option box then, in the **[Column Data Options** section, **un-tick** the **[Show Column Data]** option. These settings will print an un-priced document.

Editing the Report Footer

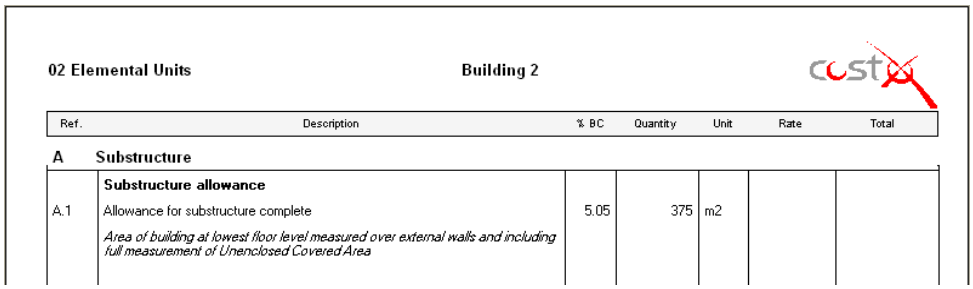
6.38. **Click** on the **[Footer]** tab and note the Report Keywords already entered into the three Text section fields.

6.39. In the **[Fonts]** section set the **[Page Footer:]** font size to **8pt**.

Previewing, Saving and Generating the Report

> *The amended layout can be viewed at any time by clicking the Preview button however changes are not saved until the Update button is clicked.*

6.40. **Click** the [**Preview]** button to compare your new layout to the original (see section 6.3 above) that was copied and edited. **Close** the preview and **click [Update]** to save your changes.



02 Elemental Units — Building 2

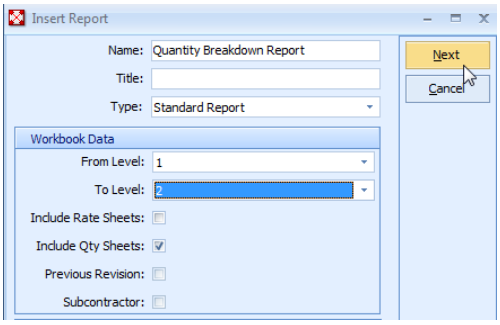
Ref.	Description	% BC	Quantity	Unit	Rate	Total
A	**Substructure**					
	Substructure allowance					
A.1	Allowance for substructure complete	5.05	375	m2		
	Area of building at lowest floor level measured over external walls and including full measurement of Unenclosed Covered Area					

6.41. In the Reports window ensure that the new report remains highlighted then **click** the **[Generate]** button. A **[Generate Report]** window appears outlining some of the report settings allowing them to be changed. Changes made here (as opposed to in Edit mode) are temporary and revert back to the original setting when the Building is closed.

6.42. In the **[Filter By:]** field **leave** the **A:Code** column **selected** and **tick** the **[Use]** option box. In **[Codes to Show:]** enter **FF** (the text in A:Code row 13 of the workbook) and **click [Preview]**. A report will generate showing only the Floor Finishes section. **Close** back to the Workbook.

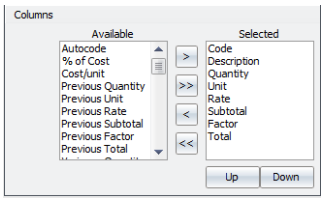
Creating a New Report

Next we will create a Quantity Breakdown Report to show any calculations carried out in the quantity sheets. We will utilise the settings covered in the previous section.



6.43. **Click** on the **[Reports]** button in the **[Workbooks]** tab, and when the **[Reports]** window opens **select** the **[Insert]** button. **Name** it "**Quantity Breakdown Report"**.

6.44. **Select levels 1 to 2** for the **[Workbook Data]** section, and ensure the **[Include Qty Sheets]** box is **ticked**. Ensure the selected columns reflect the image to the right.



6.45. **Click [Next]** to create a new report

6.46. In **[Report Properties]** window, **Click** on the **[Grouping]** tab and select **[One Group/Page]**, this will show each element on a new page.

6.47. Next in the **[Header]** tab, **select** the layout **[Single Title Only]** and **call** the report **"Quantity Breakdowns"** and align the text to **[Shown On] Center**.

6.48. In the next tab **[Columns]** change the settings for the columns in the workbook as follows:

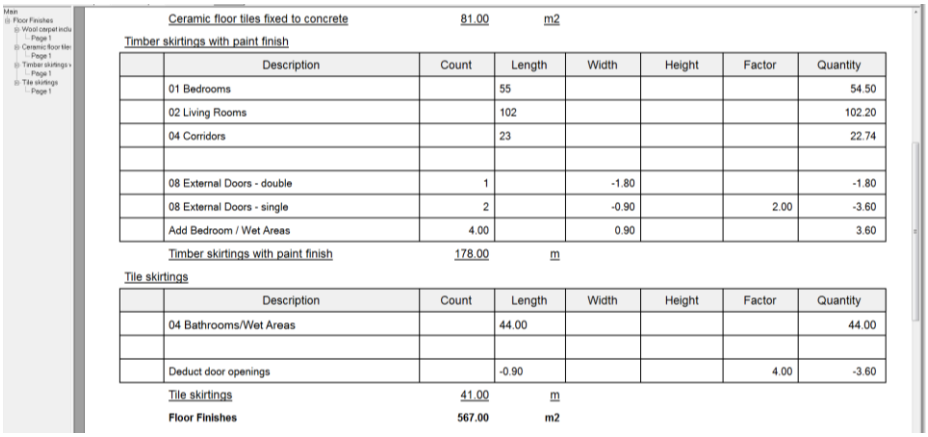
Code – Ensure **[Show in Group Footer]** is **ticked**

Description – Ensure **[Show in Group Footer]** is **ticked**

Quantity – Ensure **[Show in Group Footer]** is **ticked**, and **select [Workbook Value]** for **Group Footer Value**

Unit – Ensure **[Show in Group Footer]** is **ticked**

6.49. **Select** the **[Insert]** button once the setting above have been adjusted, then **select** the **{ Quantity Breakdown Report }** from the list of Reports and **select [Generate]**, In the **[Filter By:]** field leave the **A:Code** column selected and **tick the Use** option box. In **[Codes to Show:]** enter "**FF"** (the text in A:Code row 13 of the workbook) and **click [Preview]**. A report will generate showing only the quantity breakdown for Floor Finishes section.



Ceramic floor tiles fixed to concrete 81.00 m2

Timber skirtings with paint finish

	Description	Count	Length	Width	Height	Factor	Quantity
	01 Bedrooms		55				54.50
	02 Living Rooms		102				102.20
	04 Corridors		23				22.74
	08 External Doors - double	1		-1.80			-1.80
	08 External Doors - single	2		-0.90		2.00	-3.60
	Add Bedroom / Wet Areas	4.00		0.90			3.60

Timber skirtings with paint finish 178.00 m

Tile skirtings

	Description	Count	Length	Width	Height	Factor	Quantity
	04 Bathrooms/Wet Areas		44.00				44.00
	Deduct door openings		-0.90			4.00	-3.60

Tile skirtings 41.00 m

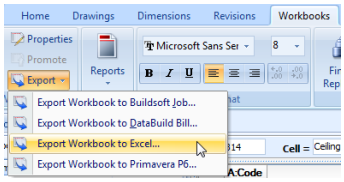
Floor Finishes 567.00 m2

Module 7: External Data & System Administration

As well as being able to export and import files created in CostX® you may also export to, and import from, files prepared in a number of external applications. This is the case for both Workbooks and various aspects of System Administration. We have already worked in System Administration in earlier exercises to create a Rate Library. In Module 7 we shall review the alternative Workbook import options, before copying an Excel® workbook into our building then review the various System Administration entities and their import and export availability.

Workbook Exports and Imports

7.1. **Click** the **[Export]** button on the **[Workbooks]** ribbon. To enable Buildsoft, DataBuild, and Primavera P6 users to view and amend Workbooks prepared in CostX® options exist to export in these formats, as well as the ability to export to Excel®.



In Excel® the Workbook will be reproduced on a single worksheet tab with the data inserted as static values with no live-link back to the CostX® database. To live-link CostX® data into Excel®, use Exactal's CostXL® software.

7.2. **Click** on the bottom section of the **[Add Workbook]** button to open the drop-down menu. An option exists to import from a Buildsoft Backup File (.e0x).

All data contained in the file can be imported into a CostX® workbook. There is also the option to import UK building cost analyses from BCIS Online, providing access to over 16,000 building models and associated cost and tender information. The building models are available on a subscription basis and can be downloaded to an XML file. CostX® also supports importing building models with cost breakdowns from CXF files. These are available on a subscription basis from CostWeb and are created by exporting the online information directly to a CXF file.

7.3. From the drop-down menu select **[Add Workbook]**.

7.4. In the **[Workbook Properties]** window enter a **[Name:]** for your workbook such as "**03 Excel® Import**" and **click [Insert]**.

7.5. **Start Excel®** on your computer and **open** the **{ Residential Workbook.xls }** file from the training dataset.

7.6. On the **[Summary]** tab of the **Excel® Workbook highlight cells A2:D34** then, hovering over the highlighted cells, **click** the **right mouse** button and **select [Copy]**.

7.7. **Click** on the  **button** in the **Taskbar** at the bottom of the screen to switch back to CostX®. **Click** the **right mouse** button over cell **A1** of the CostX® Workbook and **select [Paste]**. The Excel® Summary worksheet is copied into your new CostX® Workbook.

7.8. **Click** on the  **button** in the **Taskbar** at the bottom of the screen to re-activate Excel® then **click** on the **{ E01 Site }** worksheet tab to open it. **Highlight cells A5:E16** and, hovering over the highlighted cells, **click the right mouse** button and **select [Copy]**.

7.9. Switch **back to CostX®** and **double click** on the **[F:Subtotal]** cell on the same row as the **{ Site Preparation }** heading (F2) to **open** the **Level 2** Cost sheet. **Click** the **right mouse** button in cell **A2 of the CostX®** Workbook then **select [Paste]**.

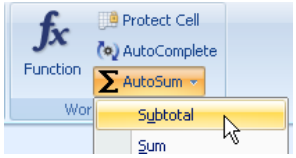
> *Note that formatting from Excel® is carried into CostX® and that formulas are automatically entered in rows F:Subtotal and H:Total*

7.10. **Click** on the  **button** to return to Level 1 of the workbook. The total of the Site Preparation element is entered against the Level 1 heading.

7.11. **Repeat the process** to copy and paste further Excel® worksheets to their respective Level 2 workbook in CostX®.

7.12. Having copied in a number of elemental sections, **click** on the **[H:Total]** column on the same row as the Construction Total heading on Level 1 in CostX® (H27). **Hold down the left mouse** button and **drag the cursor** to **highlight cells H27 up to H1**.

7.13. In the Workbooks ribbon menu **click** on the **[AutoSum]** button and **select [Subtotal]** from the drop-down menu. The value of all figures in the highlighted cells will be subtotalled in the bottom one.



7.14. Next in column **[F:Subtotal]** against the **{ Allowance for Preliminaries }** heading (F29) **enter** the following **formula** to calculate the Preliminaries by percentage, rounded up to the nearest thousand: **"=ROUNDUP(H$27*C29%,-3)"**. Refer to the Help files (Refer to Workbooks > Cell Equations Topics) for information on entering formulas.

7.15. **Click** on the **cell containing the formula** just entered and, holding the left mouse button drag the cursor over the **two cells below (F30 and F31) to highlight** all three. **Hold down the Ctrl** button and **press the D** key to duplicate the formula from the top cell to those highlighted below creating Margin and Contingency values by percentage based on the Construction Total figure.

7.16. **Click** on the **[H:Total]** column against the **{ Estimate Total }** heading (H33). **Hold down** the **left mouse** button and **drag the cursor** to highlight from this cell **up to H1** then use the AutoSum button to enter a **Subtotal** as before.

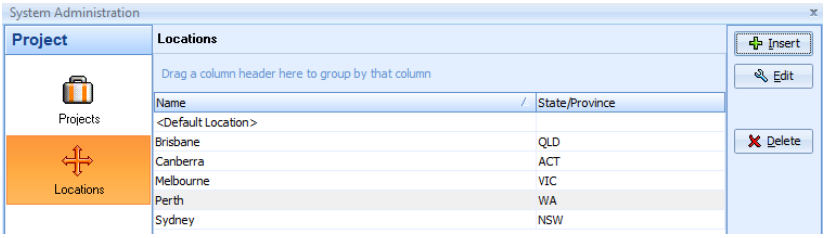
Spreadsheets can be quickly copied into CostX® to take advantage of the additional features offered.

System Administration

System Administration is used to set up or tailor the CostX® system and, as settings applied here are system-wide, changes are seen by all networked users. A Help button is present on the right hand side of all System Administration windows enabling access to further information (Using the System Administration topics) at any time.

Locations

7.17. From the **[Main Menu]** open **[System Administration]** and **click** on the **[Locations]** folder button.



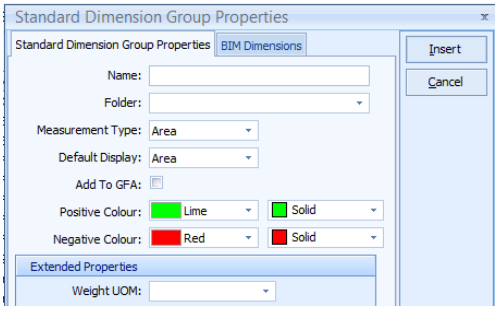
Locations can be established to differentiate prices within a Rate Library.

7.18. To create a list of Locations simply **click** on the **[Insert]** button and complete the fields.

Locations can be established to differentiate prices within a Rate Library. Once established, differing prices can be allocated to differing Locations within a Rate Library. Location: is then set for each Project aligning that Project with the correct set of rates. Applying <Default Location> to items in a Rate Library is akin to a 'global' setting as rates with a <Default Location> can be used on any Project, irrespective of its specified Location.

Standard Dimension Groups

As we have already seen in earlier exercises Dimension Groups can be added ad-hoc as required, or copied into a Building as part of a template. In addition to this a list of Standard Dimension Groups can be created in System Administration and the option set to copy them to each new Building by default.

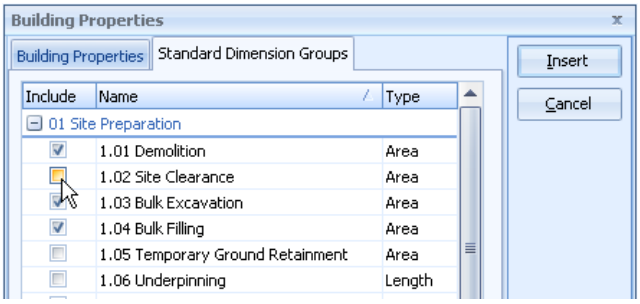


7.19. **Click** on the **[Measurement]** button at the bottom left of the System Administration window, **click** on the **[Standard Dimension Groups]** folder above, then **click [Insert]**. The **[Standard Dimension Group Properties]** window will **open**. The Name; Folder; and Measurement Type: fields, and the Add to GFA: checkbox are the same as when creating Dimension Groups from within a Building.

There is, however, an additional Include By Default: checkbox which, if ticked ensures that the Standard Dimension Group is copied into all new Buildings. Note that if a New Building is created Based On a previous building, The Standard Dimension Groups selected as Include By Default will not be inserted into this new building. There is also a Notes: field which may be completed if desired.

7.20. **Click [Cancel]** to close the **[Standard Dimension Group Properties]** window.

Once Standard Dimension Groups have been created, when a new Building is added and the Building Properties window appears, they will be listed on the Standard Dimensions Groups tab in their respective folders (see below). Depending on the Include by Default setting of each Standard Dimension Group in System Administration the checkbox in the Include column will be set against each one. Ticking or un-ticking these boxes before clicking the Insert button will determine whether or not each Standard Dimension Group is copied into the Building.



Standard Zones

Zones allow Dimensions to be extracted on a per level/unit/story/functional area basis. Zones essentially provide the ability to categorise Dimensions and therefore can even be used to categorise by time (the stage of construction). You can later filter by these zones. In System Administration a list of Standard Zones can be created which are the applied to each new Building. The use of Zones is covered in the Advanced Training course.

Units of Measure

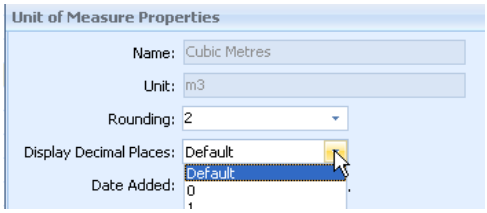
This holds typical abbreviations for units of measurement and allows the calculation and display rounding to be set individually for each one.

7.21. **Click** on the **[Unit of Measure]** folder button.

7.22. **Click** on **any row** to select it and then **click** the **[Edit]** button.

7.23. Using the drop-down menu to set the number of decimal places for **[Rounding:]** will alter the rounding applied when dragging-and-dropping Dimension Groups, and for summary calculations in Workbooks.

7.24. Setting the **[Display Decimal Places:]** alters the default Workbook setting for that Unit of Measure.



7.25. **Click [Cancel]** to close the **[Unit of Measure Properties]** window without saving any changes.

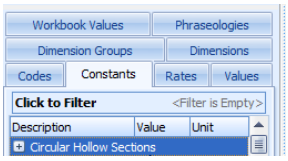
Code Libraries

Codes can be used in workbooks to flag items, thereby allowing the workbook to be re-sorted according to codes e.g. If a workbook has been structured in an elemental format and needs to be re-sorted to a trade format (or vice versa), this can be accomplished by generating a new workbook based on assigned codes. Code Libraries for any other coding categories such as building level, building block, options, accounting codes, etc; can be set up and used.

7.26. **Click** on the **[Costing]** button at the bottom left of the **[System Administration]** window, then open the **[Code Libraries]** folder above.

By clicking on the drop-down arrow on the Import button codes established in other people's CostX® systems, Buildsoft, or in Excel® (saved as .csv) may be brought into CostX®. Similarly, code libraries may be exported to Exactal Exchange File (.exf) or spreadsheet (.csv) formats. Coding is covered in the Advanced Training course.

Constants



A library of Constants can be set up or imported into CostX® for use in Workbook calculations e.g. structural and reinforcing steel weights, labour and plant hours, or conversion factors. Once entered Constants can be accessed and dragged into Workbooks from the Constants tab in the side pane. Lists of Constants may be prepared in Excel® where column A contains the Name, B the Value, C the Unit of Measure and D the Folder used to group the Constants. Use the Save As feature in Excel® to save the list as a CSV file type.

7.27. **Click** on the **[Constants]** folder button.

7.28. **Open** the **{ Steel Constants.csv }** file from the training data set and review the content.

7.29. If not already established in your system, use the **[Import Constants from CSV]** option on the Import button drop-down menu in CostX® to import this.

7.30. **Click [Close]** to exit out of **[System Administration]**.

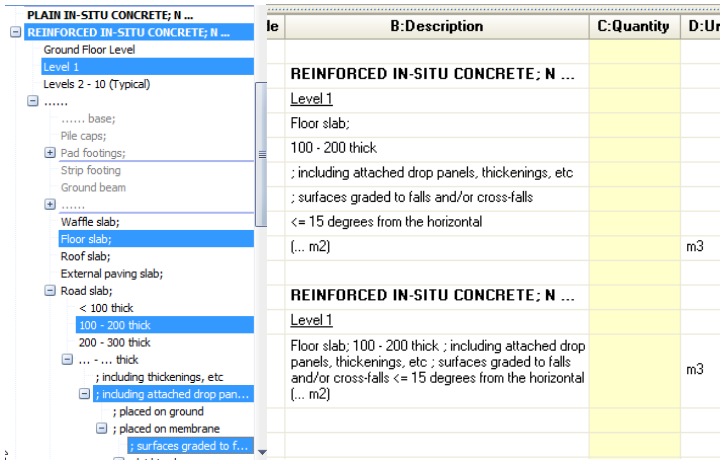
7.31. **Drill down** into the **[C:Quantity]** column of the Workbook to open a Qty sheet.

7.32. **Click** on the **[Constants]** tab in the side bar to see the Constants folders that were imported.

7.33. **Click** on a ⊞ **button** to open a folder then **drag-and-drop** a Constant into the **[F:Factor]** column of the Workbook. A live-link has been established to that Constant meaning that any quantity calculation entered on that row will be factored by the value of the Constant.

Phraseologies

A library of standard phraseologies or model description libraries may be imported into CostX® and accessed via a Phraseologies tab within Costing View to drag and drop predefined text into workbooks. Text strings may be selected individually or combined to create detailed descriptions.



Rate Libraries

We have already created a Rate Library in an earlier exercise however it is worth noting that by clicking on the drop-down arrow on the Import button rate libraries established in other user's CostX® systems, Buildsoft, CIT C21 or in Excel® (saved as .csv) may be brought into CostX® along with downloads from CostWeb. Similarly, rate libraries may be exported to Exactal Exchange Files (.exf).

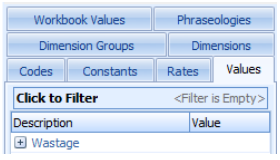
Rate Libraries prepared in Excel® must start in row 1 of the worksheet (i.e. contain no heading row) and have data entered into the respective columns outlined below. Use the Save As feature in Excel® to create a CSV (comma delimited) file type.

	A	B	C	D	E	F
16	Ply-9mm	9mm Construction Plywood - 5ply	Sheet Material	m2	14.92	Auckland
17	Ply-12mm	12mm Construction Plywood - 5ply	Sheet Material	m2	15.74	Auckland
18	Ply-17mm	17mm Construction Plywood - 7ply	Sheet Material	m2	20.5	Auckland
19	Ply-21mm	21mm Construction Plywood - 7ply	Sheet Material	m2	22.36	Auckland

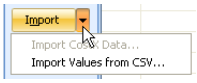
A.Unique Code B. Description C. Folder Name D. Unit of Measure E. Rate F. Location

Values

Values can represent any numeric amount that you wish to reference in workbooks e.g. wastage factors, margin, overhead allowances, etc. Once entered, Values can be accessed and dragged into Workbooks from the Values tab in the side pane.



Lists of Values may be prepared in Excel® where column A contains the Name, B the Value, and C the Folder used to group the Values. Use the Save As feature in Excel® to save the list as a CSV file type. This can then be imported into CostX® using the Import Values from CSV option on the Import button drop-down menu.



Values may set up or overridden on a per project basis by setting up a list of Values in the Project Properties window.

Module 8: 3D Measurement

CostX® has the ability to extract quantities from BIM (Building Information Model) drawings in a 3D format. There are a variety of methods that can be used to extract these quantities which range from single selection of objects through to an automatic quantity takeoff. This section of the exercise will run through the various techniques that can be used in order to extract quantities as these differ from techniques used on 2D drawings. The drawing used is a DWF (Design Web Format) file published from Revit® Architecture.

Building Set Up (PFC 5-1)

8.1. Firstly **[Add]** a **[New Building]**, give it a **name** (e.g. "**Building 3 - BIM**") and **select** the **Project** named '**Training-Your Name**' to attach it to.

8.2. Once the Building has been created **click** the **[Add]** drawing button. From the training dataset **select** the drawing **{ EcoHomes 3D.dwf }** and **click [Open]**. In the **[Drawing Properties]** window, **enter [Folder:]** name "**3D Model**" and **click [Insert]** to add the drawing.

Navigating Around the Drawing and Adjusting Views (PFC 5-2)

There are a number of ways to navigate around the drawing. Similar to a 2D drawing you can zoom in and out via the mouse wheel. You can also hold the wheel to pan around the drawing. You will also notice that there is a View Cube in the top right hand corner of the drawing view. This can assist to move the drawing around to a selected viewing perspective by clicking on any of the face, edge or corner facets. It is also possible to rotate the drawing by holding the left click on the mouse and moving the mouse.

Note that when a 3D drawing is selected, additional icons in the ribbon will be illuminated. These icons can be clicked on and off and will return a different view of the model each time another icon is selected. These icons can be selected simultaneously or separately and provide different views.

When the drawing is added CostX® also creates a number of layers. This allows the user to switch off layers in a similar way to 2D drawings.

8.3. CostX® also allows individual objects to be temporarily hidden. To do this **position the mouse over the object**, **click the right mouse** button and **select [Hide Object In]** from the menu. **Try hiding** some of the **roof** or **external wall** objects.

Notice that internal objects (e.g. doors, fittings etc.) that were previously obscured from view can now be seen and selected (by moving the mouse over them).

8.4. To re-display all objects again **right click** anywhere on the drawing and **select [Show All Objects]** from the menu.

8.5. It is also possible to walk through the building. To do this, firstly **select** an **elevation view** by using the view cube. Then, **holding the E** key on the keyboard, **move the mouse** either **forwards** or backwards to move through the building (see overleaf). You can then scroll the mouse wheel to zoom in and out and or hold down the mouse wheel to pan around. To return to the normal view, **click** the **right mouse** button and **select [Reset View]**.

8.6. CostX® additionally allows the displayed objects to be filtered by their grouping information. In this part of the exercise we will filter the door objects. Firstly **select** the **front view** by clicking the right mouse button and selecting Default View. **Move the mouse over the external garage door**, **click the right mouse** button then hover the mouse over the **[Show Only Objects In]** menu item. A sub-menu is displayed with up to four increasingly refined grouping levels. **Click** on the top **{ Doors(19) }** item to display all 19 doors (i.e. all types and sizes).

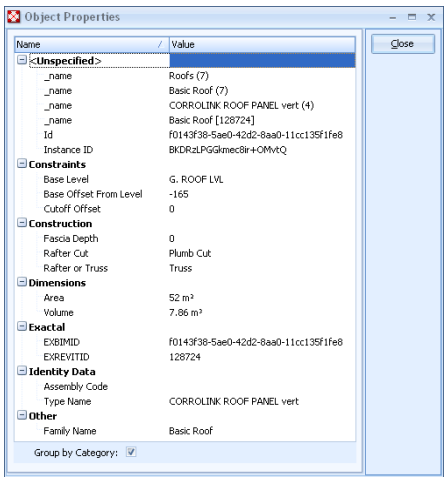
8.7. Next **right click on** one of the **flush internal doors**, hover the mouse over the **[Show Only Objects In]** menu and **select** the 2nd sub-menu item **{ M_Single-Flush (10) }**. Notice now that only the 10 flush doors are displayed.

8.8. **Right click on** one of the **displayed doors**, hover the mouse over the **[Show Only Objects In]** menu and select the **3rd filter sub-menu** item which will be the size of the selected door. Notice now that only a few doors matching the selected size are displayed.

8.9. To display all 19 doors again re-select the top option of **{ Doors(19) }** sub-menu. To re-display all objects again **right click** anywhere on the drawing and **select [Show All Objects]**.

Measurement

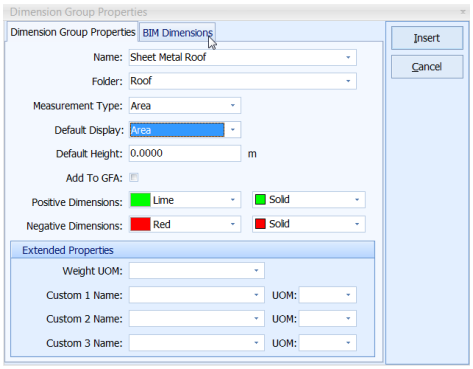
8.10. Before commencing measurement it is worth taking a look at the data contained within the model. To view this data **move the cursor over an object** on the drawing, **right click** and **select [Object Properties]**.



A window will open listing the properties specific to that object (i.e. roof). The Object Properties contain the parametric model data exported into the DWF file from the Revit® model. In this model the Revit® naming conventions form part of the object's family hierarchy, this being the category, family name and type. All of these are useful for both automatic and manual takeoffs. The other important information that is provided is the dimensions.

8.11. **[Close]** the window

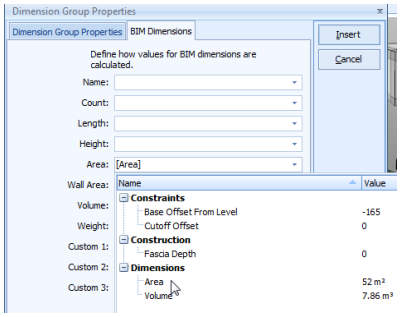
Object Mode (PFC 5-3)



Normally the workflow sequence when taking dimensions from 3D drawings would be to generate the quantities automatically from the BIM properties (this is covered in further detail later in this section). Supplementary dimension groups and additional measurement can subsequently be added as required. However for the purpose of progressively introducing the principles of the topic in this training exercise we will reverse the normal workflow and start with the measurement of individual objects.

Object Mode differs from normal 2D measurement. The first aspect that is different is in creation of Dimension Groups.

8.12. To create a Dimension Group in Object Mode, **right click on a roof object**, in this case the roof, and **select [Create Dimension Group].**



8.13. **Fill out** the **[Dimension Group Properties]** as per the first example screen shot then **click** on the **[BIM Dimensions]** tab.

These fields allow the user to select the source of the object property information from the model to create dimension group parameters.

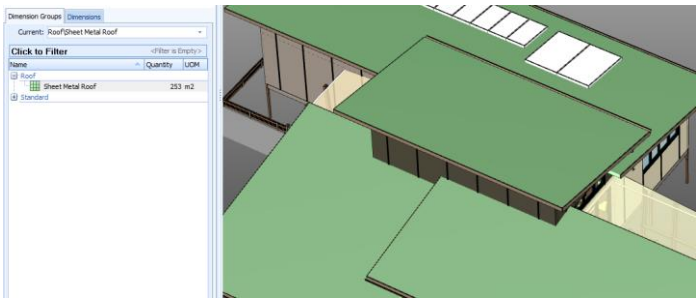
8.14. For this example first **select the drop down menu** next to the **[Area:]** field. The drop down menu displays the **[Object Properties]** list. From the list **select** the **Area** property.

8.15. You will also note that there is another object property listed referring to the volume. **Select Volume** using the drop down menu next to the **[Volume:]** field. This will allow this secondary quantity to be available from the dimension group.

8.16. **Click [Insert]**. The dimension group will be added to the task pane ready to receive dimensions.

8.17. To measure the roof **move the cursor over the roof object**. Once the object is highlighted, **click** the **left mouse** button to select the object. Once selected, the quantity will be added to the Dimension Group.

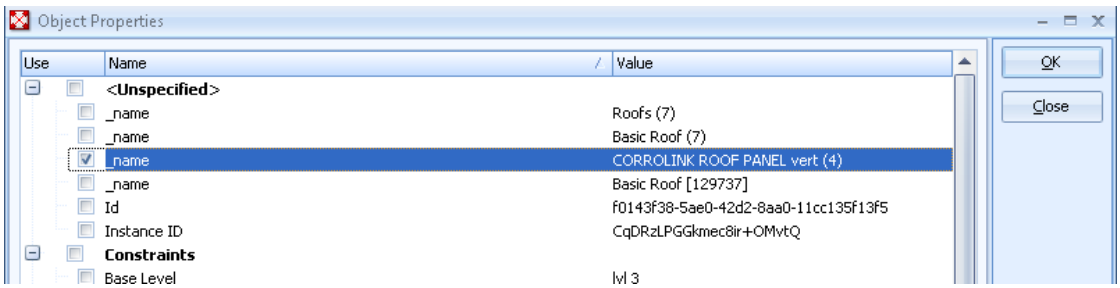
8.18. **Continue selecting** the other roof **objects**. Once complete the four roof objects should be selected and the Dimension Group should indicate a quantity of 253m2 as per the screenshot below. **Hover the mouse over the Dimension Group** and the hint box will also show the number of roof areas measured (count) and the volume.



An alternative and faster way to measure in Object Mode is to select objects which have matching properties. This will select and measure all objects from the model which have an exact match to the selected properties (e.g. name, etc).

8.19. Using the roof again, firstly **clear** the previously **measured dimensions** by right mouse button and select **[Clear all dimensions]**.

8.20. To select and measure multiple objects at once, **right click on an object**, in this case the roof, and **select [Import Object In]**, from the proceeding submenu **select [Custom...]** The **[Object Properties]** window will open in which there is the option to check the boxes to determine which properties will be selected to filter the objects. For this exercise **check** the box next to **[CORROLINK ROOF PANEL]** and **click [OK]**.



CostX® will now search for anything in the model that has a naming convention of CORROLINK ROOF PANEL and return the object quantity. Notice the quantity returned is the same as the previously used method for measuring the roof.

Importing Dimensions from BIM properties (PFC 5-4)

> *CostX® also gives the user the option to import dimensions in an automated process directly from the 3D model. This is done by extracting the parametric model data from the object properties within the DWF, and creating a list of Dimension Groups populated with quantities. This can be done for selected objects or for all objects within the model.*

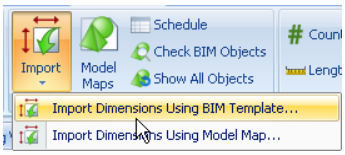
8.21. Firstly **select** the **{ Sheet Metal Roof }** dimension group, **click the right mouse** button and **select [Delete Dimension Group]**.

8.22. To import dimensions for selected objects, in this case doors, first **right click** and **select [Show All Objects]**.

8.23. **Move the mouse on** to a section of **roof**, **right click** and **select [Hide Object In]**, and in the following sub menu select **{ Roofs (7) }** to reveal the building interior.

8.24. **Hover over an internal door** and **right click**. **Select [Show Only Objects In]** and **click** on **{ Doors (19) }** so that only the 19 doors are displayed.

8.25. On the **[Dimensions]** ribbon, **click** the **[Import]** button and **select [Import Dimensions Using BIM Templates].**



8.26. A **warning message** will state that Data will be imported for visible objects only, **select [Yes]**.

> *The Select BIM Import Template window will appear containing a list of XSLT files written specifically to extract and sort data from the model. The data can be extracted from various object parameters, but the default is to categorise it in accordance with the Revit® object hierarchy of category, family name and type.*

8.27. A **Select [BIM Import Template]** window will appear. **Select** the **BIM Import Revit® General** file and **click [Open]**.

> *A progress bar will appear whilst the system extracts data from the model and creates Dimension Groups using the Revit® category to name the Dimension Group Folder, and the Revit® family name + family type to name the Dimension Group.*

8.28. A Dimension Group Folder named Doors will be created populated with the door quantities. **Open** the **[Dimension]** tab for an individual Dimension Group and use the right click menu to view or isolate individual dimensions.

8.29. Now **right click on the drawing** and **select [Show All Objects]**. Use the **[Show Only Objects In]** as before to **display** only the **windows** and then **import** the **window dimensions**.

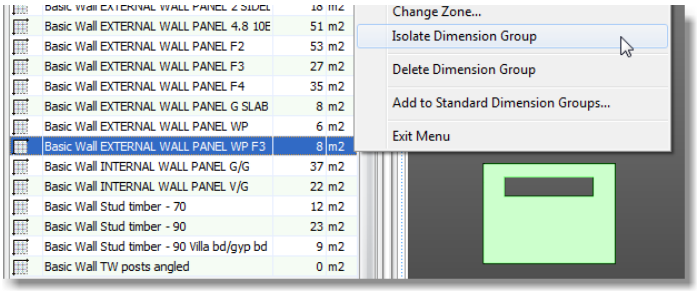
> *This process demonstrates that the BIM dimensions will be imported for whatever objects are displayed on the screen.*

8.30. To import the dimensions for all objects that have been modelled in the drawing **click the right mouse** button and **select [Show All Objects]**, then **Import [Dimensions Using BIM Template]** as before.

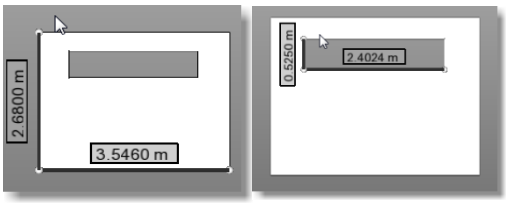
Of course, the dimensions generated are dependent upon the information that has been created in the model and may need to be augmented for estimating or scheduling purposes. This is done by adding 2D views from the DWF and measuring additional quantities, or adding additional dimension groups to complete the take-off.

Checking BIM Import

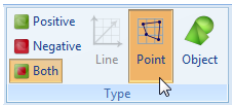
8.31. We will now use a few 3D measure functions to verify the integrity of the imported dimensions, firstly open the Dimension Group Folder called Walls and **highlight the Dimension group { Basic Wall EXTERNAL WALL PANEL WP F3 }** with 8m2. Now **right click** on this dimension group and **select [Isolate Dimension Group]**.



8.32. Now you can **use the Measure Distance** tool to click from point to point of this wall panel, hence **measure** the **length and height** of the wall panel and the opening. Remember to hold the Ctrl Key to select multiple segments. Multiplying these figures and **deducting the opening** (using a calculator) will give us 8.24 m2 compared to our 8m2 using the BIM import.

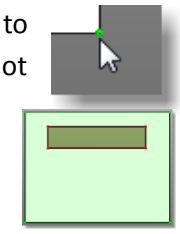


8.33. We will now carry out an alternate checking method, **select** the **[Add]** button in the **[Dimensions]** ribbon. **Create a Dimension Group** called **{ Wall Area Manual Measure }** in the folder **{ Walls }** with a **[Measurement Type:]** and **[Default Display:]**of **Area**, and **select** the **[Insert]** button.



8.34. To carry out a manual measure in 3D - **switch** to **[Point]** mode by selecting the **[Point]** button in the **[Dimensions]** ribbon under **[Type]** section.

8.35. With Object Mode switched off you will be able to **select point to point** manually, to measure an area select a point hover the mouse over the desired vertices, a green dot will appear, press the left mouse click to select.



8.36. Now select the remaining 3 corners in a similar manner and **press the Enter** key to finalise the area, similarly you can **use the Negative function** to carry out a deduction **for the wall opening**.

This measurement will register an area of around 8.24m2, which is consistent with the calculator measurement earlier and the BIM import measure. The reason for the 0.24m2 difference can be explained from the rounding settings used by the designer within the design program. The setting allows designers to set the number of decimal places for rounding. This particular model has all the Areas rounded to no decimal places, hence the 8.24m2 have been rounded to 8m2.

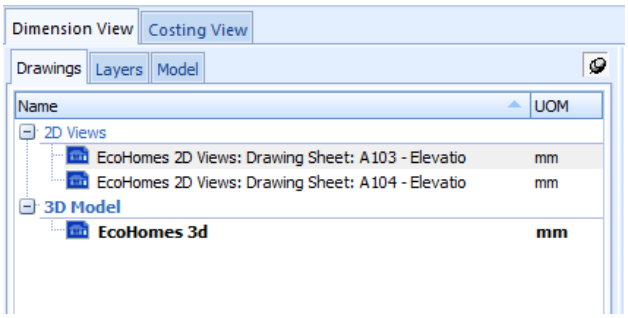
Additional Quantities

8.37. The BIM import created a Dimension Group folder named Mass. **Open** the **{ Mass }** folder and note that it contains numerous Dimension Groups with a quantity of 1. **Select one of the Dimension Groups** then **click the right mouse** button and **choose [Isolate Dimension Group]**. A single batten on the façade cladding will be shown on screen.

8.38. **Move the mouse over the batten**, **click the right mouse** button and **select [Show Only Objects In]**. A menu will open outlining the Category, Family, Type and the individual Object. **Select** to **filter by the Category**, Mass (117) to show all of the Mass objects

8.39. The battens need to be measured by length. **Click the right mouse** button **over a batten** and **select [Object Properties]**. You will see that the designer has not established a linear parameter for these objects in the model therefore the length will need to be measured in normal mode.

8.40. **Add** the drawing **{ EcoHomes 2D Views.dwf }** from the dataset. This is a multi-sheet dwf containing several 2D views of the model. It is possible to select all views but to avoid cluttering the drawings list **select** and **insert { Elevations 1 } and { Elevations 2 }** under Drawing Folder called "**2D Views**" using the Ctrl key to do multiple select.



8.41. **Close** the **{ Mass }** Dimension Group folder and then **click** the **right mouse** button and **select [Delete Folder]**.

8.42. Now **click** on the **[Add]** button in the **[Dimensions]** ribbon menu and **add a Dimension Group** called **{ Battens }** in the **{ Walls }** folder, with a **[Measurement Type:]** and **[Default Display:]** of **length**.

8.43. **Measure** the **battens** from each of the four elevations by clicking on them in the normal way.

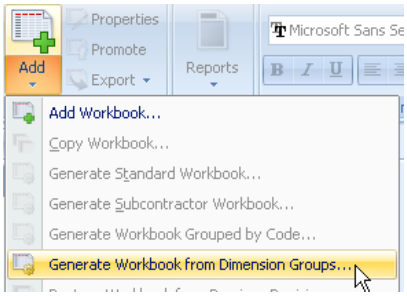
> *Using this method it is also possible to add additional dimensions into the existing BIM generated Dimension Groups, if required.*
>
> *As there are no ceiling objects in the model, the BIM import didn't generate any ceilings dimensions. Therefore add the EcoHomes 2D Views.dwf drawing again, this time selecting the ceilings plan.*

8.44. **Add** a new **Dimension Group** called **{ Ceilings }** and **measure** the **ceilings** from the plan.

Workbooks

8.45. It is now possible to create a Workbook based on the Dimension Groups. Firstly **switch over** to the **[Costing View]**.

8.46. From the Add Workbook drop down menu **select [Generate Workbook from Dimension Groups]**.



8.47. In the **Workbook Properties** window type in "**Estimate**" for name of the Workbook and **click [OK]**.

CostX® will generate a two level Workbook based on the Dimension Groups and folders. On the first level (summary level) it will take across the Dimension Group Folder and on the second level (detail level) it will list the Dimension Groups and bring across the live-linked quantities. The only thing left to do is edit the descriptions, relocate any items as necessary and fill out the rates.

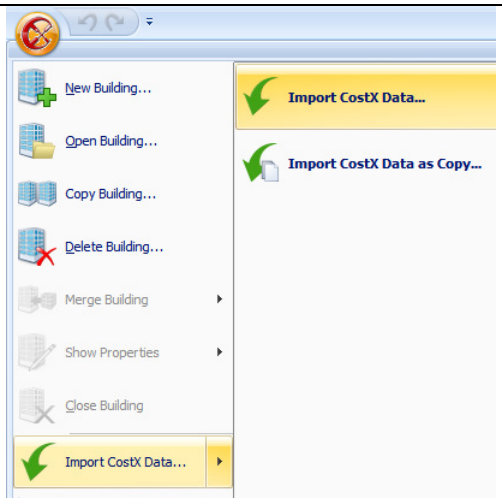
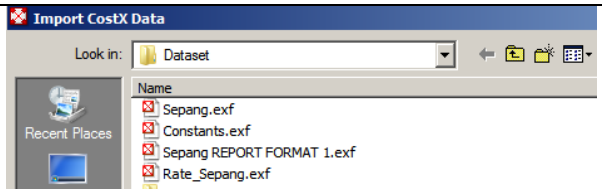
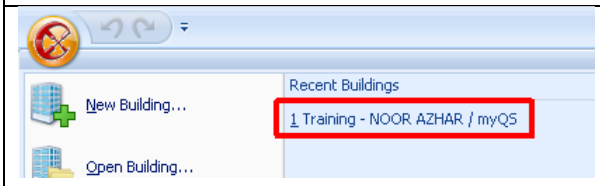
It is also possible to create Workbook templates and Rate Libraries pre-set to the family categorizations used by the Architect to bring a high level of automation to the process.

Disclaimer

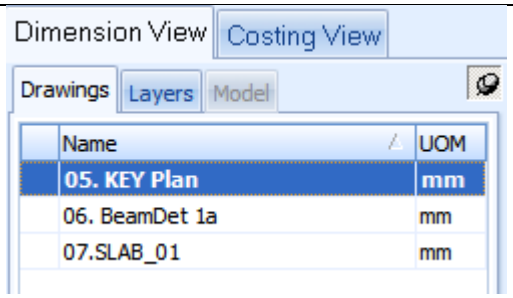
This dataset is an example only, to be used solely for the purpose of the training exercise. It is not to be used as a template for business operations. Exactal and its employees accept no liability for use of this dataset for business purposes.

TOPIC 2 : STRUCTURAL ELEMENTS

2.1 DATASET PREPARATION

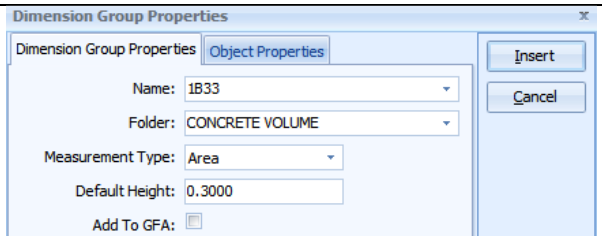
	1. Close any existing Building. 2. Import CostX Data > Import CostX Data 3. Browse to folder “2 STRUCTURAL\Dataset” > myQS.exf. 4. In the “Select Data To Import” interface, just hit “Select”. 5. In the “Select Project To Attach Buildings To”, select “Training - *<your name>*”; then hit “Select”. 6. “Import Completed” > “OK”.
	7. Repeat steps 2 – 6 to import the followings: i. Sepang_Constants.exf ii. Sepang_Rate.exf iii. MALAYSIA BoQ FORMAT 1.exf iv. MALAYSIA BoQ FORMAT 2.exf
	8. Open “Training - *<your name>* / myQS” database.

2.2 MEASURING CONCRETE VOLUME

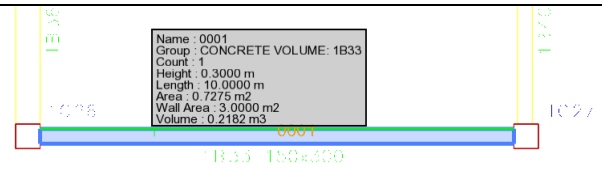


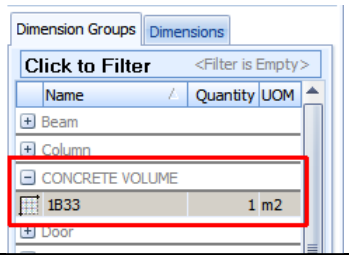
1. "Dimension View" tab > "05. KEY Plan.

Note : Alternatively, hit "F9" keyboard to switch to "Dimension View" tab.



2. "Home" tab > "Add Dimension Group".



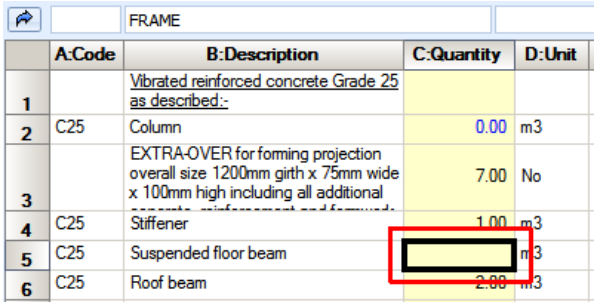


3. Zoom to beam "1B33 150x300".

4. Position the cursor inside beam 1B33 > HOLD-SHIFT keyboard > Click.

Note : Alternatively, click all four sides of beam 1B33 and ENTER keyboard.

5. The measurement is as shown.

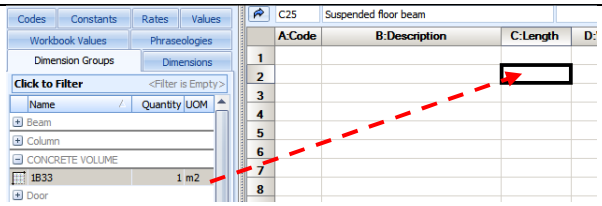


6. "Costing View" tab > highlight "Sepang" workbook.

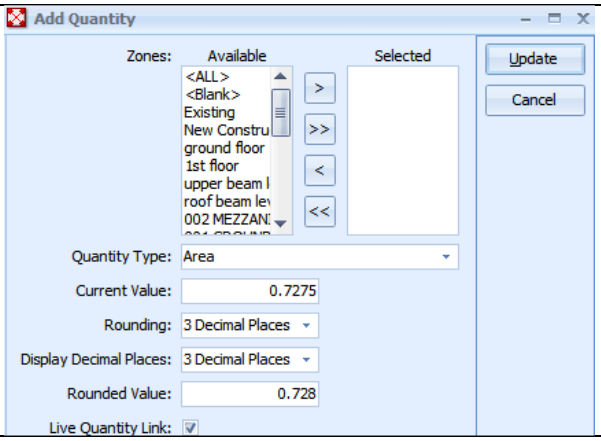
Note : Alternatively, hit "F10" keyboard to switch to "Costing View" tab.

7. Double-click "sub-total" of "FRAME".

8. Double-click "Quantity" of "Suspended floor beam".



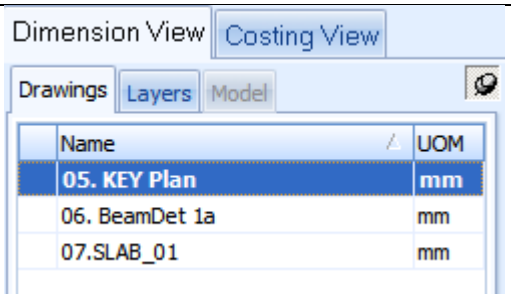
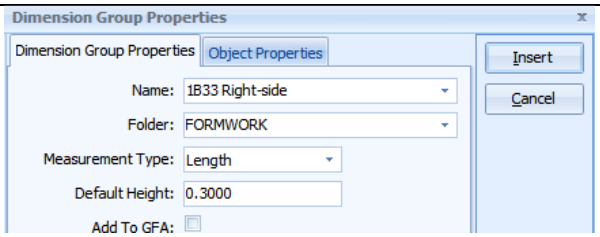
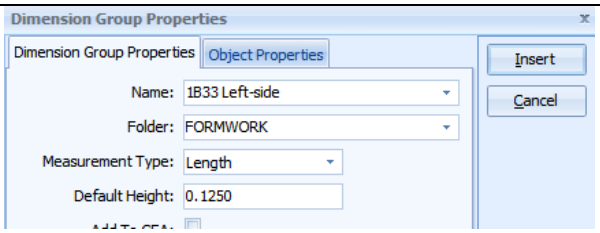
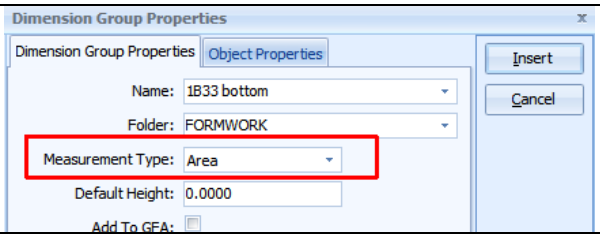
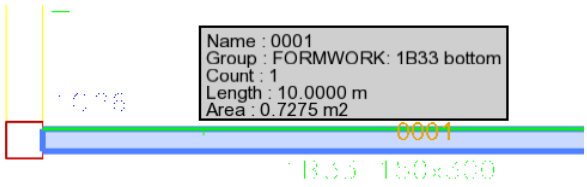
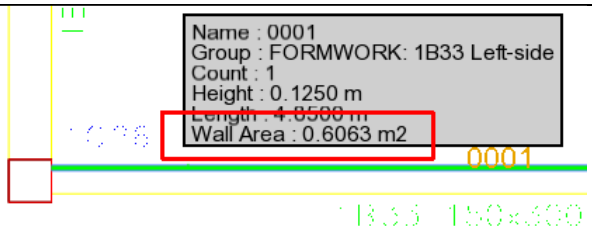
9. Drag-drop the 1B33 quantity into the workbook as shown.

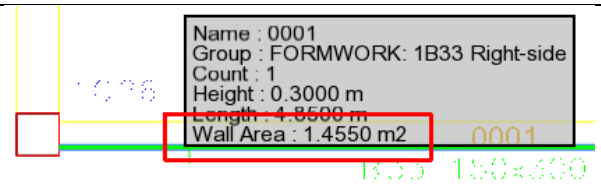


10. In the "Add Quantity" interface, update necessary attributes > Update.

11. Repeat steps 1 – 10 for other structural elements.

2.3 MEASURING SAWN FORMWORK

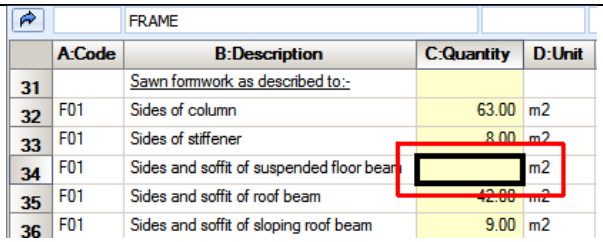
	1. "Dimension View" tab > "05. KEY Plan. Note : Alternatively, hit "F9" keyboard to switch to "Dimension View" tab.
	2. "Home" tab > "Add Dimension Group". Note : For beam 1B33, the right-side is clear ground. Therefore, the formwork depth is the beam depth.
	3. "Home" tab > "Add Dimension Group". Note : For beam 1B33, the left-side is connected to 175mm thick slab. Therefore, the formwork depth is beam depth minus slab thickness.
	4. "Home" tab > "Add Dimension Group". Note : For beam 1B33, the bottom soffit formwork is the plan-area of the beam.
	5. Highlight "1B33 bottom" dimension group. 6. Zoom to beam "1B33 150x300". 7. Position the cursor inside beam 1B33 > HOLD-SHIFT keyboard > Click. Note : Alternatively, click all four sides of beam 1B33 and ENTER keyboard. 8. The measurement is as shown.
	9. Highlight "1B33 Left-side" dimension group. 10. Position the cursor on the left-side of beam 1B33 > Click. 11. The measurement is as shown.



12. Highlight "1B33 Right-side" dimension group.

13. Position the cursor on the right-side of beam 1B33 > Click.

14. The measurement is as shown.

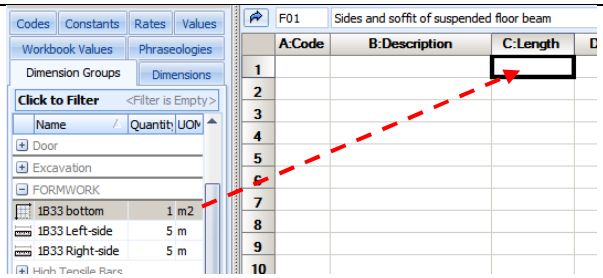


	A:Code	B:Description	C:Quantity	D:Unit
31		Sawn formwork as described to:-		
32	F01	Sides of column	63.00	m2
33	F01	Sides of stiffener	8.00	m2
34	F01	Sides and soffit of suspended floor beam		m2
35	F01	Sides and soffit of roof beam	42.00	m2
36	F01	Sides and soffit of sloping roof beam	9.00	m2

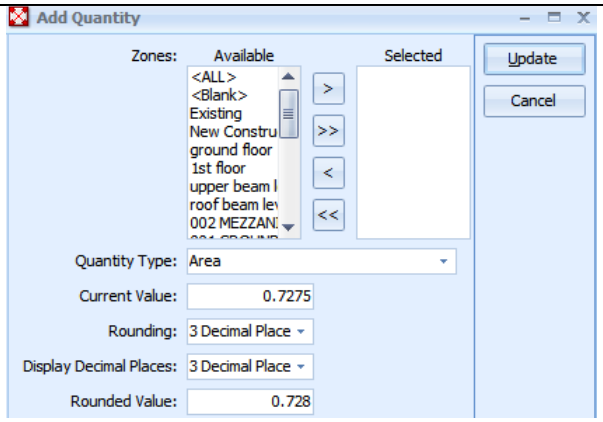
15. "Costing View" tab > highlight "Sepang" workbook.

Note : Alternatively, hit "F10" keyboard to switch to "Costing View" tab.

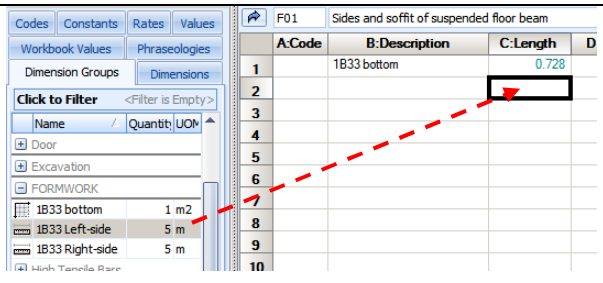
16. Double-click "Quantity" of "Sides and soffit of suspended floor beam".



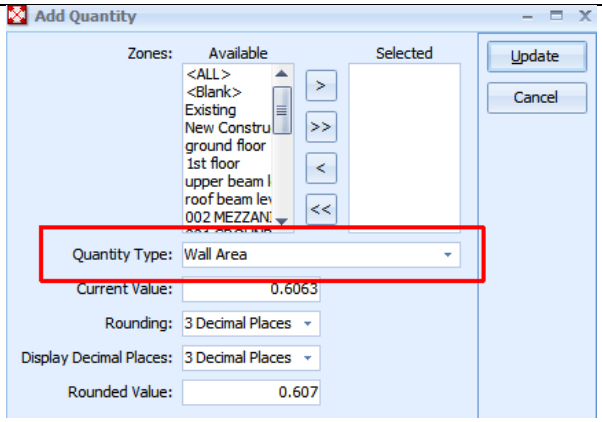
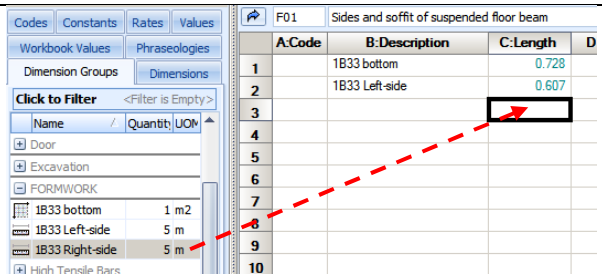
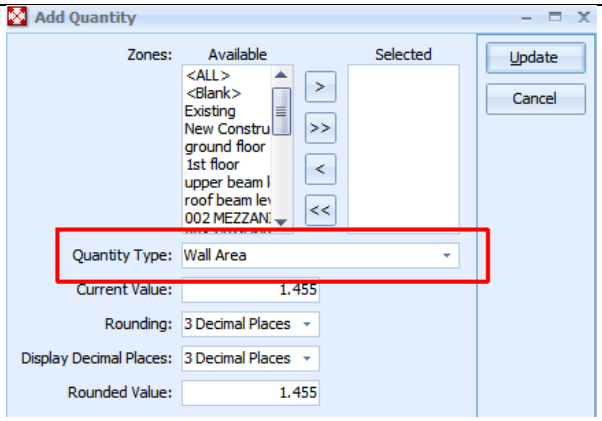
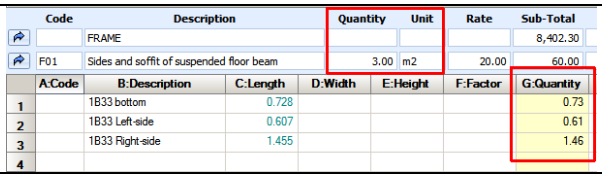
17. Drag-drop the "1B33 bottom" quantity into the workbook as shown.



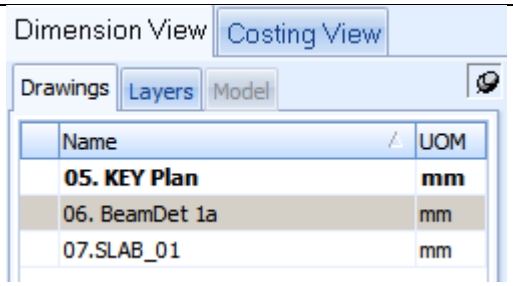
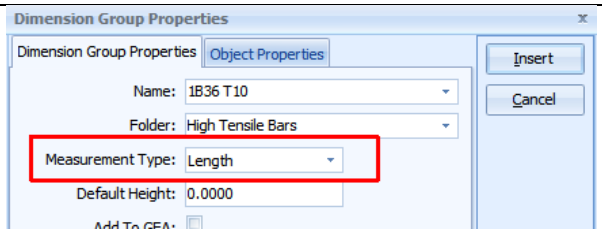
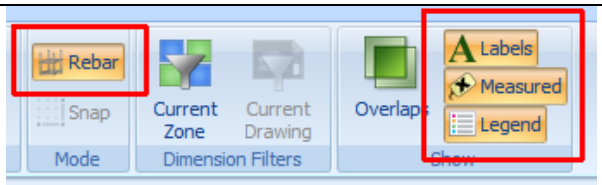
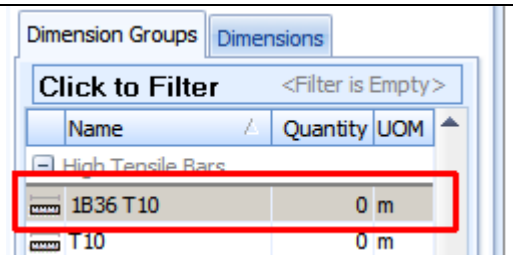
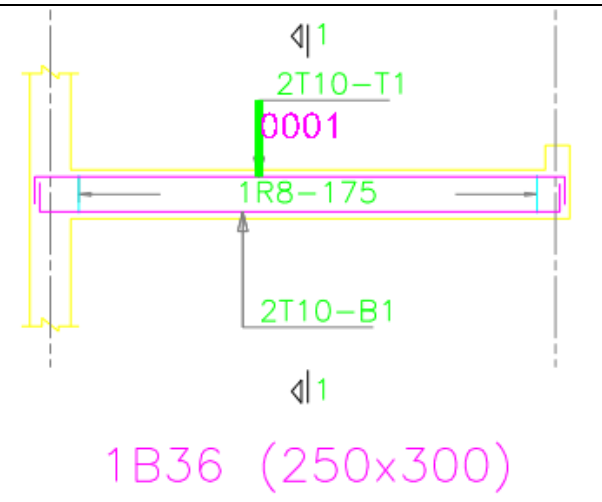
18. In the "Add Quantity" interface, update necessary attributes > Update.

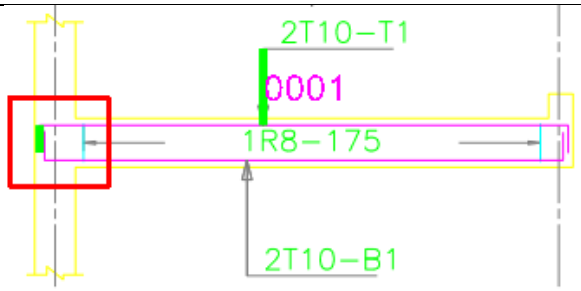
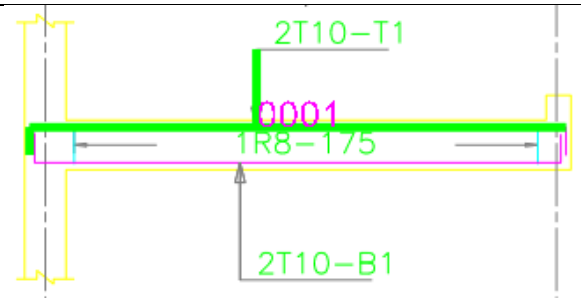
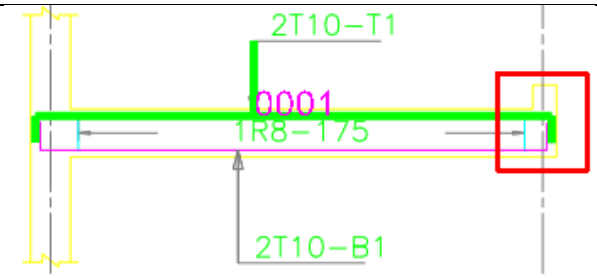
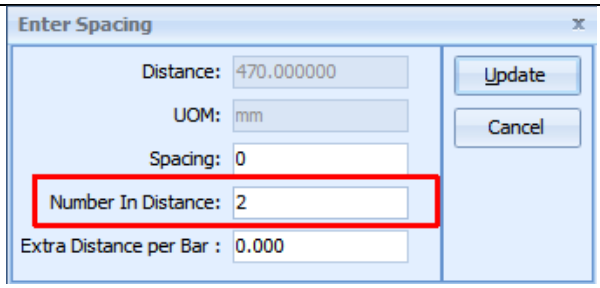
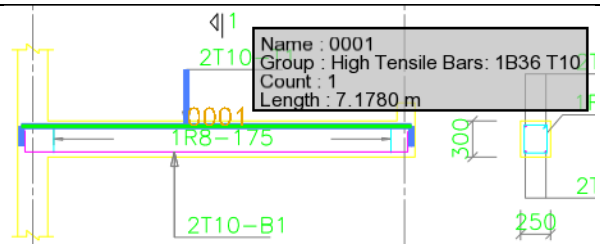


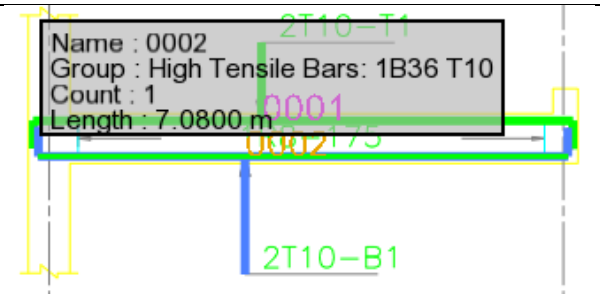
19. Drag-drop the "1B33 Left-side" quantity into the workbook as shown.

	20. In the "Add Quantity" interface, update necessary attributes > Update. Note : REMEMBER TO CHANGE THE "QUANTITY TYPE" TO "**Wall Area**".
	21. Drag-drop the "1B33 Right-side" quantity into the workbook as shown.
	22. In the "Add Quantity" interface, update necessary attributes > Update. Note : REMEMBER TO CHANGE THE "QUANTITY TYPE" TO "**Wall Area**".
	23. The completed sown formwork quantity for beam 1B33 is as shown.

2.4 MEASURING MAIN REINFORCEMENT BARS

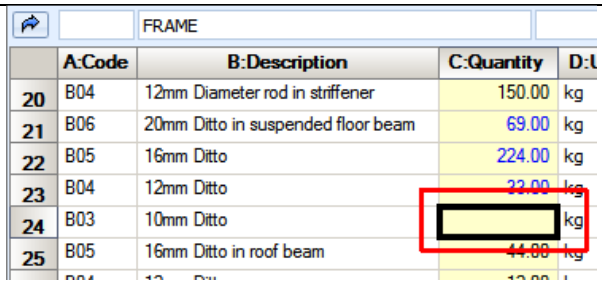
	1. "Dimension View" tab > "06. BeamDet 1a". Note : Alternatively, hit "F9" keyboard to switch to "Dimension View" tab.
	2. "Home" tab > "Add Dimension Group". Note : Let's measure beam 1B36 top and bottom main rebars (i.e. T10s).
	3. "Dimensions" tab > activate the followings: i. Rebar ii. Labels iii. Measured iv. Legend
	4. In the "Dimension Groups" panel, ensure the 1B36 T10 is selected.
	5. Zoom to beam detail 1B36 (250x300). 6. Click the vertical bar indicator. Note: The first click is not important. You may click anywhere you wish. But the "logic" entity to click is the bar indicator

	7. Click the left-side-hook of T10-top bars. Note : The dimension serial number is STILL “0001”.
	8. HOLD-CTRL + click the T10-top bars. Note : i. Before clicking the line, watch the thick-blue indicator. Ensure the thick-blue line joins and extends to the other hook. ii. The dimension serial number is STILL “0001”.
	9. HOLD-CTRL + click the right-side-hook of T10-top bars. Note : i. Before clicking the line, watch the thick-blue indicator. Ensure the thick-blue line joins and extends to the other hook. ii. The dimension serial number is STILL “0001”.
	10. Hit ENTER keyboard. 11. Key in the “Number In Distance” > Update. Note : The dimension serial number is STILL “0001”.
	12. The total bar length for T10-top is as shown.



13. Repeat steps 4 to 11 for the T10-bottom bars.

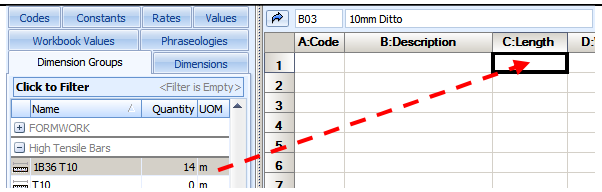
14. The total bar length for T10-bottom is as shown.



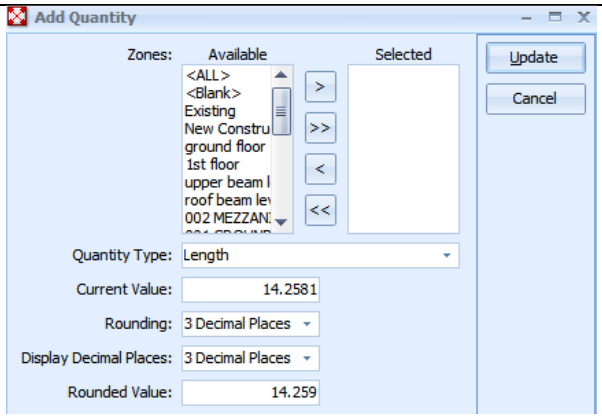
15. Costing View" tab > highlight "Sepang" workbook.

Note : Alternatively, hit "F10" keyboard to switch to "Costing View" tab.

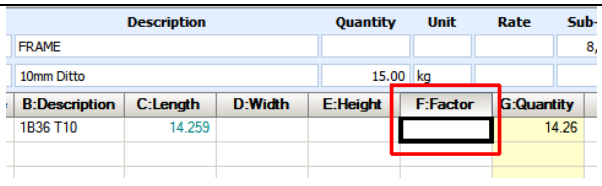
16. Double-click "Quantity" of "10mm Ditto" for suspended floor beam description.



17. Drag-drop the "1B36 T10" quantity into the workbook as shown.

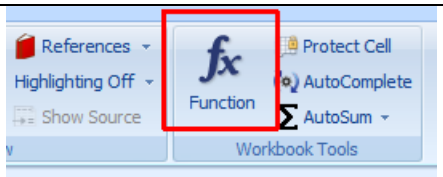


18. In the "Add Quantity" interface, update necessary attributes > Update.

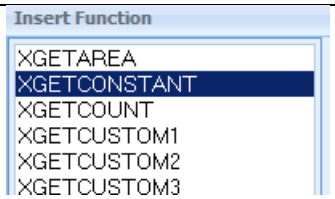
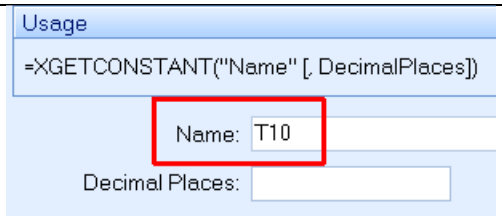
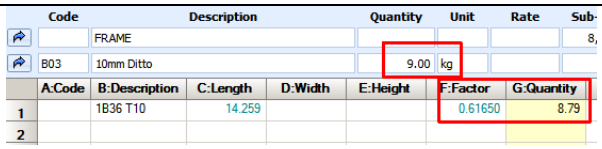


19. Highlight the "Factor" cell for 1B36 T10.

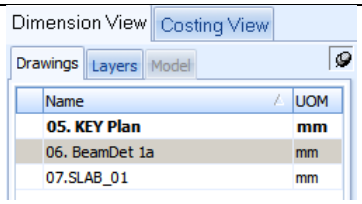
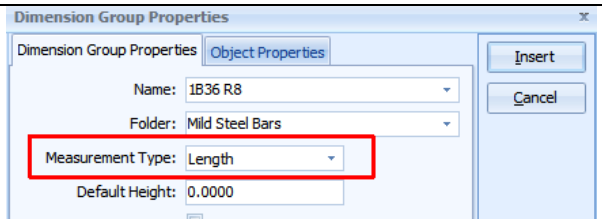
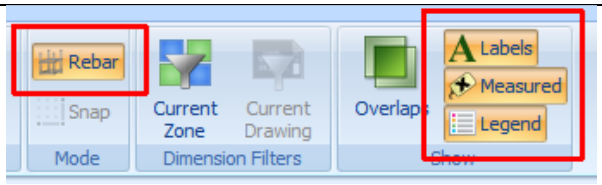
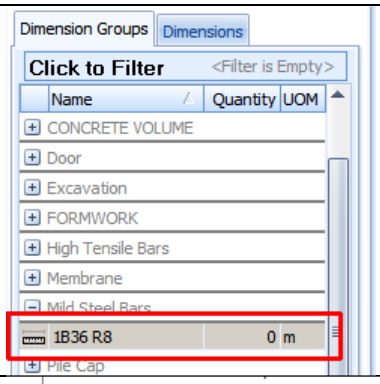
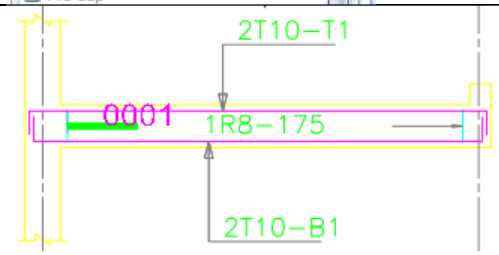
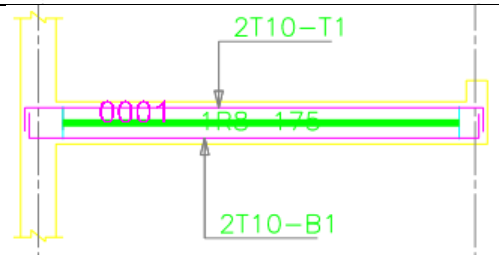
Note : We need to convert the bar length into tonnage or kg-weight.

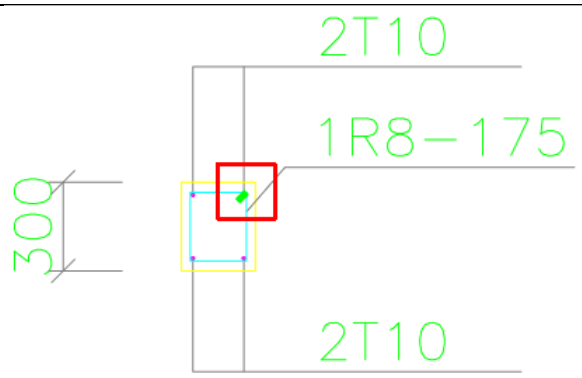
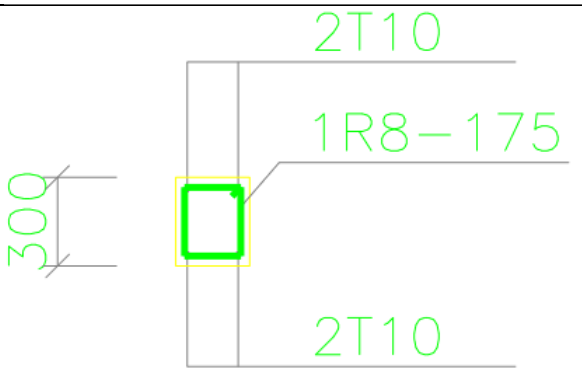
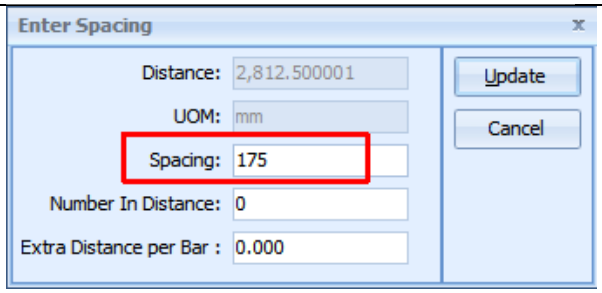
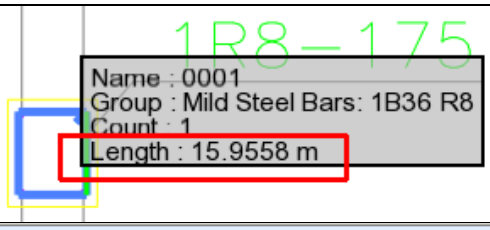
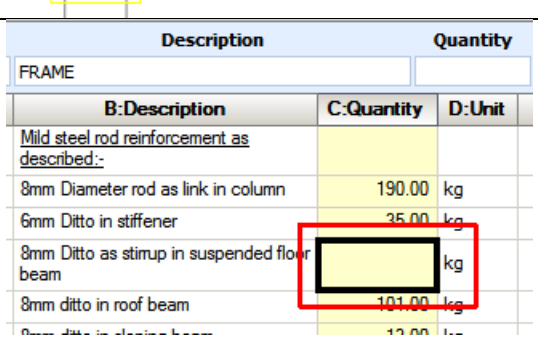


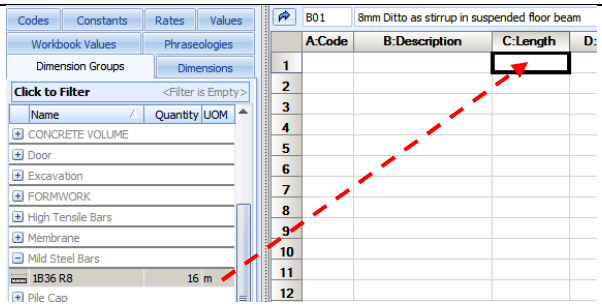
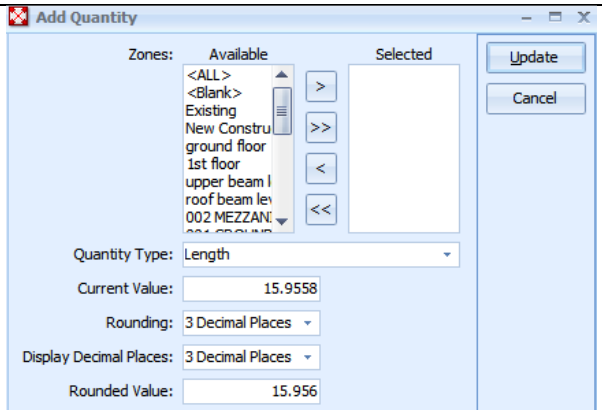
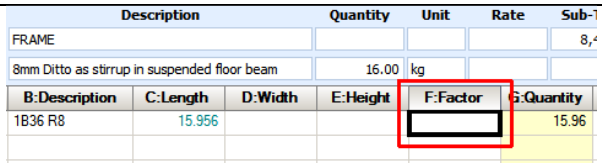
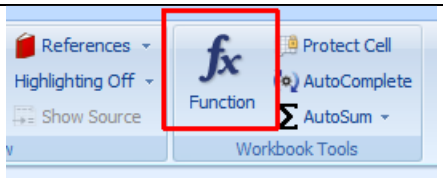
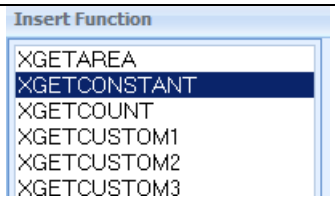
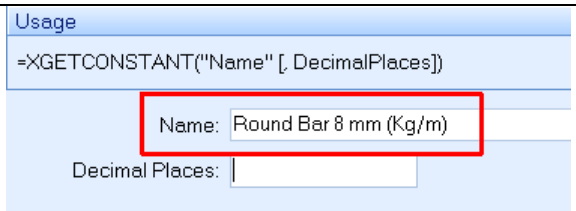
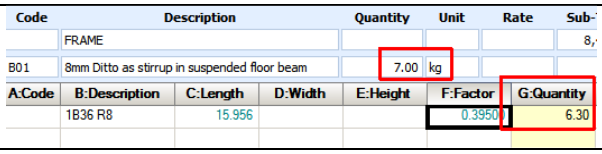
20. Click the "Function" command in the ribbon menu.

	21. Highlight “XGETCONSTANT” function.
	22. Select “T10” > Insert. Note : Just key in letter “T” and a list of high tensile bars diameters will be revealed.
	23. The total measurement for “1B36 T10s” is as shown.

2.5 MEASURING LINKS/STIRRUPS

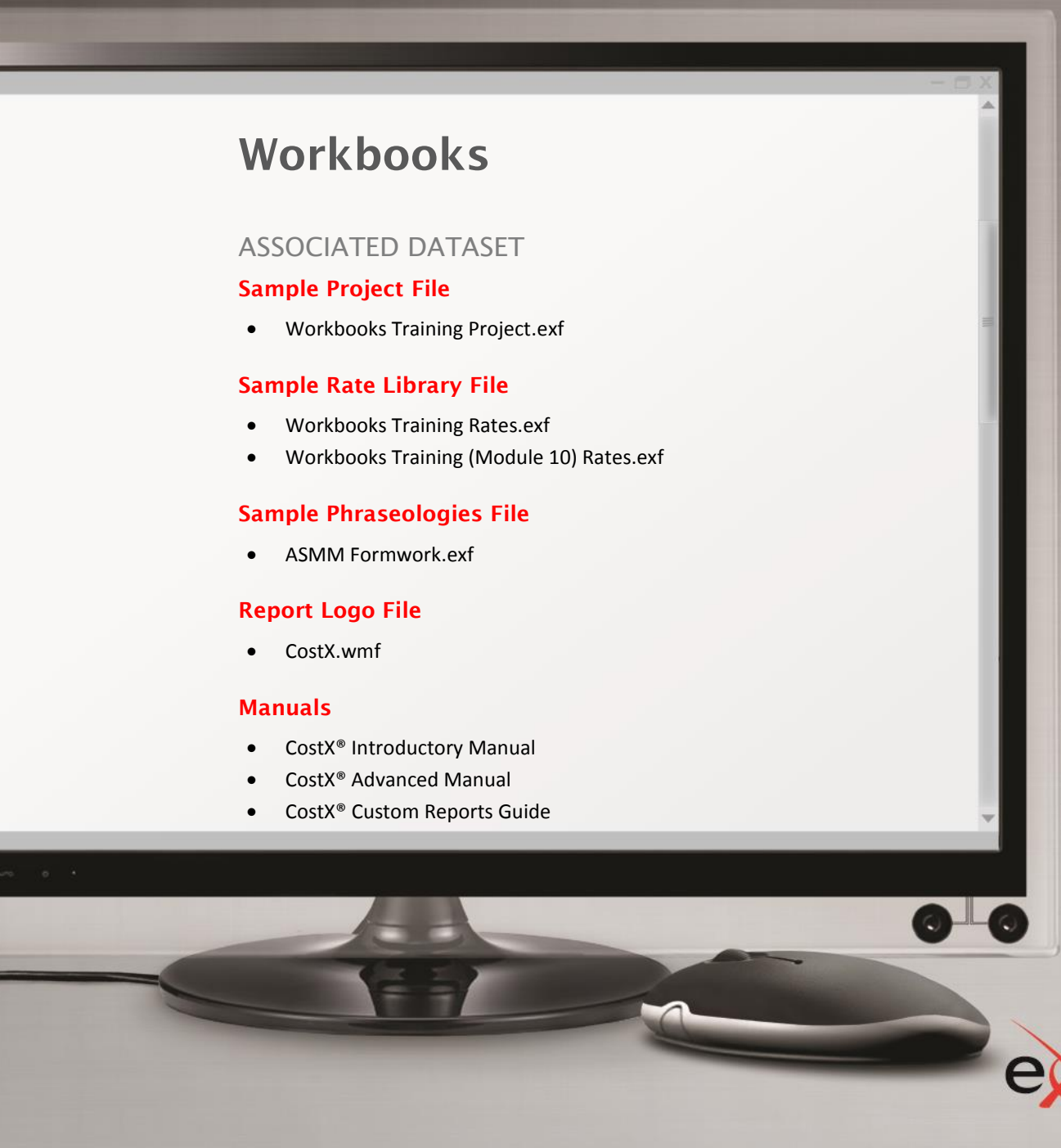
	1. "Dimension View" tab > "06. BeamDet 1a". Note : Alternatively, hit "F9" keyboard to switch to "Dimension View" tab.
	2. "Home" tab > "Add Dimension Group". Note : Let's measure beam 1B36 links/stirrups (i.e. R8-175).
	3. "Dimensions" tab > activate the followings: i. Rebars ii. Labels iii. Measured iv. Legend
	4. In the "Dimension Groups" panel, ensure the "1B36 R8" is selected.
	5. Zoom to beam detail 1B36 (250x300). 6. Click the left-side coverage line.
	7. HOLD-CTRL + click the right-side coverage line. Note : i. Before clicking the line, watch the thick-blue indicator. Ensure the thick-blue line joins and extends to the other coverage line. ii. The dimension serial number is STILL "0001".

	8. Click the hook of the links.
	9. HOLD-CTRL + click the top-left-bottom-right links lines. Note : i. Before clicking the line, watch the thick-blue indicator. Ensure the thick-blue line joins adjacent sides. ii. The dimension serial number is STILL "0001".
	10. Hit ENTER keyboard. 11. Key in the "Spacing" > Update. Note : The dimension serial number is STILL "0001".
	12. The total bar length for T10-top is as shown.
	13. Costing View" tab > highlight "Sepang" workbook. Note : Alternatively, hit "F10" keyboard to switch to "Costing View" tab. 14. Double-click "Quantity" of "8mm Ditto" for stirrup in suspended floor beam description.

	15. Drag-drop the “1B36 R8” quantity into the workbook as shown.
	16. In the “Add Quantity” interface, update necessary attributes > Update.
	17. Highlight the “Factor” cell for 1B36 R8.
	18. Click the “Function” command in the ribbon menu.
	19. Highlight “XGETCONSTANT” function.
	20. Select “Round Bar 8mm (Kg/m)” > Insert.
	21. The total measurement for “1B36 R8” is as shown.

costX 4.1

ADVANCED TRAINING EXERCISE



Workbooks

ASSOCIATED DATASET

Sample Project File

- Workbooks Training Project.exf

Sample Rate Library File

- Workbooks Training Rates.exf
- Workbooks Training (Module 10) Rates.exf

Sample Phraseologies File

- ASMM Formwork.exf

Report Logo File

- CostX.wmf

Manuals

- CostX® Introductory Manual
- CostX® Advanced Manual
- CostX® Custom Reports Guide

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The costX Family of Products

CostX®

CostX® is Exactal's top-of-the-range product. More companies are using CostX® for their complete estimating solution and are demonstrating strong returns on their investment. CostX® is a powerful project costing tool that enables estimators to utilise the most advanced on-screen measurement system while embracing BIM to deliver better results to clients. It can reduce take off time by up to 80%.

CostX® 2D

CostX® 2D does not support 3D/BIM drawings or allow for auto-revisioning, but still contains Exactal's world-leading on-screen 2D takeoff and integrated workbook. If your company does not receive 3D/BIM drawings but still wants to take advantage of the faster, smarter and more accurate estimating solution on the market, CostX® 2D is the best choice for you.

CostX® Takeoff

If you only require CostX® for measuring, purchase CostX® Takeoff and still utilise the most advanced on-screen measurement system on the market. CostX® Takeoff not only supports a variety of 2D drawings but also supports 3D/BIM models. Reduce your costs and use the best tool for the job.

CostX® Takeoff 2D

CostX® Takeoff 2D is Exactal's most basic product but still allows you to use the world-leading on-screen 2D takeoff, meaning you can measure areas, lengths and counts in a few clicks. If you have only used manual measurement and Excel® before and want to start off with something simple, CostX® Takeoff 2D may be the best choice for you.

FEATURES	CostX®	CostX® 2D	CostX® Takeoff	CostX® Takeoff 2D
BIM models/3D drawings	•		•	
2D drawings (incl PDFs)	•	•	•	•
Auto Revisioning	•		•	
Workbooks	•	•		
Subcontractor Comparison	•	•		

CostXL

CostXL allows you to link CostX® data directly into your Excel® spreadsheets

CostX® Live

CostX® Live gives you access to live CostX® data on the go through the web.

FREE

CostX® Viewer

CostX® Viewer makes it easy to freely share your CostX® projects with anyone.

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exactal precision estimating

A DIMENSIONEERING COMPANY

Contents

Introduction

This document in conjunction with the Advanced CostX® Techniques manual, aims to inform and demonstrate the principles of more advanced use of workbooks in CostX®. A basic familiarity with the software is required to undertake the exercise whereby prior completion of a CostX® Introductory Training Course, or an understanding of the principles of measurement and workbook structure within CostX®, is a pre-requisite.

The exercises are based around the use of example files and templates which have been developed for demonstration and training purposes only. Actual implementation of the software and templates will depend on users own resources and specific reporting requirements.

Save the Associated Dataset files to a location on your computer or network that may be accessed during the training exercise and work through each module sequentially. Complete all sections before moving on as each subsequent module relies on data established in previous exercises.

At its core, CostX® comprises two complementary and fully integrated modules:

- The Dimension View where drawing files can be viewed and, without the use of CAD software or any previous experience of CAD, detailed and accurate dimensions can be quickly taken from 2D images, PDF or CAD drawings, or generated automatically from 3D CAD models.

- The Costing View: a spreadsheet based workbook within which cost plans, estimates and schedules of quantities etc; are developed. It is possible to import previous documents to use as a template, access rate libraries, enter codes for sorting and generate reports.

Refer to the CostX® help files by pressing the F1 key, or by clicking the Help icon in the top right hand corner of the screen for a full explanation on how to use and implement functions. Alternatively refer to the CostX® Advanced manual for quick references.

Formatting Conventions Used

The following formatting conventions have been used throughout this training exercise.

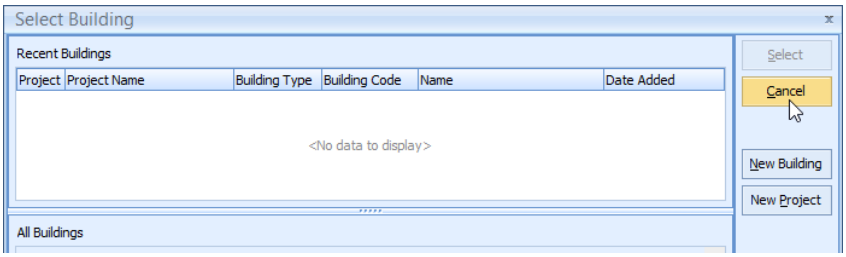
Bold Font	Direction for user
[Bold Font]	Anything fixed in CostX® i.e. button name, right click menu options, field name, etc.
{ Bold Font }	Anything which a user can change i.e. drawing name, dimension group name, workbook name, etc.
“Bold Font”	Anything a user has to enter i.e. building name, workbook name, dimension group name, etc.

Module 1: Course Setup

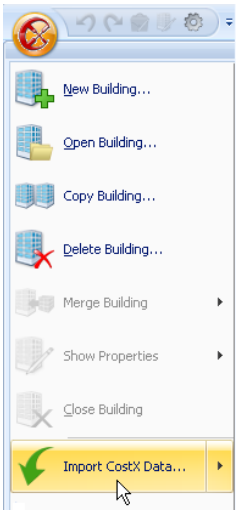
In Module 1 we shall import a CostX® Project file, incorporating previously created CostX® Building files, which shall be used as the basis of conducting this training exercise. We shall also import a copy of the Rate Library that was used in the preparation of the Building.

Importing an EXF Rate Library

1.1 **Start CostX®**, then **click** the **[Cancel]** button to close the Select Building window.



1.2 **Open** the **[Main Menu]** and **select [Import CostX® Data…]** (see right). If the sub-menu opens to the right select **[Import CostX Data…]**.



1.3 **Browse for the training dataset** and **select** the **{Workbooks Training Rates.exf}** file.

1.4 **Click [Open]** and the **[Select Data To Import]** window will appear advising that the selected file contains a rate library. **Click [Select]** to commence the import.

If you are working in a network configuration, once one person has imported the Rates Library the others will receive an [Import Conflict] warning. Choose to {Import as Copy} and amend the name to:

"Workbooks Training Rates-" followed by your name

1.5 The imported rate library contains rates for both 'Brisbane' and 'Melbourne'. If these Locations do not already exist in your database you will be asked, "Do you wish to import the location from the EXF file?" **Click [Yes]** for both locations to complete the import.

Importing an EXF Project File

1.6 **Open** the **[Main Menu]** and **select [Import CostX® Data…]** again. If the sub-menu opens to the right select **[Import CostX Data…]**.

1.7 Browse for the training data set and select the **{Workbooks Training Project.exf}** file.

1.8 **Click** [**Open**] and the **[Select Data To Import]** window will appear advising that the selected file contains two Buildings and a Project.

1.9 **Click** the **[All]** button to import the entire Project.

1.10 If the **[Select Location to Attach Project To]** dialogue box appears, **click** on the option for **{Brisbane}** and then **click [Select]**.

If you are working in a network configuration, once one person has imported the Project and Building the others will receive an [Import Conflict] warning. Choose to {Import as Copy} and amend the names to:

"Workbooks Training Project-" followed by your name
"15 Bemrose Place-" followed by your name
"57 Beach Road-" followed by your name
"Peel Street Apartments-" followed by your name

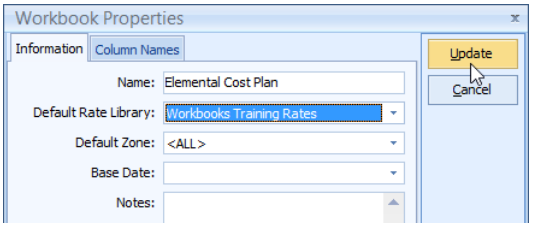
1.11 The .exf file includes drawings so you may be asked to nominate a folder for the drawing files to be saved into. **Place the drawings in the training dataset folder**.

1.12 **Open** the **[Main Menu]** and select **[Open Building]**.

1.13 In the **[All Buildings]** area of the **[Select Building]** window **click** on the newly imported **'Peel Street Apartments'** building file then **click** on the **[Select]** button. You will notice that in the Dimension View a number of drawings have already been added to the building and dimensions taken from them, and in the Costing View there is an existing workbook called 'Elemental Cost Plan'.

1.14 **Open** the **{Elemental Cost Plan}** workbook and then in the Workbooks ribbon menu **click** on the **[Properties]** button to view the properties for this workbook.

1.15 Ensure that the **[Default Rate Library]** is set as the recently imported **{Workbooks Training-Rates *(-followed by your name)*}** rate library. If not use drop-down menu to select it as the default set of rates to apply.



1.16 **Click [Update]** and if changes have been made the workbook will recalculate and a warning will appear. This will be addressed as part of a later exercise so, for now, ignore the warning and **click [OK]** to close the window.

Due to the live-links already in place the majority of the workbook will be completed however you will notice that the Substructure and Preliminaries elements have a value of zero. This will be addressed throughout this exercise.

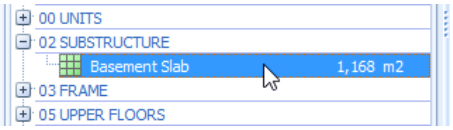
Module 2: Workbook Items

This module will demonstrate the principle of using one dimension group for many workbook quantities and introduces the XGetSpacedCountRND CostX® function.

Dimension Group Derived Items (One-To-Many Relationship)

2.1 **Double-click** on the F:Subtotal column cell **F2** to drill-down to the second level of the Substructure element. You will notice that there are no quantities.

2.2 **Open** the **{02 SUBSTRUCTURE}** dimension group folder and **select** the one dimension group in it called **{Basement Slab}**. The area of the slab has been measured with a Default Height of 0.180m, thereby capturing the perimeter length, surface area, perimeter wall area and volume in one measurement (hold the cursor over the dimension group to see this).



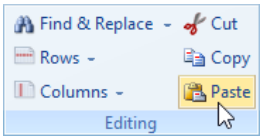
2.3 For the first workbook item, detailed excavation to edge beams, **double-click** on the C:Quantity cell **C2** to open the Qty sheet. **Drag-and-drop** the **{Basement Slab}** dimension group into the **D:Length** column.

2.4 When the **[Add Quantity]** window appears use the drop-down menu to **select** a **[Quantity Type]** of **{Length}**.

2.5 As this is a detailed build-up in the Qty sheet **set** the **[Rounding]** and **[Display Decimal Places]** to **{2}** and **click [Update]** to place the perimeter of the area measured into the D:Length column.

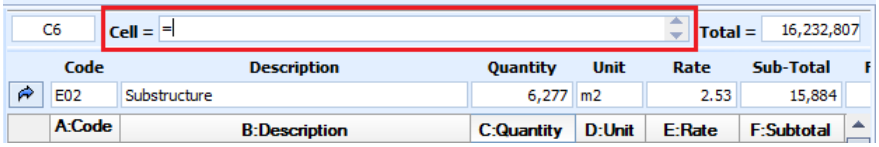
2.6 In the **E:Width** column **enter "0.3"** and in the **F:Height** column enter **"0.4"** to generate a volume calculation then **click** the lower [ ] button to return to workbook level 2.

2.7 The 300 x 400 concrete edge beam item has the same quantity as just prepared. Use the Workbooks ribbon menu buttons to **copy** the quantity from the excavation item above (**C2**) and **paste** it into the cell beneath (**C3**). Note how the drill down information is retained.



2.8 The bar reinforcement item is based on a ratio of 130kg of reinforcing per m³ of concrete. Therefore, **in cell C4 enter** the formula **"=C3*0.13"** to return the total tonnage of steel required for the edge beams.

2.9 The disposal item quantity can be derived by entering the formula "=C3" into cell C6. To do this, **click** into cell **C6** and then **click into the [Cell=]** field above the workbook (see below) and **type** in the **"="** symbol.



2.10 **Hold** down the **Ctrl** key and **click** on to cell **C3**. The formula '=C3' will appear in the Cell= field. **Press** the **[Enter]** key to enter the formula in cell C6.

2.11 For the 150 sub-base item **double-click** on the C:Quantity cell **C8** to drill down into the Qty sheet.

2.12 **Drag-and-drop** the **{Basement Slab}** dimension group into the D:Length column cell **D1** leaving the **[Quantity Type]** as **{Area}**. **Set** the **[Rounding]** and **[Display Decimal Places]** as before and **click [Update]**.

2.13 For QA purposes you may wish to **enter "m2"** in the E:Width cell **E1** adjacent to this figure to identify it is an area to anyone reviewing the Qty build-up (see below). In the F:Height column cell **F1 enter** the thickness of the fill **"0.15"** then **return** up **to workbook level 2**.

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	E02	Substructure	6,277	m2	7.27	45,607		45,607
		150 thick sub-base, levelled and compacted	176	m3	164.10	28,881		28,881

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Basement Slab		1,168.30	m2	0.15		175.25

2.14 For the sand bed item simply **drag-and-drop** the **{Basement Slab}** dimension group into the level 2 C:Quantity cell (**C9**) utilising the **[Quantity Type]** of **{Area}**. As this is a summary item **set** the **[Rounding]** to **{0}** decimals.

2.15 **Double-click** on cell **C10** adjacent to the Waterproof membrane item to open the Qty build-up sheet.

2.16 **Drag-and-drop** the **{Basement Slab}** dimension group into the D:Length cell **D1** leaving the **[Quantity Type]** as **{Area}**. **Enter "m2" in** the E:Width cell (**E1**) adjacent to this figure.

2.17 On the next row of the Qty sheet **drag-and-drop** the **{Basement Slab}** dimension group into the **D:Length column** again, but this time **select** a **[Quantity Type]** of **{Wall Area}** to return the perimeter wall area of the slab. **Set** the **[Decimal Places]** to **{2}** and **click [Update]**. Enter **"m2"** in the **E:Width** column (see below) then **return to workbook level 2**.

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Basement Slab		1,168.30	m2			1,168.30
2		Basement Slab		25.20	m2			25.20

2.18 For the perimeter formwork to the slab simply **drag-and-drop** the **{Basement Slab}** dimension group into the level 2 C:Quantity cell (**C11**) selecting a **[Quantity Type]** of **{Length}** and setting the **[Decimal Places]** to **{0}**.

2.19 For the mesh reinforcement in the slab **double-click** on the C:Quantity cell **C12** to open the corresponding Qty sheet. **Drag-and-drop** the **{Basement Slab}** dimension group into the D:Length cell **D1** leaving the **[Quantity Type]** as **{Area}**. **Enter "2"** in the **G:Factor** column (as below) to signify that two layers of mesh are required.

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Basement Slab		1,168.30			2.00000	2,336.60

2.20 **Return to workbook level 2**.

2.21 For the 180 concrete slab on ground **drag-and-drop** the **{Basement Slab}** dimension group into the level 2 **C:Quantity** column. When the **[Add Quantity]** window appears **select** a **[Quantity Type]** of **{Volume}**, **set** the **[Rounding Decimal Places]** to **{0}** and **click [Update]**.

2.22 For the surface finish item either **drag-and-drop** the **{Basement Slab}** dimension group **{Area}** into the C:Quantity cell **C14**, copy and paste the contents of cell C9 into cell C14, or enter "=C9" into cell C14.

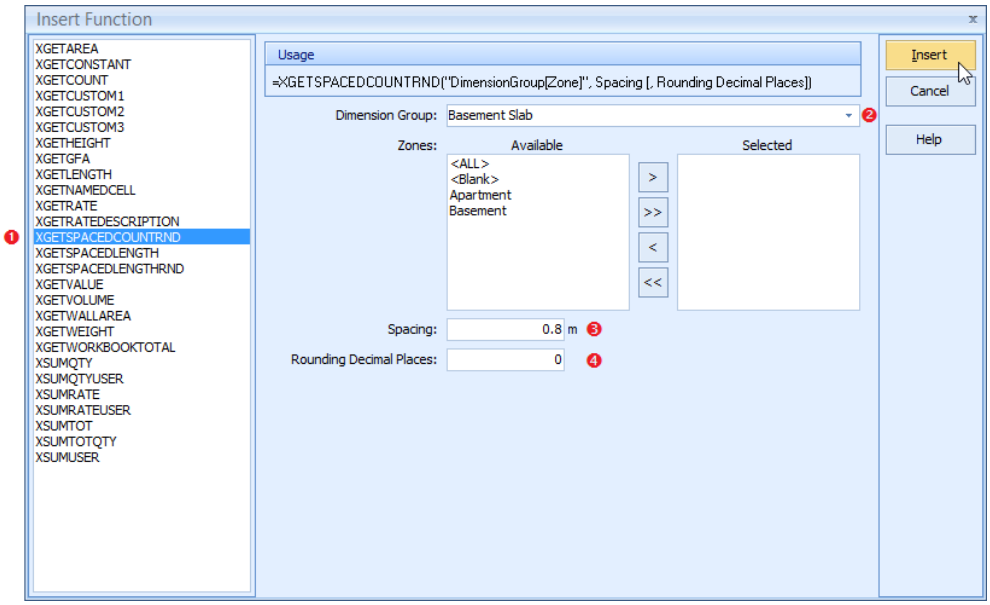
2.23 For the 200 series block wall area **double-click** on cell **C16** to open the Qty sheet. **Drag-and-drop** the **{Basement Slab}** dimension group into cell **D1** and in the **[Add Quantity]** window **select** a **[Quantity Type]** of **{Length}**.

2.24 In the **F:Height** column **enter "3.00"**(m) to multiply the basement perimeter length by the height of the block wall (see below). **Return to level 2** of the workbook.

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Basement Slab		139.98		3.00		419.94

2.25 Next for the 12mm Ø bar reinforcing to the block wall **double-click** on cell **C17** to drill down into the Qty sheet. **Click** into the first cell in the C:Count column (**C1**) and then **click** on the **[Function]** button in the Workbooks ribbon menu.

2.26 In the **[Insert Function]** Window **select XGetSpacedCountRND** from the left hand pane ❶ then use the **[Dimension Group]** drop-down menu ❷ to **select** the **{Basement Slab}** dimension group. **Enter** a **[Spacing]** of **"0.8"** ❸ and **[Rounding Decimal Places]** of **"0"** ❹ then **click [Insert]**.



This function divides every individual length dimension within the specified dimension group by the assigned Spacing to calculate the number of instances of the item, rounding up and adding 1 to account for the end. (Note: The =XGetSpacedLengthRND function performs the same calculation and then multiplies this number by the Height set for each dimension in the dimension group to return the overall length)

2.27 In the **F:Height** column **enter "3.00"** to denote the length of the reinforcing bars and in the **G:Factor** column **enter "=0.888/1000"** to convert the overall length to a tonnage of reinforcing bar. **Enter** a suitable **B:Description** against your measure then **return to workbook level 2**.

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Re-bars at 800mm centres.	176			3.00	0.00089	0.47

2.28 The tanking area will have the same quantity as the wall area plus the slab edge area. **Drill down** into the C:Quantity cell **C18**. **Drag-and-drop** the **{Basement Slab}** dimension group into the **D:Length** column using a **[Quantity Type]** of **{Length}**. **Enter "3.18"** in the **F:Height** column for this item to account for the wall height and slab perimeter height then **return to workbook level 2**.

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Basement Slab		139.98		3.18		445.14

2.29 For the backfilling item **drill down** on cell **C19** to open the Qty sheet. **Drag-and-drop** the **{Basement Slab}** dimension group into the **D:Length** column applying a **[Quantity Type]** of **{Length}**. Assuming that the basement excavation has been battered around the perimeter at a gradient of 1:1 **enter** an **E:Width** of **"3.00"**(m) and an **F:Height** of **"3.00"**(m). In the **G:Factor** column **enter "=1/2"** then **return to workbook level 2**.

	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Basement Slab		139.98	3.00	3.00	0.50000	629.91

The Substructure element has now been quantified with live-linked measurements all derived from a single dimension group. To see this measure select any cell containing green text and then click on the Show Source button in the Workbooks ribbon menu. The Basement drawing will open with the measured area shaded on screen.

Module 3: Workbook Tools

In this module we shall look at some useful workbook tools and use a selection of them to identify and correct quality assurance issues within the workbook.

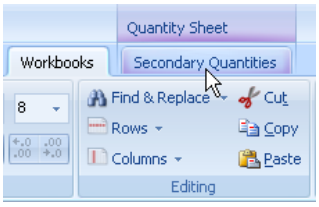
Secondary Quantities

It is possible to append secondary quantities to the end of item descriptions in CostX®. These appear in square brackets, with the appropriate unit of measure, and are based on the dimensions used in the associated Qty sheet build-up.

3.1 In the **[Costing View] return to level 1** of the workbook

3.2 **Double-click** on cell **F10** to access the level 2 Cost sheet for the Interior Doors element. The painting item to the doors (row 7) has been measured in square metres however we shall now append a secondary quantity to the description outlining the number of doors that are included in that area.

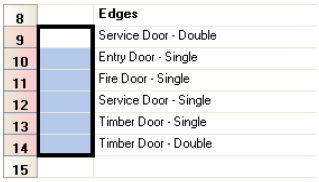
3.3 **Double-click** on the C:Quantity cell for the painting item to the face of the internal doors (**C7**) to drill down into the Qty build up sheet. An additional Secondary Quantities ribbon menu tab will appear at the top of the screen.



3.4 **Click** on the **[Secondary Quantities]** tab to open the ribbon menu.

3.5 Use the **[Type]** drop-down menu to **select** the **{Count}** secondary quantity. This will take the sum of the values in the Qty sheet C:Count column. If however the Count cell is blank on a row with a value in the H:Quantity column, that row is included in the secondary quantity with a count of 1.

3.6 As the Count column lists the number of doors twice, once for the door faces and again for the door edges, the secondary quantity will currently include double the number of doors. To overcome this, **click and drag** the cursor **over any cells in rows 9 to 14** to highlight them (see right).

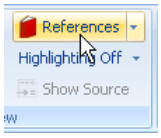


3.7 **Click** on the **[Exclude Row]** button in the ribbon menu. The row headings will highlight red denoting that these rows are excluded from the secondary quantity.

3.8 **Return to level 2** of the workbook. The description for the painting item to the face of the doors will now have the number of doors appended in square brackets at the end (see below).

6		Painting / Clear Finishing						
7		1 undercoat and 2 full coats white gloss paint; girth exceeding 300mm; doors [400 no]	2.609	m2	37.80	98.620		98.620
8		1 undercoat and 2 full coats white gloss paint; isolated surfaces n.e. 300mm girth; door linings and architraves	2.021	m	12.60	25.465		25.465
9								

Workbook References



3.9 **Open** the **[Workbooks]** ribbon menu and **click** on the **[References]** button. The References Report window will appear outlining the following quality assurance information:

Unused Dimension Groups	Measurements have been taken but not utilised in the Workbook.
Used Dimension Groups	Giving cell references for each use.
Unknown Formula References	Formulas that refer to invalid sources.
Zeros	Formulas entered that give a result of zero.

3.10 **Review** the **[Unused Dimension Groups]** and note that in this instance the 'Kitchen Splashbacks' and 'Bath Tub' dimension groups, both of which contain quantities, have not been used in the workbook.

3.11 **Scroll down** the report window to **review** the **[Unknown Formula References]** section where an invalid dimension group called Bathtub has been used in workbook formulas. Therefore, a user has changed the 'Bathtub' dimension group name to 'Bath Tub' and, in so doing, has broken the live-link between the dimension group and workbook. We shall now repair this link and then ensure that a priced item for the Kitchen Splashbacks measure is inserted into the workbook.

3.12 **Click [OK]** to close the References Report window.

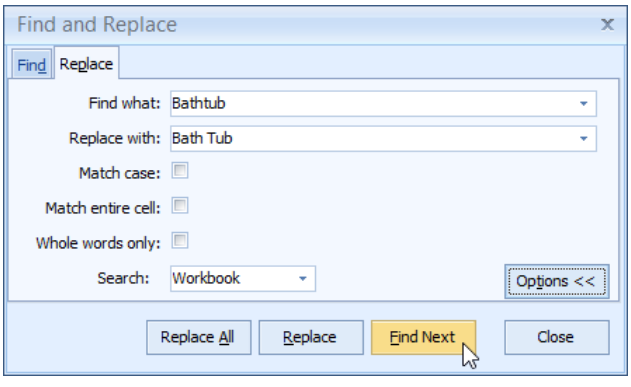
Find & Replace

Firstly we shall correct the Unknown Formula References error caused by the invalid 'Bath Tub' dimension group name.

3.13 **Return to level 1** of the workbook and **click** into cell **A1**.

3.14 **Click on the lower half of** the **[Find & Replace]** button in the Workbooks ribbon menu to open the drop-down section then **click** on **[Replace]**.

3.15 In the **[Find & Replace]** window **enter "Bathtub"** into the **[Find What]** field and **"Bath Tub"** into the **[Replace With]** field (see right).



3.16 **Click** on the **[Options >>]** button to display further search criteria.

3.17 **Use the drop-down menu** in the **[Search]** field to **select {Workbook}** (see right), ensuring that CostX® looks through the entire estimate, not just the current sheet.

3.18 **Click** the **[Find Next]** button and CostX® will open the level 2 Cost sub-sheet under the Interior Walls element and select the C:Quantity cell against the bath shower-screen item.

3.19 **Click [Replace]** and the C:Quantity cell will update with the number from the Bath Tub dimension group before CostX® continues searching and opens the level 2 worksheet under the Sanitary Plumbing element and selects the C:Quantity cell for to the Bath item.

3.20 **Keep clicking [Replace]** until a warning appears advising that the search text cannot be found.

3.21 **Click [OK]** and **then [Close]** the Find and Replace window.

Copying and Pasting/Inserting Rows

In this section we shall copy an existing workbook item and amend it to use the previously unused 'Kitchen Splashbacks' dimension group.

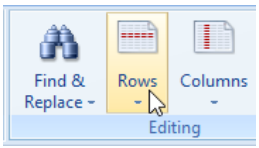
3.22 Return to Level 1 of the workbook.

3.23 Drill-down into the E13 Wall Finishes element (row 12) and **click** into any cell on row 2 (see below).

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	E13	Wall Finishes	6,277	m2	73.77	463,064		463,064

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
1		Wall Tiling						
2		Glazed ceramic tiles; fixing with adhesive; flush pointed with white grout; 150 x 150 x 6mm plain white tiles; width exceeding 300mm	2,836	m2	139.30	395,055		395,055
3		Painting / Clear Finishing						
4		1 mist coat and 2 full coats emulsion paint; general surfaces; plasterboard walls	14,947	m2	4.55	68,009		68,009

3.24 **Click** on the **[Rows]** button in the Workbooks ribbon menu and **select [Copy Row(s)]**.



3.25 **Click** in to any cell **on row 3**, the 'Painting / Clear Finishing' heading row.

3.26 **Click** on the **[Rows]** button in the Workbooks ribbon again and **select [Paste Row(s)]**. A complete copy of row 2 is inserted on row 3 (see below).

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:User1
1		Wall Tiling							
2		Glazed ceramic tiles; fixing with adhesive; flush pointed with white grout; 150 x 150 x 6mm plain white tiles; width exceeding 300mm	2,836	m2	139.30	395,055		395,055	
3		Glazed ceramic tiles; fixing with adhesive; flush pointed with white grout; 150 x 150 x 6mm plain white tiles; width exceeding 300mm	2,836	m2	139.30	395,055		395,055	
4		Painting / Clear Finishing							
5		1 mist coat and 2 full coats emulsion paint; general surfaces; plasterboard walls	14,947	m2	4.55	68,009		68,009	

3.27 **Double-click** on cell **B3** (or select the cell and press F2) to edit the B:Description text within it.

3.28 **Amend** the final words **to read, "width not exceeding 300mm"** then **press [Enter]**.

3.29 **Delete** the quantity in **the C:Quantity** column **and the** unit of measure in the **D:Unit** column **on row 3**. A warning will appear advising that you are deleting the Qty sub-sheet. **Click [Yes]** to continue.

3.30 **Open** the **{13 WALL FINISHES}** dimension group folder and **drag-and-drop** the **{Kitchen Splashbacks}** dimension group to cell **C3**. Set the [**Rounding Decimal Places]** to **{0}** and **click [Update]**.

3.31 **Enter** a **D:Unit** of **"m"** against the new item then **drill-down** into the **E:Rate** cell.

3.32 **Change** the **C:Quantity** value to **"0.30"**(m^2) to equate to the area of tiles per m of a splash-back 2 tiles high.

	E13	Wall Finishes	6,277	m2	75.31	472,759		472,759
		Glazed ceramic tiles; fixing with adhesive; flush poi	232	m	41.79	9,695		9,695
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include
1	S-Wall Tiles 150x150	150 x 150 x 6mm glazed ceramic wall tiles, fixed with adhesive, white grout	0.30	m2	139.30		41.79	41.79

3.33 **Return to level 2** of the workbook and **review the newly inserted item**.

2		Glazed ceramic tiles; fixing with adhesive; flush pointed with white grout; 150 x 150 x 6mm plain white tiles; width exceeding 300mm	2,836	m2	139.30	395,055		395,055
3		Glazed ceramic tiles; fixing with adhesive; flush pointed with white grout; 150 x 150 x 6mm plain white tiles; width not exceeding 300mm	232	m	41.79	9,695		9,695
4		**Painting / Clear Finishing**						
5		1 mist coat and 2 full coats emulsion paint; general surfaces; plasterboard walls	14,947	m2	4.55	68,009		68,009

3.34 **Click** on the **[References]** button in the Workbooks ribbon again. The References Report will open in which there should no longer be any Unused Dimension Groups, nor any Invalid Formula References noted.

Named Cells

It is possible to name cells in CostX® and use the names throughout the workbook to reference those cells.

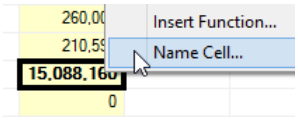
3.35 **Return to level 1** of the Elemental Cost Plan workbook where the Preliminaries value in the F:Subtotal column (F22) remains zero.

3.36 **Drill-down** to the Cost sub-sheet beneath cell **F22** and, although there are formulae in place in the F:Subtotal column of rows 1 and 2 to calculate the preliminary costs based on percentages, there is no figure in the E:Rate column to use in the calculation.

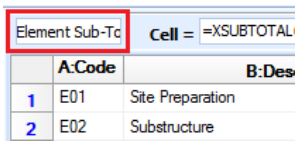
3.37 **Return to level 1** and **click** on the Element Sub-Total figure in cell **H21** to select it (see below). This is the figure that is needed in the E;Rate cell of the Preliminaries element to complete the calculations.

20	E21	Special Services	6,277	m2	33.55	210,590		210,590
21		**Element Sub-Total**			**2,403.64**			**15,088,160**
22	E25	Preliminaries	0.0	%		0		0
23	E26	Margins	6.0	%		905,290		905,290

3.38 **Click the right mouse button** over the cell and, from the bottom of the menu, **select {Name Cell…}** (see right). The Name Cell window will open pre-populated with the "Element Sub-Total" text from the B:Description column of that row.

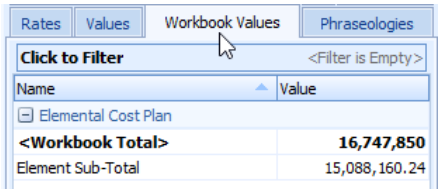


3.39 For the purposes of this exercise, leave the Name as the default and **click [OK]**. The cell name now appears in lieu of the cell reference in the box to the left of the Cell= editing field (see right).



3.40 **Drill-down** on cell **F22** to open the Cost sub-sheet beneath the Preliminaries element.

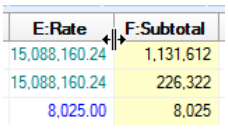
3.41 **Click** on the **[Workbook Values]** tab in the task pane and then **click** on the **[⊞]** button to expand the Elemental Cost Plan folder. In addition to the <Workbook Total> value, a value for the Element Sub-Total named cell will also be listed (see right).



3.42 **Click** on the **{Element Sub-Total}** workbook value then **drag-and-drop** it into the empty cell **E1** of the Preliminaries Cost sub-sheet. An =GetNamedCell("Name") formula is automatically entered into the cell populating it with the named cell value.

3.43 **Drag-and-drop** the **{Element Sub-Total}** workbook value into the empty cell **E2** of the Preliminaries Cost sub-sheet to complete this item.

3.44 If desired, it is possible to widen the E:Rate column to accommodate the whole number on one row. To do this move the cursor over the dividing line between the column headings until it changes to a ⇹ (see right) then click and drag the column to the desired width.



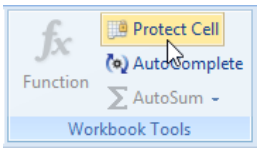
If changes are made that affect Named Cell values the workbook must be recalculated to refresh all formulae.

Cell Protection

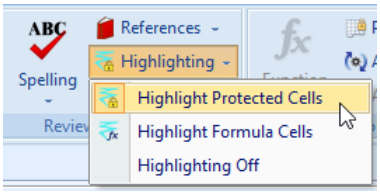
It is possible to apply protection to workbook cells, thereby preventing the contents from being amended.

3.45 **Return to level 1** of the workbook and **click** on the Element Sub-Total in cell **H21** again to select it.

3.46 **Click** on the **[Protect Cell]** button in the Workbook Tools section of the Workbooks ribbon menu (see right). The Cell= editing field will be greyed-out and you will not be able to delete or alter the contents of the cell.



3.47 Depending on the current setting, the cell background may have turned blue. If not **use the drop-down menu** on the **[Highlighting]** button (see right) to **set** the **[Highlight Protected]** Cells to **on**.



It is also possible to protect not only the current cell but also the entire hierarchy of sub-levels behind it.

3.48 **Click** on the Preliminaries F:Subtotal figure in cell **F22** to select it.

3.49 **Click the right mouse button** over the cell and **select [Protect Hierarchy]** from the menu. The selected cell will highlight blue denoting that it is protected.

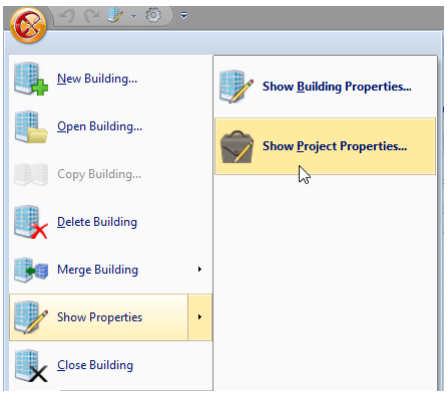
3.50 **Drill-down** to the sub-levels beneath the cell and **note that all of the content** in the hierarchy below has also been highlighted blue and **is locked**, preventing editing. Individual cells can be un-protected by selecting them and clicking on the Protection button. The cell background will change to white and the Cell= field will no longer be greyed-out.

3.51 **Return to workbook level 1**, **click the right mouse button over** the Preliminaries F:Subtotal in cell **F22** and **select [Unprotect Hierarchy]** from the menu. The entire hierarchy will be un-protected in one operation.

Module 4: Zones

In this example all of the dimensions already measured have been allocated into zones and it is therefore possible to isolate quantities by their designated zone, thereby returning the associated cost. In this module we shall set up an additional zone for this project and apply it to both new and existing dimensions. We shall then use these zoned dimensions to analyse the estimate.

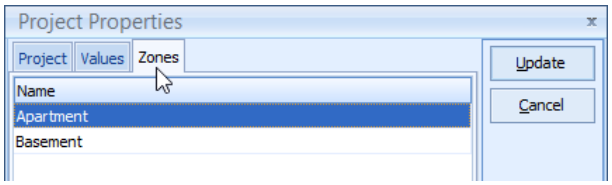
Establishing Zones

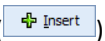


4.1 **Click** on the **[Main Menu]** button and hold the **cursor over** the **[Show Properties]** option.

4.2 When the menu opens to the right, **click** on **[Show Project Properties]** (see right).

4.3 At the top of the Project Properties window **click** on the **[Zones]** tab to open it (see below). Two zones have been established for this project, Apartment and Basement, and therefore the existing dimensions will have been allocated to one or the other accordingly.



4.4 **Click** on the **[Insert]** (

) button to add a new zone.

4.5 **Enter** a **[Name]** of **"Circulation"** and **click [Insert]** to save your entry. The new zone will appear in the Project Properties list.

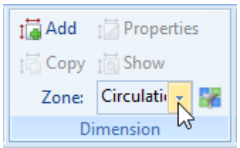
4.6 **Click** on the **[Update]** button to close out of the Project Properties window and save the changes.

Measuring Into Zones

4.7 **Click** on the **[Dimension View]** tab and **open** the **{Apartment – 8 Floor Common}** drawing.

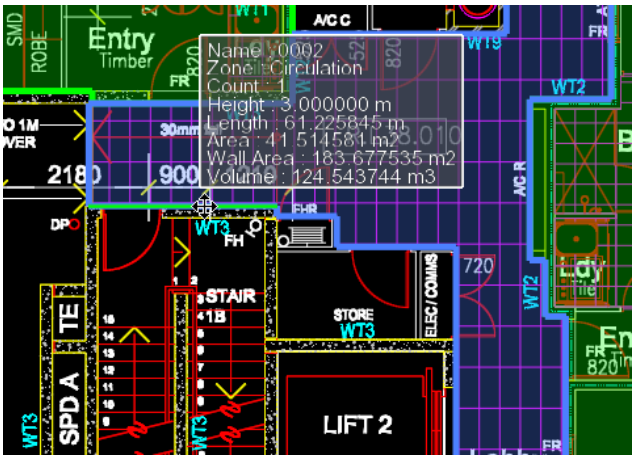
4.8 In the **{00 GFA}** dimension group folder **select** the **{Feca}** dimension group and note that the circulation area around the lift core is not shaded as it has not been measured.

4.9 **Open** the **[Dimensions]** ribbon and use the **[Zone]** drop-down menu to **select** the new **{Circulation}** zone to measure into (see right). All dimensions taken with this zone selected will be flagged with that zone reference.



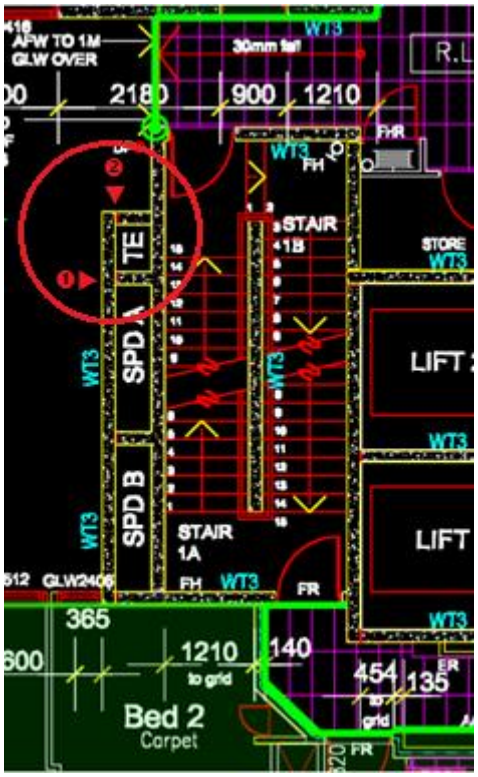
4.10 Use the Polyline method to measure the area of the corridor in one click (**hold down the [L] key, move the cursor over the corridor until it all highlights blue and click the left mouse button**). This gives a good start but doesn't cover all of the required area.

4.11 **Move the cursor over the outline of the measured area immediately above the top of the stairwell** (see right) so that the cursor changes to a four headed arrow, the line segment at which the cursor is pointing highlights green, and the measured area highlights in blue.



4.12 **Click the right mouse button** and, from the menu, **select [Uncomplete Area]**. The segment to which the cursor was attached is removed from the area outline, opening it up again, and a circle is placed at one end of the outline signifying the starting end.

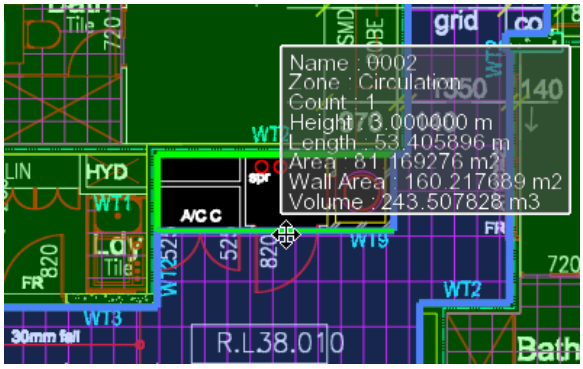
4.13 **Press** the Backspace key (←) three or four times and note that each time the key is pressed the end segment of the measured area outline is systematically removed. Keep pressing the **[Backspace]** key **until you have deleted the outline back to the fire door at the bottom of the stairwell** (see right).

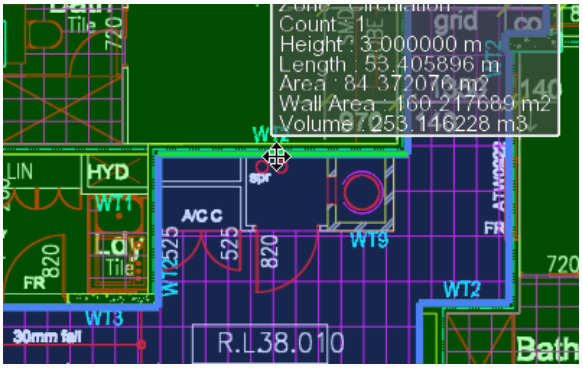


4.14 **Click** on **the two walls** marked ❶ **and** ❷ (see right) and then **press** the **[Enter]** key to re-complete the area. This leaves the riser cupboards towards the top of the circulation area still not included in the measure.

4.15 **Move the cursor over the outline of the measured area at the front of the riser cupboards** so that the cursor changes to a four headed arrow, the line segment at which the cursor is pointing highlights green, and the area highlights in blue (see below left).

4.16 **Click and release the left mouse button** then **drag the line segment up the drawing until it attaches to the back of the riser cupboards** (see below right). **Click the left mouse button again** and the perimeter of the measured area will be re-aligned to include the riser cupboards, completing the Feca measurement.





Note that the information box that appears when the cursor is held over a measured dimension on the drawing includes the Zone: into which that dimension has been allocated.

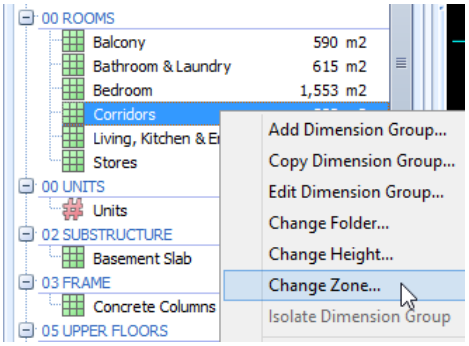
Changing Zones

4.17 **Click** on the **[⊞]** button **to expand all of the dimension group folders** (it is best to start at the bottom of the list and work upwards). A number of the existing measurements that have been taken will need to be moved from whichever zone they were previously allocated to into the new Circulation zone.

4.18 In the **{00 ROOMS}** dimension group folder **select** the **{Corridors}** dimension group. All of this quantity will need to be transferred into the Circulation zone.

4.19 **Hold the cursor over the dimension group** name, **click the right mouse button** and **select {Change Zone}** from the menu (as right).

4.20 In the **[Change Zone For Dimension Group]** window **use** the **[Zone]** drop-down menu to **select {Circulation}** then **click [OK]**.



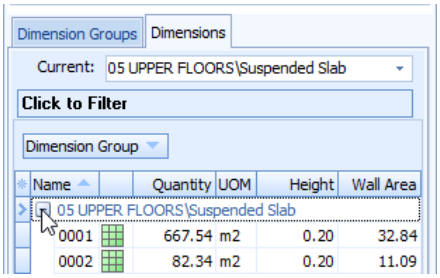
4.21 **Repeat** this process for the **{Stores}** dimension group in the **{00 ROOMS}** dimension group folder.

4.22 Next in the **{05 UPPER FLOORS}** folder **select** the **{Suspended Slab}** dimension group. The circulation areas, along with the deduction for the lift shafts, have been measured separately to the apartments however we need to allocate these particular dimensions to the new zone.

4.23 **Click** on the **[Dimensions]** tab above the list of dimension groups.

4.24 If necessary, **click** on the **[⊞]** button (see right) to display each individual measurement.

4.25 **Move the mouse over the central core measurement on the drawing** so that it highlights blue. Dimension 0002 turns grey in the dimensions list indicating that this is the corresponding measure.

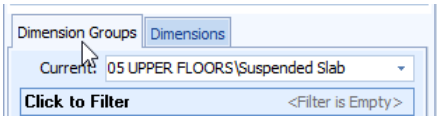


4.26 **Click the right mouse button over dimension {0002}** in the list and **select {Change Zone}** from the menu.

4.27 In the **[Change Dimension Zone]** window's **[Zone]** drop-down menu **select {Circulation}** then **click [OK]**.

4.28 Next **double-click** on the **{0003}** dimension in the dimensions list to open the Dimension Properties window and display all properties for this specific dimension. Here **use** the **[Zone]** drop-down menu to **select {Circulation}** for this dimension, then **click [Update]**. Either of these methods can be used to change the zone.

4.29 **Click** on the **[Dimension Groups]** tab (see right) and in the **{09 STAIRS}** dimension group folder **select** the **{Handrail}** dimension group. This holds a quantity of 84m.



4.30 **Click** on the **[Dimensions]** tab and, if necessary, **expand the folder** by **clicking** on the **[⊞]** button. Only one dimension is listed and when the cursor is held over it the total quantity shown in the box that appears is only 74.48m (9.31m x 8 floors). This is because measurements have been taken from two drawings, as denoted by the drawing titles being displayed in bold. CostX® defaults to show only the dimensions for the currently displayed drawing.

4.31 For the purpose of this exercise only the dimensions from the Apartment - 8 Floor Common drawing will be re-allocated as we are going to maintain the Basement as one zone and only segregate the circulation areas in the

apartments. Therefore, use one of the methods outlined previously to **set the zone as {Circulation}** for this dimension.

4.32 **Click [OK]** or **[Update]** accordingly.

4.33 **Click** on the **[Dimension Groups]** tab and **select** the **{PC Stairflight}** dimension group in the **{09 STAIRS}** folder.

4.34 **Click** on the **[Dimensions]** tab and note that, again, only the dimensions from the current drawing are displayed. As these are the two we want to re-allocate **hold down the Ctrl key** and **click on both dimensions** to select them simultaneously. **Use the right mouse click menu** method to **change the zone** of both of these dimensions to **{Circulation}**.

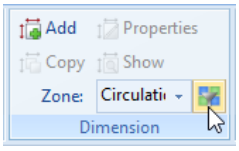
4.35 **Click** on the **[Dimension Groups]** tab. **Hold down the Ctrl key** and **click** on **each of the following** dimension groups in turn to select them all simultaneously as they all need their entire quantity allocating to the Circulation zone.

Dimension Group Folder	Dimension Group
10 INT WALLS	Core Walls
11 INT DOORS	Fire Door – Single Service Door – Double Service Door - Single
20 TRANSPORTATION	Lifts

4.36 Hold the **cursor over one of the selected dimension groups**, **click the right mouse button** and **select {Change Zone}**. **Use** the **[Zone]** drop-down menu in the Change Zone for Dimension Group window to **select {Circulation}** and **click [OK]**, amending all dimensions in all five dimension groups at once.

Zone Filter

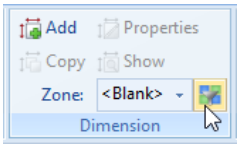
4.37 Ensure that the Circulation zone is still selected in the Zone field on the Dimensions ribbon menu then **click** on the **[Current Zone]** button (see right). The dimension groups listing will change to show only those quantities allocated to the currently selected Circulation zone.



4.38 **Use** the **[Zone]** drop-down menu to **select** the **{Apartment}** and **{Basement}** zones respectively and note that the quantities displayed for the dimension groups change accordingly.

4.39 **Use** the **[Zone]** drop-down menu to **select** the **{< Blank>}** zone. If all dimensions have been correctly allocated to one of the project's zones then all of the dimension groups should show a zero quantity for the <Blank> zone. If any quantities are displayed for the <Blank> zone select the dimension group and use the methods outlined previously to change the zone for the entire dimension group, or individual dimensions within it.

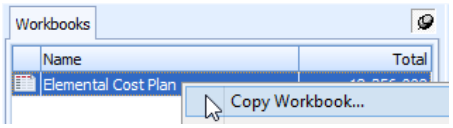
4.40 Having ensured that all dimensions are correctly allocated to a zone **click** on the **[Current Zone]** button again (see right) to turn 'off' the filter and display all quantities for all dimension groups.



Zone Analysis

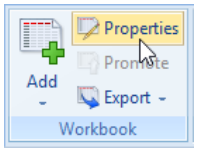
4.41 **Open** the **[Workbooks]** ribbon and **click** on the **[Recalculate Workbook]** button to ensure that all of the revised dimensions have been transferred to the Elemental Cost Plan workbook.

4.42 **Click the right mouse button over** the **{Elemental Cost Plan}** name in the Workbooks list and **select {Copy Workbook…}** from the right click menu (see right).

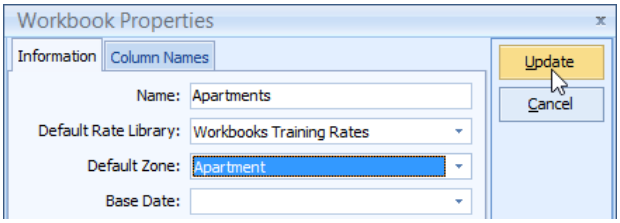


4.43 In the **[Workbook Properties]** window give your new workbook a **[Name]** of **"Apartments"** then **click [OK]**. A new Apartments workbook will appear in the Workbooks list.

4.44 **Click** on the **{Apartments}** workbook name to open the new workbook then **click** on the **[Properties]** button in the Workbooks ribbon menu (see right) to open the workbook properties.



4.45 Use the drop-down menu to **set** the **[Default Zone]** to **{Apartment}** then **click [Update]** (see right). The quantities in the workbook will be filtered to only include the Apartment zone, thereby segregating the cost of the apartments from the elemental cost plan.



4.46 **Copy** the **{Elemental Cost Plan}** workbook again to create a new workbook called **"Basement"**, and **set** the **[Default Zone]** in the Workbook Properties to extract only the **{Basement}** zone dimensions.

4.47 **Copy** the **{Elemental Cost Plan}** workbook again to create a workbook called **"Circulation"** where the **[Default Zone]** is set to extract only the **{Circulation}** zone dimensions.

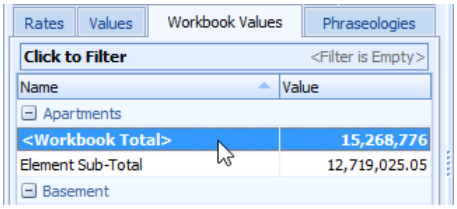
You will now have three separate workbooks isolating the costs of each zone based on the allocation of quantities into each. Within the realms of rounding within each one, we can check whether the three workbook totals add up to the original Elemental Cost Plan workbook total.

4.48 In the **[Workbooks]** ribbon menu **click** on the **[Add]** button and add a new workbook called **"Zone Summary"**.

4.49 In the **B:Description** column of the new workbook **type in** separate entries for **"Apartments"**, **"Basement"** and **"Circulation"**.

4.50 **Click** on the **[Workbook Values]** tab and use the **[⊞]** buttons to **expand** the folders for the **{Apartments}**, **{Basement}** and **{Circulation}** Workbook Values.

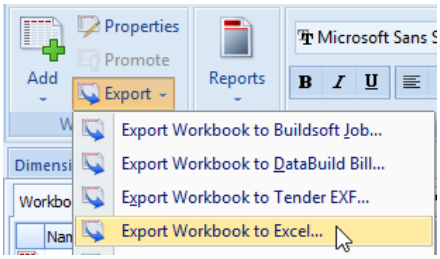
4.51 **Drag-and-drop** the **{<Workbook Total>}** value (see right) **for each to** the respective **F:Subtotal** cell in the **{Zone Summary}** workbook. Looking at the Workbooks list it can be seen that, due to rounding, the Zone Summary total does not quite match the Elemental Cost Plan total.



Rounding

The default setting within System Administration (Network configuration) or the CostX Options (Standalone configuration) is to round up calculated totals. Therefore a Qty sheet containing rows with values of 11.2 and 5.1 (=16.3) would round up to a calculated total of 17. If the two figures were allocated to different zones, when separated they would round up to 12 and 6 respectively, giving a total of 18 and thereby a discrepancy of 1.

4.52 By exporting the Elemental Cost Plan and three zone workbooks to Excel (level 1 only) and combining the figures from each into one Excel workbook, the following spread sheet (see below) can be prepared to identify where the differences lie. In this instance the only significant variance is in the Upper Floors element, which then also affects the calculations of Preliminaries, Margins and Contingencies.



	A	B	C	D	E	F	G	H	I	J
1			Peel Street Apartments							
2			Elemental Cost Plan							
3										
4	**Code**	**Description**	**Total**		**Apartment**	**Basement**	**Circulation**	**Total**		**Variance**
5										
6	E01	Site Preparation	296,783		0	296,783	0	296,783		0
7	E02	Substructure	458,991		0	458,991	0	458,991		0
8	E03	Frame	178,168		144,984	33,183	0	178,167		1
9	E05	Upper Floors	2,508,392		2,253,974	0	255,857	2,509,831		(1,439)
10	E06	Roof	328,394		257,109	71,285	0	328,394		0
11	E07	Exterior Walls & Exterior Finish	1,793,272		1,793,272	0	0	1,793,272		0
12	E08	Windows & Exterior Doors	768,111		768,111	0	0	768,111		0
13	E09	Stairs and Balustrades	86,650		0	9,760	76,890	86,650		0
14	E10	Interior Walls	2,672,241		2,325,870	0	346,371	2,672,241		0
15	E11	Interior Doors	536,424		434,078	0	102,358	536,436		(12)
16	E12	Floor Finishes	1,011,142		939,828	0	71,314	1,011,142		0
17	E13	Wall Finishes	472,759		469,492	0	3,267	472,759		0
18	E14	Ceiling Finishes	491,454		456,458	0	34,996	491,454		0
19	E15	Fittings and Fixtures	807,259		807,259	0	0	807,259		0
20	E16	Sanitary Plumbing	361,800		361,800	0	0	361,800		0
21	E17	Heating and Ventilation	1,077,715		791,895	181,195	104,625	1,077,715		0
22	E18	Fire Services	139,060		102,180	23,380	13,500	139,060		0
23	E19	Electrical Services	827,407		607,971	139,111	80,325	827,407		0
24	E20	Vertical and Horizontal Transportation	260,000		0	0	260,000	260,000		0
25	E21	Special Services	213,965		204,745	5,845	3,375	213,965		0
26										
27	E25	Preliminaries	1,384,124		1,150,610	111,107	122,538	1,384,255		(131)
28	E26	Margins	917,399		763,142	73,172	81,173	917,487		(88)
29	E27	Contract Contingencies	764,500		636,000	61,000	67,600	764,600		(100)
30										
31										
32		**TOTAL FOR BUILDING**	**18,356,009**		**15,268,778**	**1,464,812**	**1,624,189**	**18,357,779**		**(1,769)**
33										

4.53 **Open** the **{Circulation}** workbook in CostX® and **double-click** on the F:Subtotal column on the Upper Floors element row (cell **F4**) to drill-down to the level 2 Cost sub-sheet.

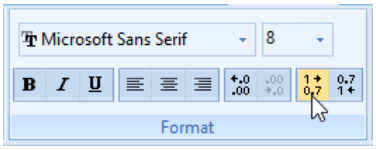
4.54 **Click** on cell **C2** and note in the Cell= field that the =XSUMQTY(0) formula in the cell is set to round to no decimal places, as denoted by the zero in brackets.

4.55 **Double-click** on cell **C2** to open the Qty sub-sheet beneath. The value in the H:Quantity column is just over 113m³ however this is being rounded up to 114m³ on the Cost sheet above.

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	E05	Upper Floors	675	m2	378.35	255,377		255,377
		N32 concrete in 200 thick suspended slab	114	m3	372.23	42,434		42,434

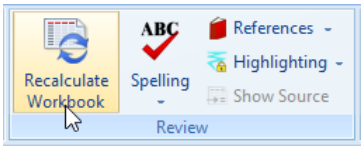
	A:Code	B:Description	C:Count	D:Length	E:Width	F:Height	G:Factor	H:Quantity
1		Suspended Slab		565.65	m2	0.20		113.13

4.56 **Return to level 2** of the workbook and **click twice** on the **[Round to More Decimal Places]** button (see right). Each time the button is clicked the rounding figure in the =XSUMQTY(2) formula increments and the totals in the C:Quantity and F:Subtotal columns update accordingly.



4.57 **Click** on cells **C8 and C9** to highlight them both **together** then **click twice** on the **[Round to More Decimal Places]** button. Again, the cell formulae will change and the C:Quantity and F:Subtotal columns will update accordingly on both rows.

4.58 **Use** the **[Recalculate Workbook]** button (see right) to refresh all calculations in the Circulation workbook and give a new Workbook Total.



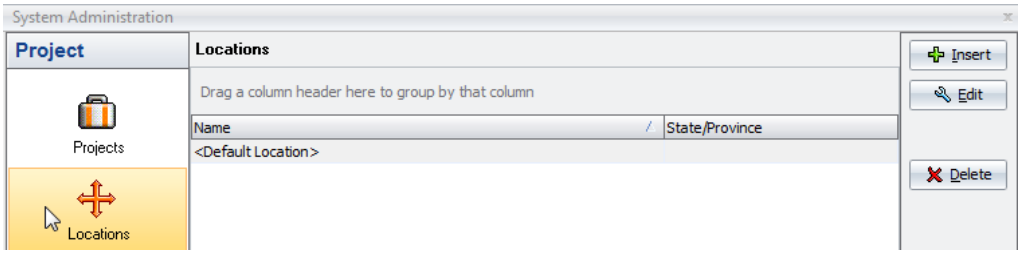
4.59 **Open** the **{Zone Summary}** workbook which will refresh to include the revised Workbook Total from the Circulation workbook, bringing the Zone Summary and Elemental Cost Plan workbook totals closer to one another.

Module 5: Locations

In this module we will review the Locations area of System Administration then review and amend an Excel derived .csv rate library to account for different pricing in different locations. We shall then import this library into CostX® and use it to compare pricing across the different locations.

Establishing/Amending Alternative Locations

5.1 From the **[Main Menu] open [System Administration]** and **click** on the **[Locations]** button (see below).



When the Workbooks Training rates and Workbooks Training Project were imported previously, if not there already, a prompt was given to add the Brisbane and Melbourne locations to the database. These, along with any others previously inserted will be listed in the Locations area of System Administration.

5.2 **Click** on the **[Insert]** button. The Location Properties window will appear where it is possible to enter the Name and State/Province for further locations, if required. (Note: If you are working in a network configuration, only one person need enter a given location).

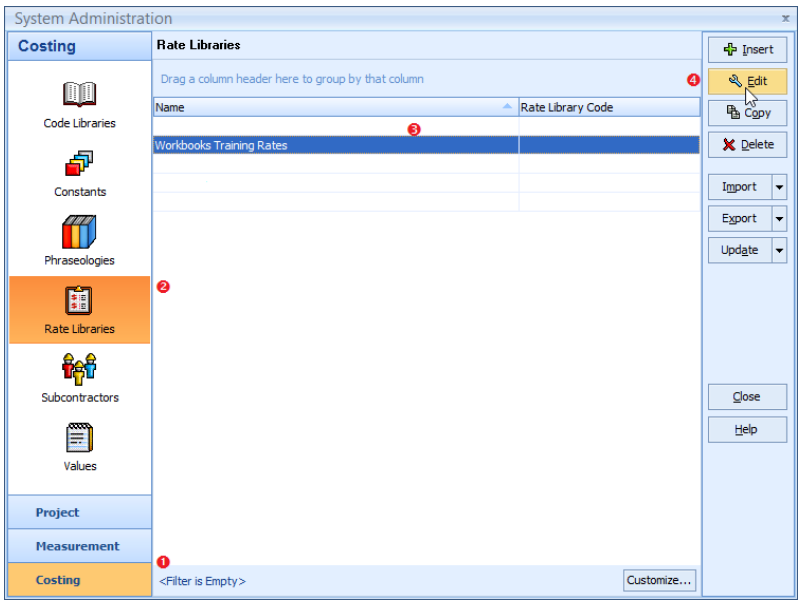
5.3 **Click [Cancel]** to suspend entry of a new location.

Reviewing Rate Libraries With Alternative Locations

5.4 In the System Administration window **click** on the **[Costing]** button at the bottom left ❶, and then **click** on the **[Rate Libraries]** button ❷ in the panel above it.

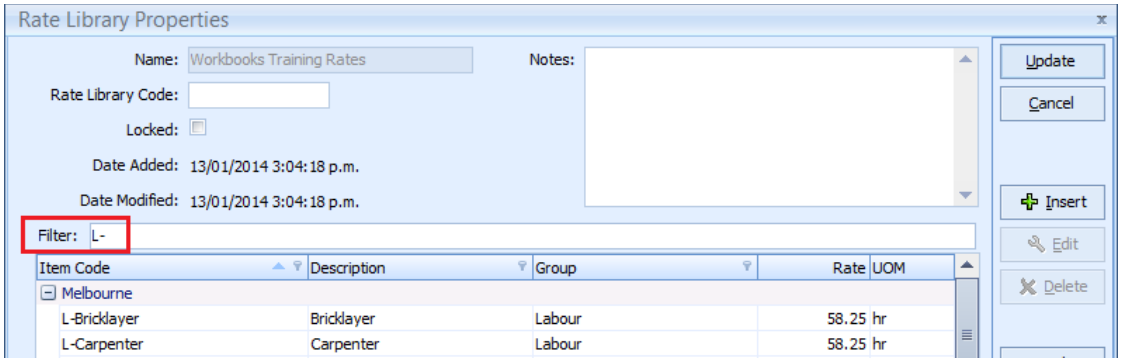
5.5 **Click** on the **{Workbooks Training Rates *(-followed by your name)*}** library ❸ that was imported previously to select it and then **click** on the **[Edit]** button ❹.

5.6 Use the scroll bar on the right hand side to **scroll to the top of the list** of rates. Note that a Melbourne folder exists at the top.



5.7 **Use** the [⊟] button to collapse the folder and note that a Brisbane folder appears.

5.8 In the **[Filter]** field **type "L-"** (see below) and then **click** on the two [⊞] buttons to **expand** both the **{Brisbane}** and **{Melbourne}** folders. Two sets of identical rate items will appear, one in each folder, the only difference between them being the figures in the Rate column.



5.9 **Clear the Filter** text and **scroll up and down** the rates pane. The 'Workbooks Training Rates *(-followed by your name)*' library contains two identical sets of rate items, one priced for the Brisbane location and one for Melbourne.

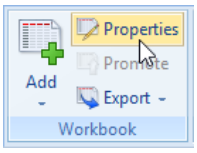
5.10 **Click [Cancel]** to exit out of the rate library.

5.11 **Click [Close]** to exit from System Administration.

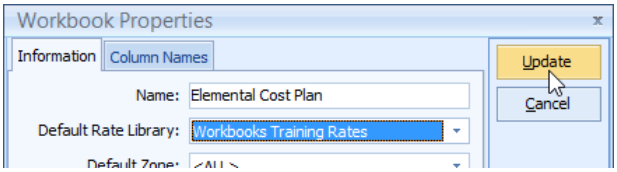
Utilising Rates for Alternative Locations

5.12 **Open** the **{Elemental Cost Plan}** workbook.

5.13 **Click** on the **[Properties]** button in the Workbooks ribbon menu to open the Workbook Properties.

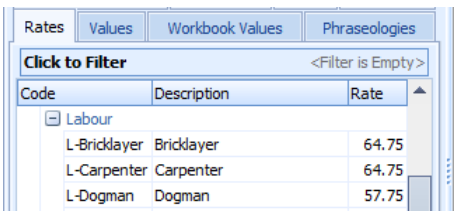


5.14 Check that the **[Default Rate Library]** remains **set** as **{Workbooks Training Rates *(-followed by your name)*}**. If not, use the drop-down menu to select it (see below).

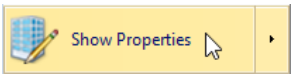


5.15 **Click [Update]** and, if necessary, the workbook will re-calculate.

5.16 **Open** the **[Rates]** tab in the task pane and **use** the [⊞] buttons to **expand** the **{Workbooks Training Rates *(-followed by your name)*}** rate library, and the **{Labour}**, **{Materials}** and **{Plant}** folders within it (see right). The rates displayed and available to drag-and-drop into the workbooks will be those for the Brisbane location.

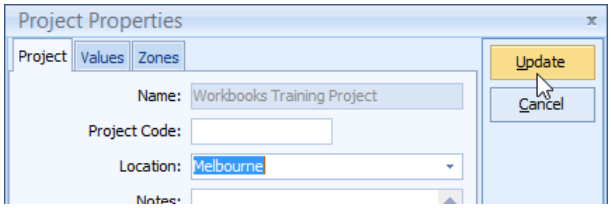


5.17 **Click** on the **[Main Menu]** button and **hold the cursor over** the **[Show Properties]** option (see right).

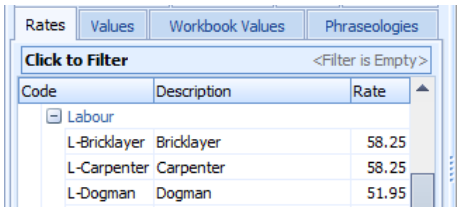


5.18 When the sub-menu opens to the right **select [Show Project Properties]** (see right).

5.19 In the Project Properties window the Location currently set for this project is Brisbane. **Use** the **[Location]** drop-down menu to **set the project location to {Melbourne}** and **click [Update]** (see below).



The Rates tab will refresh and the rates displayed and available to drag-and-drop into the workbooks from the 'Workbooks Training Rates (-followed by your name)' rate library will now be those for the Melbourne location.



5.20 **Note** the **{Elemental Cost Plan}** workbook **Total** then **click** on the **[Recalculate Workbook]** button in the Workbooks ribbon menu. After recalculation, the workbook Total will change as it is now based on the Melbourne set of rates in the 'Workbooks Training Rates *(-followed by your name)*' rate library.

Having changed the Project location, all other workbooks in this Building will also need to be re-calculated to refresh them with the Melbourne set of rates.

By having corresponding sets of location specific rates in your rate libraries you can refer to those rates in your workbook by setting the project's Location to match. If, however, there are no rates in the library that match the project's Location CostX® will default to using the <Default Location> set of rates as a 'global' alternative.

Module 6: Rates & Rate Libraries

Composite Workbook Rate Sheet Items

The majority of rates in this workbook have been built up in the Rate sub-sheet behind the cells in the E:Rate column. We shall now review and amend one of these.

6.1 In the **{Elemental Cost Plan}** workbook **click** on the F:Subtotal amount for Upper Floors (cell **F4**).

6.2 **Press** the **'F7'** keyboard function key. This is an alternative way of drilling-down into CostX sub-sheets.

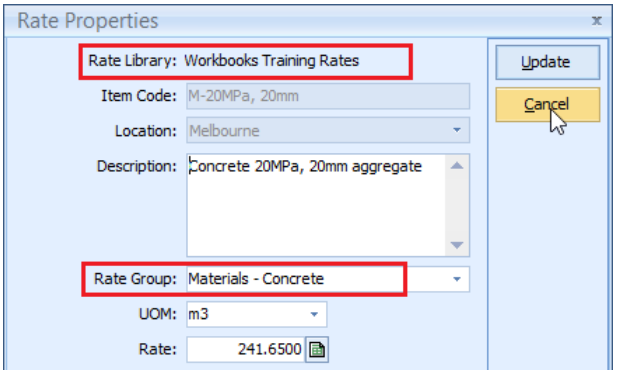
6.3 **Click** on the first item in the E:Rate column (cell **E2**, see below) and **press** the **'F7'** function key again to drill into the Rate sub-sheet.

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	E05	Upper Floors	6,952	m2	324.54	2,256,238		2,256,238
	A:Code	**B:Description**	**C:Quantity**	**D:Unit**	**E:Rate**	**F:Subtotal**	**G:Factor**	**H:Total**
1		Suspended Slab						
2		N32 concrete in 200 thick suspended slab	1.182	m3	334.99	395.958		395.958
3		Class 2 formwork including propping of varying lengths to max 3500 high	5.907	m2	109.99	649.681		649.681

6.4 The overall rate is made up of an assembly of individual items which have each been dragged-and-dropped from a rate library creating a live-link in the E;Rate column. If necessary, the source of the particular rate can be reviewed. **Select** the rate for 20MPa concrete in the first row of the E:Rate column (cell **E1** as below)

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	E05	Upper Floors	6,952	m2	324.54	2,256,238		2,256,238
		N32 concrete in 200 thick suspended slab	1,182	m3	334.99	395,958		395,958
	A:Code	**B:Description**	**C:Quantity**	**D:Unit**	**E:Rate**	**F:Factor**	**G:Total**	**H:Include**
1	M-20MPa, 20mm	Concrete 20MPa, 20mm aggregate	1.00	m3	241.65	1.10000	265.82	265.82
2	L-Labourer	Labourer	1.20	hr	29.70		35.64	35.64
3	L-Foreman	Foreman	0.50	hr	51.95		25.98	25.98
4	P-Compressor	Compressor	0.03	week	157.50		4.72	4.72
5	P-Poker	Poker	0.03	week	94.50		2.84	2.84

6.5 From the Review area of the Workbooks ribbon menu, **click** on the **[Show Source]** button. The Rate Properties for the library item will be displayed, in which it can be seen that this particular rate has come from the 'Workbooks Training Rates *(-followed by your name)*' rate library, in the 'Materials – Concrete' rate group/folder (see right).

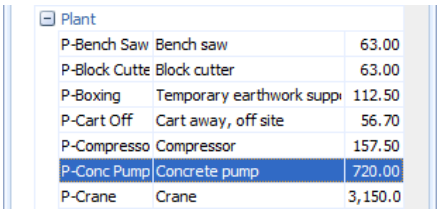


6.6 The Rate field is open, allowing editing, however if this rate is changed it will affect every instance in this and all other workbooks where live-links exist that reference it. **Click [Cancel]** to close the Rate Properties.

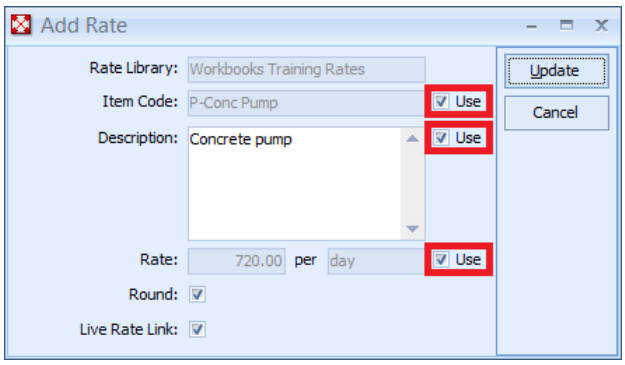
The rate build-up that we are looking is for concrete in a suspended slab and we can make changes to the rate build-up in the workbook Rate sheet, to add a concrete pump, say, that will only be effective in that specific instance and will not affect any other workbook or any other rates in this workbook.

6.7 **Click** on the **[Rates]** tab and, if necessary, **use** the **[⊞]** buttons to **expand** the **{Workbooks Training Rates *(-followed by your name)*}** library and the **{Plant}** folder within it.

6.8 **Select** the **{Concrete Pump}** (P-Conc Pump) rate (see right) then **drag-and-drop** it into cell **B6** of the workbook Rate sheet immediately beneath the last item.



6.9 The Add Quantity window will appear in which there are a number of option boxes which may be un-ticked if any of the Item Code, Description or Rate are not required in the workbook (see right). In this case leave them all ticked and **Click [Update]** to place all of the chosen information in to the Rate sheet. The rate code, description, unit of measure and rate will all be transferred into the workbook, live-linking the rate to the rate library.



6.10 **Click** into the vacant C:Quantity cell **C6** for the concrete pump where we will need to enter the constant associated with this rate item (see below). In this case we are building up a rate for the concrete floor slab which has been measured in m³, and it has already been established that the labourer will take 1.20hr to place each m³ (row 2). Therefore, **enter the formula "=1.2/8" in cell C6** to apportion the daily hire rate for the concrete pump to each m³ of concrete poured in the floor. The rate will calculate to a total in the H:Include column, and will be reflected in the Rate, Sub-Total and Total summary fields right up to the level 1 worksheet.

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	E05	Upper Floors	6,952	m2	342.90	2,383,894		2,383,894
		N32 concrete in 200 thick suspended slab	1,182	m3	442.99	523,614		523,614

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include
1	M-20MPa, 20mm	Concrete 20MPa, 20mm aggregate	1.00	m3	241.65	1.10000	265.82	265.82
2	L-Labourer	Labourer	1.20	hr	29.70		35.64	35.64
3	L-Foreman	Foreman	0.50	hr	51.95		25.98	25.98
4	P-Compressor	Compressor	0.03	week	157.50		4.72	4.72
5	P-Poker	Poker	0.03	week	94.50		2.84	2.84
6	P-Conc Pump	Concrete pump	0.15	day	720.00		108.00	108.00

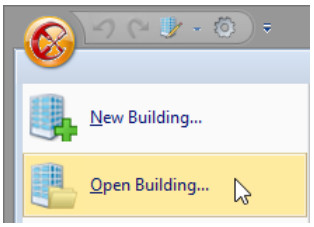
6.11 **Press** the **'F8'** function key repeatedly to return up one level of the workbook at a time until you reach workbook level 1.

Although the rate was amended solely in the one workbook cell this may have affected Named Cell values used elsewhere within the workbook so it should be re-calculated to refresh all formulae.

This rate has been specifically amended in the Elemental Cost Plan workbook only and has not been applied to the other zonal workbooks. CostX® has no way of knowing whether all workbooks should be priced the same, or whether the separate workbooks have been created to show comparisons based on different pricing. If this adjustment is required across all workbooks it will have to be replicated or copied into the others, or they can be deleted completely and then recreated by copying the adjusted Elemental Cost Plan workbook again.

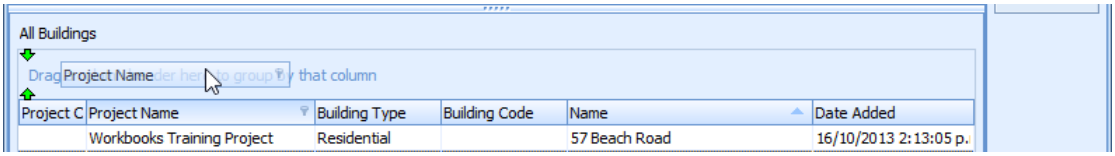
Composite Rate Library Items

We shall now look at how composite rate assemblies can be built up within a rates library, as opposed to within the workbook.



6.12 **Click** on the **[Main Menu]** button and then **[Open Building]** (see right).

6.13 In the All Buildings area of the Select Building window, **click** on the **[Project Name]** column heading and, whilst still holding the mouse click down, **drag it to the area above** where it says 'Drag a column heading here to group by that column' (see below). All of the buildings in the database will now be grouped by Project Name.

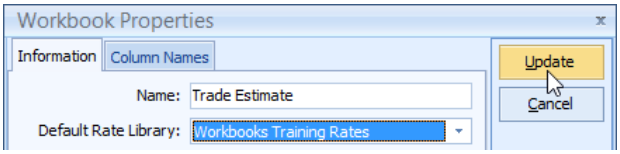


6.14 **Use** the **[⊞]** button to **expand** the **{Workbooks Training Project *(-followed by your name)*}** project folder then **double-click** on the **{57 Beach Road *(-followed by your name)*}** building to open it.

6.15 If the building does not open with the Costing View active then **click** on the **[Costing View]** tab where you will see an existing workbook named Trade Estimate.

6.16 **Open the workbook** and then in the Workbooks ribbon menu **click** on the **[Properties]** button to view the properties for this workbook.

6.17 **Ensure** that the **[Default Rate Library]** is set as the previously imported **{Workbooks Training-Rates *(-followed by your name)*}** rate library. If not use drop-down menu to select it as the default set of rates to apply.



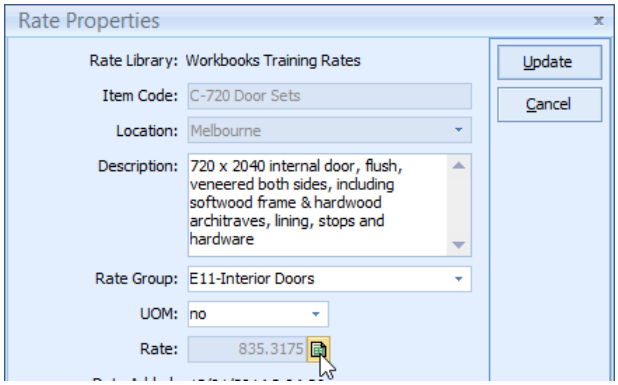
6.18 **Click [Update]** and if changes have been made the workbook will recalculate.

6.19 Using your preferred method (double-click, or F7 and F8), **drill-down** on the F:Subtotal column to see the Cost sub-sheet beneath the Joinery trade (cell **F11**). The majority of rates in this workbook are live-linked to a rate library as denoted by the green text in the E:Rate cells.

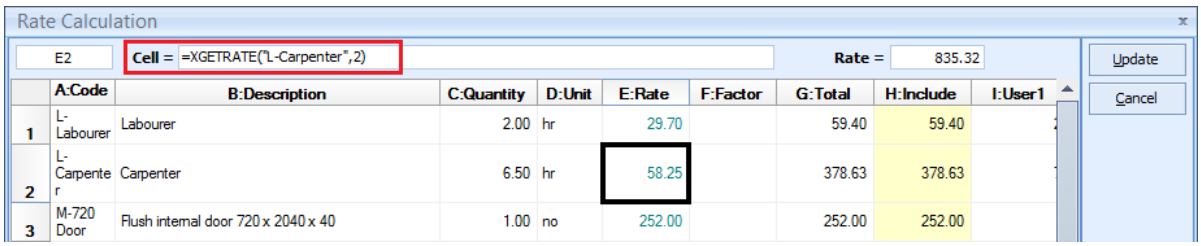
6.20 **Click** on the E:Rate column adjacent to the second Timber Doors items (cell **E9**, as below) then, in the Workbooks ribbon, **click** on the **[Show Source]** button. The Rate Properties for this rate within the rate library will open, in which it can be seen that it has come from the 'Workbooks Training Rates *(-followed by your name)*' rate library, in the 'E11–Interior Doors' rate group/folder.

7	E11.01	**Timber Doors**						
8	E11.01	Flush door; Internal quality; Veneered both sides; 620 x 1980 x 40mm; H3.2 sawn softwood frame; Softwood architraves, lining and stops; Including all hardware	1	no	866.71	867		867
9	E11.01	Flush door; Internal quality; Veneered both sides; 720 x 1980 x 40mm; H3.2 sawn softwood frame; Softwood architraves, lining and stops; Including all hardware	4	no	835.32	3,341		3,341
		Flush door; Internal quality; Veneered both sides; 820 x 1980 x 40mm; H3.2 sawn softwood frame;						

6.21 Note that, unlike the previous item, the Rate figure is locked. This signifies that the rate is not a 'flat' labour, materials or plant supply item but an assembly/composite/built-up rate. **Click** on the [ ] button to the right of the Rate field (see right) and a Rate Calculation sheet, just like the workbook Rate sub-sheet, will open showing the full build-up to the overall figure. In this case all of the figures in the E:Rate column are in green text denoting that they are live-linked.



6.22 **Click** on **any figure in** the **E:Rate** column and the Cell= field at the top of the Rate Calculation sheet will display the =XGETRATE() formula (see below). This is pulling rates from the labour, plant and materials folders within the same rate library, meaning that should any of the 'flat' supply rates be amended, all of the associated assemblies/composite/built-up rates will adjust accordingly.



	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include	I:User1
1	L-Labourer	Labourer	2.00	hr	29.70		59.40	59.40	
2	L-Carpenter	Carpenter	6.50	hr	58.25		378.63	378.63	
3	M-720 Door	Flush internal door 720 x 2040 x 40	1.00	no	252.00		252.00	252.00	

6.23 **Scroll** to the **right** and **click** on any cell containing **a figure in the [I:User1]** column. Here, a simple formula has been entered to transfer all of the labour constants across to this user column. Similarly, the cells containing figures in the J:User2 column hold a formula to transfer all of the material costs to the user column. We shall use these columns later to analyse the labour and material totals in the rate.

6.24 **Scroll down** the **[Rate Calculation]** sheet to review the components within it. In this particular estimate the four doors to which this rate has been applied are all bathroom doors, however there is no item in the rate for a bathroom lock.

6.25 It is possible to alter the assembly/composite/built-up rate within this screen and save the changes, however as noted previously, this will alter the rate for every instance where it has been used in both this and any other workbook. Therefore, **click [Cancel]** to close the Rate Calculation window.

6.26 **Click [Cancel]** again to close the Rate Properties window without saving. Instead, we shall copy the rate build-up to the workbook rate sub-sheet where we can then amend it and it will only apply to that workbook cell.

Copying Composite Rate Library Item Detail to the Workbook Rate Sheet

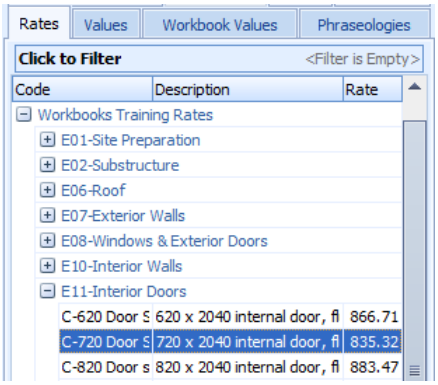
6.27 The workbook cell (E9) should still be selected so **press** the **[Delete]** key on the keyboard to clear out the existing live-linked rate.

6.28 **Double-click** on cell **E9** (or press F7) to drill into the Rate sub-sheet.

6.29 In the Rates tab of the CostX® task pane **use** the [⊞] buttons to **expand** the **{Workbooks Training Rates *(-followed by your name)*}** rate library, and the **{E11-Interior Doors}** folder within it.

These elemental folders at the top of the library contain the built-up assemblies/composite rates that are being fed from the Labour, Plant and Materials folders further down.

6.30 **Click** on the **{720 x 2040 internal door…}** (C-720 Door) rate item to select it (see right).

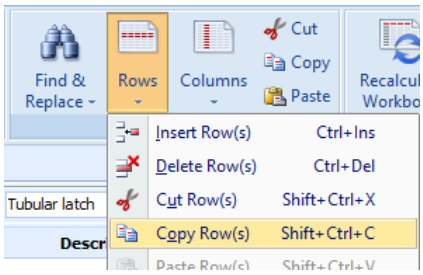


6.31 Whilst **still holding down the mouse button, also press and hold down the Alt key** on the keyboard.

6.32 **Drag-and-drop the rate library item to the first row of the Rate sub-sheet.** Note that a range of cells are highlighted, and once the mouse and Alt keys are released, the entire assembly/composite/built-up rate content from the rate library is copied into the Rate sub-sheet.

6.33 **Click** on **any cell in row 10** which contains an item for a Tubular Latch.

6.34 **Click** on the **[Rows]** button in the Workbooks ribbon and **select [Copy Row(s)]** (see right).



6.35 Still in row 10, **click** on the **[Rows]** button again and **select [Paste Row(s)]**. A complete copy of the Tubular Latch item, including the formula in the user column will be inserted in to the Rate sub-sheet.

6.36 **On either of the two identical rows delete** the **A:Code** entry, **type** in a **B:Description** of **"Thumb turn lock"** and **enter** an **E:Rate** cell value of **"30"** (see below).

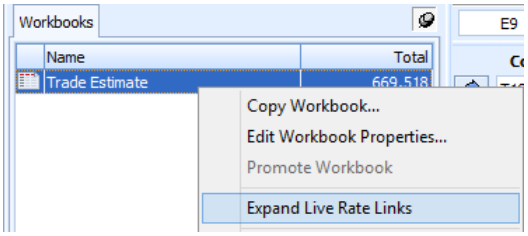
10	M-Tube Latch	Tubular latch	1.00	no	4.75		4.75	4.75	5
11		Thumb-turn lock	1.00	no	30.00		30.00	30.00	30
12	P-Bench Saw	Bench saw	0.16	week	63.00		10.24	10.24	

6.37 **Return to the workbook Cost sheet** at the level above and note that the total rate in the E:Rate column now differs from the 'C-720 Door' rate in the rate library, as seen in the Rates tab. The rate library item remains unaltered whilst the rate for this particular estimate has been amended to suit its specific requirements.

Expanding Live Rate Links

As noted, the built-up/assembly/composite rates in this workbook contain a separation of labour constants and material costs in the I:User1 and J:User2 columns. Before we can use this all of the rate build-ups must be copied into the workbook Rate sub-sheets as just undertaken for the 'C-720 Door' item. To avoid having to drag-and-drop each rate individually this can be done en-masse.

6.38 **Right Click** over the **{Trade Estimate}** workbook name to open the right click menu and **select {Expand Live Rate Links}** (see right). A warning will appear advising what this function will do.



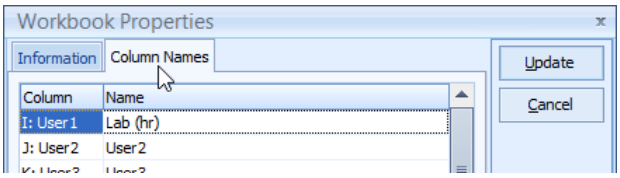
6.39 **Click [Yes]** to continue. All of the live-linked =XGETRATE() formulas in the E:Rate column throughout all Cost sheets in the workbook will be replaced with the build-up from the rate library copied into the E:Rate column sub-sheet behind the cells.

6.40 **Drill-down into any E:Rate column cell** to see the build-up and note that the formulas transferring the labour and materials figures to the rate sheet's I:User1 and J:User2 columns have also been copied in.

Renaming Workbook Columns

6.41 **Double-click** on the **{Trade Estimate}** workbook name, or click the Properties button in the Workbook ribbon, to display the Workbook Properties window.

6.42 In the Workbook Properties screen **click** on the **[Column Names]** tab at the top (see below) to see a list of the current User Column names



6.43 **Click** in the **[Name]** cell containing **{User1}** and **over-type** it with **"Lab (hr)"** (as above).

6.44 **Click** in the **[Name]** cell containing **{User2}** and **over-type** that with **"Mat ($)"**.

6.45 **Click [Update]** and the column headings within the Rate sheet are amended accordingly (see below).

E:Rate	F:Factor	G:Total	H:Include	I:Lab (hr)	J:Mat ($)
29.70		59.40	59.40	2	

6.46 **Return up to level 1** of the workbook and note that the I:User1 and J:User2 column headings have been updated on every worksheet.

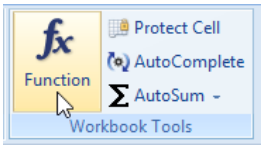
Summarising Rate Build-ups in the Workbook

For this example we shall assume that the Concrete Work and Carpentry trades are being undertaken by the contractor's in-house labour and so it is these trades that we shall summarise the labour and materials for.

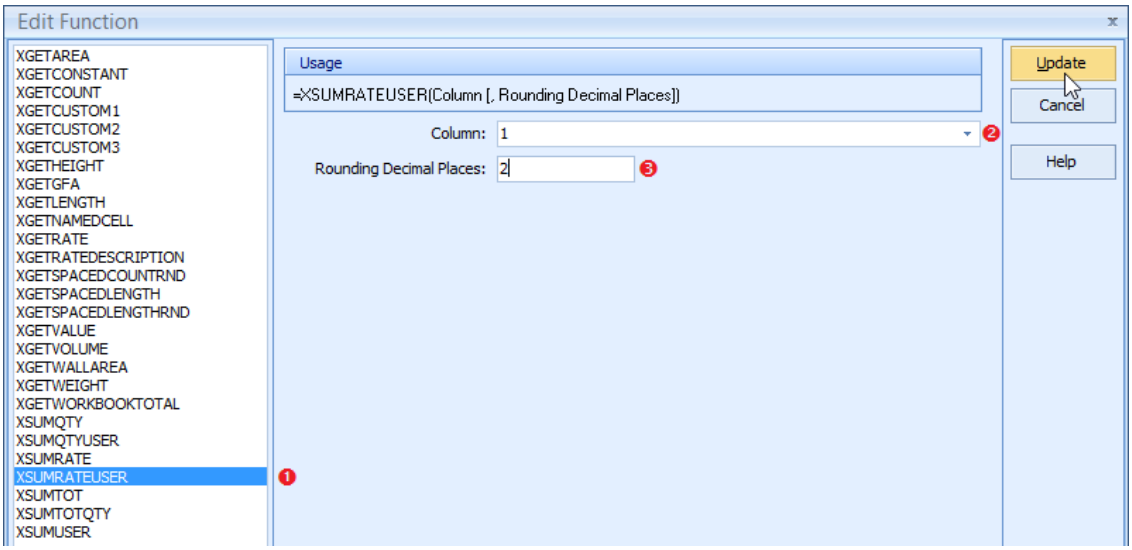
6.47 **Drill-down** on cell **F3** to access the Cost sub-sheet for the Concrete Work trade and **click** into the I:Lab (hr) cell adjacent to the first item (cell **I2**, as below).

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total	
	T06	Concrete Work	311	m2	69.03	21,468		21,468	
	A:Code	**B:Description**	**C:Quantity**	**D:Unit**	**E:Rate**	**F:Subtotal**	**G:Factor**	**H:Total**	**I:Lab (hr)**
1	E02.03	**Strip Foundations**							
2	E02.03	In-situ concrete foundations; Reinforced; 20MPa, 20mm aggregate; Poured on or against unblinded hardfill	12	m3	310.83	3,730		3,730	
3	E02.05	**Floor Slabs on Grade**							

6.48 We already know that the rate sheets contain the labour constants in their first user column so we need a formula to add the column up and give us the total. **Click** on the **[Function]** button in the Workbooks ribbon menu (see right).



6.49 In the left hand pane of the Edit Function window **click** on **{XSUMRATEUSER}** ❶. As its name suggests this function will look into the Rate sub-sheet and sum the contents of the specified user column.



6.50 **Click** on the **[Column]** drop-down menu ❷ and **select** user column **{1}** as that to sum in the Rate sheet.

6.51 **Enter** a **[Rounding Decimal Places]** of **{2}** ❸ and then **click** on the **[Update]** button. The total of the Rate sheet user column 1 (I:Lab (hr)) will appear in the cell.

6.52 **Use** the **[**  **]** buttons (Increase/Decrease Decimal Places Displayed) to show your preferred number of decimal places.

6.53 At present this just shows the total of all labour constants in the rate sheet. If we want to show the total hours we will need to multiply the constants by the quantity for this item. **Click** into the **[Cell=]** field above the workbook and **amend the formula to "=XSUMRATEUSER(1,2)*C2"** then press the **[Enter]** key.

6.54 Next **click** into the J:Mat ($) cell adjacent to the first item (cell **J2**, as below).

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total		
	T06	Concrete Work	311	m2	69.03	21,468		21,468		
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Lab (hr)	J:Mat ($)
1	E02.03	**Strip Foundations**								
2	E02.03	In-situ concrete foundations; Reinforced; 20MPa, 20mm aggregate; Poured on or against unblinded hardfill	12	m3	310.83	3,730		3,730	20.40	
3	E02.05	**Floor Slabs on Grade**								

6.55 Again we know that the individual material costs exist in user column 2 of the rate sub-sheet. **Click** on the **[Function]** button in the Workbooks ribbon menu and, in the left hand pane **click** on **{XSUMRATEUSER}**.

6.56 **Click** on the **[Column]** drop-down menu and **select** user column **{2}** as that which we wish to sum in the Rate sheet.

6.57 **Enter** a **[Rounding Decimal Places]** of **{2}** and then **click** on the **[Update]** button. The total of the Rate sheet user column 2 (J:Mat ($)) will appear in the cell.

6.58 **Use** the **[**  **]** buttons (Increase/Decrease Decimal Places Displayed) to show your preferred number of decimal places.

6.59 Again this just shows the total of all material costs in the rate sheet for a single unit. If we want to show the total cost we will need to multiply the costs by the quantity for this item. **Click** into the **[Cell=]** field above the workbook and **amend the formula to "=XSUMRATEUSER(2,2)*C2"** then **press** the **[Enter]** key.

6.60 We now have a summary for this item that tells us it will take approximately 20 hours to complete and incur material costs of around $2,900. **Click** on both of the summary cells and drag the cursor down to cover all of the rows for which items exist (cells **I2:J8**, as below)

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Lab (hr)	J:Mat ($)
1	E02.03	**Strip Foundations**								
2	E02.03	In-situ concrete foundations; Reinforced; 20MPa, 20mm aggregate; Poured on or against unblinded hardfill	12	m3	310.83	3,730		3,730	20.40	2,899.80
3	E02.05	**Floor Slabs on Grade**								
4	E02.05	Insitu concrete beds; Thickness n.e. 150mm; Reinforced; C10, 40mm aggregate	44	m3	289.68	12,746		12,746		
5	E02.05	Concrete finish; Power floating	290	m2	5.92	1,717		1,717		
6	E23.03	**Paths, Terraces and Paved Areas**								
7	E23.03	Insitu concrete beds; Thickness n.e. 150mm; Reinforced; C10, 40mm aggregate	10	m3	289.68	2,897		2,897		
8	E23.03	Concrete finish; Power floating	64	m2	5.92	379		379		

6.61 **Press** the **'Ctrl' and 'D'** keys simultaneously to duplicate the two formulae in the top row of the selection to all other selected rows (if desired, you can then delete the zeroes).

We now have an analysis of the duration and material costs for each of the Concrete Work items and, as stated previously, want the same for the Carpentry trade as well.

6.62 To save setting up the formulae again we can copy them. **Select** the top two cells in the I:Lab (hr) and J:Mat ($) columns (cells **I2:J2**, see right) and then **click** on the **[Copy]** button in the workbooks ribbon.

H:Total	I:Lab (hr)	J:Mat ($)
3,730	20.40	2,899.80

6.63 **Return to level 1** of the workbook and then **drill-down** into the F:Subtotal cell for the Carpentry trade (**F9**).

6.64 **Click** into the I:lab (hr) cell adjacent to the first item (cell **I2**) and then **click** on the **[Paste]** button in the Workbooks ribbon menu. The correct formulas complete with your preferred formatting are placed into the two columns against the first item (as below).

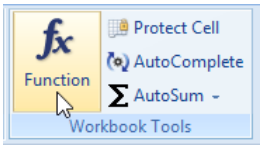
	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total		
	T17	Carpentry	311	m2	203.70	63,349		63,349		
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Lab (hr)	J:Mat ($)
1	E02.10	**Tanking, Including Protection**								
2	E02.10	Damp proof course; Width exceeding 225mm; Cavity trays;	24	m2	28.05	673		673	9.60	114.00
3	E06.03	**Roof Support Components**								

6.65 Either continue to **work your way down the I:Lab (hr) column pasting the formulae against each item** or, as before, highlight the top two cells in the columns and all of the rows into which you wish to duplicate them, and then press 'Ctrl' and 'D' together.

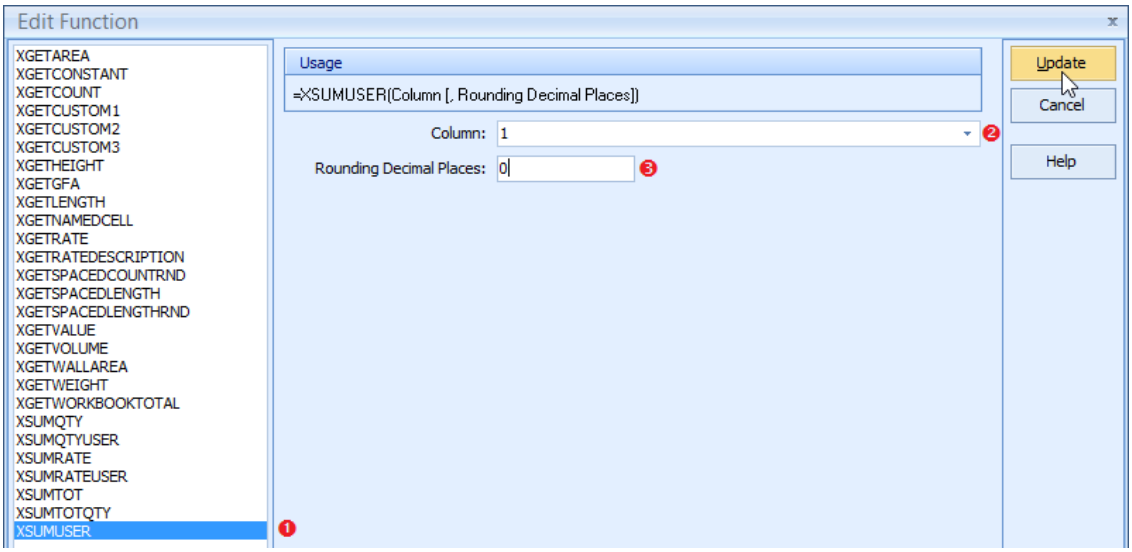
6.66 An item-by-item analysis of duration and material costs now exists for the Concrete and Carpentry trades. Obviously, depending on the information held in the rate sheet, any number of different analyses could be performed. **Return to level 1** of the workbook. The I:Lab (hr) and J:Mat ($) columns remain empty at present.

6.67 **Click** into the I:Lab (hr) column for the Concrete Works trade row (cell **I3**).

6.68 **Click** on the **[Function]** button in the Workbooks ribbon menu (see right).



6.69 In the left hand pane of the Edit Function window **click** on **[XSUMUSER]** ❶. This function will look into the Cost sheet below and sum the contents of the specified user column.



6.70 The column drop-down menu ❷ will be pre-populated with the corresponding column behind the selected cell (user column 1) which, in this case is the one we require the sum of, so **enter** a **[Rounding Decimal Places]** of **{0}** ❸ then **click** on the **[Update]** button. The total of all the labour hours in the I:Lab (hr) column at level 2 of the workbook will appear in the cell.

6.71 **Click** into the adjacent J:Mat ($) column (cell **J3**) and, in the same way as above, use the **[Function]** button in the Workbooks ribbon menu to enter an **{XSUMUSER}** formula pulling the values of user **[Column] {2}** (J:Mat ($)) from the Cost sub-sheet below.

6.72 **Highlight** both of the cells containing the new =XSUMUSER() formulae (cells **I3:J3**, see right) and **click** on the **[Copy]** button.

H:Total	I:Lab (hr)	J:Mat ($)
46,897		
34,272		
21,468	169	14,807
5,950		

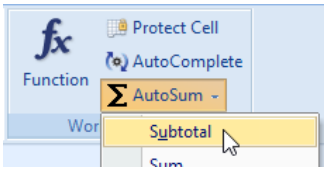
6.73 **Click** into the I:Lab (hr) cell adjacent to the Carpentry trade (cell **I9**) and then **click** on the **[Paste]** button. The two formulae from above will be replicated in the two Carpentry columns and will show the summary totals of duration and materials cost from the level 2 Cost sub-sheet below.

6.74 Finally, **click** into cell **I23** adjacent to the Construction Total cost (see right).

6.75 Hold down the left mouse button and drag it up to **highlight all cells to the top of the column**.

	22,355
$	625,725
	43,801
$	669,526

6.76 **Click** on the **[AutoSum]** button in the Workbooks ribbon menu (see right) and **select {Subtotal}** from the drop-down menu. A sum of all of the labour hours in the highlighted cells will be placed into the bottom cell of the selected range.



6.77 If desired, select this cell in isolation and use the **B** button in the Format section of the Workbooks ribbon to embolden the subtotal.

6.78 **Copy** the formula from cell **I23** and **Paste into** the adjacent cell **J23** to give a subtotal of both the duration and material costs for the Concrete Works and Carpentry trades.

Creating a New Composite Rate Library Item

6.79 Using your preferred method (double-click, or F7), **drill-down** on the F:Subtotal column for the Joinery trade (cell **F11**, as below) to see the Cost sub-sheet beneath.

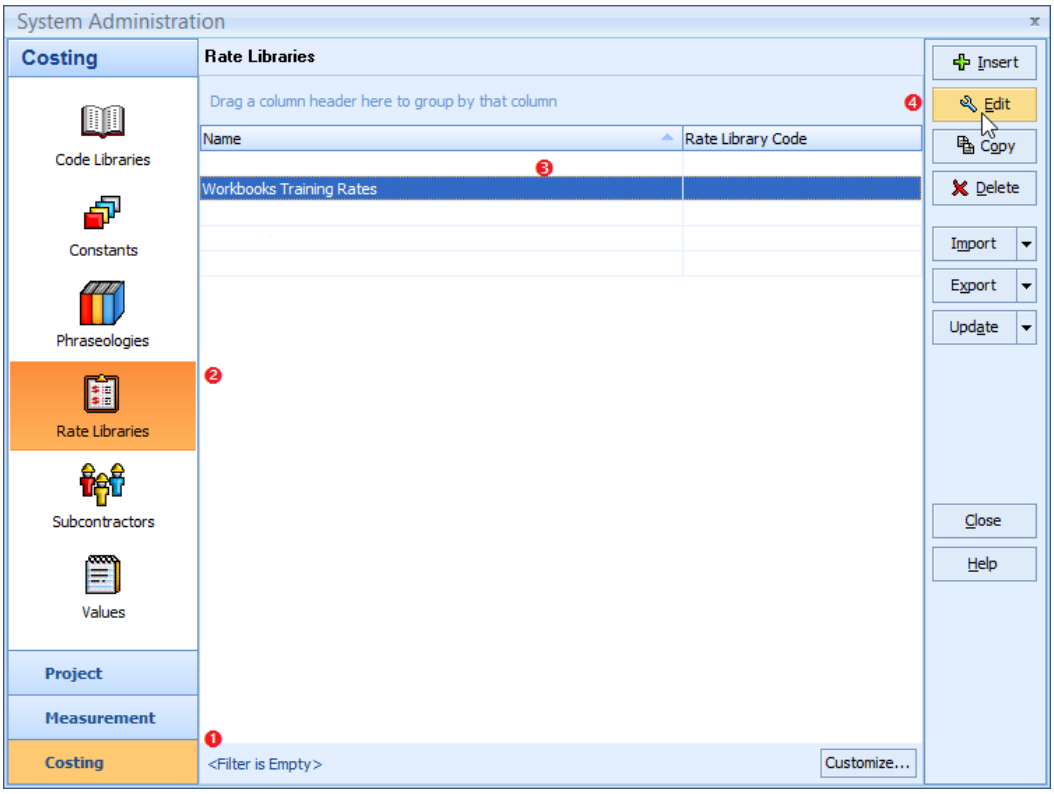
10	T18	Laminated Timber	311	m2	11.62	3,613		3,613
11	T19	Joinery	311	m2	391.27	121,685		121,685
12	T22	Roofing	311	m2	216.49	67,330		67,330

The E:Rate figure for the bench top item (cell E16, see below) is black denoting that it static text (i.e. contains no detail on the Rate sheet beneath, nor is live-linked to a rate library item). We shall now create a material supply rate and, from it a composite rate library item which can then be used to replace the flat rate in the workbook.

15	E15.06	**Sink, Vanity and Bench Tops**						
16	E15.06	Allowance for bench tops	14	m	500.00	7,000		7,000

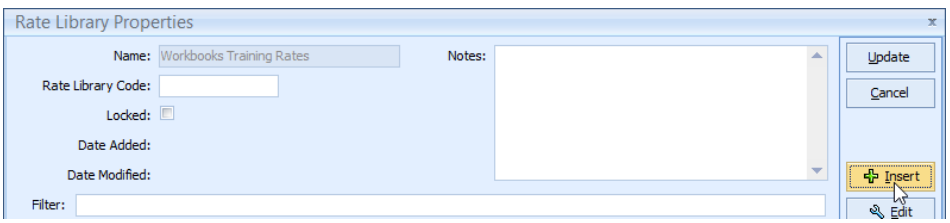
6.80 **Click** on the **[Main Menu]** button and open **[System Administration]**.

6.81 **Click** the **[Costing]** button at the bottom of the task pane ❶ and then **click** on **[Rate Libraries]** above ❷.



6.82 **Select** the **{Workbooks Training Rates *(-followed by your name)*}** library ❸ then **click** on the **[Edit]** button ❹.

6.83 In the Rate Library Properties window **click** the **[Insert button]** (see below) to add a new rate into the library.

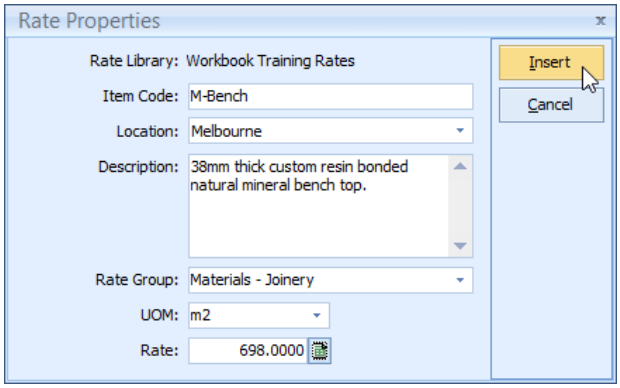


6.84 In the Rate Properties window **enter** a new **[Item Code]** of **"M-Bench"** (see right).

6.85 If necessary, use the drop-down menu to **set** the **[Location]** to **{Melbourne}**.

6.86 **Enter** a **Description** of **"38mm thick custom resin bonded natural mineral bench top."**

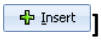
6.87 In the **[Rate Group]** field **type "Materials – Joinery"** to create a new folder in the rate library..



6.88 In the **[UOM]** field, either use the drop-down menu or **enter "m2"**.

6.89 **Enter** a figure of ($)**"698"**(per m2) to supply the bench top material in the **[Rate]** field.

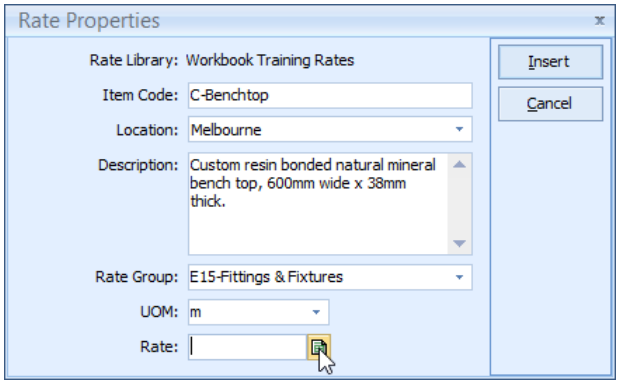
6.90 **Click** on the **[Insert]** button to save the new material supply rate for the bench top.

6.91 In the Rate Library Properties window **click** on the **[Insert**  **]** button again to add a further new rate item into the library.

6.92 In the Rate Properties window enter an **[Item Code]** of **"C-Benchtop"** (see right).

6.93 Ensure that the **[Location]** is set to **{Melbourne}** then enter a **[Description]** of **"Custom resin bonded natural mineral bench top, 600mm wide x 38mm thick."**

6.94 In the **[Rate Group]** field **type "E15-Fittings & Fixtures"** to create a new rate library folder.

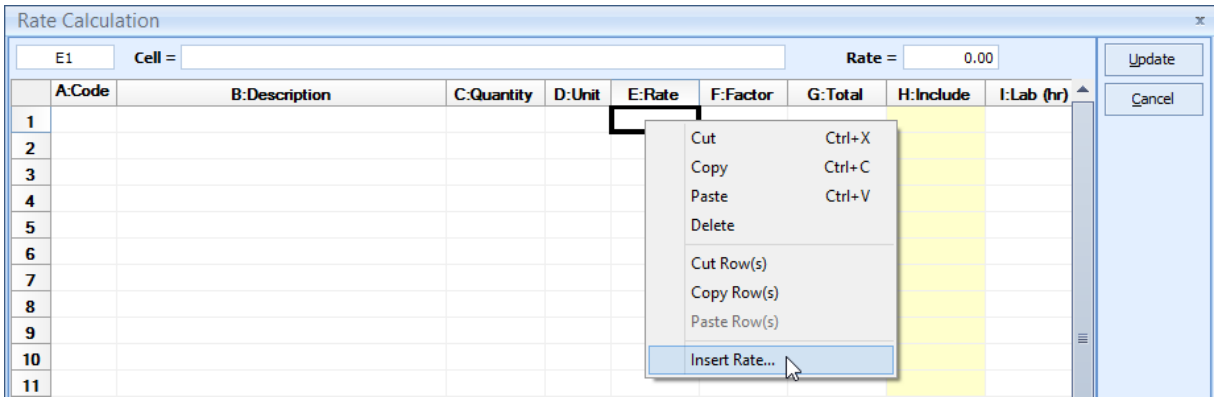


6.95 In the **[UOM]** field, either use the drop-down menu or **enter "m"** for our built-up/assembly/composite rate.

6.96 **Click** on the **[**  **]** button adjacent to the Rate field (see above). This will open the Rate Calculation sheet.

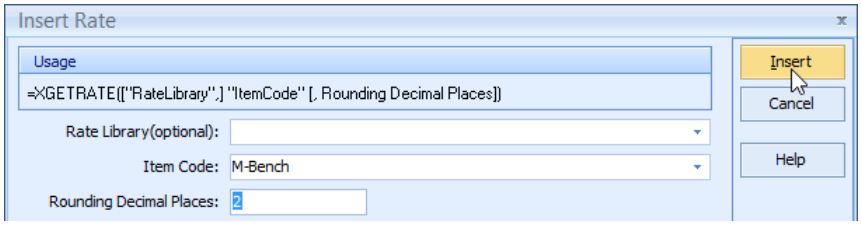
6.97 In the Rate Calculation sheet **select** the first cell (**E1**) in the E:Rate column.

6.98 **Click the right mouse** button and **select [Insert Rate...]** from the menu (see below).



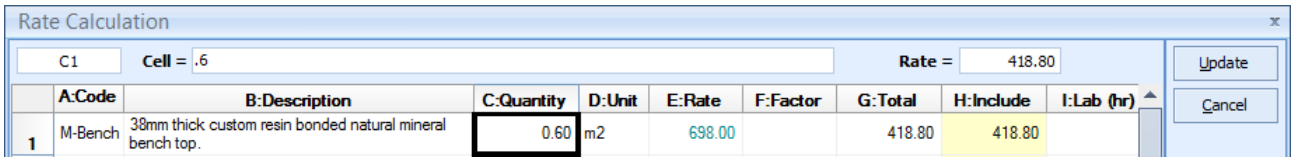
6.99 In the Insert Rate window leave the Rate Library (optional) field empty (see below).

6.100 In the **[Item Code]** field **type "M-B**" and note how the drop-down menu opens and is filtered to match the text entered so far. **Select** the **{M-Bench}** rate item.



6.101 **Set** the **[Rounding Decimal Places]** to **{2}** (as above) and **click [Insert]**. The corresponding material supply rate details are entered into the Rate Calculation sheet, with a live-link to the original rate item. If the bench top supply rate is altered, the built-up/assembly/composite rate will be updated accordingly, once complete.

6.102 In the C:Quantity column (cell **C1**) of the Rate Calculation sheet **enter** a figure of **"0.60"**(m2 per metre of 600mm wide bench top) to complete the line item (as below).

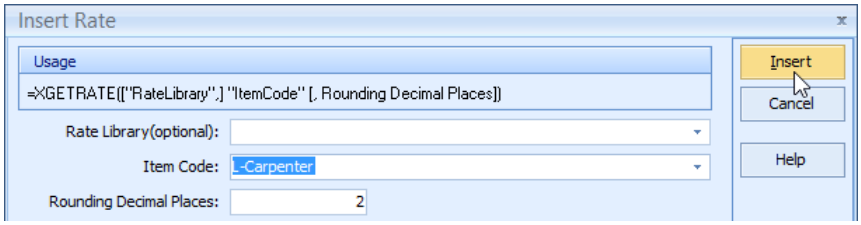


6.103 **Select** the E:Rate cell on the next row of the Rate Calculation sheet (cell **E2**), **click the right mouse** button and **select [Insert Rate...]** again.

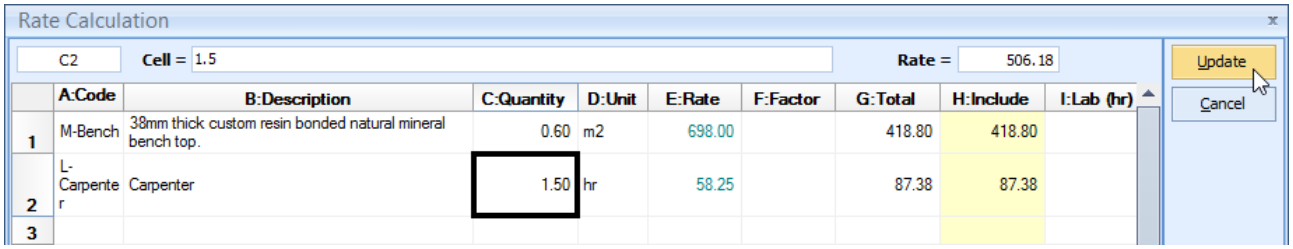
6.104 Leave the Rate Library (optional) field empty (see below) and **type "L-"** in the **[Item Code]** field.

6.105 **Select** the **{L-Carpenter}** rate item from the filtered drop-down menu.

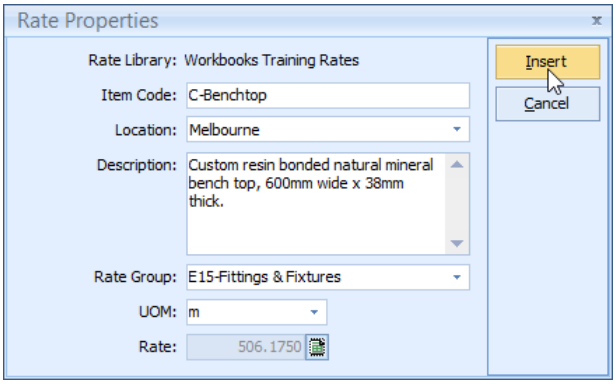
6.106 **Set** the **[Rounding Decimal Places]** to **{2}** before **click**ing **[Insert]**.



6.107 **Enter** a figure of **"1.5"**(hr/m) in the C:Quantity column (cell **C2**) then **click [Update]** to complete the rate calculation line item.



The Rate Properties window will now show your completed rate item with the Rate field greyed-out denoting that a Rate Calculation exists behind the displayed figure (as right).

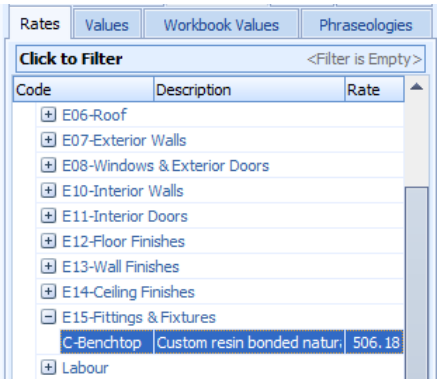


6.108 **Click [Insert]** to save the new rate item. Your new 'C-Benchtop' built-up/assembly/composite rate item will be listed in the Melbourne folder of the 'Workbooks Training Rates *(-followed by your name)*' rate library

6.109 **Click [Update]** to save and close the newly amended rate library.

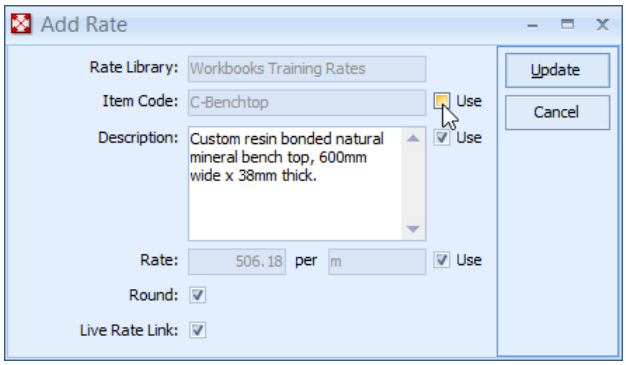
A new composite rate item based on other items in the same library has now been created and saved for use in any workbook. If either of the base rates for labour or material supply are amended in this library then the composite rate will be updated accordingly.

6.110 **Close [System Administration]** then **review** the **[Rates]** tab in the task pane. A new rate group folder called E15-Fittings & Fixtures containing the new C-Benchtop rate item exists in the 'Workbooks Training Rates *(-followed by your name)*'library (see right).



6.111 **Drag-and-drop** the **{C-Benchtop}** rate into the B:Description cell of the Joinery worksheet (**B16**).

6.112 When the Add Rate window appears **un-tick** the **[Use]** check box adjacent to the **[Item Code]** field (see below).



6.113 **Click [Update]** and the Description and rate from the rate library item will replace the B:Description and E:Rate text in the workbook. The code in the A:Code column will remain unaltered (see below).

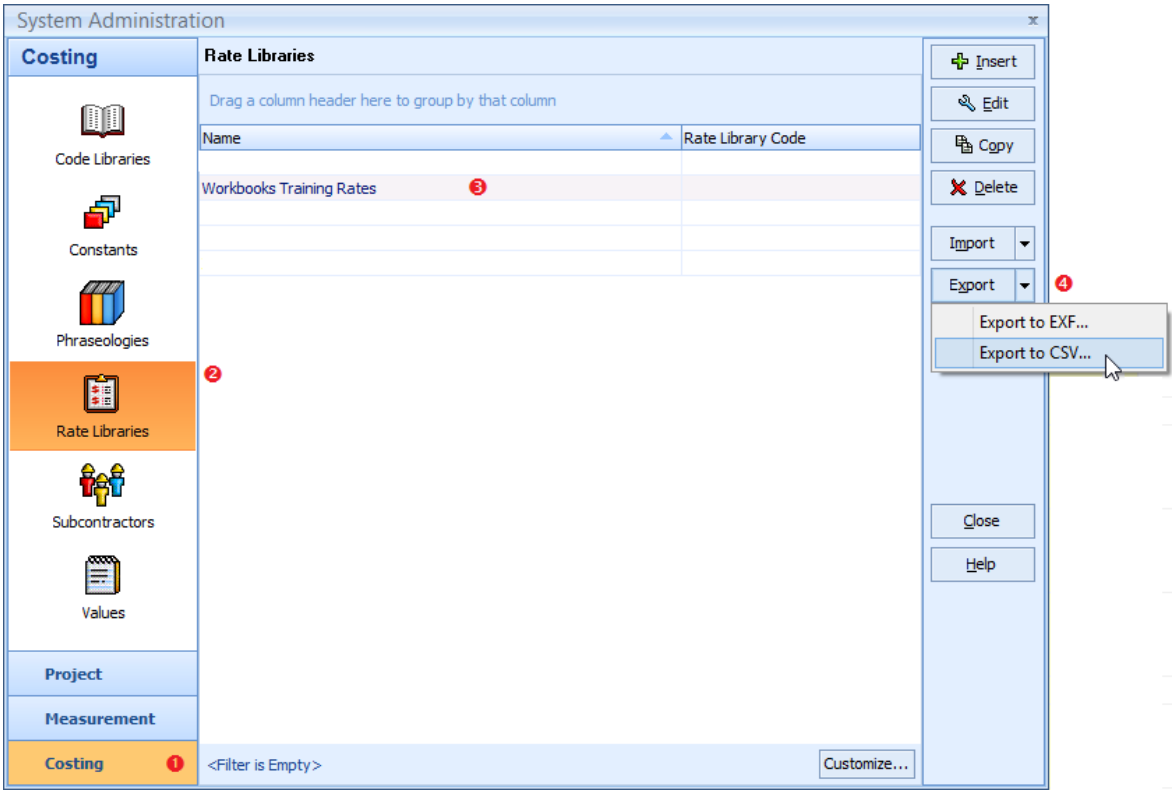
15	E15.06	**Sink, Vanity and Bench Tops**						
16	E15.06	Custom resin bonded natural mineral bench top, 600mm wide x 38mm thick.	14	m	506.18	7,087		7,087
17	E15.02	**Cupboards**						

The text in the E:Rate cell for this item is green denoting the existence of live-linked information. Selecting the cell and clicking on the Show Source button in the Workbooks ribbon menu will open the Rate Properties window allowing alterations to be made which will then be propagated throughout all workbooks where the rate has been used.

Exporting and Editing a CSV Rate Library File

6.114 **Click** on the **[Main Menu]** button and open **[System Administration]**.

6.115 **Click** on the **[Costing]** button at the bottom of the left hand task pane ❶ and then **click** on the **[Rate Libraries]** button above ❷.



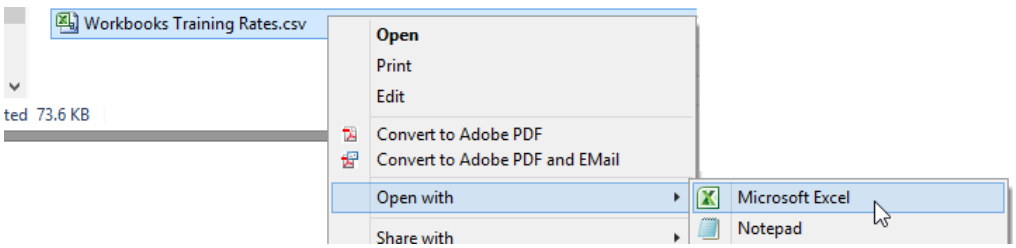
6.116 **Select** the **{Workbooks Training Rates *(-followed by your name)*}** rate library ❸ then **click** on **the drop-down** arrow portion of the **[Export]** button ❹.

6.117 **Select** the **[Export to CSV…]** option.

6.118 **Browse** for a location on your computer where you will be able to access the file later (e.g. **the Desktop**) then **click** the **[Save]** button.

6.119 **Navigate** to the location on your computer where you just saved the exported rate library (e.g. **the Desktop**) and **double-click** on the **{Workbooks Training Rates *(-followed by your name)*.csv}** file to open it.

ⓘ *If it doesn't open in Excel® then close the file and, back in your browser, right click over the file name and select Open With ➤ Microsoft Excel (as below).*



This is an example of a CostX® Rate Library as it appears in Excel® containing both flat supply items and composite items/assemblies/built-up rates. If desired, Rate Libraries can be prepared in Excel® then saved as a .csv file and imported into CostX®. CSV rate libraries must start on the first row of the worksheet (i.e. contain no heading row), contain no blank rows, and have data entered into the respective columns outlined below. If an item is to have an assembly/build-up then the build-up must appear immediately after the item.

For Items
Column A: Item Identity Code (I = item)
Column B: Rate Item Code
Column C: Rate Item Description
Column D: Rate Group/Folder Name
Column E: Unit of Measure
Column F: Rate
Column G: Location

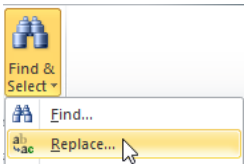
For Build-ups
Column A: Item Identity Code (B = build-up)
Column B: Rate Item Code (A:Code)
Column C: Rate Item Description (B:Description)
Column D: Quantity (C:Quantity)
Column E: Unit of Measure (D:Unit)
Column F: Rate (E:Rate)
Column G: Factor (F:Factor)
Column H: Total (G:Total)
Column I: Include (H:Include)
Column J: User Column 1 (I:User1)
etc.

6.120 Move the **cursor over the dividing lines between the column headings** until the cursor changes to a double-headed arrow (see right) then click and **drag the columns to the desired widths** to see the Excel workbook's cell contents.

6.121 **Scroll down** the workbook and note the change in column contents when the composite items/assemblies/built-up rates begin to appear, and also the proliferation of #VALUE! errors.

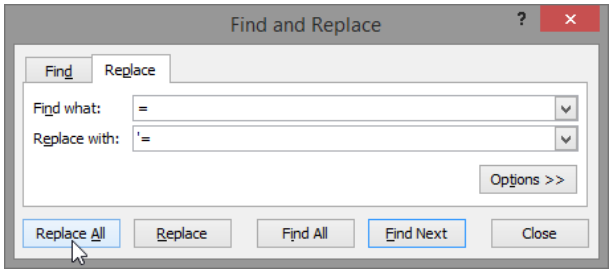
6.122 **Click** into **any of the cells containing an Error in column F**. It's actual contents are an =XGETRATE() formula from CostX®. Microsoft Excel® does not recognise these CostX® specific functions and therefore returns an error.

6.123 **Click** on the **Find & Select** button in the Home ribbon menu of Excel® and select the **Replace** option (see right).



6.124 In the **Find What** field enter an equals symbol **(=)** and in the **Replace With** field enter an equals symbol preceded by an apostrophe (**'=**) (see right).

6.125 **Click** on the **Replace All** button and the #VALUE! Errors are replaced with the CostX® formulae and the contents of columns I, J and K show the formulae used in the CostX® Rate Calculation Sheets.



6.126 **Scroll** further **down the workbook until you see the location in column G change** (around row 360). This is the start of the set of identical rate items in the 'Workbooks Training Rates *(-followed by your name)*' rate library that have a different location (Brisbane/Melbourne) and different rates.

6.127 **Find the 'L-Carpenter' rate item** (where column A contains 'I') **with a Melbourne location** (see below).

	A	B	C	D	E	F	G
	I	L-Bricklayer	Bricklayer	Labour	hr	58.25	Melbourne
	I	L-Carpenter	Carpenter	Labour	hr	58.25	Melbourne
	I	L-Dogman	Dogman	Labour	hr	51.95	Melbourne

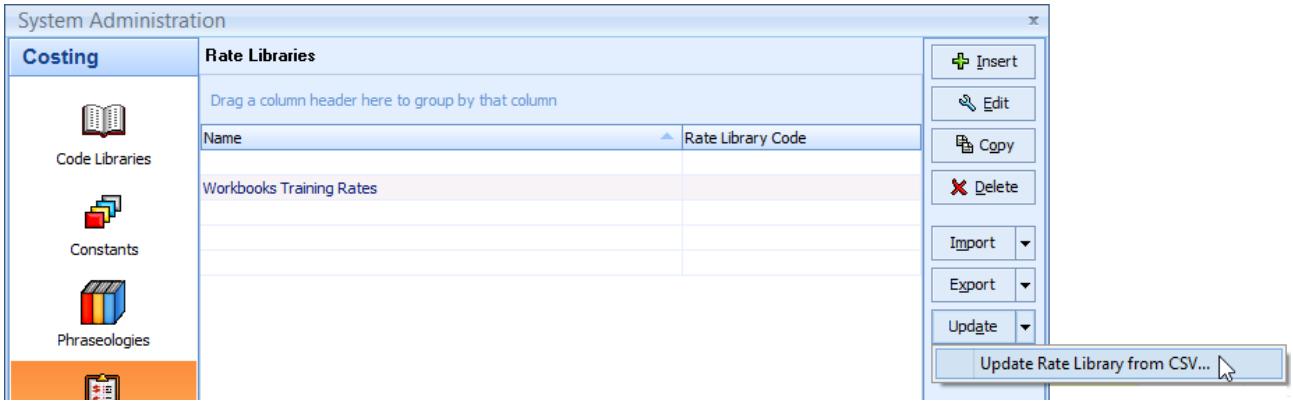
6.128 **Alter the rate** in column F for the Melbourne 'L-Carpenter' item **from $58.25 to $55.00**. This rate is used in a large number of composite items/assemblies/built-up rates within this rate library which you can see further down the workbook.

6.129 **Close Excel®** and each time that you are prompted **click** either **'Save' or 'Yes'** to overwrite the existing .csv file with your amended version.

Importing /Updating Rate Libraries From CSV Files

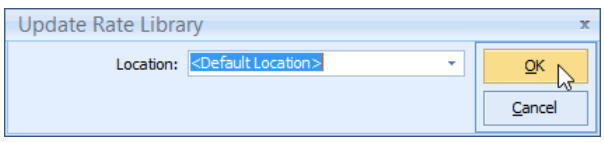
6.130 **In CostX® ensure that you still have the {Workbooks Training Rates *(-followed by your name)*} rate library selected** in the Rate Libraries area of System Administration (If not, re-open System Administration > Costing > Rate Libraries and select it).

6.131 **Click** on the drop-down portion of the **[Update]** button and select **[Update Rate Library from CSV…]** (see below).



6.132 **Browse** for the recently amended **{Workbooks Training Rates *(-followed by your name).csv*}** file and **click** on the **[Open]** button. The Update Rate Library window will appear.

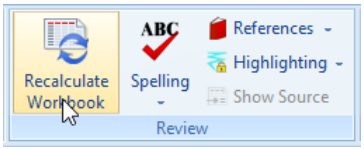
6.133 In the **[Location]** field use the drop-down menu to **select {<Default Location>}** (see right). This location will be used for any rates without a location specified in column G of the CSV file.



6.134 **Click [OK]** and the selected rate library will be updated with any amended or additional rates.

6.135 **Close [System Administration]**.

6.136 **Note the workbook Total for the {Trade Estimate}** workbook then **click** on the **[Recalculate Workbook]** button in the Workbooks ribbon menu. All live-linked formulae will be refreshed and the Workbook Total will be updated to reflect the revised L-Carpenter rate being applied throughout.



6.137 Using your preferred method (double-click, or F7), **drill-down** on the F:Subtotal column for the Joinery trade (cell **F11**) to see the Cost sub-sheet beneath.

6.138 **Drill into any** of the **E:Rate** column cells **containing blue text** and note that the L-Carpenter rate in all of the workbook Rate Calculation sheets is now included at $55.00 (see below).

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total
	T19	Joinery	311	m2	388.08	120,692		120,692
	E08.04	Hardwood door sets; Single; To suit structural oper	2	no	1,474.45	2,949		2,949

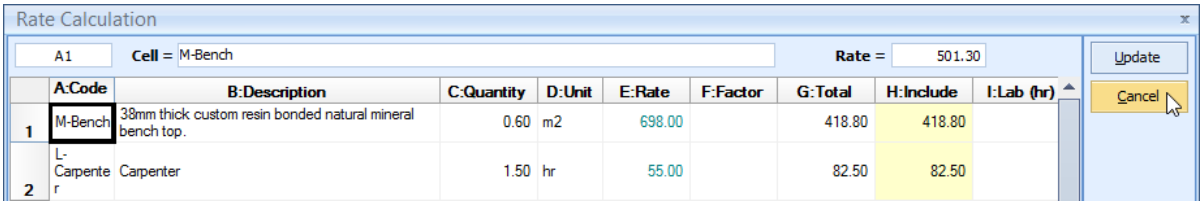
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include
1	L-Labourer	Labourer	2.00	hr	29.70		59.40	59.40
2	L-Carpenter	Carpenter	7.00	hr	55.00		385.00	385.00
3	M-HW Dr Set Sg	Hardwood door sets, 1.00 x 2.10	1.00	no	913.50		913.50	913.50

6.139 **Return to** the **level 2** Cost sheet and **select** the only cell in the E:Rate column containing green (live-link) text (**E16**, as below).

15	E15.06	**Sink, Vanity and Bench Tops**						
16	E15.06	Custom resin bonded natural mineral bench top, 600mm wide x 38mm thick.	14	m	501.30	7,018		7,01

6.140 **Click** on the **[Show Source]** button in the Workbooks ribbon menu to open the Rate Properties window for this rate.

6.141 **Click** on the **[ ]** button adjacent to the Rate field to open the Rate Calculation sheet and note that the L-Carpenter rate used in the composite item/assembly/built-up rate has also been amended to $55.00.



6.142 **Click** the **[Cancel]** button in the Rate Calculation and Rate Properties windows to return to the Joinery trade Cost sub-sheet.

Module 7: Default Rate Libraries

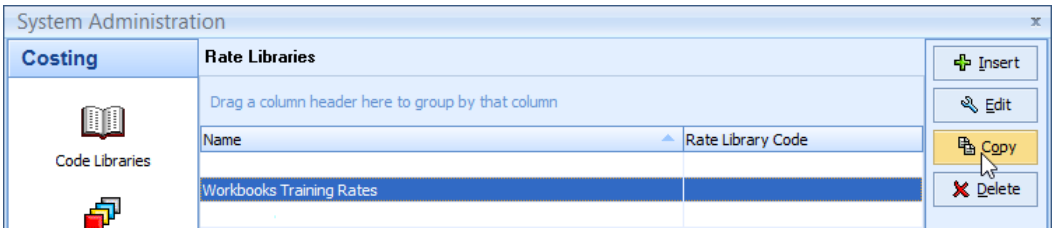
We will now create a copy of the 'Workbooks Training Rates *(-followed by your name)*' rate library and use it to introduce the concept of default rate libraries.

Copying Rate Libraries

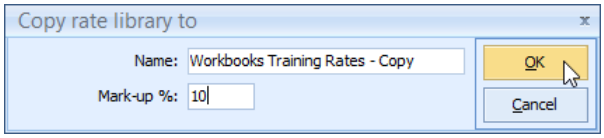
7.1 **Click** on the **[Main Menu]** button and open **[System Administration]**.

7.2 **Click** on the **[Costing]** button at the bottom of the left hand task pane and then **click** on the **[Rate Libraries]** button above.

7.3 **Select** the **{Workbooks Training Rates *(-followed by your name)*}** rate library then **click** on the **[Copy]** button (see below).



7.4 In the **[Copy Rate Library To]** window leave the **[Name]** as **{Workbooks Training Rates *(-followed by your name)* – Copy}** but **enter** a **[Mark-up %]** of **"10"**(%) then **click [OK]** (see right).



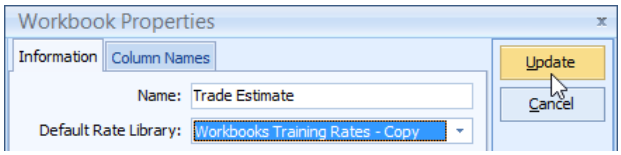
7.5 A warning will appear advising that the mark-up percentage will only be applied to items in the rate library and not to composite item/assembly/built-up rate sheets. As all of our composite items/assemblies/built-up rates are live-linked to items within the rate library the mark-up will be applied across the board. **Click [Yes]** to continue and a new 'Workbooks Training Rates *(-followed by your name)* - Copy' rate library will appear in the Rate Libraries window.

7.6 **Close [System Administration]**.

Using Default Rate Libraries

7.7 **Click** on the **[Properties]** button in the Workbooks ribbon menu to open the Workbook Properties window for the **{Trade Estimate}** workbook.

7.8 Use the **[Default Rate Library]** drop-down menu to **select {Workbooks Training Rates *(-followed by your name)* – Copy}** (see right).



7.9 **Note the workbook Total** value then **click [Update]**. The workbook will re-calculate and the Total will now reflect the pricing contained in the copy of the original rate library, with a 10% mark-up.

The copy of the original rate library will contain all of the same rate items with the same rate item codes. Therefore all of the =XGETRATE() formulae in the workbook, which refer to the rate code, will be able to find the appropriate rates from either the original rate library, or the copy. By copying the rate library and amending it, either by applying a global mark-up or by editing individual rates (in CostX®, or by exporting to CSV and then Updating from CSV in CostX®), pricing can be updated on a job-by-job or periodic basis merely by selecting the corresponding Default Rate Library in the Workbook Properties.

Further Explaining Default Rate Libraries

7.10 **Drill-down** into the Joinery trade (cell **F11**) to open the Cost sub-sheet beneath.

7.11 **Click** on the only cell in the E:Rate column containing green (live-link) text (**E16**) that was previously dragged-in from the Default Rate Library at the time.

Note that the formula in the Cell= field is =XGETRATE("C-Benchtop",2) where "C-Benchtop" refers to the rate item code and the 2 determines the number of decimals to round the rate to. As this rate was dragged from the Default Rate Library there is no reference as to which rate library to get the 'C-Benchtop' rate from. CostX® will search the Default Rate Library set in the Workbook Properties to find the rate.

7.12 **Click** on the **[Rates]** tab and use the **[⊞]** buttons to **expand** the **{Workbooks Training Rates *(-followed by your name)*}** rate library **and** the **{E15-Fittings & Fixtures}** folder within it. The rate shown in the library will be different to that in the workbook cell as this is no longer the Default Rate Library (see below).

7.13 **Drag-and-drop** the **{C-Benchtop}** rate item into the E:Rate cell for this item (**E16**) and **click [Update]**. Note that the rate in the cell changes and that the formula is now =XGETRATE("Workbooks Training Rates *(-followed by your name)*","C-Benchtop",2).

Because this rate did not come from the Default rate Library set in the Workbook Properties, CostX® has automatically added the specific rate library reference into the formula. No matter what library is specified as the Default Rate Library for this workbook, this particular rate will always be taken from the specified rate library included in the formula.

For comparison you might wish to see alternatively priced workbooks simultaneously. This could be achieved by first using the drop-down section of the Add button in the Workbooks ribbon menu to create a copy of the initial workbook, and then amending the Workbook Properties reference the alternative Default Rate Library.

Module 8: Phraseologies

Phraseologies allow the maintenance of standard phrases or model descriptions in a hierarchical library. This library can be utilised to assemble predefined phrases, codes and units of measure to form bill/schedule of quantities descriptions. Phraseologies may be created in or imported into CostX® and are accessed via the Phraseologies tab to drag-and-drop text into workbooks. These text strings may be selected individually or combined to create detailed descriptions.

Importing Phraseologies from CSV

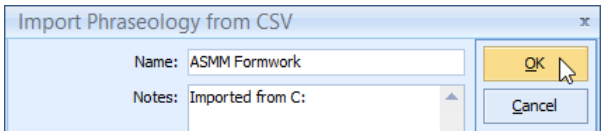
8.1 **Click** on the **[Main Menu]** button and **open [System Administration]**.

8.2 **Click** on the **[Costing]** button at the bottom of the left hand task pane and then **click** on the **[Phraseologies]** button above (see right).

8.3 If no previous phraseologies were created or imported into the system this list will be blank. **Click** on the drop-down menu on the right of the **[Import]** button and **select [Import Phraseology from CSV…]**

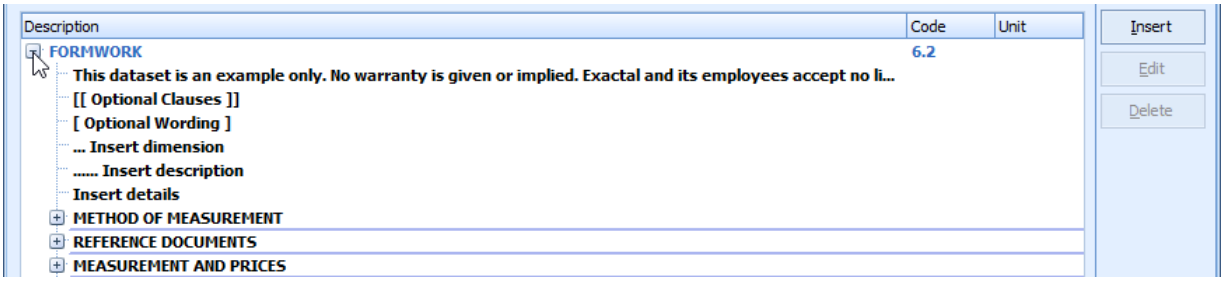
8.4 **Browse** for the **Training Dataset**, **select** the **{ASMM Formwork.csv}** file and **click** the **[Open]** button.

8.5 The Import Phraseology from CSV window will open. **Click [OK]** (see right). The Phraseologies window will now include the 'ASMM Formwork' phraseology library.



8.6 **Click** on the **[Edit]** button to open the phraseology library.

8.7 **Use** the **[⊞]** button to **expand** the **{FORMWORK}** folder **and the hierarchy beneath**.



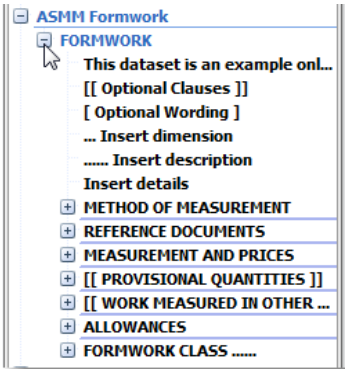
New line items can now be added to any level of this hierarchy using the Insert button within the Phraseology Properties window. Here a phrase could be created with a code and UOM and nominated as to which level of the hierarchy this new description belongs.

8.8 **Click** on the **[Cancel]** buttons in the Phraseologies window.

8.9 **Click [Close]** in the **[System Administration]** window.

Using Phraseologies in Workbooks

8.10 In the Workbooks ribbon **click** on the **[Add]** button. If the drop-down menu appears **click** on the **[Add Workbook]** option.

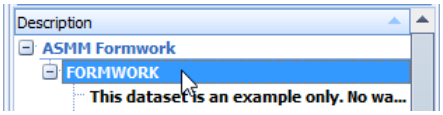


8.11 In the Workbook Properties window **enter** a **[Name]** of **"Formwork"** then **click** on the **[Insert]** button.

8.12 **Open** the **[Phraseologies]** tab in the task pane where you will find the newly imported 'ASMM Formwork' phraseology library.

8.13 **Click** on the **[⊞]** button to further expand and view the phraseology library hierarchy (see right).

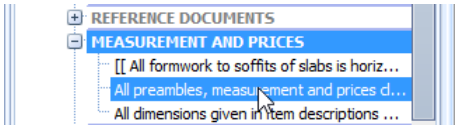
8.14 **Click** on the **{FORMWORK}** node of the hierarchy (see right) then, holding down the left mouse button, **drag-and-drop** it into the B:Description column of the first row of the Workbook (cell **B1**). This copies the Code, Description and Unit (if applicable) from the Phraseologies list into the workbook (as below).



	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal
1	6.2	FORMWORK				
2						

8.15 **Click** the **[⊞]** button to **expand** the **{FORMWORK}** folder and then the **{MEASUREMENT AND PRICES}** folder.

8.16 **Click** on the **{MEASUREMENT AND PRICES}** phrase and then, whilst **hold down** the **'Ctrl'** key, also **click** on the **{All preambles, measurement and prices clauses….}** phrase. Both phrases will highlight to indicate that multiple phrases have been selected.



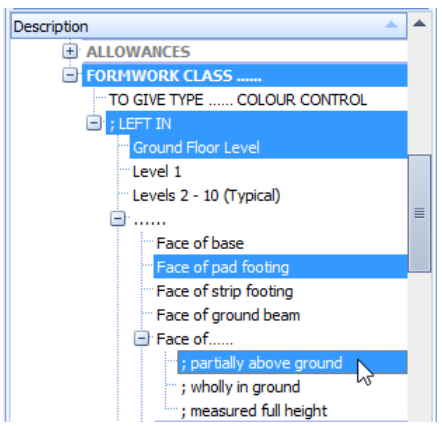
8.17 Hold down the left mouse button and **drag-and-drop** the phrases into cell **B3** of the workbook. The two phrases will be placed in two separate cells in two rows of the B:Description column of the workbook.

	A:Code	B:Description	C:Quantity	D:Unit
1	6.2	FORMWORK		
2				
3		MEASUREMENT AND PRICES		
4		All preambles, measurement and prices clauses, allowances and all other relevant clauses and notes in all other Sections will where applicable, apply equally to this Section.		
5				

The Ctrl key allows multiple items to be selected simultaneously. The order of the selection determines the hierarchy the phrases are inserted into the workbook.

8.18 **Holding down** the **'Ctrl'** key as before, **click** on the

{FORMWORK CLASS ….}
{;LEFT IN}
{Ground Floor Level}
{Face of pad footing} and
{; partially above ground} multiple phrases to select them simultaneously (see right).



8.19 **Hold down** the **'Alt'** key then **drag-and-drop** these multiple phrases into workbook cell **B6**. All of the phrases are combined into one description in the cell (see below), as opposed to being placed in individual cells. Holding down the Alt key allows the user to combine phrases from the library.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate
1	6.2	FORMWORK			
2					
3		MEASUREMENT AND PRICES			
4		All preambles, measurement and prices clauses, allowances and all other relevant clauses and notes in all other Sections will where applicable, apply equally to this Section.			
5					
6		FORMWORK CLASS .....; ; LEFT IN; Ground Floor Level; Face of pad footing; ; partially above ground		m2	
7					

Once in the workbook, editing of the descriptions is possible in the normal manner. Quantities and rates from the Dimension Groups and Rate Libraries respectively may be dragged-and-dropped into the appropriate columns to complete the workbook line item.

Module 9: Custom Reports

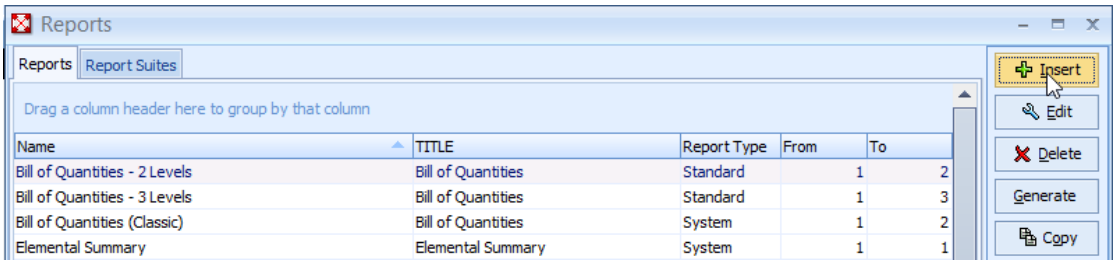
A number of 'System' reports are shipped with the CostX® software however the functionality exists to create your own report templates to suit the particular requirements of your business. The 'Standard' report writer is covered in the CostX® Introductory Training Exercise however CostX® also has a 'Custom' report writer which we shall now use to create a simple report template.

Creating a Custom Report

9.1 **Re-open** the **{Trade Estimate}** workbook by clicking on its name in the Workbooks tab.

9.2 In the Workbooks ribbon menu **click** on the **[Reports]** button (see right). If the drop-down menu appears **click** on the **[Print Workbook to Report…]** option.

9.3 In the Reports window **click** on the **[Insert]** button (see below) to add a new report template.



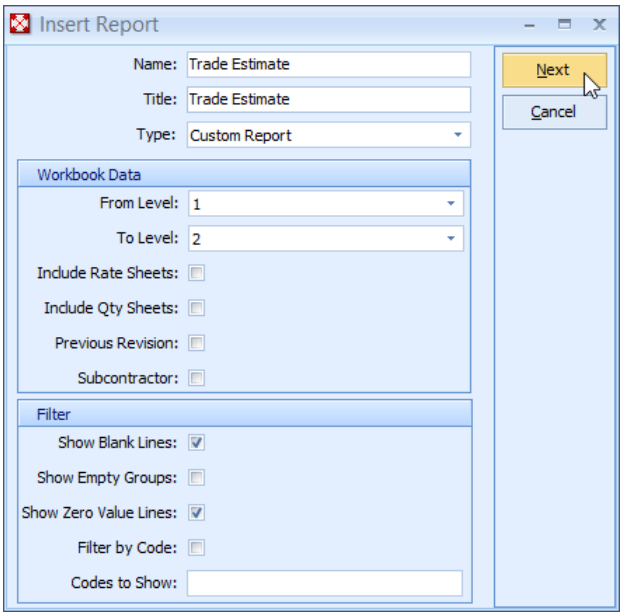
9.4 In the Insert Report window **enter** a **[Name]** of **"Trade Estimate *(-followed by your name)*"** (see right).

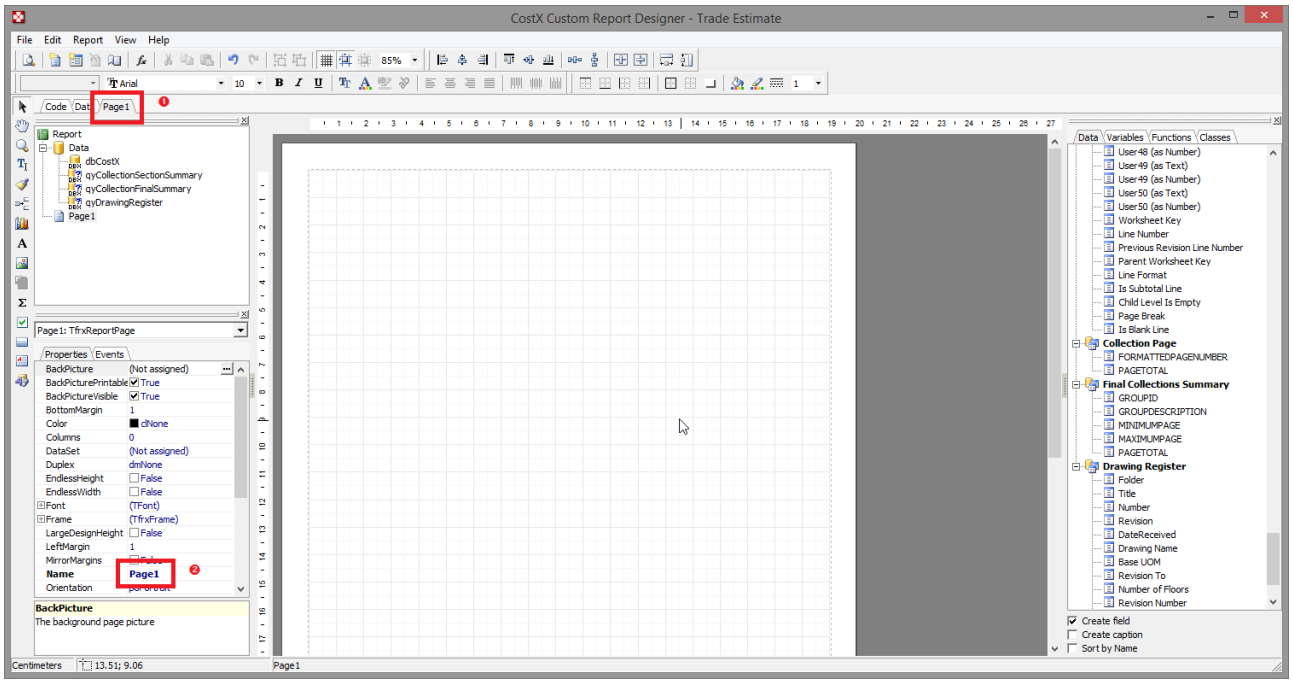
9.5 **Enter** a **[Title]** of **"Trade Estimate"** (see right).

9.6 If necessary use the drop-down menu to **set** the **[Report Type]** as **{Custom Report}**.

9.7 **Ensure** that the **[From Level]** is set to **{1}** and the **[To Level]** is set as **{2}** respectively.

9.8 **Click** on the **[Next]** button. The CostX® Custom Report Designer screen will open showing a blank page.

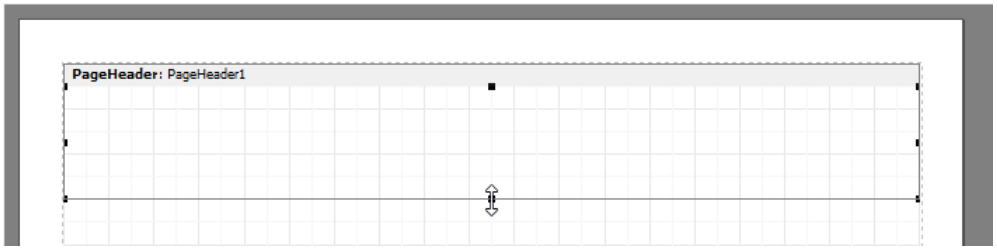




The tab at the top ❶ and the Name in the Properties pane ❷ identify this as 'Page 1', however, this should be considered as page *style* 1 not page *number* 1, as the length of the report will vary dependent on the information in each workbook. We shall now design two separate page styles for the trade summary and trade detail.

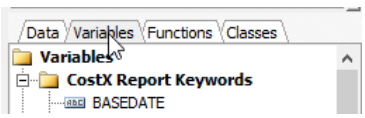
9.9 **Click** into the **[Name]** property ❷ and **over-type** the **"Page 1"** text **with "Summary"** then **press** the **[Enter]** key. The tab name will change accordingly.

9.10 **Click** on the **[**  **Insert Band]** button in the Object Toolbar at the very left hand edge of the screen and when the menu opens **select** the **{Page Header}** option. A Page Header area will appear on the report page, into which we can add the components that are to show at the head of each Summary style page.



9.11 Either move the cursor over the lower edge of the page header band and drag it down to correspond with the third gridline on the page (as above), or **click** on the **[PageHeader]** band to select it and the **edit** the **[Height]** property to **"2.50"**(cm) to increase the area available.

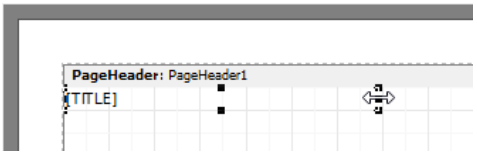
9.12 **Click** on the **[Variables]** tab at the right hand side of the screen to open a list of variable data available within the CostX® database.



9.13 Within the **[CostX Report Keywords]** folder **click** on the **{TITLE}** variable.

9.14 Holding down the left mouse button, **drag-and-drop** it **to the top left corner of the [PageHeader]** report band (see over). A box containing the text '[TITLE]' will appear in the header indicating that the report title ('Trade Estimate') that we entered when creating the report will be printed in this position at the head of each Summary style page.

9.15 Move the **cursor over the right hand edge** of the memo box and **drag it out to widen it** (see right).

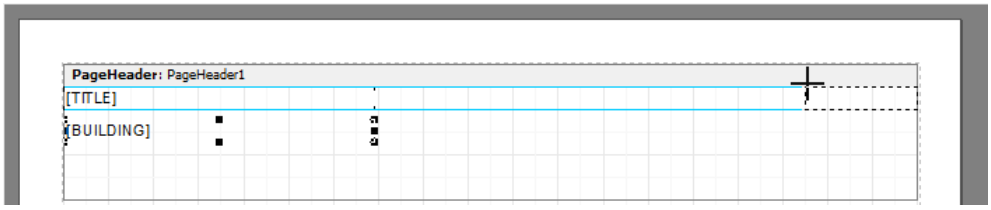


9.16 Repeat these steps to **drag-and-drop** the **{BUILDING}** variable **to the left edge of the [PageHeader] band**, slightly below the {Title}. Again, the 'BUILDING' text in square brackets (signifying a variable) will be placed in a box in the page header band indicating that the Building name (in this case '57 Beach Road') will be placed at the head of each Summary style page.

9.17 **Drag the right hand edge** of the **{[BUILDING]}** memo box **out to widen it**. Note that a blue line appears when it aligns with the existing {[TITLE]} text box above.

9.18 **Click** on the **[Picture Object]** button in the Object Toolbar at the left hand edge of the screen. **Move the cursor over the report page** and an empty box with a positioning cross will appear.

9.19 **Drag the box to the top right hand corner of the [PageHeader] band**. Again, blue lines will appear once it aligns with other fields on the page (see below). Once it is in the desired position **click** the left mouse button **to place it in the report band**. The Picture dialogue box will appear.



9.20 **Click** on the **[ ]** button to open a browser and **navigate to the training dataset**.

9.21 **Select** the **{CostX.wmf}** file from within the dataset and **click** on the **[Open]** button. The CostX® logo will appear in the Picture dialogue box.

9.22 **Click** on the **[ ]** button to add this image into the picture object box in the page header.

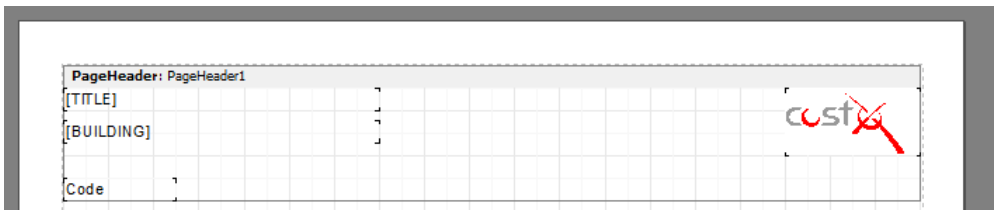
9.23 **Drag the bottom left node point** of the picture object box out **until the bottom edge aligns with the second gridline** on the page **and the logo fits in the width of the box** (see right).

Next we shall add the column headings for Code, Description, Quantity, etc. to the page header band.

9.24 **Click** on the **[Text Object]** button in the Object Toolbar at the left hand edge of the screen. **Move the cursor over the report page** and an empty box with a positioning cross will appear.

9.25 **Drag the box to the bottom left hand corner of the [PageHeader]** band and once it is in the desired position **click** the left mouse button **to place it in the report band**. The Memo dialogue box will appear.

9.26 **Type** the word **"Code"** into the **[Memo]** dialogue box and **click** the **[OK]** button. The 'Code' text will appear in the memo box without square brackets surrounding it indicating that it is static text, not a variable (see below).



9.27 **Click on the following buttons** in the formatting toolbar at the top of the screen.

centres the text within the memo box.

places a border to all four sides of the memo box; and

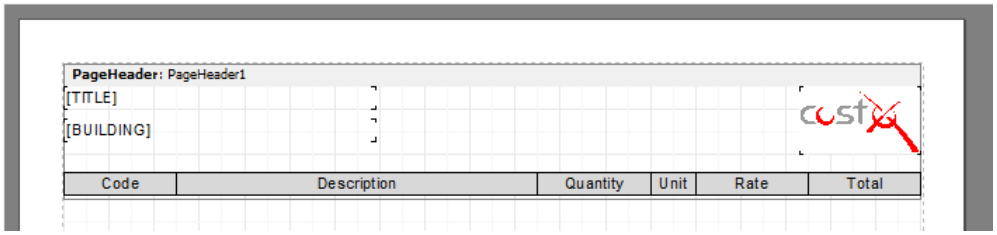
opens a choice of fill colours to apply to the background of the memo box.

9.28 **Click** on the **[Text Object]** button in the Object Toolbar again and **move the cursor over the report page**. An empty box with a positioning cross will appear.

9.29 **Drag the box to the bottom right hand corner of the [PageHeader]** band and once it is in the desired position **click** the left mouse button **to place it in the report band**. The Memo dialogue box will appear.

9.30 **Type** the word **"Total"** into the **[Memo]** dialogue box and **click** the **[OK]** button. The 'Total' text will appear in the memo box which will also inherit the formatting applied to the 'Code' memo box previously.

9.31 **Repeat clicking** on the **[Text Object]** button **to drag further memo boxes** into the page header **for "Description", "Quantity", "Unit" and "Rate"** column headings, **re-sizing each one** as necessary to complete the column headings (see below).



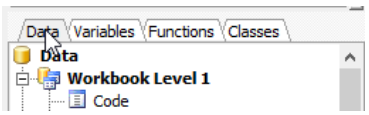
Having built a fairly basic page header band we shall now create a band to display the data from Level 1 of the workbook, thereby creating a Trade Summary.

9.32 **Click** on the **[Insert Band]** button in the Object Toolbar at the very left hand edge of the screen and when the menu opens select the **{Master Data}** option. A Master Data area will appear on the report page and the Select DataSet dialogue box will appear.

9.33 **Select {Workbook Level 1}** in the list to link each instance of this band to each instance of that data in the workbook and then **click [OK]**.

9.34 Before adding any data to the band **amend the Height to "0.70"(**cm) by either amending the Height property in the Properties task pane, or by dragging the bottom edge of the band down one step.

9.35 **Click** on the **[Data]** tab at the right hand side of the screen (see right) and use the **scroll**-bar to move **to the top of the list**. A Workbook Level 1 folder will be evident in which there are database listings for all of the columns at Level 1 of the workbook.



9.36 **Within** the **[Workbook Level 1]** folder **click** on the **{Code}** data field and, holding down the left mouse button, **drag-and-drop** it **to the centre left of the [MasterData] report band**. A box containing the text '[Workbook

Level 1."Code"]' will appear in the report band. Again, the last used formatting styles will be applied so **click on the following buttons** to amend it.

aligns the text to the left within the memo box.

removes all borders from all four sides of the memo box; and

opens a choice of fill colours, or no fill, to apply to the background of the memo box.

9.37 **Drag** the edges of **the memo box** to re-size it **to align with the "Code"** column heading in the page header band above using the blue lines that appear as guides. All of the 'Workbook Level 1."Code"' text itself need not be visible as this is not the final output that will appear on the report print.

9.38 **Click on the following data fields** one by one **and drag them into the [MasterData] band, aligning them vertically** with the '[Workbook Level 1."Code"]' field **and re-sizing their width to align with the appropriate column headings** accordingly, **and formatting them as required**. Remember that each time formatting is applied the next data field that you drag into the report band will inherit the same format style.

{Description}
{Quantity (as Text)}
{Unit}
{Rate (as Text)}; and
{Total (as Text)}

Using the (as Text) data fields as opposed to the (as Number) alternatives means that the figures in the report will appear the same way that they are displayed in the workbook and not be subject to any number formatting rules. i.e. if a mixture of decimal places are displayed in the workbook (15m², 6.96t, etc.) then the same will be evident in the report irrespective of any rules to format numbers to no decimal places, say.

9.39 **Click** on the **[Preview]** button to see a copy of the report output as it is thus far.

9.40 Note any required adjustments and then **[Close]** the preview and make any alterations.

There are myriad settings that can be made in the Properties of each report object or by using the various toolbar buttons not all of which can be covered here. Refer to the CostX® Custom Reports Guide for further details.

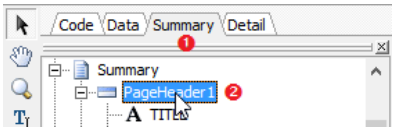
We shall now add a second page style to the report to incorporate the detail from Level 2 of the workbook.

9.41 **Click** on the **[New Report Page]** button. A blank report style page will appear on a new tab named Page 1.

9.42 **Click** into the **[Name]** property and **over-type** the **"Page 1"** text **with "Detail"** then **press** the **[Enter]** key. The tab name will change accordingly.

9.43 **Click** on the **[Summary]** tab ❶ to open it again.

9.44 In the report tree pane **click** on the **[PageHeader1]** branch ❷ to select it. The contents of the page header report band will also be selected.



9.45 **Click** on the **[Copy]** toolbar button **then** re-open the Detail report page style by **click**ing on the **[Detail]** tab.

9.46 **Click** on the **[Paste]** toolbar button then **move the cursor over the empty [Detail] page**. A copy of the page header band from the Summary page will appear and move up and down with the cursor.

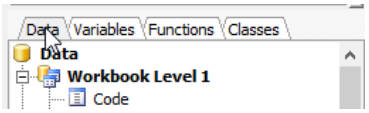
9.47 **Click** anywhere **on the page** and the pasted page header will position itself against the top margin.

9.48 **Click** on the **[Insert Band]** button in the Object Toolbar at the very left hand edge of the screen and when the menu opens **select** the **{Master Data}** option. A Master Data area will appear on the report page and the Select DataSet dialogue box will appear.

9.49 **Select {Workbook Level 1}** in the list to link each instance of this band to each instance of that data in the workbook and then **click [OK]**.

9.50 Before adding any data to the band amend the Height to 0.70cm by either amending the Height property in the Properties task pane, or by **drag**ging **the bottom edge of the band down one step**.

9.51 **Click** on the **[Data]** tab at the right hand side of the screen (see right) and use the **scroll**-bar to move **to the top of the list** so that the Workbook Level 1 folder is evident.



9.52 Within the **[Workbook Level 1]** folder **click** on the **{Code}** data field and, holding down the left mouse button, **drag-and-drop** it **to the centre left of the [MasterData] report band**. A box containing the text '[Workbook Level 1."Code"]' will appear in the report band. Again, the last used formatting styles will be applied so **click** on **the formatting buttons** to amend it.

9.53 **Drag** the edges of **the memo box** to re-size it **to align with the "Code"** column heading in the page header band above using the blue lines that appear as guides.

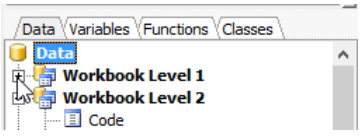
9.54 **Click** on the **{Description}** data field and **drag it into the [MasterData] band**, **aligning it vertically** with the '[Workbook Level 1."Code"]' field **and re-sizing it horizontally** to align with the appropriate column heading.

9.55 **Click** on the **[Insert Band]** button in the Object Toolbar at the very left hand edge of the screen and when the menu opens **select** the **{Detail Data}** option. A Detail Data area will appear on the report page and the Select DataSet dialogue box will appear.

9.56 **Select {Workbook Level 2}** in the list to link each instance of this band to each instance of that data in the workbook and then **click [OK]**.

9.57 Before adding any data to the band **amend the [Height] to "0.70"**(cm) by either amending the Height property in the Properties task pane, or by dragging the bottom edge of the band down one step.

9.58 In the **[Data]** tab at the right hand side of the screen **click** on the **[⊟]** button to **collapse the [Workbook Level 1] folder** (see right). The Workbook Level 2 folder will now be visible in which there are database listings for all of the columns at Level 2 of the workbook.



9.59 Within the **[Workbook Level 2]** folder **click** on the **{Code}** data field and, holding down the left mouse button, **drag-and-drop** it **to the centre left of the [MasterData] report band**. A box containing the text '[Workbook Level 2."Code"]' will appear in the report band.

9.60 **Drag** the edges of **the memo box** to re-size it **to align with the "Code"** column heading in the page header band above using the blue lines that appear as guides.

9.61 **Click on the following data fields** in the **[Workbook Level 2]** folder one by one **and drag them into the [DetailData] band, aligning them vertically** with the '[Workbook Level 2."Code"]' field, **re-sizing them to align with the appropriate column headings**, and **formatting them as required**. Remember that each time formatting is applied the next data field that you drag into the report band will inherit the same format style.

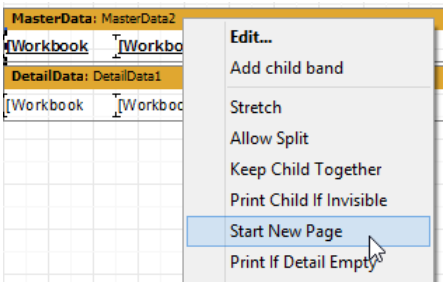
{Description}
{Quantity (as Text)}
{Unit}
{Rate (as Text)}; and
{Total (as Text)}

By using the Master Data and Detail Data bands we have now created a report page style where for each instance of the Master Data (in this case each row of data at workbook level 1 = each trade) the report will print the associated detail (in this case each row of data at workbook level 2). As the Master Data band is therefore, effectively a heading we shall do two further things, as follows.

9.62 **Click on either of the data fields in the [MasterData] report band, hold down the Shift key and click on the other** to select them both simultaneously.

9.63 **Click** on the **[Bold]** and **[Underline]** buttons in the formatting toolbar to format both data fields accordingly.

9.64 **Click the right mouse button over** the **[MasterData]** report band header and, from the drop-down menu, **select {Start New Page}**.

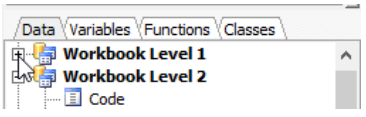


9.65 **Click** on the **[Preview]** button to see a copy of the report output as it is thus far. The report will start with a Trade Summary mimicking the content of workbook level 1, followed by a trade-by-trade detail breakdown from workbook level 2 with each new trade starting on a new page and having a bold and underlined title. At present there is no total for each trade at the foot of the detail so we shall add one shortly.

9.66 First, note any required alterations and then **[Close]** the preview to make the necessary adjustments.

9.67 **Click** on the **[Insert Band]** button in the Object Toolbar at the very left hand edge of the screen and when the menu opens **select** the **{Footer}** option. A new band will appear at the foot of the detail data band on the report page.

9.68 The number that we require at the foot of each trade detail section is the total for that trade which is the corresponding total against that trade at workbook level 1. **Click** on the **[⊞]** button next to the **[Workbook Level 1]** folder in the Data tab to expand the folder.



9.69 Within the **[Workbook Level 1]** folder **click** on the **{Total (as Text)}** data field and, holding down the left mouse button, **drag-and-drop it to the bottom right of the [Footer] report band**. A box containing the text '[Workbook Level 1."Total (as Text)"]' will appear in the band.

9.70 Again, the most recently applied formatting will be replicated for this field so **use the following buttons** in the toolbar to amend it.

removes/adds underlining to the text within the memo box.

aligns the text to the right within the memo box; and

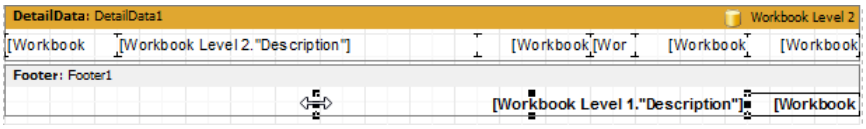
and add/remove borders to the top and bottom of the memo box.

9.71 **Drag** the edges of **the memo box** to re-size it **to align with the "Total" column heading** in the page header.

9.72 Within the **{Workbook Level 1}** folder **click** on the **{Description}** data field and, holding down the left mouse button, **drag-and-drop it adjacent to the {[Workbook Level 1."Total (as Text)"]}** data field already in the band.

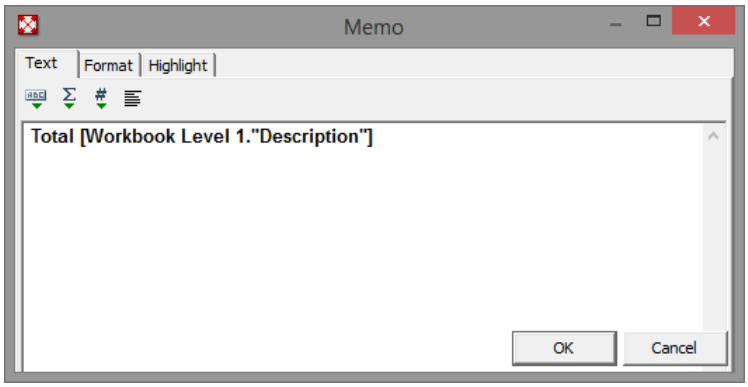
9.73 As before, the most recently applied formatting will be replicated for this field so **use the formatting buttons** to set it **to have no borders**.

9.74 **Drag** the edges of **the memo box to re-size it** to fit any of the trade headings (as below).



9.75 **Double-click** on the **{[Workbook Level 1."Description"]}** field to open the Memo editing dialogue box.

9.76 **Click at the start of the existing text and type in the word "Total** " (including the space), as below, then **click** on the **[OK]** button. As this falls outside of the square brackets it is not part of the variable and is therefore static text preceding whatever text is produced by the '[Workbook Level 1."Description"]' variable.



9.77 **Click** on the **[Preview]** button to see a copy of the report output which will now include a total at the foot of each trade section along with text identifying it as the total for the corresponding trade name.

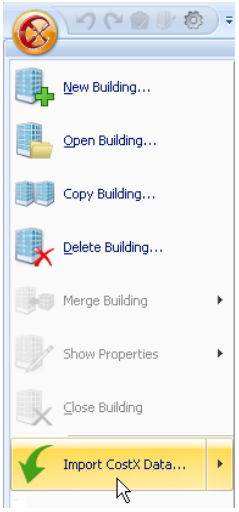
9.78 **[Close]** out of the report preview and then **click** on the **[ ]** button to exit the CostX Custom Report Designer and save your report template.

The Reports window will now include your 'Trade Estimate (-followed by your name)' report template in the list, allowing it to be selected and generated for any other workbook with a similar two level structure as the one we have been using.

Module 10:Generating A Workbook From Dimension Groups

Throughout this exercise we have looked at creating workbooks by dragging-and-dropping the available content from the various libraries within CostX®. Alternatively, it is possible to generate a workbook automatically based on the contents of the Dimension Groups. This is a powerful function, especially when the Dimension Groups have been generated from a BIM Template or Model Map import.

Importing an EXF Rate Library



If you are working in a network configuration, only one person need import the rate library file into the system.

10.1 **Open** the **[Main Menu]** and **select [Close Building]**. CostX® data cannot be imported whilst a Building is open.

10.2 **Open** the **[Main Menu]** again and **select [Import CostX® Data…]** (see right). If the sub-menu opens to the right select **[Import CostX Data…]**.

10.3 **Browse for the training dataset** and **select** the **{Workbooks Training (Module 10) Rates.exf}** file.

10.4 **Click [Open]** and the **[Select Data To Import]** window will appear advising that the selected file contains a rate library.

10.5 **Click [Select]** to commence the import.

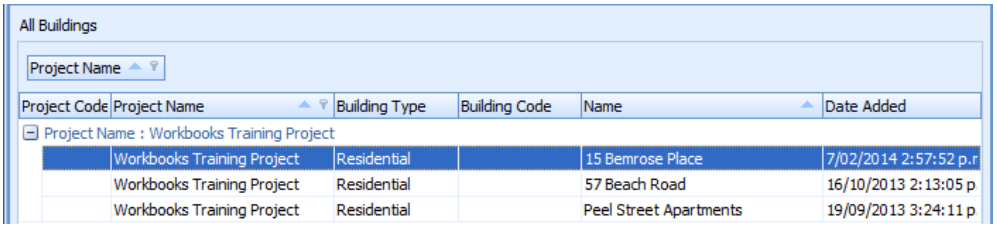
10.6 A confirmation will appear once the import has completed. **Click [OK]**.

Generating A Workbook From Dimension Groups

10.7 **Click** on the **[Main Menu]** button and then **[Open Building]**.

10.8 In the All Buildings area of the Select Building window **use** the **[⊞]** button to **expand** the **{Workbooks Training Project *(-followed by your name)*}** project folder.

10.9 **Double-click** on the **{15 Bemrose Place *(-followed by your name)*}** building to open it.



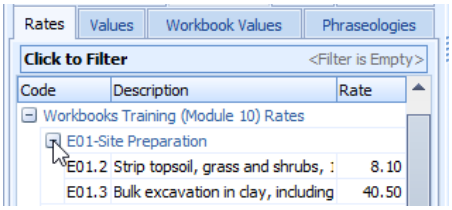
10.10 If the building does not open with the Dimension View active then **click** on the **[Dimension View]** tab where you will see two drawings and a number of existing dimension group folders.

10.11 **Click** on the **[⊞]** button **to expand all of the dimension group folders** (it is best to start at the bottom of the list and work upwards). All of the existing measurements have been taken into dimension groups that have been named with an elemental coding. In a 3D BIM model this coding may have been held as a parameter against the model objects and could have been used as the criteria for automatically naming each dimension group during the Import BIM Data From Drawings process.

10.12 **Click** on the **[Costing View]** tab to open it. No workbooks currently exist.

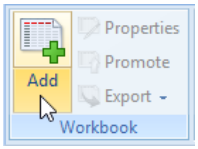
10.13 **Open** the **[Rates]** tab in the task pane.

10.14 **Use** the **[⊞]** buttons to **expand** the **{Workbooks Training (Module 10) Rates}** rate library, and the folders within it (see right).The rates in this library are all coded with the same elemental coding system used in the naming of the dimension groups in this building.



10.15 In the Workbooks ribbon menu **click** on the lower half of the **[Add]** button (see right).

10.16 From the drop-down menu **select [Generate Workbook from Dimension Groups…]**. The Workbook Properties window will open.



10.17 In the Workbook Properties window **enter** a **[Name]** of **"Elemental Estimate** (see right).

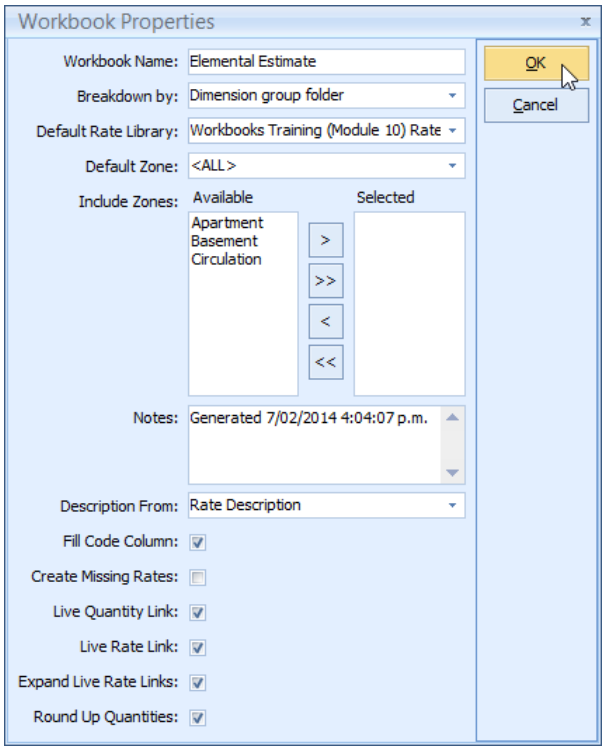
10.18 If necessary use the drop-down menu to **set** the **[Breakdown by]** option as **{Dimension Group Folder}**.

10.19 Use the drop-down menu to **set** the **[Default Rate Library]** as the recently imported **{Workbook Training (Module 10) Rates}**.

10.20 Use the **[Description From]** drop-down menu to **select {Rate Description}** as the basis for generating descriptions.

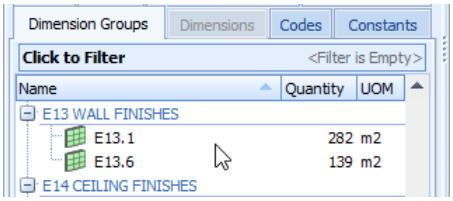
10.21 **Tick the following option boxes** (see right)

{Fill Code Column}
{Live Quantity Link}
{Live Rate Link}
{Expand Live Rate Links}
{Round Up Quantities}



10.22 **Click [OK]**. A new 'Elemental Estimate' workbook will be generated in which all of the entries in the B:Description column are derived from the dimension group folder names.

10.23 **Click** on the **[Dimension Groups]** tab to open it and **scroll-down to the E13 WALL FINISHES** dimension group folder (see right). Two dimension groups (E13.1 and E13.6) exist within this folder.



10.24 **Double-click** (or press F7) on the F:Subtotal column for the E13 WALL FINISHES element in the workbook (**cell F11**). Two items exist in the workbook with corresponding codes (E13.1 and E16.1) in the A:Code column (see below).

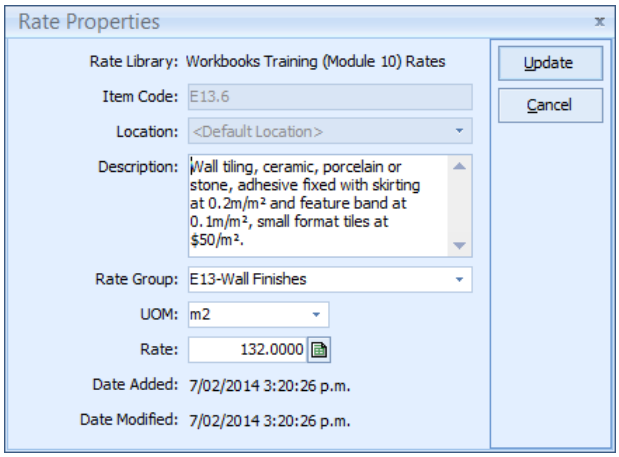
		E13 WALL FINISHES				41,828		41,828
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
1	E13.1	10mm GIB Standard plasterboard finish on and including 50 x 25mm strapping battens at 600mm centres, stopped to F4 finish, painted.	283	m2	82.50	23,348		23,348
2	E13.6	Wall tiling, ceramic, porcelain or stone, adhesive fixed with skirting at 0.2m/m² and feature band at 0.1m/m², small format tiles at $50/m².	140	m2	132.00	18,480		18,480

10.25 **Click** on the E:Rate cell for the second item (**cell E2**). The formula in this cell is =XGETRATE("E13.6") which references the *rate item* in the default rate library with a code of E13.6.

10.26 **Click** on the C:Quantity cell for the second item (**cell C2**). The formula in this cell is =XGETWALLAREA("E13.6",0) which references the *dimension group* with a code of E13.6 and applies the Default Display quantity type used.

10.27 **Click** on the B:Description cell for the second item (**cell B2**). The formula in this cell is =XGETRATEDESCRIPTION("E13.6") which references the *rate item* in the default rate library with a code of E13.6 and returns the descriptive text held within.

10.28 Whilst still in cell B2 **click** on the **[Show Source]** button in the Workbooks ribbon to open the rate library item (see right) where it can be seen that the Description and Rate for this item correspond with those in the workbook.



10.29 **Click [Cancel]**.

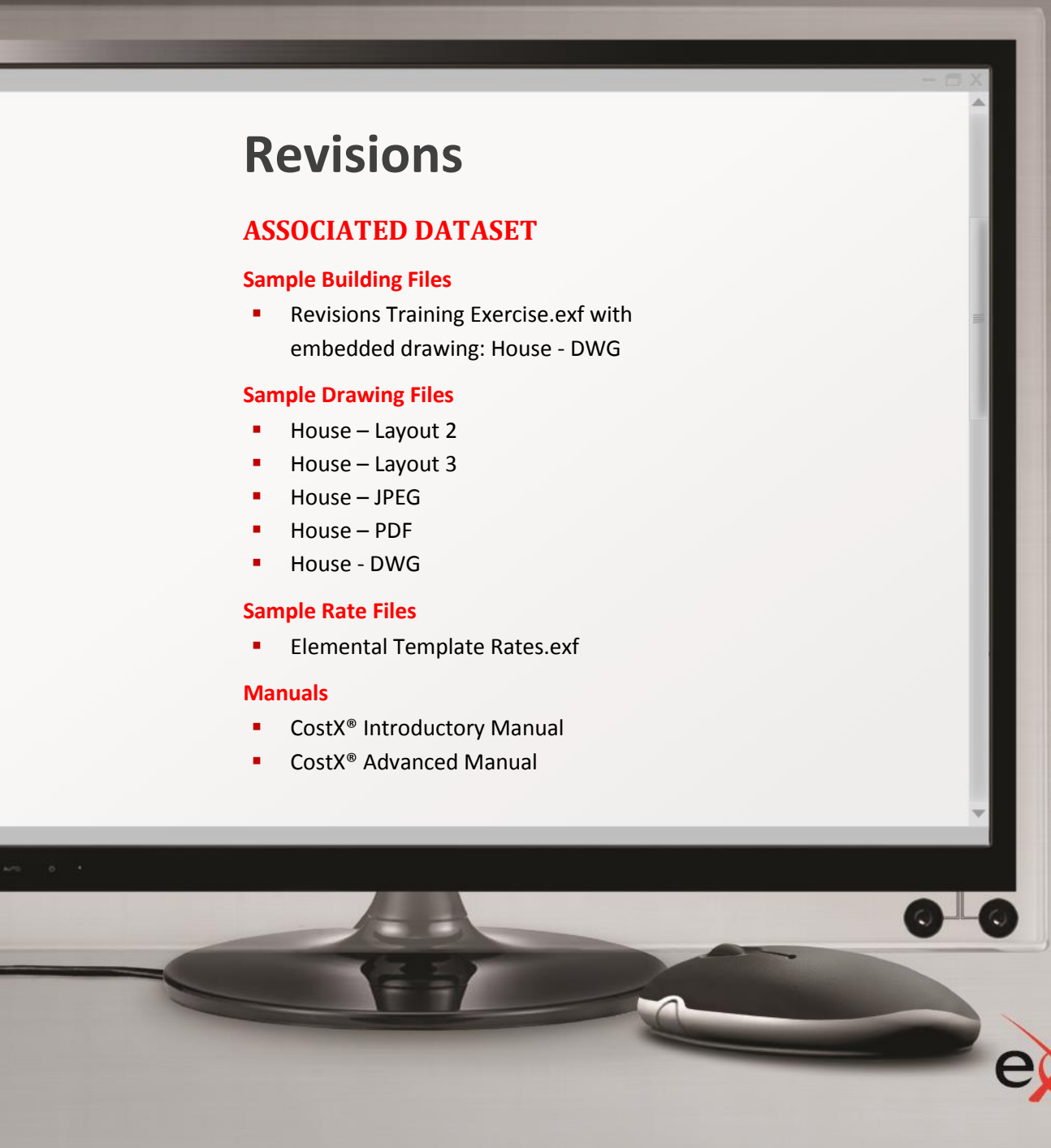
10.30 Note that the E:Rate cell on the first row of the workbook contains blue text. **Drill-down on cell E1** to open the Rate sub-sheet. As the option to Expand Live Rate Links was checked in the Workbook Properties screen during generation any rates in the library that are built-up/assemblies/composite items will have their detail copied into the Rate sub-sheet.

By measuring into dimension groups with names that correspond with item codes in a rate library, and Default Display quantity types that correspond with the Unit for that item, fully priced workbooks can be generated automatically. Options exist within the generation process to determine whether the descriptions are derived from the dimension group names or rate descriptions, and whether rates are expanded within the new workbook, where possible. Using a collaborative approach the codes may be built-in to 3D BIM models by the designer, or could be added to the model retrospectively using CostX® External Properties functionality, which would then allow quantities to be harvested automatically into the coded dimension groups ready for workbook generation.

Disclaimer

This dataset is an example only, to be used solely for the purpose of the training exercise. It is not to be used as a template for business operations. Exactal and its employees accept no liability for use of this dataset for business purposes.

ADVANCED TRAINING EXERCISE



Revisions

ASSOCIATED DATASET

Sample Building Files

- Revisions Training Exercise.exf with embedded drawing: House - DWG

Sample Drawing Files

- House – Layout 2
- House – Layout 3
- House – JPEG
- House – PDF
- House - DWG

Sample Rate Files

- Elemental Template Rates.exf

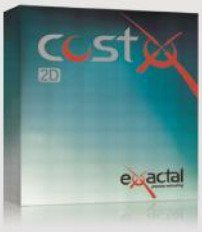
Manuals

- CostX® Introductory Manual
- CostX® Advanced Manual

The costX Family of Products

CostX®

CostX® is Exactal's premium product. More companies are using CostX® for their complete estimating solution and receiving strong returns on their investment. CostX® is a powerful project costing tool that enables estimators to use the most advanced on-screen measurement system while embracing BIM to deliver better results to clients. It can reduce take off time by up to 80%.



CostX® 2D

CostX® 2D does not support 3D/BIM drawings or allow for auto-revisioning, but still contains Exactal's world-leading on-screen 2D takeoff and integrated workbook. If your company does not receive 3D/BIM drawings but still wants to take advantage of the faster, smarter and more accurate estimating solution on the market, CostX® 2D is the best choice for you.

CostX® Takeoff 2D

CostX® Takeoff 2D is Exactal's most basic product but still allows you to use the world-leading on-screen 2D takeoff, meaning you can measure areas, lengths and counts in a few clicks. If you have only used manual measurement and Excel® before and want to start off with something simple, CostX® Takeoff 2D may be the best choice for you.

FEATURES	CostX®	CostX® 2D	CostX® Takeoff 2D
BIM models/3D drawings	•		
2D drawings (incl PDFs)	•	•	•
Auto Revisioning	•		
Workbooks	•	•	
Subcontractor Comparison	•	•	

CostXL

CostXL allows you to link CostX® data directly into your Excel® spreadsheets

CostX® Live

CostX® Live gives you access to live CostX® data on the go through the web.

FREE

CostX® Viewer

CostX® Viewer makes it easy to freely share your CostX® projects with anyone.

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A DIMENSIONEERING COMPANY

Contents

Introduction

This document in conjunction with the CostX® Introductory and Advanced manuals, aims to inform and demonstrate the principles of Revisioning using CostX®.

A basic familiarity with CostX® is required in order to undertake this exercise. Prior completion of a CostX®® Introductory Training Course, or an understanding of the principles of measurement and workbook structure within CostX®, is a pre-requisite.

Save the Associated Dataset files to a location on your computer or network that may be accessed during the training exercise and work through each section sequentially. Complete each step before moving on, as each subsequent step relies on the previous data. The exercises are based around the use of example files and templates which have been developed for demonstration and training purposes only.

Refer to the CostX® help files by pressing the F1 key, or by clicking the Help icon  in the top right hand corner of the screen for more detail of functions. Further information can also be found in the Revisions FAQ section of the Help files, a copy of which is appended to this document.

Also refer to Section 9 – Revisions of the CostX® Advanced Manual.

Formatting Conventions Used

Following are the formatting conventions used throughout this training exercise.

Bold Font	Direction for User
[Bold Font]	Anything fixed in CostX® for example button name, right click options, field names, etc.
{ Bold Font }	Anything which a user can change, for example drawing name, dimension group name, model map name, workbook name.
"**Bold Font**"	Anything a user has to enter, for example building name, workbook name, dimension group name.

Building Revisions in CostX® - Overview

The Building Revisions function in CostX® enables the scope of a project to be managed and tracked. During the course of a project, designs progressively change as design work proceeds or in response to unforeseen circumstances. As revised drawings for a building are issued to reflect the design changes, the building revision status in CostX® is incremented and the drawings are promoted from the previous to the new issue. CostX® compares the dimensions that have already been extracted from the previous drawings to the same drawing objects in the new drawing issue and displays them for adjustment and acceptance by the user. The comparison of dimensions is done for all area, length and count dimensions and when the revised dimensions are accepted, the dimension group quantities are automatically updated. Workbooks also support revisions, allowing the updated quantities from the new drawing to automatically update the new workbook revision.

Drawings, dimensions and workbooks from previous revisions may be viewed at any time using the drop down selection list located in the Building Revision section of the Revisions tab, creating a comprehensive audit trail.

Revisions Training Set Up

Import Building Template and Rate Library

- **Create** a **project** named **"Training-Revisions-" followed by your name** or initials, set to **Default Location**.
- **Import** the building **{ Revisions Training Exercise.exf }** and **attach it to** the '**Training-Revisions-Your Name**' project.
- The exf file includes a drawing so you will be asked to **nominate a destination folder** for the drawing file. **Place** it in the training dataset folder named **"Drawings".**
- **Import** the **rate library { Elemental Template Rates.exf }** (This rate library will already be in your CostX® database if you have completed Exactal's CostX® Introductory Training Exercise).

Create New Building Based on Template

- **Create** a **new building** and give it a name (e.g. for training purposes your first name or surname or some other unique identifying reference, followed by **"Revisions 1"**) and attach it to the **{ Training-Revisions-Your Name } project**. **Do not click Insert yet**.
- In the **[Based On section]** of the **[Building Properties]** window, use the drop-down menus to select the **{ Training-Revisions-Your Name }** Project, and the **{ Revisions Training Exercise }** Building to copy from. **Ensure** that the **[Use Drawings]**; **[Use Dimension Groups]**; **[Use Dimensions]**; and **[Use Workbooks]** check boxes are **all ticked**, then **click [Insert]**.

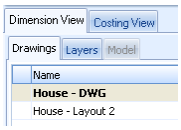
> *A new Building, based on the imported template will open containing a drawing, a set of Dimension Groups with quantities, and two priced Workbooks. This completed Building will form the basis of the Revisioning exercise.*

Module 1: Revisioning

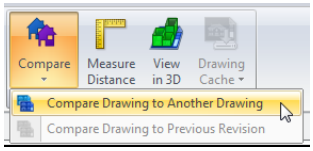
Comparing Drawings

When a revised drawing arrives, before commencing the revisioning process it may be worthwhile to compare the new drawing to the current issue to determine the extent of the changes and whether it is in fact appropriate to increment the building revision.

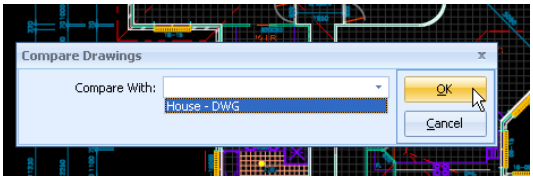
1.1. **Click** on **[Add Drawing]** and **insert { House – Layout 2}** . Both drawings will now appear on the drawings list.



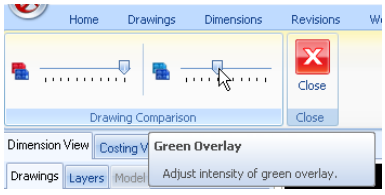
1.2. Now **click** on the **[Compare]** drawing button on the **[Drawings]** ribbon and **select [Compare Drawing to Another Drawing]**.



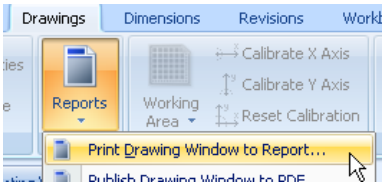
1.3. **Select { House – DWG }** from the drop down list and **click { OK }**.



CostX® will overlay the two drawings with the drawing selected in the drawing list shown in green, the other in red. The colour intensity may be adjusted for ease of viewing. By holding down the left mouse button, the green overlay may be moved and re-positioned over the red.

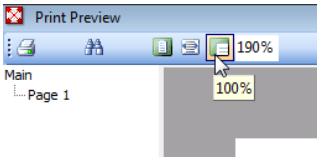


A screen shot of the overlay may be printed as a hard copy, PDF or report file for issue by use of the Reports button on the Drawings ribbon. The report will print the view as seen on screen, so zoom in and crop the view as desired prior to printing.



1.4. **Click** on the **[Drawings]** tab to **open** the **[Drawings]** ribbon, then **click** on the **[Reports]** button and **select [Print Drawing Window to Report]**.

1.5. **Insert** as desired the details in the **[Print Drawing Window]** (e.g. Add a title such as "**Drawing Revision**") and then **click [Preview]**. **Change** the **scale buttons** for ease of viewing. From here either print using the print icon or **close** using the **[Close]** button.



1.6. To return to the drawing screen, **click** the **[Comparison]** tab to open the **[Comparison Ribbon]** and then **click** the **[Close]** button.

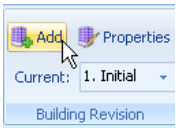
You now have the option to either work on the new drawing alongside the previous, or create a building revision and promote the previous drawing to consolidate it into the new revision.

Promoting a drawing

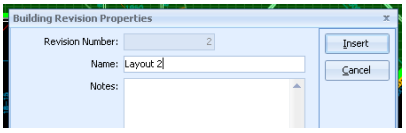
1.7. For this exercise, a revision will be created. Therefore **delete** the newly added **drawing { House – Layout 2 }** by clicking on its name to select it, then **right click** and **select [Delete Drawing]**.

1.8. **Click** on the **{ House – DWG }** drawing name to open the drawing.

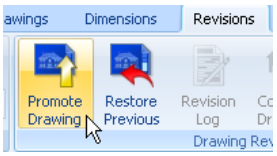
1.9. To **create** a **Building Revision**, **click** on the **[Revisions]** tab to open the Revisions Ribbon, then **click** the **[Add]** button in the Building Revision section of the ribbon.



1.10. A **[Building Revision Properties]** window will appear. **Enter** "**Layout 2**" in the name box and **click [Insert]**. A new revision has been created. Note the padlock icon denoting that the drawing is now locked.

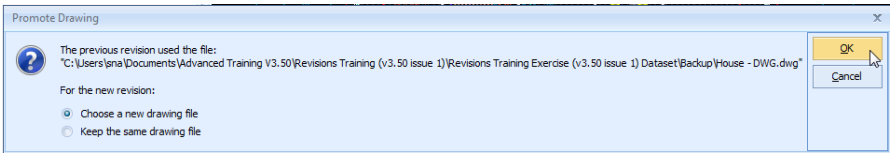


1.11. **Click** the **[Promote Drawing]** button in the **[Drawing Revision]** section of the Revisions ribbon.



There is also a Promote button on the Drawings ribbon which can be used for same purpose.

1.12. Another pop up window will be displayed asking if a new drawing file is required. **Click [Choose a new drawing file]** for the revision.



1.13. **Locate** the drawing file **{ House – Layout 2.dwg }** and **click [Open]**. A drawing properties window will be shown. **Change the name** to **{ House – Layout 2 }** and **click** the **[Update]** button.

The screen will display the new drawing, overlaid with the dimensions taken from the previous drawing. All dimension group totals will have reduced by the amount of the dimensions taken from that drawing. If all drawings contributing to the Dimension Group are promoted, the total will reduce to zero.

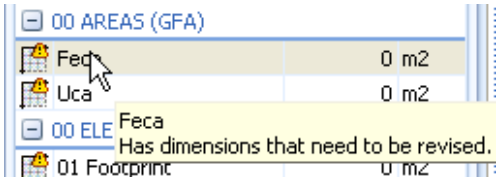
When dimensions are initially captured via the sticky cursor, they attach to drawing lines which define a length, or the border of an area, or to register a count. In Revise Mode, CostX® identifies where lines have been moved, deleted or added in the revised drawing. These changes directly impact on the dimensions which are attached to the original location of the lines. CostX® enables the dimension attachment to the line to be re-established in its revised location, and the dimension updated accordingly, or the dimension deleted if it is no longer required.

The dimensions measured from the previous version of the drawing will be superimposed onto the revised version. Where dimensions match up with the revised drawing they will

show in green, but where a line has moved so that the dimension no longer matches up, it will show in yellow.

Each Dimension Group can then be revised by accepting the dimension as shown on the revised drawing, or amending the measurement to relocate the dimensions to their revised locations. This is done via mouse click on the superceded (yellow highlighted) line, and then either hold the click and drag the line to its new location, or release click and then click on the new location.

The task now is to revise (or validate) all of the dimensions measured from the old drawing to suit the new drawing. All such dimensions, groups and the drawing will each have a warning icon against them until all dimensions are revised.

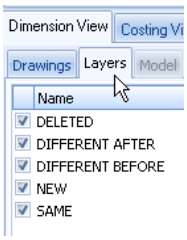


This does not all have to be done at once and new dimensions can still be measured whilst old dimensions remain unrevised.

Comparing drawings after creating revision

1.14. Before starting the revisioning, first compare the old and new drawings to gain an appreciation of the extent of changes. **Click** the **[Compare Drawings]** button on the **[Revisions]** ribbon. A **[Compare]** window will open which gives the user a number of comparison options (e.g. match objects, match lines and overlay).

There is also a Compare button on the Drawings ribbon, do not use that button as it has different function.



1.15. **Try all three methods of comparison** to understand where the changes have occurred. Note the use of Layers to filter the Match type comparison overlays. The Reports button on the Drawings ribbon can also be used at this stage to print screen shots of the comparison overlays.

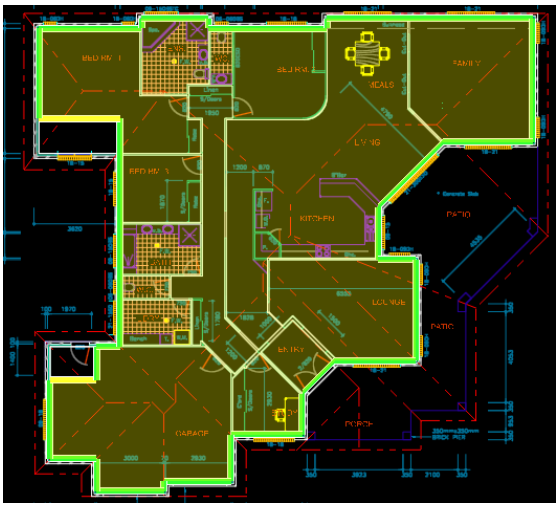
1.16. **Click** the **[Close]** button in **[Compare Ribbon]** to return to the drawing view.

Revising dimensions

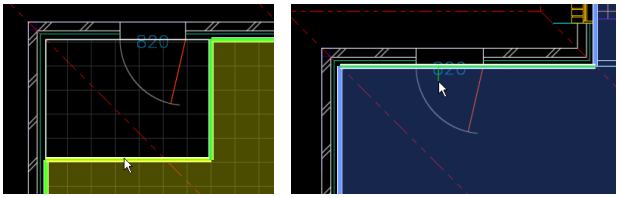
Revision using drag and drop

1.17. Each of the Dimension groups with a warning icon will need to be revised or validated. **Select** the **FECA** group. A warning message will appear to load data from previous version, **click [Yes]** button. Measurements which have changed are indicated on the drawing by yellow highlighting and these need to be revised (validated). **Make sure that mouse cursor is not hovering over the dimension.**

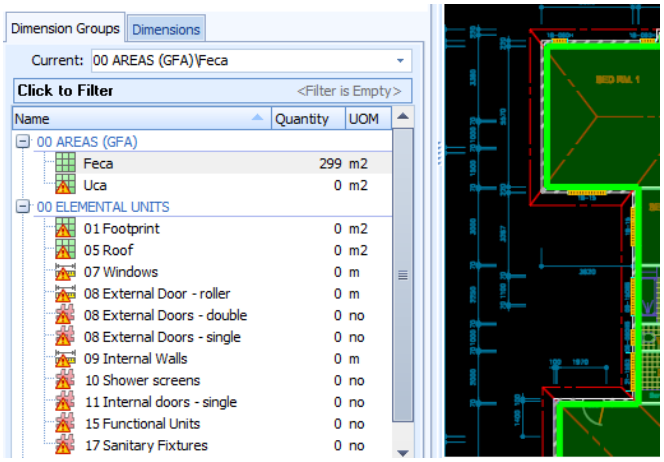
In order to revise the FECA dimensions, the yellow segments which indicate a changed line on the drawing now need to be relocated to their new positions.



1.18. **Hover over** the **yellow line** and when the dimension is selected the cursor changes to cross-cursor mode. Then **click, hold, drag and drop**, or click, release, move and click again to drop the segment to attach to the new line.

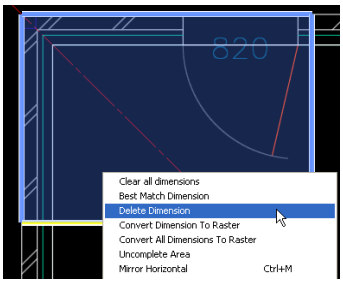


1.19. When the dimensions are fully highlighted in green (no yellow), **click** the **[Accept All]** button in the **[Revise Dimensions]** section of the **[Revisions]** ribbon, or Accept Dimension in the right click menu. The revised dimension will appear in the dimension group and the warning icon will disappear.



Deleting invalid dimension

1.20. Now **select** the **{ UCA }** dimension group. As the yellow dimension is no longer valid it can be deleted. **Hover the cursor to** select the **dimension**, then either **right click** and **select [Delete Dimension]**, or use the Delete All Invalid button on the Dimensions Ribbon to delete the invalid dimensions in the dimension group. Then **[Accept]** the remaining dimension.



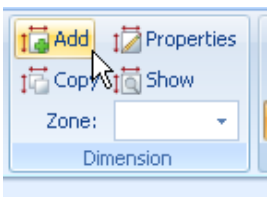
1.21. **Work through each of the dimension groups**. **If** in any of the groups there are **no yellow dimensions**, simply **[Accept All]** to validate the existing dimensions and move on. Every dimension has to be Accepted. Note that drawing layers can be switched on or off in the normal way to assist the validation process.

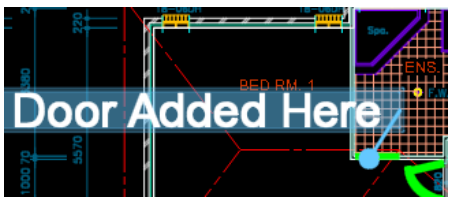
To identify all of the dimensions on the drawing within a dimension group that have yet to be accepted, move the cursor over the drawing and hold the space bar. A line will extend from the cursor to each dimension. Sometimes after you Accept All, the warning icon will remain. This is because there is still an invalid (yellow) dimension somewhere on the drawing. Hold the space bar to reveal the location of the invalid dimension.

If you wish to undo any revisions, click the Restore Mode button which will show previous dimensions. To restore them, either right click over the dimension and select Restore Dimension, or click the Restore All button to restore all the dimensions in the dimension group. Then click the Restore Mode button again to exit the mode. For partially accepted revisions, you can also use the "Ctrl z key" function to undo the last action, or the Esc key to cancel the current action.

Sometimes a dimension will show as invalid even though the drawing does not appear to have changed. This can be because the line on the drawing has been moved, but only by an imperceptible amount. Simply double click on the line (i.e. click to select and click to drop in a single action). Alternatively use right click and select Best Match Dimension.

1.22. In Dimension group **{ 11 Internal Doors – single }**, the door to Bedroom 1 Ensuite has been removed so the dimension is shown as invalid. However, this would appear to be a drawing error as a door is still required. Therefore, **delete the yellow dimension** in order to complete the revisioning exercise. Then **add a door** back into the measure either **by registering a count on the door opening in Line** or Point mode (by clicking the Line Mode button) or add a manual dimension into the dimension group using the Add button in the Dimension section of the Dimensions ribbon. Then annotate the dimension label or create a markup to the drawing.





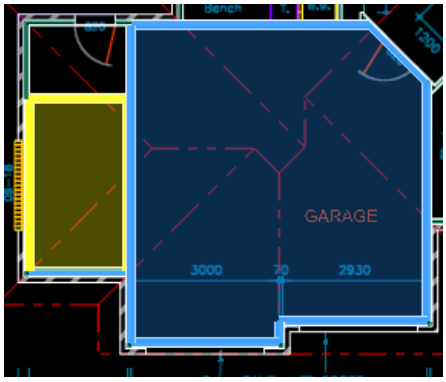
Measuring Additional Objects

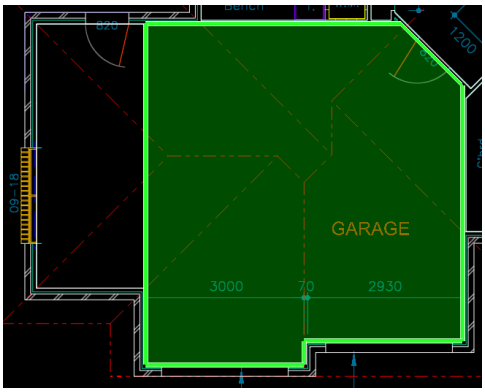
1.23. If you have switched to Point mode to count the door, **click** the **[Line Mode]** button again to return to Line mode.

1.24. In Dimension Group **{ 17 Sanitary Fixtures }**, **accept the existing dimensions** as correct, **then measure the two new fixtures** into the same dimension group as individual block counts.

Using 'Uncomplete Area' tool

1.25. Under **{ 00 Rooms }** dimension folder, the garage area has been increased to incorporate the deleted store. The **store dimension can be easily deleted** but the garage dimension cannot be revised with a simple drag and drop. **Right click** on invalid store dimension, and then, **select** [**Delete Dimension**].

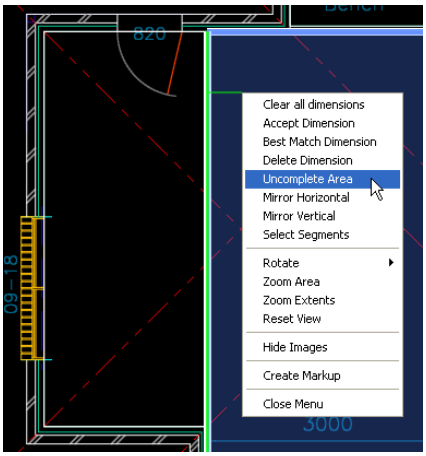


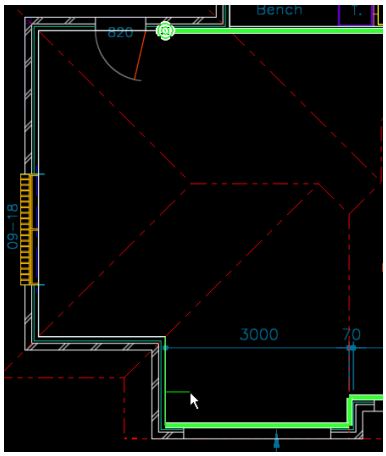


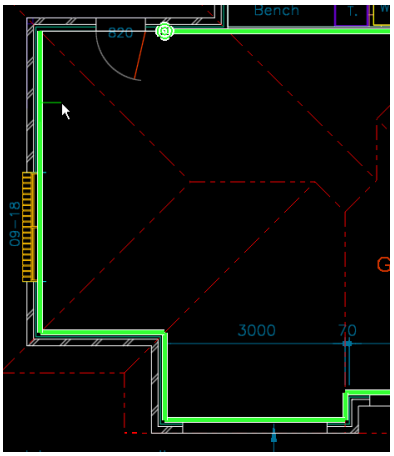
1.26. For garage dimension, in such situations it is necessary to **remove a segment of the garage area** to open, or "uncomplete" the area, and then **re-trace the perimeter** of the area to suit the revised layout. To do this, **hover the cursor to** select the **segment** to be moved and then **right click** and **select [Uncomplete Area]**.

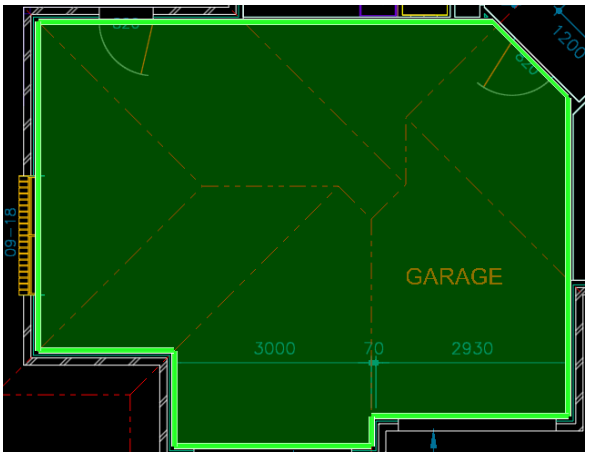
> *The segment will be removed and the area will become open sided. One of the open ends will be marked with a start icon and the unmarked open end is the end point to which you now add new segments. (To delete segments from the unmarked end use the Backspace key).*

1.27. **Click** around the new sections of **perimeter to** enclose the revised **garage area**, then press **Enter** to capture the new area dimension. (Refer screen shots on following page).



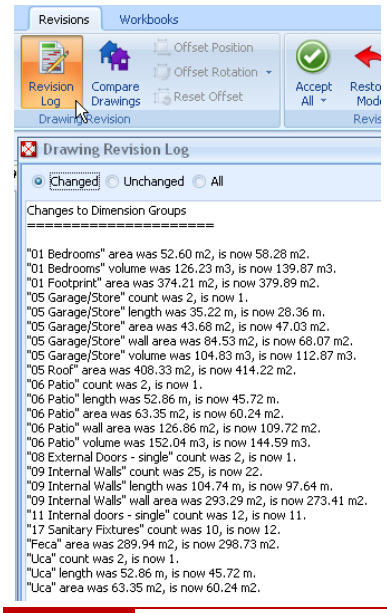


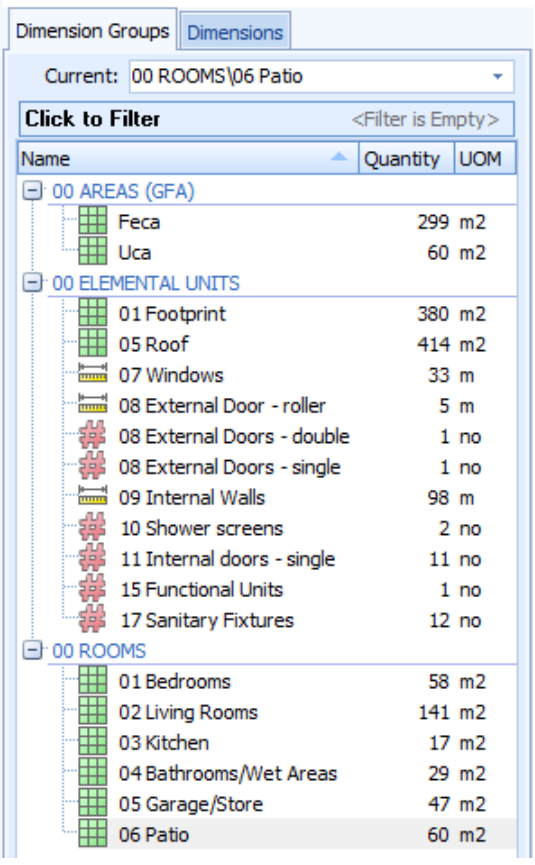




1.28. The completed revised dimensions should appear as shown here.

1.29. The **[Revision Log]** button provides details of all dimension changes. This list can be highlighted, copied and pasted.

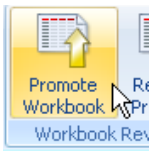




Workbooks

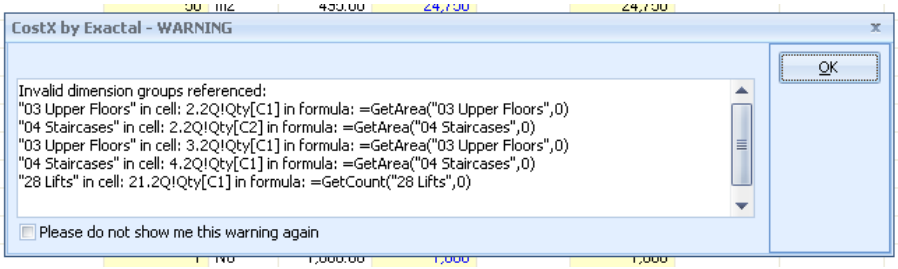
1.30. When the dimensions have all been revised, **click** the **[Costing View]** tab to switch to the workbooks which are all locked. **Select** the **{ 02 Elemental Units }** workbook.

1.31. **Click** the **[Promote Workbook]** button in the **[Workbook Revision]** section of the **[Revisions]** ribbon.



There is also a Promote button on the workbook ribbon which can be used for same purpose.

1.32. A warning box may warn that there are Invalid Dimension Groups in the workbook. This refers to cells in the workbook which contain a link formula to Dimension Groups for which there are no dimensions. If the warning is as shown below, none of these items are applicable to this building so **click [OK].**

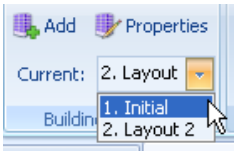


The workbook will be updated with all of the revised quantities.

The other (01 GFA Budget) workbook can be promoted in the same way if desired but this is not really necessary as it has been superceded by the 02 Elemental Units workbook.

View Previous (Audit Trail)

1.33. **Click** on the **drop down** arrow in the **[Building Revision]** section of the ribbon and **select [1. Initial]**. This will revert both the Costing and Dimension Views back to the previous (Initial) revision of the building. These views are retained so the original dimensions and costings can always be referenced at a later date.

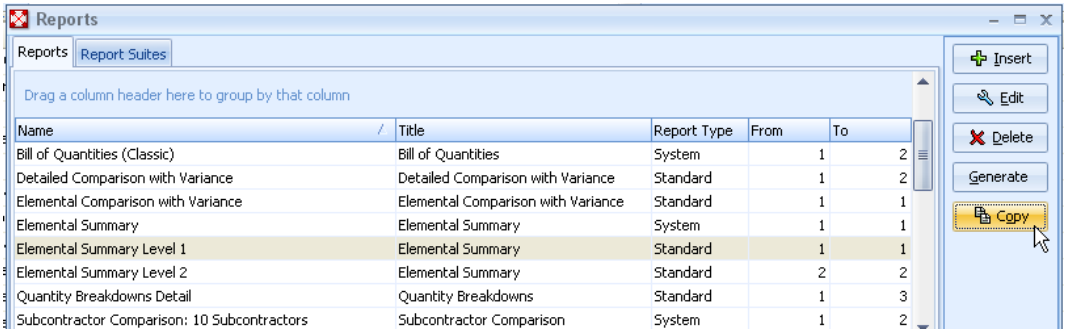


1.34. Then use the drop-down list to **re-select** the '**2. Layout 2**' revision.

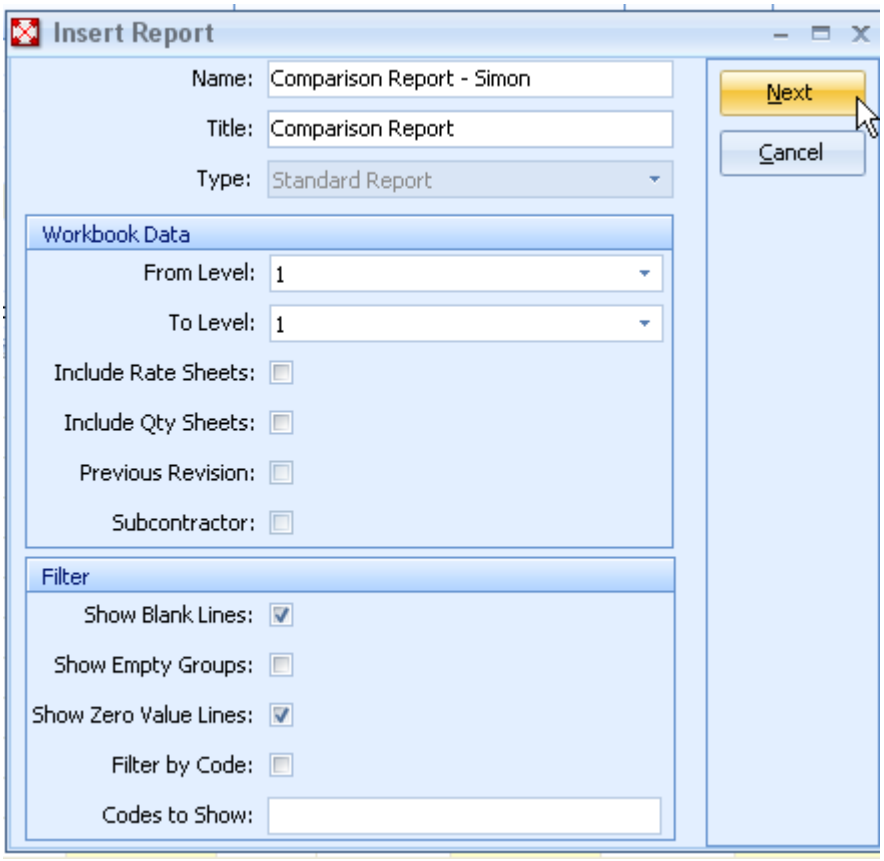
Comparison Report

1.35. **Select** the **{ 02 Elemental Units }** workbook in the **{ Layout 2 }** Revision. To generate a report showing the variance that has occurred in the revision, **select** the **[Workbooks] ribbon**, then **click** the **[Reports]** button.

1.36. **Select** the **{ Elemental Summary Level 1 }** report and **click** [**Copy]** button to create a template to work on

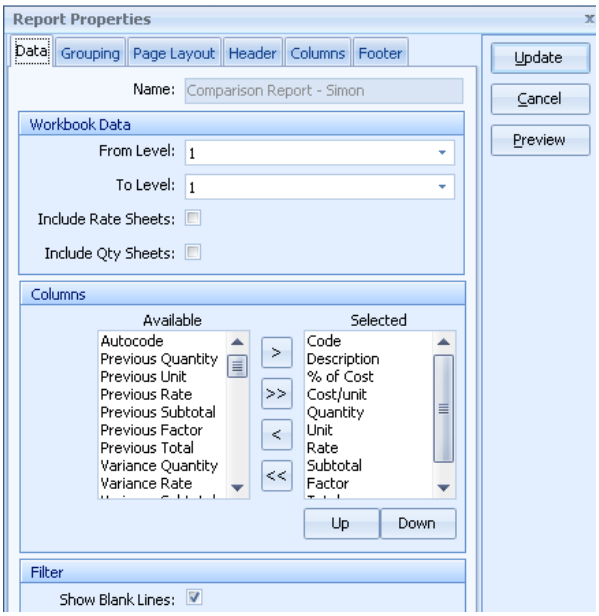


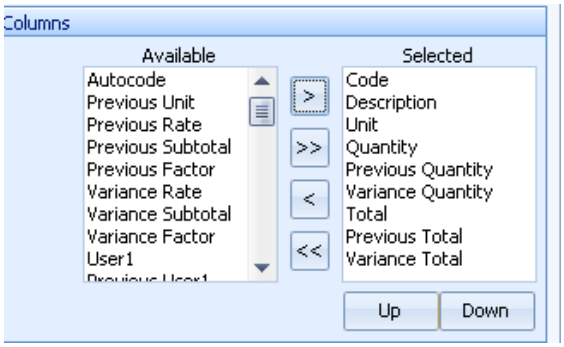
1.37. **Name** the copy "**Comparison Report-Your Name (or initials)**" and **insert** a **Title** of "**Comparison Report**". **Click "Next"**.



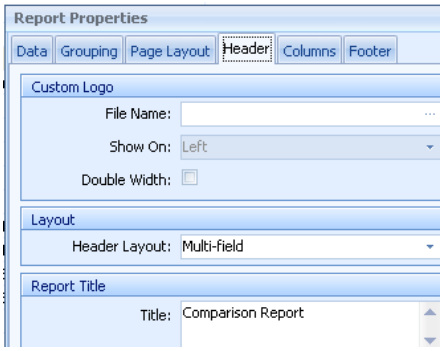
1.38. Comparison Report will now be added to the list of report templates. **Highlight the Comparison Report**, and **click [Edit]** button.

1.39. A **[Report Properties]** box will appear. This is where you can customise the Report template to suit your needs. The Data tab determines what information appears in the Report. **Shuffle the required fields between [Available] and [Selected]**. An example for a Comparison Report may be as shown below.

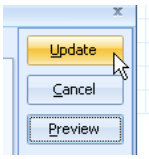




1.40. Now **select** the **[Header]** tab and **confirm** that the **Report title** reads “Comparison Report”.



1.41. Now **click [Preview]** to view the Report. If you are satisfied with the Report, **close the preview** and then **click [Update]**. Your changes will not be saved unless you update.



The Report is shown on the next page.

Comparison Report

Project: Training-Revision **Details:** 02 Elemental Units
Building: Shahid Revision 1

Code	Description	Unit	Quantity	Previous Quantity	Variance Quantity	Total	Previous Total	Variance Total
SB	Substructure	m2	380	375	5	28,690	28,313	378
CL	Columns	m2	415	409	6	6,225	6,135	90
UF	Upper Floors	m2	0	0	0	0	0	0
SC	Staircase	m2	0	0	0	0	0	0
RF	Roof	m2	415	409	6	72,625	71,575	1,050
EW	External Walls	m2	218	216	2	42,510	42,120	390
WW	Windows	m2	50	50	0	24,750	24,750	0
ED	External Doors	m2	18	20	-2	6,922	7,829	-907
NW	Internal Walls	m2	254	272	-18	26,629	28,489	-1,860
NS	Internal Screens & Borrowed Lights	m2	2	2	0	927	927	0
ND	Internal Doors	m2	21	23	-2	11,638	12,696	-1,058
WF	Wall Finishes	m2	726	759	-33	18,126	18,965	-838
FF	Floor Finishes	m2	594	587	7	24,367	24,379	-12
CF	Ceiling Finishes	m2	359	354	5	28,718	28,263	455
FT	Fitments	No	1	1	0	15,000	15,000	0
SE	Special Equipment	No	1	1	0	1,000	1,000	0
PD	Sanitary Fixtures, Plumbing & Gas	No	12	10	2	30,000	25,000	5,000
AC	Air Conditioning	m2	299	290	9	34,354	33,343	1,011
FP	Fire Protection	m2	359	354	5	5,385	5,299	85
LP	Electric Light, Power & Communications	m2	359	354	5	39,606	38,979	627
TS	Transportation Systems	m2	0	0	0	0	0	0
SS	Special Services	m2	359	354	5	12,564	12,365	199
	Element Sub-Total					**430,036**	**425,427**	**4,609**
PR	Preliminaries	%	9.00	9.00	0.00	38,703	38,288	415
YY	Contingency Provisions	%	2.50	2.50	0.00	10,751	10,636	115
BM	Builders Margin	%	6.00	6.00	0.00	25,802	25,526	277
ET	Escalation To Tender	%	4.00	4.00	0.00	17,201	17,017	184
	Building Total					**522,493**	**516,893**	**5,600**
	Professional Fees	%	6.00	6.00	0.00	31,350	31,014	336
	Fees - Other	%	2.00	2.00	0.00	10,450	10,338	112
	Construction Total					**564,293**	**558,245**	**6,048**

Experiment with other Report configurations, but rather than editing existing templates, make a copy of them to edit so that the original is preserved. Superfluous report templates can be deleted if they are definitely no longer required.

Module 2: Incremental Revision

Revising dimensions

2.1. Return to the **[Dimensions View]** and **open** drawing **{ House – Layout 2 }**.

2.2. **Click** the **[Add]** button in the Building Revision section of the **[Revisions]** ribbon.

2.3. **Add a new revision** named "**Layout 3"**. There will now be three building revisions in the drop-down list, named Initial, Layout 2 and Layout 3.

2.4. **Promote the drawing { House – Layout 2 }** and **choose the new drawing file { House – Layout 3 }** from the dataset, and change the drawing name to House Layout – 3.

2.5. **Use Comparison** as before to **identify the changes**.

2.6. **Revise the dimension groups**. Many can be accepted unchanged. Hints:

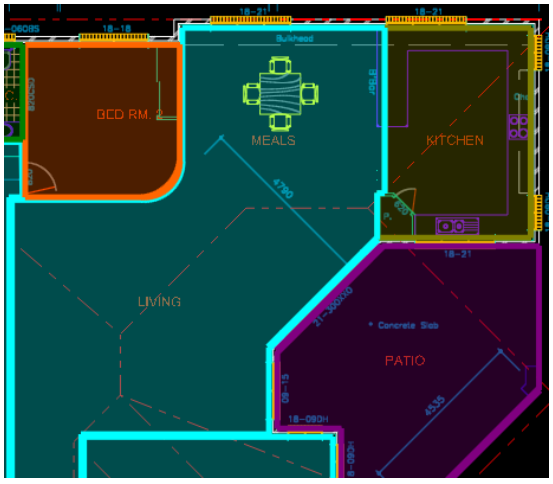
An internal sliding door has been deleted and re-drawn in the same location;

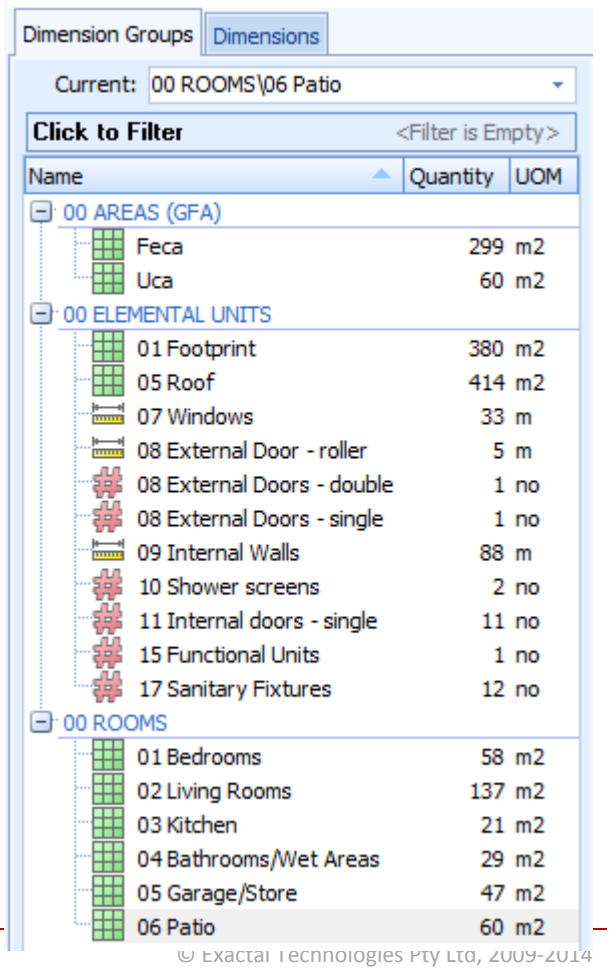
Delete functional unit count and remeasure it from relocated position;

A sanitary fixture has been relocated and two others have been deleted and re-drawn in the same location; in each case, use the shift key when dropping to register a block count;

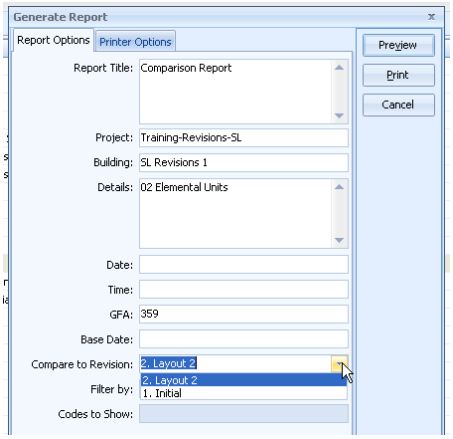
For the Living Room adjustment, delete the section over the Family Room which has changed to kitchen. Uncomplete the Meals area segment and adjust it around the new Kitchen. Click and drop or drag and drop the segments around the old Kitchen area.

For the Kitchen, delete the old dimension and re-measure it in the new location.





The completed revised dimensions should appear as shown here.



2.7. **Switch to** the **[Costing View]** and **promote** the **{ 02 Elemental Units }** workbook.

2.8. **Generate** a **Comparison Report**. Note that in the Generate report box, there is the option to compare the current workbook revision against any of the previous revisions – in this case, Layout 2.

Comparison Report

Project: Training-Revision **Details:** 02 Elemental Units
Building: Shahid Revision 1

Code	Description	Unit	Quantity	Previous Quantity	Variance Quantity	Total	Previous Total	Variance Total
SB	Substructure	m2	380	380	0	28,690	28,690	0
CL	Columns	m2	415	415	0	6,225	6,225	0
UF	Upper Floors	m2	0	0	0	0	0	0
SC	Staircase	m2	0	0	0	0	0	0
RF	Roof	m2	415	415	0	72,625	72,625	0
EW	External Walls	m2	218	218	0	42,510	42,510	0
WW	Windows	m2	50	50	0	24,750	24,750	0
ED	External Doors	m2	18	18	0	6,922	6,922	0
NW	Internal Walls	m2	226	254	-28	23,689	26,629	-2,940
NS	Internal Screens & Borrowed Lights	m2	2	2	0	927	927	0
ND	Internal Doors	m2	21	21	0	11,638	11,638	0
WF	Wall Finishes	m2	670	726	-56	16,726	18,126	-1,400
FF	Floor Finishes	m2	573	594	-21	24,531	24,367	164
CF	Ceiling Finishes	m2	359	359	0	28,718	28,718	0
FT	Fitments	No	1	1	0	15,000	15,000	0
SE	Special Equipment	No	1	1	0	1,000	1,000	0
PD	Sanitary Fixtures, Plumbing & Gas	No	12	12	0	30,000	30,000	0
AC	Air Conditioning	m2	299	299	0	34,354	34,354	0
FP	Fire Protection	m2	359	359	0	5,385	5,385	0
LP	Electric Light, Power & Communications	m2	359	359	0	39,606	39,606	0
TS	Transportation Systems	m2	0	0	0	0	0	0
SS	Special Services	m2	359	359	0	12,564	12,564	0
	Element Sub-Total					**425,860**	**430,036**	**-4,176**
PR	Preliminaries	%	9.00	9.00	0.00	38,327	38,703	-376
YY	Contingency Provisions	%	2.50	2.50	0.00	10,646	10,751	-104
BM	Builders Margin	%	6.00	6.00	0.00	25,552	25,802	-251
ET	Escalation To Tender	%	4.00	4.00	0.00	17,034	17,201	-167
	Building Total					**517,419**	**522,493**	**-5,074**
	Professional Fees	%	6.00	6.00	0.00	31,045	31,350	-304
	Fees - Other	%	2.00	2.00	0.00	10,348	10,450	-101
	Construction Total					**558,813**	**564,293**	**-5,480**

Module 3: Revisioning with differing drawing files

CostX® has the ability to promote and revise drawings of differing file types and scales – for example, when a hand drawn sketch or PDF is later upgraded and re-issued as a CAD drawing. The following exercise will demonstrate this function.

Revision from JPEG to PDF drawing

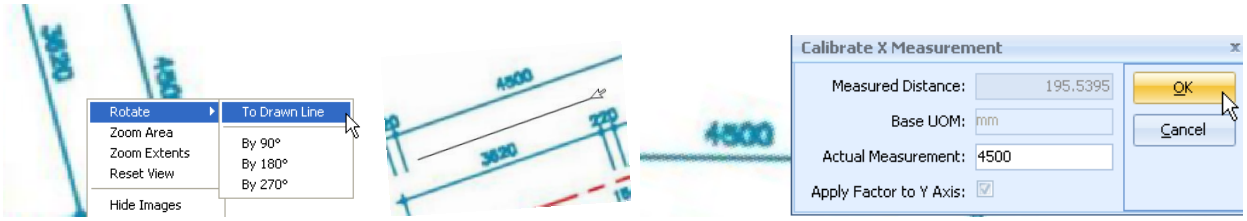
3.1. **Close** the **current building**.

3.2. **Create a new building** and give it a **name** (eg. for training purposes your first name or surname or some other unique identifying reference, followed by "**Revisions 2**") and **attach it to** the **{ Training-Revisions-Your Name }** project. **Do not click Insert yet**.

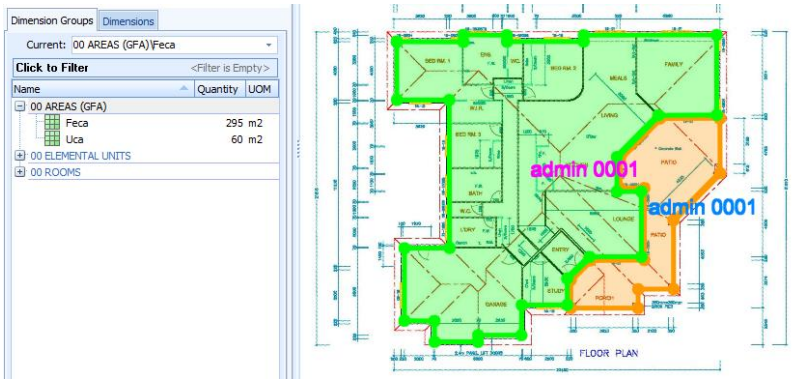
3.3. In the **[Based On]** section of the **[Building Properties]** window, use the drop-down menus to **select** the **{ Training-Revisions-Your Name }** Project, and the **{ Revisions Training Exercise }** Building to copy from. Ensure that the **[Use Drawings]** and **[Use Dimensions]** check boxes are **unticked**; and the **[Use Dimension Groups]** and **[Use Workbooks]** check boxes are **ticked**; then **click [Insert]**. A new Building, based on the imported template, will open containing a set of empty Dimension Groups, and two Workbooks.

3.4. **Add** the **{ House – JPEG }** drawing. Do not amend the scale in the Drawing properties box.

3.5. **Rotate the drawing** to a drawn line, then **calibrate** it.



3.6. **Measure the { FECA }** (Fully Enclosed Covered Area) to the inside face of the external walls; and the **UCA** (Unenclosed Covered Area) to the patio. Measurement will default to Raster Mode because this is a Point drawing.



3.7. **Open** the **[Costing View]**. **Delete** the **[02 Elemental Units]** workbook.

3.8. **Select** the **[01 GFA Budget]** workbook. **Click [Recalculate Workbook]**.

Promoting JPEG to PDF

3.9. **Add** a **Building Revision**. Give it the name "**PDF**".

3.10. **Open** the **[Dimension View]**. **Promote the drawing**. Choose a new file for the revision and **select** the **{ House – PDF }** file.

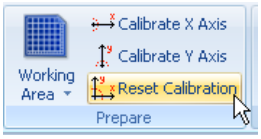
3.11. In the **[Drawing Properties]** box, change the drawing name to **[House – PDF]**.

> *Note that the calibrated scale has been retained from the previous version of the drawing and cannot be changed. This is because CostX® defaults to the same scale when promoting a drawing, and a calibration factor cannot be changed after dimensions have been measured.*

3.12. **Click [Update]** and then **select [FECA]** dimension group.

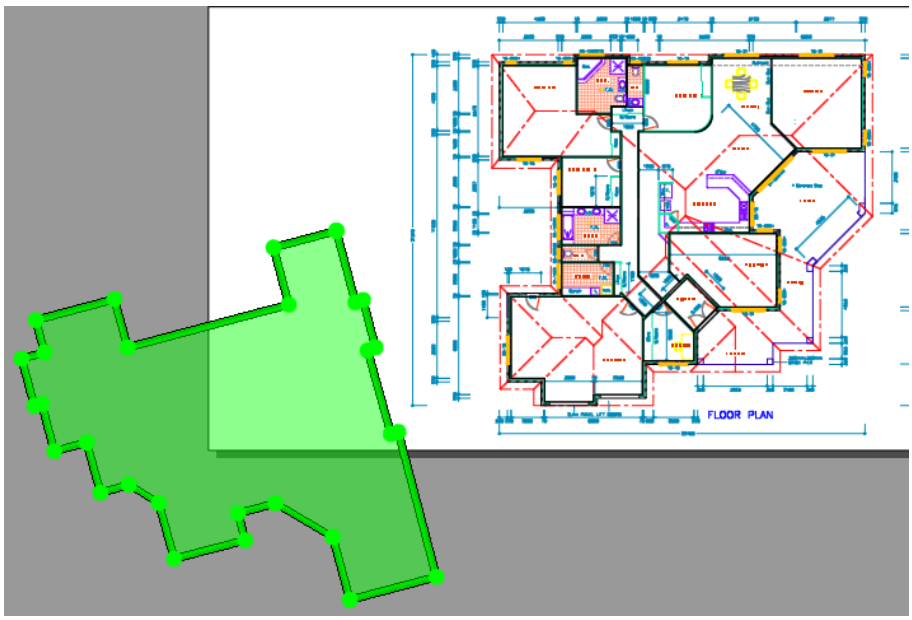
> *The dimensions measured from the JPEG drawing will be overlaid on the PDF, however zoom out the view and a scale mis-match will be apparent. This is because the calibration factor of 1:23.15 does not match the PDF scale which is 1:200.*

3.13. **Open** the **[Drawings]** tab and **click [Reset Calibration]** to clear the calibration factor.

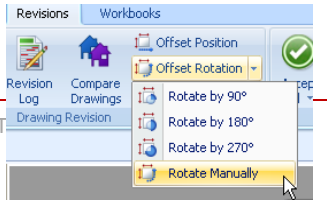


3.14. Then **double click** on the **drawing name** to open the Drawing Properties box. The scale will have been reset to 1:1. **Amend the scale to 1:200**.

> *The scales now match, however the dimension is mis-aligned to the new drawing. In order to relocate the dimension, the Offset Position and Offset Rotation tools can be used.*



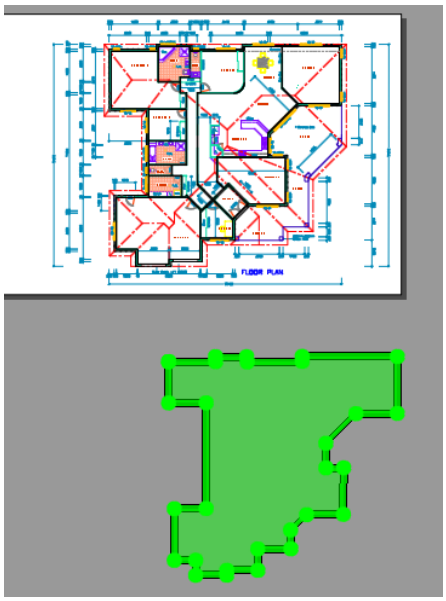
Rotating dimensions



3.15. In the **[Drawings Revision]** section of the **[Revisions]** tab, **left click [Rotate Manually]** from the Offset Rotation drop-down menu.

3.16. Then **left click** in the drawing view to open rotation mode. Gently **move the mouse from side to side**, and the dimension will rotate, centred around the drawing. **When the dimension rotation is aligned** to the drawing, **left click** to close rotation mode. This process can be repeated to make fine adjustments.

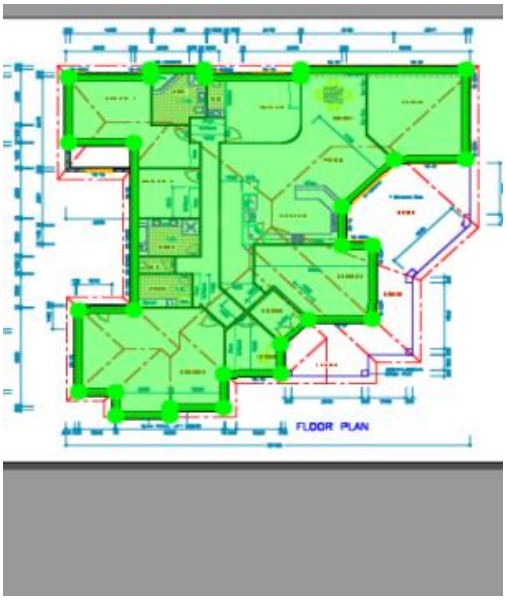
3.17. The rotated dimension is shown below.



Offsetting dimensions

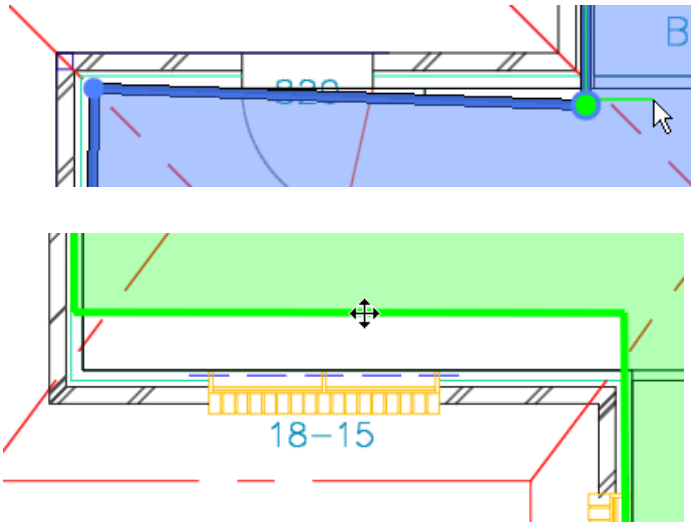
3.18. Now that the rotation has been aligned, the Offset Position tool can be used to place the dimension in its correct position on the drawing. **Left click** the **[Offset Position]** button to open Offset mode.

3.19. S**elect a point on the dimension**, usually a corner, which corresponds to a point on the drawing. **Left click** on the dimension point to grab the dimension, then **move the mouse** to drag the dimension to the drawing. Zoom in to make the placement more precise, note that the selected point snaps to points on the PDF drawings, this setting can be toggled using the Snap button in the dimensions ribbon. **Place the cursor on the destination point** on the drawing, and **left click** to drop the dimension. This process can be repeated to make fine adjustments.



3.20. Now the dimension can be "**cleaned up**". The dimension is

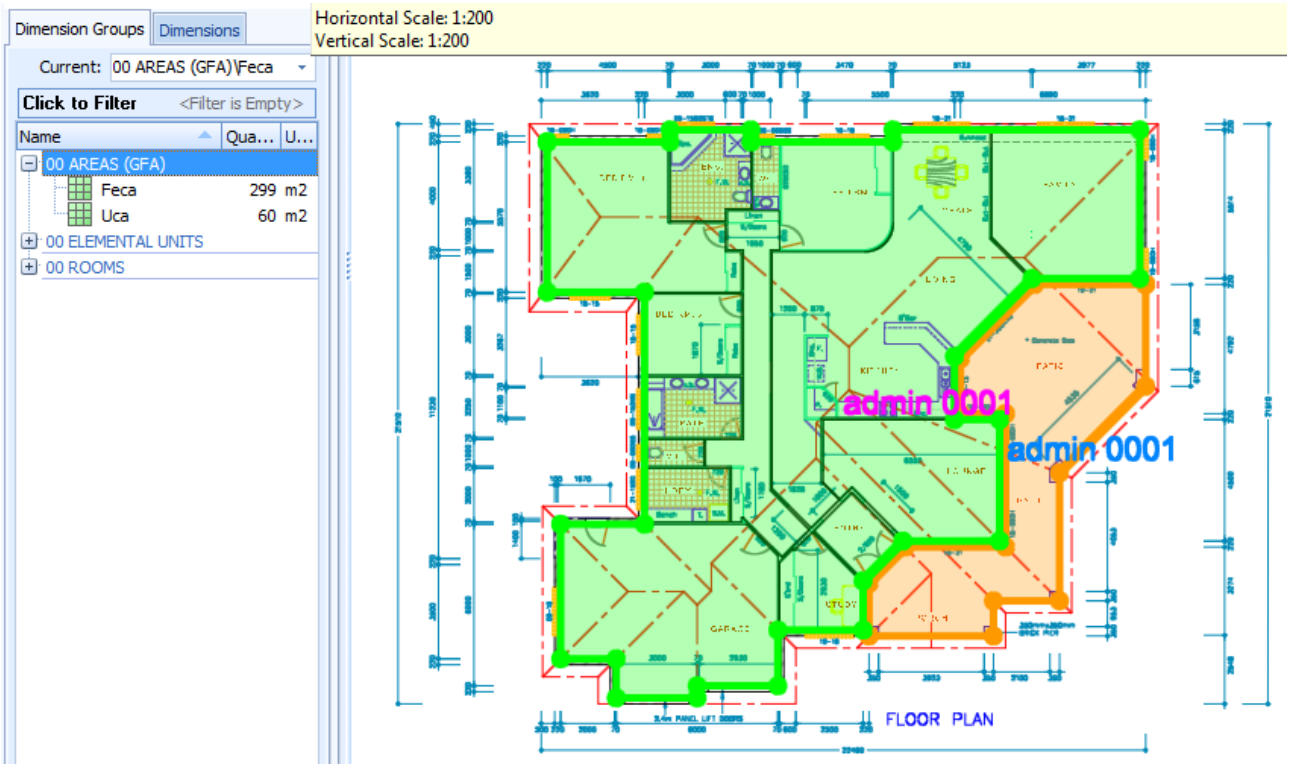
a Point dimension, however utilising the Snap Function in CostX® the dimension points can be connected to the Line points in the PDF.



3.21. When the adjustments are complete, **click [Accept All]** to revise the **FECA** dimension.

Offsetting done on any dimension (in this case the FECA dimension) is applied to all other dimensions. Therefore the offsetting will not need to be done again, and all other dimensions can be revised in the normal way.

3.22. **Select** the **{ UCA }** dimension group, revise the dimension as necessary using **click and drag**, and then **[Accept]**.



3.23. **Open** the **[Costing View]** and **promote** the **Workbook { 01 GFA Budget }**. **[Generate]** and **[Preview]** a **{ Comparison Report }**.

Comparison Report

Project: Training-Revision **Details:** 01 GFA Budget
Building: Revision 2 - SL

Code	Description	Unit	Quantity	Previous Quantity	Variance Quantity	Total	Previous Total	Variance Total
SB	Substructure	m2	361	354	7	29,682	29,117	565
CL	Columns	m2	361	354	7	7,015	6,881	134
UF	Upper Floors	m2	361	354	7	0	0	0
SC	Staircase	m2	361	354	7	0	0	0
RF	Roof	m2	361	354	7	73,682	72,278	1,404
EW	External Walls	m2	361	354	7	39,571	38,817	754
WW	Windows	m2	361	354	7	21,584	21,173	411
ED	External Doors	m2	361	354	7	7,195	7,058	137
NW	Internal Walls	m2	361	354	7	26,980	26,466	514
NS	Internal Screens & Borrowed Lights	m2	361	354	7	1,439	1,412	27
ND	Internal Doors	m2	361	354	7	12,591	12,351	240
WF	Wall Finishes	m2	361	354	7	17,987	17,644	343
FF	Floor Finishes	m2	361	354	7	32,376	31,760	617
CF	Ceiling Finishes	m2	361	354	7	28,779	28,231	548
FT	Fitments	m2	361	354	7	14,390	14,115	274
SE	Special Equipment	m2	361	354	7	1,079	1,059	21
PD	Sanitary Fixtures, Plumbing & Gas	m2	361	354	7	25,182	24,702	480
AC	Air Conditioning	m2	361	354	7	35,974	35,289	685
FP	Fire Protection	m2	361	354	7	5,396	5,293	103
LP	Electric Light, Power & Communications	m2	361	354	7	39,690	38,934	756
TS	Transportation Systems	m2	361	354	7	0	0	0
SS	Special Services	m2	361	354	7	12,591	12,351	240
	Element Sub-Total					**433,182.74**	**424,930.95**	**8,251.78**
PR	Preliminaries	%	9.00	9.00	0.00	38,986	38,244	743
YY	Contingency Provisions	%	2.50	2.50	0.00	10,830	10,623	206
BM	Builders Margin	%	6.00	6.00	0.00	25,991	25,496	495
ET	Escalation To Tender	%	4.00	4.00	0.00	17,327	16,997	330
	Building Total					**526,317**	**516,291**	**10,026**
	Professional Fees	%	6.00	6.00	0.00	31,579	30,977	602
	Fees - Other	%	2.00	2.00	0.00	10,526	10,326	201
	Construction Total					**568,422**	**557,594**	**10,828**

3.24. **Close** the **[Preview]** and **Close** the **Reports** window.

Revision from PDF to DWG drawing

3.25. **Open** the **Dimension View**. **Select** the **FECA** dimension group, and **clear the dimensions**. Then **clear** the dimensions in the **UCA** dimension group.

3.26. In the **[Dimensions]** ribbon, **click** the **[Line Mode]** button to switch from Point Mode to Line Mode.

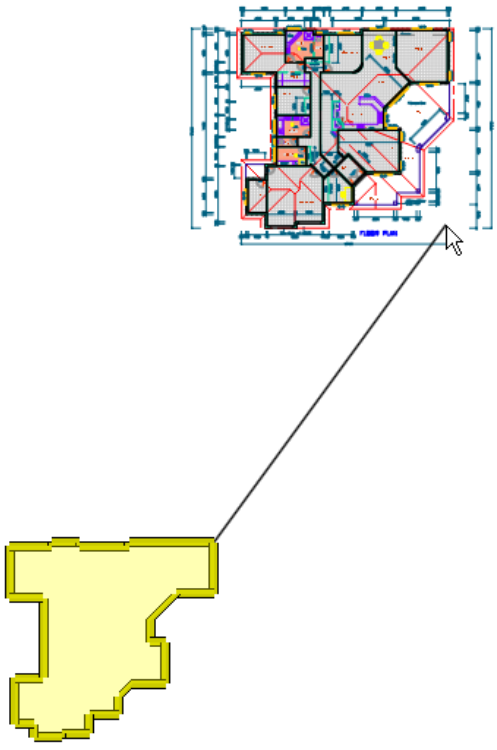
3.27. **Re-measure** the **FECA** and **UCA** in Line Mode. (Note – the PDF drawing has layers – if desired, adjust the layers to simplify the measurement).

3.28. **Open [Costing View]** and **recalculate** the workbook.

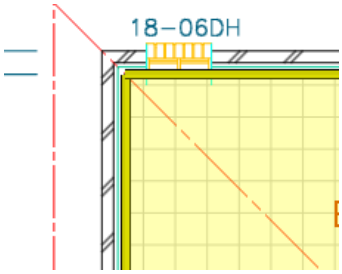
3.29. **[Add]** a **Building Revision**. Give it the name "**DWG**".

3.30. **Open** the **[Dimension View]**. **Promote** the **drawing**. **Choose a new file** for the revision and **select** the **{ House – DWG }** file. In the **[Drawing Properties]** box, **change** the drawing name to **{ House – DWG }**. Note that the scale of 1:200 has been retained from the PDF version of the drawing – **change** the **scale to 1:1** which is the DWG scale**. Click [Update.]**

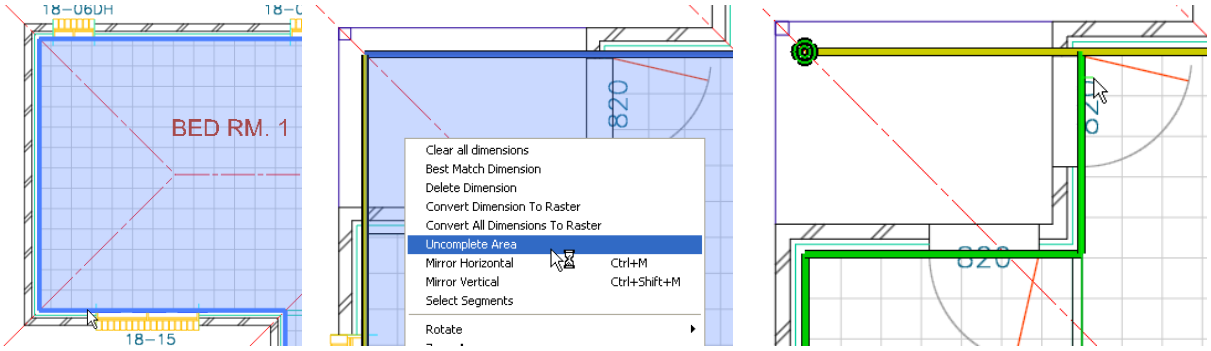
3.31. **Select [FECA]** dimension group. The drawing will open but the dimension may not be visible as it may be off-screen. **Press and hold the space bar** which will show a line from the cursor to the dimension. Zoom out and the dimension should become visible.



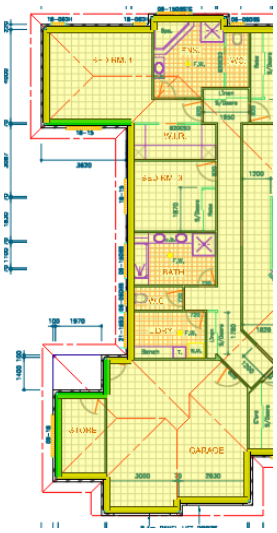
3.32. In this case, the Offset Rotation is not required. Therefore, **click** the **[Offset Position]** button, **click** on a corner point of the dimension, **drag it to the drawing**, **zoom in**, and **accurately place** the corner point on the corresponding corner point of the drawing.



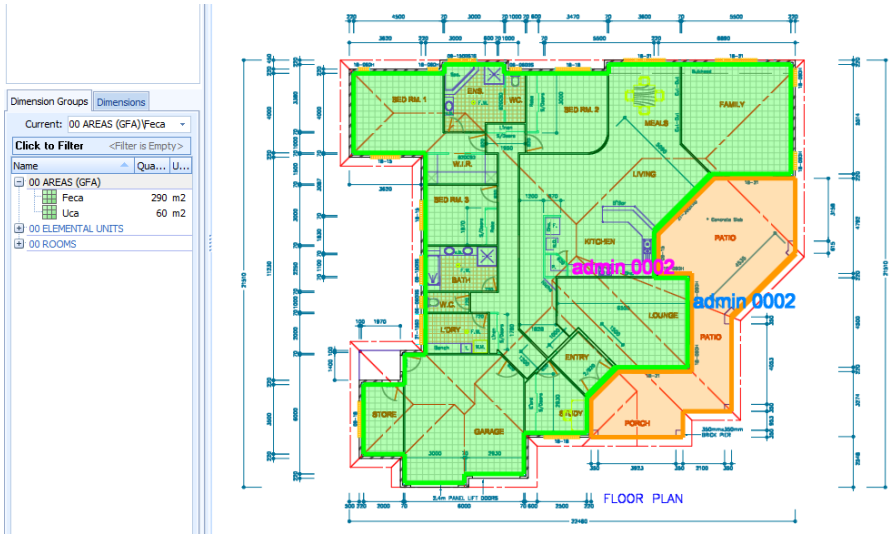
3.33. **Ensure that Line Mode is switched on** (i.e. shows orange background). **Click and drop to revise the segment** where Bedroom 1 has changed, and use **[Uncomplete Area] to revise the segments** where the **garage store** has changed.



The remaining yellow segments may be individually revised, or collectively revised by clicking "Best Match All". If Best Match All has been used, check the revisions to verify that the match is correct for all segments. Then click Accept All.



3.34. **Select** the **{ UCA }** dimension group, **click [Best Match All]**, verify the matches and **[Accept All]**.



3.35. **Open** the **[Costing View]** and **Promote** the **Workbook. [Generate]** and **[Preview]** a **{ Comparison Report }.**

Comparison Report

Project: Training-Revision **Details:** 01 GFA Budget
Building: Revision 2 - SL

Code	Description	Unit	Quantity	Previous Quantity	Variance Quantity	Total	Previous Total	Variance Total
SB	Substructure	m2	351	360	-9	28,895	29,615	-719
CL	Columns	m2	351	360	-9	6,829	6,999	-170
UF	Upper Floors	m2	351	360	-9	0	0	0
SC	Staircase	m2	351	360	-9	0	0	0
RF	Roof	m2	351	360	-9	71,728	73,514	-1,786
EW	External Walls	m2	351	360	-9	38,522	39,481	-959
WW	Windows	m2	351	360	-9	21,012	21,535	-523
ED	External Doors	m2	351	360	-9	7,004	7,178	-174
NW	Internal Walls	m2	351	360	-9	26,265	26,919	-654
NS	Internal Screens & Borrowed Lights	m2	351	360	-9	1,401	1,436	-35
ND	Internal Doors	m2	351	360	-9	12,257	12,562	-305
WF	Wall Finishes	m2	351	360	-9	17,510	17,946	-436
FF	Floor Finishes	m2	351	360	-9	31,518	32,303	-785
CF	Ceiling Finishes	m2	351	360	-9	28,016	28,714	-698
FT	Fitments	m2	351	360	-9	14,008	14,357	-349
SE	Special Equipment	m2	351	360	-9	1,051	1,077	-26
PD	Sanitary Fixtures, Plumbing & Gas	m2	351	360	-9	24,514	25,124	-610
AC	Air Conditioning	m2	351	360	-9	35,020	35,892	-872
FP	Fire Protection	m2	351	360	-9	5,253	5,384	-131
LP	Electric Light, Power & Communications	m2	351	360	-9	38,638	39,600	-962
TS	Transportation Systems	m2	351	360	-9	0	0	0
SS	Special Services	m2	351	360	-9	12,257	12,562	-305
	Element Sub-Total					**421,698.83**	**432,198.56**	**-10,499.73**
PR	Preliminaries	%	9.00	9.00	0.00	37,953	38,898	-945
YY	Contingency Provisions	%	2.50	2.50	0.00	10,542	10,805	-262
BM	Builders Margin	%	6.00	6.00	0.00	25,302	25,932	-630
ET	Escalation To Tender	%	4.00	4.00	0.00	16,868	17,288	-420
	Building Total					**512,364**	**525,121**	**-12,757**
	Professional Fees	%	6.00	6.00	0.00	30,742	31,507	-765
	Fees - Other	%	2.00	2.00	0.00	10,247	10,502	-255
	Construction Total					**553,353**	**567,131**	**-13,778**

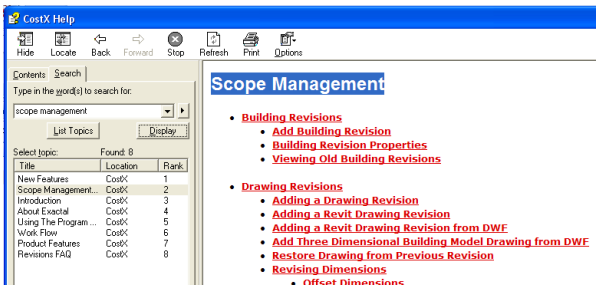
3.36. **Close** the **[Print Preview]** and **Close** the **[Reports]** window.

3.37. Use the drop down menu in the **Building Revision** section of the **[Revisions]** tab to review all three revisions of the House, containing a JPEG, PDF and DWG file respectively.

Disclaimer

This dataset is an example only, to be used solely for the purpose of the training exercise. It is not to be used as a template for business operations. Exactal and its employees accept no liability for use of this dataset for business purposes.

Appendix – Revisions FAQs



Refer to Section 9 of the CostX® Advanced manual for more detail on Revisions. Also refer to the Help files topics relating to Scope Management.

When should a building revision number be incremented?

A building revision should be incremented when a new set of drawings are received and dimensions measured from the previous issue need to be adjusted, or when the status of a building at a particular point needs to be maintained for future reference.

Why is the Add building revision button disabled?

Incrementing the building revision number is only possible if the current building revision contains some data such as a drawing revision or workbook revision.

What name should I give the building revision?

The name is optional and should be descriptive so that the revision can be easily identified at a later date. Some examples of building revision naming schemes are.

- Use the project stage or phase names.
- Use the time and date of the revision (this data is also stored with the building revision).
- Use the drawing revision codes as devised by the architect.
- Use names referring to the level of detail in the workbooks (eg, initial budget, elemental cost plan etc.).

Why can't I promote a new drawing revision?

It is only possible to promote a new drawing revision if the drawing does not already have a drawing revision for the current building revision. The **Promote** button is disabled if a drawing revision already exists for the current building revision. In other words, if the drawing was either added in the current building revision, or promoted to the current building revision, you will need to increment the building revision before another drawing revision can be added.

Why can't I change the Base UOM of a building?

Since the Base UOM applies to all revisions of a building, it is disabled after the building revision is incremented. This prevents it being changed and therefore prevents the dimension group totals from earlier revisions from being changed accidentally.

How can I view a previous building revision?

Review the Help topic Viewing Old Building Revisions.

What if the new set of drawings has an extra drawing?

Once the new set of drawings has arrived, the building revision should be incremented to preserve the existing state and allow it to be referred to again later if required. A new drawing may be added to any revision at any time without affecting previous revisions. Simply add the new drawing. For more details, review the Help topic Adding Drawings

What if the new set of drawings arrived and one of the drawings in CostX® is no longer needed?

Once the new set of drawings has arrived, the building revision should be incremented to preserve the existing status and allow it to be referred to again later if required. A drawing may then be removed from the drawings list without affecting previous revisions. Simply delete the unwanted drawing .For more details, review the Help topic Removing Drawings.

What if the filename has changed between drawing revisions?

The drawing filename can change between revisions without any problems in CostX®. Simply select the new filename when adding the new drawing revision. Of course, the drawing name remains the same but when the mouse is moved over the drawing name in the Drawings List Window the hint displays the new drawing filename.

What if the scale has changed between drawing revisions?

The drawing scale can change between revisions without any problems in CostX®. Simply enter the new scale when adding the new drawing revision. Previous revisions are kept in the old scale to maintain the correct dimensions.

What if the number of floors a drawing represents has changed between drawing revisions?

The number of floors a drawing represents can change between revisions without any problems in CostX®. Simply enter the new number of floors the drawing represents when adding the new drawing revision. Previous revisions maintain the old number of floors the drawing represented and therefore maintain the correct dimensions.

How can I tell whether a drawing revision is current in the current building revision?

The reason this is important is that at the point a building revision is incremented, all existing workbooks and drawings are locked as read-only which prevents any further editing. All existing drawings and workbooks are from the previous building revision or earlier. In order to edit or take dimensions, the drawing revision must be at the current building revision.

There are several ways to tell if a drawing revision is at the current building revision:

1. Move the mouse over the drawing in the Drawings List Window and the hint displays the revision number of the drawing. If this number is lower than the current building revision, then the drawing is not at the current building revision and must be promoted before dimensions can be extracted or its properties edited.

2. Select the drawing in the Drawings List Window and display the **Drawings** Ribbon Toolbar. If the **Promote** button is enabled, the drawing is not at the current building revision and must be promoted before dimensions can be extracted or its properties edited.

Can I make changes to an earlier drawing or workbook revision?

Yes, but it is not recommended. Revisions in CostX® enable scope management, and the integrity of the audit trail is compromised if earlier revisions are modified. Note also that if no later revisions of workbooks or drawings exist, some modifications to workbooks or drawings are propagated forward through later building revisions depending on the nature of the change. For example, if a drawing is at revision 2 and the most recent building revision is 4, and the drawing is edited in revision 2, the changes will be applied to revision 3 and revision 4 of the building.

To make changes to a drawing or workbook from a previous building revision, select the corresponding building revision from the Building Revision Drop Down Selection List. The old building revision is displayed in a locked mode. To make changes to any drawings, or workbooks in the previous building revision, unlock the building revision from the Building Revision Properties.

How do I lock a workbook from being changed?

When a new building revision is added, the previous building revision is locked, preventing the workbooks and their sheets and totals from changing. To manually lock a workbook, review the Help topic Locking and Unlocking Workbooks.

What if the drawings have been offset between revisions?

CostX® handles this by providing the option to offset the dimensions and therefore line up unrevised dimensions with the promoted drawing. More details can be found in the topic Offset Dimensions. Overlay Comparisons can also be offset to line up if required.

How can I tell if there are dimensions on a drawing have not been revised?

Drawings that have dimensions needing revising are indicated with an icon. Additionally if you move the mouse over the drawing title you will see the message **Has dimensions that need to be revised** in the displayed hint.

What should I do if I get a message 'The revision contains drawings with unrevised dimensions. Do you still want to add a new revision?'?

It is recommended that you click the **No** button. Next, look at the list of drawings and find which drawings have the icon displayed against them. These drawings have not been completely revised. Finish revising the dimensions before adding the new building revision.

Note that if you click the **Yes** button at the prompt, and the new building revision is added without all the dimensions being revised, those dimensions are effectively removed from the new building revision and will no longer be available to revise. To avoid this, ensure all dimensions are revised before creating a new building revision.

costX 4.1

ADVANCED TRAINING EXERCISE

Subcontractor Comparison

ASSOCIATED DATASET

Sample Building File

Subcontractor.exf

Manual

CostX® Introductory Manual

exactal precision estimating

The costX Family of Products

CostX®

CostX® is Exactal's premium product. More companies are using CostX® for their complete estimating solution and receiving strong returns on their investment. CostX® is a powerful project costing tool that enables estimators to use the most advanced on-screen measurement system while embracing BIM to deliver better results to clients. It can reduce take off time by up to 80%.

CostX® 2D

CostX® 2D does not support 3D/BIM drawings or allow for auto-revisioning, but still contains Exactal's world-leading on-screen 2D takeoff and integrated workbook. If your company does not receive 3D/BIM drawings but still wants to take advantage of the faster, smarter and more accurate estimating solution on the market, CostX® 2D is the best choice for you.

CostX® Takeoff 2D

CostX® Takeoff 2D is Exactal's most basic product but still allows you to use the world-leading on-screen 2D takeoff, meaning you can measure areas, lengths and counts in a few clicks. If you have only used manual measurement and Excel® before and want to start off with something simple, CostX® Takeoff 2D may be the best choice for you.

FEATURES	CostX®	CostX® 2D	CostX® Takeoff 2D
BIM models/3D drawings	•		
2D drawings (incl PDFs)	•	•	•
Auto Revisioning	•		
Workbooks	•	•	
Subcontractor Comparison	•	•	

CostXL

CostXL allows you to link CostX® data directly into your Excel® spreadsheets

CostX® Live

CostX® Live gives you access to live CostX® data on the go through the web.

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Content

Formatting Conventions Used

Following are the formatting conventions used throughout this training exercise.

Bold Font	Direction for User
[Bold Font]	Anything fixed in CostX® for example button name, right click options, field names, etc.
{ Bold Font }	Anything which a user can change, for example drawing name, dimension group name, model map name, workbook name.
"**Bold Font**"	Anything a user has to enter, for example building name, workbook name, dimension group name.

Module 1: Subcontractor Comparison System in CostX®

The Subcontractor Comparison System in CostX® consists of two main parts: a pre-formatted Subcontractor Comparison Workbook; and a suite of default Subcontractor comparison report templates. The report templates are included in the CostX® installation.

Throughout this document you will see **(PFC 7-1)** references. These identify the relevant Process Flow Charts related to that particular section of the training, copies of which can be found on the www.exactal.com website.

Comparison Training Set Up

1.1. **Open [System Administration]** which can be accessed via the main menu.

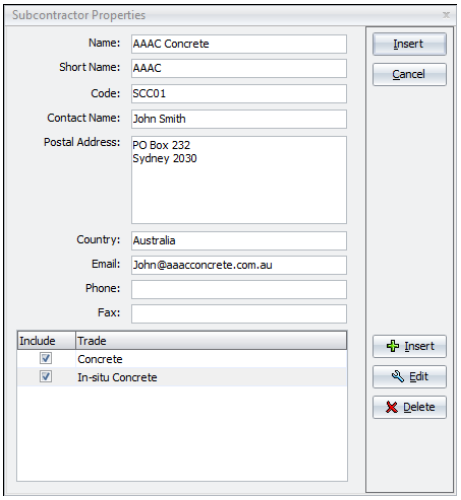
1.2. **Insert a project** named "**Training-Comparison-**" followed by your name or initials, **set to { Default Location }**.

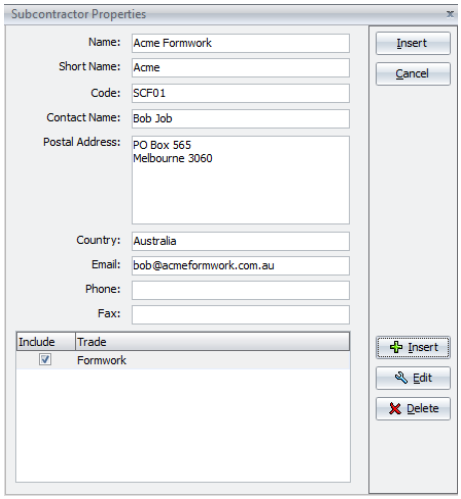
1.3. Whilst still in System Administration, **open** the **[Costing]** tab and then **click** on the **[Subcontractors]** button. A new subcontractor can be added by clicking Insert. All subcontractors that are added here need to have their specific trade nominated.

> *The subcontractor list is displayed (empty initially). A subcontractor library with contact details may be created in Subcontractors, and all listed subcontractors will then be available for selection within the Subcontractor comparison workbook for their trade without having to type them in each time. (Note - subcontractors who are not listed in the library can still be added into a comparison workbook for specific projects.)*

1.4. For the purpose of this exercise, **add four sample subcontractors – two for Concrete**, and **two for Formwork**, similar to the following examples. Make sure the "Include" box is ticked.

1.5. **Close [System Administration]**.





1.6. **Open** the **[Main Menu]** and **select [Import CostX Data]**. **Import** the building '**Subcontractor.exf**' and attach it to the **{ Training-Comparison-Your Name }** project.

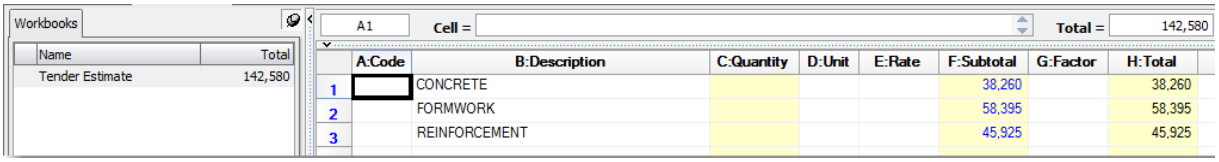
1.7. **Create a new building** and give it a **name** (e.g. for training purposes **your first name** or surname or some other unique identifying reference, **followed by "Comparison 1"**) and **attach it** to the **{ Training-Comparisons-Your Name }** project. **Do not click Insert yet**.

1.8. In the **[Based On]** section of the **[Building Properties]** window, use the drop-down menus to **select** the **[Training-Comparison-Your Name]** Project, and the **[Subcontractor]** Building to copy from. **Ensure** that the **Use Workbooks check box is ticked** (and all the others are **not** ticked), **then click [Insert]**. A new Building, based on the imported template, will open.

1.9. **Click** on the **[Costing View]** tab and the building will contain a priced Workbook called Tender Estimate. This Workbook will form the basis of the Comparison exercise.

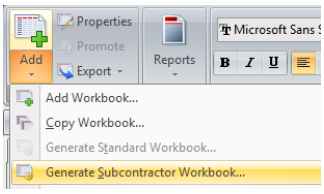
Subcontractor Comparison Workbooks (PFC 7-1)

1.10. **Open** the **[Tender Estimate]** workbook.

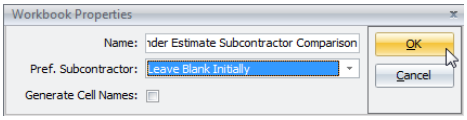


1.11. **Click** on the **[Workbooks]** tab to open the Workbooks ribbon.

1.12. **Generate a subcontractor comparison workbook** by selecting the **[Generate Subcontractor Workbook]** option from the **[Add]** workbook drop down menu.

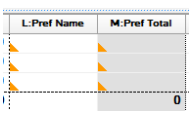


A Workbook Properties box will open with a naming option for the new workbook which adds the words "Subcontractor Comparison" to the name of the source workbook. This name can be left as is or amended at this point, but cannot be the same as the source workbook. Further there is the option to choose the Preferred Subcontractor Setting, here you can choose to:



Leave Blank Initially (Default) – this option will leave the preferred subcontractor column empty until the user defines it

Prefill Preferred From Estimate – this option fills the preferred subcontractor column with the estimate amount



1.13. **Leave** the workbook name "**Tender Estimate Subcontractor Comparison**" as it is.

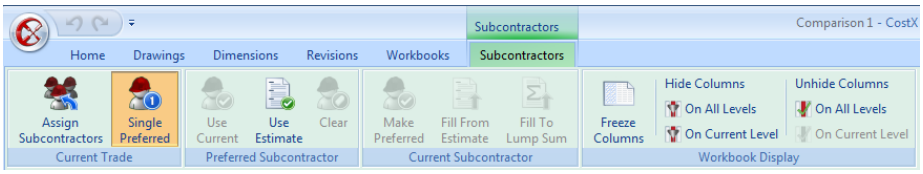
Generate Cell Names option will automatically generate named cells for key data (not used in this exercise – refer to sections 12.4 and 16 of the Advanced CostX® Techniques manual for more detail on named Cells).

L:Pref Name	M:Pref Total
Estimate	38,260
Estimate	58,395
Estimate	45,925
	142,580

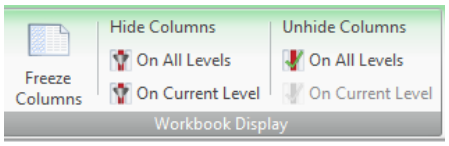
1.14. **Leave** the **Generate Cell** option **un-checked** and **select [OK]**, a new Subcontractor Comparison workbook is generated and a Subcontractors ribbon will open.

Note that Column L: Pref Name and M: Pref Total is blank. Alternatively if the option Prefill Prefered From Estimate option was selected previously, these columns would have been prefilled with the current estimate total.

1.15. **Click** on the **[Subcontractors]** tab if the Subcontractors ribbon is not open.



The Subcontractor workbook contains features such as fixed columns for lowest and preferred subcontractors, read only cells, automatic formulas, subcontractor selection, empty price flags, columns formatting, and Subcontractor headings, amongst other things.



To ease navigation within the workbook, single or multiple columns can be hidden by use of the buttons in the Workbook Display section of the ribbon, or with right click menu options.

All subcontractors in the library that have the "Include" box ticked against trades that exist in the workbook are automatically pre-filled in the workbook against those trades.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Contingency	J:Escalation	K:BWIC	L:Pref Name	M:Pref Total	N:Low Name	O:Low Total	P:SC1 Name	Q:SC1 Total	R:SC2 Name	S:SC2 Total
1		CONCRETE				39,157		39,157	0	0	0					AAA Concrete	0.00	BBBC Concrete	0.00
2		FORMWORK				58,395		58,395	0	0	0					Acme Formwork	0.00	Easy Formwork	0.00
3		REINFORCEMENT				45,925		45,925	0	0	0								
4		**SUBTOTAL**				**143,477.00**		**143,477.00**	**0**	**0**	**0**		**0**						
5		CONTINGENCY										CONTINGENCY	0			CONTINGENC	0.00		
6		ESCALATION										ESCALATION	0			ESCALATION	0.00		
7		BWIC										BWIC	0			BWIC	0.00		
8																			
9						143,477		143,477	0	0	0		0		0				

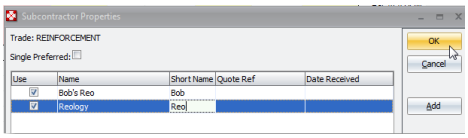
Note that the subcontractors previously added for Concrete and Formwork have been automatically added to the Concrete and Formwork trades (in columns P and R).

Assigning subcontractors

1.16. **To specify subcontractors** for the Reinforcement trade, **click on a cell in the Reinforcement row** to select the Reinforcement trade (e.g. cell A3), then **click** the **[Assign Subcontractors]** button in the Current Trade section of the ribbon, or right click and select the option 'Assign Subcontractors". **(PFC 7-2)**

> *In either case, the library set up in system administration for this trade will appear. If no subcontractors are shown, i.e. the box is empty, this is because none have been set up, or the nominated trades for the subcontractors in the library do not match the selected trade in the workbook. New subcontractors can be added by re-opening system admin, or they can be added here by clicking on the Add button but will only be specific to this job.*

1.17. **Add two sample Reinforcement subcontractors**.



> *Each needs a full name and a short name. A quote reference and date received can also be added.*

1.18. The "Single Preferred" box means that only one subcontractor per trade can be selected as preferred. **Untick** the **[Single Preferred]** box to allow multiple subcontractor selections for this trade. **(PFC 7-3)**

1.19. **Click [OK]** and the new subcontractors are auto filled into the appropriate cells in the workbook.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Contingency	J:Escalation	K:BWIC	L:Pref Name	M:Pref Total	N:Low Name	O:Low Total	P:SC1 Name	Q:SC1 Total	R:SC2 Name	S:SC2 Total
1		CONCRETE				39,157		39,157	0	0	0					AAA Concrete	0.00	BBBC Concrete	0.00
2		FORMWORK				58,395		58,395	0	0	0					Acme Formwork	0.00	Easy Formwork	0.00
3		REINFORCEMENT				45,925		45,925	0	0	0					Bob's Reo	0.00	Reology	0.00
4		**SUBTOTAL**				**143,477.00**		**143,477.00**	**0**	**0**	**0**		**0**						
5		CONTINGENCY										CONTINGENCY	0			CONTINGENC	0.00		
6		ESCALATION										ESCALATION	0			ESCALATION	0.00		
7		BWIC										BWIC	0			BWIC	0.00		
8																			
9						143,477		143,477	0	0	0		0		0				

> *When you drill down to level 2 the column headings in each trade show the subcontractor's short name in columns P and R as shown below.*

		REINFORCEMENT				45,925		45,925										
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Contingency	J:Escalation	K:BWIC	L:Pref Name	M:Pref Total	N:Low Name	O:Low Total	P:Bob Rate	Q:Bob Total
1		**WORK TO NEW BUILDINGS**															
2		**STRUCTURAL GRADE DEFORMED BAR REINFORCEMENT**															
3		Quantities of bar reinforcement only include for laps shown on the drawings															
4		Level 1															
5		N12 bar as cast-in rods in pad footing; gazebo -[16 No]	0.02	t	3,500.00	70		70									
6		N20-N36 bar in ground beam	1.53	t	3,500.00	5,355		5,355									
7		N20-N36 bar in ground slab	0.41	t	3,500.00	1,435		1,435									
8		N20-N36 bar in ground beam; secure garage	0.53	t	3,500.00	1,855		1,855									
9		Level 2															

1.20. **Go back up to level 1** if you are at level 2.

1.21. **Click** on a cell in the **Formwork row** to select the Formwork trade, and **check** that the **[Single Preferred]** button is highlighted in orange (or click the Assign Subcontractors button and check that the Single Preferred box is **ticked.)**

This means that only one subcontractor can be selected as preferred for this trade.

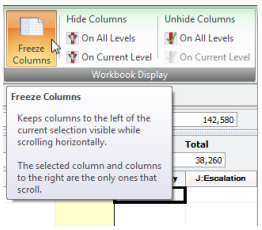
1.22. **Do** the **same** for the **Concrete trade**. Then **drill down to level 2** of the Concrete trade.

Note that if you wish to insert a quote reference and date received for prices received from subcontractors for these trades, whilst at Level 1 click the Assign Subcontractors button to open the Subcontractor Properties dialogue box for each trade and insert the details. If the subcontractor later submits a revised quote, these details can be over-written. If you wish to remove a subcontractor from the comparison, un-tick the Use box against their name in the Subcontractor Properties box.

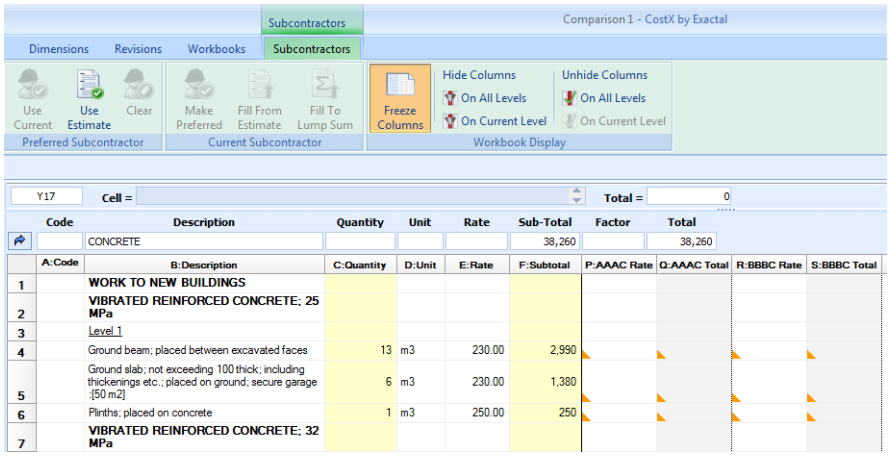
Hiding and freezing columns

1.23. **Click** on **cell G1** and **drag the mouse to** also select **cell H1**. Then **hide columns** G and H on both levels 1 and 2 by clicking the **[On All Levels]** button. **(PFC 7-9)**

1.24. Whilst still on level 2 of the Concrete trade, **click on cell I1** to select column I (Contingency). Then **click** the **[Freeze Columns]** button which will freeze the view pane on column F (Subtotal).



1.25. Then **use the horizontal scroll bar** or tab to the right to **display the subcontractor columns** next to the subtotal column (column P next to column F) as shown below.



Prices will now be entered for each of the subcontractors in their respective columns. Rates and text can be copied and pasted into multiple cells. Type prices into the Rate column (white one) and the Total column is filled out automatically by multiplying with the quantity column. (Note – if you type directly into the total column, the rate is automatically calculated and filled in). Each cell that needs to have data entered is tagged with a small

orange corner tag, which disappears when the data is entered. Remaining tags indicate cells that still need to have data entered.

Entering subcontractor prices

1.26. **Enter the following prices** (this would normally be the prices received from the subcontractor):

First Subcontractor;

$10 lower than the estimate for each of the concrete items;
$10 higher for the dowel joints and $2 higher for the sawn joints respectively;
All the integral finishes marked as “Excl”.

Second Subcontractor;

$10 higher than the estimate for each of the concrete items;
$10 lower for the dowel joints and $2 lower for the sawn joints respectively;
All the integral finishes marked as “Incl”.

The finished pricing should appear as below;

1. Estimate total $ 38,260
2. First subcontractor $ 34,840
3. Second subcontractor $ 36,780

1.27. **Scroll to** the left to expose the “**Pref” (Preferred) and “Low” (lowest) columns**. The Low columns (N & O) have automatically been filled in with data.

B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	L:Pref Name	M:Pref Total	N:Low Name	O:Low Total	P:AAAC Rate	Q:AAAC Total	R:BBBC Rate	S:BBBC Total
Floor slab; 200 - 300 thick; placed on formwork :[25 m2]	6	m3	250.00	1,500			AAA Concrete	1,440	240.00	1,440	260.00	1,560
Attached beam; placed into formwork	18	m3	250.00	4,500			AAA Concrete	4,320	240.00	4,320	260.00	4,680
All levels												
Isolated columns; including copper slag aggregate particles; placed into formwork	14	m3	300.00	4,200			AAA Concrete	4,060	290.00	4,060	310.00	4,340
Stairs including landings, placed into formwork	4	m3	270.00	1,080			AAA Concrete	1,040	260.00	1,040	280.00	1,120
EXPANSION AND SIMILAR JOINTS												
Expansion joints and similar; including any necessary preparation, formwork and accessories												
Dowel joint in slab 0 - 100 thick including: R16 galvanised dowels 300 long at 300 centres with end cap; 10 thick Abeflex joint filler and 10 x 10 polyurethane sealant; Type DJ, as detailed on drawing S01.01	14	m	60.00	840			AAA Concrete	980	70.00	980	50.00	700
Dowel joint in slab 0 - 100 thick including: R16 galvanised dowels 300 long at 300 centres with end cap; 10 thick Abeflex joint filler and 10 x 10 polyurethane sealant; Type DEJ, as detailed on drawing S01.01	5	m	60.00	300			AAA Concrete	350	70.00	350	50.00	250
Sawn joints												
Sawn contraction joint in concrete slab including polyurethane sealant; Type SJ, as detailed on drawing S01.01	36	m	12.00	432			AAA Concrete	504	14.00	504	10.00	360
Joint smoothly at junction of new and existing walkway and/or pavement; including isolation barrier, saw cutting existing surface and making good, etc	49	m	12.00	588			AAA Concrete	686	14.00	686	10.00	490
INTEGRAL FINISHES												
Steel trowelled integral finish												
Finish to ground slab	81	m2	6.00	486					Excl	Excl	Incl	Incl
Finish to ground slab; secure garage	50	m2	1.00	50					Excl	Excl	Incl	Incl
Finish to ground slab; refuse enclosure	15	m2	6.00	90					Excl	Excl	Incl	Incl
Finish to floor slab	304	m2	6.00	1,824					Excl	Excl	Incl	Incl
				38,260		**0**		**34,840**		**34,840**		**36,780**

The Single Preferred option was ticked for this trade, which means that only one subcontractor can be selected as Preferred. Hence the Low column is showing the first subcontractor for all items because that subcontractor is lowest overall, even though some of the rates are higher.

1.28. To demonstrate this principle, **go up to level 1** of the Concrete trade, and **click** the **[Single Preferred]** button to switch it off. **Drill back down to level 2** and note that the Low column is now showing the lowest price for each item and a lowest total of $ 34,120.

1.29. However in this instance we wish to retain Single Preferred status, so **go back up to level 1**, **re-select [Single Preferred]**, then **return to level 2**.

> *Once a price has been entered, you can select the subcontractor for that item as "preferred" (regardless of whether the price is the lowest), in order to arrive at a tender price. However, before selecting a preferred subcontractor, adjustments may need to be made to the pricing to ensure that the comparison is on a "like for like" basis. In this case, the estimate pricing will be used to price the items excluded from the first subcontractors tender.*

Fill from estimate

1.30. **Click** and **drag to select all four "Excl" cells** (cells P27 to P30). Then **click** the **[Fill From Estimate]** button in the Current Subcontractor section of the ribbon, or use the right click menu "Fill From Estimate" option. The estimate rate will be inserted in the cells, with small blue marker tags to indicate use of an estimate rate.

> *The Low column changes because the second subcontractor is now the lowest overall.*

1.31. To select the second subcontractor as preferred, **click** on **a cell with their name** or total in it (a cell in column N, O, R or S) to select it, then **click** the **[Make Preferred]** button in the Current Subcontractor section of the ribbon, or the Use Current button in the Preferred Subcontractor section of the ribbon.

> *Note: these buttons are interchangeable, and you can also use the right click menu "Use This Subcontractor" option.* ***(PFC 7-7)***
>
> *The Pref columns (L,M) will be filled with the selected subcontractor's details for all estimate items, and their details in the subcontractor columns (R,S) will be underlined. Note that the Preferred selection can be cleared by use of the "Clear" button in the Preferred Subcontractor section of the ribbon, or use the right click menu "Clear Preference" option.* ***(PFC 7-8)***

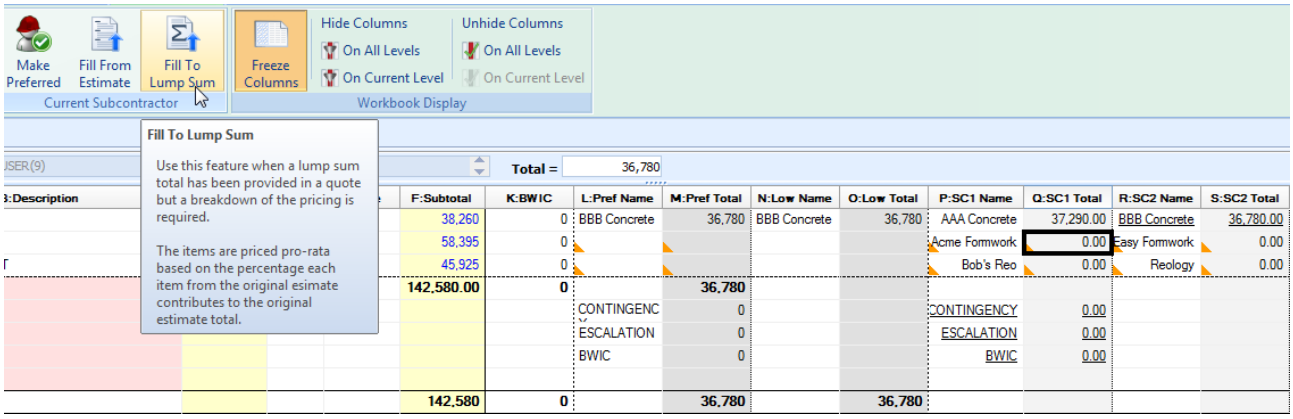
1.32. **Go back up to level 1**. The **preferred details** have been **carried to level 1**.

> *Note that because this is a Single Preferred trade, the selection of preferred could have been done at level 1 in the same way as it was done at level 2.*

Fill from lump sum

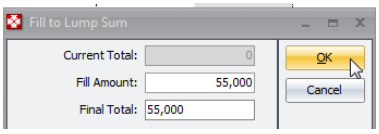
1.33. For the pricing of the **Formwork trade**, we will assume that the first subcontractor has submitted a lump sum price with no rate breakdown. In level 1 of the comparison workbook, **click** on the **total cell** for the first subcontractor (cell Q2) to select it. Then **click** on the **[Fill To Lump Sum]** button in

the **[Current Subcontractor]** section of the ribbon, or use the right click menu Fill to Lump Sum option. **(PFC 7-5)**



:Description	F:Subtotal	K:BWIC	L:Pref Name	M:Pref Total	N:Low Name	O:Low Total	P:SC1 Name	Q:SC1 Total	R:SC2 Name	S:SC2 Total
	38,260	0	BBB Concrete	36,780	BBB Concrete	36,780	AAA Concrete	37,290.00	BBB Concrete	36,780.00
	58,395	0					Acme Formwork	0.00	Easy Formwork	0.00
	45,925	0					Bob's Reo	0.00	Reology	0.00
	142,580.00	**0**		**36,780**						
			CONTINGENC	0			CONTINGENCY	0.00		
			ESCALATION	0			ESCALATION	0.00		
			BWIC	0			BWIC	0.00		
	142,580	**0**		**36,780**		**36,780**				

1.34. This box allows an amount to either be added to an existing Current total, or a Final Total entered. **Enter** a lump sum of **$55,000.00** in the **[Final Total]** box and **select [OK]**.



1.35. Then **drill down to level 2**, **Freeze column I**, and then verify that the lump sum figures have been spread over all the items pro-rata to the estimate pricing. The details are also shown in the Low column as this is the only pricing entered so far.

Edge of floor slab; not exceeding 250 wide	15	m	25.00	375	ACME Formwork	353	23.55	353		
Edge of floor slab; to form penetration; not exceeding 250 wide	6	m	25.00	150	ACME Formwork	141	23.55	141		
FORMWORK CLASS 2										
All levels										
Soffit of landing slab; including stutting not exceeding 3000 high	5	m2	120.00	600	ACME Formwork	565	113.02	565		
Soffit of stair flight; sloping	10	m2	120.00	1,200	ACME Formwork	1,130	113.02	1,130		
Side of isolated circular column 500 diameter	69	m	35.00	2,415	ACME Formwork	2,275	32.97	2,275		
Edge of landing; not exceeding 250 wide	7	m	35.00	245	ACME Formwork	231	32.97	231		
Face of riser; not exceeding 250 wide	33	m	35.00	1,155	ACME Formwork	1,088	32.97	1,088		
Edge of stringer including cutting to profile of treads and risers; not exceeding 250 wide	12	m	35.00	420	ACME Formwork	396	32.97	396		
Feature grooves 25 x 96 in circular column; as detail L on drawing S03.02	158	m	35.00	5,530	ACME Formwork	5,208	32.97	5,208		
Raking cutting	2	m	35.00	70	ACME Formwork	66	32.97	66		
				58,395		**55,000**		**55,000**		**0**

1.36. **Enter the following prices** for the second subcontractor; for Formwork Class 4 price each item $5 less than the estimate rates, and **enter "Excl" against** all the **Formwork Class 2** items.

B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	N:Low Name	O:Low Total	P:ACME Rate	Q:ACME Total	R:Fwel Rate	S:Fwel Total
WORK TO NEW BUILDINGS										
FORMWORK CLASS 4										
Level 1										
Edge of ground slab; not exceeding 250 wide	59	m	25.00	1,475	Formwell	1,180	23.55	1,389	20.00	1,180
Edge of ground slab	2	m2	80.00	160	Formwell	150	75.35	151	75.00	150
Level 2										
Soffit of floor slab; including strutting 3000 - 4000 high	258	m2	100.00	25,800	Formwell	24,510	94.19	24,300	95.00	24,510
Soffit of floor slab; exceeding 200 thick; including strutting 3000 - 4000 high	23	m2	100.00	2,300	Formwell	2,185	94.19	2,166	95.00	2,185
Sides and soffit of attached floor beam	165	m2	100.00	16,500	Formwell	15,675	94.19	15,541	95.00	15,675
Edge of floor slab; not exceeding 250 wide	15	m	25.00	375	Formwell	300	23.55	353	20.00	300
Edge of floor slab; to form penetration; not exceeding 250 wide	6	m	25.00	150	Formwell	120	23.55	141	20.00	120
FORMWORK CLASS 2										
All levels										
Soffit of landing slab; including stutting not exceeding 3000 high	5	m2	120.00	600			113.02	565	Excl	Excl
Soffit of stair flight; sloping	10	m2	120.00	1,200			113.02	1,130	Excl	Excl
Side of isolated circular column 500 diameter	69	m	35.00	2,415			32.97	2,275	Excl	Excl
Edge of landing; not exceeding 250 wide	7	m	35.00	245			32.97	231	Excl	Excl
Face of riser; not exceeding 250 wide	33	m	35.00	1,155			32.97	1,088	Excl	Excl
Edge of stringer including cutting to profile of treads and risers; not exceeding 250 wide	12	m	35.00	420			32.97	396	Excl	Excl
Feature grooves 25 x 96 in circular column; as detail L on drawing S03.02	158	m	35.00	5,530			32.97	5,208	Excl	Excl
Raking cutting	2	m	35.00	70			32.97	66	Excl	Excl
				58,395		**44,120**		**55,000**		**44,120**

1.37. Then **highlight all the "Excl" cells** in column R and **click** the **[Fill From Estimate]** button. The first subcontractor now becomes the lowest.

B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	N:Low Name	O:Low Total	P:ACME Rate	Q:ACME Total	R:Fwel Rate	S:Fwel Total
WORK TO NEW BUILDINGS										
FORMWORK CLASS 4										
Level 1										
Edge of ground slab; not exceeding 250 wide	59	m	25.00	1,475	ACME Formwork	1,389	23.55	1,389	20.00	1,180
Edge of ground slab	2	m2	80.00	160	ACME Formwork	151	75.35	151	75.00	150
Level 2										
Soffit of floor slab; including strutting 3000 - 4000 high	258	m2	100.00	25,800	ACME Formwork	24,300	94.19	24,300	95.00	24,510
Soffit of floor slab; exceeding 200 thick; including strutting 3000 - 4000 high	23	m2	100.00	2,300	ACME Formwork	2,166	94.19	2,166	95.00	2,185
Sides and soffit of attached floor beam	165	m2	100.00	16,500	ACME Formwork	15,541	94.19	15,541	95.00	15,675
Edge of floor slab; not exceeding 250 wide	15	m	25.00	375	ACME Formwork	353	23.55	353	20.00	300
Edge of floor slab; to form penetration; not exceeding 250 wide	6	m	25.00	150	ACME Formwork	141	23.55	141	20.00	120
FORMWORK CLASS 2										
All levels										
Soffit of landing slab; including stutting not exceeding 3000 high	5	m2	120.00	600	ACME Formwork	565	113.02	565	120	600
Soffit of stair flight; sloping	10	m2	120.00	1,200	ACME Formwork	1,130	113.02	1,130	120	1,200
Side of isolated circular column 500 diameter	69	m	35.00	2,415	ACME Formwork	2,275	32.97	2,275	35	2,415
Edge of landing; not exceeding 250 wide	7	m	35.00	245	ACME Formwork	231	32.97	231	35	245
Face of riser; not exceeding 250 wide	33	m	35.00	1,155	ACME Formwork	1,088	32.97	1,088	35	1,155
Edge of stringer including cutting to profile of treads and risers; not exceeding 250 wide	12	m	35.00	420	ACME Formwork	396	32.97	396	35	420
Feature grooves 25 x 96 in circular column; as detail L on drawing S03.02	158	m	35.00	5,530	ACME Formwork	5,208	32.97	5,208	35	5,530
Raking cutting	2	m	35.00	70	ACME Formwork	66	32.97	66	35	70
				58,395		**55,000**		**55,000**		**55,755**

Addendum

1.38. **Select** the **first subcontractor** as **preferred**.

1.39. Assume now that an addendum to the Formwork trade has been received. The Addendum item will need to be inserted **into the pink section** at the end of the trade. **Insert** the item as follows; type "**ADDENDUM NO. 1**" as a heading in the pink cell B22 and **click Enter**.

1.40. A new pink cell will appear in cell B23. **Click on cell B23** to select it, then **select** the **right click** menu **Insert Row(s)]** option. Then **drag to select cells B23 and B24** and use the **right click** menu "**Insert Row(s)** option again. Cells B22 to B26 should now all be pink.

19		Edge of stringer including cutting to profile of treads and risers; not exceeding 250 wide	12	m	35.00	420		420
20		Feature grooves 25 x 96 in circular column; as detail L on drawing S03.02	158	m	35.00	5,530		5,530
21		Raking cutting	2	m	35.00	70		70
22		**ADDENDUM NO. 1**						
23								
24								
25								
26								
27						**58,395**		**58,395**

1.41. Now **copy and paste** the "**FORMWORK CLASS 4**" heading from cell B2 to cell B23, then copy the "Level 2" sub-heading and the "**Soffit of floor slab**..." item from cells B6 and B7 into cell B24.

1.42. **Insert a quantity** of minus (-) 50 m2 into columns C and D and the estimate rate of $100 in column E.

ADDENDUM NO. 1					
FORMWORK CLASS 4					
Level 2					
Soffit of floor slab; including strutting 3000 - 4000 high	-50	m2	100.00	-5,000	

1.43. **Select** pink **cell B26**, **insert** another **row.**

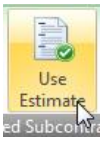
1.44. Then **select** pink cells **B26 and B27** and **insert two more rows** so that cells B26 to B29 are all pink.

1.45. Then **copy and paste** cells B23 to 25 into cell B26. **Edit the heading** in cell B26 to "**FORMWORK CLASS 3**". **Insert a quantity** of 50 m2 and a **rate** of $110/m2.

1.46. In **cells P25 and R25**, against the negative quantity, **Type-in** the **subcontractor's rates** from cells P7 and R7, respectively. The preferred subcontractors name will show in the Pref Name column against the new item.

1.47. **Select cell P28 and R28**, one by one, and Use **[Fill From Estimate]** to insert the estimate rate against the new item.

1.48. **Click** on that **cell (L28)** to select it, then **click** the **[Use Estimate]** button in the Preferred Subcontractor section of the ribbon.



ADDENDUM NO 1												
FORMWORK CLASS 4												
Level 2												
Soffit of floor slab; including strutting 3000 - 4000 high	-50	m2	100.00	-5,000	Acme Formwork	-4,710	Acme Formwork	-4,710	94.19	-4,710	95.00	-4,750
FORMWORK CLASS 3												
Level 2												
Soffit of floor slab; including strutting 3000 - 4000 high	50	m2	110.00	5,500	Estimate	5,500	Acme Formwork	5,500	110.00	5,500	110.00	5,500
				58,895		**55,791**		**55,791**		**55,791**		**56,505**

1.49. Go back up to Level 1, **drill down to Level 2** of the **{ Reinforcement trade }**, and **Freeze column I**.

1.50. **Fill in the following prices** in the subcontractor columns. First subcontractor – bar reinforcement all at $3,400/t and fabric reinforcement at $18/m2. Second subcontractor – bar reinforcement all at $3,100/t, fabric reinforcement at $22/m2.

WORK TO NEW BUILDINGS										
STRUCTURAL GRADE DEFORMED BAR REINFORCEMENT										
Quantities of bar reinforcement only include for laps shown on the drawings										
Level 1										
N12 bar as cast-in rods in pad footing; gazebo :[16 No]	0.02	t	3,500.00	70	Reology	62	3,400.00	68	3,100.00	62
N20-N36 bar in ground beam	1.53	t	3,500.00	5,355	Reology	4,743	3,400.00	5,202	3,100.00	4,743
N20-N36 bar in ground slab	0.41	t	3,500.00	1,435	Reology	1,271	3,400.00	1,394	3,100.00	1,271
N20-N36 bar in ground beam; secure garage	0.53	t	3,500.00	1,855	Reology	1,643	3,400.00	1,802	3,100.00	1,643
Level 2										
N12 bar in floor slab	4.17	t	3,500.00	14,595	Reology	12,927	3,400.00	14,178	3,100.00	12,927
N16 bar in floor slab	1.22	t	3,500.00	4,270	Reology	3,782	3,400.00	4,148	3,100.00	3,782
N20-N36 bar in beam	2.48	t	3,500.00	8,680	Reology	7,688	3,400.00	8,432	3,100.00	7,688
R6-R10 bar as tie in beam	0.51	t	3,500.00	1,785	Reology	1,581	3,400.00	1,734	3,100.00	1,581
R12 bar as tie in beam	0.25	t	3,500.00	875	Reology	775	3,400.00	850	3,100.00	775
All levels										
N20-N36 bar in column	0.55	t	3,500.00	1,925	Reology	1,705	3,400.00	1,870	3,100.00	1,705
R6-R10 bar as helical reinforcement in column	0.34	t	3,500.00	1,190	Reology	1,054	3,400.00	1,156	3,100.00	1,054
N12 bar in stair and landing	0.26	t	3,500.00	910	Reology	806	3,400.00	884	3,100.00	806
HARD DRAWN STEEL WIRE FABRIC REINFORCEMENT										
Quantities of fabric reinforcement are net - no allowance made for any laps										
Level 1										
SL82 fabric in ground slab	84.00	m2	20.00	1,680	Reology	1,848	18.00	1,512	22.00	1,848
SL82 fabric in ground slab; secure garage	50.00	m2	20.00	1,000	Reology	1,100	18.00	900	22.00	1,100
SL82 fabric in ground slab; refuse enclosure	15.00	m2	20.00	300	Reology	330	18.00	270	22.00	330
				45,925		**41,315**		**44,400**		**41,315**

1.51. The objective now will be to select the second subcontractor for the bar reinforcement and the first subcontractor for the fabric. To do this**, select** all the **subcontractor name cells in the Low name column** (cells N5 to N24). Then **click** the **[Use Current]** or Make Preferred button. Then **go back up to Level 1**.

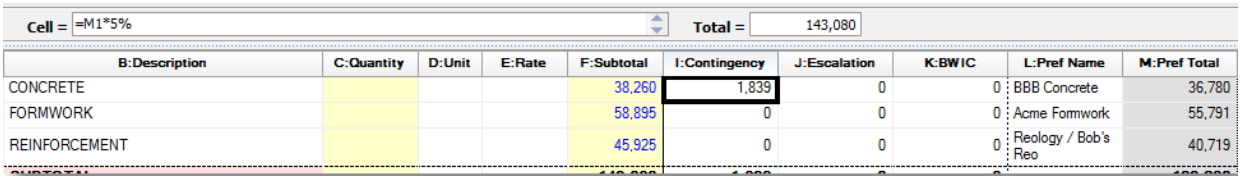
CONCRETE				38,260	BBB Concrete	36,780	BBB Concrete	36,780	AAA Concrete	37,290	BBB Concrete	36,780
FORMWORK				58,895	Acme Formwork	55,791	Acme Formwork	55,791	Acme Formwork	55,791	Easy Formwork	56,505
REINFORCEMENT				45,925	Reology / Bob's Reo	40,719	Reology	41,315	Bob's Reo	44,400	Reology	41,315
SUBTOTAL				**143,080**		**133,290**						
CONTINGENCY					CONTINGENCY	0			CONTINGENCY	0		
ESCALATION					ESCALATION	0			ESCALATION	0		
BWIC					BWIC	0			BWIC	0		
				143,080		**133,290**		**133,886**				

Mark-up Allowances

> *The Subcontractor workbook contains columns to add Contingency, Escalation and BWIC (Builder's Work in Connection) allowances. This may be done at Summary level 1 or at Detail level 2.*

1.52. **Unhide columns** at all levels.

1.53. **Select** the **Concrete trade Contingency** (cell I1 on Level 1). **Insert** the formula **"=M1*5%"**. In the **Escalation cell** J1 **insert "=M1*2.5%".** In **cell K1** (BWIC) **insert zero** (0).



Cell = =M1*5% Total = 143,080

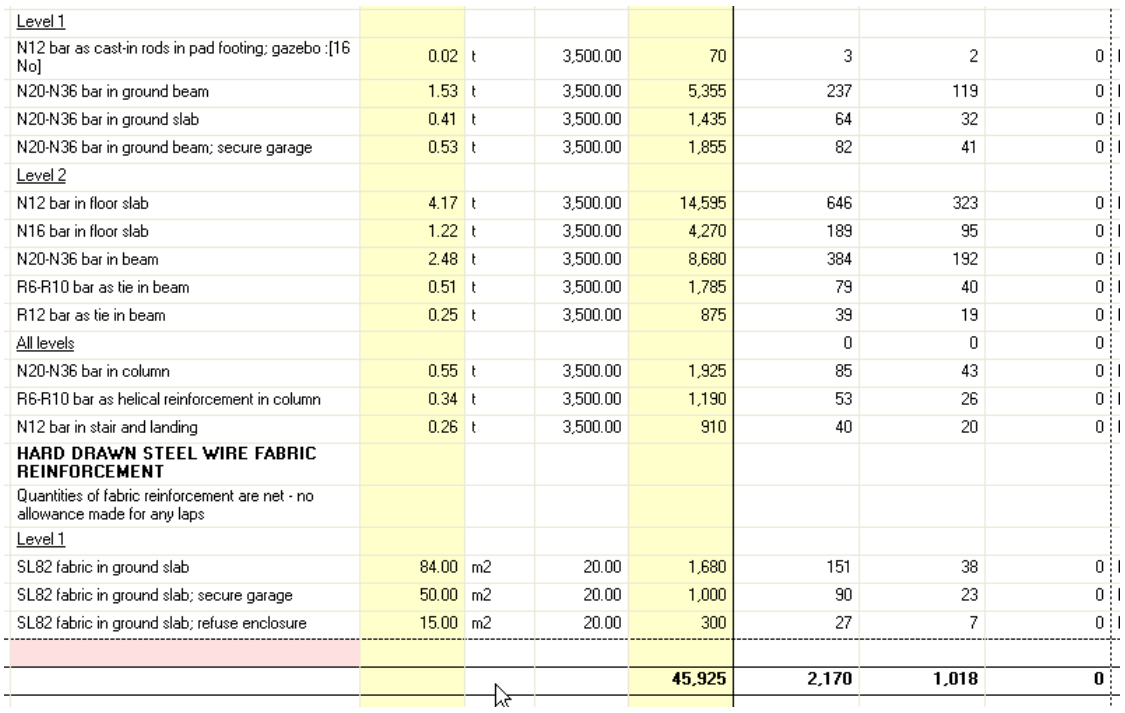
B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	I:Contingency	J:Escalation	K:BWIC	L:Pref Name	M:Pref Total
CONCRETE				38,260	1,839	0	0	BBB Concrete	36,780
FORMWORK				58,895	0	0	0	Acme Formwork	55,791
REINFORCEMENT				45,925	0	0	0	Reology / Bob's Reo	40,719

1.54. **Repeat for** the **{ Formwork }** trade and apply the formulas to cell M2.

> *Each Mark-up column will be totaled and the totals will be added into the mark-up item rows in the Pref column. (Note: the items also appear in the Low and SC1 columns but this is for functional reasons).*

1.55. **Drill down to level 2** of the **{ Reinforcement }** trade and **insert** the formula **"=M5*5%" in cell I5**. Then **copy and paste the formula** into the remaining bar reinforcement items in column I. Then **insert** the formula **"=M22*10%" in cell I22** and **copy and paste** into cells **I23 and I24**.

1.56. **Insert** the formula **"=M5*2.5% into cell J5"** then **copy and paste** it into all the remaining items in column J. **Insert zero** (0) against all the items in **column K**.



Level 1								
N12 bar as cast-in rods in pad footing; gazebo :[16 No]	0.02	t	3,500.00	70	3	2	0	I
N20-N36 bar in ground beam	1.53	t	3,500.00	5,355	237	119	0	I
N20-N36 bar in ground slab	0.41	t	3,500.00	1,435	64	32	0	I
N20-N36 bar in ground beam; secure garage	0.53	t	3,500.00	1,855	82	41	0	I
Level 2								
N12 bar in floor slab	4.17	t	3,500.00	14,595	646	323	0	I
N16 bar in floor slab	1.22	t	3,500.00	4,270	189	95	0	I
N20-N36 bar in beam	2.48	t	3,500.00	8,680	384	192	0	I
R6-R10 bar as tie in beam	0.51	t	3,500.00	1,785	79	40	0	I
R12 bar as tie in beam	0.25	t	3,500.00	875	39	19	0	I
All levels					0	0	0	
N20-N36 bar in column	0.55	t	3,500.00	1,925	85	43	0	I
R6-R10 bar as helical reinforcement in column	0.34	t	3,500.00	1,190	53	26	0	I
N12 bar in stair and landing	0.26	t	3,500.00	910	40	20	0	I
HARD DRAWN STEEL WIRE FABRIC REINFORCEMENT								
Quantities of fabric reinforcement are net - no allowance made for any laps								
Level 1								
SL82 fabric in ground slab	84.00	m2	20.00	1,680	151	38	0	I
SL82 fabric in ground slab; secure garage	50.00	m2	20.00	1,000	90	23	0	I
SL82 fabric in ground slab; refuse enclosure	15.00	m2	20.00	300	27	7	0	I
				45,925	**2,170**	**1,018**	**0**	

1.57. **Go back up to Level 1**. The Mark-up totals from Level 2 have automatically been carried up to Summary level 1.

The completed Level 1 should appear as follows.

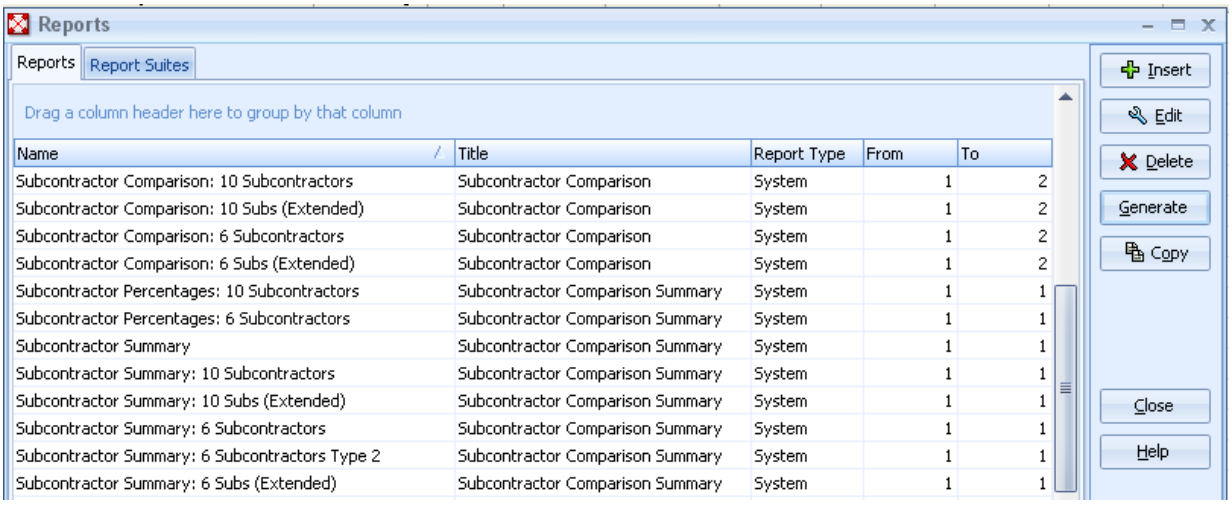
B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	I:Contingency	J:Escalation	K:BWIC	L:Pref Name	M:Pref Total
CONCRETE				38,260	1,839	920	0	BBB Concrete	36,780
FORMWORK				58,895	2,790	1,395	0	Acme Formwork	55,791
REINFORCEMENT				45,925	2,170	1,018	0	Reology / Bob's Reo	40,719
SUBTOTAL				**143,080**	**6,799**	**3,332**	**0**		**133,290**
CONTINGENCY								CONTINGENCY	6,799
ESCALATION								ESCALATION	3,332
BWIC								BWIC	0
				143,080	**6,799**	**3,332**	**0**		**143,420**

If the Mark-ups are not required, the three rows can be deleted from level 1 by using the Delete Rows function and the Mark-up columns can be left blank and hidden.

Subcontractor Comparison reports

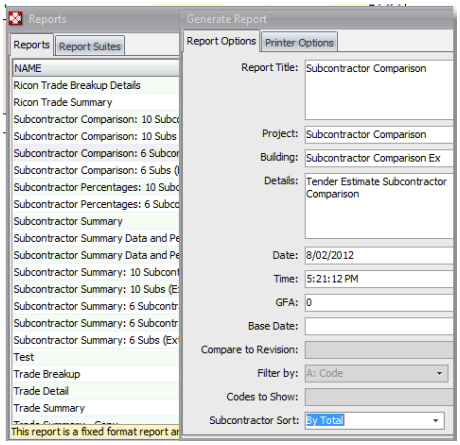
There are 12 report templates provided with CostX® for Subcontractor Comparison reporting. These are System Reports and cannot be edited, but can be copied and then edited as a Custom Report. (Refer to Section 13 of the Advanced CostX® Techniques manual.)

1.58. **Click** on the **[Reports Generate]** button on the **[Workbooks]** ribbon to open the **[Reports]** window. Verify that the following 12 Report Templates are listed.



Name	Title	Report Type	From	To
Subcontractor Comparison: 10 Subcontractors	Subcontractor Comparison	System	1	2
Subcontractor Comparison: 10 Subs (Extended)	Subcontractor Comparison	System	1	2
Subcontractor Comparison: 6 Subcontractors	Subcontractor Comparison	System	1	2
Subcontractor Comparison: 6 Subs (Extended)	Subcontractor Comparison	System	1	2
Subcontractor Percentages: 10 Subcontractors	Subcontractor Comparison Summary	System	1	1
Subcontractor Percentages: 6 Subcontractors	Subcontractor Comparison Summary	System	1	1
Subcontractor Summary	Subcontractor Comparison Summary	System	1	1
Subcontractor Summary: 10 Subcontractors	Subcontractor Comparison Summary	System	1	1
Subcontractor Summary: 10 Subs (Extended)	Subcontractor Comparison Summary	System	1	1
Subcontractor Summary: 6 Subcontractors	Subcontractor Comparison Summary	System	1	1
Subcontractor Summary: 6 Subcontractors Type 2	Subcontractor Comparison Summary	System	1	1
Subcontractor Summary: 6 Subs (Extended)	Subcontractor Comparison Summary	System	1	1

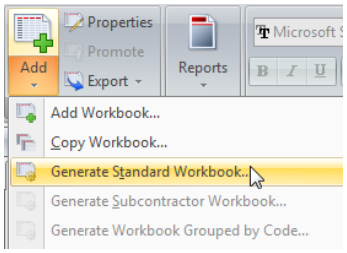
1.59. **Select each of the report templates** in turn to **generate and preview** the report. The "extended" reports include the Mark-up columns and the others do not.



> *Note that the subcontractors are shown on the summaries in the same order as they appear in the workbook. This order can be amended by using the Subcontractor Sort menu in the Generate Report dialogue. "By Total" will sort in ascending order of value.*

Priced Tender (PFC 7-10)

When the comparison exercise is complete and a tender price has been determined, a Tender Schedule priced using all the selected subcontract prices may be generated.



1.60. With the completed Comparison workbook open, **click** the **Add dropdown menu** on the **[Workbooks]** ribbon and use the **[Generate Standard Workbook]** option. A new name will be required for the workbook. **Open** the **new workbook** and navigate through it.

The workbook is a standard workbook which can be edited in the normal way. Additional data has already been inserted into it including the Mark-up allowances, and the names of the selected subcontractors listed against their pricing.

CONCRETE				36,780		36,780	1,839	920	0 BBB Concrete
FORMWORK				55,791		55,791	2,790	1,395	0 Acme Formwork
REINFORCEMENT				40,719		40,719	2,170	1,018	0 Reology / Bob's Reo
SUBTOTAL				**133,290**		**133,290**	**6,799**	**3,332**	**0**
CONTINGENCY				6,799		6,799			CONTINGENCY
ESCALATION				3,332		3,332			ESCALATION
BWIC				0		0			BWIC
				143,421		**143,421**	**6,799**	**3,332**	**0**

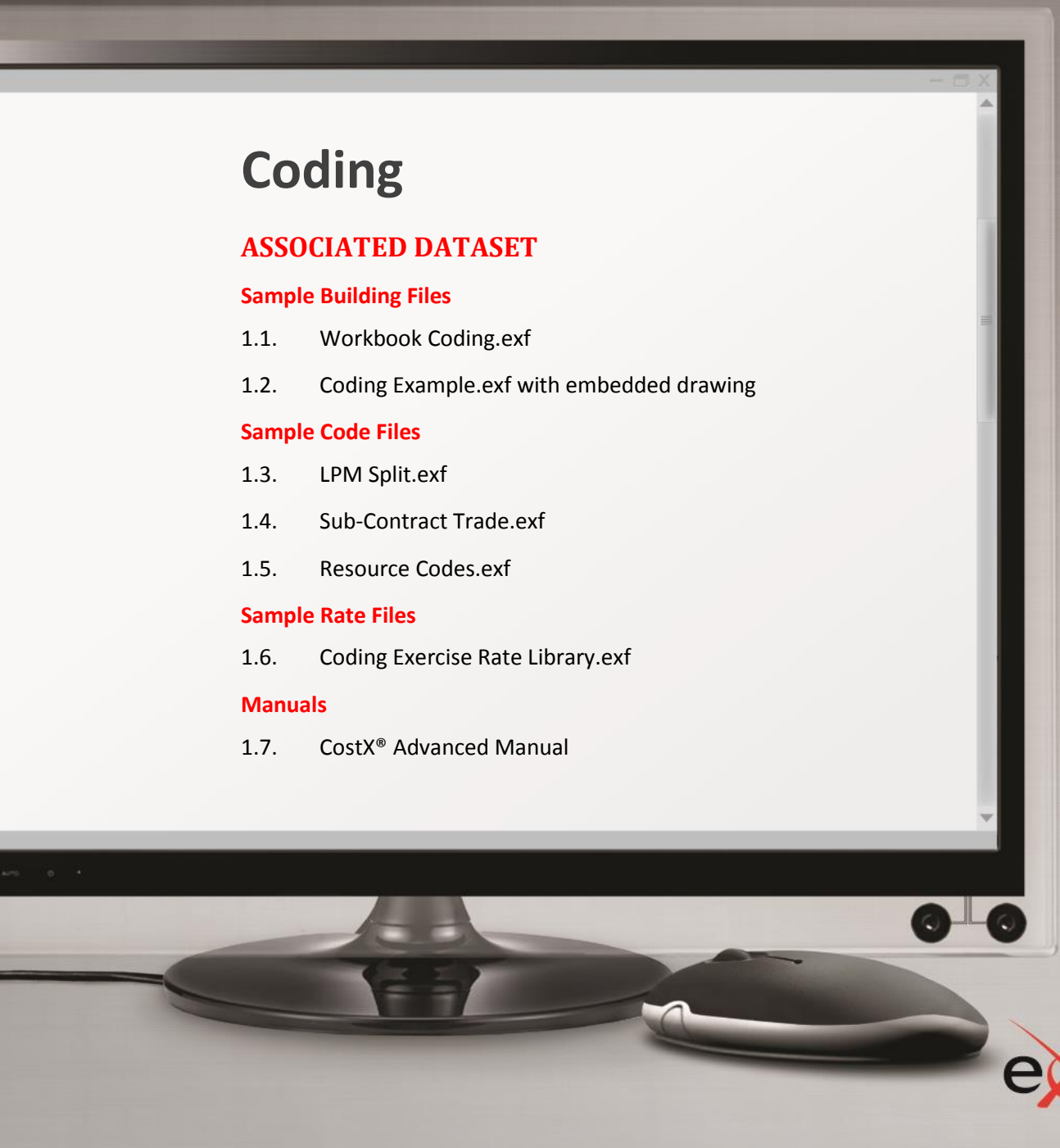
This workbook may be used with any of your normal report templates to print a tender schedule or Bill of Quantities.

Disclaimer

This dataset is an example only, to be used solely for the purpose of the training exercise. It is not to be used as a template for business operations. Exactal and its employees accept no liability for use of this dataset for business purposes.

costX 4.1

ADVANCED
TRAINING EXERCISE



Coding

ASSOCIATED DATASET

Sample Building Files

1.1. Workbook Coding.exf

1.2. Coding Example.exf with embedded drawing

Sample Code Files

1.3. LPM Split.exf

1.4. Sub-Contract Trade.exf

1.5. Resource Codes.exf

Sample Rate Files

1.6. Coding Exercise Rate Library.exf

Manuals

1.7. CostX® Advanced Manual

exactal
precision estimating

The costX Family of Products

CostX®

CostX® is Exactal's premium product. More companies are using CostX® for their complete estimating solution and receiving strong returns on their investment. CostX® is a powerful project costing tool that enables estimators to use the most advanced on-screen measurement system while embracing BIM to deliver better results to clients. It can reduce take off time by up to 80%.

CostX® 2D

CostX® 2D does not support 3D/BIM drawings or allow for auto-revisioning, but still contains Exactal's world-leading on-screen 2D takeoff and integrated workbook. If your company does not receive 3D/BIM drawings but still wants to take advantage of the faster, smarter and more accurate estimating solution on the market, CostX® 2D is the best choice for you.

CostX® Takeoff 2D

CostX® Takeoff 2D is Exactal's most basic product but still allows you to use the world-leading on-screen 2D takeoff, meaning you can measure areas, lengths and counts in a few clicks. If you have only used manual measurement and Excel® before and want to start off with something simple, CostX® Takeoff 2D may be the best choice for you.

FEATURES	CostX®	CostX® 2D	CostX® Takeoff 2D
BIM models/3D drawings	•		
2D drawings (incl PDFs)	•	•	•
Auto Revisioning	•		
Workbooks	•	•	
Subcontractor Comparison	•	•	

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Contents

Introduction

This document aims to inform and demonstrate the principles of applying and using codes within CostX® to allow workbook data to be sorted and arranged in alternative groups and levels of data. The exercises are based around the use of example files and templates which have been developed for demonstration and training purposes only. Actual implementation of the software and templates will depend on users own resources and specific reporting requirements.

Save the Associated Dataset files to a location on your computer or network that may be accessed during the training exercise and work through each exercise sequentially.

Prerequisites

It is assumed for the purpose of working through this training document that the user has a proficient working knowledge of the basic functionality and arrangement of CostX®.

What is Coding within CostX®?

CostX® is a powerful and flexible estimating tool and part of this is derived from the ability to re-use information generated in the program in alternative ways.

One of the functions within CostX® is the ability to make a copy of workbook data re-arranging the individual items contained into alternative headings in a new workbook. In order to control how information is re-arranged Codes are assigned to items within CostX®.

Codes may be placed at any or all levels of a workbook, within rate and quantity build-ups and within rate library item build-ups. The location for the placement of codes varies depending on the desired outcome.

Codes placed in a workbook work in tandem with an associated Code Library.

When would coding be Necessary?

CostX® can be used without ever having the need to insert coding. However using coding allows data to be re-sorted and hence allows a further degree of analysis and use. A simple example for the use of coding might be to use an existing workbook following a standard elemental arrangement and create a new workbook arranged by subcontract trade.

Formatting Conventions Used

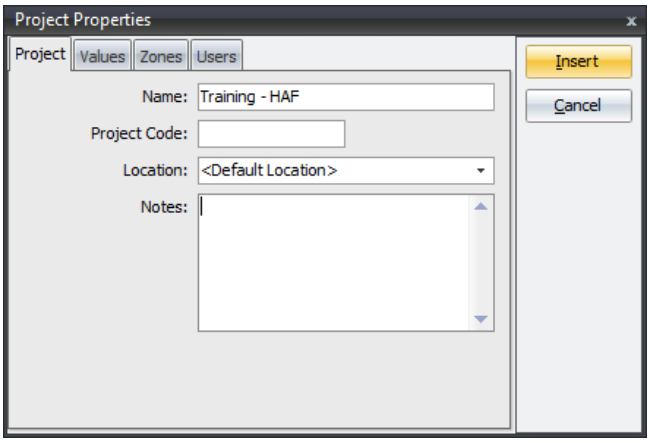
Following are the formatting conventions used throughout this training exercise.

Bold Font	Direction for User
[Bold Font]	Anything fixed in CostX® for example button name, right click options, field names, etc.
{ Bold Font }	Anything which a user can change, for example drawing name, dimension group name, model map name, workbook name.
"**Bold Font**"	Anything a user has to enter, for example building name, workbook name, dimension group name.

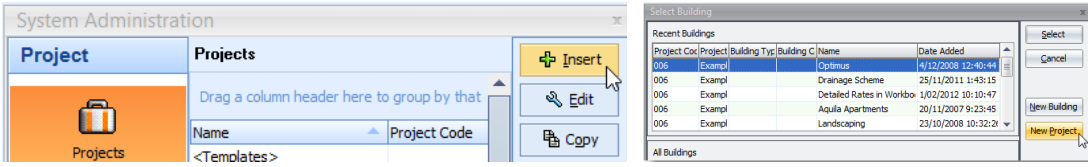
Module 1: Introductory Coding Exercise

Project Setup

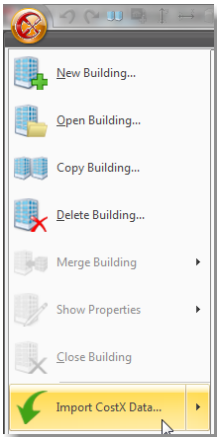
1.1. Prior to importing the first Building **create a new Project** named "**Training-**" **followed by your name** and with the **location** set to **<Default Location>.**



This can be done by clicking on Insert button in the Projects section of System Administration or by clicking on the New Project button at the right of the Select Building window. An empty Project Properties dialog will open allowing the above details to be entered. Then close down the Select Building or System Administration Window.



1.2. **Select** the **[Main Menu]** and go to the **[Import CostX® Data]** button, import the file called **{ Workbook Coding.exf }** included in the training dataset. When asked to select the Training – Your Name project created earlier.



1.3. **Open** the newly **imported building**, and note that there is an existing workbook with an example Concrete trade measured and priced.

Code Library Setup (PFC – 8.1)

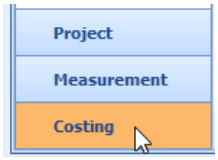
We will now code this workbook Elementally. On level 2 of Concrete elemental unit, for example, line item 27 belongs to Substructure in an Elemental format, hence we will utilise one of the user columns to assign a code SB to nominate it to Substructure:

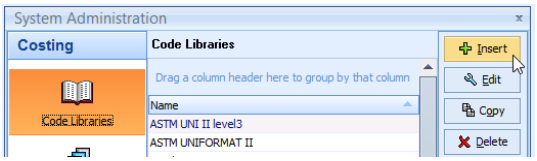
B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:User1
Pad footing placed between excavated faces :[51 No]	34	m3	230	7,820		7,820	SB

The first step is to create a Library for these Codes.

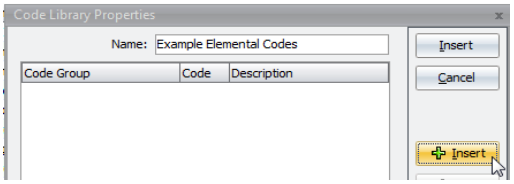
1.4. Go into the **[Main Menu]** and **select [System Administration]**.

1.5. Next, **select [Costing]**, then **[Code Libraries]** and **select** the **[Insert] button** with a plus symbol next to it.

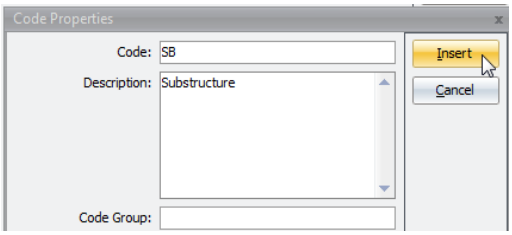




1.6. **Input** "**Example Elemental Codes**" into the Name: field, and **select** the **[Insert]** button with a plus symbol next to it.

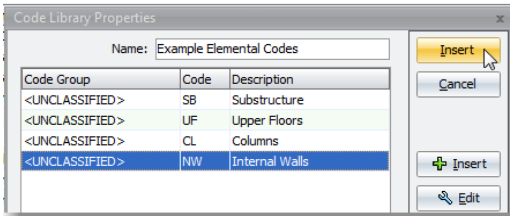


1.7. **Type** "**SB**" into the **[Code:]** field, and **{ Substructure }** into the **{ Description: }** field, ignore the Code Group field and **select [Insert]**.



Simillarly create the following codes:

- UF – Upper Floors
- CL – Columns
- NW – Internal Walls



1.8. Once completed, **Click** the **[Insert]** button to save the code library.

Note, the column Code Group was ignored in this exercise, hence it appears above as <UNCLASSIFIED>. Essentially a Code Group allows the user to insert a group of related Codes and Descriptions into one Code Group. This can then be utilized further in the sorting of workbooks. Code Groups will be discussed in the Advanced Coding Exercise Modules. Also refer to Appendix A, A.1 for further explanation.

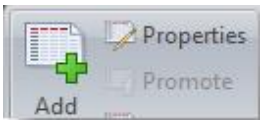
1.9. **Close [System Administration]** to return to the Concrete Workbook.

The newly created Code Library should now be visible under the Codes tab to the left of the workbook, ready to be used/referenced.

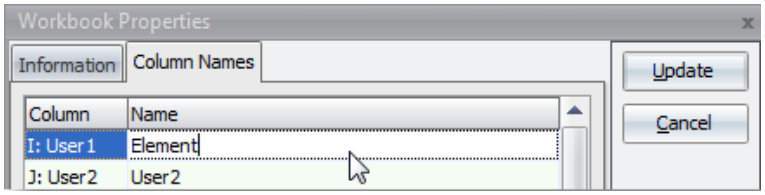
Using Code Libraries (PFC – 8.2)

1.10. **Drill down to** the second level of the **{ Concrete }** trade. We shall utilize the column called User 1 to code the workbook.

1.11. **Open** the **[workbook properties]** window; this can be done either by selecting the Properties button in the Workbook ribbon, or by double clicking on the Workbook name.



1.12. **Select** the **[Column Names]** tab and rename **[User1]** to read "**Element**", then **select** "**Update**", and Note that User1 has now been renamed Element.



There are two ways of utilising these codes in a workbook, firstly the user can drag and drop the code from the code libraries tab into the desired column of the workbook, alternatively the actual code can be simply typed into the desired column. We shall try the latter first.

1.13. Ignore all Preamble Notes and Scroll down to expose line number 26: **{ INSITU CONCRETE N32 }** and 27: **{ Pad footing placed between …. }**, as these items belong under Substructure, we shall **type** "**SB**" (as per our code library structure) **into Column { I:Element }**

26		**INSITU CONCRETE N32**						SB
27		Pad footing placed between excavated faces :[51 No]	34	m3	230	7.820	7.820	SB

Line item 26 and 27 will now be relocated under Substructure when the workbook is resorted.

1.14. Next, **drag and drop** the code **UF** from the code library into Line 39: **{ Suspended slab 100-200 thick including… }** into column **{I:Element}**. This action will place the selected code into the cell.

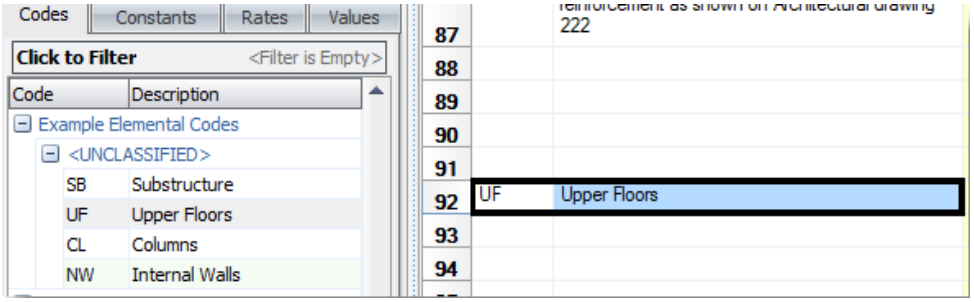
1.15. **Continue to assign** the bill descriptions with the **codes** SB, UF, CL, and NW.

Some line items such as headings may need to appear in multiple elements. For example, when line number 28 is reached, it is evident that the heading requires multiple codes in order to appear in both the Substructure and Upper Floors elements. Multiple codes can be entered using a semi-colon to separate the codes.

1.16. **Enter** the **codes SB;UF** into I:Element column of **line number 28**

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Element
28		REINFORCED INSITU CONCRETE N32							SB;UF

CostX® also allows the user to utilize the description assigned to a code in the Workbook. For example, if UF Upper Floors was dragged and dropped into the description column, CostX® will automatically fill the Description and Code column from the selected Code Library.



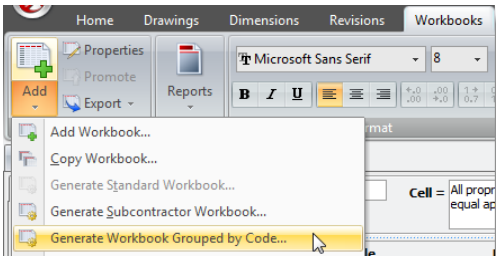
1.17. The following is an extract of the coded workbook:

B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:Element
INSITU CONCRETE N32							SB
Pad footing placed between excavated faces :[51 No]	34	m3	230	7,820		7,820	SB
REINFORCED INSITU CONCRETE N32							SB;UF;CL
Below ground floor level							SB
Pad footing placed between excavated faces :[43 No]	140	m3	230	32,200		32,200	SB
Ground beam placed between excavated faces	708	m3	230	162,840		162,840	SB
Pedestal :[22 No]	2	m3	230	460		460	SB
Slab on ground 100-200 thick including thickenings :[5471 m2]	579	m3	230	133,170		133,170	SB
Slab on ground 100-200 thick including thickenings laid to falls :[898 m2]	93	m3	230	21,390		21,390	SB
Suspended ramp slab 100-200 thick :[15 m2]	3	m3	250	750		750	SB
Plinth 100-200 thick :[94 m2]	10	m3	280	2,800		2,800	SB
Hob :[4 m]	1	m3	280	280		280	SB
Ground floor level to level 1							UF;CL
Suspended slab 100-200 thick including band beams and thickenings :[661 m2]	170	m3	230	39,100		39,100	UF
Plinth 100-200 thick :[111 m2]	12	m3	250	3,000		3,000	UF
Hob :[166 m]	2	m3	280	560		560	UF
Attached beam	12	m3	230	2,760		2,760	UF
Isolated column	7	m3	300	2,100		2,100	CL

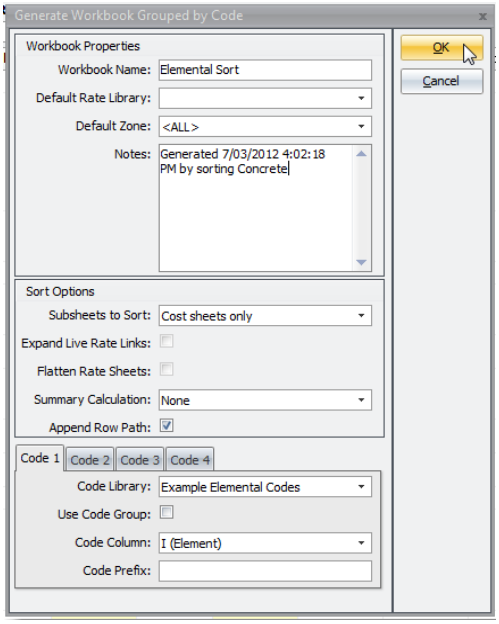
For a complete example of codes for this workbook please refer to 'Elemental Codes Workbook Completed' PDF in the training dataset.

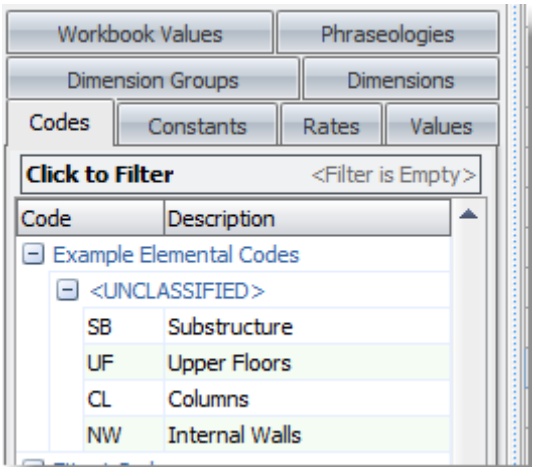
Generating a Workbook Grouped by Code (PFC – 8.3)

1.18. Ensure all line items have been coded, except the Preamble Notes. **Select** the drop down menu under the **[Add]** button, in the **[Workbooks]** ribbon. **Select [Generate Workbook Grouped by Code…]**



1.19. Name the new workbook "**Elemental Sort**", ignore the rest of the settings until Code Library, and here **select** the previously created **Code Library { Example Elemental Codes }**. And finally select the column **{ I (Element) }**. Ensure the settings are as follows and **select [OK]**. A new workbook will be created resorted elementally. The new workbook will utilize the Code Library to create Code and Description in the 1st Level.





	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:F
1	SB	Substructure				507,890	
2	UF	Upper Floors				47,965	
3	CL	Columns				2,100	
4	NW	Internal Walls				11,100	
5	Uncoded	Uncoded				0	
6							
7							

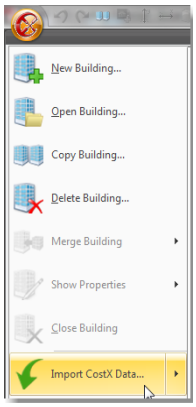
CostX® will sort the original workbook according to the codes assigned in the nominated column. For instance all items with UF codes, are now included in the second level of Upper Floors. Note if multiple Codes were used, these items will appear multiple times.

Any item not coded in the source workbook will appear in the second level of the description Uncoded. In this example it will be all Preamble Notes.

Module 2: Advanced Coding Exercises

There are a number of files that need to be imported into the system in order to progress through the different exercises. These files consist of Code Library, Rate Library and Building files, these will be imported in turn and their contents quickly reviewed as a precursor to undertaking the exercises.

Please Note – Appendix A to this document contains a comprehensive Overview and Reference for coding and code libraries.



2.1. **Close** the **current building** via the Main Menu.

2.2. Next, **Import the building file** named **{ Coding Example Building.exf }** into the Training-*Your Name* Project.

This building file contains a sample estimate, the Initial Estimate workbook, and will be used during the exercises to sort the information into supplementary workbooks based on the code structures inserted next to the estimate items and in the rate calculations.

Rate Library File

The rate library which needs to be imported into the system for this training exercise includes both 'resource items', which are direct monetary sums and 'composite items', each of which have a built-up rate calculation referencing the resource items and utilizing factors such as labour outputs (e.g. X hrs of a tradesperson / m2 of work), material conversion between typical purchase units and measurement units (e.g. Y m3 of concrete / m2 of concrete bed) and plant outputs (e.g. Z weeks of plant / m3 of excavation), as follows:

The labour 'Resource Items' represent hourly rates for trade persons, the Item Codes for these rates are prefixed with 'L-' and they are all contained within a Group named 'Z-LABOUR RESOURCES'.

The materials 'Resource Items' represent rates for the supply of individual component materials in typical purchase units and are prefixed with 'M-' and they are all contained within a Group named 'Z-MATERIAL RESOURCES'.

The plant 'Resource Items' represent the weekly or daily cost of hiring construction plant and are prefixed with 'P-' and they are all contained within a Group named 'Z-PLANT RESOURCES'.

The above noted rate items each contain lump sum rates for each item i.e. they do not have a built-up rate.

The 'Composite Items' represent rates for measured items of work, each item comprises a built up 'composite' rate calculation referring and live linked to the relevant labour, material and plant 'Resource' rates within the library and factoring their respective supply cost and unit of measure to the measurement unit of the completed work. The image below provides a typical example of such a rate calculation.

Please note the colour of the Rates, this indicates the live rate link.

Rate Calculation

A1 Cell = L-Roofer Rate = 23.89

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include	I	J
1	L-Roofer	Roofer	0.50	hr	16.00		8.00	8.00		lab
2	M-Roof, Underfelt	Roofing, Underfelt	1.00	m2	1.00		1.00	1.00		mat
3	M-Timber, 19x19 Swn	Timber, 19x19 Sawn Softwood	2.35	m	0.40		0.94	0.94		mat
4	M-Roof, Concr Tiles	Roofing, Concrete Interlocking Tiles 500x250	0.01	1000	1,100.00		11.50	11.50		mat
5	M-Roof, Nails	Roofing, Nails	20.92	no	0.10		2.09	2.09		mat
6	P-Stihl Cut Off Saw	Stihl Cut Off Saw (incl. Blades)	0.01	day	25.00		0.36	0.36		plant
7										
8										
9										

Also please note the lab, mat & plant Coding which has been inserted in column J against each item and will be utilized in conjunction with the associated codes in the LPM Split code library later in this exercise, additionally note the Resource Coding applied in the A:Code column which will also be used later in this exercise in conjunction with the Resource Codes code library.

The 'Composite Items' are prefixed with 'C-' and they are arranged within trade Groups prefixed with 'Comp-' (e.g. Comp-Roofing, Comp-Groundworks') allowing rate groups to be isolated and rates quickly and easily located.

2.3. Please now **import the Rate Library** into CostX®. (This can be done using the **[Import CostX® Data option]** on the **main menu** or using the **[Import]** button in **[System Administration]**)

Note that the rate library has been imported it is possible to review (and change) it in the Rate Libraries Section within System Administration. For the 'Composite Items' within the rate library in order to review / edit the rate click on the rate calculation icon next to the rate input box, the rate input box will be Grayed Out indicating the presence of a rate calculation.

2.4. **Open** the **rate library** and **review** a couple of the **rate calculations**. Observe how each item in each of the rate calculations has been assigned a lab, plant or mat code in column J associated with its resource type and a 'resource' code in column A:Code.

The Initial Estimate workbook has live linked rates to this Coding Exercise Rate Library (the default library set within the workbook properties window).

Code Library Files

There are three Code Libraries which need to be imported into the system for this exercise.

The 'LPM Split' code library contains four items and their associated abbreviated codes; Labour (lab), Plant (plant), Material (mat) and Other (other). These abbreviated codes have been inserted next to the headings in the workbook in user column J (which has been re-named "LPM Code") and also next to the rate items in the composite rate library calculations, also in column J. These will be used to generate a workbook split to show what component of the estimate contains the labour, plant, material and other elements.

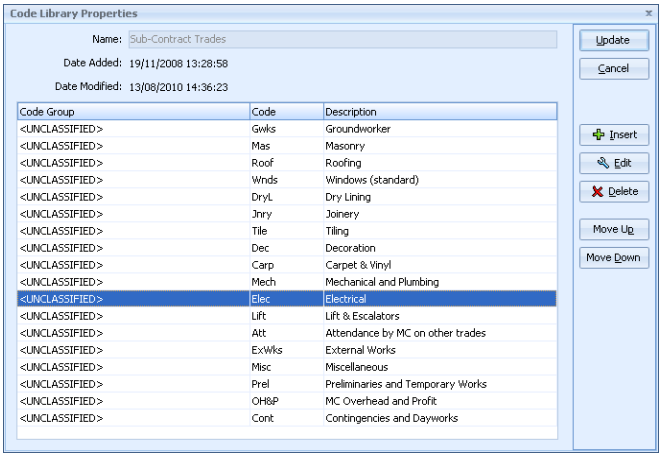
The 'Sub-Contract Trades' code library contains a number of abbreviated codes which reference various sub-contract trades. These codes have been inserted in the user column K (which has been re-named "Sub-Contract Trades") beside the relevant items and headings on the second level of the workbook. These will be used to generate a workbook sorting the Initial Estimate from an elemental format to a trade format.

The 'Resource Codes' code library contains codes which are referenced from the 'composite items' in the rate library in column A. From these codes a resource analysis can be generated which will show the quantity and total costs applicable to each type of labour, material and the various items of plant.

2.5. **Import** the three **code libraries** into CostX®.

2.6. **Open** the **{ LPM Split }** code library and **review its contents**, observe the 'Code' field is the code used in coding the previously reviewed rate library items.

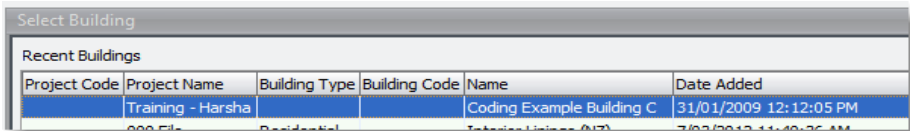
2.7. Now **open** the **{ Sub-Contract Trades }** code library and **observe the code** and description fields. The contents of the 'Code' field are used to code the workbook, the 'Description' field contains the descriptions which will be placed in the B:Description column of a workbook generated using this code library.

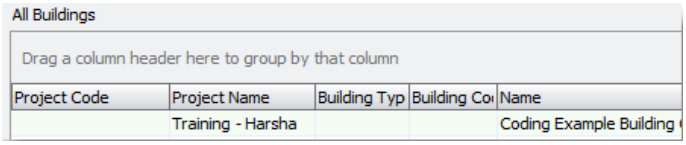


Code Group	Code	Description
<UNCLASSIFIED>	Gwks	Groundworker
<UNCLASSIFIED>	Mas	Masonry
<UNCLASSIFIED>	Roof	Roofing
<UNCLASSIFIED>	Wnds	Windows (standard)
<UNCLASSIFIED>	DryL	Dry Lining
<UNCLASSIFIED>	Jnry	Joinery
<UNCLASSIFIED>	Tile	Tiling
<UNCLASSIFIED>	Dec	Decoration
<UNCLASSIFIED>	Carp	Carpet & Vinyl
<UNCLASSIFIED>	Mech	Mechanical and Plumbing
<UNCLASSIFIED>	Elec	Electrical
<UNCLASSIFIED>	Lift	Lift & Escalators
<UNCLASSIFIED>	Att	Attendance by MC on other trades
<UNCLASSIFIED>	ExWks	External Works
<UNCLASSIFIED>	Misc	Miscellaneous
<UNCLASSIFIED>	Prel	Preliminaries and Temporary Works
<UNCLASSIFIED>	OH&P	MC Overhead and Profit
<UNCLASSIFIED>	Cont	Contingencies and Dayworks

Note the 'Move Up' and 'Move Down' buttons which can be used to re-order the position of the codes in the code library, when a workbook is generated using this code library the descriptions will be placed in the workbook in the order in which they are stored in the code library.

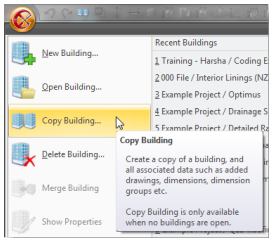
2.8. Locate and **Open** the building file named "**Coding Example Building** from the **[Select Building]** window. It should appear as the first building under the Recent Buildings screen. Alternatively, locate the Project Training – Your Name in the list under All Buildings.





If desired, you may copy the Coding Example Building using the Copy Building button on the main menu and provide a new name for the copy of the Building and work through this exercise using the copy of the Building.

Note that the building has a drawing included, with some Elemental Measurements taken from it.



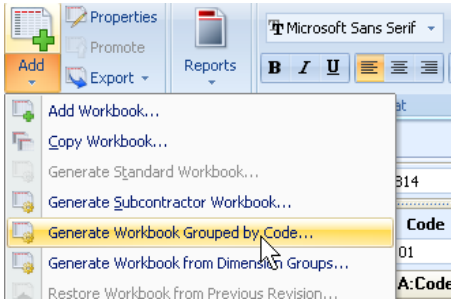
2.9. **Open** the **building file** and **review the coding** structures used on the second level of the **{ Initial Estimate }** Workbook:

Note that the codes inserted in the workbook in column J (renamed LPM Code under the Column Names tab in the Workbook Properties dialog) have been inserted only against headings rather than individual items, this allows the headings to be replicated in a workbook generated using the LPM Split code library. The codes for the quantified items have been included in the rate calculations in the live linked rate library, as previously observed, as this is the location containing the pricing details for the items in the workbook. Had the price for the items been built-up using the Rate sheets in the workbook the codes would have been inserted in column J of the rate sheets.

Note also that the codes inserted in column K (renamed Sub-Contract Trades) have been inserted against individual quantified items and their directly associated headings and that headings pertaining to more than one trade have multiple codes inserted and separated by a semi-colon.

Generating Workbooks Grouped by Code

In order to resort a workbook using the code or codes inserted we use the Generate Workbook Grouped by Code method. This is accessed from the drop down arrow attached to the Add Workbook button on the Workbooks Ribbon Toolbar, thus:-



Since the initial estimate has a number of codes inserted next to the items and also in the rate library, it is possible to re-sort the estimate into newly generated workbooks based on these codes. The purpose of this training exercise is to re-sort the initial estimate and analyse the data by generating additional workbooks using single and multiple codes. There are several permutations of workbooks that can be generated using the three code libraries.

Trade Analysis

The first workbook that will be generated is the Trade analysis.

2.10. Firstly ensure the **{ Initial Estimate }** workbook has been **selected** in the Costing view as this is the source workbook from which the new workbook will be generated.

2.11. **Click** on the drop down arrow of the **[Add]** Workbook button and **select** the **[Generate Workbook Grouped by Code]** option.

The Generate Workbook Grouped by Code window will appear in which the parameters required to generate the workbook will be specified.

2.12. In the Workbook **{ Name: }** field give the workbook a name, for example "**Sub-Contract Trades**" or some other identifying name, this is the name that will appear in the Workbook List Window on completion.

The Default Rate Library field is pre-filled with the name of the default rate library from the source workbook, which in this instance is Coding Exercise Rate Library. As this mirrors the default rate library in the Initial Estimate workbook it therefore contains the rates referenced by the live rate links in the workbook.

The Default Zone field allows a Default Zone to be specified for the new workbook if required. For this training exercise we will not be using zones therefore leave this field at the default setting of <ALL>, indicating live linked quantities in all zones are will be included. For further details regarding zones please refer to the help file topic 'Using Zones in Functions'.

Optionally notes may be entered in the Notes field, by default the notes field is pre-filled with a description indicating the date and time the workbook was generated and the name of the source workbook.

Under the Sort Options section, the Subsheets to Sort field indicates to the system which areas of the workbook to search for codes, for this particular trade analysis the codes are located on the Cost sheets, therefore the 'Cost sheets only' value should be selected.

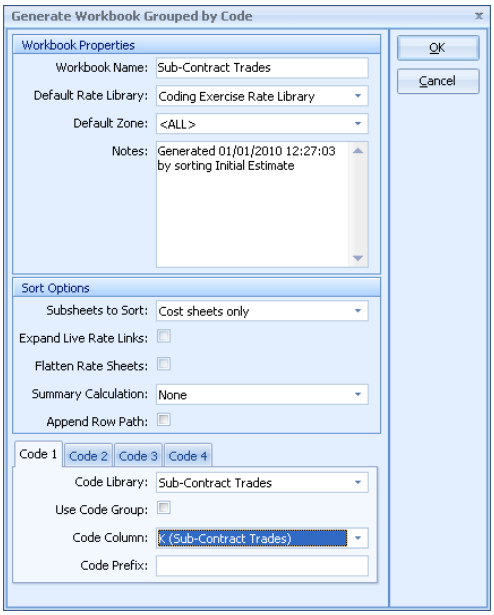
The Expand Live Rates Links and Flatten Rate Sheets checkboxes are used in conjunction with the 'Cost and rate sheets' option (if selected in the foregoing field) and are detailed later in this training exercise.

The Summary Calculation specifies whether the summary level of the new workbook has the Quantity, Unit and Rate columns filled in (by calculating a quantity or rate), in addition to the Subtotal and Total columns which are always filled in. An exercise using this feature is detailed later in this training exercise therefore the value 'None' should be left.

The Append Row Path option if selected, adds in brackets at the end of each item in the generated worksheet the sequential row number at each level representing the drilldown path to the original item in the source workbook e.g. ticking it would result in a description like "Clearing site of vegetation generally; (1.5)" as opposed to "Clearing site of vegetation generally;" if un-ticked. This function has no other effect on the process and is the user is free to choose whether or not to use this function, for this exercise however un-tick the checkbox.

2.13. **Ensure** the **[Code 1]** tab is **selected**.

2.14. In the **{ Code Library: }** field select **{ Sub-Contract Trades }** from the dropdown menu.



This specifies to the system that it is to create a group at level 1 of the generated workbook for each of the descriptions contained within the Trades code library and then systematically sort each of the items from the initial estimate (drilling down as necessary) into the relevant group by matching the code inserted in the workbook to the code in the library.

2.15. Ensure the **[Use Code Group]** box is **un-ticked**.

A tick in this box would specify an additional level of grouping such that the generated workbook would be grouped by Code Group at the highest level followed by the Description at the second level and coded items at the third level, you will notice from the above code library contents that the Code Group has not been used in this code library.

2.16. Under the **[Code Column:]** section **select** the **{ K (Sub-Contract Trades) }** column from the dropdown menu.

The Code Column setting specifies column K as the reference column in the initial workbook as containing the codes to be matched against the selected code library.

It is important that the correct Code Library and Code Column are selected as the generated workbook will be based on a match between the two.

The Code Prefix field can be used to temporarily apply a text prefix to the codes in a code library whilst the workbook is being generated, for example if the codes in the code library were Gwks, Mas, Roof … and the corresponding codes in the workbook were Q-Gwks, Q-Mas, Q-Roof … the 'Q-' could be specified here as a code prefix rather than altering the code library or workbook. For this training exercise however code prefixes are not required.

The Generate Workbook Grouped by Code dialog should be now have been completed and should be similar to the example above.

CostX® has the ability to utilize up to four coding structures simultaneously, the code library name and reference column containing the code are specified sequentially on the four Code X tabs, in this instance we will be using just one code structure.

2.17. **Click** on the **[OK]** button to generate the workbook.

A new workbook will be added in the workbook list window and is displayed automatically in the main viewing window. The summary sheet should appear similar to the screen shot below.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:
1	Gwks	Groundworker				27,891		27,891	
2	Mas	Masonry				32,395		32,395	
3	Roof	Roofing				20,976		20,976	
4	Wnds	Windows (standard)				24,652		24,652	
5	DryL	Dry Lining				11,518		11,518	
6	Jnry	Joinery				31,542		31,542	
7	Tile	Tiling				6,593		6,593	
8	Dec	Decoration				3,488		3,488	
9	Carp	Carpet & Vinyl				5,493		5,493	
10	Mech	Mechanical and Plumbing				12,951		12,951	
11	Elec	Electrical				3,770		3,770	
12	Lift	Lift & Escalators				0		0	
13	Att	Attendance by MC on other trades				1,160		1,160	
14	Misc	Miscellaneous				0		0	
15	Prel	Preliminaries and Temporary Works				35,000		35,000	
16	OH&P	MC Overhead and Profit				18,000		18,000	
17	Cont	Contingencies and Dayworks				7,000		7,000	

The code and description in the A:Code and B:Description columns respectively have been inserted from the Code library, the blue subtotals signify the presence of further details on the Level 2 cost sheet and summarize the total from each, in this case, trade.

Drilling down to a level 2 Cost sheet on a particular row will display the items from the initial workbook which have a corresponding code.

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total			
	Dec	Decoration				3,488		3,488			
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:User1	J:User2	K:User3
1	02C	Roof								lab;plant;mat	Jnry; Roof; Dec
2		**Painting / clear finishing**								lab;plant;mat;	Dec
3		**General surfaces**								lab;plant;mat;	Dec
4		1 undercoat and 2 full coats white gloss paint; Isolated surfaces girth n.e. 300mm; Eaves & Gutter boards	190	m	3.60	684		684			Dec
5	02H	Internal Doors								lab;plant;mat	Jnry; Dec
6		**Painting / clear finishing**								lab;plant;mat;	Dec
7		**General surfaces**								lab;plant;mat;	Dec
8		1 undercoat and 2 full coats white gloss paint; Girth exceeding 300mm; Doors	38	m2	10.80	410		410			Dec
9		1 undercoat and 2 full coats white gloss paint; Isolated surfaces girth n.e. 300mm; Door fittings and architraves	57	m	3.60	205		205			Dec
10	03A	Wall Finishes								lab;plant;mat	Tile; Dec
11		**Painting / clear finishing**								lab;plant;mat;	Dec
12		General surfaces; 1 mist coat and 2 full coats emulsion paint; To pasteboard	489	m2	1.30	636		636			Dec
13	03B	Floor Finishes								lab;plant;mat	Tile; Carp; Jnry; Dec
14		**Painting / clear finishing**								lab;plant;mat;	Dec
15		**General surfaces**								lab;plant;mat;	Dec
16		1 undercoat and 2 full coats white gloss paint; Isolated surfaces girth n.e. 300mm; Skirtings	213	m	3.60	767		767			Dec
17	03C	Ceiling Finishes								lab;plant;mat	DryL; Dec

In the example above the Decoration (Dec) row was drilled down, items from various elemental sections (Roof, Internal Doors, Wall Finishes…) in the initial estimate workbook which were coded 'Dec' have been collated together under the Decoration section. Items which have multiple codes (e.g. the Floor Finishes title on row 13 has the codes Tile, Carp, Jnry & Dec) will be placed in each of the respective level 2 Cost sheets.

Take a few moments to review the new workbook.

Labour Plant Material Analysis

The second workbook that will be generated is the labour, plant and material analysis.

2.18. **Re-select** the **{ Initial Estimate }** workbook, then **click** on the drop down menu of the **[Add]** Workbook button and **select** the **[Generate Workbook Grouped by Code]** option again.

2.19. In the **[Workbook Name:]** field give the workbook a name, for example "**LPM Split**" or some other identifying name. Leave the [Default Rate Library:] and [Default Zone:] fields at their default values

2.20. Under the Sort Options section, in the **[Subsheets to Sort:]** field select **[Cost and rate sheets]** from the dropdown menu.

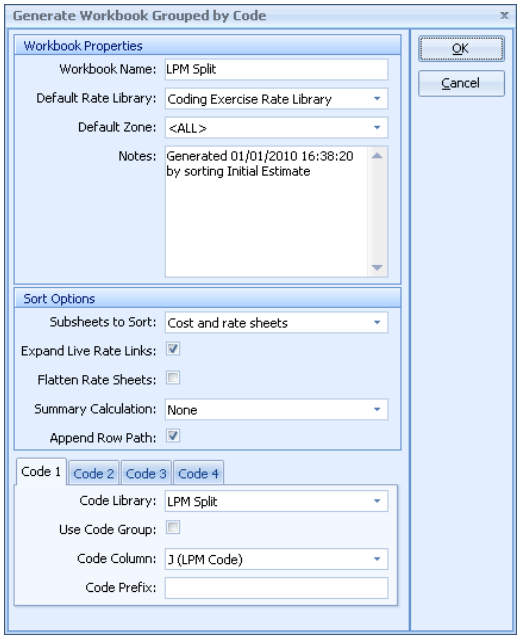
This indicates to the system which areas of the workbook to search for codes. In the initial estimate workbook codes have been inserted in both the cost sheets and rate build-ups where needed.

2.21. Also ensure that the **[Expand Live Rates Links]** checkbox is **ticked**. This will specify to the system to additionally search for codes in the rate library calculations. Leave the Flatten Rate Sheets checkbox un-ticked and the Summary Calculation as None.

2.22. If you un-ticked the **[Append Row Path]** in the previous Sub-Contract Trade analysis ensure the checkbox is **ticked** this time.

2.23. In the **Code 1** tab **select** the **[Code Library]** field as **{ LPM Split }** and ensure the **[Use Code Group]** box is **un-ticked**. For reference this Code Library contains the following codes and descriptions:

Code Group	Code	Description
<UNCLASSIFIED>	lab	Labour
<UNCLASSIFIED>	plant	Plant
<UNCLASSIFIED>	mat	Materials
<UNCLASSIFIED>	other	Other



2.24. Under the **[Code Column]** section **select** the **J (LPM Code)** column from the dropdown menu.

This specifies column J this time as the reference column in the initial workbook as containing the codes to be matched against the selected code library.

The Generate Workbook Grouped by Code dialog should be now have been completed and be similar to the example shown above.

2.25. **Click** on the **[OK]** button to generate the workbook.

The code and description in the A:Code and B:Description columns have been inserted from the LPM Split code library this time as this was the library selected when the workbook was generated, consequently the summary level of the new workbook indicates the financial split between Labour, Plant, Material and Other.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
1	lab	Labour				75,732		75,732
2	plant	Plant				7,028		7,028
3	mat	Materials				99,671		99,671
4	other	Other				60,000		60,000
5								

Drilling down to the level 2 Cost sheet will display the item headings from the initial workbook which were coded as either lab;plant;mat; or other in the Cost sheet and items from the initial workbook which were coded as either lab, plant, mat or other in the rate build-up.

	Code	Description	Quantity	Unit	Rate	Sub-Total	Factor	Total			
	lab	Labour				75,732		75,732			
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	I:User1	J:User2	K:User3
1	01	Substructure (1.1)								lab;plant;mat;	Gwks;Mas;
2		**Groundworks (1.2)**								lab;plant;mat;	Gwks
3		**Site preparation (1.3)**								lab;plant;mat;	Gwks
4		Removing trees; Girth n.e. 600mm - 1.50m (1.4)	1	No	259.00	259		259			Gwks
5		Clearing site of vegetation generally; (1.5)	311	m2	2.04	634		634			Gwks
6		**Excavating (1.6)**								lab;plant;mat;	Gwks
7		Topsoil for preservation; Average depth 150mm (1.7)	311	m2	0.68	211		211			Gwks
8		To reduce levels; Maximum depth n.e. 0.25m (1.8)	78	m3	2.92	228		228			Gwks
9		Trenches; Width exceeding 300mm; Maximum depth n.e. 1.00m; Commencing 400mm below existing ground level (1.9)	57	m3	5.83	333		333			Gwks
10		**Working space allowance to excavations (1.10)**								lab;plant;mat;	Gwks
11		Trenches (1.11)	190	m2	3.62	688		688			Gwks
12		**Earthwork support (1.12)**								lab;plant;mat;	Gwks
13		Maximum depth n.e. 1.00m; Distance between opposing faces n.e. 2.00m (1.13)	190	m2	9.80	1,862		1,862			Gwks
14		**Disposal (1.14)**								lab;plant;mat;	Gwks
15		Surface Water (1.15)	1	Item		0		0		lab;plant;mat;	Gwks

Notice the Rates on this occasion are blue signifying the presence of further details on the Level 3 rate sheets. This is because the original rate calculations which contained labour, plant and material elements in combination have been split whilst the workbook was being generated under the relevant code in the summary level. Take a moment to drill down into a few of the Rate sheets contained under the Labour, Plant and Material summary groups, notice in each instance the correlation between the items within the rate sheet and the labour, plant or material group drilled down from the summary level 1 cost sheet.

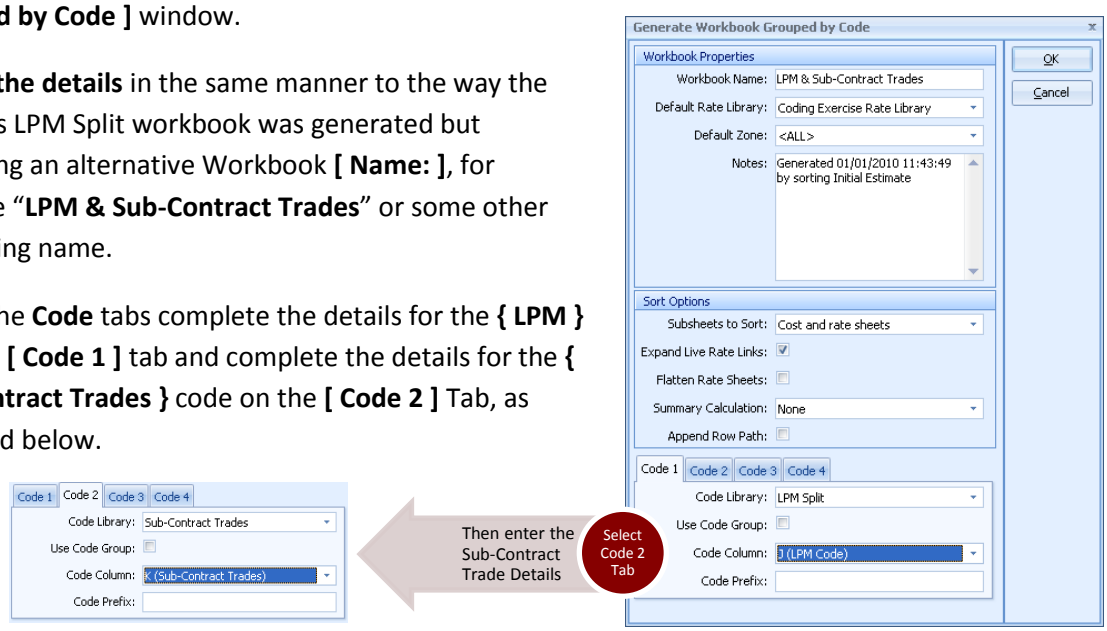
Multiple Coding Analysis

The previously generated workbooks have been generated using a single code. In this exercise we will generate a workbook using both the LPM Split and Sub-Contract Trades codes simultaneously. This will re-sort the initial estimate into a LPM analysis on the first level, and a trade analysis on the second level, followed by the items at level 3.

2.26. Firstly ensure the **{ Initial Estimate }** workbook is **re-selected**. Then **open** the **[Generate Workbook Grouped by Code]** window.

2.27. **Fill out the details** in the same manner to the way the previous LPM Split workbook was generated but specifying an alternative Workbook **[Name:]**, for example "**LPM & Sub-Contract Trades**" or some other identifying name.

2.28. Under the **Code** tabs complete the details for the **{ LPM }** code on **[Code 1]** tab and complete the details for the **{ Sub-Contract Trades }** code on the **[Code 2]** Tab, as indicated below.



2.29. **Click** on the **[OK]** button to generate the workbook. The first level of the workbook will show the LPM breakdown (as per the previous LPM only exercise), as shown below.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
1	lab	Labour				75,732		75,732
2	plant	Plant				7,028		7,028
3	mat	Materials				99,671		99,671
4	other	Other				60,000		60,000

Drilling down to the level 2 Cost sheet shows either the Labour, Plant or Material group element split down further by Sub-Contract Trade, as show below.

	lab	Labour				75,732		75,732
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
1	Gwks	Groundworker				13,209		13,209
2	Mas	Masonry				16,581		16,581
3	Roof	Roofing				6,139		6,139
4	Wnds	Windows (standard)				4,278		4,278
5	DryL	Dry Lining				9,327		9,327
6	Jnry	Joinery				10,713		10,713
7	Tile	Tiling				4,465		4,465
8	Dec	Decoration				2,556		2,556
9	Carp	Carpet & Vinyl				1,883		1,883
10	Mech	Mechanical and Plumbing				4,609		4,609
11	Elec	Electrical				1,508		1,508
12	Lift	Lift & Escalators				0		0
13	Att	Attendance by MC on other trades				464		464
14	Misc	Miscellaneous				0		0

Therefore at this level the analysis indicates that there is 13,209 of Groundworker Labour included in the estimate. Drilling down further will display the items from the initial workbook, and then drilling down into a Rate sheet with show the relevant Labour, Plant or Material split of the original rate.

Resource Analysis

This analysis will sort the initial estimate into the individual labour, plant and materials 'resource' items. Prior to undertaking this analysis we'll recap on the structure of the rate library and code library.

The Coding Exercise Rate Library contains both 'composite' and 'resource' rate items, each of which has a unique rate library Item Code, as the examples below:

Item Code	Description	Group	UOM	RATE
Location : <Default Location>				
C-Roof Struc	Roof Structure, Timber trusses	Comp-Roofing	m2	34.90
C-Roof Tiles	Interlocking concrete roof tiles	Comp-Roofing	m2	23.89
L-Roofer	Roofer	Z-LABOUR RESOURCES	hr	16.00
M-Roof, Conc HR Tile	Roofing, Concrete Half Round	Z-MATERIAL RESOURCES	no	15.00
M-Roof, Concr Tiles	Roofing, Concrete Interlocking	Z-MATERIAL RESOURCES	1000	1,100.00
M-Roof, Nails	Roofing, Nails	Z-MATERIAL RESOURCES	no	0.10
M-Roof, Underfelt	Roofing, Underfelt	Z-MATERIAL RESOURCES	m2	1.00
M-Timber, 19x19 Swn	Timber, 19x19 Sawn Softwood	Z-MATERIAL RESOURCES	m	0.40
P-Stihl Cut Off Saw	Stihl Cut Off Saw (incl. Blades)	Z-PLANT RESOURCES	day	25.00

The Initial Estimate workbook contains live links to the 'composite' rates in the Coding Exercise Rate Library.

The 'composite' rate calculations in the Coding Exercise Rate Library are each built-up using live links to various 'resource' rates which are also contained within the Coding Exercise Rate Library. The rate library Item Code associated with each 'resource' rate (refer to example above) used in the rate calculations are included in the A:Code column against each item, as the example below:

Rate Calculation

E1 Cell = =GetRate("L-Roofer",2) Rate = 23.89

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Factor	G:Total	H:Include
1	L-Roofer	Roofer	0.50	hr	16.00		8.00	8.00
2	M-Roof, Underfelt	Roofing, Underfelt	1.00	m2	1.00		1.00	1.00
3	M-Timber, 19x19 Swn	Timber, 19x19 Sawn Softwood	2.35	m	0.40		0.94	0.94
4	M-Roof, Concr Tiles	Roofing, Concrete Interlocking Tiles 500x250	0.01	1000	1,100.00		11.50	11.50
5	M-Roof, Nails	Roofing, Nails	20.92	no	0.10		2.09	2.09
6	P-Stihl Cut Off Saw	Stihl Cut Off Saw (incl. Blades)	0.01	day	25.00		0.36	0.36

The Item Code in the rate library for each of the 'resource' rate items has a corresponding Code in the Resource Codes code library which will be used in this analysis, as the example below:

Code Library Properties

Name: Resource Codes
Date Added: 12/02/2009 15:17:05
Date Modified: 18/05/2009 15:18:30

Update
Cancel
Insert
Edit
Delete
Move Up
Move Down

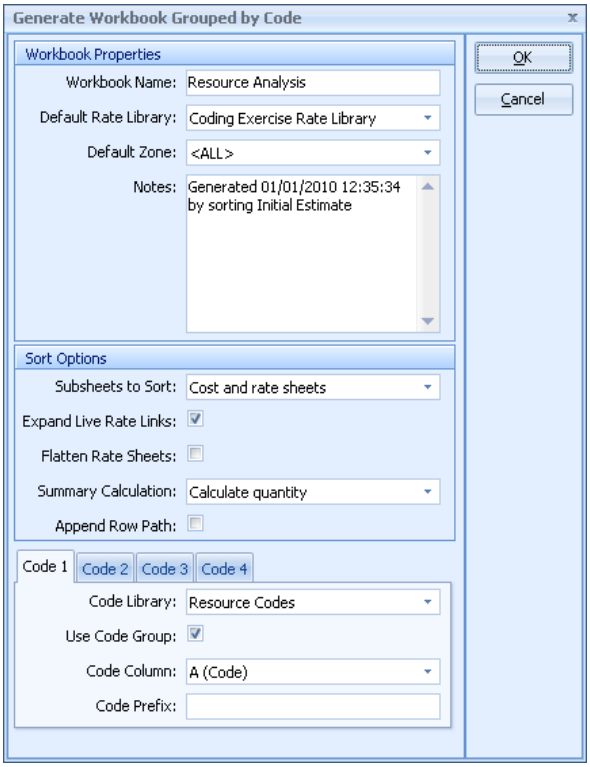
Code Group	Code	Description
Labour	L-Roofer	Roofer
Labour	L-Tiler	Tiler
Material	M-Roof, Conc HR Tile	Roofing, Concrete Half Round Tiles, 500r
Material	M-Roof, Concr Tiles	Roofing, Concrete Interlocking Tiles 500x
Material	M-Roof, Nails	Roofing, Nails
Material	M-Roof, Underfelt	Roofing, Underfelt
Material	M-Timber, 100x75 Swn	Timber, 100x75 Sawn Softwood
Material	M-Timber, 19x19 Swn	Timber, 19x19 Sawn Softwood
Plant	P-Stihl Cut Off Saw	Stihl Cut Off Saw (incl. Blades)
Plant	P-Vibrating Roller	Vibrating Roller
Plant	P-Water Pump	Water Pump

Notice also the Code Group column in the above example and that each item has been assigned to belong within a specific code group based on, in this instance, the type of resource. The Code Group may be used when generating a workbook grouped by code to provide an additional level of grouping.

Having briefly recapped, we'll now proceed to generate the workbook.

2.30. **Ensure** the **{ Initial Estimate }** workbook is **re-selected**. Then **bring up** the **[Generate Workbook Grouped by Code]** dialog.

2.31. **Fill out the details** as shown in the image below.



2.32. Note that the **[Code Column:]** is selected as **A:Code** as the resource codes are located within this column in the rate library calculation sheets.

2.33. For the same reason the **[Cost and Rate Sheets]** and **[Expand Live Rate Links]** options in the **[Sort Options]** section have been selected.

2.34. Notice also the **[Summary Calculation]** field has been selected as **Calculate Quantity**, this is explained in further detail below.

2.35. As noted previously, the **[Code Library]** being used in this analysis has been set up using Code Groups (categorized into the groups of Labour, Plant & Material) therefore ensure the **[Use Code Group]** checkbox is **ticked**.

2.36. Now **Click** on the **[OK]** button to generate the workbook.

You will observe the workbook is created summarizing Labour, Plant and Material totals at level 1 by using the Code Group details from the code library, and individual resource item totals at level 2 by using the Code and Descriptions from the code library.

		Material				99,671		99,671
	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total
2	M-Aggregate, Type 1	Aggregate, Type 1 Sub-base material	73	m3	40.00	2,920		2,920
3	M-Carpet, Al DS	Carpet, Aluminium Division Strip	14	m	5.00	70		70
4	M-Carpet, Broadloom	Carpet, Broadloom PC £15/m2	194	m2	15.00	2,910		2,910
5	M-Carpet, Gripper	Carpet, Gripper Rod	194	m	0.25	49		49
6	M-Carpet, Underlay	Carpet, Underlay	194	m2	3.00	582		582
	M-Cart Away.	Cart Away, Off Site	117	m3	18.00	2,106		2,106

As the Calculate Quantity option was selected in the Summary Calculation field when the workbook was generated the second level sheets additionally display a quantity, unit and rate against each item. The rate which has been inserted is a live link to the default rate library and uses the custom function =GetRate("zzz"), where zzz is the code for each item (as displayed in the A:Code column) and comes from the code library. As the code library and rate library have matching item codes the corresponding rate value is returned from the default rate library. The UOM is inserted from the default rate library for each matching rate and the quantity of each item is calculated using a standard formula.

If the Use Code Group option had not been selected the Labour, Plant and Material totals at level 1 would have been skipped and the individual item totals created on the level 1 cost sheet.

Disclaimer

This dataset is an example only, to be used solely for the purpose of the training exercise. It is not to be used as a template for business operations. Exactal and its employees accept no liability for use of this dataset for business purposes.

Appendix A: Coding Overview & Reference

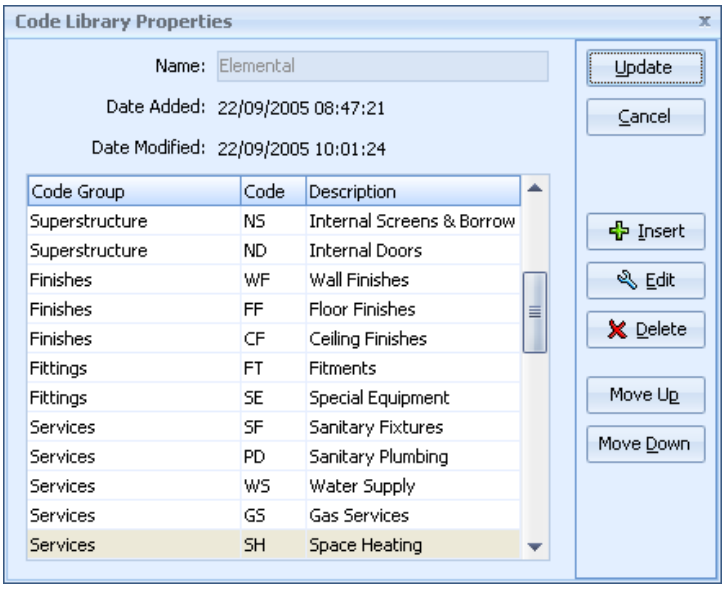
A.1 Code Libraries

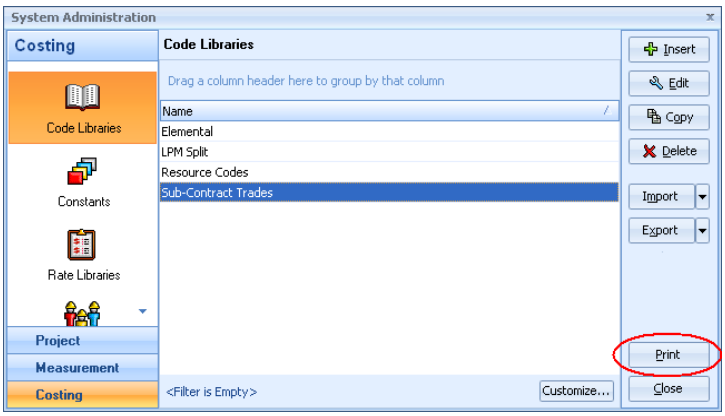
Code Libraries are set up in the Code Libraries section located under the Costing group in the System Administration area of CostX® and consist of three fields of information:

Code – This is a short unique reference code for the item, this is also the code that is required to be placed in the selected column in a workbook to enable a new workbook to be generated and sorted using this code library. Codes may be up to 20 characters in length.

Description – This is a description for the item, this text will be placed as a grouping level description in the B:Description column of a new workbook during its generation, items with a matching Code will be placed sequentially in the level beneath.

Code Group – (Optional) This allows similar items to be arranged in groups and can provide additional functionality during the generation of the new workbook.





The example to the left shows how a Code Library might be arranged on an Elemental basis and indicates how similar items have been assigned in Code Groups.

The order in which the items appear in the list will be replicated in a new workbook when it is generated. Items can be moved up and down in the list using the Move Up and Move Down buttons.

It is possible to print the contents of a Code Library to use as a reference list whilst entering codes into a workbook. Open the Costing group in System Administration and select the Code Libraries option, highlight the desired Code Library and click the Print button to the right of the list. The required printer may then be selected.

A.2 Placing Codes in Workbooks

In a workbook codes are placed in either the A:Code column or one of the 50 user columns to the right of the H:Total column. Workbooks can be set up with a number of different coding structures to allow different or multiple sorting options on same workbook. Codes pertaining to a particular coding structure (and code library) must be located in the same column at every level (including rate and quantity sheets and rate library item calculation sheets if coding is extended into these).

For convenience it is possible to change the User 1, User 2, User 3 … User 50 headings shown at the top of the user columns in the workbook – Select the required workbook in the workbook list window then click on the Properties button in the Workbook group on the Workbooks Ribbon Toolbar and navigate to the Column Names tab in the Workbook Properties dialog, the column names displayed in the Names column may then be overwritten or amended as necessary.

Codes may be entered manually or dragged in from the Codes List view at the bottom left of the Costing View (the cell contents may then be copied and pasted and filled down in the usual manner). Codes entered in a worksheet must match identically the text in the 'Code' field of the corresponding Code Library, If a code is entered (or incorrectly entered) which does not match the selected code library entry a group will be created in the new workbook with a description of 'Invalid codes' and will include such items.

If an item is not coded (either at the level in which it has been entered or at a preceding higher level) a group will be created in the new workbook with a description of 'Uncoded' and will include such items.

Title Coding

Multiple codes can be included in the same workbook cell if separated with a semicolon ';'. This may be required for example for a title or heading located on a preceding row or level. By specifying multiple codes against an item will allow it to be replicated in each of the corresponding groups in the new workbook. An example is included below:

At level 2 of a workbook (below) rows 2-6 relate to joinery items denoted by the Code 'Jnry' in column J, rows 12-14 relate to roofing (Roof) items and rows 20-22 relate to decoration (Dec) items. The title on row 1 however relates to all three trades and is therefore coded 'Jnry; Roof; Dec' such that it will appear as a title in each of the resulting three groups in the new workbook.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	J:Sub-Contract Trades
1	02C	**Roof**							Jnry; Roof; Dec
2	02C	**Carpentry / timber framing / first fixing**							Jnry
3	02C	**Trusses**							Jnry
4	02C	Allowance for Roof structure based on GIFA	290	m2	34.90	10,121		10,121	Jnry
5	02C	**Plates**							Jnry
6	02C	100 x 75, sawn treated softwood; bedded on mortar	97	m	5.15	500		500	Jnry
11									
12	02C	**Plain roof tiling**							Roof
13	02C	**Roof coverings**							Roof
14	02C	Roof coverings; 45deg pitch; Interlocking concrete roof tiles 500 x 250mm; Including 19 x 19mm treated softwood battens	576	m2	23.90	13,766		13,766	Roof
19									
20	02C	**Painting / clear finishing**							Dec
21	02C	**General surfaces**							Dec
22	02C	1 undercoat and 1 full coat white gloss paint; Isolated surfaces girth n.e. 300mm; Eaves & Gutter boards	190	m	3.60	684		684	Dec
23									

At the preceding Level 1 of the same workbook row 3 includes a heading which is also required to be included in the three trades in the new workbook and therefore also has been coded to include the Jnry, Roof & Dec codes (it also includes other trade codes required for other sub-element groups to which it also relates).

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	J:Sub-Contract Trades
1	01	**Substructure**							Gwks; Mas
2	01	Substructure	290	m2	107.11	31,061		31,061	Gwks; Mas
3	02	**Superstructure**							Jnry; Roof; Dec; Mas; Wnds; DryL
4	02A	Frame	290	m2	0.00	0		0	Misc
5	02B	Upper Floors	290	m2	0.00	0		0	Misc
6	02C	Roof	290	m2	117.62	34,109		34,109	Jnry; Roof; Dec
7	02D	Stairs	290	m2	0.00	0		0	Misc
8	02E	External Walls	290	m2	88.89	25,779		25,779	Mas

Consequently the Joinery section of the newly created workbook looks as below having picked up the Heading from Level 1- Row 3, the title from Level 2 – Row 1 and the items from Level 2 – Rows 2-6, all presented in the correct order.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	J:User2
1	02	**Superstructure**							Jnry; Roof; Dec; Mas; Wnds; DryL
2	02C	**Roof**							Jnry; Roof; Dec
3	02C	**Carpentry / timber framing / first fixing**							Jnry
4	02C	**Trusses**							Jnry
5	02C	Allowance for Roof structure based on GIFA	290	m2	34.90	10,121		10,121	Jnry
6	02C	**Plates**							Jnry
7	02C	100 x 75, sawn treated softwood; bedded on mortar	97	m	5.15	500		500	Jnry

Additionally the Roofing section of the newly created workbook looks as below having also picked up the Heading from Level 1- Row 3 and the title from Level 2 – Row 1 but the items from Level 2 – Rows 12-14, again all presented in the correct order.

	A:Code	B:Description	C:Quantity	D:Unit	E:Rate	F:Subtotal	G:Factor	H:Total	J:User2
1	02	**Superstructure**							Jnry; Roof; Dec; Mas; Wnds; DryL
2	02C	**Roof**							Jnry; Roof; Dec
3	02C	**Plain roof tiling**							Roof
4	02C	**Roof coverings**							Roof
5	02C	Roof coverings; 45deg pitch; Interlocking concrete roof tiles 500 x 250mm; including 19 x 19mm treated softwood battens	576	m2	23.90	13,766		13,766	Roof

Hierarchy of Coding

Workbooks in CostX® follow a hierarchy allowing each row at each level to 'Drill Down' to a further sheet, down to 10 levels in fact.

It follows therefore the Coding flows in a similar manner unless overridden by coding at a lower level. Consequently a row with a drill down which has been coded with say Jnry and Dec codes would include all items at all subsequent levels in the resulting Joinery and Decoration groups in the new workbook unless they are overridden with a code or codes inserted at a lower level.

Coding into a Workbooks Rate and Quantity Sheets

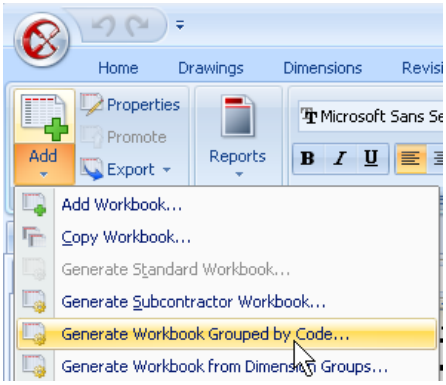
In the same way that Codes can be inserted on a Cost Sheet at any level they can also be inserted on Rate Sheets and Quantity Sheets and have the same effect. If there are corresponding codes (i.e. codes pertaining to the same code library) on the cost sheets the same column will need to be used.

Coding into Rate Library Calculation Sheets

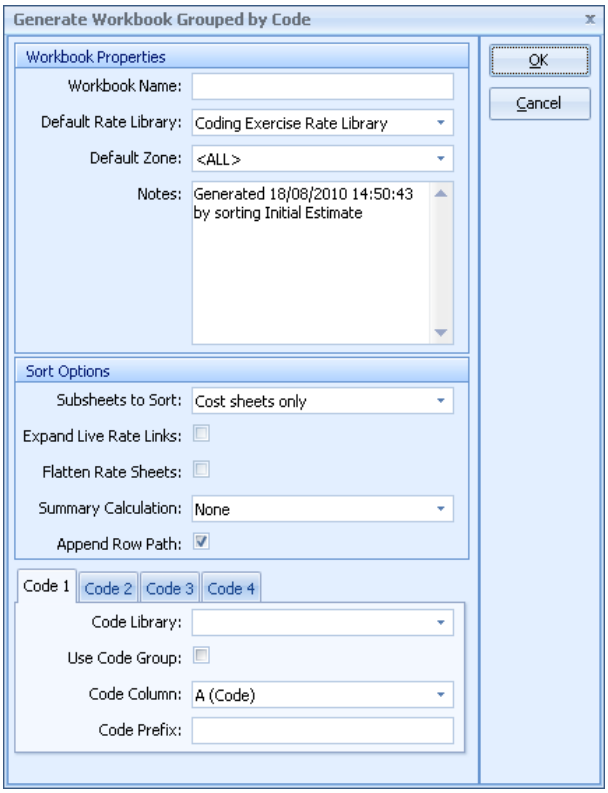
Items built up on a Rate Calculation sheet in a rate library can also have codes inserted. If there are corresponding codes (i.e. codes pertaining to the same code library) on the cost or rate sheets of the workbook the same column will need to be used.

A.3 Generate Workbook by Code

In order to generate a new workbook grouped (sorted) by code from an existing source workbook it is first necessary to have inserted the relevant coding structure into the source workbook and have a code library set up in System Administration containing all of the codes inserted in that workbook.



To generate the new sorted workbook first select the source workbook from the workbook list window. Then click on the drop down arrow of the Add Workbook button and select the Generate Workbook Grouped by Code option.



The Generate Workbook Group by Code dialog is then displayed as per the image to the left, this section explains each of the fields and inputs required, once the required settings have been entered however click the OK button to generate the new workbook:

Workbook Name – This is the name the newly created workbook will be given in the current building file. Many users find it useful to include in the name a reference to the source worksheet and code used to generate the workbook for ease of identification at a later date, this information may also be entered in the Notes field.

Default Rate Library – This is optional, however if live rate links exist in the source worksheet this would normally be selected to mirror the default rate library of the source workbook. The Default Rate Library field is pre-filled with the name of the default rate library from the source workbook if one has been selected.

Default Zone – This applies a zone filter in the newly created workbook based on the zone selected. By default all zones are included which is indicated by the keyword <ALL>. If a different default zone is specified, the functions that live link to dimension groups (e.g. GetArea) will return results filtered by the selected default zone unless the live link function references a specific Zone or Zones. In other words, if individual functions do not have any zones specified, and the default zone is set on the workbook, those functions will return the value of dimensions in the selected default zone only. If the default zone is selected as <Blank>, all dimensions with a blank zone are included.

Notes – Optionally notes may be entered in the Notes field, by default the notes field is pre-filled with a description indicating the date and time the workbook was generated and the name of the source workbook.

Subsheets to Sort – Specifies whether just the Cost Sheets are checked for Codes or additionally the Quantity or Rate Sheets. The options available have the following effects:

Cost sheets only - The Codes inserted in the cost sheets only are used to re-sort the workbook, any Codes in the Qty & Rate sheets are ignored. Qty and Rate breakdowns are maintained.

Cost and quantity sheets – The Codes inserted in the Cost and Qty sheets are used to re-sort the workbook and if necessary the Qty breakdown is split according to the Code, any Codes in the Rate sheets are ignored. Rate breakdowns are maintained.

Cost and rate sheets – The Codes inserted in the Cost and Rate sheets are used to re-sort the workbook and if necessary the Rate breakdown is split according to the Code, any Codes in the Qty sheets are ignored. Qty breakdowns are maintained.

Expand Live Rate Links – *Only available when the Cost and rate sheets option is selected, as above.* If selected, this option will check additionally for Codes in the Rate Calculation Sheets of any live linked rates in a rate library. Its function will be the same as if the rate buildup was contained on a Rate sheet in the workbook.

Flatten Rate Sheets – *Only available when the Cost and rate sheets option is selected, as above.* If selected this option will bring the line items from the rate breakdown (and rate library calculation sheets if Expand Live rate Links is also ticked) up to the Cost sheet combining the descriptions and multiplying out their quantities.

Summary Calculation – If the new workbook is generated using the default 'None' then the summary level(s) will carry forward the total of the relevant sub sheets, the Quantity / Unit / Rate columns will be left blank.

It is possible for the summary level of the new workbook to automatically have the Quantity, Unit and Rate columns filled in if appropriate. The alternative options have the following effects:

Calculate quantity - If this option is chosen, the Rate field is filled with a GetRate() formula returning a rate from the specified default rate library with a code matching the item code in the A:Code column, the Unit field uses the UOM for that rate and the Quantity field is calculated by dividing the subtotal by the rate. A default rate library must be selected and rates must exist in the rate library specified for the codes denoted in the A:Code column for this option to be able to return values in the Rate and Quantity columns.

Calculate rate - If this option is chosen, GFA rates are calculated in the Rate column. The Quantity column is filled with a GetGFA() formula, the Unit column uses m2 or ft2 etc. depending on the Building's UOM, the Rate column is calculated by dividing the subtotal by the GFA quantity. A building GFA must have been specified (using the Add to GFA checkbox in the Dimension Group Properties dialog for the relevant Dimension Groups) for this option to be able to return values in the Rate and Quantity columns.

Append Row Path – Enabling this function will add in brackets at the end of each item in the newly generated workbook the 'drill down' path to the original item in the source worksheet e.g. in the format (10.17.3).

The last section of the Generate Workbook Grouped by Code window has four Code tabs. CostX® has the ability to utilize up to four different coding structures simultaneously which can be entered on these tabs sequentially. The inputs are identical on each of the four tabs and are as follows:

Code Library – This specifies which of the various Code Libraries stored in the System Administration area of the system is to be used to look up the codes inserted on the workbook in the relevant column (specified in the Code Column field, see below). If only the Code 1 tab is completed a group is generated at level 1 of the new workbook for each of the Descriptions contained within the specified code library and then the items from the source workbook are systematically sorted into the relevant group (drilling down as necessary) by matching the code inserted in the workbook to the code in the library. If multiple Code tabs are completed a group is generated at level 1 of the new workbook for each of the Descriptions from the code library specified on the Code 1 tab, further groups are generated at level 2 (under each of the groups at level 1) for each of the Descriptions from the code library specified on the Code 2 tab and so on if the Code 3 and Code 4 tab are also completed, the items from the source workbook are sorted into a level immediately below the final grouping level.

Use Code Group – A tick in this checkbox would specify an additional level of grouping (using the Code Group names from the code library) at a level immediately above the level containing the groups created from code library Descriptions (refer to Code Library above). If Use Code Group was specified on the Code 1 tab, a group is generated at level 1 of the new workbook for each of the Code Group names contained within the specified code library, a further group is generated at level 2 of the new workbook for each of the Descriptions contained within the specified code library and then, if no further Code tabs are completed, the items from the source workbook are systematically sorted under the relevant group. If further Code tabs are completed additional grouping levels would also be created based on the Descriptions from the code library specified on each subsequent Code tab (and additionally Code Group names if the Use Code Group is also specified on those Code tabs) before the level containing the items from the source workbook.

Code Column – This specifies which column in the source workbook contains the codes relating to the specified Code Library on each Code tab. The details entered in the Code Library and Code Column work in tandem as the generated workbook will be based on a match between the two.

Code Prefix – In some cases, such as an imported workbook, codes in a workbook may be prefixed (e.g. Q-) whereas codes in an associated code library may not. If the code library doesn't have the prefix, it can be temporarily applied at the time of generation by entering the relevant text into the Code Prefix field. For example, if the codes in the workbook were Q-Gwks, Q-Mas, Q-Roof … and the corresponding codes in the code library were Gwks, Mas, Roof … the 'Q-' could be specified in this field as a code prefix rather than altering the code library or workbook.

costX 4.1

ADVANCED
TRAINING EXERCISE

BIM & 3D Measurement

ASSOCIATED DATASET

Sample Drawing Files

- 3D Training Module 1-4 Office Drawing.dwfx
- 3D Training Module 5 Structural Drawing.dwf
- 3D Training Module 6 Revised Structural Drawing.dwf
- 3D Training Module 7 QSID Drawing.dwfx
- Module 8 Drawing With Base Quantities.ifc
- Module 8 Drawing Without Base Quantities.ifc

BIM Import Templates

- BIM Import Revit General.xslt
- BIM Import Revit by QSID or ELEMENT CODE.xslt

Manuals

- CostX® Advanced Manual
- Digital Drawing Files for Measurement Purposes

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The cost Family of Products

CostX®

CostX® is Exactal's premium product. More companies are using CostX® for their complete estimating solution and receiving strong returns on their investment. CostX® is a powerful project costing tool that enables estimators to use the most advanced on-screen measurement system while embracing BIM to deliver better results to clients. It can reduce take off time by up to 80%.

CostX® 2D

CostX® 2D does not support 3D/BIM drawings or allow for auto-revisioning, but still contains Exactal's world-leading on-screen 2D takeoff and integrated workbook. If your company does not receive 3D/BIM drawings but still wants to take advantage of the faster, smarter and more accurate estimating solution on the market, CostX® 2D is the best choice for you.

CostX® Takeoff 2D

CostX® Takeoff 2D is Exactal's most basic product but still allows you to use the world-leading on-screen 2D takeoff, meaning you can measure areas, lengths and counts in a few clicks. If you have only used manual measurement and Excel® before and want to start off with something simple, CostX® Takeoff 2D may be the best choice for you.

FEATURES	CostX®	CostX® 2D	CostX® Takeoff 2D
BIM models/3D drawings	•		
2D drawings (incl PDFs)	•	•	•
Auto Revisioning	•		
Workbooks	•	•	
Subcontractor Comparison	•	•	

CostXL

CostXL allows you to link CostX® data directly into your Excel® spreadsheets

CostX® Live

CostX® Live gives you access to live CostX® data on the go through the web.

FREE

CostX® Viewer

CostX® Viewer makes it easy to freely share your CostX® projects with anyone.

Call us now for a **FREE** demonstration of our estimating solutions.

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A DIMENSIONEERING COMPANY

Contents

Introduction

This Training Exercise aims to build on the knowledge learnt in the Introduction to CostX® course in respect to working with three dimensional (3D) Building Information Models. It is comprised of several modules in which the tools available within CostX® will be utilized to extract parametric data from BIM Model files, measure quantities directly from 3D Models, and automatically update data for progressive design changes. The 3D Model files used in this training exercise are Design Web Format (DWF/DWFx™) and IFC files which have been published from Autodesk® Revit® Architecture.

Save the Associated Dataset files to a location on your computer or network that may be accessed during the training exercise and work through the training modules sequentially.

Throughout this document you will see **(PFC 5-1)** references. These identify the relevant Process Flow Charts related to that particular section of the training, copies of which can be found on the www.exactal.com website.

Refer to the CostX® help files by pressing the F1 key, or by clicking the Help icon in  the top right hand corner of the screen for a full explanation on how to use and implement functions.

Prior to undertaking this training, the CostX® Advanced Manual is essential reading.

Formatting Conventions Used

Following are the formatting conventions used throughout this training exercise.

Bold Font	Directions for User
[Bold Font]	Functions fixed in CostX® for example button name, right click options, field names, etc.
{ Bold Font }	Options which a user can change, for example drawing name, dimension group name, model map name, workbook name.
“Bold Font”	Fields a user has to enter, for example building name, workbook name, dimension group name.

3D Drawing Files Overview

Before commencing with the training exercise it is necessary to understand the difference between 3D CAD drawings and 3D BIM Models.

CAD Drawings

Traditional 2D and 3D CAD programs use vector graphics to replicate the human process of drawing on paper. Vector graphics is the use of geometrical primitives such as points, lines, curves and shapes or polygons, which are all based on mathematical equations, to represent images. Regardless of whether it is rendered in 2D or 3D, a vector based CAD drawing is simply a collection of lines, arcs and text, drawn to graphically represent physical entities.

Because they are based on geometric data, these graphical representations cannot describe the properties and attributes of the entities they represent, nor the relationship of the entities to each other. To overcome this limitation, design-related industries have developed object-based data model applications in which the interface remains graphic, but geometry is only one of the properties of the entities, which will also contain physical and performance data such as spatial relationships, geographic information, quantities and properties of the building components.

BIM Models

BIM refers to (and is an acronym for) the process of virtual Building Information Modelling based on digital information exchange. Throughout this process, various disciplines can share the data model and manipulate it to progressively refine the design. Consequently the data model is often referred to as a BIM Model. A BIM Model is an arrangement of three dimensional virtual objects where each object is of a known function and type and where a set of rules exist which determine the inter-relationship with other virtual model objects. The objects are termed “intelligent” because they comply with these behavioural parameters. A door knows that it is a door, and when it is placed into a wall, the wall knows it has to have an opening to suit that particular door. The parametric properties are inter-related. If the door size is changed, the wall opening will change to suit.

All of the physical and functional characteristics of the building model are held in the central database. As the model changes, all of the objects within it parametrically adapt themselves to the new design. Since the database holds all the information for each of the model objects, it will always represent the latest iteration of the design – plus, as a database, it is capable of being interrogated in various ways to extract differing types of data. Hence, the more data that is added to it, the wider the range of analyses such as building performance, schedules and costs that can be leveraged from it.

CostX® and BIM Models

The BIM software primarily used by building designers includes Revit® by Autodesk®, MicroStation® by Bentley®, and ArchiCAD® by Graphisoft®. All have a native file format (RVT, DGN and PLN respectively) but these formats are not interoperable and the data models cannot be shared with outside parties. The medium of exchange will therefore generally be limited to drawing views (but not object data) exported to graphical CAD formats such as DWG™, or 2D drawings printed to paper or PDF.

However, Revit® is also able to publish 3D data in DWF™ format and all BIM software is able to export in a file format called IFC (Industry Foundation Classes) which is a neutral and open specification that is not controlled by a single vendor or group of vendors. Essentially a DWF™ is like an intelligent 3D PDF; it is read-only and contains restrictions on some of the model data provided – however it is still data rich because it is 3D and retains key parametric properties of the objects.

CostX® is able to view data models in DWF™, DWFx™ and IFC format and utilize the database information to automatically generate quantities. Of course, the quality of the output is reliant on the parametric coding of the objects within the database, but as designers continue to develop their object libraries the amount of data available will improve. However, for estimating or scheduling purposes it will generally be necessary to augment the BIM data with additional measurement from 2D or 3D drawing views.

Industry Foundation Classes (IFC) Files

IFC is a data model standard published by buildingSMART® for open BIM interoperability. It is intended to be a common format to enable data sharing and exchange across multiple applications and disciplines (referred to as “openBIM”).

IFC-compliant applications can both export and import IFC data models, and re-use or edit the data. Because each of the proprietary data model formats have their own architecture, the import and export process involves mapping or translating the data between their internal schema and the IFC schema – and back again.

Proprietary data models are tightly integrated with their host application and optimised to work with it. In contrast, the IFC model is more complex because it has to be more broadly structured to allow entities to be combined or related in various ways as required by the different proprietary applications with which it needs to work. For simplicity, most of the sample files used in this training are DWFx™, however in Module 8 we review an IFC file exported from Revit®, compare the data structure to a DWFx™ file exported from the same model, and generate quantities from the IFC model data.

Revit® Model Structure

Within the Revit® object library, information about the model objects (also termed Elements), is classified into a hierarchical structure of Categories, Families, and Types. The data held about the objects is referred to as the Type parameters. When placed into a building model, the occurrence of the object within the model is called an Instance. The data determining the behaviour of the object in a particular instance is referred to as Instance Parameters. The Instance Parameters will usually include certain dimensional data (quantities) of the object.

The following extract from the Revit® Architecture 2010 User's Guide overviews the classification system.

Revit Architecture

Revit Architecture 2010 User's Guide > Revit Essentials > What Is a Project? > Building with Elements >

Categories, Families, and Types

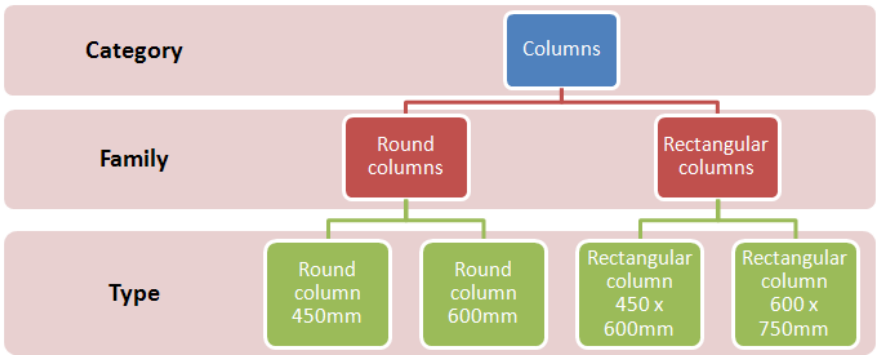
Revit Architecture classifies elements by categories, families, types, and instances.

Category: A category is a group of elements that you use to model or document a building design. For example, categories of model elements include walls and beams. Categories of annotation elements include tags and text notes.

Family: Families are classes of elements in a category. A family groups elements with a common set of parameters (properties), identical use, and similar graphical representation. Different elements in a family may have different values for some or all properties, but the set of properties—their names and meaning—is the same. For example, six-panel colonial doors could be considered one family, although the doors that compose the family come in different sizes and materials. Structural members (such as w shapes) are another family. See Revit Families.

Type: Each family can have different types. A type can be a specific size of a family, such as a 30" X 42"(A0) title block or a 32" x 84" (910 x 2110) door. A type can also be a style, such as default aligned or default angular style for dimensions. A family can have several types. For example, a table may be available in several sizes. Each size table is a different type within the same family.

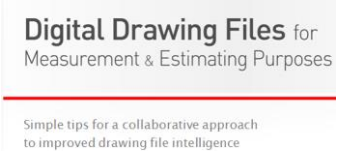
Instance: Instances are the actual items (individual elements) that are placed in the project and have specific locations in the building (model instances) or on a drawing sheet (annotation instances). Each instance belongs to a family and, within that family, a particular type.



Drawing File Optimisation

Exactal publishes a document which provides general tips and guidance to designers on how various drawing file types may be arranged and optimized for quantities measurement and estimating activities, and to assist in team communication. These are not mandatory requirements, but simply reflect some of the more common optimizations.

Read this document to gain an appreciation of the optimisations, and provide copies to designers you are working with as guidance for what you would like to receive from them.



Measurement Techniques Overview

In CostX®, Dimensions and their associated values are taken from drawings and collated into Dimension Groups, which aggregate the individual Dimension values. Dimension Groups are also collected together in Dimension Group Folders. Dimension values may be imported directly from quantity values (also known as object properties) contained within the data model for the various objects and may also be measured from the 3D drawing view. Some of the methods require the Dimension Group(s) to be created prior to importing or measuring dimensions and some of the methods will automatically create the required Dimension Groups and Folders as dimensions are imported. Each of the methods will be covered in a detailed measurement module. The methods are:

- Object Mode
- Importing Dimensions using a BIM Template
- Importing Dimensions using a Model Map
- 3D Measure Mode

These methods are summarized below and more detailed instructions are also included in the table which follows.

Object Mode

With this method dimensions with associated values are imported from object property values contained within the drawing file into the currently selected Dimension Group. This method requires the Dimension Group to be created and selected prior to importing dimension values. When the Dimension Group is created it is necessary to specify (map) which of the available object properties are imported and which Dimension Group value field they are imported into. Once the Dimension Group has been established the user can then choose the objects for which dimensions are to be imported by either by selecting them individually or by area in the drawing window or by selecting one or more common properties with which to match (select) objects.

Import Dimensions using a BIM Template

With this method Dimension Group folders and Dimension Groups are created automatically and dimensions with associated values are imported from object properties contained within the data model based on a set of rules contained within a BIM Import Template. The BIM Import Template specifies (maps) which of the available parametric object property values are imported and which Dimension Group value field they are imported into. The user can choose the objects for which dimensions are to be imported by filtering or hiding the displayed objects or layers before commencing the import process.

Import Dimensions using a Model Map

With this method Dimension Group folders and Dimension Groups are created automatically and dimensions with associated values are imported from object properties contained within the data model based on a set of rules defined by the user in a Model Map. The Model Map allows the user to specify (map) for different groups of objects which of the available object properties are imported and which Dimension Group value field they are imported into. The user can choose the objects for which dimensions are to be imported by either selectively defining the Model Map, or by filtering or hiding the displayed objects or layers before commencing the import process.

3D Measure Mode

With this method dimensions are measured on screen into the currently selected Dimension Group by selecting vertex points (e.g. corners or ends of objects on the drawing): one for a count type of Dimension Group, two or more for a length, and three or more for an area. This method requires the Dimension Group to be created and selected prior to measuring the dimensions, but does not require any mapping to the values contained in the data model because the dimensions are being measured from the drawing and not imported from the object properties.

Measuring – 3D Measure Mode

Create or select a Dimension Group of the correct measurement type, then:

- **Areas** - click on each vertex in sequence around the area to be measured, at the last corner, before returning to the start, press the Enter key. All vertex points must be in the same flat plane.
- **Lengths** – click on the vertex at one end of the length to be measured and move the mouse to the vertex at the other end of the length then click again. To add further segments to the length, prior to moving the mouse cursor hold down the Ctrl key and then click on the required additional vertex points, release the Ctrl key when the measurement is complete.
- **Counts** – click on a vertex to register a count.

TIP: If a previous measured dimension is highlighted (selected) when commencing the measurement of a new dimension, hold down the O + Ctrl keys (O + Shift for Lengths) when clicking on the first vertex point. Alternatively zoom in further or temporarily turn off the display of Measured Items.

Creating a Dimension Group for Object Mode Measurement

- Filter the displayed objects and / or adjust the view to suit.
- Highlight the object to be measured by moving the mouse cursor over it in the drawing window.
- Right click and select Create Dimension Group from the right click menu.
- In the Dimension Group Properties dialog box complete as a minimum the Name, Folder and Measurement Type. Additionally a Default Height and display Colours for the dimensions may also be entered or selected.
- If the Weight or the Custom fields are going to be used the Extended Properties section allows the Unit of Measure for the Weight value and an alternative Name and Unit of Measure for the three Custom values to be selected or defined.
- Select the Object Properties tab. For each of the required dimension fields in turn, click on the drop down arrow button to the right of the required dimension field and select the appropriate object property (the dimension property source). Once the required dimension fields have been completed click the Insert button.

Importing Individual Dimensions – Object Mode

- Filter the displayed objects and / or adjust the view to suit.
- Create a Dimension Group for Object Mode measurement (see above) for the object(s) intended to be measured.
- Highlight the object to be measured by moving the mouse cursor over it in the drawing window, the object will highlight in green.
- Click once with the left mouse button, the dimension will be created in the currently selected Dimension Group extracting values from the BIM object properties specified in the dimension property source fields previously set up in the Dimension Group properties dialog.

Importing Multiple Dimensions – Object Mode

- Filter the displayed objects and / or adjust the view to suit.
- Create a Dimension Group for Object Mode measurement (see above) for the objects intended to be measured.
- Highlight an object of the type to be measured by moving the mouse cursor over it in the drawing window, the object will highlight in green.
- Right click and choose the Import Objects In / Custom...option from the right click sub-menu.
- Place ticks in the checkboxes to the left of the required object properties fields. Only objects which are currently displayed and have matching values to all of the object properties ticked will be selected (and hence associated dimensions created in the Dimension Group).
- Click OK to import the dimensions.

Importing Multiple Dimensions – Using a BIM Template

- Ensure the required objects (i.e. the objects for which dimensions are to be imported) are visible in the drawing window. *To import dimensions for all objects contained in the drawing, right click over the drawing window and select the Show All Objects option before importing the dimensions. To import dimensions for selected object groups or selected objects filter and / or hide objects before importing the dimensions.*
- Click the Import button located in the BIM group on the Dimensions Ribbon Toolbar and select the Import Dimensions Using BIM Template option. If objects have been hidden or filtered a warning will be displayed.
- In the Select BIM Import Template dialog browse to and select the required BIM Import Template to use for the import and once selected click the Open button to commence the import.

Importing Multiple Dimensions – Using a Model Map

- Ensure the required objects (i.e. the objects for which dimensions are to be imported) are visible in the drawing window. *To import dimensions for all objects contained in the drawing, right click over the drawing window and select the Show All Objects option before importing the dimensions. To import dimensions for selected object groups or selected objects filter and / or hide objects before importing the dimensions.*
- Click the Import button located in the BIM group on the Dimensions Ribbon Toolbar and select the Import Dimensions Using Model Map option. If objects have been hidden or filtered a warning will be displayed.
- In the Select Model Map dialog select the required Model Map to use for the import and once selected click the Select button to commence the import.

Creating a Model Map

- Click the Model Maps button located in the BIM group on the Dimensions Ribbon Toolbar.
- Select either the Global or Project tab to create either a globally available (i.e. to all projects) or project specific model map respectively. Click the Insert button.
- In the Model Map Properties dialog box complete as a minimum the Name field. Additionally Notes may also be entered. Click OK to open the new model map.
- Select the first node in the model tree window for which a model map entry is to be defined.
- Complete each field required in the mapping definition window by either:
  - Dragging the required object property field (column) from the schedule window and dropping it into the required field in the mapping definition window.
  - Entering text (a text string) into a text based mapping definition field (e.g. Folder, Dimension Group, Dimension, Zone, Weight UOM or Custom 1-3 Name or UOM) enclosing it with " " (quotation marks).
  - To add a further object property or unformatted number in a field which generates a dimension value (e.g. Count, Length, Height, Area, Wall Area, Volume, Weight Value or Custom 1-3 Value) add the required mathematical operator (+ addition, - subtraction, * multiplication or / division) at the end of the object property name or unformatted number, then drag in the additional object property field or enter the required unformatted number.
  - To add a further object property or text string into a text based Mapping Definition field add the + (plus) sign at the end of the object property name or text string, then drag in the additional object property field or enter the required text string enclosing it with " " (quotation marks).
  - If required, select a specific Measurement Type of either Count, Length, Area or Volume using the Measurement Type drop down field. Alternatively leaving as Automatic will select the most appropriate measurement type based on the other completed fields.
- Repeat for each of the additionally required nodes in turn.
- Once the required entries have been defined in the model map click on the Close button.

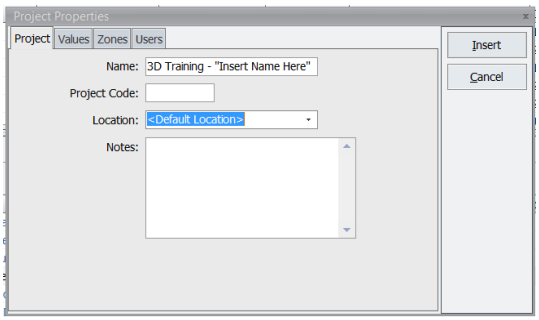
Module 1A Getting Started

Creating a New Project (PFC 1-3)

For this training exercise we will firstly create a new Project into which we will create our new Buildings for the modules.

M1A.1 If a building is currently open **click** the **[Main Menu]** button and **select** the **[Close Building]** option.

M1A.2 **Click** on the **[New Project]** button at the right of the Select Building dialog



If the Select Building dialog is not currently displayed double click on the blank background below the ribbon toolbar). An empty Project Properties dialog will open.

M1A.3 **Enter** a **[Name]**: for the project as **"3D Training-" followed by your name**.

M1A.4 Use the dropdown menu in the **[Location:]** field to select **<Default Location>** then **click [Insert]**. Your new Project has now been created.

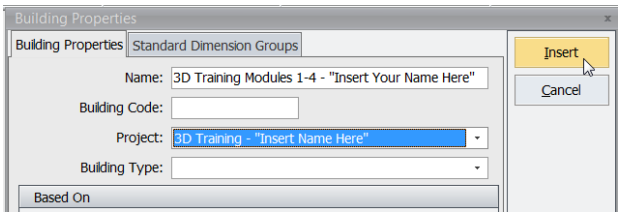
Creating a New Building (PFC 1-4)

Now the training project has been created we will create a new building for the first training module.

M1A.5 **Click** on the **[New Building]** button on the right of the dialog.

A new building may also be created from the Main Menu by selecting the New Building option e.g. if the Select Building dialog isn't displayed).

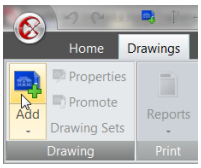
M1A.6 The **[Building Properties]** dialog will be displayed, enter **"3D Training Modules 1-4 -" followed by your name** in the **[Name:]** field.



M1A.7 In the **[Project:]** field use the drop down menu to **select** the **'3D Training-*Your Name*'** project that was previously created.

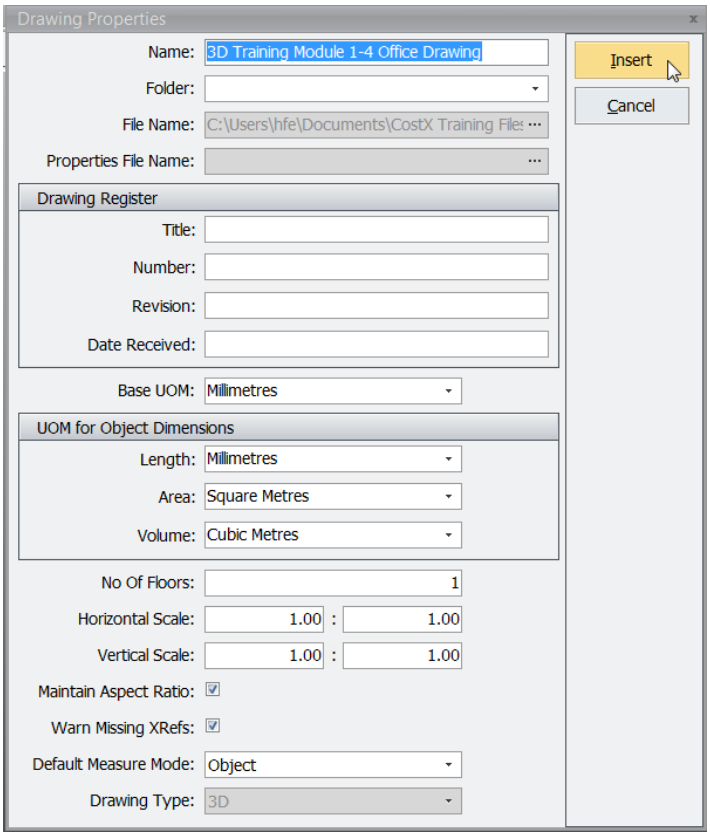
M1A.8 Ignore the Based On section and **click [Insert]**. This will create the new Building and the CostX® display will open in the Dimension View ready for you to add drawings etc.

Adding a 3D BIM Drawing (PFC 5-1)



M1A.9 **Click** on the **[Drawings]** Ribbon at the top of the screen to open the Drawings Ribbon Toolbar, then **click** on the **[Add]** button (see right), if the drop-down menu appears simply select the Add Drawing option.

M1A.10 A browser window will open, browse for and **select** the **{ 3D Training Module 1-4 Office Drawing.dwfx }** drawing from the dataset you saved previously to your computer or network drive then **click** on the **[Open]** button. The Drawing Properties dialog will be displayed:



M1A.11 Ensure the settings are as indicated above and **click [Insert]** to add the BIM drawing to the building.

M1A.12 The drawing will now be visible in the drawing window, displaying the default front view.

Module 1B Views and Drawing Navigation

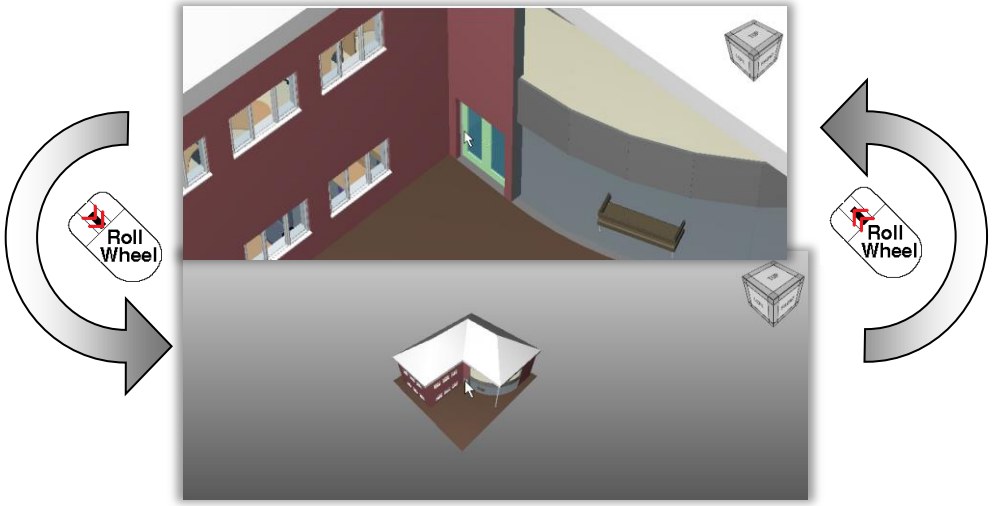
CostX® provides various methods to adjust the 3D Model view. These include zooming, panning and rotating drawings, hiding or showing only selected objects or layers, selecting a transparent or ghost view of objects, and moving through the building.

CostX® also provides two additional windows when working with BIM drawings; the Model Tab in which the object hierarchy can be displayed and selected, and the Schedule Window in which the object properties for the displayed objects can be reviewed.

Zooming (PFC 5-2)

Zooming is most easily undertaken by rolling the mouse scroll wheel forwards or backwards.

M1B.1 **Position the mouse over the middle of the model** of the building and roll the **scroll wheel forwards to zoom in and backwards to zoom out**. Note that the drawing is zoomed around the current mouse cursor position.

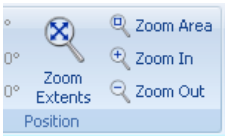


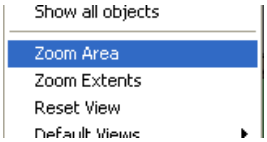
Zooming using the scroll wheel is also a fast technique to move from one area of the drawing to another as an alternative to panning (see below).

For example, if you are zoomed in to the left hand side of the building and wish to view the right hand side, roll the wheel backwards so the whole building is visible in the drawing window, move the cursor to the required position, and roll the wheel forwards.

Alternatively the + (plus) and – (minus) keys on the keyboard may be used to zoom the drawing in or out around the centre of the drawing window.

Zooming may also be performed using the zoom control buttons in the Position group of the Drawings Ribbon. The Zoom In and Zoom Out buttons will zoom the drawing in the same manner as the + / - keyboard shortcut keys. The Zoom Extents button will zoom the drawing out such that the entire model is visible in the drawing window whilst the Zoom Area button allows a rectangle to be dragged out over a specific area of the drawing to zoom in to that area, these tools are also available on the right mouse click menu.



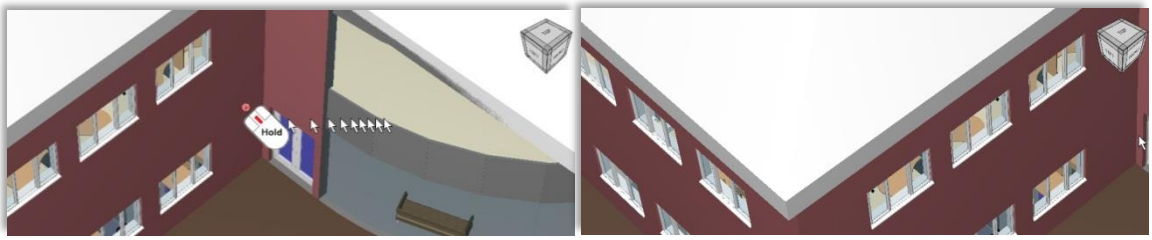


Panning (PFC 5-2)

Panning is the movement of the drawing from side to side and/or up and down in the drawing window. The simplest method to pan the drawing is via the mouse wheel by holding down the scroll wheel of the mouse and moving the mouse in the direction you wish to move the drawing.

M1B.2 **Position the mouse over the model** of the building and **press and hold down the scroll wheel** on the mouse.

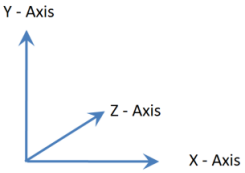
M1B.3 With the scroll wheel held down **move the mouse to the right**, the drawing is moved (panned) with the mouse cursor.



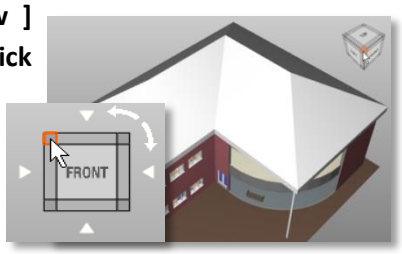
Alternatively the ↑ up, ↓ down, ← left and → right arrow keys on the keyboard and the vertical and horizontal scroll bars located to the right and below the drawing window may be used when the drawing has been zoomed in.

Rotating – View Cube (PFC 5-2)

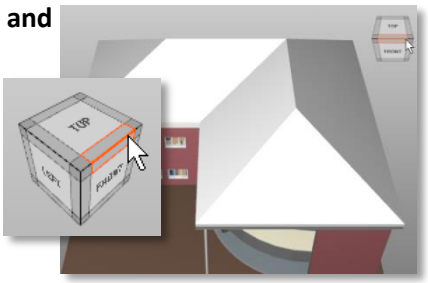
Rotating is the movement of the drawing around the x, y or z axis (shown right) to view the model from different viewing perspectives. The simplest method to rotate the drawing is by using the View Cube displayed in the upper right corner of the drawing window by clicking on any of the faces, edges or corners.



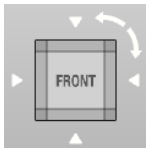
M1B.4 **Right click over the drawing** and **select** the **[Reset View]** option to reset the drawing to the default front view. Then **click on the upper left corner of the view cube** as shown right. The drawing will be rotated to an oblique view i.e. a view between the Front, Left and Top viewing perspectives.

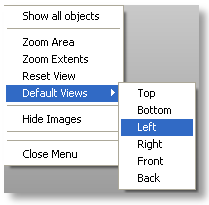


M1B.5 **Click on the edge of the view cube between the Top and Front** faces. The drawing will be rotated to a view half way between the Front and Top viewing perspectives.



M1B.6 **Click** on the **[Front]** face of the view cube. The drawing will now be rotated to the original Front viewing perspective.





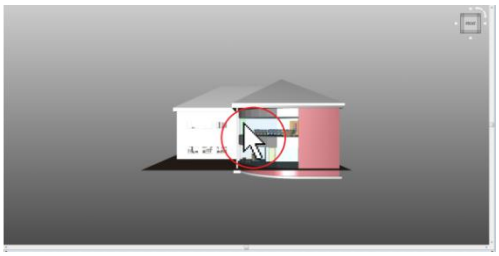
Default viewing perspectives may also be selected from the Default View option on the right click menu.

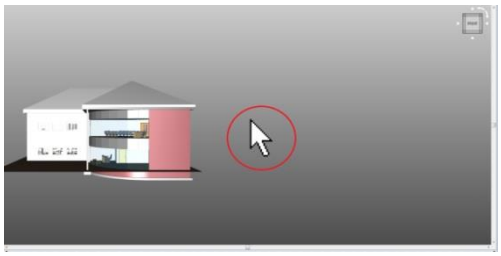
Rotating – Mouse

The drawing may also be freely rotated by holding down the left mouse button and moving the mouse in the required direction of rotation. The position of the mouse cursor between the centre and the extremities of the drawing window and moving the mouse in a combination of up/down/left/right directions will provide simultaneous rotation around all three axes.

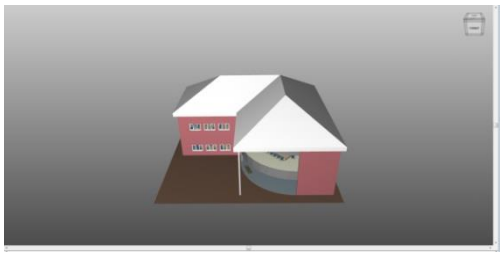
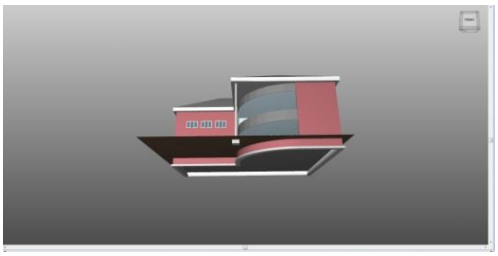
Rotation Around the X Axis

M1B.7 **Position the mouse cursor roughly in line with the horizontal centre of the drawing window** (the model does not need to be in the centre of the drawing window).



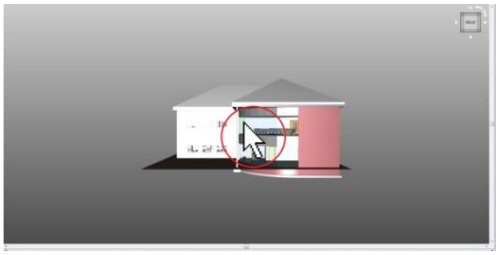
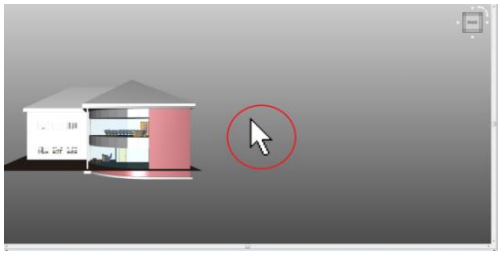


M1B.8 **Press and hold down the left mouse button, move the mouse forward / backward** to rotate the drawing around the X-Axis. **Release the mouse button when the required rotation has been achieved**.

Rotation Around the Y Axis

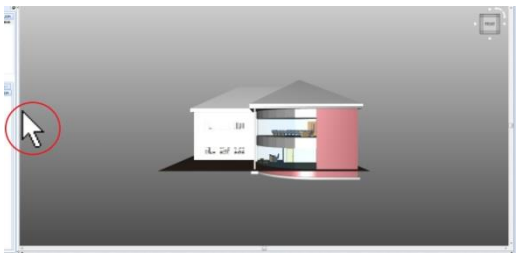
M1B.9 **Position the mouse cursor roughly in line with the vertical centre of the drawing window** (the model does not need to be in the centre of the drawing window).

M1B.10 **Press and hold down the left mouse button, move the mouse left / right** to rotate the drawing around the Y-Axis. **Release the mouse button when the required rotation has been achieved**.

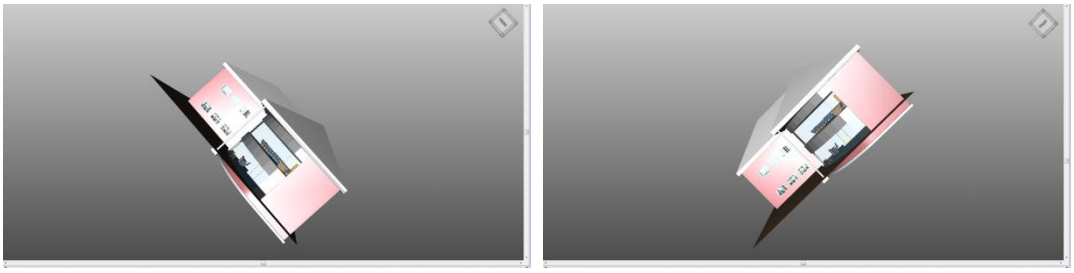

Rotation Around the Z Axis

M1B.11 **Position the mouse cursor roughly in line with the vertical centre** of the drawing and at the extremity of the drawing window (either to the left or the right).



M1B.12 **Press and hold down the left mouse button, move the mouse forward / backward** to rotate the drawing around the Z-Axis. **Release the mouse button when the required rotation has been achieved**.

The same rotation is also possible by positioning the mouse cursor roughly in line with the horizontal centre of the drawing and at the extremity of the drawing window (either top or bottom) and moving the mouse left or right.



If necessary rotate the drawing in stages (i.e. release the mouse button, reposition the mouse towards the centre or extremities of the drawing window as required to achieve rotation around the required axis and then continue to rotate the drawing).

The view cube rotates dynamically with the drawing and it is often useful to review the rotation of the drawing by reference to the view cube.

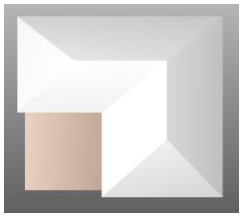
Viewing the Interior

Most building models will include the external elements such as walls, roofs etc. which in a 3D view may obscure the interior of the building. CostX® therefore facilitates the review and selection of such internally modelled objects in a number of ways.

Move Through the Building (PFC 5-2)

Moving through a building model is undertaken by holding down the 'E' key on the keyboard and moving the mouse slowly forwards or backwards (up or down) to move in and out of the building. When the 'E' Key has been released the drawing may be panned and zoomed as required.

M1B.13 **Right click over the drawing** and **select** the default **[Top view]** (shown right) from the right click Default Views menu option.

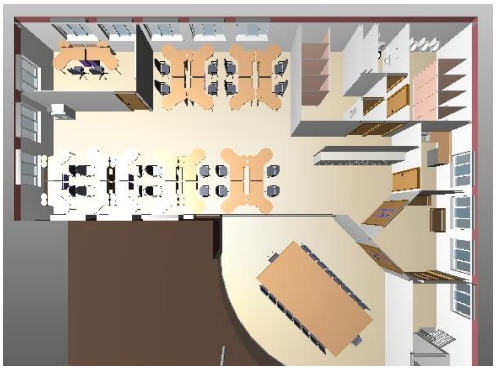


M1B.14 **Hold down the 'E' key** on the keyboard and **move the mouse slowly forwards** to move down through the building.

The display size (zoom) of the building may become extended beyond the drawing window boundaries, if this occurs release the 'E' key then position the mouse cursor over the centre of the drawing window and roll the mouse scroll wheel backwards to zoom out as necessary, then hold down the 'E' key once more and continue to move the mouse forwards to continue to move down through the building.

M1B.15 When a suitable internal view of the ground floor is obtained **release the 'E'** key. It is now possible to position the mouse cursor over the visible internal objects highlighting them in green and thus allowing object specific options to be selected from the right click menu (e.g. Show Only Objects In, Hide Objects In, Object Properties etc.)

M1B.16 **Hold down the 'E' key** once more and **move the mouse slowly backwards** to move back up through the building until an internal view of the upper floor is obtained.



M1B.17 **Right click over the drawing window** and **select** the **[Reset View]** option from the right click menu when the review is complete. (Alternatively hold down the 'E' key and move the mouse sufficiently far backwards to back completely out of the partial view).

The Move Through feature can be paused and resumed as many times as required to review the model detail simply by releasing or holding down the 'E' key.

Filtering the View

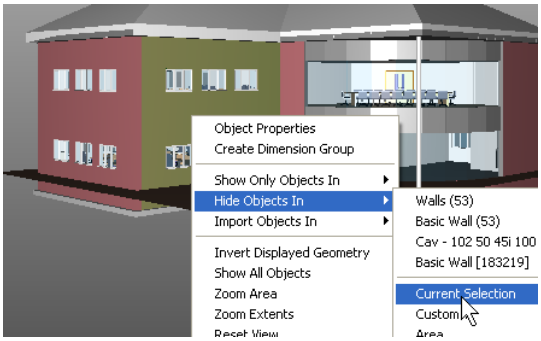
Hiding objects (PFC 5-2)

Hiding objects is used to temporarily remove an object or group of objects from the drawing view to be able to review and select other objects that lie behind or are otherwise obscured.

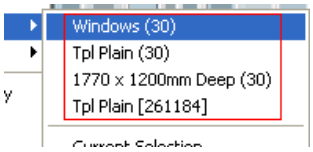
M1B.18 **Rotate the drawing to a position between the Left and Front views**.

M1B.19 **Position the mouse cursor over the external wall** as shown (zoom in as necessary).

M1B.20 **Right click** and hover the mouse over the **[Hide Object** In **]** option and **choose** the **[Current Selection]** option. The wall object will be temporarily hidden. **Repeat this process and hide the adjacent external wall to the left**.



After right clicking over an object and selecting the Hide Objects In option, the first four sub-menu options above the separator line represent four increasingly refined filtering levels to choose from.



The filtering levels will generally accord to the following:

***Category** (i.e. the element category of the objects e.g. ceilings, doors, columns or floors)*

***Family** (i.e. a logical grouping of objects having the same key attributes within the category e.g. for Doors - Overhead-Sectional, Single-Internal, Double-Internal, Double-External)*

***Type** (i.e. a logical grouping of objects having the same size/purpose etc. within the Family e.g. for Doors/Single-Internal - 810x2110mm, 910x2110mm, 1010x2110mm)*

***Instance** (e.g. a specific single object)*

When the required group or sub-group is chosen all objects belonging in that grouping level will be hidden from view.

M1B.21 **Position the mouse cursor over one the external window objects** as highlighted right (zoom in as necessary), **right click** and hover the mouse over the **[Hide Objects In]** option and **choose the Uppermost Windows option**. All of the objects in the Windows group will be temporarily hidden.

M1B.22 It is now possible to position the mouse cursor over the visible internal objects highlighting them in green and thus allowing object specific options to be selected from the right click menu (e.g. Show Only Objects In, Hide Objects In, Object Properties etc.)

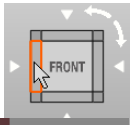
M1B.23 Re-display all the objects again by **right clicking anywhere on the drawing** and select the **[Show All Objects]** option from the right click menu.

Show Only Objects In (Filtering Objects by Group) (PFC 5-2)

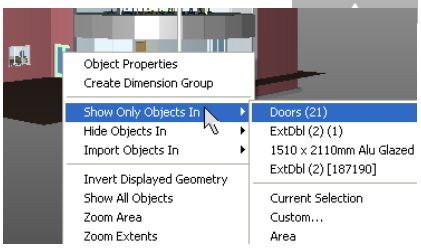
Showing Only Objects In a group (i.e. filtering by an object group) allows objects belonging to a specific group or sub-group (e.g. Doors or Internal Doors) or objects with common object properties and values (e.g. level/floor) to be displayed in isolation in the drawing window.

The sub-menu grouping levels which are displayed reflect the grouping hierarchy for the specific object highlighted, with the object Category at the top, then the Family, then the Type, then the Instance (refer to the definitions in the Hiding Objects section above).

M1B.24 Rotate the drawing to a view half way between the Front and Left viewing perspectives (**click on the edge of the view cube to the left of the Front face** - as shown right).

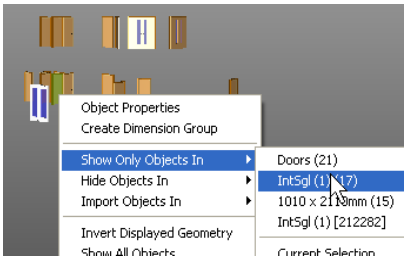


M1B.25 **Position the mouse cursor over the external glazed door**, it will then be highlight in green, **right click** and hover the mouse cursor over the **[Show Only Objects In]** menu option.

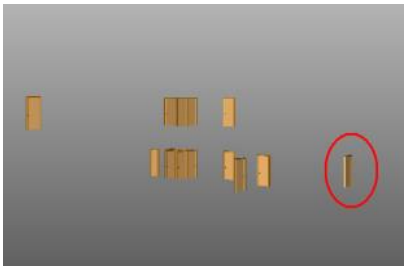


M1B.26 **Select the top 'Doors' option** from the sub-menu, the drawing view will be filtered to display just door objects (i.e. all of the objects which belong in the Door Category).

M1B.27 **Right click over one of the internal single doors** and **select** the **[Show only Object In]**, then **Select the second 'IntSgl'** option from the sub-menu, the drawing view will be filtered to display just Internal Single door objects (i.e. all of the objects which belong in the IntSgl Family).



M1B.28 **Right click over the furthest right internal single door** (shown right circled red) and **select** the **[Show only Object In]**, then **select the third '810 x 2110mm'** option from the sub-menu, the drawing view will be filtered to display only the two 810 x 2110mm Internal Single door objects (i.e. all of the objects of this specific Type).



M1B.29 **Right click over one of the two remaining doors** and **select** the **[Show only Object In]**, then **Select the fourth option** from the sub-menu, the drawing window will be filtered to display only this specific door object (i.e. this specific door Instance).

It is possible, in the same manner, to select any of the grouping levels at any time, e.g. to redisplay a higher grouping level for the objects or further filter the shown objects.

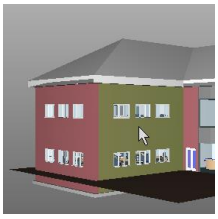
M1B.30 **Right click over the remaining door** and **select** the **[Show only Object In]**, then **Select the second 'IntSgl' option** once more from the sub-menu, the drawing window will re-display all Internal Single door objects, next right click over one of the other larger doors and select the third '1010 x 2110mm" option from the sub-menu, the drawing window will now be filtered to display only the 1010 x 2110mm door objects.

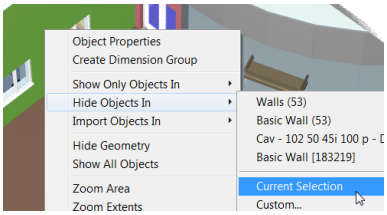
Show Only Objects In / Custom… (Filtering by Selecting Object Properties)

In addition to filtering objects by the sub-menu options it is also possible to customize the filter by selecting the **[Show Only Objects In / Custom..]** option from the right click menu and then choosing the required selection criteria.

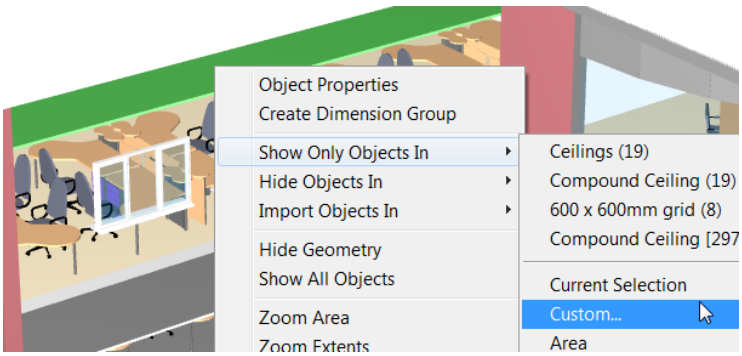
M1B.31 Firstly **right click over the drawing** and **select the [Show All Objects]** option from the right click menu to redisplay all of the hidden objects.

M1B.32 **Position the mouse cursor over the external wall** object as highlighted right, then **right click and select** the **[Hide Objects In/ Current Selection]** option.





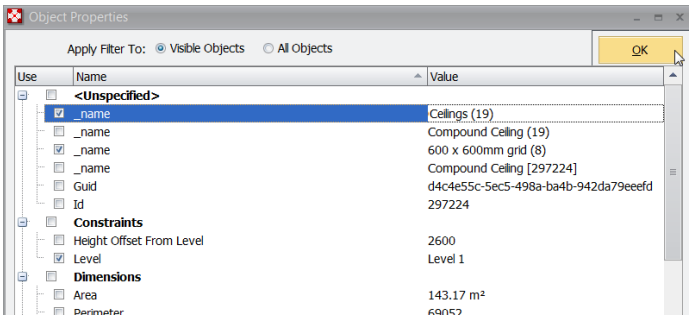
M1B.33 **Position the mouse cursor over The upper Level internal ceiling object** as highlighted below, **right click over the ceiling** and hover the **mouse over** the **[Show Only Objects In]** option then **choose** the **[Custom…]** option from the displayed sub-menu.



The Object Properties dialog is opened.

M1B.34 **Ensure the Visible Objects option is selected** in the radio buttons at the top of the Object Properties dialog box.

M1B.35 **Place a tick** in the checkbox to the **left of the object property named '_name' and with a value of 'Ceilings'**. Also **place a tick** in the checkbox to the **left of the object property named '_name' with a value of '600 x 600mm grid'** and the **checkbox to the left of the object property named 'Level' with a value of 'Level 1'**.

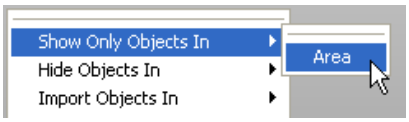


M1B.36 **Click** the **[OK]** button to apply the filter, the drawing window will be further filtered to display only 600 x 600mm grid ceilings located within Level 1 of the building.

Show Only Objects in / Area (Filtering Objects Within a Defined Area)

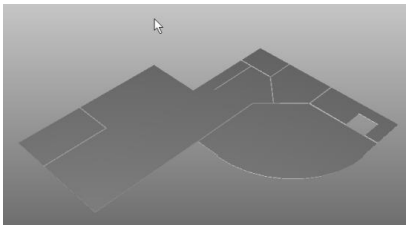
In addition to filtering objects it is also possible to show only objects in a particular area, this will show only objects which fit (in their entirety) within an area dragged out over the drawing.

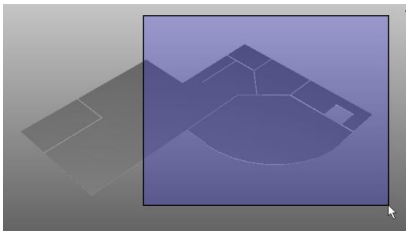
M1B.37 **Right click anywhere over the drawing** and hover the mouse over the **[Show Only Objects In]** option and **select** the **[Area]** option from the sub-menu.

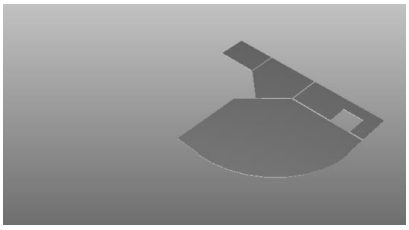


M1B.38 Position the mouse cursor as shown below left and then **hold down the left mouse button to define the upper left corner** of the area, as shown in the Screen Shot below.

M1B.39 Continue to **hold down the mouse button and drag the cursor to the bottom right corner** as shown below right, then **release the mouse button**. The view will display only the ceiling objects which were entirely within the defined area preview.

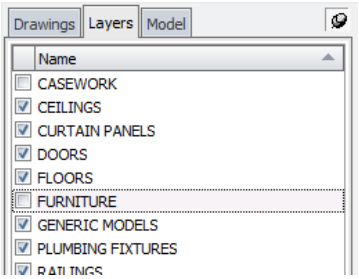






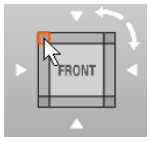
Adjusting Layers (PFC 5-2)

When a 3D BIM drawing is added, the building layers corresponding to the various Element Categories are created, these can be reviewed and may be toggled between being shown and hidden after selecting the Layers tab. The layer functions work independently to the other display options such as hiding or filtering objects.



Layers may be toggled between being shown and hidden individually (after the Layers tab has been selected) by clicking over the relevant checkbox to add or remove the tick. Layers which are currently shown are indicated with a tick and layers which are hidden are un-ticked.

M1B.40 **Right click over the drawing** and **select** the **[Show All Objects]** option to redisplay the previously hidden objects, the drawing should still be rotated to an oblique view, if not **click on the upper left corner of the view cubes Front face**.



M1B.41 **Click** on the **[Layers]** tab located above the drawings list window.

M1B.42 **Click** in turn over the **checkboxes to the left of the Roofs, Roof Soffits, Floors and Ceilings** to turn off (hide) each of these layers. As each layer is turned off the associated objects within each layer are removed from view.

Layers may also be hidden (with the Layers tab selected) by clicking with the left mouse button whilst the mouse cursor is positioned over and is highlighting an object in the drawing window.

M1B.43 **Position the mouse cursor over one of the wall objects**, it will be highlighted in orange, **click once with the left mouse button**, the wall layer is then turned off.

Holding down the Shift key whilst an object is highlighted will highlight all other objects in the same layer.

M1B.44 **Position the mouse cursor over one of the furniture objects** and then **hold down the Shift key** on the keyboard, all objects in the layer will be highlighted, **click once with the left mouse button**, the furniture layer is then turned off.

The Drawings Ribbon Toolbar also contains several buttons which control the display of layers and when used in combination with the other layer control techniques can provide a quick method to isolate a specific layer.

M1B.45 **Click** on the **[Drawings] Ribbon** to display the Drawings Ribbon (if it isn't currently displayed).

M1B.46 **Click** on the **[Show all layers]** (or the Show layers as per file) button, all layers will now be displayed in the drawing window.

M1B.47 **Position the mouse cursor over one of the wall objects** and **click once with the left mouse button** to turn off the wall layer (alternatively remove the tick adjacent to the Walls layer name in the layers list window).

M1B.48 **Click** on the **[Invert layers]** button, the drawing window will now show all the layers that are previously hidden and hide all the layers that were previously shown, leaving in this instance just the walls layer visible.

An alternative method is to turn off all layers and then select the required layers to be displayed in the layers list window.

M1B.49 **Click** on the **[Hide All layers]** button, all layers will now be hidden.

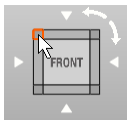
M1B.50 **Place a tick in the checkbox adjacent to the Furniture layer** in the layers list window, the Furniture layer only will now be displayed.

M1B.51 Before moving on **turn all layers back on** (**Click** on the **[Show All layers]** button) and click on the Drawings list tab to exit layers mode.

Transparent View (PFC 5-2)

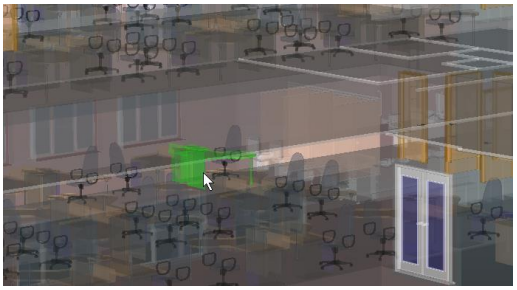
By default 3D BIM objects are displayed in CostX® with a solid shading. It is possible to toggle the display between a solid and transparent appearance using the Transparent button on the Drawings Ribbon Toolbar. When the transparent view is turned on it is possible review and select (highlight) objects previously obscured from view i.e. objects within the interior of a building model for example.

M1B.52 The drawing should still be rotated to an oblique view, if not **right click over the drawing** and **select** the **[Reset View]** option to reset the drawing to the default front view and then **click** on the **upper left corner of the view cube** (as shown right) to select an oblique view.



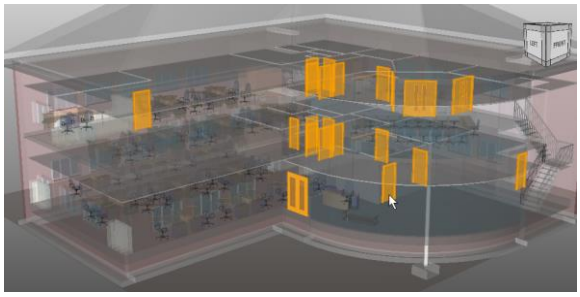
M1B.53 **Click** on the **[Transparent]** button located on the **[Drawings] Ribbon** to turn on the transparent view.

M1B.54 Slowly **move the mouse cursor over the drawing** and notice how internal objects are now visible and can be highlighted (i.e. allowing the various right click menu options such as Show Only Objects In to be used), try also rotating the drawing to alternative viewing perspectives.



M1B.55 **Click** on the **[Transparent]** button located on the **[Drawings] Ribbon** once more to turn off the transparent view.

The transparent view may also be used in conjunction with the Layers List view (i.e. when the Layers tab is selected), allowing layer contents to be reviewed and / or turned off as necessary.



One of the other main uses of the transparent view is that it allows dimensions or Dimension Groups once imported or measured to be reviewed in context with the overall model

Ghost View

Ghost View shows hidden objects or layers in faint outline, which helps to identify the placement of displayed objects within the model.

M1B.56 **Position the mouse cursor over an external door** in the drawing window, it will be highlighted green, **right click** and **select [Show Only Objects In] ...Doors** to filter the view to show only doors.

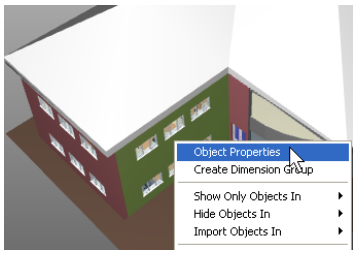
M1B.57 **Click** the **[Ghost View]** button on the **[Drawings] ribbon** to show all hidden objects in Ghost mode.

M1B.58 **Click** the **[Ghost View]** button again to turn off Ghost mode.

View Object Properties

Each object in a BIM drawing has set of parametric properties. This information may be viewed for individual objects by right clicking over the object and selecting the **Object Properties** option, the object properties will then be displayed in a new window.

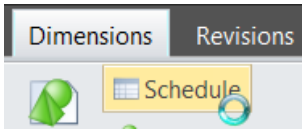
M1B.59 **Position the mouse cursor over the wall object** (shown right) in the drawing window, it will be highlighted green, **right click** and **select** the **[Object Properties]** option.

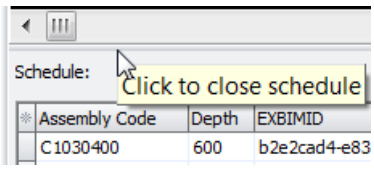


M1B.60 A window will open allowing the properties specific to the selected object to be reviewed. **Click** on the **[Close]** button to close the dialog.

View Multiple Objects Properties / Schedule Window

The object properties for multiple objects can be reviewed simultaneously in the Schedule Window. The Schedule displays as a table below the main drawing window and schedules the object properties for all objects currently displayed in the drawing window. The Schedule Window can be displayed or hidden by clicking on either the Schedule button located on the Dimensions Ribbon Toolbar or by clicking on the schedule window resizing bar located beneath the main drawing window.





The schedule window may also be resized vertically to reveal more or less rows by dragging the schedule window resizing bar up or down.

M1B.61 **Click** on the **[Dimensions]**Tab to display the Dimensions Ribbon Toolbar and then on the **[Schedule]** button to display the Schedule Window beneath the drawing window.

M1B.62 **Position the mouse cursor over an external door in the drawing window**, it will be highlighted green, **right click** and **select [Show Only Objects In]... Doors** to filter the view to show only doors. The Schedule will display only the door data.

The columns and rows displayed in the schedule window are automatically selected as objects are filtered, hidden and / or layers are turned on or off etc.

If required the columns displayed in the schedule window may be manually customized by clicking on the customize columns button  *in the upper left corner of the schedule window and adding or removing ticks from the relevant checkboxes (click on the customize columns button*  *again to close the selection window).*

CostX® also provides an option to copy the displayed object data from the schedule window to the Windows® clipboard, from where it can then be pasted into a workbook or other software application. Right click over the schedule window (in the desired row, column or cell as necessary) and select the required copy option from the right click menu.

Model Tab / Model List Window

The Model List Window displays the hierarchy of the BIM model in the form of nodes at different levels representing the object groups, sub-groups and items.

The various nodes of the model tree can be expanded and reduced by clicking on + & - buttons to the left of the node description.

M1B.63 **Click** on the **[Model]** tab located above the drawings list window to display the Model List Window, also referred to as the Model Tree. **Click** on the **'Drawing' node** to display all objects in the model. **Open the [Schedule]**.

M1B.64 Then **click** on the **'Doors' node**, notice that the drawing and schedule windows have now been filtered to display only the door objects. **Move the cursor over the displayed doors**, which will highlight in green as you move over them. As each door highlights, the corresponding row in the Schedule will also highlight.

M1B.65 **Click on various rows in the Schedule**. As each row is selected, the corresponding door in the view will highlight.

M1B.66 **Select in turn each branch under the 'Doors' Node** in the model list window. As each node is selected both the drawing window and schedule window are progressively filtered.

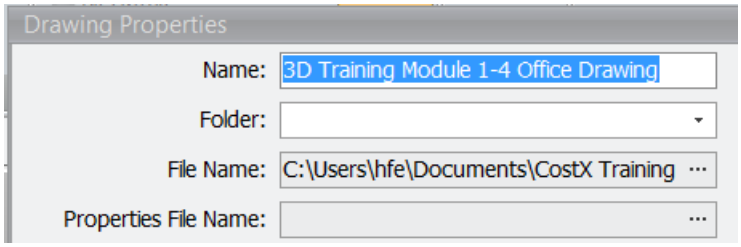
M1B.67 Hold the **Ctrl key** and **click on a selection of branches and sub-branches** under various nodes. All the selected items will display.

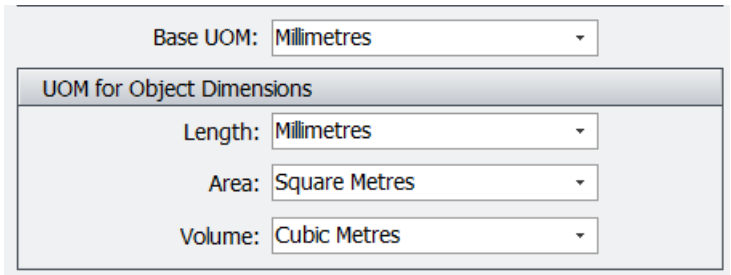
M1B.68 **Click** on the **'Doors' node**, then hold the **Shift key** and **click on the Plumbing Fixtures node**. Both nodes and all intervening nodes will be selected.

> *Using the model list window in conjunction with the schedule window is a quick and efficient method to review object properties for the model and is a key model navigation tool to use when importing BIM dimensions or measuring quantities.*

Module 1C Units of Measure (UOM) for Object Dimensions

When a drawing is added to the building, the Base UOM and UOM for Object Dimensions settings are retained from the previously added drawing. They may not be appropriate for the newly added drawing, and should be verified to ensure they are applicable. This is an important point to emphasise because UOM in BIM models are commonly not defined. There is no way to automate this validation, which needs to be done by the user.





In CostX®, the Drawing Properties dialog can be reopened after the drawing has been added, and the UOM can be revised. Hence it is possible to load the drawing using the default settings, then verify the UOM either by reviewing dimensional data in the schedule window, or by measuring or importing a known length, area and volume dimension as a check prior to commencing the actual measurement exercise.

Therefore having added the drawing we shall verify the units of measurement within the drawing file to ascertain that the units of measurement are correct.

As most building models will contain Floor objects and as most floor objects will have Area, Length (Perimeter), and Volume values, these are often a good choice of objects to review in the first instance to ascertain if units of measurement have been defined within the drawing file.

M1C.1 **Click** on the **[Model] tab** to display the Model List Window then **select** the **'Floors' node**.

M1C.2 Display the Schedule Window by **clicking** on the **[Schedule] button** on the **[Dimensions] Ribbon**.

M1C.3 In the schedule window **locate the columns relating to the floor objects area, length and volume**, these are named Area, Perimeter and Volume respectively.

M1C.4 Check whether the values in these columns have units of measurement specified.

To widen a column in the schedule window position the mouse cursor to the right hand side of the column heading 

(the mouse cursor will change to the 'drag' ⇹ shape) press and hold down the left mouse button and drag the mouse to the right to widen the column, release the mouse button when the required size has been achieved.

M1C.5 **If the values have a unit of measurement defined it will be appended after the actual value** and all values of the same type (i.e. area, length and volume type values) will also have the same unit of measurement specified.

	Area	Perimeter	Volume
	324.97 m²	82056	73.12 m³
	331.55 m²	81821	74.60 m³
	343.62 m²	82352	164.94 m³
	3.63 m²	7622	0.73 m³

M1C.6 If the values do not have a unit of measurement appended after the value all values of that type in the drawing file will similarly be undefined in terms of the UOM and should be verified.

- *When the BIM file is created by the designer there is an option which allows units of measurement to be assigned to Length, Area & Volume values types (e.g. m2 or mm2). Where these have been assigned they will be used.*

- *For any values in the BIM file where such units of measurement have not been assigned, the units specified in the UOM for Object Dimensions section of the dialog will be used instead.*

- *In this example units of measurement have been specified in the BIM file for Area and Volume values types but not for the Length value type (the Perimeter values are a length type of value). Therefore if the Perimeter value is imported it will automatically be assumed to be in the Unit of Measure specified in the*

Length field in the UOM for Object Dimensions section of the Drawing Properties dialog, which in this case is specified as Millimetres.

For this drawing file the Area and Volume values do have a UOM specified, m2 and m3 respectively, however the Length values does not. We will need to verify a BIM length value against a known length to identify the correct UOM. Door, Column or Beam objects will commonly have a Width value and the size is usually stated in one of the description fields, so this can be used to verify the UOM.

M1C.7 **Click** on the **'Doors' node** in the model list window to filter the door objects in the schedule window and scroll across the schedule columns to review the various object descriptions to see if one has a stated size. We can see that the first item in the schedule window has a stated size of 1510 x 2110mm.

M1C.8 **Locate the Width column** (which contains length type of values) to see how the value relates to the stated size. We can see that the value is expressed as 1510 for this item which confirms the length values are in millimeters (if the value was expressed as 1.510 it would have confirmed that length values were in meters).

Having now determined the units of measure for Area, Length and Volume values in the BIM model we can now double check the correct settings have been specified in the Drawing Properties dialog.

M1C.9 **Click** on the **[Drawings] list** tab to redisplay the drawings list window and then **double click** on the **[3D Training Module 1-4 Office Drawing]** in the list to reopen the Drawing Properties dialog, **check, and if necessary amend, the UOM** for Object Dimensions settings to ensure they match the UOM's we have just determined from the schedule window, click Update to close the Drawing Properties dialog.

If UOM's are not defined in the drawing file and it isn't possible to confirm the units solely with reference to the object data, then the UOM's can be identified by importing a known length, area or volume dimension into a Dimension Group and verifying the imported dimension value. If for example the UOM should be meters rather than millimetres, or imperial rather than metric etc., the Dimension Group value will usually be obviously incorrect.

In the following example of a schedule (structural floor) you will notice that none of the Area, Perimeter or Volume fields have a UOM appended, indicating that units of measurement have not been defined in the drawing file.

Schedule:

Area	Assembly Code	Family Name	Height Offset From Level	Level	Level1	Level2	Level3	Level4	Perimeter	Structural	Structural Usage	Type Name	Volume
22379216	B1010	Floor	0	FOUNDATION	Floors	Floor	152 Concrete	Floor	20154	Yes	Slab	152 Concrete	3.41
19441977	B1010	Floor	0	FOUNDATION	Floors	Floor	152 Concrete	Floor	18570	Yes	Slab	152 Concrete	2.96
19412034	B1010	Floor	0	FOUNDATION	Floors	Floor	152 Concrete	Floor	18285	Yes	Slab	152 Concrete	2.96
1637910912	B1010	Floor	-51	Level 4	Floors	Floor	152 Concrete	Floor	211304	Yes	Slab	152 Concrete	249.62
1698870024	B1010	Floor	0	GROUND LEVEI	Floors	Floor	152 Concrete	Floor	212362	Yes	Slab	152 Concrete	258.91

Importing dimensions from this model using a BIM Template would yield the following result. Notice the large quantity for the Floor Area.

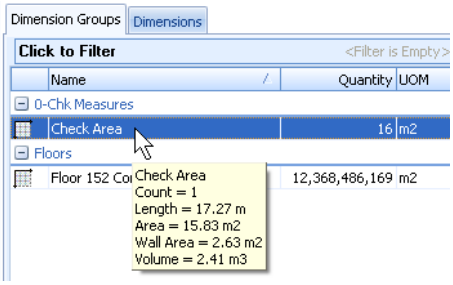
Dimension Groups | Dimensions

Floor 152 Concrete

Name	Flrs	Length	Area	Volume
194883	1	212.36	1,698,870,024.00	258.91
249765	1	14.63	12,345,782.00	1.88
249887	1	17.27	15,834,807.00	2.41
250019	1	14.63	12,345,782.00	1.88

When an unrealistic figure arises, a wrong UOM can be assumed.

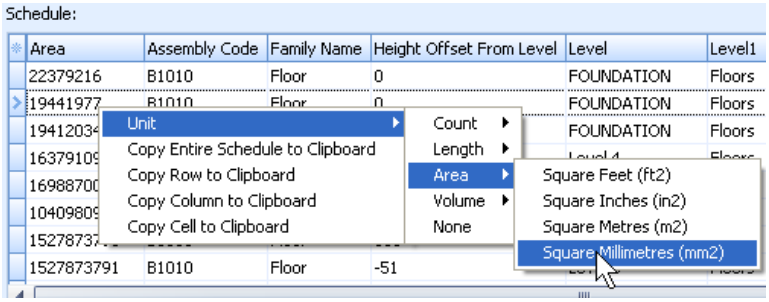
Using a blank dimension group to carry out a 3D Measure of a small sample will give you a comparable figure, from which the correct UOM can be determined.



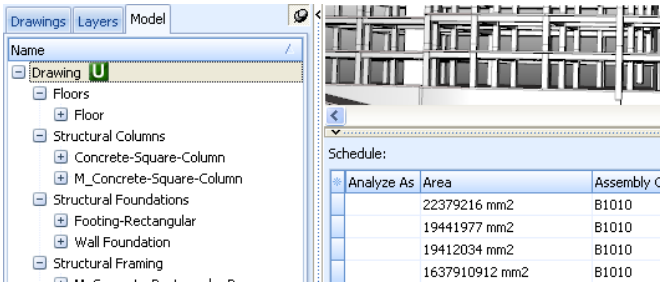
Hence we can see from comparing the two different area values that the BIM area value is in fact in mm2.

Having now established the actual UOM's for Area, Length and Volume type values we could now delete the temporary Dimension Groups and folders we imported / created for the check measurements and then review and amend as needed the UOM details in the Drawing Properties dialog prior to undertaking the actual measurement.

TIP: When units have not been assigned, it is possible to specify the units of measurement within the Schedule Window, either for the entire drawing or any of the hierarchical nodes (i.e. object groups) selected in the model tree list window. Open the Schedule, hover the cursor over the relevant column heading, then use the right click menu option "Unit" to assign units to the values.



The Units will appear in the Schedule and a green U symbol will be inserted against the relevant branch of the Model tree.



Module 2 Object Mode Measurement

In this module we will learn how to create Dimension Groups for object mode measurement and import dimension values for single and multiple drawing objects. We will also learn how to assign a unit of measurement for object property source fields where a unit of measurement has not been included when the drawing file was created by the designer.

Creating Dimension Groups for object based dimensions is undertaken in a different manner to creating Dimension Groups for measurements taken from 2D or 3D drawings. Those measurements use the on-screen measurement tools to measure dimensions directly from the drawing. In contrast, Object Based dimensions taken from a BIM Model import the dimensions from the object property values contained within the data model which have been generated by the source BIM modelling software (e.g. Revit®).

It is therefore necessary when a dimension is imported in object mode to specify (map) which object properties are going to be imported, and into which Dimension Group field(s) the property values are going to be placed.

Usually when dimensions are imported using object mode the drawing objects are firstly filtered using one or more of the techniques previously described so that the objects requiring measurement may viewed and selected more readily. A Dimension Group is then created via the right click menu option which allows the available object property source fields to be viewed and selected when creating the Dimension Group.

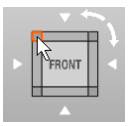
Once the Dimension Group has been created, dimensions can be imported from the drawing by left clicking over each object in turn to measure individual objects, by defining an area on screen to select simultaneously all encompassed objects (via an option on the right click menu) or by selecting one or more properties (via an option on the right click menu) which are common to a number of objects to be measured into the Dimension Group.

Dimensions measured in this manner may be used in lieu of the other 3D measurement tools for the entire model or for specific object groups or objects or to supplement or change imported BIM values. Object mode measurement provides the user the ability to specify the Dimension Group folder and Dimension Group names, select the primary measurement type and which of the available object property fields are to be mapped to the dimension value fields and also the choice over which objects are used for the measurement.

Creating Dimension Groups for Object Mode Measurement

M2.1 Use the Model List Window to filter the windows by **clicking** on the **[Model] Tab**, then **click** on the **'Windows' group** (node). Finally **click** on the **[Drawings]** tab to the left of the Model tab to re-enable measurement mode.

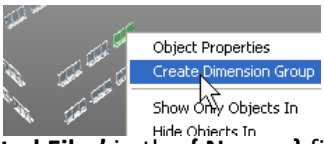
M2.2 Prior to commencing this part of the module **right click over the drawing** and **select** the **[Reset View]** option to reset the drawing to the default front view and then **click** on the **upper left corner of the view cube** (as shown right) to select an oblique view.



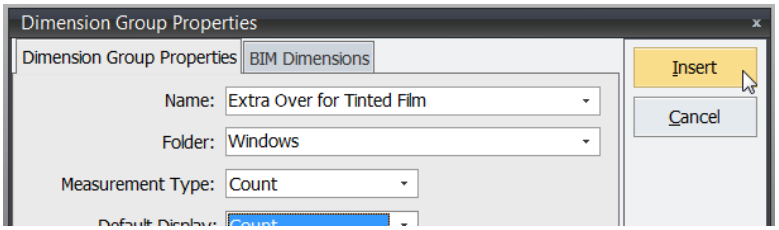
M2.3 **Ensure the Schedule is displayed**. As the window objects have been filtered the Schedule will list out just the window objects.

M2.4 For the dimensions we are going to create we will be using the Height and Width fields. Scroll down in the Schedule window to ensure all of the window objects have values for these fields. We can also see from the Schedule that all of the windows are of the same type and size.

M2.5 **Right click over one of the windows** and **select** the **[Create Dimension Group]** option.

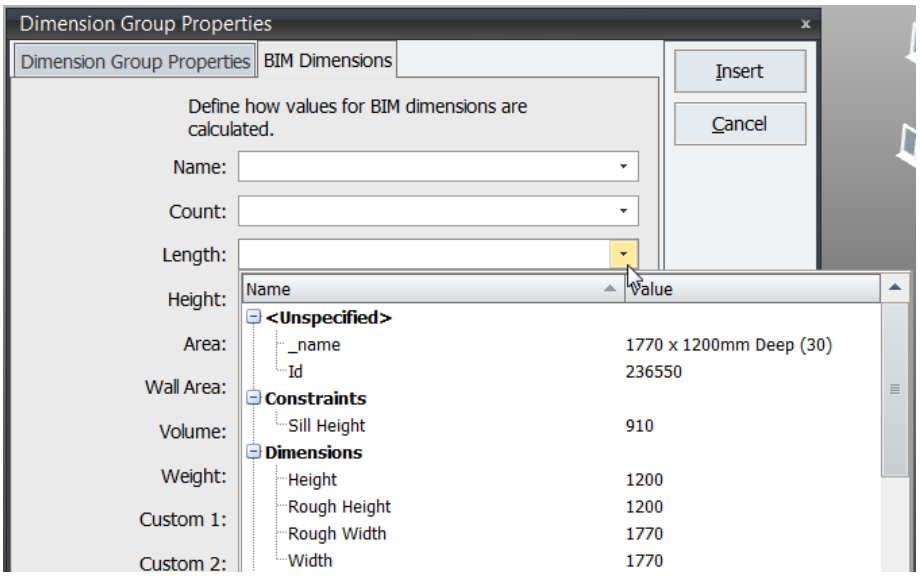


M2.6 In the Dimension Group Properties dialog **enter 'Extra Over for Tinted Film'** in the **{ Name: }** field and **'Windows'** in the **{ Folder: }** field, also **select** the **[Measurement Type:]** as **Count**.



A measurement type of count is selected in this instance to allow the number of windows measured to be displayed in the Dimension Group list window. A count of 1no will automatically be generated for each dimension measured, we will also be mapping the width and height fields which will be automatically multiplied by one another to produce a Wall Area (vertical area) dimension value. The Count, Width and Wall Area values will all be available, we shall see later in this module how formulas may be used to calculate an area in a Custom or Area field directly instead.

M2.7 **Click** on the **[BIM Dimensions]** tab to display the Dimension Property Source fields and then **click** on the **drop down list** arrow on the right hand side of the **[Length:]** Dimension Group field. The object properties dialog is displayed showing the fields and values contained within the drawing file for the selected window object.



M2.8 **Click** on the **{ Width }** object property field to select it.

Upon selection the Object Properties dialog is closed and the chosen object property field, Width in this case, is displayed in the Dimension Groups Length: field within square brackets '[ ]', in other words the Width field from the drawing file has been mapped to the Length field for the dimensions. As such when a dimension is imported into this Dimension Group (by clicking over an object in drawing window) the value in the Width object property field will be imported into the dimensions Length value.

M2.9 Next, in a similar manner as before, **click** on the drop down list arrow on the right hand side of the **[Height:]** dimension field and **select** the **{ Height }** object property field.

When a Dimension Groups Height field is completed in this way and an object with a corresponding value is measured into the Dimension Group the height value is applied in the same manner as in 2D Dimension Groups; i.e. any area or length value imported into the Dimension Group will be multiplied by the height to produce a volume value and wall area value respectively. If there are no area or length values the count value will be multiplied by the height value to produce a length.

M2.10 Once the Length and Height fields have been selected as described above **click** the **[Insert]** button to add, and select the Dimension Group ready to import dimensions into it.

***TIP:** When creating the Dimension Group, be sure to right click over the specific object or an object of the specific type / size / function to be measured, to ensure that the correct object property fields are available for selection (as different types of objects will have different object property fields).*

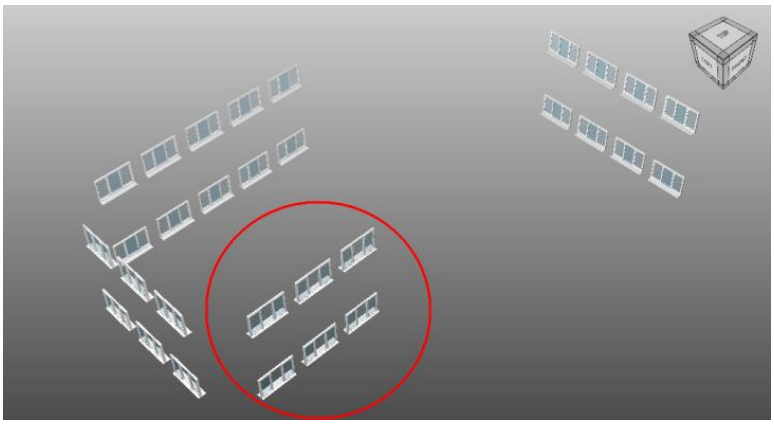
It is also advisable to ensure that for all objects which it is intended to measure into the Dimension Group that a value exists in all of the object property fields which will be selected when adding the Dimension Group.

Therefore it is generally recommended to filter the displayed objects (using the right click menu options or the layers or model tabs as appropriate) and review the object properties for the filtered objects in the Schedule Window prior to adding the Dimension Group and creating the dimensions.

Measuring a Single Object in Object Mode

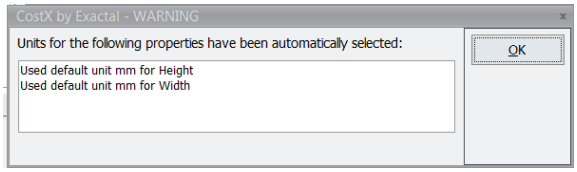
Having created the Dimension Group for the Object Mode measurement we are now ready to select objects in the drawing window to import the dimensions.

For the purpose of this section of the training we will measure the six windows on the front elevation (circled red below) into the Dimension Group we have just created.

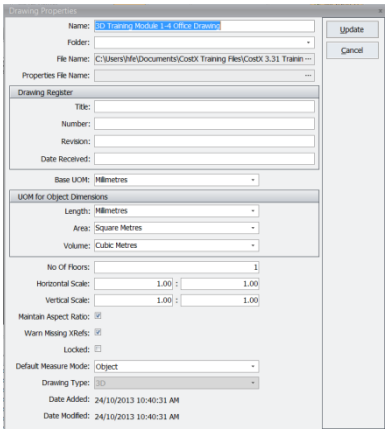


M2.11 **Position the mouse cursor over one of these windows** (circled above) and **click** once with the left mouse button to import the dimension for the selected object.

A message will be displayed identifying that units of measure have been automatically selected for the Width and Height fields.



This message is displayed as this drawing file did not have units of measurement included for length type of values when the file was exported from the design modelling software.

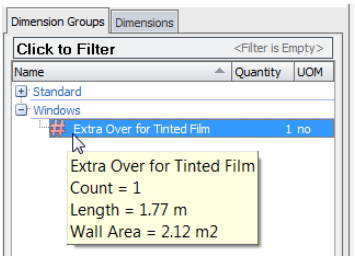


In this instance both the Width and Height values imported from the drawing file have been selected as mm, as 1) they have each been mapped to a Dimension Group field which produces a linear (or length) value and 2) the Unit of Measure (UOM) for Object Dimensions was set as mm for linear (or length) values in the Drawing Properties dialog when the drawing was added (shown right).

M2.12 **Click** on the **[OK]** button to close the message.

Notice that the selected window object is highlighted in green in the drawing window and the Dimension Group has a count value now of 1.

M2.13 **Hover the mouse cursor over the 'Extra Over for Tinted Film'** Dimension Group in the Dimension Groups list window to display the pop-up hint, notice from the hint that the Wall Area (vertical area) of the windows has been calculated as a product of the Width and Height values and also that the Length value is also available.



M2.14 **Position the mouse cursor over another one of the six windows on the front elevation and left click** again, when the message identifying the automatically selected units of measure is displayed **click [OK]**.

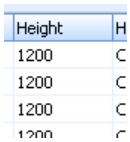
The automatically selected units of measure message is displayed each time a dimension is measured in this manner if one or more of the object property values being imported does not have a unit of measurement specified.

If the units of measurement have not been included in the drawing file for one or more object property fields, as in this case, it is possible to specify the units of measurement in CostX® using the Schedule Window, which we will do now prior to measuring the remaining four windows.

Specifying a Unit of Measurement to an Object Property Field

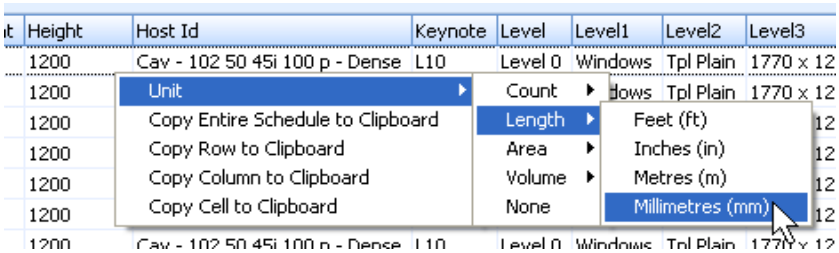
M2.15 **Select** the **[Model] tab** and **find the [Windows] node. In the Schedule Window** use the horizontal scroll bar located beneath the schedule window to locate the Height column, widen the column by positioning the mouse cursor to the right hand side of the column heading 

(the mouse cursor will change to the 'drag' ✣ shape) press and hold down the left mouse button and drag the mouse to the right to widen the column slightly, release the mouse button when the required size has been achieved.

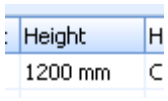


Notice that the values in this column do not have a unit of measure indicated to the right of the value, signifying that units of measurement have not been included in the drawing file for this type of value (i.e. a length type of value).

M2.16 **Right click** anywhere over the **[Height] column**, hover the **mouse over** the **[Unit]** option, a further sub-menu of measurement types is displayed, hover the **mouse over** the required measurement type – **[Length]** in this case, a further sub-menu of units of measurement is displayed, **click** on the required unit of measurement – **[Millimetres]** in this case to specify that the values in the Height field for the scheduled objects are in mm.



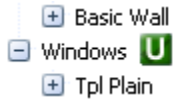
Notice that the values in the height column are now appended with the specified unit of measurement (mm).



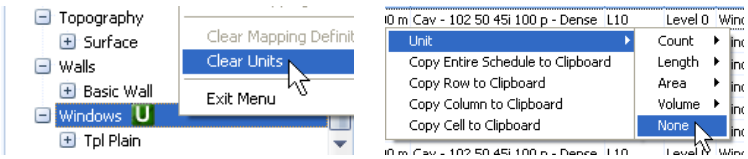
M2.17 **Repeat the above process to specify the units of measurement for the Width field as mm.**

When units of measurement have been specified in this manner the Model List Window displays a Unit symbol to the left of object group(s) for which the units have been set.

M2.18 **Click** on the **[Model] tab** and scroll down to the **'Windows' group** (node), **notice** the **[U (Unit)]** symbol to the left of the Windows group signifying that units of measurement have been manually assigned to objects within this group, **click back on the [Drawings tab]** located immediately above the model list window to return to measurement mode.



> **TIP**: If it is required to remove previously specified units of measurement for a group of objects right click over the name of the required object group displaying the U (Unit) symbol in the Model List Window and select the Clear Units option. Alternatively, in the Schedule Window, after having firstly filtered the displayed and scheduled objects accordingly, right click over the column for which the UOM is to be cleared then hover the mouse over the Unit option and select the None option from the displayed sub-menu, this will clear the unit of measurement set against the selected column (object property field) for the currently scheduled object group.



M2.19 **Click** in turn **over the remaining four windows** on the front elevation to complete the measurement, **notice** that the **units of measure message is no longer displayed** for each dimension as the missing units of measurement have now been specified.

Measuring Multiple Objects in Object Mode

M2.20 In the same manner as before (Section M2.1 above) **right click** over **one of the window objects** and **create a new [Dimension Group]** called **'Lintels'** in the **'Windows' folder** with a **{ measurement type }** this time of **[Length]** then **click** on the **[BIM Dimensions]** tab.

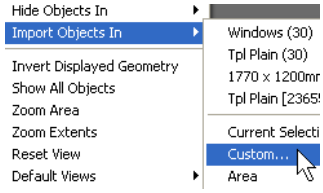
M2.21 Using the drop down selection arrow on the right hand side of the **[Length:]** field select the **{ Width }** object property field from the object properties window. **Edit the contents** of the **[Length:]** field by **adding +0.30** such that the Length field reads [Width]+0.30

When the dimensions are imported the value in the Width object property field will be entered into the dimensions Length value (it will be converted from mm to m as part of the import) and will have 0.30m added to it for the lintel end bearing. The additional length is included in the formula as 0.30 (m) rather than 300 (mm) as the Dimension Group has a base unit of measure of Meters (the Base Unit of Measurement for the dimensions groups is selected when the building is initially set up).

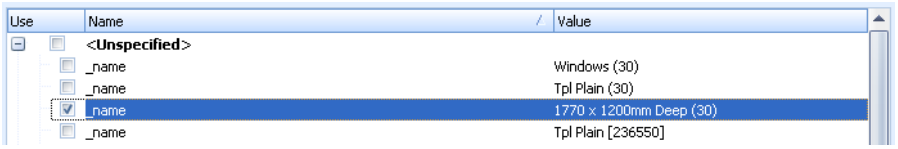
M2.22 Once the required details have been entered **click** on the **[Insert]** button to create and select the Dimension Group ready for measurement.

Now that the Dimension Group has been created we can simultaneously import (measure) multiple dimensions into it for all of the window objects.

M2.23 **Right click over one of the window objects** and hover the **mouse** cursor **over the [Import Objects In]** option then **choose** the **[Custom…]** option from the sub-menu, the Object Properties dialog will be displayed.



M2.24 **Place a tick** in checkbox to the **left of the '_name'** field towards the top of the object properties dialog which will have a value of **'1770 x 1200mm Deep'** (corresponding to the object Type) by clicking with the left mouse button over the checkbox.



M2.25 Once ticked **click** the **[OK]** button to create the dimensions.

From the objects currently visible in the drawing view each object matching a Type of '1770 x 1200mm Deep' will be imported (selected). The dimension values will be extracted from the object properties based on the fields which were specified in the Dimension Group Properties dialog when the Dimension Group was added (i.e. Length = [Width]+0.30).

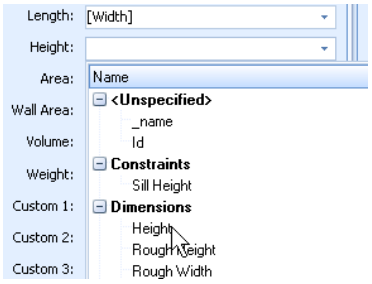
M2.26 **Click** on the **[Dimensions] tab**, notice that **each dimension has a length value of 2.07m** (i.e. the 1.77m width of the window plus the 0.30m which was added for the bearing ends of the lintels). Click back on the Dimension Groups tab to redisplay the Dimension Groups list.

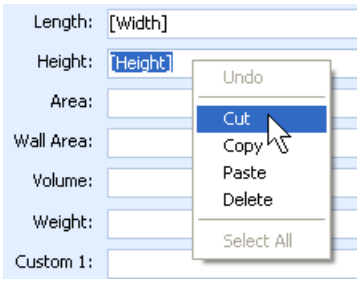
We will now create another Dimension Group to generate quantities for the window girth, this time using the window objects grouping details, which are available to directly select from the Import Objects In sub-menu, rather than using the Custom option.

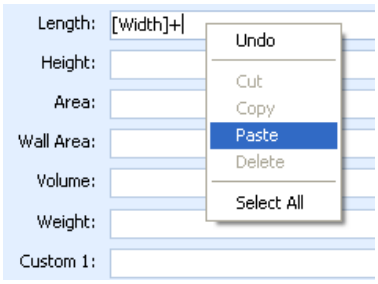
M2.27 In the same manner as before (Section M2.1 above) **right click** over one of the **window objects** and **[create a new Dimension Group]** called **{ 'Pointing – Window Girth' }** in the **'Windows'** folder with a **[measurement type]** of **{ Length }** then **click** on the **[BIM Dimensions]** tab.

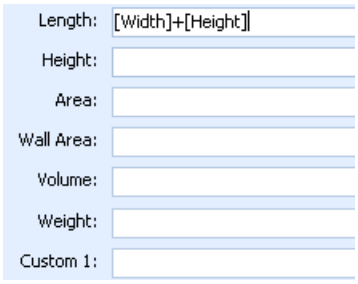
M2.28 Using the drop down selection arrow on the **right hand side of the [Length:]** field **select** the **{ Width }** object property field from the object properties window, **edit the contents of the [Length:]** field to read as either **' [Width]+[Width]+[Height]+[Height] ' or ' ([Width]*2)+([Height]*2) ' or ' ([Height]+[Width])*2 '**.

It is possible to highlight and cut/copy text and paste it between the dimension property source fields, therefore if you are creating a formula with more than one object property field it is possible to temporarily select the required object property field in one of the blank dimension property source fields then use the Cut (or Copy) option from the right click menu and then use the Paste option from the right click menu to paste it into the required place in the formula being created, as indicated in the example below:

1. 

2. 

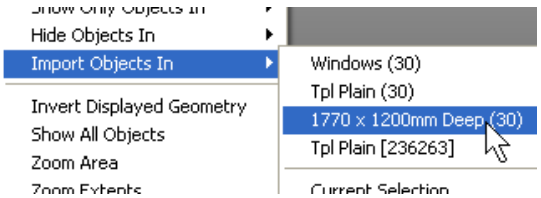
3. 

4. 

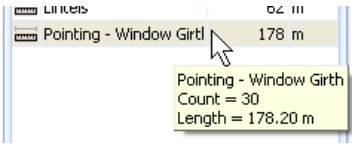
M2.29 Once the required details have been entered **click** on the **[Insert]** button to create and select the Dimension Group ready for measurement.

M2.30 **Right click over one of the windows** and hover the **mouse over** the **[Import Objects In]** option.

The first four sub-menu options above the separator line represent four increasingly refined grouping levels; selecting one will import dimensions for all currently visible objects belong within the selected grouping level. The grouping levels accord to the object Category, Family, Type and Instance.



M2.31 **Click** on the **[1770 x 1200mm Deep]** option on the sub-menu to create the dimensions, notice all 30no windows are measured into the new Dimension Group.



M2.32 Select the Dimensions tab, notice that the dimensions which have been created are all 5.94m in accordance with the formula entered when the Dimension Group was created. Click back on the Dimension Groups tab to redisplay the Dimension Groups list.

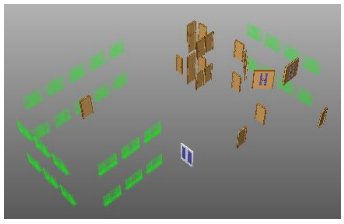
Using the Custom 1 – 3 Dimension Group fields with Object Mode Measurements

In addition to the standard Dimension Group value fields (Count, Length, Height, Area, Wall Area, Volume & Weight) CostX® also provides three additional custom value fields. The custom value fields differ slightly from the standard Dimension Group fields in that the name and unit of measurement may be specified by the user. The names specified for the custom value fields will be displayed in the majority of dialog boxes throughout CostX® and the unit of measurements specified for the custom value fields (provided a standard unit of measurement is selected e.g. m, m2, in, in2 etc..) will be used to automatically convert between the UOM for the imported BIM values and the UOM for the custom value fields.

We will now create a Dimension Group using the custom value fields and measure the door objects to obtain quantities for frames and architraves.

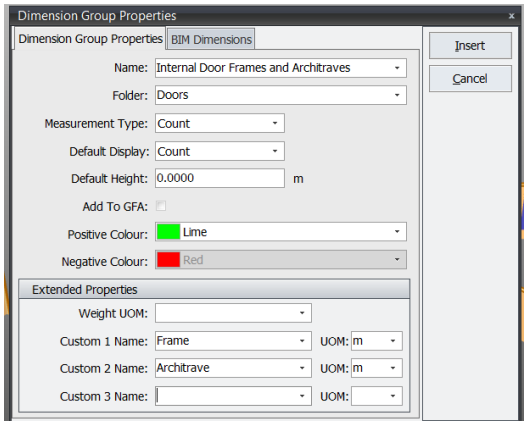
M2.33 Prior to commencing, use the Model List Window to filter the door objects, **click** on the **[Model] tab**, then scroll up to the **[Doors] group (node) and click** on it to select it. Finally **click** on the **[Drawings]** tab to the left of the Model tab to re-enable measurement mode.

> *The drawing view will display the measured dimensions shading / marker / outline for the currently selected Dimension Group even if the object(s) from which they were imported or measured are hidden. To prevent this shading / marker / outline from being displayed simply create and select an empty Dimension Group. Creating a Dimension Group called '0-Blank' (i.e. zero-Blank) in a folder also called '0-Blank' should allow this dimension to remain at the top of the Dimension Groups list window.*

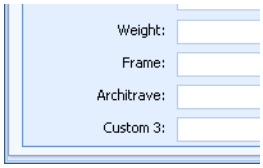


M2.34 **Right click** over one of the **internal doors** and **select** the **[Create Dimension Group]** option, the Dimension Group properties dialog will be displayed.

M2.35 **Enter** a Name of **{ 'Internal Door Frames and Architraves' }** and enter the **[Folder]** as **{ 'Doors' }** and **select** the **[Measurement Type]** as **{ Count }**. In the **[Custom 1]** fields towards the bottom of the dialog **enter { 'Frame' }** for the name and **select** a **UOM** of **{ m }** using the drop down selection button on the right of the field. In the **[Custom 2]** fields enter **{ 'Architrave' }** for the Name and **select { m }** again for the **UOM**, the Dimension Group properties should be as shown:

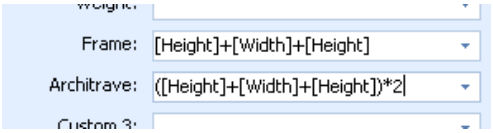


A measurement type of count is selected in this instance to allow the number of door frames measured to be displayed in the Dimension Group list window.



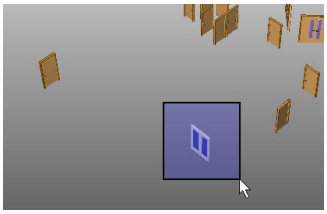
M2.36 **Click** on the **[BIM Dimensions]** tab, notice at the bottom of the dialog the previously entered names for the Custom 1 & 2 fields are displayed in lieu of 'Custom 1' and 'Custom 2' default names.

M2.37 In the **[Frame]** field **enter '[Height]+[Width]+[Height]'** as the value calculation, in the **[Architrave]** field **enter '([Height]+[Width]+[Height])*2'** as the value calculation, as shown below (remember you can temporarily select the [Width] and [Height] object property fields in an unused field and use the right click cut / copy / paste options).



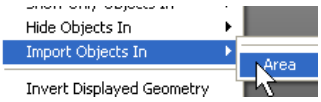
M2.38 **Click [Insert]** to create and select the Dimension Group.

M2.39 **Right click** over the **External double door** and use the right click menu **to hide the door**.

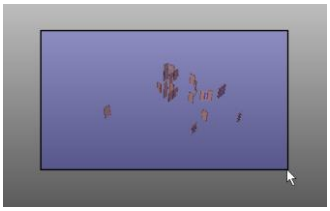


Having hidden the external door object we can now use the Import Objects In / Area technique to measure all of the remaining doors simultaneously.

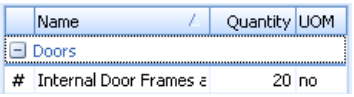
M2.40 **Right click anywhere over the drawing window** and hover the **mouse over** the **[Import Objects In]** option and **select [Area]** from the sub-menu.



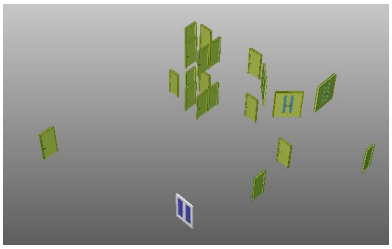
M2.41 **Drag a rectangle out over all of the remaining doors** (position the mouse cursor at the upper left corner of the area you wish to define, press and hold down the left mouse button and drag the mouse to the bottom right corner then release the mouse button).



Dimensions are created for only the 20no visible doors, which we can see from the Dimension Group value.



M2.42 To review this visually, right click on one of the measured doors and select Show Only Objects In…Doors to redisplay all doors in the drawing window. Notice that the internal doors which have been measured are shaded green, whereas the external door which was not measured is not shaded.



In addition to the method used above, the doors to be imported could have been selected by any of these alternative methods:

1) Measure each of the internal door objects in turn by clicking over them sequentially;

2) *Use the Import Objects In method and either select the uppermost Doors group from the sub-menu or the Area option to import dimensions for all doors and then delete the dimension pertaining to the external door;*

3) *Right click in turn over each required door family (e.g. first a double internal door and then a single internal door) and use the Import Objects In method selecting the second group (e.g. IntDbl and IntSgl respectively) from the sub-menu to import dimensions for each of the required door families sequentially;*

Module 3 BIM Import Template

In this module we will learn how dimensions can be imported using a BIM Import Template.

The concept of the BIM Import Template process is to provide a method to automatically create Dimension Groups and folders and import (usually in bulk) dimensions into them from multiple drawing objects, all with minimal user input.

BIM Import Templates are special macro / script files written by Exactal for use with CostX® and have a .XSLT file extension. They are used to automatically import object property data from a BIM Model in accordance with a set of rules which determine how the Dimension Groups and Dimension Group Folders will be configured and which object property values will be imported. In essence the BIM Import Template process automates the previously undertaken steps from the last module (i.e. for each type of object it creates a Dimension Group, determines which property values to import, selects which objects to import into each Dimension Group & imports the object dimensions).

When dimensions are imported using a BIM Template the Dimension Group Folders and Dimension Groups are automatically created based on the hierarchal grouping descriptions within the BIM Model, and the dimensions are automatically imported into them based on the most appropriate of the available dimensional values.

The BIM Import routine only works for the objects which are visible in the drawing window when the import is performed, therefore, the template may be used to import dimensions for a single object, one or more object groups or the entire drawing.

Usually therefore prior to importing dimensions using a BIM Template the displayed drawing objects are adjusted either by showing all objects (to import dimensions for the entire drawing) or filtered as required using one or more of the techniques outlined in the ‘Adjusting Views and Drawing Navigation Overview’ section of this document (to import dimensions for selected objects or object groups).

The Model tab can be used to view the BIM Model hierarchy which will indicate how the Dimension Groups will be configured.

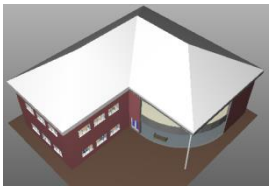
Import Dimensions for Selected Objects

Import Doors

We'll start by importing dimensions for selected door objects.

M3.1 Firstly to ensure all objects are visible once more, **right click** over the **drawing window** and **select** the **[Show All Objects]** option.

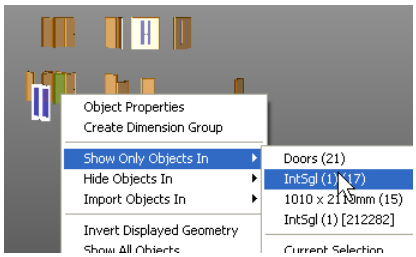
M3.2 The drawing should still be displaying an oblique view of the front left of the building, if not **right click** over the **drawing** and **select** the **[Reset View]** option from the right click menu then **click** on the **upper left corner** of the **view cube**.



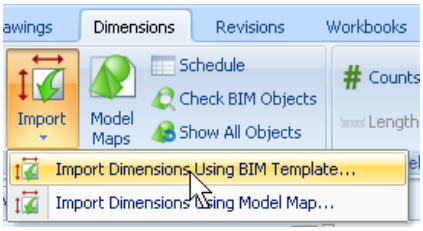
We'll now use Show Only Objects In method to filter the internal single doors.

M3.3 Position the mouse **cursor over** the **external double door**, **right click** and hover the **mouse over** the **[Show Only Objects In]** option and **select** the **uppermost Doors option** from the sub-menu to isolate the door objects.

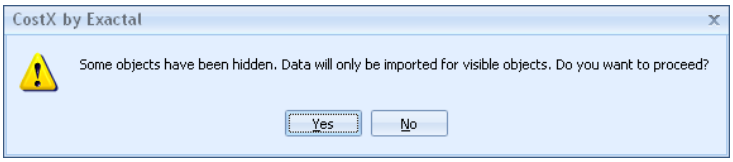
M3.4 Position the mouse **cursor over** one of the **internal single doors**, **right click** and hover the **mouse over** the **[Show Only Objects In]** option and **select** the **second [IntSgl] option** to isolate the internal single door objects.



M3.5 Having now filtered the internal single doors, **click** on the **[Dimensions] Ribbon Tab** to display the Dimensions Ribbon Toolbar, **click** on the **[Import]** button and **select** the **[Import Dimensions Using BIM Template]** option.

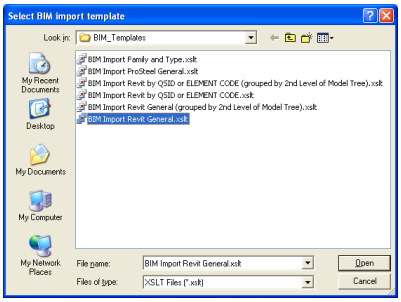


A message will be displayed indicating that some objects have been hidden and data will only be imported for the visible objects.

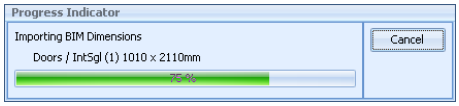


M3.6 **Click [Yes]** to acknowledge the message and proceed.

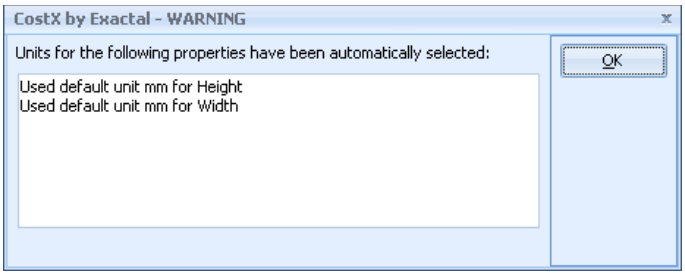
M3.7 The Select BIM Import Template browser window will now be displayed. (The default list of BIM Templates should be displayed, but if not, navigate to the location in which you have saved the training dataset and open the BIM_Templates folder). **Select** the **{ 'BIM Import Revit General.xslt' }** file and **click** the **[Open]** button to commence the import.



The dimensions for the displayed objects will be imported during which time a Progress Indicator will be displayed on screen.



A message will be displayed advising that the default mm units were automatically selected for the Height and Width values.

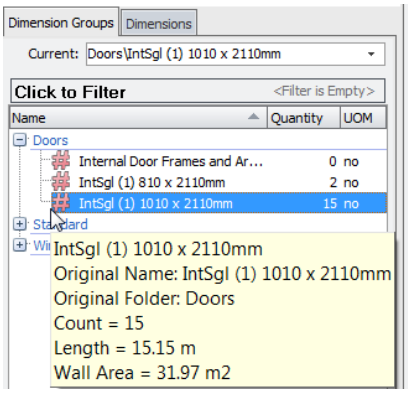


M3.8 **Click [OK]** to close the message, (the contents of the message window may be copied to the Windows® clipboard if required).

To verify the automatically selected UOM's use the schedule window, locate in turn each of the fields (column headings) noted in the warning message and scroll down in the schedule window to verify the numerical values in these columns are in the UOM (mm) automatically selected, (we learnt in the previous module how UOM's can be specified for particular fields and groups of objects to prevent the message being displayed).

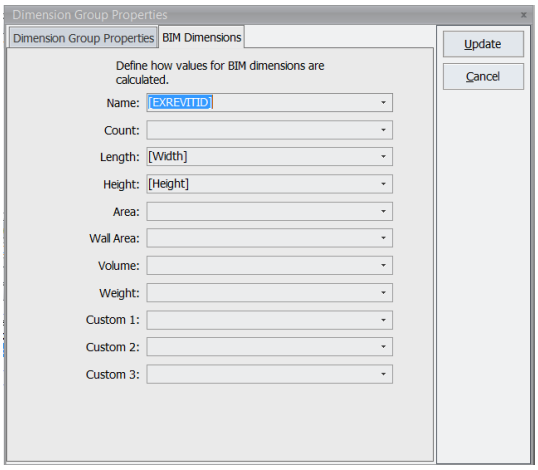
Turning our attention now to the Dimension Groups List Window you will notice that two additional Dimension Groups have been created under the Doors folder corresponding to the two internal single door sizes, each of which having the associated number of doors counted.

M3.9 **Hover** the mouse **cursor over the { IntSgl (1) 810 x 2110mm' } Dimension Group**, a hint will be displayed, **notice** that in addition to the **Count value Length and Wall Area (vertical area) values have also been created** during the import. The same is true for the 'IntSgl (1) 1010 x 2110mm' Dimension Group too.



The Dimension Group Properties dialog may be used to review which object property fields have been imported from the drawing into a Dimension Group.

M3.10 **Double click** on one of the two new **Dimension Groups in the list** to display the Dimension Group Properties dialog and select the **[BIM Dimensions]** tab.



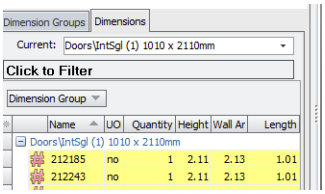
The Dimension Group value fields mapped during the import will be displayed. In this instance for each dimension the dimension Name has been taken from the objects EXREVITID field, the dimension Length value has been taken from the objects Width property field and the dimension Height value has been taken from the objects Height field. The dimension count and wall area fields are blank, however you will recall values corresponding to these fields were displayed in the hint, a count value of 1 is automatically created for every object during the import therefore the count field does not need to have an associated object property entry for the count value to be generated, the wall area value for each dimension is the product of the length and height in this instance (as there isn't an object property filed mapped to the Dimension Groups Wall Area field).

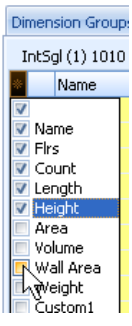
M3.11 **Click [Cancel]** to close the dialog box once it has been reviewed.

The Dimensions Tab may be used to review the individual dimension values imported / created for these fields.

M3.12 **Select** the **{ IntSgl (1) 1010 x 2110mm } Dimension Group** then **click** on the **[Dimensions] tab** to display the dimensions list, by default (as this Dimension Group is of a count measurement type) the list displays the imported dimension name, the number of floors and a count value of 1.

M3.13 **Click** on the **Column Selection** button located in the upper left corner of the dimensions list, a column selection window will be displayed, **place ticks** in the **[Length]**, **[Height]** and **[Wall Area]** fields by clicking in the checkbox to the left of the field names, then **close** the **column selection** window by clicking on the Column Selection button again.

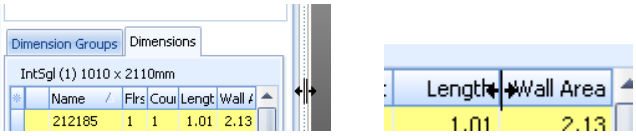




Columns relating to these fields will now be displayed in the dimension list window and the dimension values reviewed.

If you wish to enlarge the side bar window, position the mouse cursor over the separating bar between the side bar and the drawing window. The mouse cursor will change to a 'horizontal drag' ↔ *shape, hold down the left mouse button and drag the bar to the right to enlarge the side bar window. Release the mouse button when the desired width is*

obtained. The width of individual columns within the list may also be adjusted, position the mouse cursor to the right of the column heading for the column to be adjusted hold down the left mouse button and drag the column to the required size.



It is also possible to review the dimension details (in the dimension list window) in conjunction with the original object data (in the schedule window).

M3.14 **Open** the **[Schedule]**.

M3.15 **Hover** the mouse cursor **in turn over several of the highlighted doors in** the **drawing window**, **notice** that the **corresponding item is highlighted in both the [Dimension] list window and the [Schedule] window** each time.

M3.16 Now **click** in turn over **several** of the **dimensions** in the **[Dimension] list window**, **notice** that the **corresponding object is highlighted in both the drawing window and the [Schedule] window** each time.

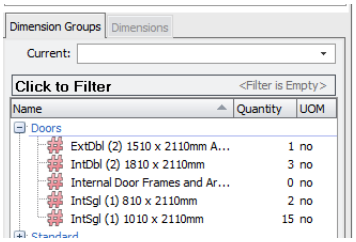
M3.17 **Click** on various **rows** in the **[Schedule]** and the **drawing object and dimension will highlight**.

M3.18 **Click** on either the **[Schedule]** button or the Schedule Window Resizing Bar **to hide the Schedule**, and also **re-display** the **[Dimension Groups]** List by clicking on the Dimension Groups tab.

We'll now re-display all door objects and repeat the BIM Template import process.

M3.19 **Right click** over **one of the doors** in the drawing window then hover the **mouse** cursor **over** the **[Show Only Objects In]** option and **select** the uppermost **['Doors']** option from the sub-menu again to redisplay all doors.

M3.20 Repeat the BIM Template Import process as before. **Click** on the **[Import]** button **on the [Dimensions Ribbon]** Toolbar and **select** the **[Import Dimensions Using BIM Template]** option, select the **['BIM Import Revit General.xslt']** file and click the **Open** button to commence the import.



Upon completion you will notice that the Doors Dimension Group folder now contains Dimension Groups for the remaining two door types (ExtDbl… & IntDbl…) and the original Dimension Groups IntSgl… remain unaffected by repeating the import process.

Review Dimensions

It may be desired to review the location of measured objects in context to the overall building model.

M3.21 With just the doors still displayed, **click** on the **[Ghost View]** button **in the [Drawings] Ribbon** to show hidden objects in outline. **Select** in turn several **different Dimension Groups** in the Dimension Groups list window, notice that the highlighted objects and their relative position can be seen and established (the drawing may be panned, zoomed or rotated as necessary). **Click the button again to close [Ghost View]**.

M3.22 **Right click** over the **drawing window** and **select** the **[Show All Objects]** option from the right click menu, **then turn on** the transparent display by clicking on the **[Transparent] button** in the Drawings Ribbon.

M3.23 **Select** the **{Internal Door Frames and Architraves} Dimension Group** then display the Dimensions List window by **click**ing on the **[Dimensions]** tab.

M3.24 **Select** in turn a couple of **individual dimensions** from the dimensions list window, **notice** that the **selected dimension is highlight in blue** allowing its relative position to be ascertained.

M3.25 **Click** on the **[Transparent]** button to close transparent mode and re-display the Dimension Groups List by **click**ing on the **[Dimension Groups]** tab.

Import Walls

Next we shall use the model list window to filter the displayed objects leaving only the walls visible and then import dimensions for those objects using the BIM Import Template.

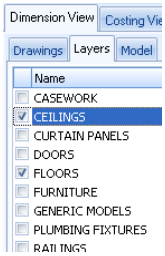
M3.26 **Select** the **[Model]** tab to display the model list window, scroll down the list to **locate** the **[Walls]** node then **click on it** to filer the drawing to display only the walls.

M3.27 **Repeat the [BIM Template] Import** process as before.

M3.28 Once completed **click** on the **[Drawings] tab** (located to the left of the Model tab) then scroll down in the Dimension Groups List window. **A new folder named { Walls }** and a series of Dimension Groups **have been created** for the wall objects which can then be reviewed as necessary in a similar manner as before.

Import Ceilings and Floors

We shall now import dimensions for all of the ceiling and floor objects, this time filtering the visible objects using the layers method of filtering.



M3.29 **Right click over the drawing window** and **select** the **[Show All Objects]** option from the right click menu to redisplay all of the drawing objects, then **click** on the **[Layers]** tab and **untick** the **[Ceilings]** and **[Floors] layers**, next **click** on the **[Invert]** Layers **button on the Drawings Ribbon** Toolbar. This will leave only the Floors and Ceilings layers visible.

M3.30 Once the layers have been adjusted as shown right **re-select** the **[Drawings]** tab (located to the left of the layers tab) to return to measurement mode.

M3.31 **Repeat the [BIM Template] import** process as before.

M3.32 Once the import completes **notice in the Dimension Groups List** window that **two new folders ('Ceilings' & 'Floors')** have been created each containing a number of new Dimension Groups relating to the various ceiling and floor types.

Import Dimensions for an Entire BIM Model

So far we have seen how objects can be filtered in varying ways prior to using a BIM template to import the dimensions; this method may have advantages in various scenarios, for example:

- Where a user has decided to import dimensions sequentially so as to review them and supplement them as necessary prior to importing the next set of dimensions.
- Where only some of the object types or groups would be relevant to the quantification exercise in hand, or conversely where most object types will be relevant but some are not required.
- Where it has been decided to quantify some objects or object types by other means (e.g. using a model map, individual object based measurements or 3D measure mode) or from other drawings.

However it is possible to import dimensions for the entire model en masse, this is done by simply ensuring all objects are shown and all layers are turned on prior to undertaking the import.

M3.33 **Select** the **[Model] tab** to display the model list window, scroll up to the top of the list then **click** on the uppermost **['Drawing'] node** to re-display all objects and layers, then **re-select** the **[Drawings]** list tab.

M3.34 **Repeat the [BIM Template] import process** once more in the same manner as undertaken previously for the last few BIM Template imports.

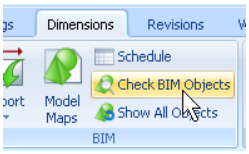
M3.35 Once completed **expand** each of the **newly created Dimension Group folders** by clicking on the (expand) button to the left of each Dimension Group name, you will **notice** that a substantial number of **additional Dimension Groups** have now been created which now represent all of the objects in the drawing.

The Dimension Groups and dimensions imported in this module using the BIM Template are in addition to the Dimension Groups and dimensions measured in Object Mode in the previous module for the Frames, Tinted Film, Pointing & Lintels (for various window and door objects) as those Dimension Groups were created with different names to the dimensions groups automatically created whilst importing dimensions using the BIM Template.

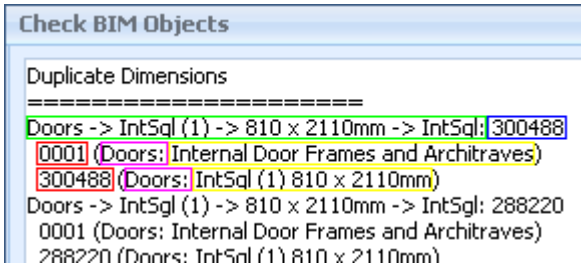
Check BIM Objects Report

It is possible to generate a report indicating whether/which objects in the drawing file have been used more than once (referred to as duplicate dimensions) & whether/which objects are unused for object based or imported dimensions.

M3.36 **Click** on the **[Check BIM Objects] button on the [Dimensions] Ribbon** Toolbar, the Check BIM Objects window will be displayed.



The first section of the report scheduled under the Duplicate Dimensions heading will provide details of any duplicated objects and the associated dimensions. (If none the report will indicate 'No Duplicates')



If any objects have been used more than once for object based or imported dimensions there will be an entry in the report for each duplicated object, the first line of each entry will display the hierarchical grouping levels for the object (highlighted in green above) followed by the objects unique ID (highlighted in blue above). The remaining two or more lines of the entry (indented slightly) will display the dimension name (highlighted in red above) followed by the Dimension Group folder name (highlighted in purple above) followed by the Dimension Group name (highlighted in yellow above) of all of the duplicate dimensions for the object;

The second section of the report scheduled under the Unused Objects heading will provide details of any unused objects, if there are no unused objects the report will indicate 'All Objects Are Used' which is the case in this instance.

If any objects currently have not been used there will be a single line entry for each unused object displaying the hierarchical grouping levels for the object followed by the objects unique ID.

The contents of the Check BIM Objects window can be highlighted and copied to the Windows® clipboard if required in the usual manner.

M3.37 **Click [OK]** to close the window.

As we have seen in this module the BIM Import Template process imports dimensions for the objects which are currently displayed. This allows dimensions to be imported either en masse by ensuring all objects and layers are shown prior to undertaking the import or more selectively by filtering the displayed objects using the right click menu options, by filtering using the model list window or by filtering using the layers list window, or combinations thereof.

Module 4 3D Measure Mode

The concept of 3D Measure Mode is to provide additional functionality to enable manual measurement of dimensions from 3D drawing views. This can be useful for example if a drawing object does not have the necessary type of BIM value to import using other methods, or to measure dimensions across or between multiple drawing objects. It can also be used to validate imported BIM values or to supplement or replace the imported BIM values.

3D Measure Mode provides the user the ability to specify the Dimension Group folder and Dimension Group names, select the primary measurement type, and measure dimensions by selecting one or more vertices (corner or end points of 3D objects).Usually when measurements are made using 3D Measure Mode, a Dimension Group is created first. This is done in the same manner as creating Dimension Groups for measurements taken from 2D drawings, by specifying a Name, Folder and Measurement Type for the Dimension Group (additionally a Default Height and Display Colours for the dimensions may also be specified). Prior to measurement, objects are usually also filtered so they can be viewed and selected more readily. Once the Dimension Group has been created and the required objects filtered, dimensions are measured by left clicking over required vertex points.

If 3D Measure Mode measurements are going to be used to replace dimensions imported using a BIM Import Template, the following steps may be useful to isolate the Dimension Group and amend its properties in preparation for the replacement measurements being taken:

1. *Right click over the relevant Dimension Group and select the Isolate Dimension Group option, this will filter the displayed (and scheduled) objects leaving just the objects for which dimensions were previously imported into the Dimension Group (during the BIM Import Template process) and consequently the objects for which replacement measurements will be required.*

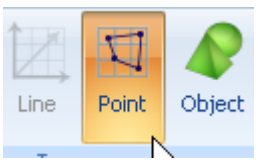
2. *Right click over the drawing window and select the Clear All Dimensions option; this will delete all of the previously imported dimensions from the Dimension Group.*

3. *Click on the Properties button on the Dimensions Ribbon Toolbar (or double click on the Dimension Group name in the Dimension Groups list window) to display the Dimension Group Properties dialog for the Dimension Group. Amend if necessary the current entries shown in the dialog (e.g. the Measurement Type:, Default Height: etc.) to suitable values for the new 3D Measure Mode dimensions which will be measured then select the Object Properties tab. Highlight and delete in turn the entries in the Dimension Property Source fields and click Update to save the changes and close the dialog window.*

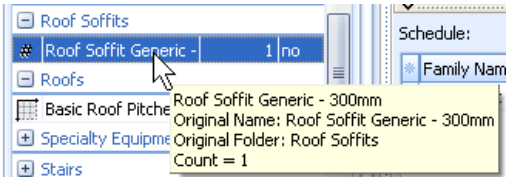
Measuring 3D Measurement Mode Dimensions

We'll start by reviewing some of the imported BIM values from the previous module and use the 3D Measurement Mode tools to measure some supplementary dimensions.

M4.1 **Click** on the **[Point]** button on the **[Dimensions] Ribbon** Toolbar to turn on 3D Measure Mode and consequently turn off Object Mode (the Point button will now be displayed with an orange background and the Object button with a neutral background signifying this).



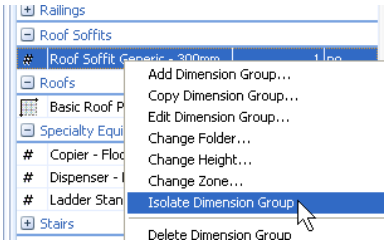
In the Dimension Groups list navigate to and expand the { 'Roof Soffits' } Dimension Group folder. You will find a single Dimension Group named 'Roof Soffits Generic – 300mm' which is quantified as a count with a value of 1no. Hover the mouse over the Dimension Group display the pop-up hint, as you will notice from the hint only a count value has been created when the dimensions were imported using the BIM Template.



to

Firstly we'll review the object properties to ascertain if there are any other BIM values which may be of assistance, although we could display and right click over the object in the drawing window and select the Object Properties option, an alternative (which is especially useful where a Dimension Group contains dimensions for a number of objects), is to use the schedule window.

M4.2 Isolate the object by **right clicking** over the **Dimension Group { Roof Soffit Generic - 300mm}** and **select** the **[Isolate Dimension Group]** option. **Open** the **[Schedule]**. The display and schedule window will be filtered to display only the single roof soffit item.



From reviewing the object properties for this object in the schedule window, you will **notice** that there is very little **object data** for this particular object and in particular **no 'Area' value** or other suitable quantity which may have been of assistance for a costing exercise. Whilst there may potentially be other methods by which the designer could model this roof soffit in the BIM software and provide an area value, or the area could be measured from 2D plans we shall measure directly from the 3D model using 3D Measure Mode.

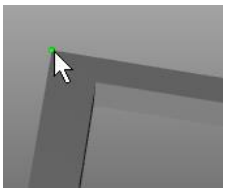
Although the existing dimension could be deleted from the Dimension Group and then the object measuring into the same Dimension Group using 3D Measure Mode we shall in this instance create a new Dimension Group.

M4.3 **Create** a Dimension Group in the normal manner by on the **[Add] button** at the left hand side of the **[Dimensions] Ribbon**. **Enter** "**Roof Soffit Area"** in the **{ Name: } field** and **ensure the existing "Roof Soffits" folder** is **selected** in the **{ Folder: } field** and the Measurement Type is selected as Area and **click [Insert]** to create and select the Dimension Group (the name obviously could be any name to suit the application).

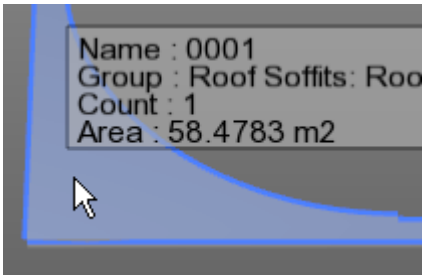
To measure the plan area of the soffit we could measure around the outside perimeter as a positive dimension and around the inside perimeter as a negative (or deduct) dimension. However in this instance we can use the *Quickpoint* 3D area measurement tool.

M4.4 Firstly **rotate** the **drawing** as needed **to obtain a clear view over** the upper surface of the roof soffit item, a view part way between the front and top views is ideal, this can be selected with the view cube.

If you move the mouse cursor over the upper surface of the outside perimeter of the roof soffit object, a green sphere will be displayed as you move over corners or intersection points. These vertex points are the starting points for Standard 3D area measurement.



M4.5 **Move** the **cursor over** the **top of the soffit area** and **hold** the **Shift key**. The entire area will highlight in blue. **When it highlights**, **left click** the mouse to capture the area.



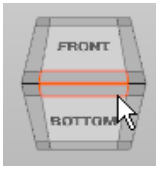
Now we will turn our attention to the 'Basic Roof Pitched – Warm – Industrial' Dimension Group included under the 'Roofs' folder.

M4.6 **Open** the **{ Roofs } folder** and **right click** over the **{ 'Basic Roof Pitched – Warm – Industrial' } Dimension Group** and **select** the **[Isolate Dimension Group]** option.

M4.7 **Open** the **[Schedule]** and **review** the available **object properties**. The roof object has area and volume dimensions but **does not have a perimeter or length value**. As the perimeter length is required to make an allowance for eaves and gutters we will therefore measure the perimeter length into a new Dimension Group.

M4.8 **Create** a **new Dimension Group** called **"Roof Perimeter"** in the **"Roofs" { folder }** with a **{ measurement type }** of **" Length"**.

M4.9 Orientate the drawing to a viewing perspective half way between the Front and Bottom views, to do this **click on the edge of the View Cube below the word 'Front'** (as indicated right).



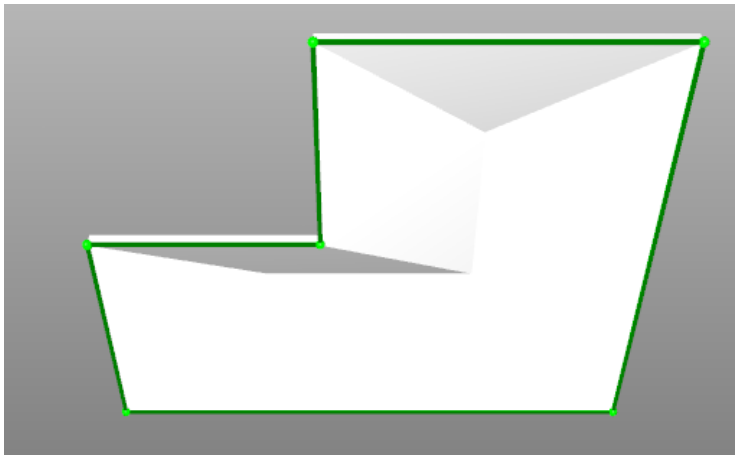
M4.10 **Move the mouse cursor** towards the **lower left hand corner of the roof**. When the corner point (vertex) is highlighted with a green sphere (i.e. the mouse has connected to that corner) **click** the left mouse button **to select the corner**.

M4.11 **Move the mouse cursor towards the lower right hand corner of the roof**. A blue preview line will be displayed between the first and second corners.

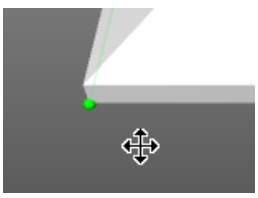
M4.12 **Click** again with the left mouse button to **select the second corner** and **create the length measurement**. The two corners will be highlighted with green spheres with a connecting line displayed between them. This is *Standard* length measurement.

M4.13 Now **hold** the **Shift key** and **move the mouse cursor across any point along the right hand perimeter of the roof**. A blue preview line will display. **Left click** the mouse **to capture** the **length**. This is *Quickpoint* length measurement.

M4.14 Keep **hold** of the **Shift** key and **move the cursor across each section of roof perimeter** in turn. **Left click** as **each segment highlights** to measure the complete roof perimeter. If any of the required segments do not highlight, try zooming in or adjusting the orientation slightly so that CostX® can lock onto the required vector line.



When using the Standard length measurement method, it is not possible to start a length dimension on the same vertex point as a previous dimension ended. To overcome this, move the cursor over the vertex at the end of the existing dimension so that the cursor changes shape to a four pointed arrow. This signifies that the cursor has connected to the vertex of the existing dimension, which could then be dragged and dropped to amend the existing dimension or have further segments added with the Ctrl key. However it is also possible to use the same point to start a new dimension, as follows.



To override the selection of the existing dimension to allow the same corner to be selected for a new measurement, hold down the O key on the keyboard. The connecting line previously shown between the cursor and the corner will be removed, click once with the left mouse button to select this corner as the first corner of a new length measurement and then release O key. Then move the cursor to the next selection point.

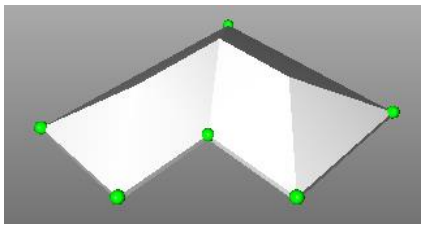
M4.15 To review the extent of the measurements to ensure they are all in the same plane, **turn on** the transparent view by clicking on the **[Transparent]** button on the **[Drawings] Ribbon** and **rotate the roof**.

M4.16 **Click** on the **[Transparent] button** once more **to turn off transparent view.**

Having now measured a quantity for the roof perimeter (for example for guttering) we shall next create a Dimension Group to measure a quantity for the corners in the perimeter (for example for 90 deg bends in gutters or junctions in the closure details) again using 3D Measure Mode but this time as a Count type of Dimension Group.

M4.17 **Create a new Dimension Group** called **"90 Deg Bends in Roof Perimeter"** in the **"Roofs" { folder }** with a **{ measurement type }** of **"Count"**.

M4.18 **Left click once** on a **vertex at each external and internal corner of the roof perimeter**. If the drawing has been rotated select an appropriate view using the View Cube and / or rotate the drawing as needed to click on each corner.



M4.19 Before continuing re-display all drawing objects by **right click**ing **over the drawing window** and **select**ing the **[Show All Objects]** option.

Module 5 Model Maps (PFC 5-5)

In this module we will create a new building and add a new 3D BIM model together with associated 2D plans and sections. We will then learn how to create a Model Map and import dimensions using it.

A Model Map is a user defined 'template' which specifies how object properties contained within a 3D BIM Model drawing can translated into dimension information and automatically imported into CostX®.

When dimensions are imported using a Model Map, the quantity values for the drawing objects are read from the selected object property fields within the BIM Model and a series of Dimension Groups and folders are automatically created containing the values.

The concept of the Model Map is twofold. Firstly it allows the user to use any of the object property fields, either individually or in combination, or to directly enter text to determine the Dimension Group name and folder configuration. This in turn determines the degree of subdivision of the imported dimensions and the resulting quantities. Secondly it allows the user to use (map) any of the object property values, or to directly enter numerical values, into any of the Dimension Group value fields (e.g. Length, Height, Area etc.). These can be used either individually (as a finite value) or in combination (to create a formula).

A Model Map would normally be used to import dimensions where the user requires more control over the import process as compared to the BIM Import Template process, but still requires an automated and /or replicable process (as compared to Object Mode measurement).

Model Maps may be set up at Global or Project level, and can also be copied allowing the establishment of Model Map templates if required.

In this module we will create a multi-tiered Model Map which will be used to import a variety of dimensions and will demonstrate how Model Maps can be used to:

1) Provide greater user control in the creation and naming of Dimension Group Folders and Dimension Groups to customize the BIM data output;
2) Utilize the model tree structure to create a Model Map which is applicable generally to the selected object group but also subdivides down into sub-group specifics;
3) Create formulas within a Model Map to calculate additional measurement information over and above that imported using a standard BIM Template or contained within the BIM Model properties.

Building Set-up (PFC 1-4)

M5.1 **Click** the **Main Menu**  **button** and **select** the **[Close Building]** option to close the currently open building file.

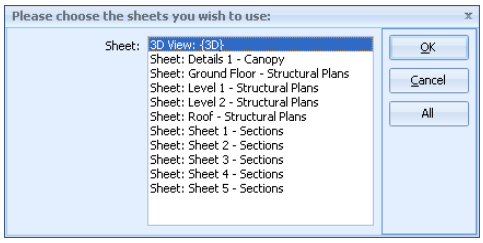
M5.2 **Click** the **Main Menu**  **button** again and **select** the **[New Building]** option, the Building Properties dialog will be displayed, **enter "3D Training Modules 5-6 - " followed by your name** in the **{ Name: } field**.

M5.3 In the **{ Project } field** use the drop down menu to select the **"3D Training-*Your Name*" project** that was previously created.

M5.4 Ignore the remaining fields and **click [Insert]**. This will create the new Building and the CostX® display will open in the Dimension View ready for you to add drawings etc.

Adding a Multi-Sheet Drawing

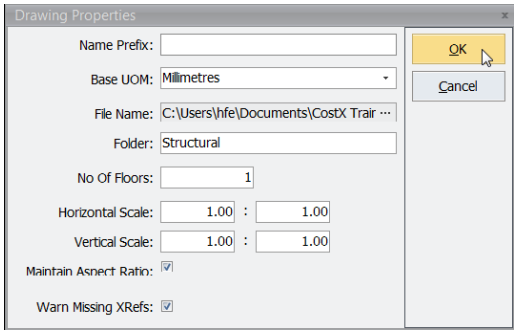
M5.5 **Click** on the **[Add] button** on the **[Drawings] Ribbon** Toolbar, browse to the location in which you previously saved the dataset and **select** the **'3D Training Module 5 Structural Drawing.dwf' drawing** and **click [Open]**. As the DWF file contains several sheets you will be prompted to choose the sheet or sheets to use.



An individual sheet may be added by selecting it the list and clicking on the OK button, several sheets may be added at once by selecting the first sheet to add from the list then holding down the 'Ctrl' key on the keyboard and selecting in turn the other sheets to add before clicking the OK button.

M5.6 In this instance we wish to add all of the sheets therefore **click** on the **[All]** button.

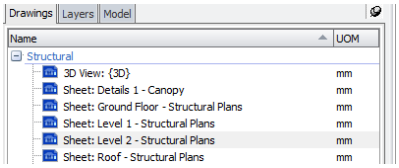
The Drawing Properties dialog will be displayed. The Name Prefix + each Sheet name will be displayed in the Drawings List window. The Name Prefix field defaults to the file name of the drawing but can be amended (or deleted) if required.

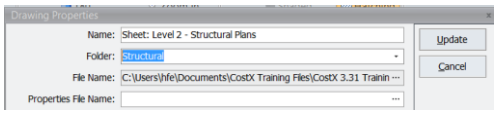


M5.7 **Delete** the content of the **{ Name Prefix: } field**. And **insert "Structural"** in the **{ Folder: } Field**.

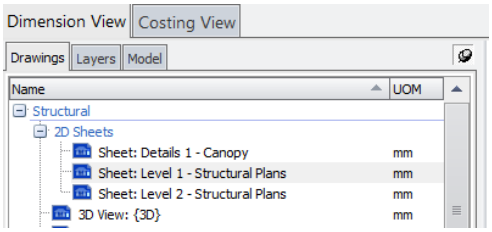
M5.8 **Ensure** the **settings are as shown here** and **click [OK]** to add the drawings.

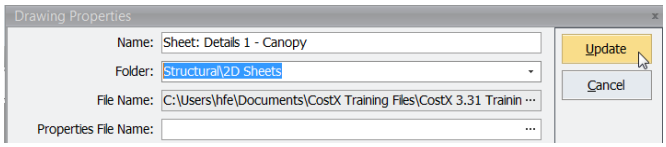
Note all drawings have been entered under a folder called Structural, this can be edited at any stage by Selecting the Drawing Properties and Changing the Folder Option.





Additionaly, subfolders can be created by fixing the character "\" after the exisitng text in the Folder Field. For Example the 2D Drawings can be inserted into a sub folder called 2D Sheets by typing "Structural\2D Sheets" into the Folder Field in Drawing Properites.



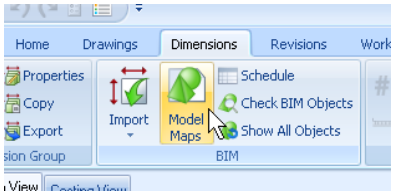


M5.9 Take a few moments to familiarize yourself with the 3D view and the 2D sheets.

The 3D view must be open whilst defining a Model Map, however it is possible to temporarily close a Model Map while it is being defined to access and review other drawings before reselecting the 3D view to resume the mapping definition.

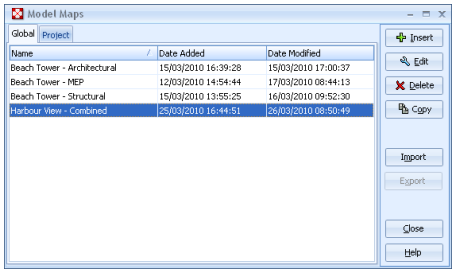
Creating a Model Map & the Model Map User Interface

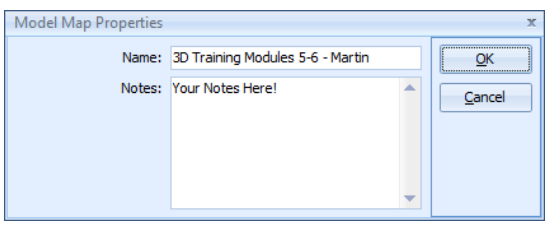
M5.10 **Select** the **[Structural: 3D View {3D}] drawing** in the drawings list window, i.e. the drawing for which a model map is to be created, then **display** the **[Dimensions] Ribbon** Toolbar by clicking on the Dimensions Ribbon Tab.



M5.11 **Click** on the **[Model Maps] button**. The Model Maps list dialog is displayed.

M5.12 Note at the upper left corner the 'Global' & 'Project' tabs. Selecting either tab filters the displayed list of existing Model Maps and equally determines which type of Model Map is created when the Insert button is clicked.



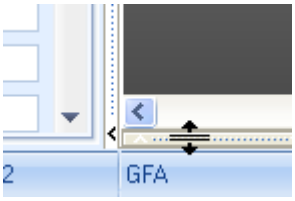


M5.13 For this training module we will create a Project Model Map therefore **click** on the **[Project] tab**, then **click** on the **[Insert] button**. In the **{ Name: } field** of the Model Map Properties dialog **enter "3D Training Modules 5-6 - *Your Name*"** for the name, optionally notes may be entered in the Notes field.

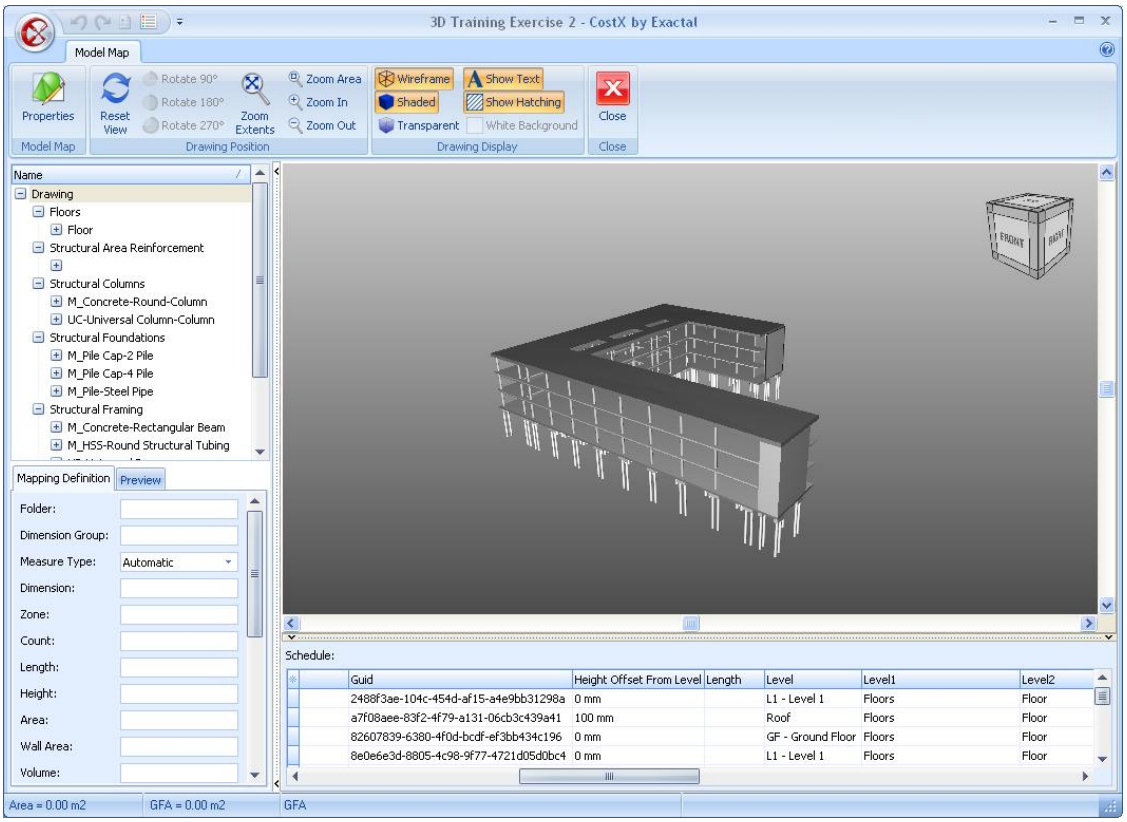
With the Network version of CostX® the Model Map Properties dialog will additionally show an Editing Access drop down field, selecting Shared allows all users to use and edit the Model Map, whilst selecting Private allows all users to use the Model Map but only the user who created it can edit it.

M5.14 **Click [OK]** to create the new Model Map and display the mapping definition user interface.

M5.15 Also **display** the **Schedule Window** by **clicking** on the **Schedule Window size adjustment bar** located immediately below the drawing window's horizontal scroll bar.



The user interface will now look similar to the following example. The various screen regions required to create entries for the Model Map are as follows:



Model Map tab and associated Model Map Ribbon Tool Bar *located at the top of the user interface. The Properties button on the left of the ribbon toolbar will display the Model Map Properties dialog once more allowing the name of the model map and the notes field to be amended. The various control buttons located within the Drawing Position and Drawing Display sections of the ribbon toolbar have the same function as with the normally displayed user interface. The Close button on the right of the ribbon toolbar closes the Model Map user interface and returns to the normally displayed user interface. Changes made as the Model Map entries are being created (or edited) are saved progressively.*

Model Tree List Window *located directly beneath the Model Map Ribbon Toolbar on the left of the user interface. This displays the same model hierarchy information as would be displayed when the Model tab is normally selected. Selecting a node (object group level) in the Model Tree List Window similarly filters the objects displayed in the Drawing Window and scheduled in the Schedule Window. It additionally selects the node against which a Model Map Entry is created (or edited). A node displayed in Bold in this list window signifies that a Model Map Entry has been created for that node.*

Mapping Definition & Preview Window *located directly beneath the Model Tree List Window on the left of the user interface. The Mapping Definition tab displays on the left hand side of the window the various CostX® Dimension Group and dimension field names, and to the immediate right of each field name is an associated entry field within which data from the Schedule Window columns (i.e. Object Property Source fields) can be can be dragged in, free text entered (must be within quotation marks), and unformatted numerical values and mathematical operators can be typed. When the relevant entry*

fields have been completed they define (for the objects contained within the currently selected model tree node) how object information within the BIM drawing will be mapped to produce Dimension Groups and dimension values upon import. When the relevant entry fields in the mapping definition window have been completed for a particular node of the model tree this is known as a Model Map entry for that node. The Preview tab will allow the structure and values of the Dimension Groups and dimensions which would result from importing dimensions using the Model Map to be reviewed.

Drawing Window *located directly beneath the Model Map Ribbon Toolbar on the right of the user interface. This displays the modelled objects in the same manner as would be displayed with the normally displayed user interface when the Model tab is selected, objects are similarly filtered based on the node currently selected in the Model Tree List Window and the right click menu options are the same.*

Schedule Window *located directly beneath the Drawing Window on the right of the user interface. This schedules the object properties for the displayed objects in the same manner as would be scheduled with the normally displayed user interface. Objects are similarly filtered based on the node currently selected in the Model Tree List Window and the right click menu options are the same. However, additionally with the model map user interface the Object Property fields (columns within the schedule) may be dragged and dropped to the relevant entry field within the Mapping Definition Window as part of the process of creating a Model Map entry.*

Creating a Basic Model Map Entry

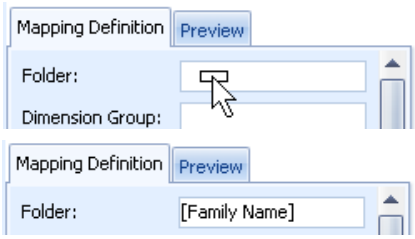
In this part of the module we'll learn the principles of creating Model Map entries and how text (within quotation marks) and multiple object property fields (columns) may be combined (using the mathematical **+** operator) to control Dimension Group naming and the associated grouping of objects and their associated dimension values.

M5.16 **Select** the **'Floors' node** in the Model Tree List Window, the displayed and schedule objects will be filtered to just these objects, and then briefly review the available data.

The columns in the schedule window are the Object Property Source Fields and each row represents an individual object. The Family Name and Type Name and also the Level1, Level2… columns may be useful for the Folder Name and Dimension Group names respectively, the Level column may be useful for the Zone and the Area, Perimeter and Volume columns may be useful for the respective Area, Length and Volume fields, we can also see that each of the columns contains a value for each of the filtered objects.

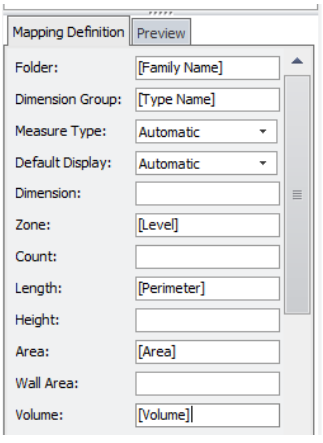
We will use (drag and drop) these columns to create a simple model map entry for this object group (i.e. the Floors group (node) as selected in the model tree list window).

M5.17 **Locate** the **Family Name column in the schedule window** and **position the mouse cursor over it**, **press and hold down the left mouse** button and **drag the cursor directly over the entry field** to the right of the **{ Folder: }** item in the Mapping Definition window.



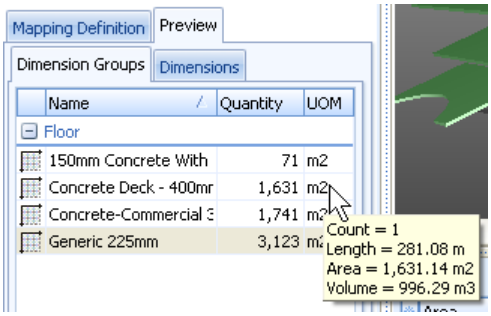
M5.18 Now **release** the left mouse button to complete dragging and dropping the column from the schedule window to the mapping definition window. The Folder: entry field will be populated with the column name (i.e. the object property source field name) displayed within square brackets.

M5.19 **Repeat the drag and drop process as described above by dragging the Type Name, Level, Perimeter, Area and Volume columns** (object property source fields) from the Schedule Window **into the { Dimension Group }, { Zone}, { Length}, { Area} and { Volume } fields** in the Mapping Definition fields respectively. The Mapping Definition window should be as shown to the right.



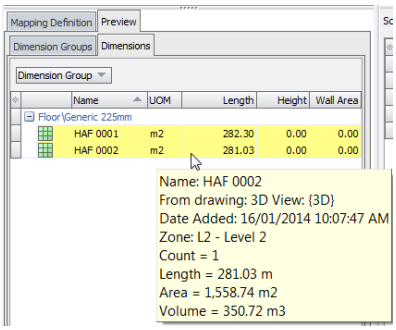
The Measurement Type: field specifies the type of Quantity value and UOM which will be displayed in the Dimension Groups list window for the resulting Dimension Groups and hence will also be the pre-selected quantity type when dragging and dropping them into a workbook (Not available in CostX® Takeoff). By default the Automatic option is selected, this will automatically select the most appropriate measurement type based on the other completed entry fields (this can be reviewed by previewing the Dimension Groups). A specific measurement type may also be select using the drop down list button.

M5.20 **Click** on the **[Preview] tab** to review the structure of the dimensions groups and folders which will be created during the import, a pop-up hint can also be displayed by hovering the mouse over a Dimension Group or dimension:



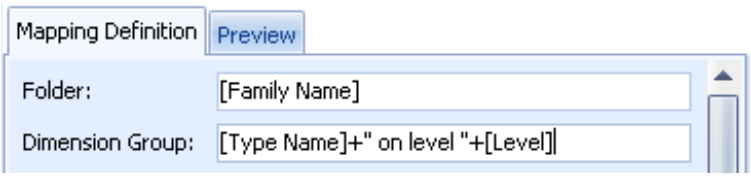
M5.21 **Review the Dimension Groups and Dimensions preview tabs** in conjunction with the data in the Schedule Window notice how the previously created mapping entry in the Mapping Definition Window controls how Dimension Groups & folders and dimensions & their associated values would be created and arranged upon import. **Notice** that **only one Folder named 'Floors' is shown as all five objects in the Schedule Window have a Family Name of 'Floors'**. Notice also that there are four Dimension Group names, one corresponding to each of the four different object types (as specified by using the Type Name column in the Dimension Group field).

M5.22 **Select** now the **{ Generic 225mm }** Dimension Group then **click** on the **[Dimensions]** preview **tab**, notice the Dimension Group contains two dimensions (as there are two objects scheduled which have a Type Name of 'Generic 225mm').

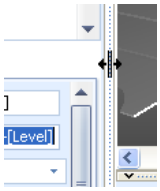


In other words the entries in the Folder and Dimension Group fields are filtering the relevant BIM objects with matching object properties into the relevant Dimension Group and Folder. Also note from the pop-up hint which is displayed by hovering the mouse over any of the individual dimensions that the Zone field is also imported from the specified 'Level' column. The Zone information may of course be used within workbooks in the normal manner to sub-divide Dimension Group values.

M5.23 **Click** back on the **[Mapping Definition] tab** to show once more the model map entry then **click** at **the end** of the **{ Dimension Group: } entry field** and add **+" on level "+** to the end of the [Type Name] entry, now **drag** over **the [Level] column** and **drop** it at the **end** of the **{ Dimension Group: } entry** field. The Dimension Group entry field should now be as follows:

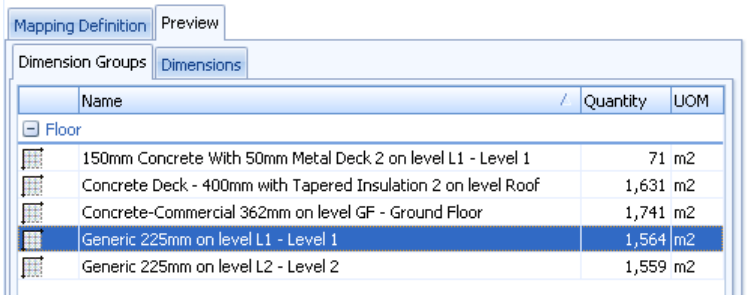


TIP: to expand the width of the side bar (i.e. the region of the user interface displaying the Model Tree List and Mapping Definition windows) position the mouse cursor over the separator bar between the side bar and the drawing/schedule window then hold the left mouse button down and drag out the separator bar to the required size.



M5.24 **Click** on the **[Preview] tab** once more, **notice** that now the **Level column** (object property source field) has been **appended to** the **previous Dimension Group entry field** that there are now five

dimensions groups one corresponding to each combination of the Type Name AND Level object property source fields (as specified in the Dimension Group: field).

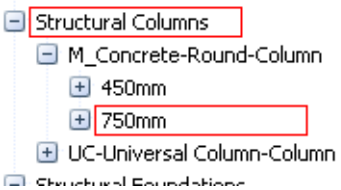


This shows how combining two or more object property source fields (columns) in the Dimension Group: field allows the objects (and therefore dimensions) to be more discreetly filtered and arranged when imported.

M5.25 **Click** back on the **[Mapping Definition] tab** and then **select** the **[Structural Columns] node** in the model tree list window. Note that the Floors node is highlighted in bold signifying that a Model Map entry has been defined against that node of the model tree.

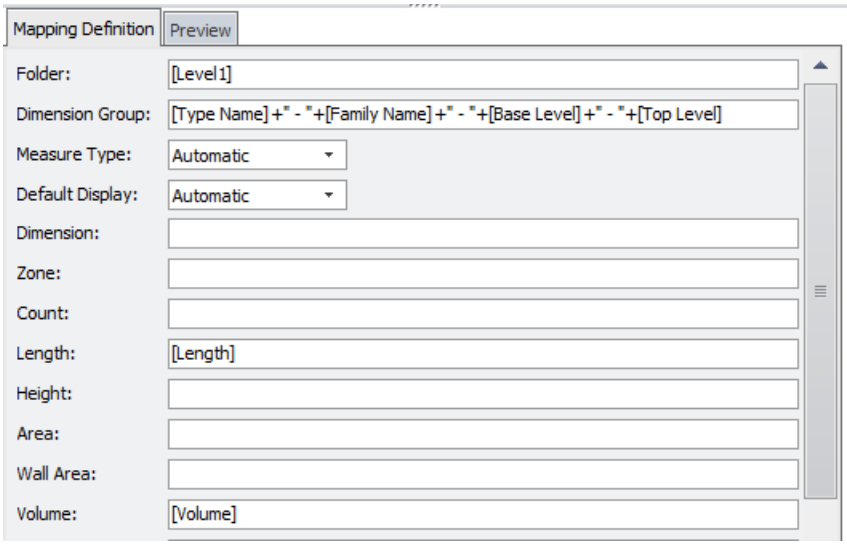
Hierarchically Arranged Model Map Entries

This part of the module will create a Model Map entry for the Structural Columns node of the model tree, and will then create a sub-division Model Map entry for the 750mm (Concrete Round Columns) node of the model tree (i.e. a lower level node on the structural columns branch of the model tree).



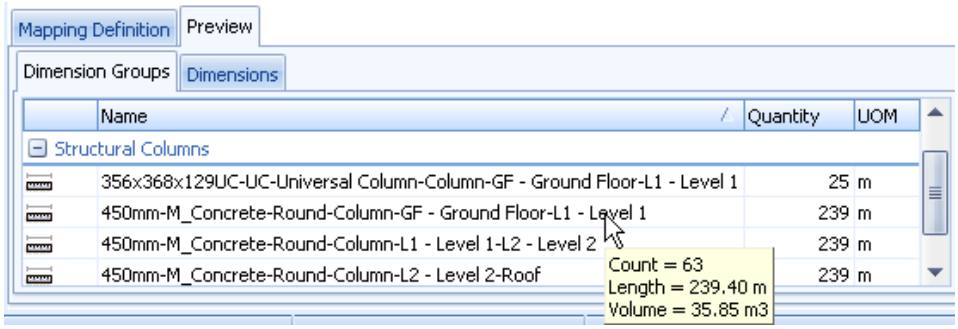
From this we'll see how the hierarchy of the model tree may be used to create a Model Map entry which is generally applicable for the majority of objects in a chosen group whilst also creating an alternate 'overriding' Model Map entry for a specific sub-group of objects.

M5.26 With the Structural Columns node selected in the model tree list window **create** the **model map entry shown below** by dragging and dropping columns from the schedule window into the relevant fields and directly entering the **+" - "+** between each of the column names dropped in the Dimension Group: field.



Note the use of the Type Name column (which can be seen from the data in the schedule window specifies the object size), the Family Name (which specifies the object material and the Base Level and Top Level (which indicate the levels between which the objects have been modelled) in the Dimension Group: entry field.

M5.27 **Click** on the **[Preview] tab** which will display a single Dimension Group folder and several Dimension Groups differentiated by size, material and the various building levels, as shown below.



M5.28 **Select** in turn **several** of the **Dimension Groups** in the Dimensions Groups preview list window, **notice** that as **each** is **selected** the relevant **objects are highlighted in the drawing window**.

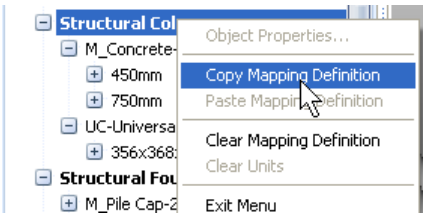
Upon review it transpires that the 7nr objects included in the last '750mm M_Concrete-Round-Column…' Dimension Group are not in fact building 'Columns', rather they are plinths partially within and partially above ground but have been modelled within Revit® using a structural column family.

We may therefore decide that we wish them to be included under a different Dimension Group folder and be described with a different Dimension Group name, so in this case we shall create a further Model Map entry for the lower level node of the model tree, grouping just these objects, as an 'override' to the

previously created Model Map entry. We shall do this by copying and over and amending the previously created model map entry.

M5.29 **Click** on the **[Mapping Definition]** tab to quit the preview.

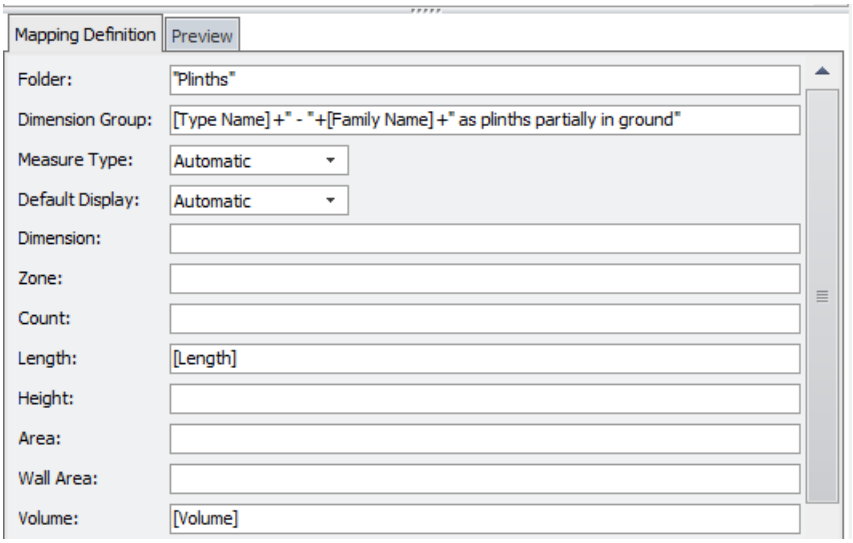
M5.30 **Right click** over the **[Structural Columns] node** in the **model tree** list window and **select** the **[Copy Mapping Definition]** option from the right click menu, this option copies the Model Map entry from the selected node to the system clipboard such that it can be pasted against a new node as an alternative to creating an entirely new Model Map entry.



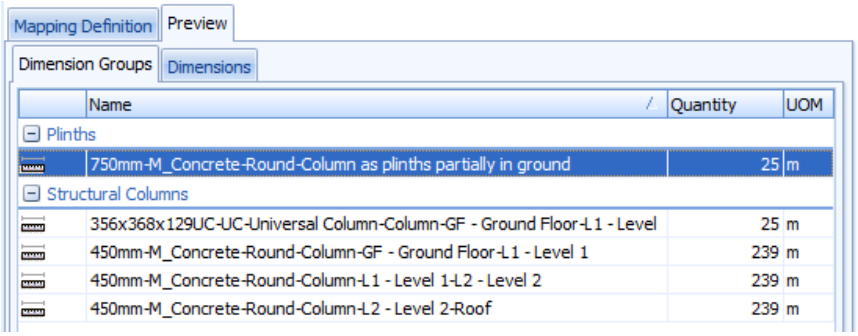
M5.31 **Expand** the **[M_Concrete-Round-Column] node** located under the Structural Columns node by clicking on the '+' button to the left of the node's name, then **click** on the **[750mm] node** to select it. The Drawing Window and Schedule Window will filter down to the relevant 7nr objects for which we wish to 'override' the previously defined Model Map.

M5.32 **Right click** over the **[750mm] node** and **select** the **[Paste Mapping Definition] option** from the right click menu, the mapping definition copied from the previous node is pasted against the selected node and may now be edited.

M5.33 **Click** in the **{ Folder: } entry field** and **delete the current contents** and **insert** in lieu **"Plinths"** (including the quotation marks), next **click** in the **{ Dimension Group }** entry **field** and **delete the "–"+[Base Level]+"-"+[Top Level]** from the end of the current entry and **add in lieu " as plinths partially in ground"**, leave the remaining fields. The Model Map entry should now be as follows:



M5.34 To preview the import results for the whole Structural Columns node including this 'overriding' lower level Model Map entry **select** the **[Structural Columns] node** once more in the model tree list window then **click** on the **[Preview] tab**.



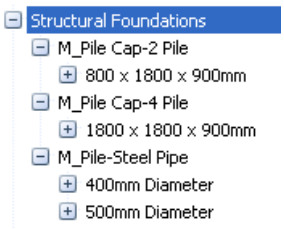
Notice that the 'plinth' dimensions are now included in a Dimension Group with a suitably revised description and under a separate folder, which means the mapping definition details entered in the lower level node have taken precedence.

M5.35 **Click** back on the **[Mapping Definition] tab** and then **select** the **[Structural Foundations] node** in the model tree list window. **Note** that now the **Floors**, **Structural Columns** and the **750mm nodes are all highlighted** in the model tree list window in bold signifying that Model Map entries exist for each of those nodes of the model tree.

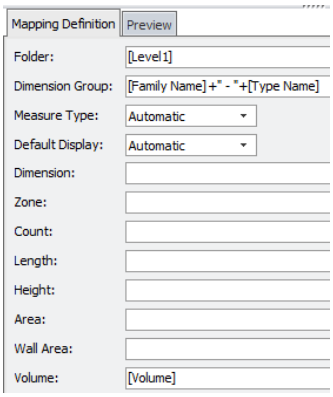
Using the Weight & Custom Fields and Formulas

This part of the module introduces the use of formulas (ie. using several columns and directly entered numerical values in a single Dimension Group value field) and the principles of using the Weight & Custom 1, 2 & 3 fields to create additional dimension value information calculated from the available object properties.

M5.36 **Expand** the **three nodes beneath the [Structural Foundations] node** in the model tree list window and review the information in the Schedule Window. This reveals that the Structural Foundations node includes objects relating to two differently sized pile caps for which length, volume and width values are available, and two differently sized steel piles for which a volume is available. So in this instance we shall create a Model Map entry for Pile Caps and Piles separately.



M5.37 **Select** the **[800 x 1800 x 900mm] node** under the Structural Foundations/ M_Pile Cap-2 Pile node in the model tree list window and **complete the { Folder: }** and **{ Dimension Group: } entry fields as shown to the right**. **Drag over the Volume column into the { Volume: } field.**



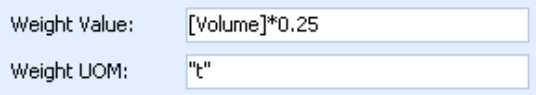
For the Pile Caps, the Length, Volume and Width columns from the schedule window will be used in combination with simple formulas to calculate a Reinforcement Weight, Plan Surface Area, Girth/Perimeter and Formwork Area.

M5.38 **Scroll** down **to the bottom of the Mapping Definition** window using the vertical scroll bar **to reveal the Weight & Custom Fields**.

The weight value has two entry fields. The Weight Value: field is used to specify a value or formula to calculate the weight value, and the Weight UOM: field is used to specify the Unit of Measurement which the value represents.

M5.39 In the **{ Weight Value: } field drag over the Volume** column **then append *0.25** (i.e. to calculate the reinforcement weight at 0.25t (250kg) per cubic meter of concrete).

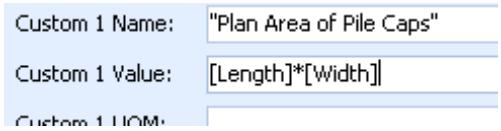
M5.40 In the **{ Weight UOM: } field** enter **"t"** (including the quotation marks) as the tonnes unit of measurement for the resulting values. The weight fields should now be as follows:



There are three Custom Fields each with associated Name, Value and UOM entry fields. The Custom x Name: field is used to specify the name for the dimension, the Custom x Value: field is used to specify an object property, value or calculation (or combinations thereof) in the same manner as the standard Dimension Group value fields (e.g. Length, Area etc.) and the Custom x UOM: field is used to specify the Unit of Measurement which the value represents.

M5.41 In the **{ Custom 1 Name: } field enter "Plan Area of Pile Caps"** (including the quotation marks).

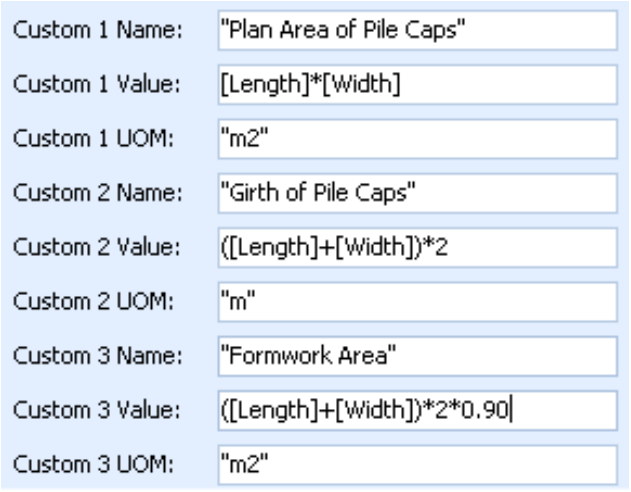
M5.42 In the **{ Custom 1 Value: } field drag over the Length** column then **append a "*"** (mathematical multiplication operator) **to the end and then drag in the Width column after the *** such that the Custom 1 Value: entry field is **as shown right**. This specifies that the Custom 1 Value: field will be calculated as the product of the length and width of each object. In the **{ Custom 1 UOM: } field enter "m2"** (including the quotation marks) as the unit of measurement for the resulting values.



M5.43 In a similar manner **create entries** in the **three Custom 2 fields** with a **name** of **"Girth of Pile Caps"**, a **value calculation of ([Length]+[Width])*2** and a **UOM of "m"** to calculate the girth of the pile caps.

M5.44 For the **Custom 3 Field, enter "Formwork Area"** (including the quotation marks) in the Custom 3 Name: field and **"m2"** (including the quotation marks) in the Custom 3 **{ UOM: } field.**

M5.45 For the **{ Custom 3 Value: } field**, **highlight the entire contents of the { Custom 2 Value: } field then right click over it and select Copy**. **Right click over the { Custom 3 Value: } field**



and select Paste to replicate the girth calculation, **append *0.90** to **end of the { Custom 3 Value } field** (i.e. to multiply the girth by the height of 0.90m (900mm)).

M5.46 The Custom 1, 2 & 3 fields should now be complete as shown above.

M5.47 **Click** on the **[Preview] tab** to review the definition. **Then return to the [Mapping Definition] tab**.

As all of the pile caps possess values in the same Schedule columns (object property source fields) and are all 900mm deep, the Model Map entry will be same for the remaining pile caps. Therefore copy and paste the mapping definition as follows:

M5.48 **Right click** over the **[800 x 1800 x 900mm] node** in the model tree list window and **select** the **[Copy Mapping Definition] option** from the right click menu.

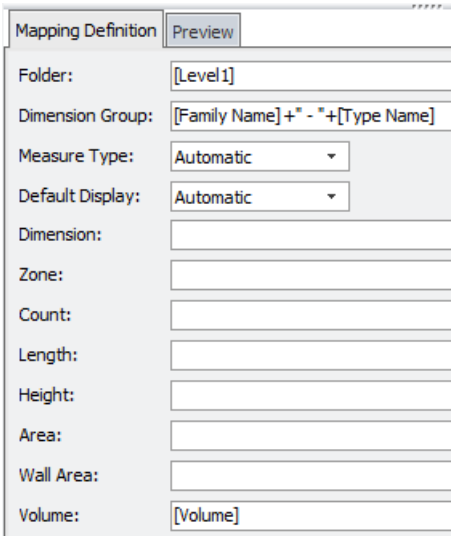
M5.49 Now **select** the **[1800 x 1800 x 900mm] node** then **right click over** it and **select** the **[Paste Mapping Definition] option** from the right click menu.

Next we'll create a mapping definition for the steel piles within the structural foundations node:

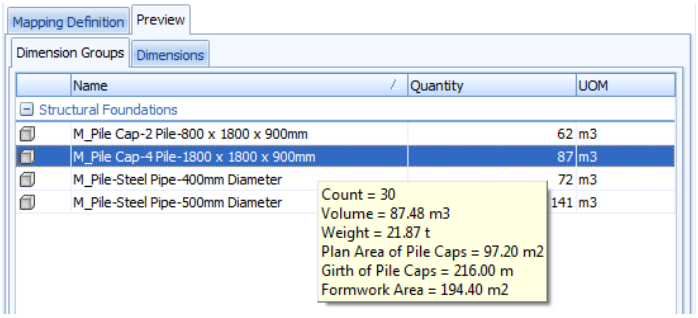
M5.50 **Select** the **[M_Pile-Steel Pipe] node** by clicking on it in the model tree list window.

M5.51 Reviewing the object properties in the Schedule Window identifies that the pile objects each have a Volume value only.

M5.52 **Complete the { Folder } and { Dimension Group } entry fields as shown to the right**. **Drag over the Volume object property** source field into the **{ Volume } field**.



M5.53 To preview the import results for the whole Structural Foundations node **select** the **[Structural Foundations] node in the model tree** list window then **click** on the **[Preview] tab**.



M5.54 Hover the cursor over one of the pile cap Dimension Groups, notice in the pop-up hint that in addition to the Count and Volume values the reinforcement weight, plan area, girth and formwork area are all provided based on the calculations entered in the Weight and Custom fields, complete with the Names given to the Custom 1 – 3 fields.

Structural Framing and Cut Length

Next we will complete Model Map entries for the Structural Framing and Walls nodes prior to importing dimensions using the Model Map.

M5.55 **Click** back on the **[Mapping Definition] tab** and then **select** the **[Structural Framing] node in the model tree** list window.

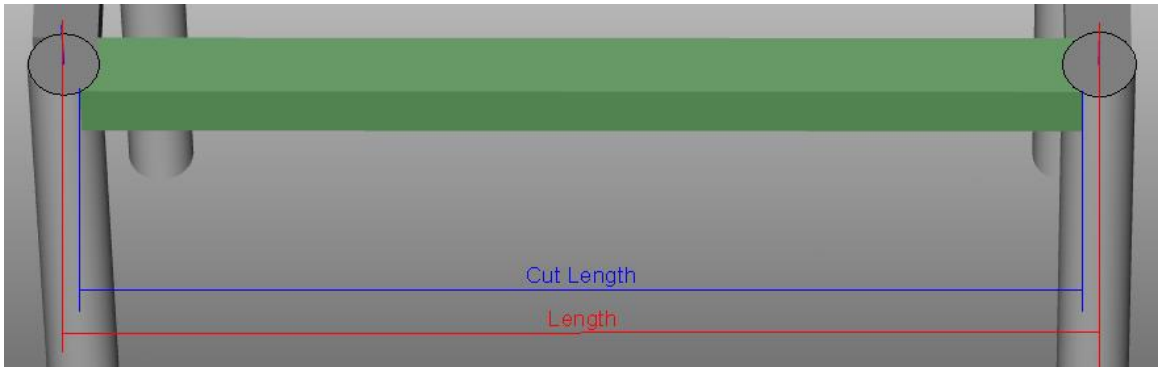
M5.56 **Note** that in the Schedule Window, **amongst other data each object has a Length value and a Cut Length value.**

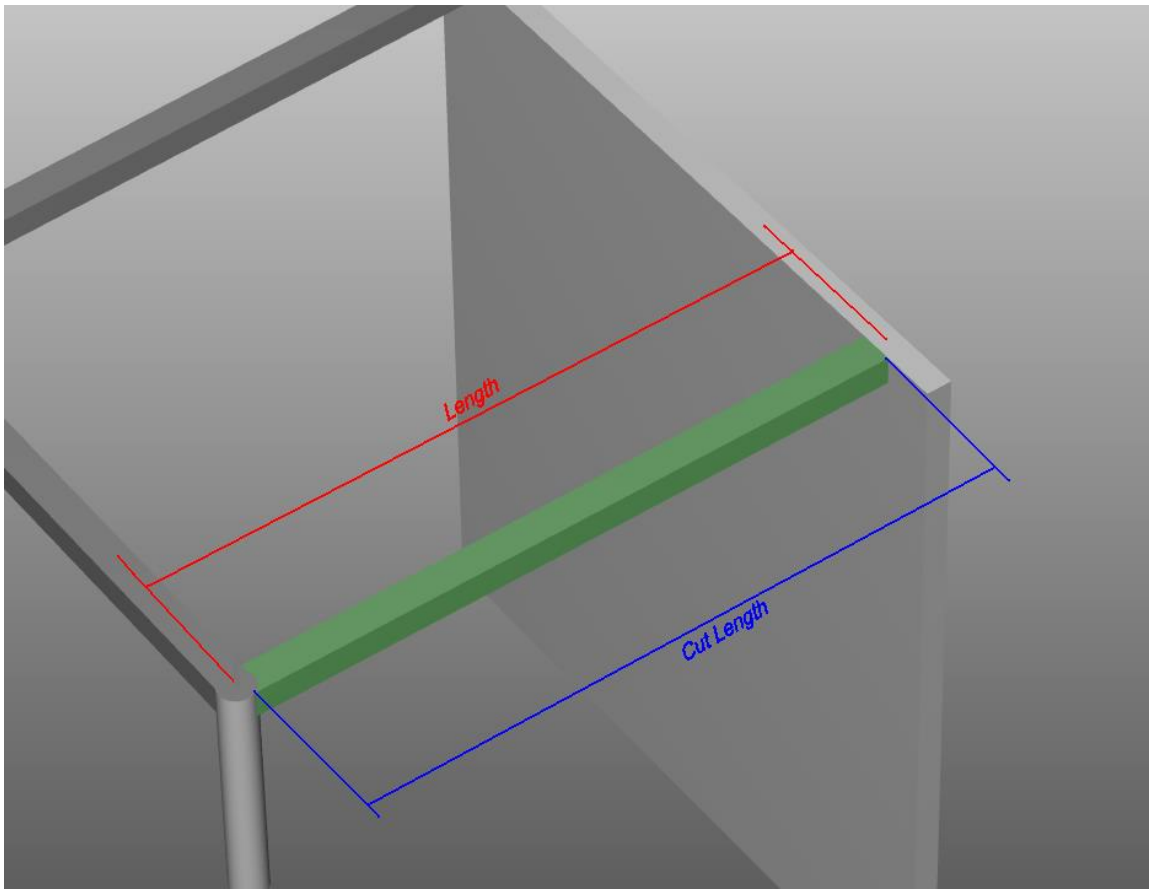
*The **Length** value is the 'analytical' length of the beam between the attachment points of the beam (referred to a Beam Handles in Revit®). The attachment points are generally the theoretical centerline of the supporting or interconnecting column, wall, beam or other member at each end of the beam.*

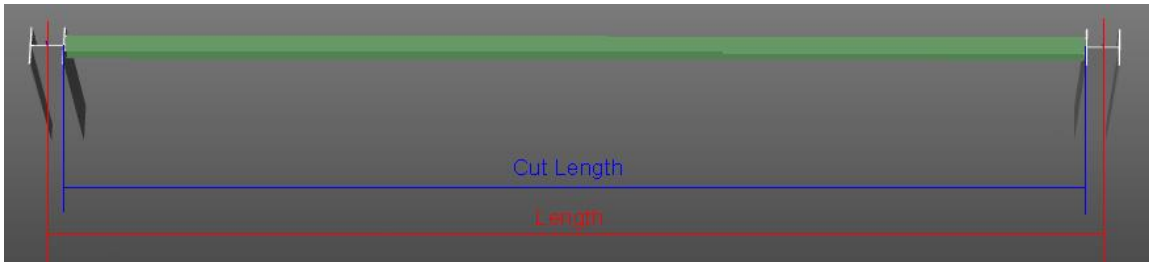
*The **Cut Length** value is the theoretical 'physical' length of the beam. For concrete beams this is generally the distance between the faces of the supporting or interconnecting member at each end of the beam i.e. the face of supporting walls or the sides of supporting beams or columns. A beam may connect to an irregular (i.e. non flat) surface or to more than one object (e.g. partly to a column & partly to another beam) in which case the cut length is to the furthest point at each end of the beam.*

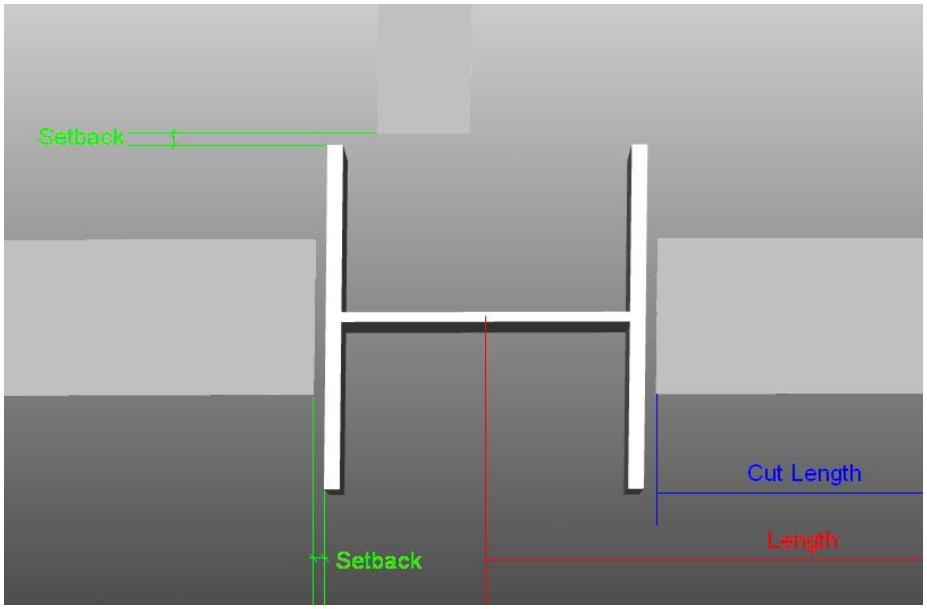
For steel beams the cut length is generally the distance between the surfaces of the supporting beam or column sections (the beam surface is considered to be either the face of the flange on a flange side or in-line with the edges of the flange on the web side (rather than actually to the face of the web) but the cut length is also generally subject to a slight reduction (a "Setback") at each end for connections and by way of a construction tolerance.

The following diagrams illustrate these general principles for the Length and Cut Length values for beams:









The following extract from the Revit® Architecture 2010 Glossary overviews the Revit® definitions for the Cut Length and Length beam properties.

Beam Instance Properties

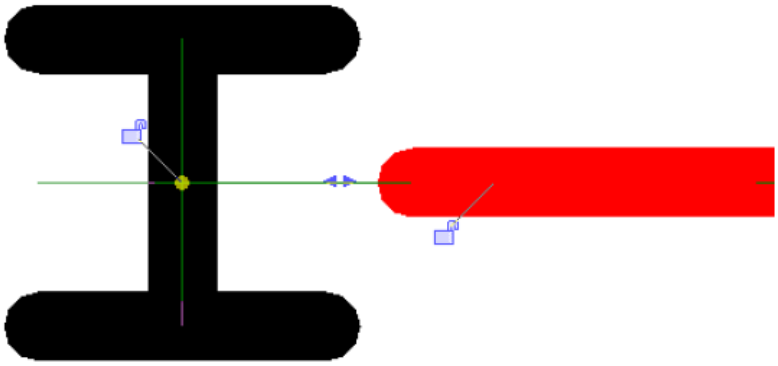
Properties will vary depending on the beam families that are specified during the installation process. The following instance properties apply to beam families that load during a typical installation:

Name	Description
Cut Length	The physical length of the beam. This is a read-only value.
Length	The length between beam handles. See Beam Handles. This is the analytical length of the beam. This is a read-only value.

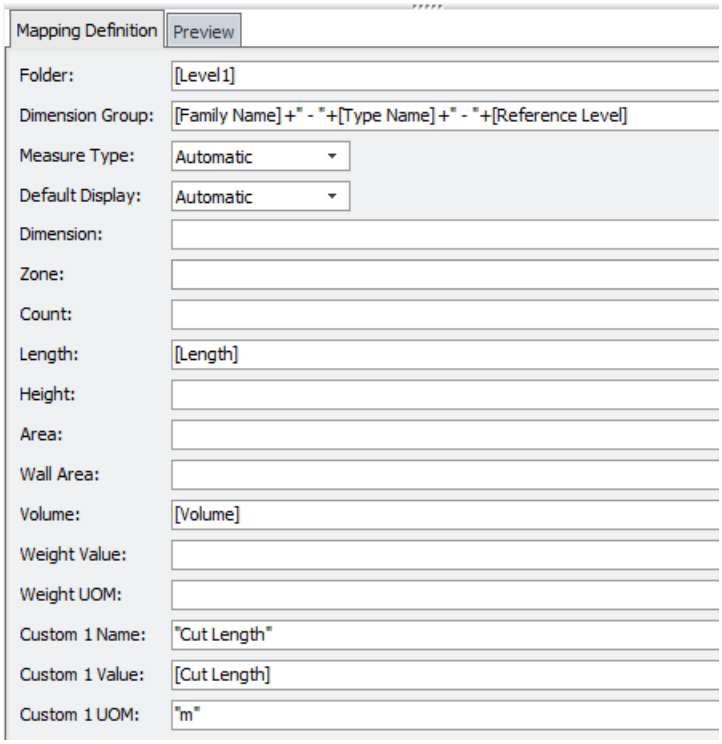
Beam Handles

The beam handles of a beam are the attachment points of the beam. Beam handles display as small filled circles that indicate where the end of the selected beam is attached to a column or wall.

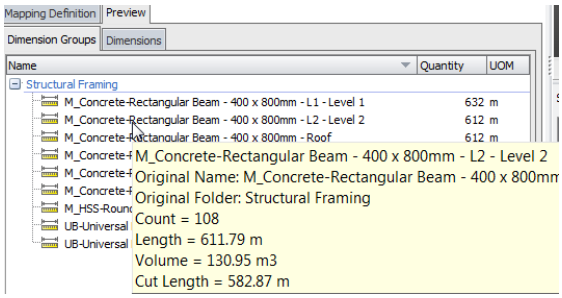
Beam and column in plan with a beam handle at the column center



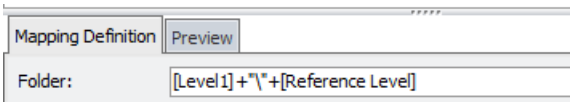
M5.57 **Drag over** the **Level1 column** to the **{ Folder: } field**, then **drag over** the **Family Name, Type Name & Reference Level columns** each **separated with +"-"+** to the **{ Dimension Group: } field**, next **drag over** the **Length and Volume columns to the respective { Length: } and { Volume: } fields** and finally **create** the **Custom 1 fields** with a **name** of **"Cut Length"**, a **value** of **[Cut Length]** (i.e. drag over the Cut Length column) and a **UOM** of **"m"**.



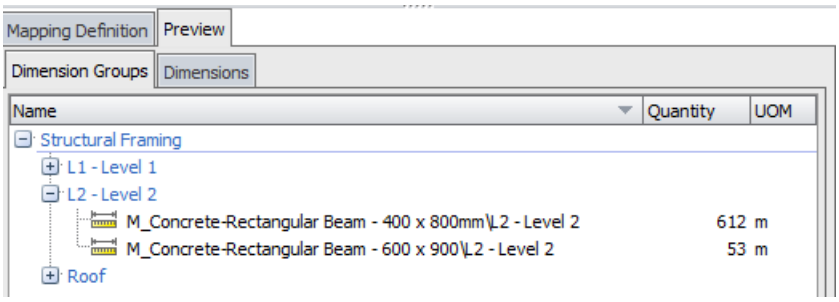
M5.58 **Click** on the **[Preview] Tab**. Note that each dimension has the length as the primary quantity and Cut Length when you hover over one of the Dimension Groups.



M5.59 We will utilise a Sub Folder System to further breakdown the Dimension Groups into its Levels. **Click** on the **[Mapping Definition] Tab** to return. **Append** the **{Folder: } Field** with **+"\"+[Reference Level]** to the end of the existing content.



M5.60 Now **click** the **[Preview] tab**, and note the Structural Framing Folder has been further divided.

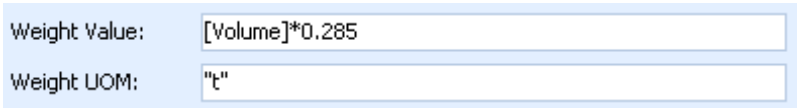


For the Concrete Rectangular Beams we will add an additional value for the reinforcement weight. This will not be applicable for the steelwork objects included in the Structural Framing node, but we can copy, paste and edit the mapping definition to the concrete beams node and add the additional fields.

M5.61 **Right click** over the **[Structural Framing] node** in the model tree list window and **select** the **[Copy Mapping Definition] option** from the right click menu.

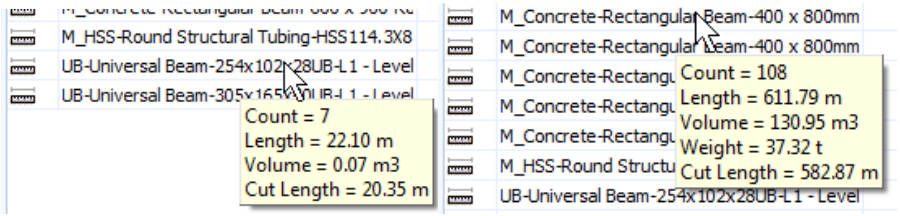
M5.62 Now **select** the **[M_Concrete-Rectangular Beam] node** then **right click** over it **and select** the **[Paste Mapping Definition]** option from the right click menu to paste the mapping definition copied from the previous node.

M5.63 In the **{ Weight Value: } field drag over the Volume** column and **append** it with ***0.285** (to calculate a reinforcement weight based on 285kg/m3) and **enter "t"** in the **{ Weight UOM: } field**. The weight fields should now be as follows:



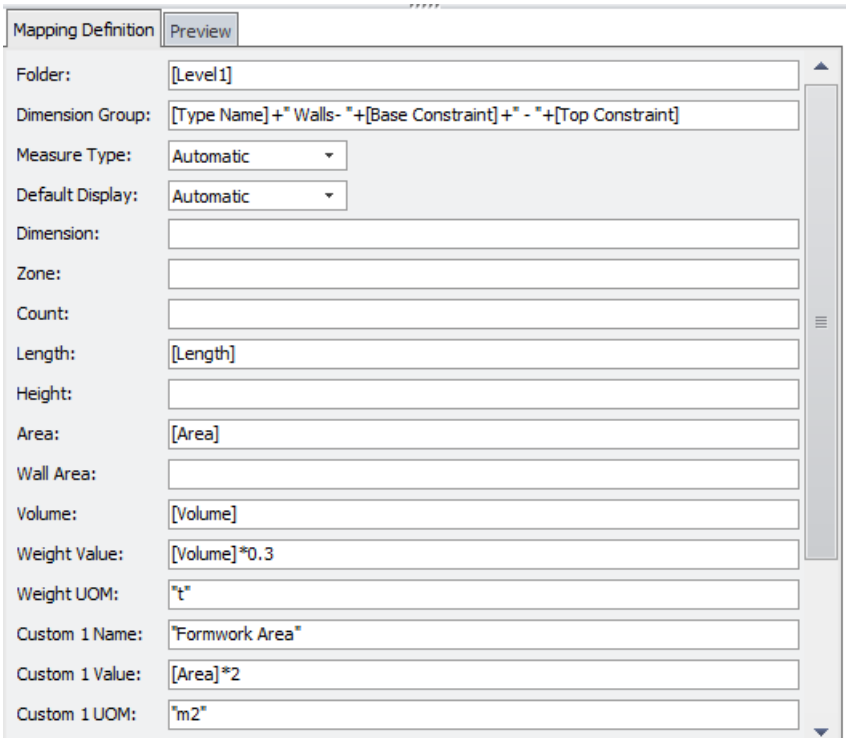
M5.64 **Select** the **[Structural Framing] node** once more and **click** on the **[Preview]** tab.

M5.65 Hover the mouse over one of the Universal Beam Dimension Groups in the preview window, notice that a Count, Length, Volume and Cut Length are displayed in the pop-up hint. Now hover the mouse over one of the Concrete Rectangular Beam Dimension Groups in the preview window, notice that additionally the reinforcement Weight value is displayed.



M5.66 **Click** back on the **[Mapping Definition] tab** to close the preview.

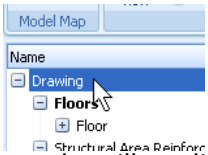
M5.67 Finally **select** the **[Walls] node in the model tree** list window and **create** a **model map entry as shown below**, note that the **{ Dimension Group: }** field is completed as:
[Type Name]+" Walls- "+[Base Constraint]+" - "+[Top Constraint]



M5.68 **Click** on the **[Preview]** tab **to review** the definition. Then **return to** the **[Mapping Definition] tab**.

So far as we have been progressing through this module we have previewed several of the Model Map entries for specific objects groups (by selecting their node in the model tree list window prior to clicking on the preview tab). However it is possible to preview the import results for the Model Map as a whole.

M5.69 **Select** the **node at the very top of the model tree** list window titled **'Drawing'**.



M5.70 This is the highest level grouping node and contains all of the model objects arranged hierarchically beneath, as such selecting the Drawing node will re-display all model objects in the drawing and schedule windows and will also allow a preview of all of the previously defined Model Map entries.

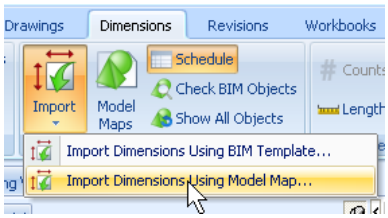
M5.71 **Click** on the **[Preview] tab and review** the import results which will be obtained for the whole model. Once the review has been undertaken **click** on the **[Close] Model Map button** on the **[Model Maps] Ribbon** Toolbar to close the Model Map and return to measurement mode.

Importing Dimensions using a Model Map

In this part of the module we will use the Model Map we have defined in the previous stages to import the dimensions information into our building. In the same manner as with importing dimensions using a BIM Template it is possible to selectively (or sequentially) import dimensions for specific object groups or objects by filtering and / or hiding objects prior to commencing the import process (i.e. using the various right click menu options, the model tree list window and / or the layers list window). However as we have already previewed the model map import results whilst creating the Model Map, we shall proceed to import all of the dimensions en masse.

M5.72 Firstly ensure all drawing objects are shown, **right click over the drawing window** and **select** the **[Show All Objects] option** (alternatively click on the Show All Objects button located on the Dimensions Ribbon Toolbar).

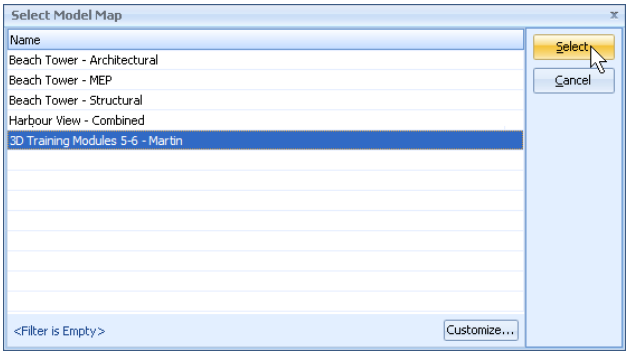
M5.73 Next **click** on the **[Import] button** located **on the [Dimensions] Ribbon** Toolbar and **select** the **['Import Dimensions Using Model Map']** option. The Select Model Map dialog will be displayed.



M5.74 **Locate** the '3D Training Modules 5-6 – *Your Name*' model map in the list (if there are more model maps than can be displayed in the list a vertical scroll bar will be displayed on the right of the list window).

M5.75 The list window contains a list of all Global and Project Model Maps pertaining to the current project and is displayed initially in reverse chronological order. To sort the list by the Name column click the mouse on the Name column heading. An arrow will indicate that the column is being used for sorting the list and the direction of the sort.

M5.76 **Once the model map has been selected in the list click on the Select button** to commence the import. After a short period of time the Dimension Groups will appear in the Dimension Groups list window, populated with dimensions as defined in the Model Map.



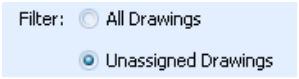
Drawing Sets and Associated Views

When the drawing file was added in Section M5.2 it contained multiple sheets / views and we selected to add all of the sheets at once. This designates all of these sheets as a Drawing Set. All of the drawings within a Set are linked such that when an imported BIM dimension or Dimension Group is selected, the object(s) corresponding to that dimension or Group are highlighted on all the drawings in the Set.

M5.77 **Click** on the **[Drawing Sets] button** on the **[Drawings] Ribbon** Toolbar.

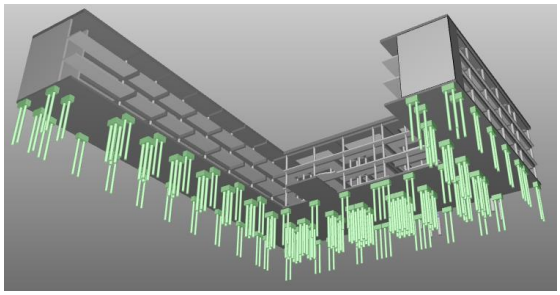
M5.78 The Drawing Sets dialog will be displayed listing the Drawing Sets for the building (from here new Drawing Sets can inserted and existing Drawing Sets deleted or edited).

M5.79 In this instance there is only a single Drawing Set, **select** it in the list **and click on the [Edit] button**. All of the drawings assigned to the selected drawing set are displayed with a ticked checkbox. **Once reviewed click [Cancel], then [Close] the Drawing Sets dialog**.

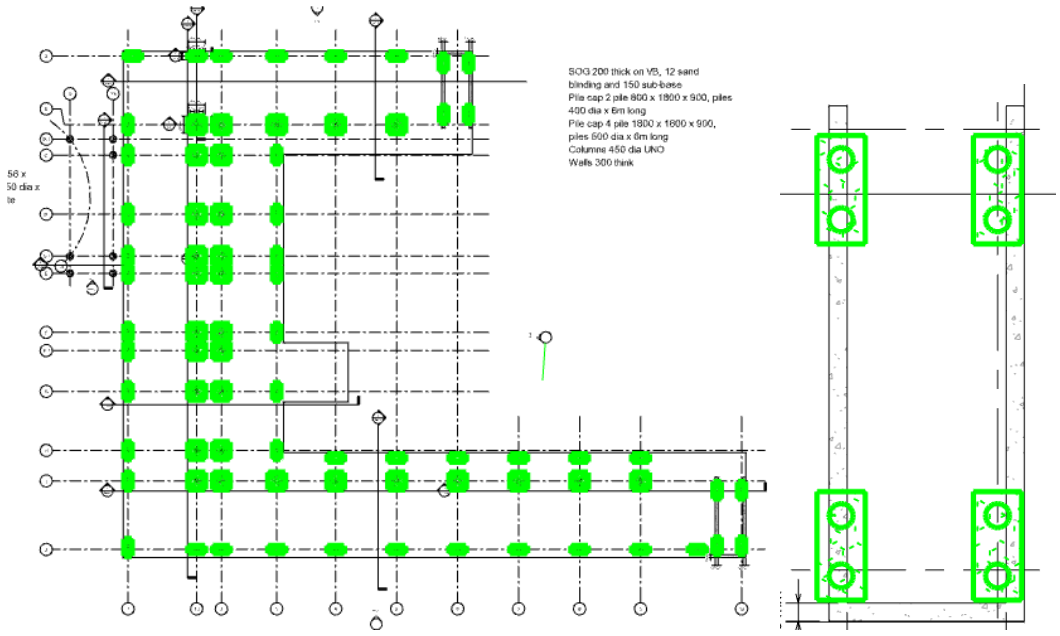


By default the Drawing Set Properties dialog displays the names of all of the drawings assigned to the Drawing Set (which are the ones displayed with a tick in the checkbox) and any other drawing which isn't assigned to another Drawing Set. The Unassigned Drawing filter may be changed to display All Drawings by use of the Filter radio buttons. A drawing can be unassigned from the drawing set by removing the tick from the associated checkbox and unassigned drawings can be assigned to the Drawing Set by placing a tick in the associated ckeckbox (e.g. if a further view of the model was received after the initial multi-sheet drawing was added or if the views were received as separate files). Note that drawings in a Drawing Set must all have been issued from the same source BIM Model.

M5.80 **Scroll down to the Structural Foundations folder in the Dimension Groups list** window, expand the folder by clicking on the + button to the left and then **click** on the **{ folder }** to simultaneously display the dimensions imported into the four Dimension Groups within the folder which will appear as follows.

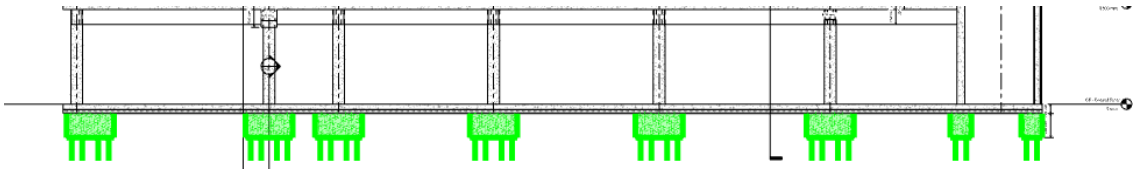


M5.81 Now **click** on the **[Structural: Sheet: Ground Floor – Structural Plan]** drawing **in the drawings list** window, as this is an associated view of the 3D model (and assigned in the same Drawing Set) the pile caps and piles are also highlighted on this view.



M5.82 The same is true for the other drawing sheets if they are assigned to the same Drawing Set and they contain a 2D representation of the objects highlighted in the 3D model view, (i.e. the objects from which the BIM dimensions were imported into the currently selected Dimension Groups).

M5.83 **Select** the **[Structural: Sheet 1 – Sections] drawing** in the drawings list window to review this dimension display feature on a second of the associated views.



M5.84 **Reselect** the **[Structural: 3D View {3D}] drawing** in the drawings list window.

Reviewing Imported Dimensions

It is important to understand the basis of imported BIM dimensions. Selected check measurements such as the following examples can help to avoid potential misinterpretations.

Floor and Roof Slabs

Areas: The BIM area value for each of the floor objects in this BIM model represent the area to the extents of the slab and where in this example some of the slabs have openings within them, the area values in the BIM model include the deduction of the area of the openings.

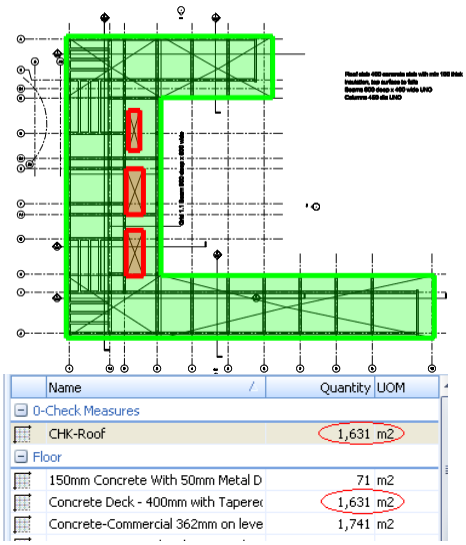
Lengths: The BIM perimeter value for each of the floor objects in this BIM model represent the length of the outside perimeter of the floor slab, consequently the perimeter values do not include the length of the exposed edges at the openings within the slab.

Volumes: In Revit® certain families of objects, typically slabs and walls, are modelled as an assembly of component parts or layers. In this example the suspended concrete floor slab at level 1 is a single 225mm thick object, however the roof slab is 400mm of concrete with a varying depth of insulation over, and the 362mm slab on ground is made up of 200mm of concrete on 12mm sand blinding on 150mm of sub base. The BIM volume value is the gross volume of the assembly including all component layers.

Roof slab - Area

M5.85 **Select** the **['Structural: Sheet: Roof - Structural Plans'] drawing in the drawing list** window and create a Dimension Group (**click** on the **[Add] button** at the left hand side of the **[Dimensions] Ribbon** Toolbar) **called "CHK-Roof"** in a **{ folder } called "0-Check Measures"** with a **{ measurement type } of Area**. As the concrete part of the roof slab is 400mm thick **enter "0.40" in** the **{ default height } field**, then **click [Insert]**.

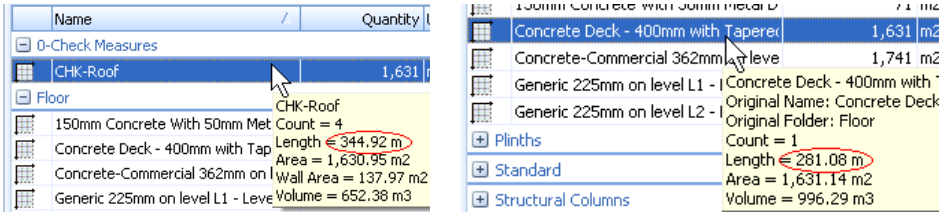
M5.86 **Use the *Polyline* method (L Key) to measure the overall area of the roof as a positive dimension and deduct the voids as a negative dimension** (click on the Negative button on the Dimensions Ribbon Toolbar to measure a negative dimension), as indicated right.



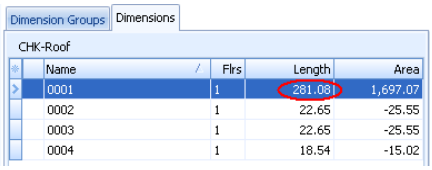
We can see in the Dimension Group list that the area of the check measurement of 1,631m2 matches the area imported from the BIM parameters into the 'Concrete Deck - 400mm with Tapered Insulation 2 on level Roof', so we know the imported area value includes the deduction for voids.

Roof slab – Perimeter Length

M5.87 **Hover** the **mouse** in turn **over the imported { Concrete Deck - 400mm with Tapered Insulation 2 on level Roof } Dimension Group and the { CHK-Roof } Dimension Group** and **compare the Length values in the pop-up hint**. The imported BIM dimension has a length of 281m whereas the check measure has a length of 345m



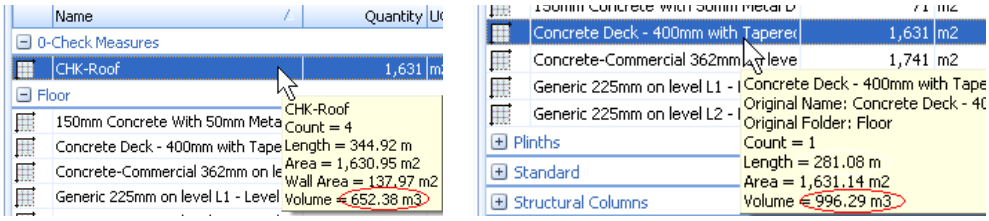
M5.88 **Select** the **{ CHK-Roof } Dimension Group** and **click** on the **[Dimensions] tab to review** the individual dimensions length values.



We can see the positive area measurement for the overall slab has the same length value as the imported BIM dimension for the roof, so we know the imported BIM length (perimeter) is for the overall slab excluding the perimeter around the voids.

Roof Slab - Volume

M5.89 **Click** back on the **[Dimension Groups] tab** and then **hover the mouse** again in turn over the **imported { Concrete Deck - 400mm with Tapered Insulation 2 on level Roof } Dimension Group and the { CHK-Roof } Dimension Group and compare the Volume values** in the pop-up hint.



We can see that the imported BIM dimension has a volume of 996m3 whereas the check measure has a volume of 652m3. As we know the check measure volume is the area (which matches the imported BIM Area) x 400mm (i.e. being the slab depth entered as the default height) we know **the imported BIM volume represents more than just the concrete element of the concrete roof deck**. The BIM 'Type Name' parameter (included as part of the Dimension Group name) **in this instance identifies that the BIM object is a composite object** (known as a System Assembly) **comprised of the 400mm of concrete slab and the tapered insulation**. Therefore the imported **BIM volume includes the volume of the overall object** i.e. including the volume of the tapered insulation.

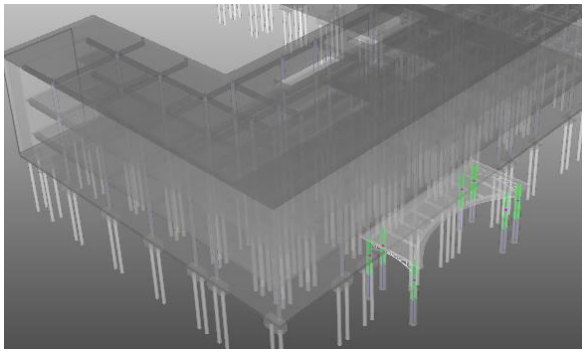
Plinths and Columns

Length: The BIM length value for each of the column objects in this BIM model represents the length of the column between the stated Base Level and Top Level and includes the +/-'ve adjustment amounts included in the Base Offset and the Top Offset fields.

Volume: The BIM volume value for the concrete column objects in this BIM model represents the length of the column multiplied by its cross-sectional area; however where the column passes through a floor object the BIM volume for the column includes the deduction of the shared volume in the floor.

Steel Columns - Length

M5.90 **Select** the **[Structural: 3D View: {3D}] drawing** once more in the drawings list window and then **select** the **{ 356x368x129UC UC-Universal Column…. } Dimension Group** in the Dimension Groups list window, then **click** on the **[Dimensions] tab** to display the dimensions list window.

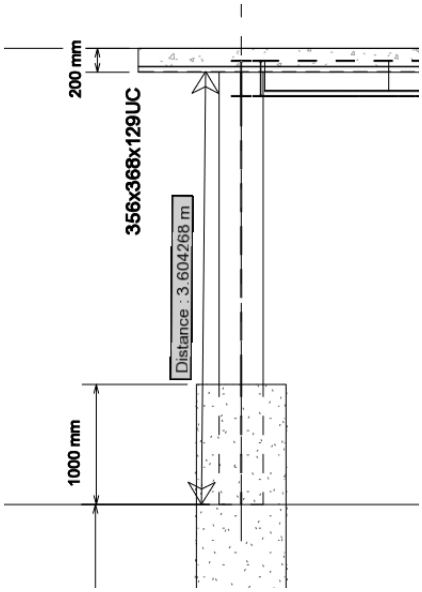


M5.91 **Locate these columns in the drawing window** (using transparent mode and zooming / rotating the drawing will be of assistance).

M5.92 Once located we can see that these are **supporting columns** to the canopy and from the dimensions view can also see **these are all 3.60m**, we can verify this by using the measure distance feature on the canopy details drawing.

M5.93 **Select** the **[Structural: Sheet: Details 1 – Canopy] drawing** in the drawings list window, then **zoom into** one of **the Section details.**

M5.94 **Press** the **'M' key on** the **keyboard** to enable measure distance mode (or click on the Measure Distance button on the Drawings Ribbon Toolbar) then **click** once **horizontally in line with the base of the steel column** (shown dashed as it is encased in concrete) and then **move the mouse** cursor **in line with the top of the steel column**, the distance arrow follows the cursor position and the **displayed distance value confirms the length of the columns as 3.60m**. **Press** the **'M' Key again** to cancel measure distance mode.



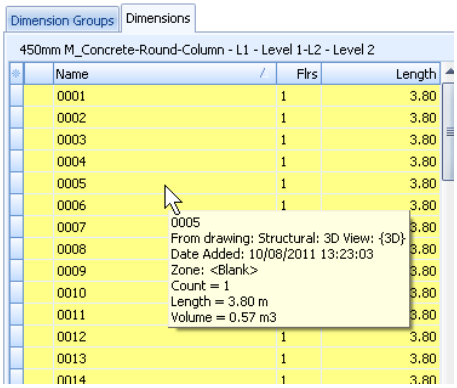
Concrete Column - Length

M5.95 **Select** the **[3D View: {3D}] drawing** and **click** back on the **[Dimension Groups] tab**, then **select the { 450mm M_Concrete-Round-Column - L1 - Level 1-L2 - Level 2 } Dimension Group**.

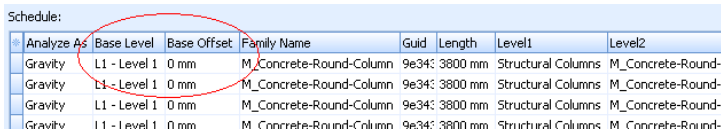
TIP: *If the names in the Dimension Groups list window are not fully displayed, hovering the mouse over a Dimension Group will open a pop-up hint showing the full name.*

M5.96 **Right click** over the **Dimension Group** and **select** the **[Isolate Dimension Group] menu option** to filter the displayed and scheduled objects.

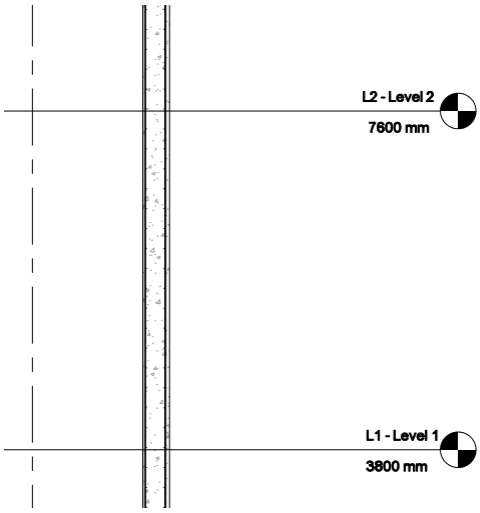
M5.97 **Click** on the **[Dimensions] tab** to view the individual dimensions. **Each column has an imported length of 3.80m** and, from the pop-up hint an **imported volume of 0.57m3**.



M5.98 Review the Base Level & Offset and the Top Level & Offset information in the Schedule window.



The Base Level is the vertical datum with which the base of the column is associated; the Base Offset is the vertical distance from the Base Level to the actual base of the column. The Top Level is the vertical datum with which the top of the column is associated, and the Top Offset is the vertical distance from the Top Level to the actual top of the column.



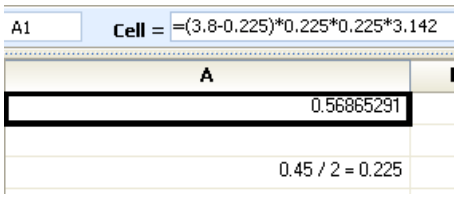
M5.99 **Select** the **[Structural: Sheet 1 – Sections] drawing** in the drawings list window and then **zoom in to the level (datum) indicators** located on the right of each section in this case.

The level datum information in conjunction with the Base & Top Offset values from the schedule can be used to calculate & confirm the imported BIM length, ie. L2 Datum (7600mm) minus the Top Offset value from the schedule window (0mm), less the L1 Datum (3800mm) minus the Base Offset value from the schedule window (0mm) >>> **(7600-0)-(3800-0) = 3.80m confirming the imported BIM length value of 3.80m** is the column length through and including the thickness of the slab (and beams) through which they pass.

Concrete Columns - Volume

The columns are all 3.80m long from top of slab to top of slab, they are all 450mm diameter, and they pass through a slab which is 225mm thick.

M5.100 Using a calculator (or alternatively create a new blank workbook in the Costing View and use the Calc Sheet – not available in CostX® Takeoff) calculate the volume of the column using the standard volume calculation of the area of the base x height, where the area is $Area = \pi r^2 = \pi \left(\frac{d}{2}\right)^2$, for the height use the length (3.80m) less the thickness of the slab through which the column passes (0.225m).



You will have calculated a volume of 0.569m3, which corresponds to the imported BIM volume for each column and therefore confirms the volume of these columns is the volume of concrete between the slabs.

Structural Framing

Length: Refer to page 73 - the BIM Length value of a member is the 'analytical' span length to the centreline of attachment members.

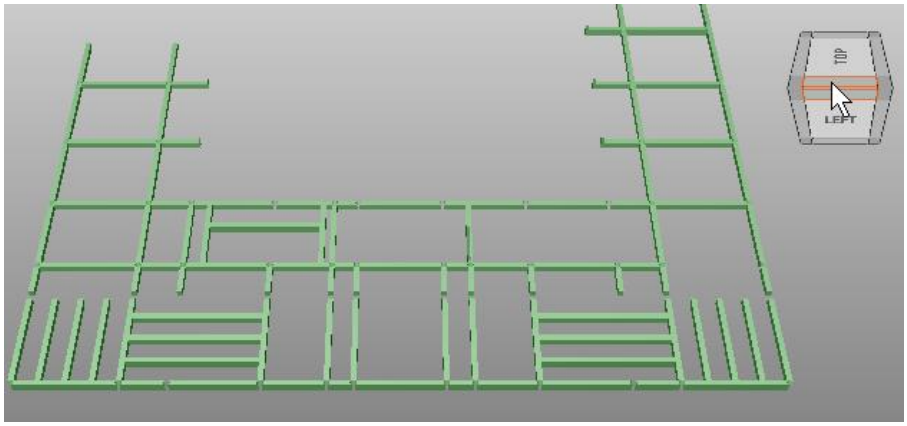
Cut Length: Refer to page 73 - the BIM Cut Length value of a member is the theoretical 'physical' length between the surfaces of attachment members.

Volume: the BIM volume values for the concrete beam objects in this BIM model represent the net volume of the beam below any attached slabs and between the faces of the attachment members. Where the beam extends into an intersecting column / floor / beam object the BIM volume value for the beam excludes the shared volume in the intersecting member.

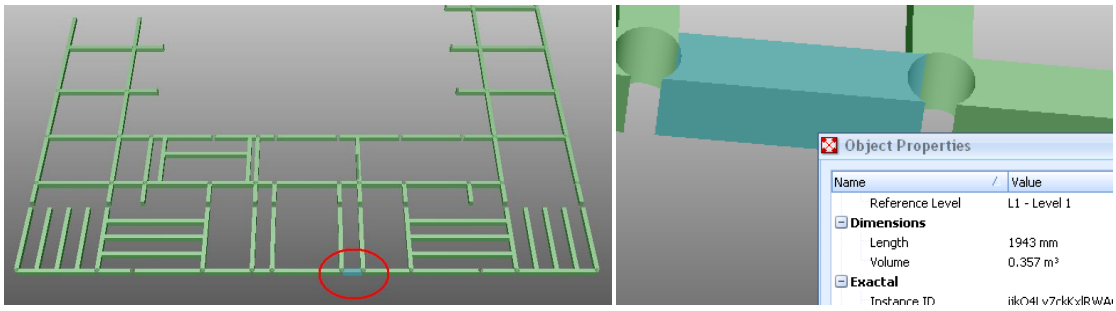
Concrete Beams - Length

M5.101 **Redisplay the Dimension Groups List** window and **select** the **{ M_Concrete-Rectangular Beam - 400 x 800mm - L1 - Level 1 } Dimension Group** then **isolate the Dimension Group** using the right click menu option.

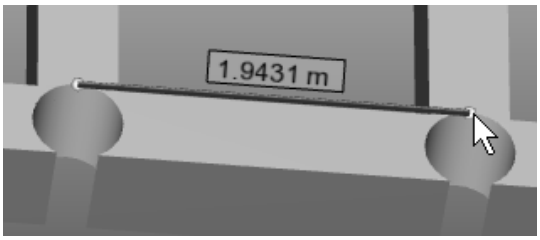
M5.102 **Select** the **top / left oblique view using the view cube as shown below**.

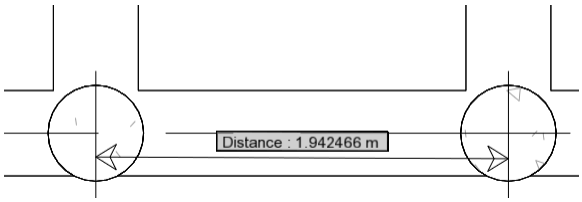


M5.103 **Zoom in to the small beam indicated below**, then **right click** over it and **select** the **[Object Properties] option**, **take** a **note of the Length value of 1943mm** and then **[close]** the object properties dialog.



M5.104 **Using** the **[measure distance]** ('M' key function) as before **check** the **length between the column centerlines** at each end of the beam, when done **press** the **'M' Key again to cancel measure distance mode**. This could also be done on the 2D plan.



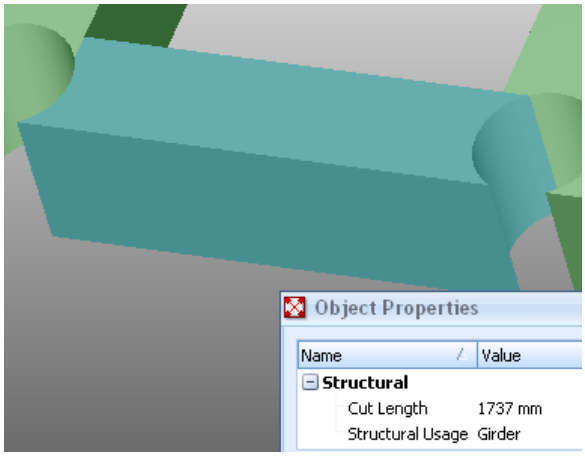


The **measured distance confirms the imported BIM Length is the centerline measurement**.

Concrete Beams – Cut Length

Owing to the size and circular shape of the columns and the way the drawing has been configured, the face of the attachment point at beam intersections may in some instances be the connection point with the column, and in other instances may be the connection point to the adjacent beam. The cut length is the distance between the furthest points highlighted when the mouse cursor is over the beam.

M5.105 **Right click** over the **beam** again and **select** the **[Object Properties] option**, take a **note** this time of the **Cut Length value**:



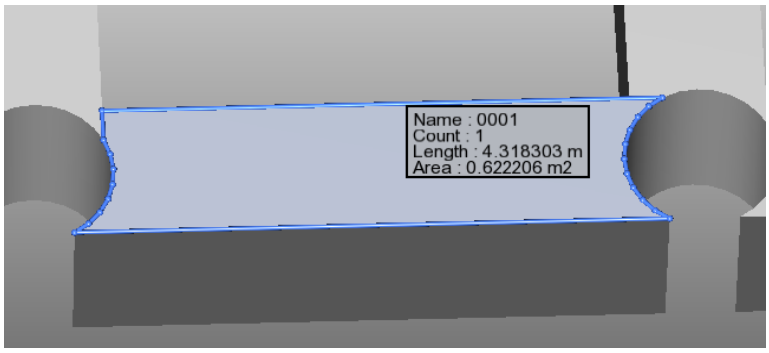
M5.106 **Using** the **[measure distance]** ('M' key) function as before **check** the **length between the furthest points which were highlighted at each end of the beam**, when done press the 'M' Key again to cancel measure distance mode. The **measured distance confirms the imported BIM Cut Length is the physical length between attachment points.**

Concrete Beams – Volume

A method to verify a beam volume which can be useful for irregular shaped attachment points is to measure the plan surface area and multiply it by the depth, as illustrated in the example below.

M5.107 **Select** an **external beam with irregular attachments**. **Create** a **Dimension Group** with an **Area measurement type and measure the plan surface area of the beam** to multiply by the beam depth. Alternatively, insert the depth as a Default Height.

Plan Surface Area

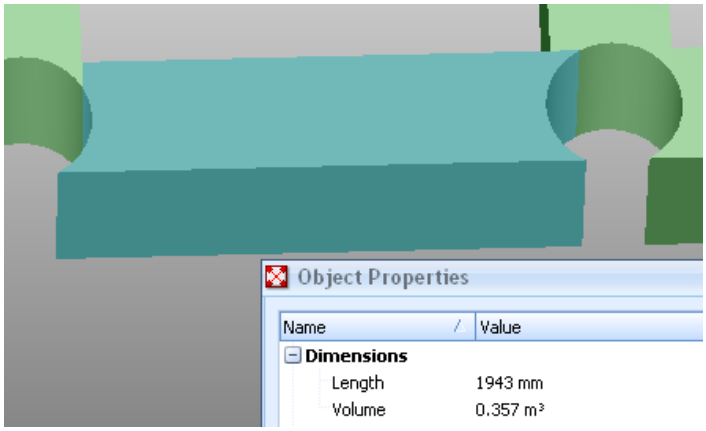


Plan Surface Area of beam between actual attachment surfaces (SA) = 0.622m2

Depth

Depth of beam (below attached slab) (D) = 0.575m

Volume



Volume of beam =

SA x D

0.622 x 0.575 = 0.3576m3

Walls

Length: the BIM Length value for a wall object represents the length from end to end of freestanding walls or to the centreline of adjoining or connecting walls.

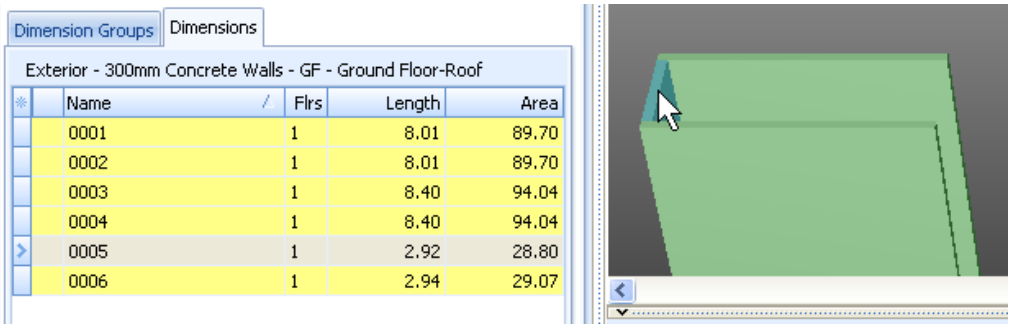
Area: the BIM area value for a wall object represents the physical 'face' area of each wall object comprising the length from end to end (as drawn into the model without accounting for intersections) and height from base to top (between the top of the bottom slab and the soffit of the upper slab in this example). If a wall contains openings the area values will exclude the area of the openings.

Volume: The BIM volume value is the face area multiplied by the thickness (depth).

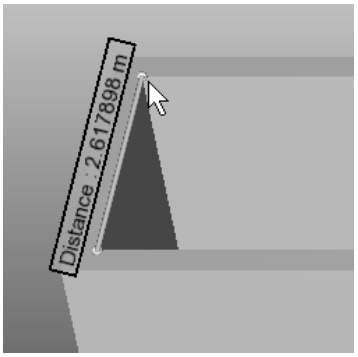
Walls - Length

M5.108 **Select** the **{ Exterior - 300mm Concrete Walls - GF - Ground Floor-Roof } Dimension Group** in the Dimension Groups list window and **isolate the Dimension Group** using the right click menu option.

M5.109 **Display** the **[dimensions] list** window then move the mouse **cursor over one of the shorter walls** in the drawing window, the corresponding dimension will be highlighted in the dimensions list window, make a **note of the length in this example 2.92m**.



M5.110 **Using** the **[measure distance]** ('M' key) **function** as before **measure the length of this wall on the inside surface** (i.e. between the walls to which it is attached). Press the 'M' Key again to cancel measure *distance mode.*



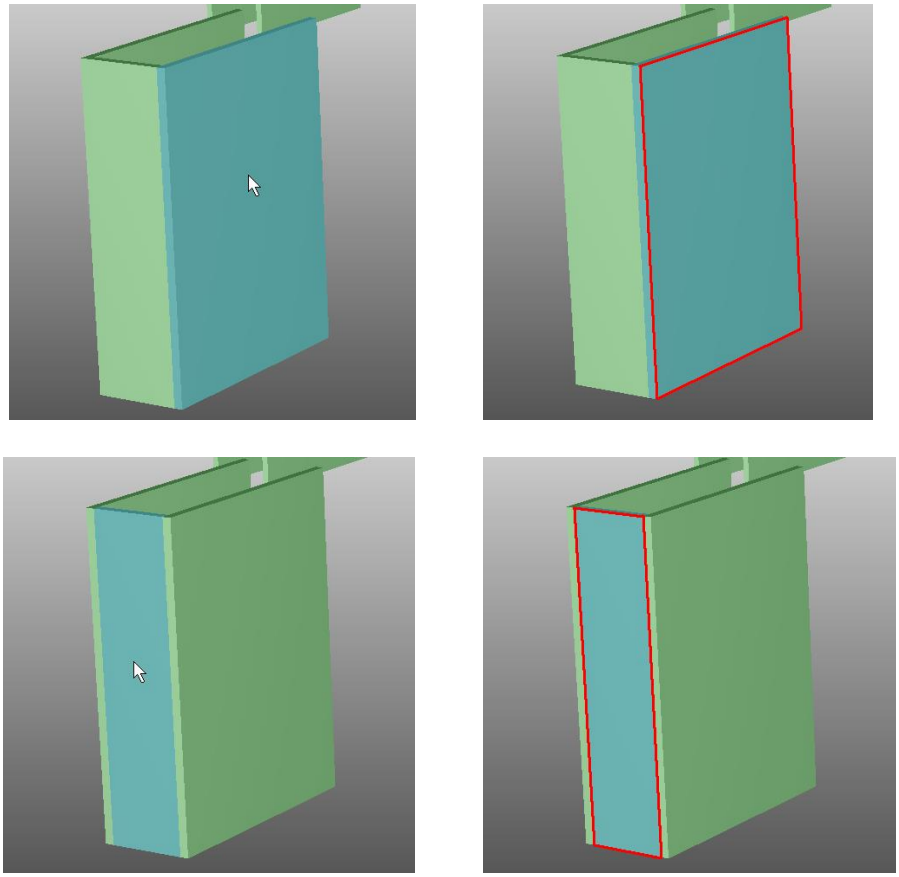
TIP: *The walls are described as 300mm thick but this could also be verified using the measure distance function.*

M5.111 Add an additional allowance for the extra distance to the centerline of the adjoining walls (i.e. half the thickness of the wall at each connected end) to the displayed value. In this example, 2.618m + (½*0.30m) + (½*0.30m) equalling 2.918m which corresponds to the imported BIM Length of 2.92m to the centerline of intersecting walls.

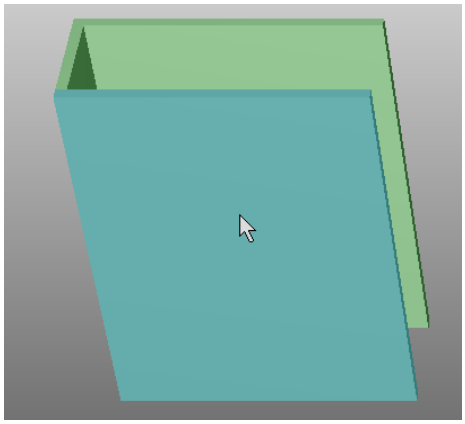
Walls - Area

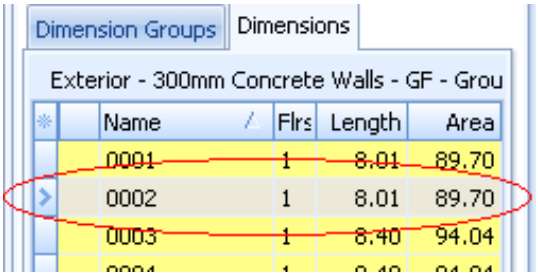
The area of these walls is the area on face as drawn into the model. The extent of the area can be reviewed by hovering the mouse over the wall object, providing there is nothing obstructing the view of the highlighted object the shaded (highlighted) area on the face of the wall is the extent of the area as shown below.

Highlighted Object Extent of Area

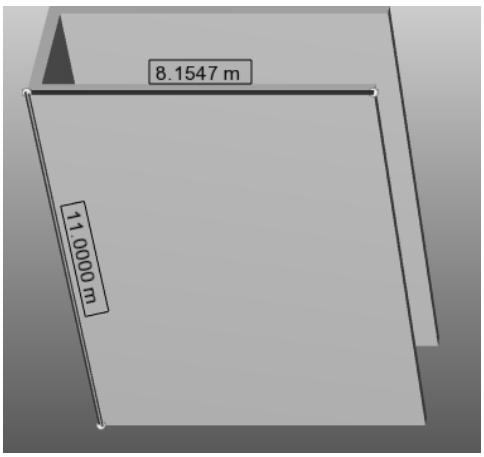


M5.112 **Hover** the **mouse cursor over one of the longer wall objects** in the drawing window, **take note of the extent of the shaded area on the face of the wall and the area value for the dimension highlighted in the dimensions list window**.





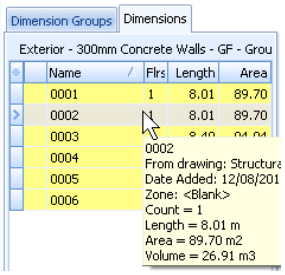
M5.113 **Press** the **'M' key** again to return to measure distance mode, **click** on the **front corner at the right hand side of the wall**, this time **hold down** the **Ctrl key** on the keyboard and **move the mouse to the front corner at the left hand side of the wall, when the sphere is displayed over the corner click again**, still holding down the Ctrl key **move the mouse to the bottom front corner when the sphere is displayed over this corner click once more**. The dimensions (i.e. the length and height of this wall) are displayed simultaneously.



M5.114 Using a calculator (or a Workbook Calc sheet in the Costing View – not available in CostX® Takeoff) multiply these two distances together, the result will correspond to the area value for the dimension that was highlighted in the dimensions list window previously.

In this example 8.155m x 11.00m = 89.705m2 which corresponds to the imported BIM Area value for this wall and provides confirmation that the area value is the area on the face

M5.115 **Multiply the area for this wall by the thickness** e.g. 89.705m2 x 0.30m to calculate the volume (26.911m3), then hover the mouse cursor over this dimension in the dimensions list window and compare the calculated result to the volume value displayed in the pop-up hint



As the two values match the **BIM volume value is confirmed** as the face area of the wall multiplied by the walls thickness.

M5.116 **Repeat** the **last few steps** this time **to confirm the area and volume values for the interconnecting shorter wall**, note in doing this there is no area or volume overlap between the two walls.

Module 6 Revisions

In this module we will create a new revision to the Building we have been working on in Module 5 and promote the 3D BIM drawing using a new revision. We will then learn how the dimensions are updated and the various methods of reviewing the changes between the revisions.

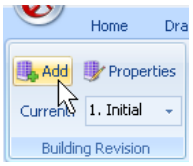
When BIM dimensions are imported into CostX© (using a BIM Import Template or Model Map for example) an individual dimension is created for each object and the dimension's values (e.g. Area, Length etc.) are imported from the object values stored in the BIM Model file. When the BIM drawing is promoted to a new (revised) version, the new file is loaded and the individual dimension values previously imported for the existing objects are automatically updated to reflect the revised object values for any amended objects, or a zero value if the object no longer exists. For new objects which have been added into the later revision of the BIM Model and for which no dimensions currently exist, the same method (or methods) used to previously import the existing dimensions are now repeated.

If 3D Measure Mode dimensions had been measured in the previous version these are highlighted as unrevised and can be reviewed, amended as needed and accepted to complete the revisioning process. Associated 2D views of the BIM model can also be promoted and any existing measured dimensions reviewed and accepted in the normal manner.

Creating a Building Revision

M6.1 **Ensure you still have the "3D Training Modules 5-6 - *Your Name*" building open**, if not open it once more using the main menu options.

M6.2 **Click** on the **[Revisions] Ribbon** Tab to display the Revisions Ribbon Toolbar then **click** on the **[Add] button** to open the Building Revision Properties dialog.



M6.3 **Enter "Rev 2" in the { Name: } field**, optionally notes may also be added in the Notes: field, and **click [Insert]** to create the new Building revision (the Revision Number field displays the automatically incremented revision number and cannot be amended).

M6.4 The Building revision is created, you will notice that the Current: field on the Revisions Ribbon Toolbar will display the automatically generated revision number and the name given for the building revision. The drawings will be displayed in the drawing list window with a padlock symbol indicating that they have not yet been promoted into the current building revision and are therefore locked.

M6.5 The next task therefore will be to promote the required drawing.

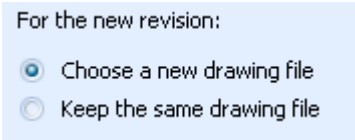
Promoting the 3D Model View Drawing

M6.6 **Select** the **[Structural: 3D View {3D}]** in the **drawing** list window.

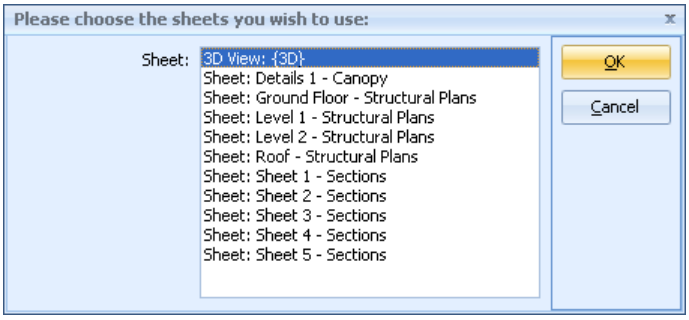
M6.7 **Click** on the **[Promote Drawing] button** on the **[Revisions] Ribbon** Toolbar.

You will a prompted whether you wish to choose a new drawing file for the revision. Keeping the same drawing file will promote the existing drawing (and all dimensions imported or measured from it) from the previous building revision into the current building revision, unlocking the drawing and thus allowing the existing dimensions to be amended and/or new measurements taken. Selecting a new file will prompt for a new drawing file (and sheet if required) to be selected and upon selection will add the new drawing to the current building revision and update the previously imported BIM dimensions for corresponding objects in the new drawing file.

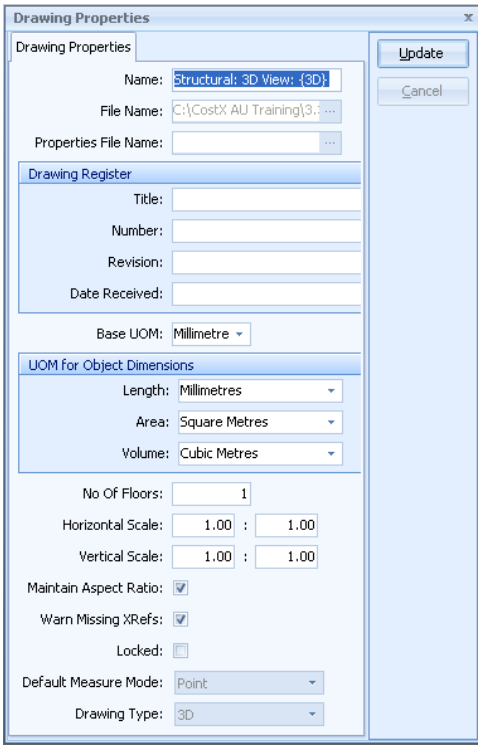
M6.8 **Select** the **option** to **{ choose a new file for the revision }**. A browser window will open, **browse to the location** in which you previously **saved the dataset** and **select** the **'3D Training Module 6 Revised Structural Drawing' drawing** and **click [Open]**.



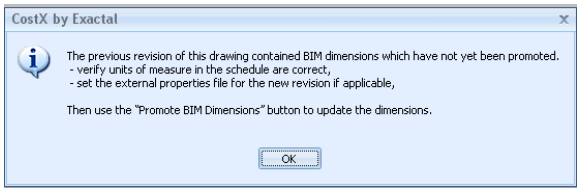
M6.9 As the DWF file contains several sheets you will be prompted to choose the sheet to use for the new revision. **Select** the **{ 3D View {3D} } sheet** and **click [OK]**.



M6.10 **Ensure the details in the Drawing Properties dialog which is displayed are as shown to the right** and **click [Update]** to continue.



M6.11 A prompt will appear. **Click [OK]**.



M6.12 **Click** the **[Promote BIM Dimensions] button** on the **[Revisions] ribbon**.

Upon completion a message will be displayed indicating that changed and deleted BIM dimensions have been automatically revised, and that the BIM Template, Model Maps and clicking on objects methods can be used to measure dimensions for objects which are new to this revision of the building.

M6.13 **Click [OK]** on the message to close it.

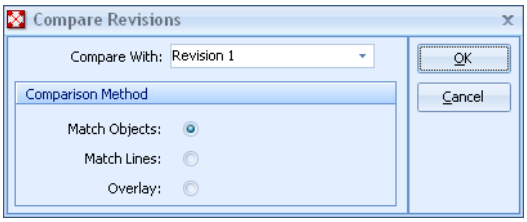
If any 3D Measure Mode dimensions had been measured in the previous revision the drawing title and the Dimension Groups containing the 3D Measure Mode dimensions (and the dimensions themselves) will be flagged with an unrevised warning icon, these dimensions will need to be reviewed, revised as necessary and accepted to complete the revisioning process. Once all 3D Measure Mode dimensions have been accepted in a Dimension Group and for the drawing, the warning icon will be removed.

M6.14 The associated 2D sheets could also be similarly promoted at this point or this could be done at a later time, the Padlock icon obviously signifies the 2D sheets which have not been promoted.

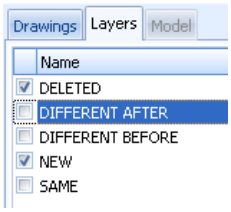
Compare Drawing to Earlier Revision

It may be of assistance to review visually the changes between the drawing revisions.

M6.15 **Click** on the **[Compare Drawings] button** on the **[Revisions] Ribbon** Toolbar and the Compare Revisions dialog will open. The drop down Compare With: field can be used to select the version with which to compare the new revision (in this case as there is only a single previous version only Revision 1 will be available). **Ensure Match objects is selected and click [OK].**



M6.16 Once the Comparison view is displayed **click** on the **[Layers] tab** to display the layer filter options. **Change the checkboxes leaving only the { Deleted } and { New } checkboxes ticked.**



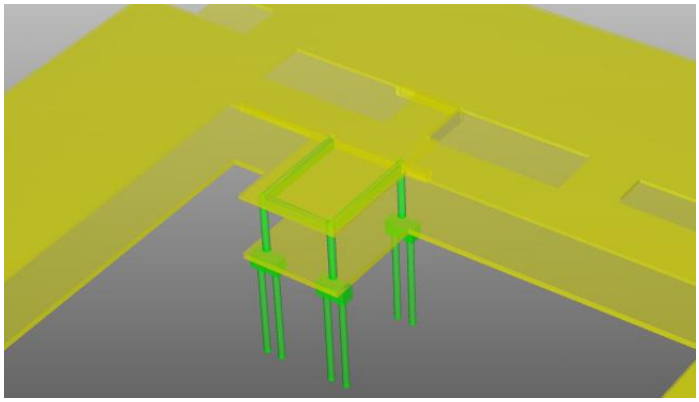
M6.17 The Drawing Window will now display only the new objects (in green) and the deleted objects (in red). It may be helpful to rotate and / or zoom the drawing.

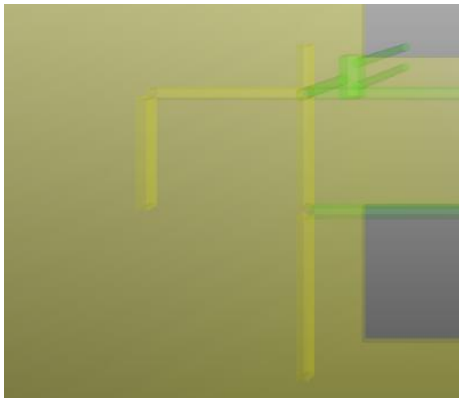
M6.18 The comparison shows that a pile cap & associated piles has been deleted and that several pile caps & associated piles, columns and beams have been added between revisions.

M6.19 **Place** a **tick** in the **{ Different After } checkbox**, this will additionally display objects which exist in both revisions of the drawing but have been adjusted between the revisions and display them as they are in the current revision. Selecting the Different Before checkbox displays the same objects but displays them as they were in the previous revision.

M6.20 You will notice that two floors and several beams have been adjusted between revisions.

M6.21 **Try using different combinations of** the view options, the **[Transparent] View** (refer to section 4.6) and the **Move Through (E key) feature** to review the changes.





M6.22 Once the changes have been reviewed **click** on the **[Close] button** on the **[Comparison] Ribbon** Toolbar to return to normal view.

Importing New Dimensions

Changed and deleted BIM dimensions which were previously imported in the earlier Building revision from the earlier drawing have been automatically revised. Dimensions for new objects now need to be imported.

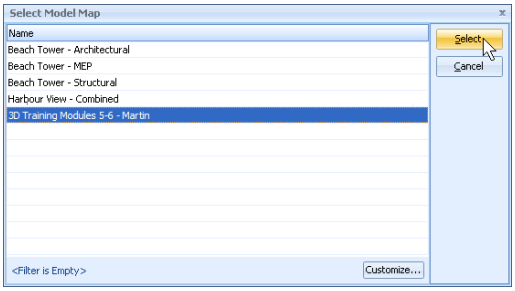
As all the dimensions were previously imported using a Model Map the same method will be used to import the dimensions for the new objects into the existing Dimension Group and folder structure. Had a BIM Template or the selecting objects methods been used previously, then these methods would be used to import dimensions for the new objects instead.

We have seen from visually reviewing the new objects added between the revisions that the new objects are all of a similar type to existing objects imported previously, consequently the previously created Model Map can be used without further amendment. Had the new objects been different in type or nature to the objects in the previous drawing revision it is advisable to review the model map accordingly. It is possible however at any time to review, using the Check BIM Objects button, any unused objects (i.e. any objects in the BIM model which do not have an imported dimension).

M6.23 Ensure all of the drawing objects are displayed in the drawing window by **click**ing on the **[Show All Objects] button** on the **[Dimensions] Ribbon** Toolbar.

M6.24 To Import the dimensions for the new objects **click** on the **[Import] button** on the **[Dimensions] Ribbon** Toolbar and **select** the **[Import Dimensions using Model Map]** option. The Select Model Map dialog will be displayed.

M6.25 **Locate the '3D Training Module 5-6 – *Your Name*' model map** in the list (if there are more model maps than can be displayed in the list a vertical scroll bar will be displayed on the right of the list window).

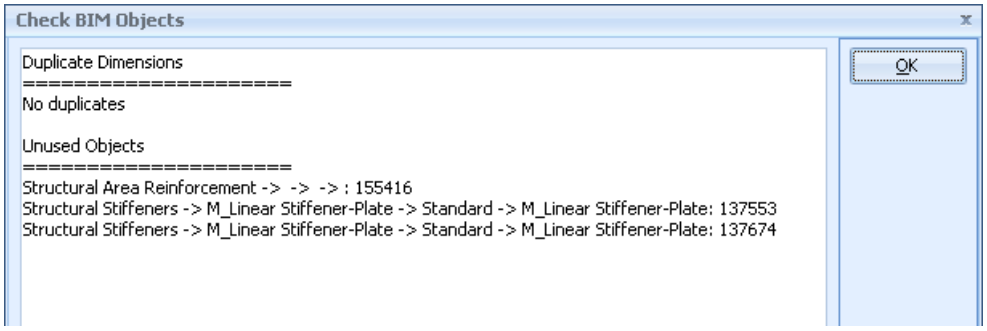


M6.26 Once the model map has been selected in the list **click** on the **[Select]** button to commence the import.

Reviewing Any Unused Objects

A report can be produced at any time to review any unused objects i.e. any objects in the BIM model which do not have an imported dimension.

M6.27 **Click** on the **[Check BIM Objects] button** on the **[Dimensions] Ribbon** Toolbar, the Check BIM Objects window will be displayed.



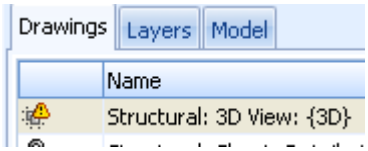
M6.28 For each object (if any) which currently has not been used there will be a single line entry listed under the Unused Objects heading displaying the hierarchical grouping levels for the object followed by the objects unique ID (which can be used to isolate the object using the model tree list view). If there are no unused objects the report will indicate 'All Objects Are Used'.

M6.29 You may recall that we purposefully did not create model map entries previously for the Structural Area Reinforcement or Structural Stiffeners object groups (such that we could demonstrate the unused objects feature here) which is the reason these objects appear as unused.

M6.30 In this case the unused objects are intentional so, **click** on the **[OK] button** to close the report window.

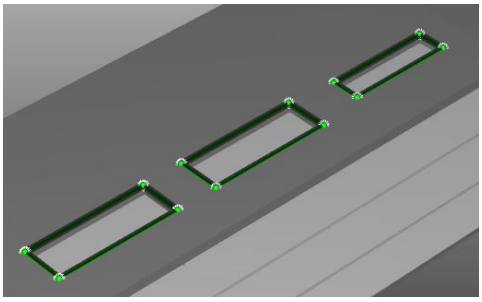
Had there have been any unused objects which were not intentionally unused the displayed grouping information will be of assistance to either further review and update the model map (if a Model Map was used to import the dimensions) or to locate or create the relevant Dimension Group to measure the unused objects using the selecting objects method.

The contents of the Check BIM Objects window can be highlighted and copied to the Windows® clipboard if required in the usual manner.

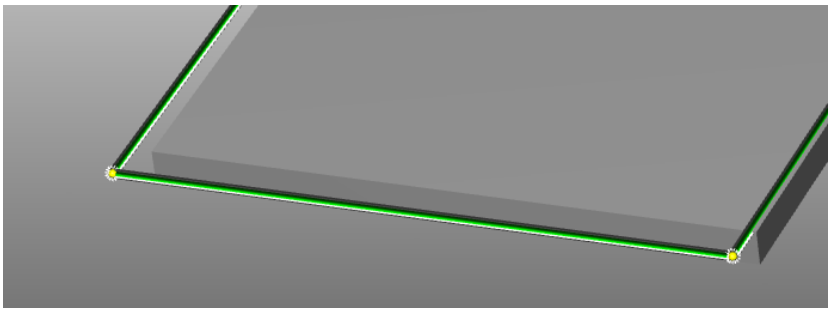


If the drawing title in the drawings list window displays a yellow warning icon after promoting the three dimensional drawing with a new file this signifies that there is at least one 3D Measure Mode dimension measured from the drawing. The Dimension Group(s) containing such dimensions will also display a similar warning icon as will the individual dimensions themselves.

These Dimension Groups can then be reviewed for any changes. The review process includes the verification of click points, to ensure these are all valid and in the correct position.



If the corner click points were no longer in a valid position (i.e. had the corners of the object on which the corner click points were defined originally been revised between the revisions) the invalid click points would be displayed in a Yellow colour as indicated in the example below, in which case the corner click points could be dragged and dropped to the revised (valid) position prior to accepting the dimensions.

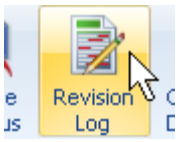


These measures can then be verified using the Accept All button on the Revisions Ribbon Toolbar (if a sub-menu is displayed the lower half of the button was clicked in which case select the Accept All Dimension option).

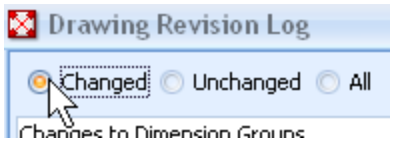
Revision Log

After a drawing has been promoted a report can be generated to identify Changes to Dimension Groups and Dimensions.

M6.31 **Click** on the **[Revision Log] button** on the **[Revisions] Ribbon** Toolbar, The Drawing Revision Log window will be displayed.



M6.32 The revision log can display details of Changed, Unchanged, or All Dimension Groups and Dimensions by selecting the required radio button above the report content. **Select** the **[Changed] option** to review details of only the changed values.



The Changes to Dimension Groups section schedules each changed Dimension Group value and identifies the Dimension Group name in quotation marks, followed by the Dimension Group value type (e.g. length, volume, count etc.), followed by the previous and new values in the format of 'was x, is now y'.

The Changes to Dimensions section contains a heading for each of the changed Dimension Groups and identifies beneath each heading for each revised dimension the dimension name, followed by details of whether the dimension values have been added, changed or not carried forward (deleted) since the previous revision, followed by the associated values

The contents of the Drawing Revision Log window can be highlighted and copied to the Windows® clipboard if required in the usual manner.

M6.33 **Click** on the **[Close] button** to close the window.

Module 7Additional Model-based Shared Parameters and User-Defined External Properties

Model-based Shared Parameters

During the previous modules relatively simple BIM files have been used which contained only standard model properties, i.e. the parameters and values created automatically and by default by the BIM design software. Designers are however able to include useful additional Shared Parameters into the model, which we will see in the example we will now review.

Building Set-up (PFC 1-4)

M7.1 **Click** the **Main Menu**  **button** and **select** the **[Close Building] option** to close the currently open building file.

M7.2 **Click** the **Main Menu**  **button** again and **select** the **[New Building] option**, the Building Properties dialog will be displayed, **enter "3D Training Module 7.1 - " followed by your name** in the **{ Name: } field**.

M7.3 In the **{ Project } field** use the drop down menu to **select** the **'3D Training-*Your Name*'** project that was previously created.

M7.4 Ignore the remaining fields and **click [Insert]**. This will create the new Building and the CostX® display will open in the Dimension View ready for you to add drawings etc.

M7.5 Once the building has been created **select** the **[add] button** from the **[Drawing } ribbon**. **Select** the drawing named **'3D Training Module 7 QSID Drawing.dwfx'** from the saved dataset. **Hit [Insert]** in the Drawing Properties Window.

Additional Shared Parameters

In this example the designer has included a new Shared Parameter named QSID which provides an additional Elemental classification for model objects, based in this case on the element definitions contained within the Australian Cost Management Manual (e.g. 01 Substructure, 02 Columns, 03 Upper Floors and the like).

M7.6 **Open** the **[Model] Tab** and **display** the **[schedule]**.

M7.7 **Click in turn over several of the Model Tree branch levels** (e.g. Curtain Panels, Floors, Railings, Stairs etc.). **Notice in the schedule window each has a QSID column** containing the relevant elemental grouping code and description.

M7.8 **Return to the [Drawings] Tab** and **[Show All Objects]**. **Click** on the **[Import] button** on the **[Dimensions] Ribbon** Toolbar and **select** the **[Import Dimensions Using BIM Template]** option.

M7.9 **Select** the **'BIM Import Revit by QSID or ELEMENT CODE.xslt' file** and **click** the **[Open]** button to commence the import. A progress indicator will be displayed during the import.

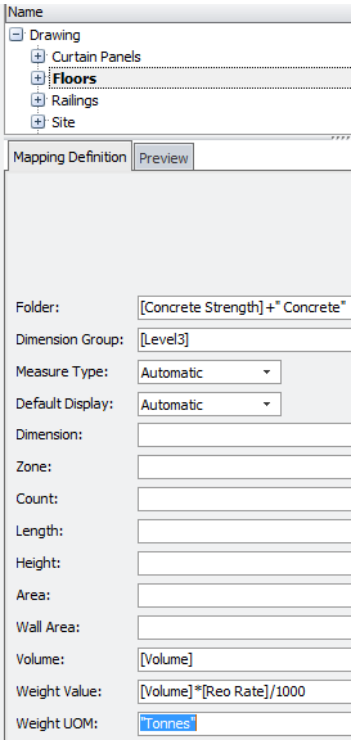
M7.10 Once the import process has completed and any information messages closed, the Dimension Group folders are arranged by QSID element.

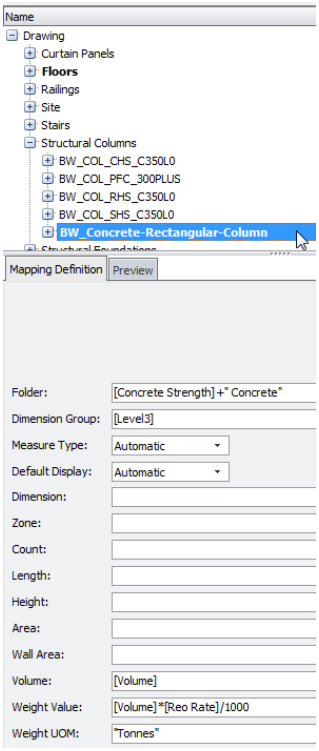
The designer has also introduced a number of other additional useful parameters such as concrete strength and reinforcement ratios for the relevant objects.

M7.11 **Open** the **[Model] tab** and **filter** to the **Floors node**. **Open** the **[Schedule]** to see how all the floor objects have Concrete Strength and Reo rate properties.

M7.12 Then **click** on the **[Model Maps] button** on the **[Dimensions] Ribbon** and **[Insert]** a **Model Map called "QSID Concrete"**.

M7.13 **Create a mapping definition as shown below, then also copy and paste the Mapping definition to the BW_Concrete_Rectangular_Column node.**

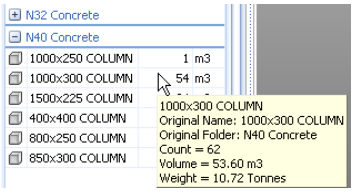




M7.14 **[Close]** the **Model Map** and **return** to the **[Drawings] View**. **Close** the **[Schedule]** and **[Show All Objects]**.

M7.15 **Import Dimensions Using Model Map, using the QSID Concrete map**.

M7.16 Dimension Group folders are created for each Concrete Strength category, and each dimension includes a Weight value for reinforcing steel based on the Reo Rate property.



User-Defined External Properties

This powerful feature allows a CostX® user to insert additional data into the BIM Properties Schedule, which will attach to the corresponding object within the model. The data can then be used for measurement purposes as part of the normal CostX® BIM workflow via CostX® BIM Templates, Model Maps and object-based Dimension Groups. Examples of user-defined data might include elemental or trade coding, additional dimensions, formula calculations, life-cycle data, etc. This data is referred to as External Properties.

In this module we will add extra dimensional data into a model and show how this can be used in a mapping definition to provide additional measurement functionality. We will also add elemental coding to the model for sorting purposes, and also add a building revision to see how External Properties files fit into the revisioning workflow.

Building Set-up (PFC 1-4)

M7.17 **Click** the **Main Menu**  **button** and **select** the **[Close Building] option** to close the currently open building file.

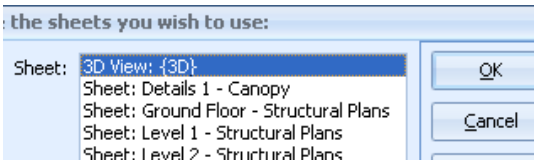
M7.18 **Click** the **Main Menu**  **button** again and **select** the **[New Building] option**, the Building Properties dialog will be displayed, **enter "3D Training Module 7.2 - " followed by your name** in the **{ Name: } field.**

M7.19 In the **{ Project } field** use the drop down menu to **select** the **'3D Training-*Your Name*' project** that was previously created.

M7.20 Ignore the remaining fields and **click [Insert]**. This will create the new Building and the CostX® display will open in the Dimension View ready for you to add drawings etc.

M7.21 **Click** on the **[Add] button** on the **[Drawings] Ribbon** Toolbar, browse to the location in which you previously saved the dataset and **select** the **'3D Training Module 5 Structural Drawing.dwf' drawing** and **click [Open]**.

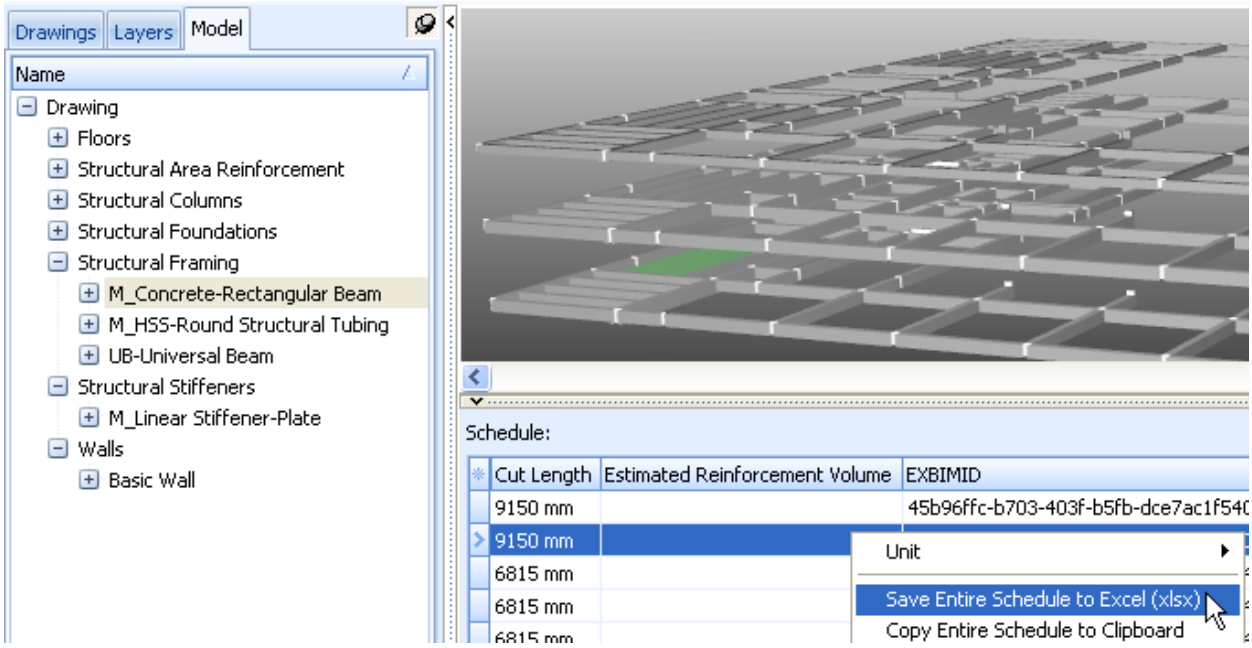
As the DWF file contains several sheets you will be prompted to choose the sheet or sheets to use. **Select** the **[3D View] only**, and **click [OK]**.



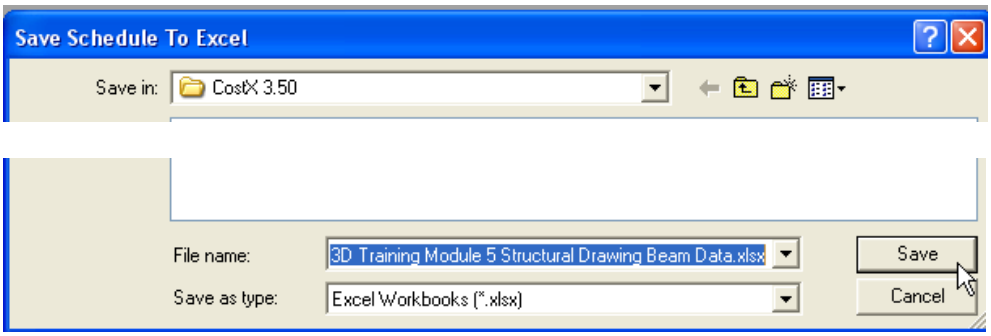
Creating the External Properties File

M7.22 **Open** the **[Model] Tab**, and **select** the **[M_Concrete-Rectangular Beam] node** (under the Structural Framing node). **Open** the **[Schedule]**.

M7.23 **Right click over the Schedule** and **select [Save Entire Schedule to Excel (xlsx)]**.



M7.24 An Open File dialog box will open. By default the xlsx file location and name are the same as the drawing file. **Append the words "Beam Data" to the end of the name and click [Save]**.



M7.25 If the xlsx file doesn't open automatically, open it in Excel®.

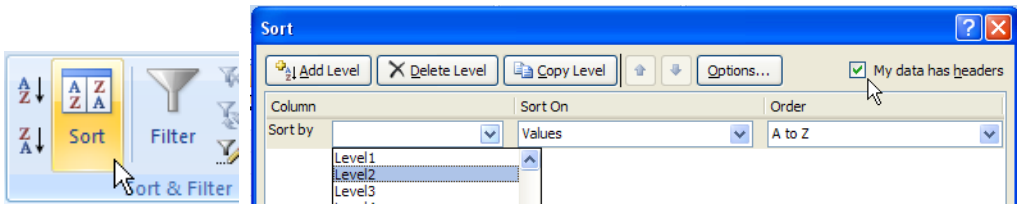
M7.26 **Add four new column headings to the spreadsheet as follows**.

	N	O	P	Q	R	S
1	Type Name	Volume	Beam Width	Beam Depth	Slab	Beam Height
2	400 x 800mm	1.595 m³	400	800	225	=Q2-R2
3	400 x 800mm	0.658 m³				
4	400 x 800mm	1.361 m³				
5	400 x 800mm	0.941 m³				

M7.27 **Enter the additional data for all rows. Note that the level 1 and 2 slabs are both 225 thick, and the Roof slab is 400 thick**.

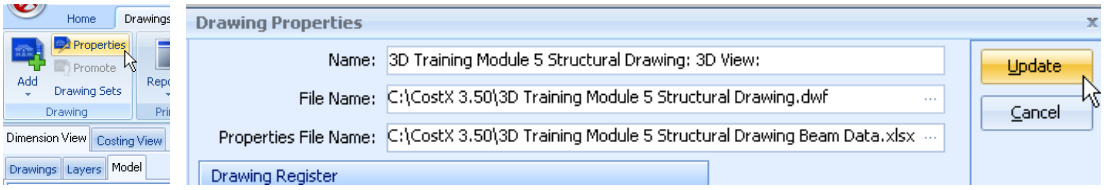
L	N	P	Q	R	S
Reference Level	Type Name	Beam Width	Beam Depth	Slab	Beam Height
Roof	400 x 800mm	400	800	400	400
Roof	400 x 800mm	400	800	400	400
Roof	400 x 800mm	400	800	400	400
L1 - Level 1	400 x 800mm	400	800	225	575
L1 - Level 1	400 x 800mm	400	800	225	575
L1 - Level 1	400 x 800mm	400	800	225	575
L1 - Level 1	600 x 900	600	900	225	675
L1 - Level 1	600 x 900	600	900	225	675

***TIP**: For ease of working in the spreadsheet in Excel®, data may be filtered or sorted, and columns may be deleted to reduce clutter. The deleted data is not lost (because it is an attribute of the model file in CostX®) it is simply being removed from the spreadsheet. However, be careful not to delete the EXBIMID column as this is required to tag the additional data to its intended object. The Row 1 headings must also remain at Row 1.*



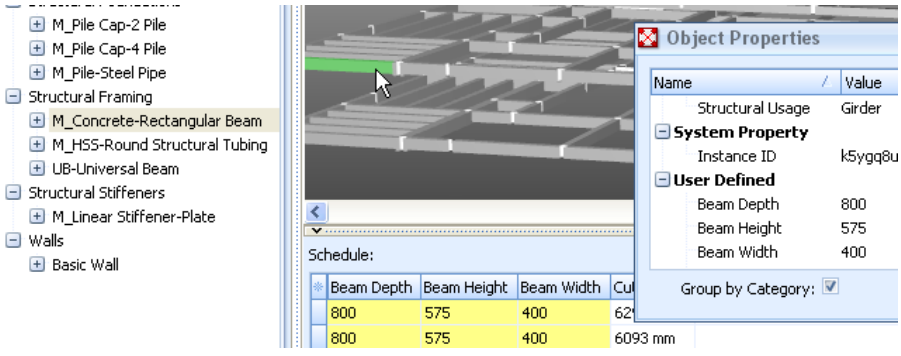
M7.28 **When the adjustments are complete, save and close the amended xlsx file**.

M7.29 **Return** to **CostX®** and **open** the **Drawing Properties** dialogue **by clicking** the **[Properties] button** or by double-clicking on the drawing name. In the **{ Properties File Name }** box **click** on the **ellipsis (…) button** to open an Open File dialog box and **navigate** to the **saved xlsx file**. **Click [Open]** to attach the file to the drawing properties and then **click [Update]** to close the Drawing Properties box.

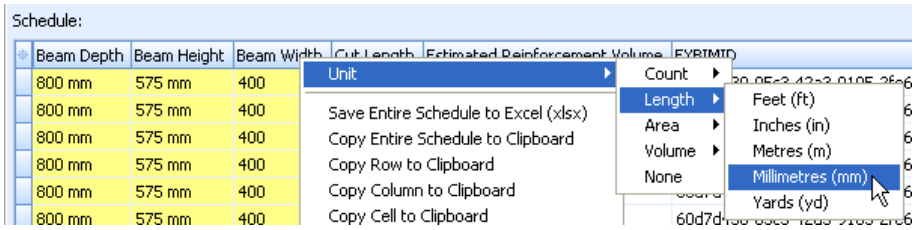


M7.30 **Open** the **[Model] Tab**, and **select** the **[M_Concrete-Rectangular Beam] node** (under the Structural Framing node). **Open** the **[Schedule]**.

M7.31 The added columns will be highlighted in yellow. R**ight click over one of the beams and select [Object Properties]**. The additional data is shown as User Defined properties.

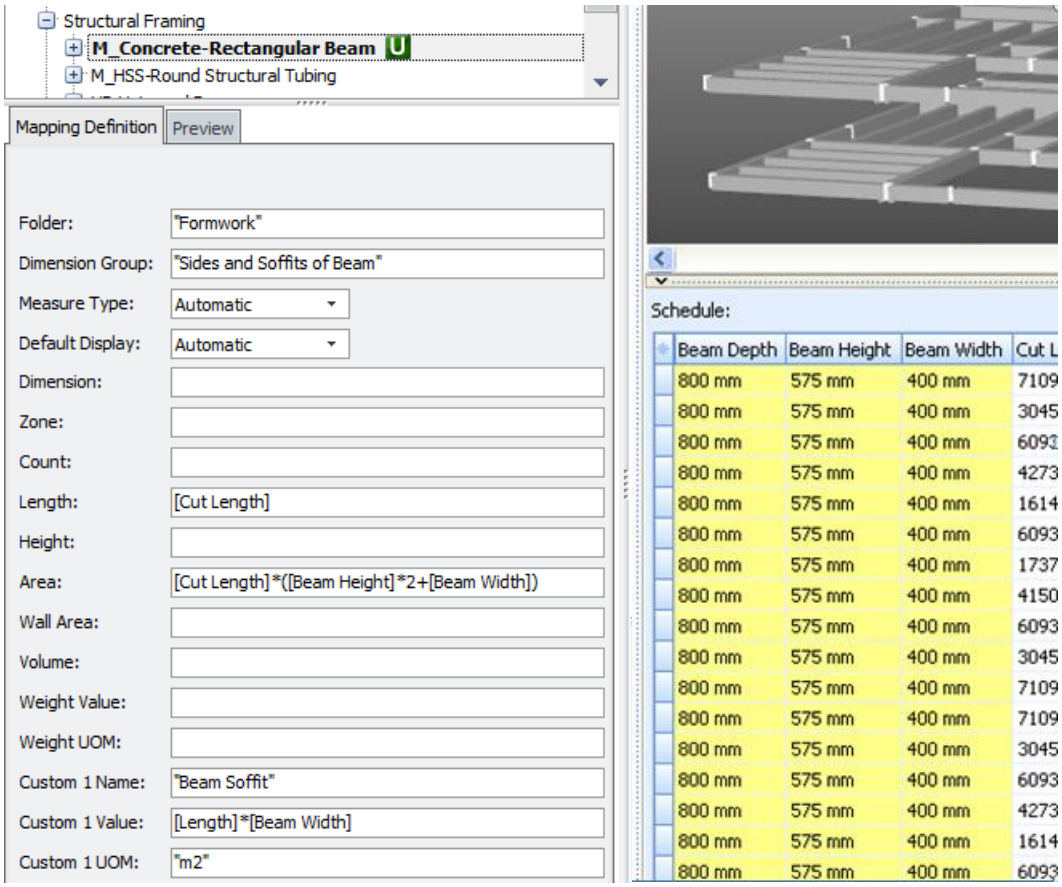


M7.32 **Set a Length Unit of millimetres for each of the new columns**.

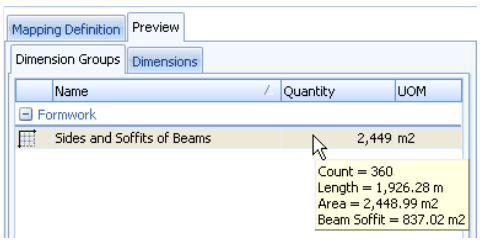


Using External Properties in a Model Map

M7.33 **Click** on the **[Model Maps] button** on the **[Dimensions] Ribbon**. **Insert** a **Model Map under the Project tab called "Beam Formwork" and create a mapping definition as follows:**



M7.34 **[Preview]** the **mapping definition**. The formwork area is provided (excluding beam ends which will need to be measured directly from the 3D or 2D views) and the custom Beam Soffit area can be used as a deduction from the floor slab areas to calculate slab soffit formwork. Note that Cut length was used for beam formwork because Cut length is a net dimension between intersections, and Length was used for the slab soffit deduction because Length is a gross dimension across intersections. Close the Preview.



M7.35 **Ensure that either the Structural Framing family node or the Drawing node (all objects) is selected. Close** the **[Model Map] view**, and **open** the **[Drawings] tab**. **Click** on the **[Import] button** on the **[Dimensions] Ribbon** Toolbar and **select** the **[Import Dimensions Using Model Map] option**.

M7.36 **Select** the **"Beam Formwork" Model Map** and **click** the **[Select] button** to commence the import and create the Dimension Group.

Adding External Properties does not alter the source DWFx™ drawing file, it only changes the drawing properties within CostX®. External Properties can only be added prior to import of any BIM dimensions or measurement of any quantities, because a drawing file cannot be changed after quantities have been measured from it. When an Excel® External Properties file is attached to a drawing in CostX® it automatically gets locked as read-only, and cannot subsequently be edited and re-attached.

In order to add additional properties to the same drawing after import or measurement of dimensions, there are two options:

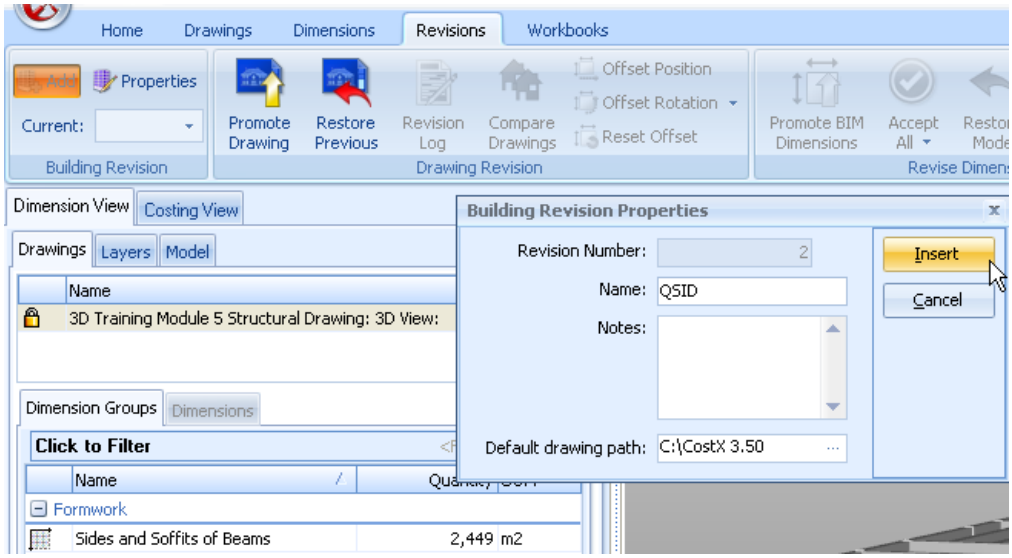
1) delete the existing Dimension Groups and re-measure them after updating the properties. If the dimensions were based on BIM imports this can be done relatively easily. To update the properties, either delete the existing external properties file and create a new one, or copy the existing read-only file and edit the copy. Then open the drawing properties and attach the new or edited file.

2) add a Building Revision and promote the drawing file, using the same drawing file but with updated user-defined properties. This will be demonstrated in the next section.

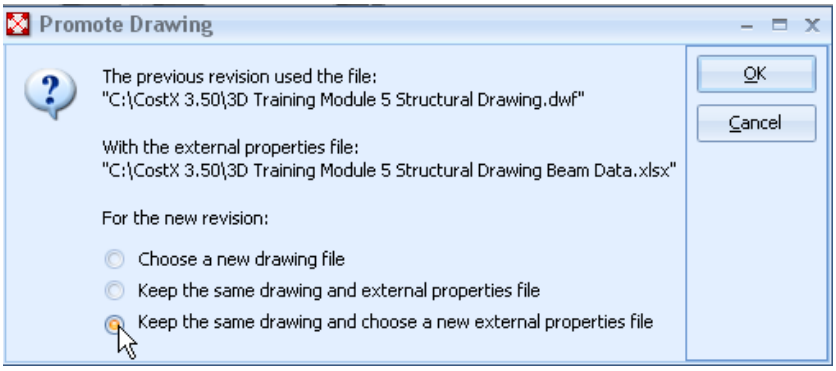
Adding External Properties can also be utilised to automate a Quantity Take Off and a Priced Workbook. This can be achieved by entering Cost Codes into the BIM Model via the Excel file, and using a Model Map in combination with a rate library to automatically generate a priced estimate complete with item descriptions. Refer to Section 6.15 in the Advanced Manual for further information.

Adding supplementary External Properties to a Drawing

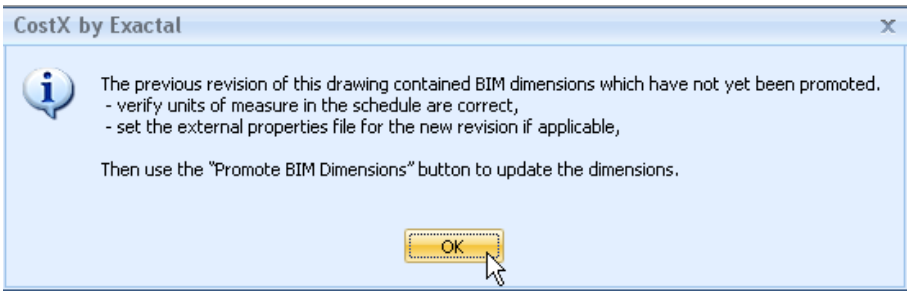
M7.37 **Open** the **[Revisions] ribbon** and **click** the **[Add] button** to add a revision. **Name the revision "QSID"** and **click [Insert]**.



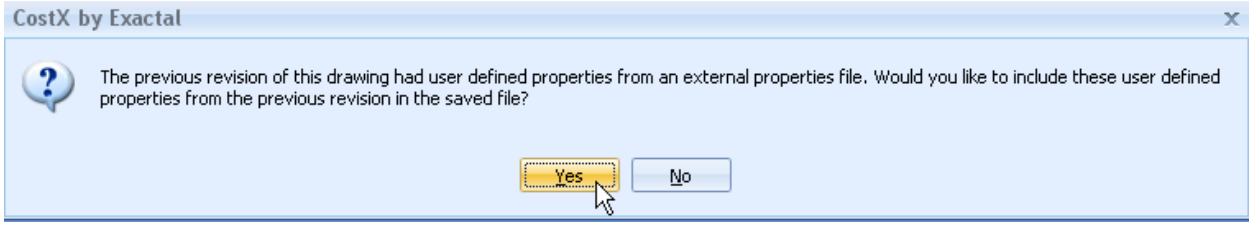
M7.38 **Click** the **[Promote Drawing] button**, **select the third option** and **click [OK]**.



M7.39 **Select only the first 3D View sheet**. **A prompt will then open, click [OK]**.



M7.40 **Open** the **[Schedule]**. **Right click over the Schedule** and **select [Save Entire Schedule to Excel (xlsx)]**. A prompt will open. **Click [Yes]**.



M7.41 **An Open File dialog box will open. By default the xlsx file location and name are the same as the drawing file. Append the words "QSID" to the end of the name and click [Save]**.

> *The previous xlsx External Properties file with the suffix "Beam Data" will also be in the same folder. This file has automatically been converted to read-only and cannot be edited. It must be retained as it contains the External properties relative to the previous revision.*

M7.42 If the xlsx file doesn't open automatically, open it in Excel®.

M7.43 The Beam Data columns added to the previous file have been automatically inserted into the new file, at the right hand side of the spreadsheet. **Add another heading QSID in the next column. Insert an elemental coding in each row for each object. Use the following codes.** If you elect to sort column data or hide columns or rows, remember to maintain the Row 1 headers and do not delete the EXBIMID column. **When complete, save and close the xlsx file.**

01 SUBSTRUCTURE

02 COLUMNS

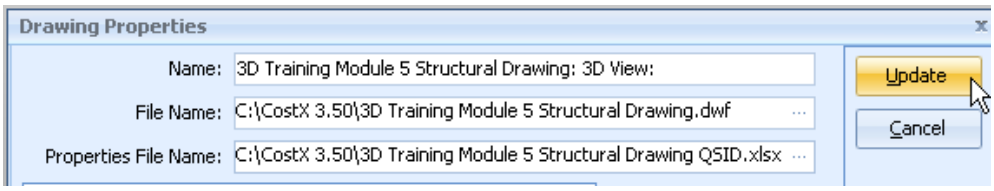
03 UPPER FLOORS

05 ROOF

06 External Walls

Q	R	V	AG	AH	AI	AJ	AK	AL
Level1	Level2	Reference Level	Beam Width	Beam Depth	Slab	Beam Height	QSID	
Walls	Basic Wall						06 EXTERNAL WALLS	
Walls	Basic Wall						06 EXTERNAL WALLS	
Walls	Basic Wall						06 EXTERNAL WALLS	
Walls	Basic Wall						06 EXTERNAL WALLS	
Walls	Basic Wall						06 EXTERNAL WALLS	
Walls	Basic Wall						06 EXTERNAL WALLS	
Floors	Floor						03 UPPER FLOORS	
Floors	Floor						05 ROOF	
Floors	Floor						03 UPPER FLOORS	
Floors	Floor						03 UPPER FLOORS	
Floors	Floor						03 UPPER FLOORS	
Structural	M_Concrete-Rectangular Beam	L1 - Level 1	400 mm	800 mm	225	575 mm	03 UPPER FLOORS	
Structural	M_Concrete-Rectangular Beam	L2 - Level 2	400 mm	800 mm	225	575 mm	03 UPPER FLOORS	
Structural	M_Concrete-Rectangular Beam	L2 - Level 2	400 mm	800 mm	225	575 mm	03 UPPER FLOORS	
Structural	M_Concrete-Rectangular Beam	Roof	400 mm	800 mm	400	400 mm	05 ROOF	
Structural	M_Concrete-Rectangular Beam	Roof	400 mm	800 mm	400	400 mm	05 ROOF	

M7.44 **Return to CostX®** and **open** the **Drawing Properties dialogue by clicking** the **[Properties] button** or by double-clicking on the drawing name. In the **{ Properties File Name } box click on the ellipsis (…) button** to open an Open File dialog box and **navigate to the saved xlsx file**. **Click [Open]** to attach the file to the drawing properties and then **click [Update]** to close the Drawing Properties box.



M7.45 **Open** the **[Model] tab**. **Open** the **[Schedule] and verify that the QSID column is included** and shown highlighted in yellow. Click on a beam to move the Schedule to a beam row and verify that the Beam Data from the previous revision has been included and that the millimetre Units previously set for the Beam Data columns are still shown.

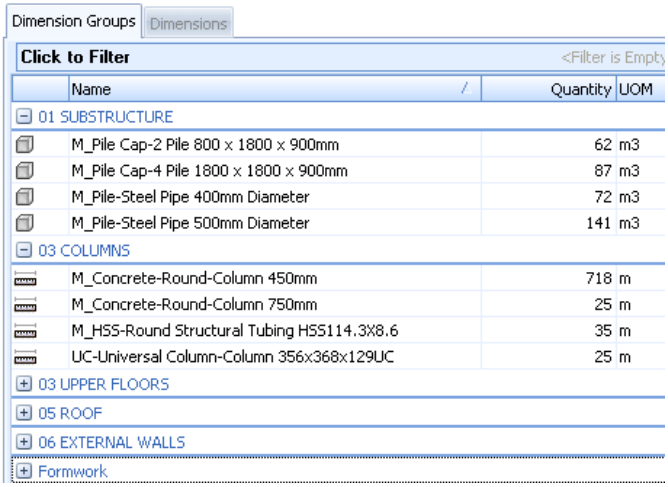
M7.46 **Return** to the **[Drawings] tab**. The Dimension Group previously imported will still be shown as zero quantity. **Right click over the drawing and select Show All Objects.**

M7.47 **Open** the **[Revisions] ribbon** and **click [Promote BIM Dimensions]**. A prompt will open. **Click [OK]**. The Dimension Group quantities will be refreshed.

M7.48 **Open** the **[Dimensions] ribbon** and **click** on the **[Import] button**. **Select** the **[Import Dimensions Using BIM Template]** option.

M7.49 **Select the 'BIM Import Revit by QSID or ELEMENT CODE.xslt'** file and **click** the **[Open] button** to commence the import. A progress indicator will be displayed during the import.

M7.50 Once the import process has completed and any information messages closed, the Dimension Group folders are arranged by QSID element.



Module 8 Introduction to IFC Files

As stated in Section 2.4 of this document, IFC cannot replicate the authoring functions of the various proprietary BIM applications, nor is that its intention. The aim is to provide a broadly based, vendor-neutral exchange format for BIM Model data to facilitate:

- Cross-discipline co-ordination of BIM models
- Data sharing and exchange across IFC-compliant applications
- Extraction and re-use of data for other downstream tasks associated with building ownership and operation.

The process of sharing data via the IFC format is termed an IFC Exchange. In practical terms, the need to convert the host data to IFC format and the fact that the IFC is structured to support a multiplicity of data types across a wide range of disciplines can lead to a high level of complexity in the IFC model. IFC exchanges therefore follow what is termed an "Exchange Requirement" which specifies the data that needs to be present in any given exchange and thereby limits the scope of the exchange so that different audiences can focus on the data relevant to them.

An associated IFC View Definition, or MVD (Model View Definition) defines a subset of the IFC schema that will satisfy the specified Exchange Requirements. Most IFC exchanges are therefore governed by an MVD.

The official buildingSMART® MVD for the AEC industry is the IFC2x3 Coordination View Version 2.0. When exporting an IFC file, IFC-compliant architectural BIM software maps the IFC export to the requirements of this definition. Because the main purpose of the Coordination View is to allow sharing of model data between the architectural, structural and MEP disciplines, the definition does not specify requirements for export of dimensions, so of itself the IFC will not contain quantities. However, dimension data available in the host application will be exported as a Property Set.

In 2006 buildingSMART® commenced work on a definition of model-based quantification of building spaces and elements, termed "Base Quantities". These augment the IFC 2x3 Coordination View definition by adding the ability to transmit Base Quantities for selected spatial, building, and structural elements, which get included in an IFC export as a tick-box option.

In this module we will review an IFC file exported from Revit® (both with and without Base Quantities), compare the data structure to a DWFx™ file exported from the same model, and generate quantities from the IFC model data.

Building Set-up (PFC 1-4)

M8.1 **Click** the **Main Menu**  **button** and **select** the **[Close Building] option** to close the currently open building file.

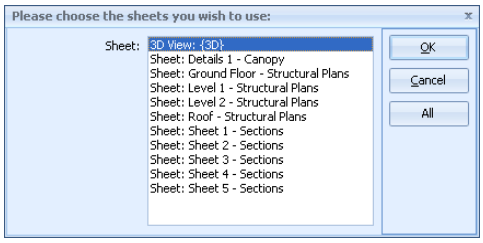
M8.2 **Click** the **Main Menu**  **button** again and **select** the **[New Building] option**, the Building Properties dialog will be displayed, **enter "3D Training Module 9 - " followed by your name** in the **{ Name: field }**.

M8.3 In the **{ Project } field** use the drop down menu to **select** the **'3D Training-*Your Name*' project** that was previously created.

M8.4 Ignore the remaining fields and **click [Insert]**. This will create the new Building and the CostX® display will open in the Dimension View ready for you to add drawings etc.

Adding the Drawings

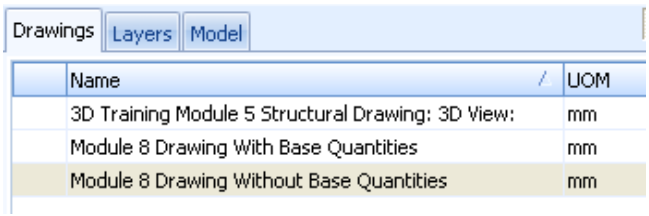
M8.5 **Click** on the **[Add] button** on the **[Drawings] Ribbon** Toolbar, browse to the location in which you previously saved the dataset and **select the '3D Training Module 5 Structural Drawing.dwf' drawing** and **click [Open]**. As the DWF file contains several sheets you will be prompted to choose the sheet or sheets to use. **Select** the **3D View only**, and **click [OK]**.



M8.6 After the 3D view has loaded, **click** on the **[Add] button** on the **[Drawings] Ribbon** Toolbar. The browser will open in the dataset. This time **select "Module 8 Drawing with Base Quantities.ifc" and click [Insert]**.

M8.7 **Then repeat with "Module 8 Drawing Without Base Quantities"**.

M8.8 The Drawing List should appear as follows.

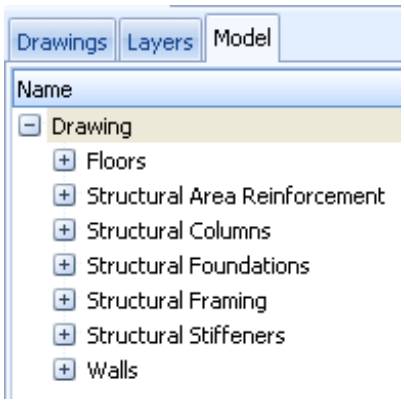


TIP: *IFC files often load with the plan view as the default "Front" view. Use the mouse controls to rotate the view to the required orientation.*

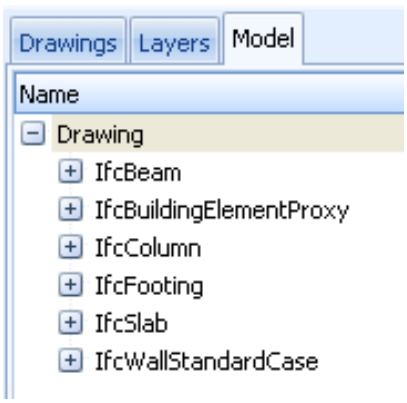
IFC Model Hierarchy and Base Quantities

M8.9 **Select** the **[Structural Drawing: 3D View:] drawing** in the drawings list window, then **open** the **[Model] Tab**. The Model Tree will present in standard Revit® Family Hierarchy format.

M8.10 **Return** to the **[Drawings] Tab** and **select [Module 8 Drawing With Base Quantities]**, then **open** the **[Model] Tab**. The Model Tree is now presented in IfcBuildingElement format.

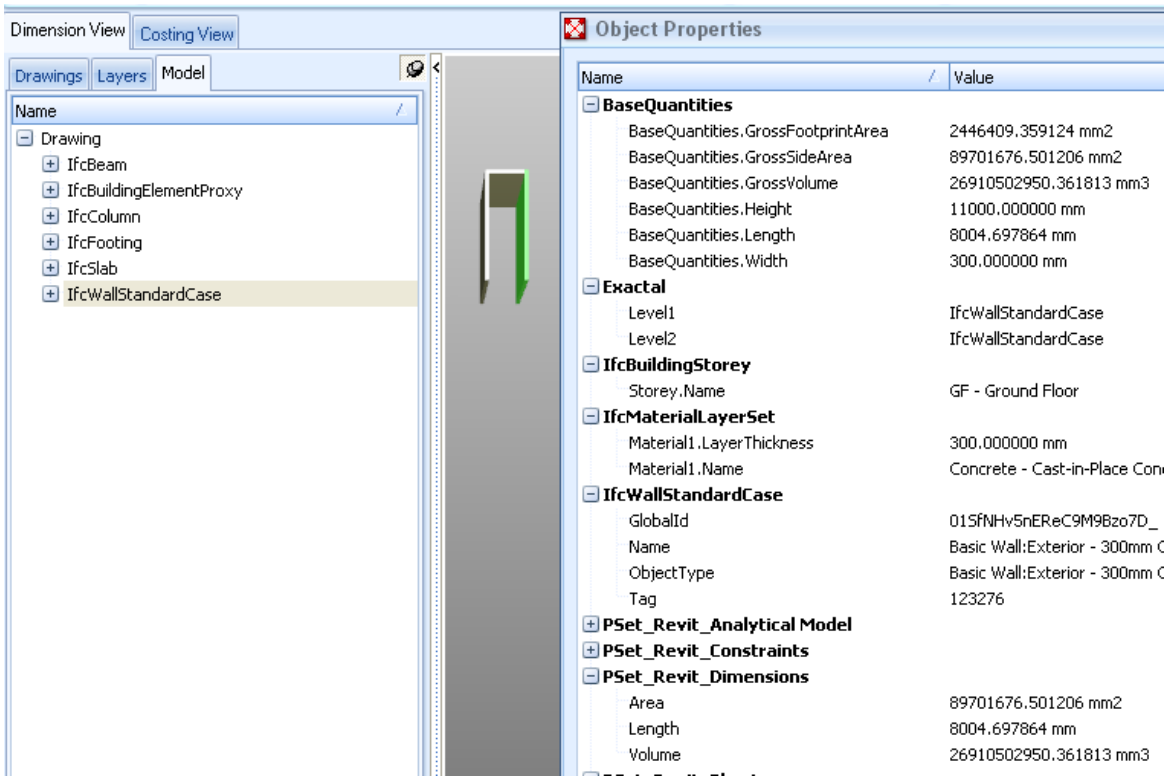


Revit® Family

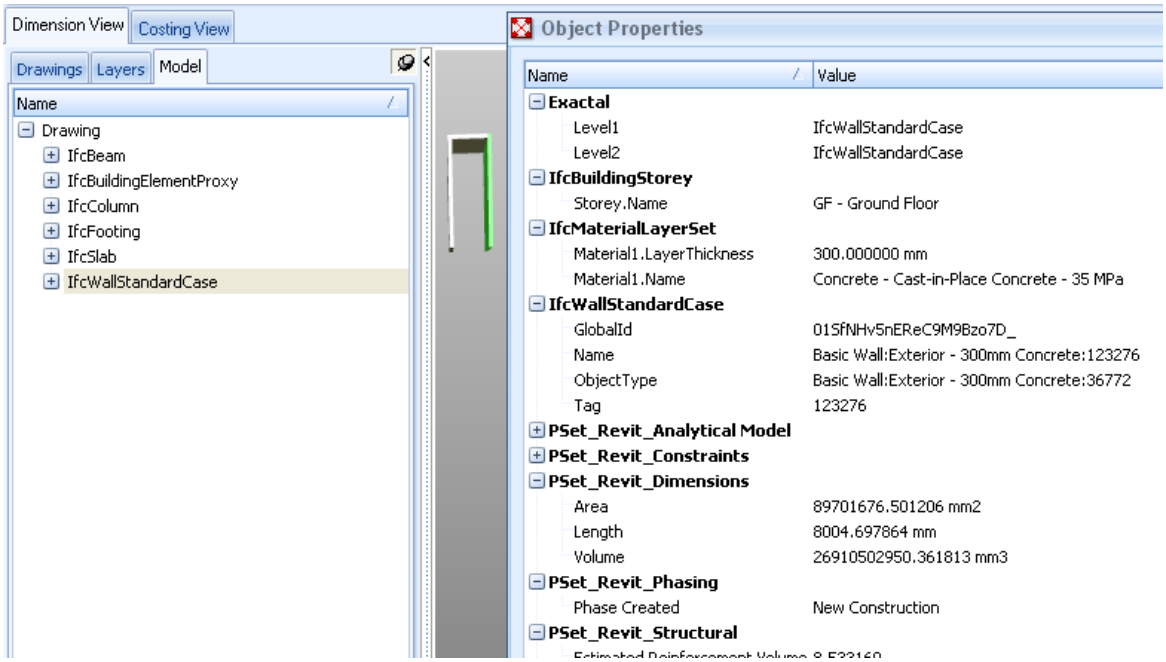


IfcBuildingElement

M8.11 **Filter to the [IfcWallStandardCase] branch of the tree**, then **right click on a wall object** and **select [Object Properties].** Note that the IFC includes Base Quantities in accordance with the buildingSMART® definitions. The Revit® Dimension properties are also available as a Property Set (**PSet_Revit_Dimensions**). Both can be used in Model Maps.

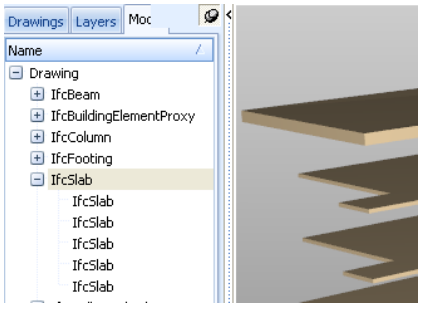


M8.12 **Close** the **[Object Properties] box**, return to the **[Drawings] Tab** and **select [Module 8 Drawing Without Base Quantities]**, then **open** the **[Model] Tab**. **Filter to the [IfcWallStandardCase] branch of the tree**, then **right click on a wall object and select [Object Properties]**. Note that the IFC has no dimension properties, however the Revit® Dimension properties are still available as a Property Set (**PSet_Revit_Dimensions**) and can be used in Model maps. Close the Object Properties box.

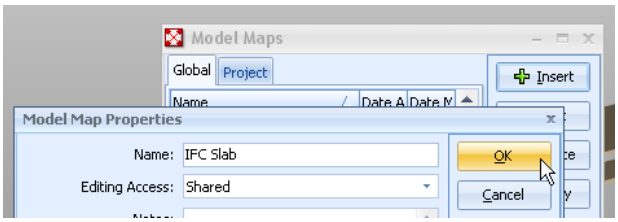


Verification of Base Quantities

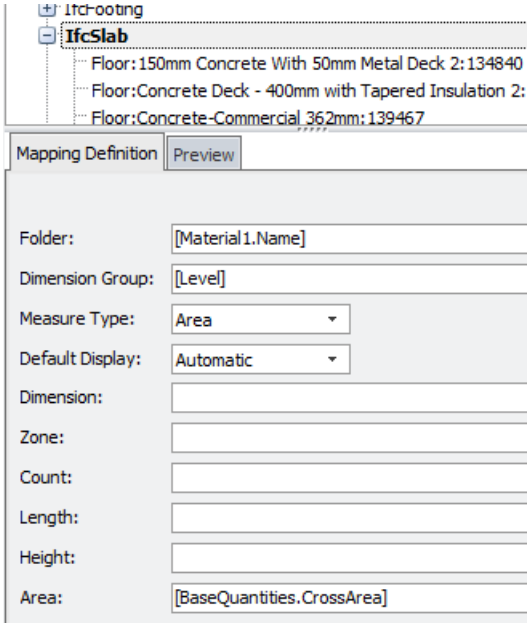
M8.13 **Return** to the **[Drawings] Tab** and **select [Module 8 Drawing With Base Quantities]**. **Open** the **[Model] Tab** and **filter to the [IfcSlab] branch**.

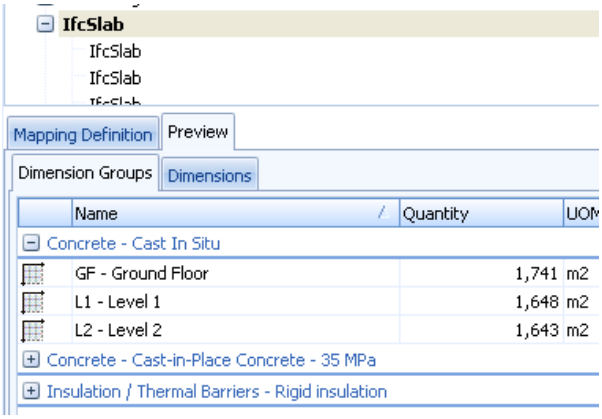


M8.14 Then **click** on the **[Model Maps] button** on the **[Dimensions] Ribbon** and **Insert a Model Map called "IFC Slab".**



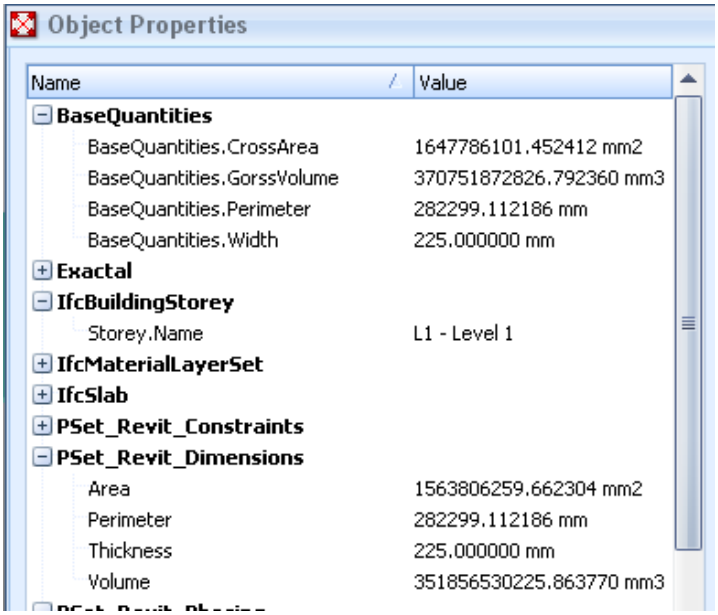
M8.15 Create a mapping definition as shown below.





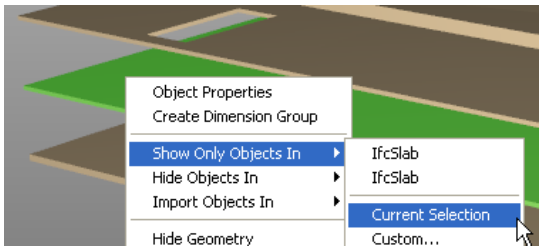
M8.16 **[Close]** the **Model map to return to the [Drawing] View**. Also **close** the **[Schedule] View**.

M8.17 **Move the cursor to the Level 1 slab, right click and select Object Properties**. Compare the Base Quantities and the P_Set_Revit_Dimensions. The Area and Volume Base Quantities are gross values whereas (as previously determined in Module 5.10) the corresponding Revit® dimensions are net.

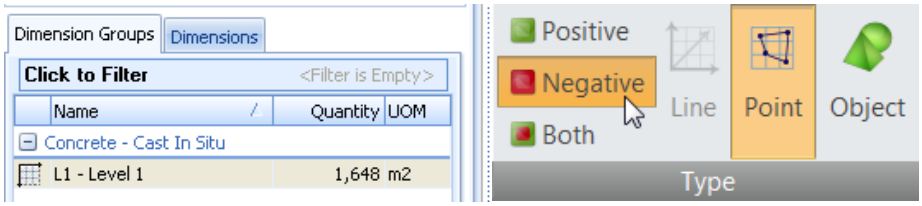


The buildingSMART® standard Base Quantity Definition also includes net area and volume definitions which may be provided in some IFC files.

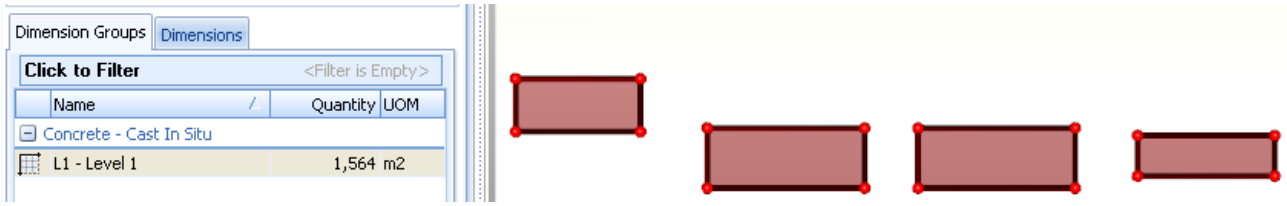
M8.18 **Close** the **[Object Properties] box**, then **right click** on the **Level 1 slab again and filter the view to [show only the Current Selection]**.



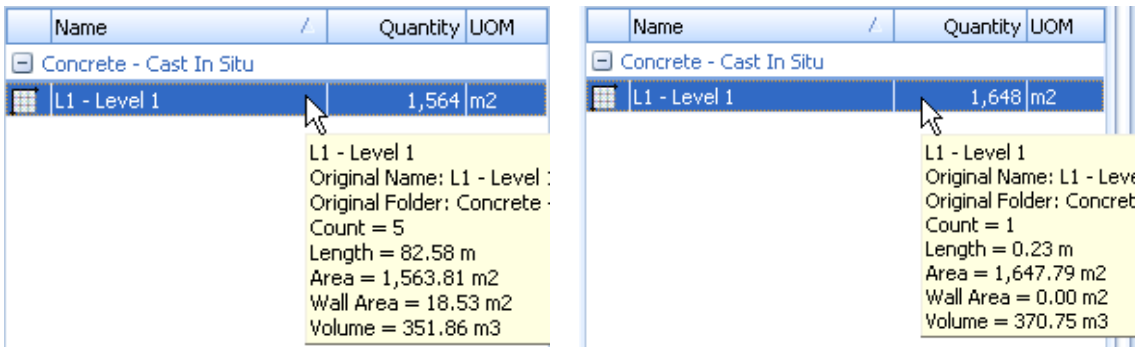
M8.19 **Import the level 1 slab dimensions using the IFC Slab Model Map, Select the newly created Dimension Group.** Then **switch** to **[Point] Mode** and **select [negative] measurement**.



M8.20 **Measure a negative dimension for each of the slab openings into the existing Dimension Group**.



M8.21 The adjusted area conforms to the net area dimension property. Now **open** the Dimension Group **[properties]**, and **insert** a **{ default height }** of **"0.225m"** (the thickness of the slab). **Hit [Update]**. Hover the cursor over the Dimension Group and the hint box will display a volume which accords with the net volume dimension property. Next, delete each of the negative opening dimensions on the drawing. The volume hint will now accord with the gross volume property.



Disclaimer

This dataset is an example only, to be used solely for the purpose of the training exercise. It is not to be used as a template for business operations. Exactal and its employees accept no liability for use of this dataset for business purposes.

DIGITAL DRAWING FILE OPTIMISATION

For Measurement & Estimating Purposes

Simple tips for a collaborative approach
to improved drawing file intelligence

exactal
precision estimating

Contents

Acknowledgements

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1 Introduction

All construction projects will have a number of key objectives, and almost without exception these will include adherence to cost and budgetary constraints. Whilst there is nothing new in these requirements, the way and speed they can be achieved has improved significantly and continues to improve because of the use of CostX®. CostX® is an interoperable estimating software tool which supports the seamless transfer of digital design information between designers and non-CAD users for measurement and estimating purposes.

Amongst other powerful features, CostX® allows its users to measure from a variety of drawing file formats without running CAD software, and without the ability to amend or alter the files. The measurements are then utilized in the preparation of working documents required for the various stages of a project, such as option or change appraisals, estimates, bills of quantities, material schedules, tenders, and the like.

Whilst CostX® supports a wide variety of file formats, thus enabling its use on any project, file formats for design data vary and each inherently provides differing levels of data richness and functionality. CostX® users can leverage better drawing file intelligence in a way that can dramatically improve productivity, and this means that the arrangement and configuration of data for each drawing file format can be optimized to improve communication and yield the greatest benefit to the team. This enables work that traditionally could have taken days to complete to be done in hours, leading to improved project delivery and resulting in benefits to the client and design team alike.

Notwithstanding these benefits, electronic drawing files are commonly issued in the lesser intelligent file formats, usually basic 2D raster or vector PDF files, sometimes 2D or 3D CAD formats and only occasionally 3D object-based BIM models. Furthermore, the file data is often not configured in a way to best suit the measurement process and quantity extraction. This represents a missed opportunity because regardless of the file format used, the configuration of data for each drawing file format can easily be optimized to improve communication and yield the greatest benefit to the team.

This document aims to provide general tips and guidance for the more common file formats on how drawing files may be arranged and optimized to improve team communication, and specifically to assist in the quantities measurement and estimating activities. It is not intended to be a mandatory requirement for each file format, but rather to reflect some of the more common optimizations which are of benefit.

Generally, the simple suggestions made in this document will be broadly applicable and could readily be incorporated into workflows for most projects. However, they are by no means exhaustive and it is up to project teams to establish their own information exchange protocols and collaborative workflow methodologies to suit project requirements and individual circumstances.

2 What to Provide - Overview

Drawing file formats which can be used for measurement and estimating purposes range from simple 2D raster formats, through 2D PDF or CAD files, to 3D object-based DWF™, DWFx™ and IFC BIM models. Each of these formats progressively provides increasing levels of drawing file intelligence which can be leveraged by CostX® users to dramatically improve measurement and estimating productivity.

Quantities are obtained either by on-screen measurement from 2D or 3D drawings, or by importing dimensional information directly from the BIM data model.

The details below reflect a general preference order based on the useable intelligence contained within various file formats, although CostX® supports the use of all of them.

2.1 3D DWF™ and DWFx™ files from Revit®

If Revit® is the software used to design the building, a multi-sheet DWF™ or DWFx™ export with a default 3D model view (or series of 3D views each showing different elements) and 2D sheets of all plans, elevations and sections will enable CostX® users to utilize the database information to automatically generate quantities from the 3D views, and augment the database quantities with additional measurement from the 2D or 3D drawing views or sheets. With Revit®, DWF™ and DWFx™ files are preferred to IFC files.

There are several optimizations which can assist the team when producing 3D models and views in Revit®, these are described in Section 8. As Revit® is also capable of exporting individual DWG™ files of the 2D views and sheets, these may also be requested where additional measurement functionality may be required. Please refer to Section 6.

2.2 IFC Files from ArchiCAD®

If ArchiCAD® has been used, provide an IFC 2X3 Extended Coordination View export with Base Quantities as described in Section 10. Prior to export ensure that objects are mapped to their correct IFC categories, which may involve use of override settings and creation of additional IFC-specific parameters.

In addition to the IFC, provide a full 2D set of plans, sections, elevations and details in 2D DWG™ format as described in Section 6.

2.3 2D CAD Formats

For most other CAD packages, DWG™ files can be used as an interoperable format between design disciplines to aid coordination, not least because the logical use of layers and blocks within them allows the identification and isolation of the relevant details, and this assists with the speed of measurement. There are several beneficial optimizations when producing DWG™ files as described in Section 6. Note that CostX® cannot be used to alter or amend DWG™ or any other CAD files. 2D DGN™ files are also supported by CostX®.

2.4 Vector-based PDFs

PDF files are a commonly issued output for design data, in part because this format is read-only and can be easily opened with a number or freely available and simple to use viewing packages. PDF files exported from a CAD package will usually contain vector coordinates however little else of the embedded intelligence of the CAD files from which they are generated.

Whilst vector PDF files can readily be used for measurement in CostX®, advanced measurement tools such as blocks and polylines which rely on CAD intelligence are not available. However if there is no choice but to issue vector PDF files there are a few optimizations which can enhance the data and thereby usability of the file, such as including layers in the PDF file to allow isolation of the relevant details which is of assistance for both review purposes and when taking measurements from the drawing. Please refer to Section 5.

2.5 Raster image files (incl. raster PDFs)

Raster image (JPEG, BMP, TIFF, etc) and raster PDF files provide the least data and do not contain any vector or other intelligence from the source CAD file. Sometimes, certain export settings in CAD programmes will determine whether a PDF is produced as a vector or raster file, or a combination – it can be quite common for PDF files to contain both vector and raster components. Whilst raster or combined raster/vector files can readily be used for measurement in CostX®, it is preferable to issue the DWG™ source files or all-vector PDFs as they have a far greater range of use. However if there is no alternative but to issue image raster files, the details in Section 4 provide several optimisation tips.

3 General Guidance (All 2D file formats)

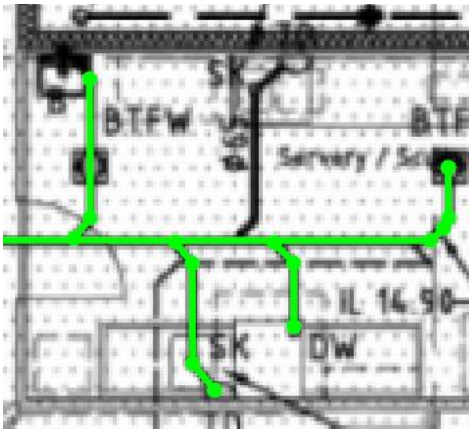
Irrespective of the file format provided, one of the key features of CostX® is the ability to identify and track changes which occur on progressive drawing issues. Consequently there are a few general suggestions to consider when creating and issuing drawings for a project which include:

1. Try to use a consistent scale, orientation and position for progressive issues of each drawing.
2. Try to be consistent with the drawn information included on each drawing for progressive issues.
3. Consider establishing a drawing numbering/referencing structure and use it consistently for progressive issues.

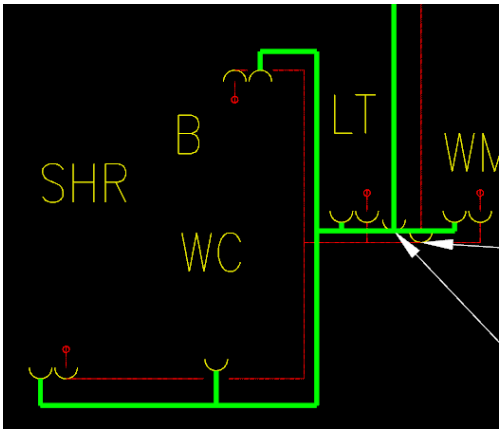
4 Raster Image Files (incl. Raster PDFs) and their limitations

CAD programs are based on vector graphics, however the drawings are often published and issued in one of the raster image formats which means that the inherent resolution and intelligence is lost. Often the drawings are difficult to read but cannot be enlarged without further loss of resolution, and the scale can sometimes be difficult to determine accurately.

CostX® supports both raster and vector formats but uses different modes of measurement for each, reflecting the nature of the data available. Measurement of a raster image traces an overlay over the top of the drawing, whereas vector measurement attaches to the actual vector lines within the drawing. Hence vector measurement is faster and more accurate, and can identify changes in drawing revisions by detecting the amended vector co-ordinates of the measured lines.



Raster Mode measurement in CostX®

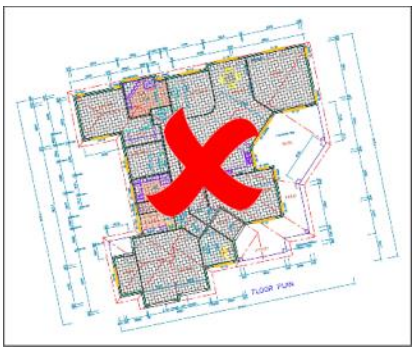


Vector Mode measurement in CostX®

For these reasons, although AutoCAD® and similar CAD programs can export/plot raster image files, the preference is to receive DWG™ files or Vector based PDF files (refer to Sections 6 & 7). If you have no choice but to issue raster files instead of vector files it is critical to provide scale information, particularly as the image may get distorted during transmission. This seems basic but is neglected surprisingly often.

1. Provide X and Y scale bars and / or figured dimensions to allow the drawing scale to be calibrated more accurately.

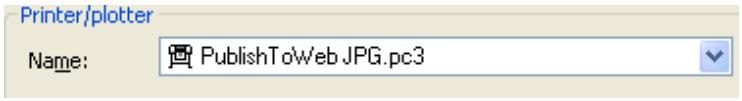
2. Orientate the drawing to be appropriately rotated (e.g. square to the boundary of the image file).

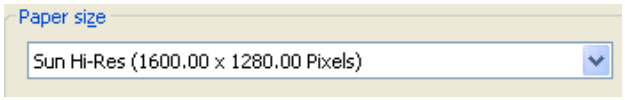


3. Use a consistent scale and orientation for progressive drawing issues.

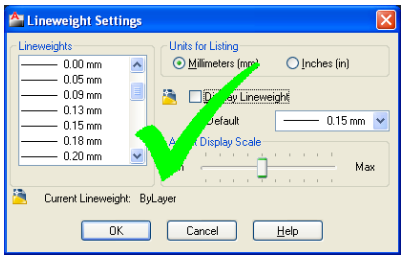
4. A JPG or PNG file format would be preferred over BMP and TIFF due to file size and quality considerations.

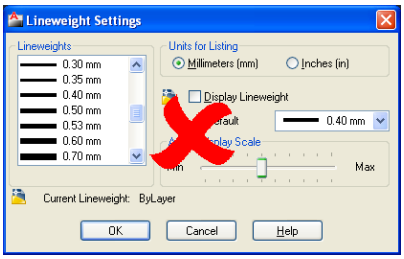
5. If plotting from a CAD package directly, choose an appropriate paper size setting (e.g. 1600 x 1280 pixels, A3 etc. or larger for very large drawings) to enhance resolution.





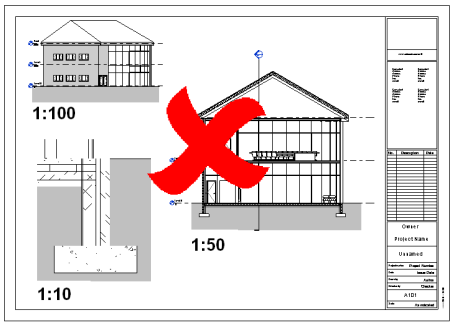
6. Try not to use heavy lineweights, as these may obscure other drawn details.





7. If scanning a drawing use a DPI setting of 100-150DPI generally, for drawings with very fine details use a DPI setting of 200-300DPI.

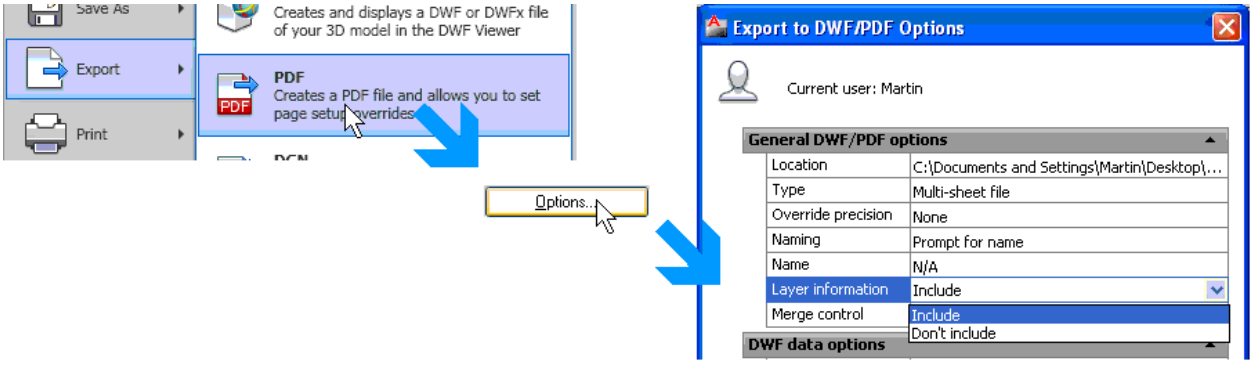
8. Try not to have views at different scales in the same image file. Where this is not possible try to arrange the views at one scale in one area of the sheet and views at a different scale in another area of the sheet rather than having details at different scales interspersed throughout the image.



5 Vector based PDF files and their limitations

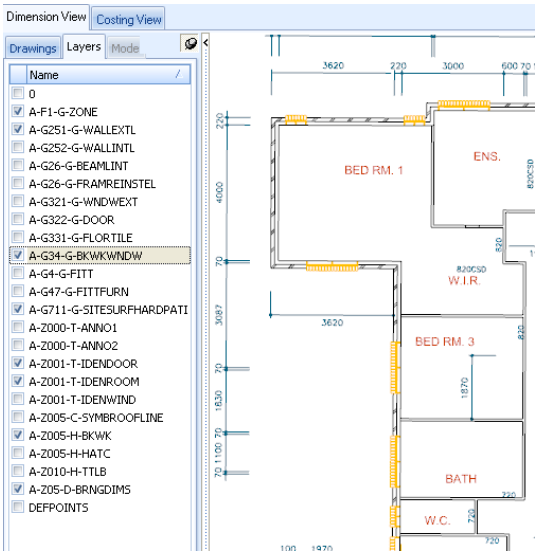
A commonly issued output from CAD programs is a PDF file which contains vector co-ordinates but little else of the embedded intelligence of the source CAD files. This means that measurement can be done in vector mode but advanced measurement tools which rely on CAD intelligence such as polylines and blocks are not available. Also, layer information is commonly excluded from PDF files, which means that the drawing view cannot be filtered to facilitate the measurement process.

Owing to its superior resolution and accuracy, a vector PDF is preferable to a raster image but the preference would be to receive DWG™ files (refer to Section 7).If you have no choice but to issue vector PDF files instead of CAD files, export as a PDF (in preference to plotting to a PDF printer) and be sure to include layer information. Note – vector PDFs with layers included can also be exported from a DWG™ opened in AutoDesk® DWGTrueView™.

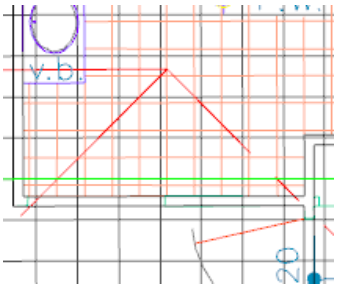


If layers are enabled in PDF and CAD files, the estimating software can filter the display to make viewing and measurement much quicker and easier, by 1) eliminating unwanted data to reduce clutter and 2) isolating data for measurement. Hence it is very helpful if layers are configured in a logical manner, for example:

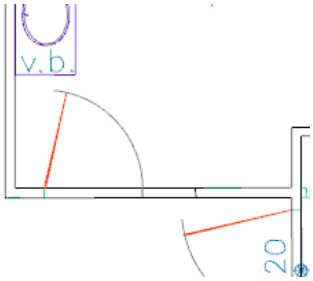
- Put different building elements onto different layers.
- Put like items within an element onto the same layer or distribute them logically onto a series of layers.
- Ensure the layer states are correct for all layers before saving the file. Layers which are not required should be frozen.
- Use the hatching tools to create hatching or include it on a separate layer.



Wall layers isolated for measurement in CostX®

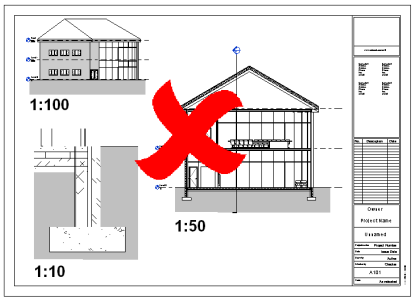


Unfiltered layers in CostX®

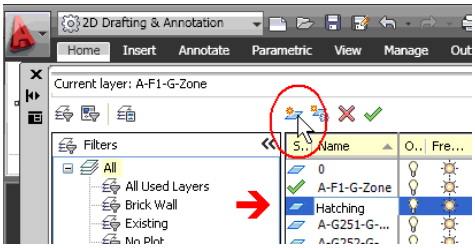


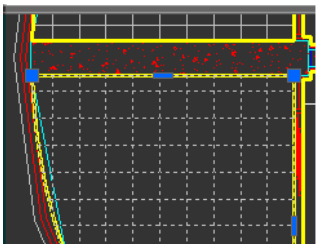
Filtered layers in CostX®

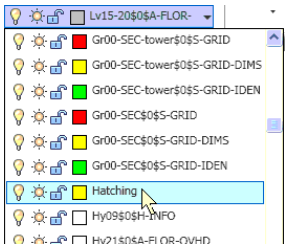
1. Provide scale annotation, scale bars and / or figured dimensions.
2. Orientate the drawing to be appropriately rotated (e.g. square to the boundary of the image file).
3. Use a consistent scale and orientation for progressive drawing issues.



4. Try not to have views at different scales in the same PDF file. Where this is not possible try to arrange the views at one scale in one area of the sheet and views at a different scale in another area of the sheet rather than having details at different scales interspersed throughout the image.
5. Try to include any hatching in the drawing on a different drawing layer(s) to other drawn details to enable it to be displayed or hidden as necessary.

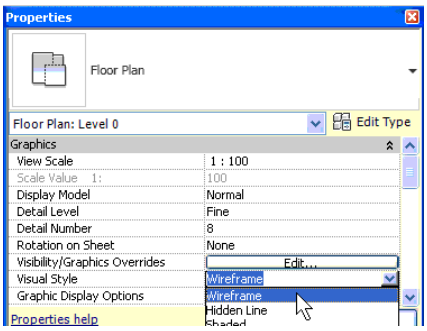






6. If creating a PDF from AutoCAD® use the export to PDF option rather than printing to a PDF.

7. If creating a PDF from Revit®, select a hidden line or wireframe visual style so that the PDF will be in vector format. Styles such as shaded, coloured, etc will result in raster or combined raster/vector content.



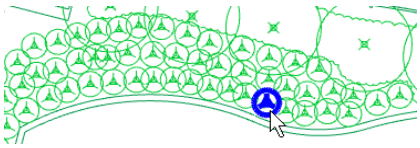
6 2D CAD files

The 2D CAD formats such as DWG™, DWF/DWFx™ and DGN™ are capable of being rich in content and CostX® users (who cannot edit the drawing file as CostX® is read-only) can exploit this intelligence with various advanced measurement tools.

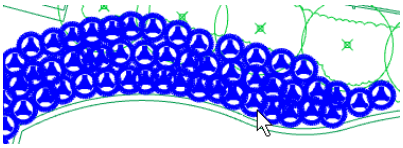
6.1 Blocks

CostX® can make use of blocks by counting all instances of a block in a single action, hence it is very helpful if blocks are included in drawing files and are configured in a logical manner.

1. A single block object being recognized in CostX.

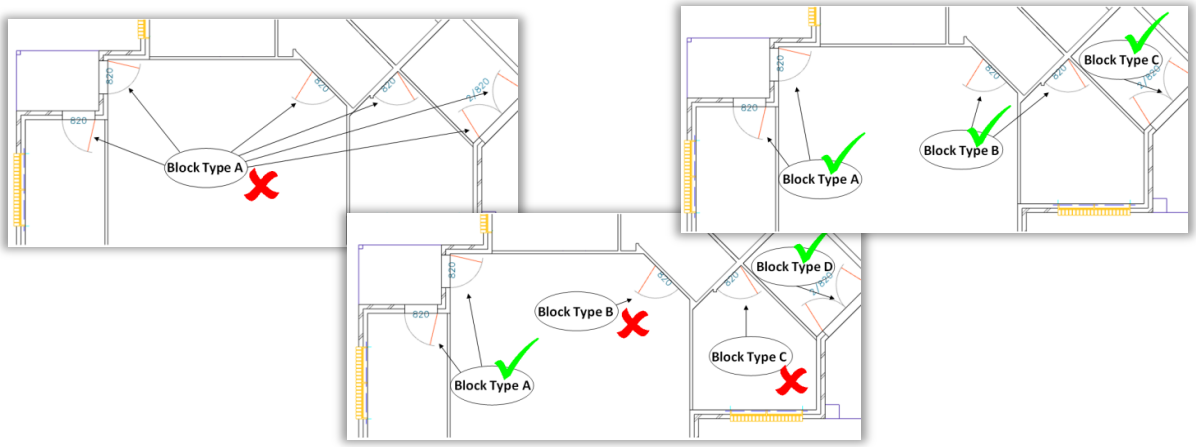


2. Multiple instances of the same block being recognized in CostX.

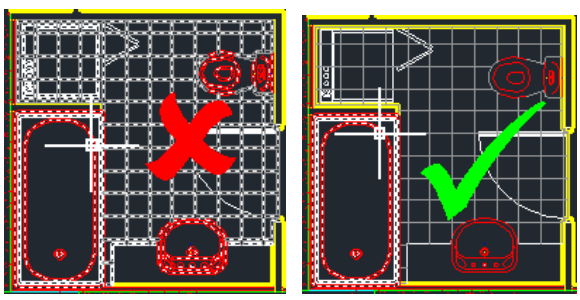


3. Clicking once with the mouse measures all such blocks on the drawing in a single action.

- Do not group multiple objects into a single block.
- Co-ordinate blocks with layers so that details can be isolated and then measured very quickly.
- Try not to use the same block for different (albeit visually similar) objects in a drawing, equally try not to use different blocks for the same object in a drawing.



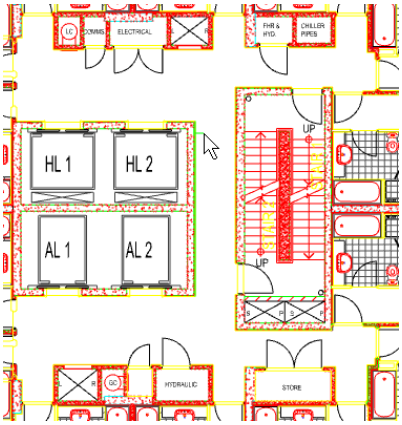
- It is better to define individual composite ‘objects’ as blocks and not to create blocks comprising multiple objects.



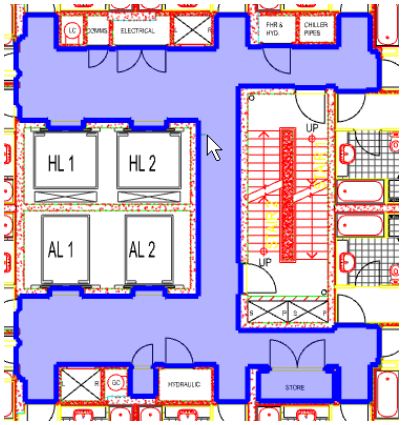
6.2 Polylines

Simply put, CAD drawings are made up of multiple lines and arcs. The polyline command allows a series of lines or arcs to be combined into a single continuous entity to create highly complex shapes.

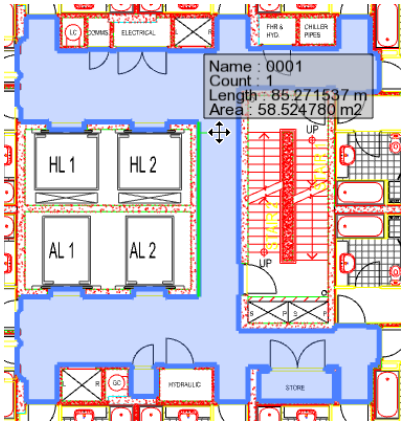
CostX® is able to recognize the geometry of polylines and automatically return the area and perimeter of the shape, no matter how complex, with a single action. Hence it is very helpful if floor plans, rooms, areas, etc. are defined by polylines in drawing files.



Cursor positioned over polyline in CostX®



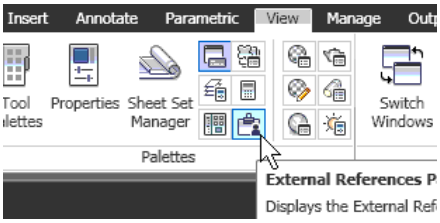
Polyline being recognized in CostX®

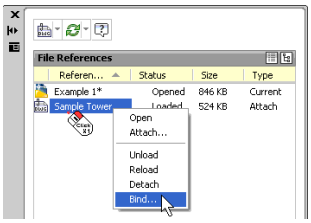


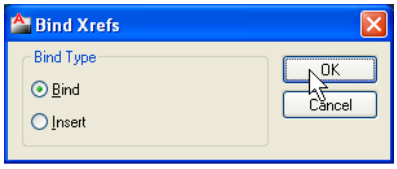
A single mouse click captures area and perimeter

6.3 X-Refs

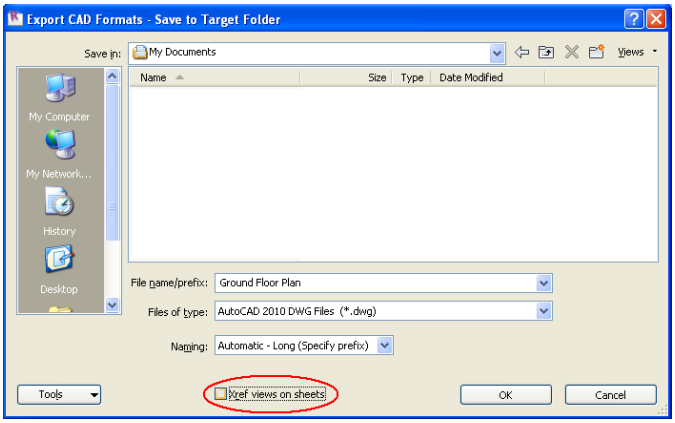
Dependant files e.g. Xref's / non-standard fonts should be either bound in with the DWG™ file or provided as separate files using the correct relative directory structure.





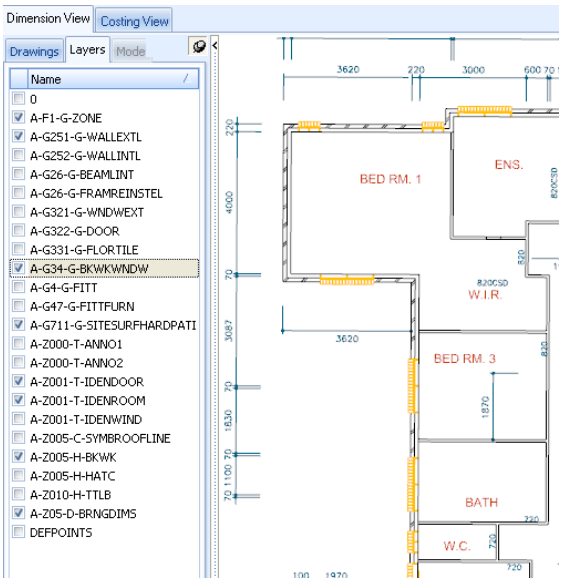


If exporting to DWG™ from Revit® the Xref views on sheets in the Save to Target Folder dialogue option should not be ticked.

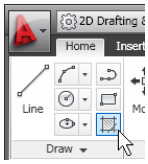


6.4 Layers

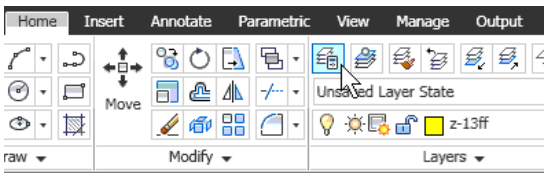
CostX® is able to use layers where provided to filter the display to make viewing and measurement much quicker and easier, by 1) eliminating unwanted data to reduce clutter and 2) isolating data for measurement. Hence it is very helpful if layers are provided and configured in a logical manner.

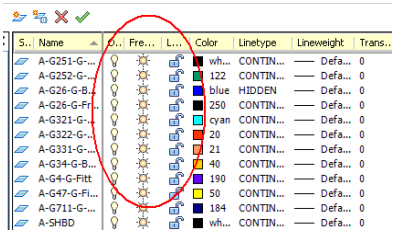


- Put different building elements onto different layers.
- Put like items within an element onto the same layer or distribute them logically onto a series of layers.
- Use the hatching tools to create hatching rather than using other tools to represent hatching. Try not to disassociate/explode hatching.

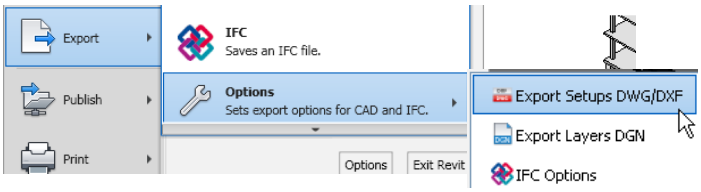


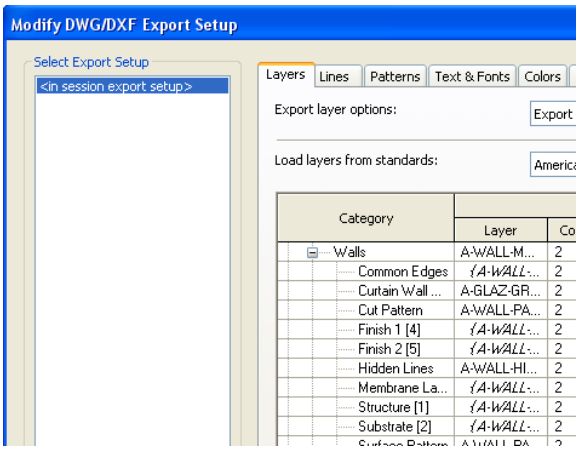
- Review the layer states for all layers before saving the DWG™, layers which are not intended to be seen should be frozen.



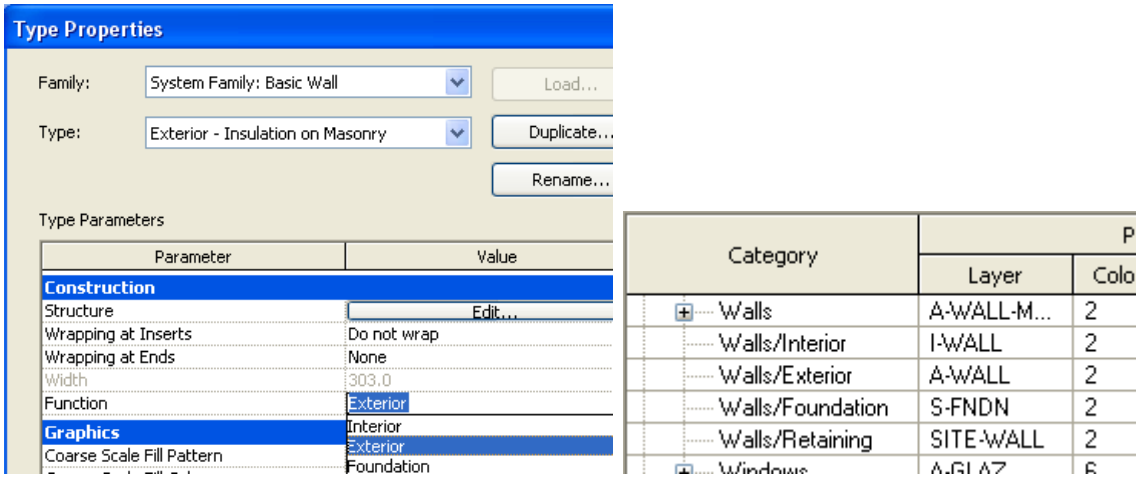


- If exporting a DWG™ file from Revit® arrange object categories into logical and appropriate layers, eg. separate the wall finishes from the structure.

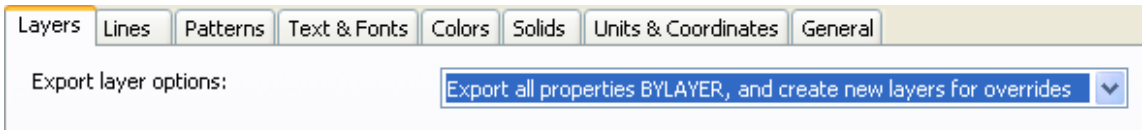




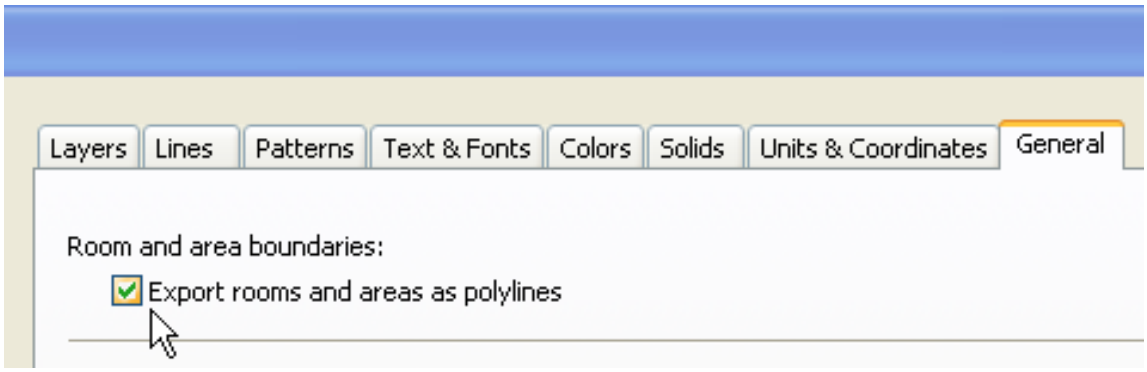
- Specifying appropriate Type Properties and Layers where the layers can be specified in conjunction with the Type Properties (e.g. specifying an Interior or Exterior function for walls) can also be beneficial.



- Set the Export layer options to “new layers for overrides”



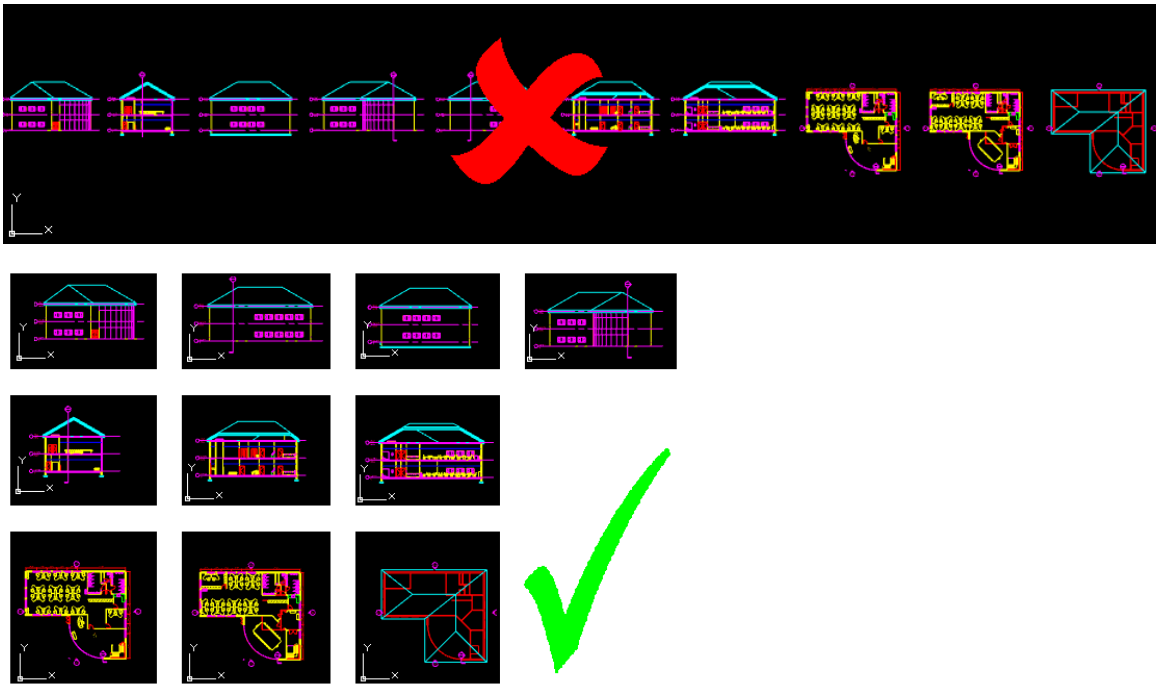
- Under the general tab, tick the check box to export rooms and areas as polylines



6.5 Model Space and Paper Space

CostX will default to Model space views since these contain the active model and hence are the most accurate with no scaling required as they are generally at 1:1. If the file contains both Model Space and Paper Space, an option is provided to load either or both, but Model space is preferred.

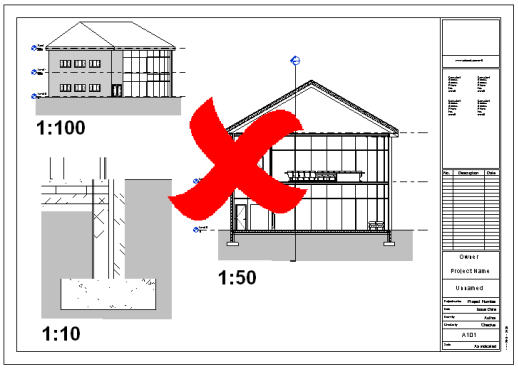
- Rather than multiple Paper space sheets with viewports to a single Model space view, a separate Model space DWG™ file for each plan / elevation / section / etc. is preferred. On larger buildings, where plans etc. may normally be divided between several Paper space views (eg. to fit onto a series of A3 sheets), do not break the Model view up in the same way. It is preferred to measure on a single Model space view for an entire level/floor.



- Avoid using different unit scales in the same Model space, eg. if 1 unit represents 1mm avoid mixing this with another scale for 1 unit.

- Provide scale annotation, scale bars and / or figured dimensions on Paper space sheets

- Avoid where possible having views at different scales on the same Paper space sheet, where this is not possible try to arrange the views at one scale in one area of the sheet and views at a different scale in another area of the sheet rather than having details at different scales interspersed throughout the image.



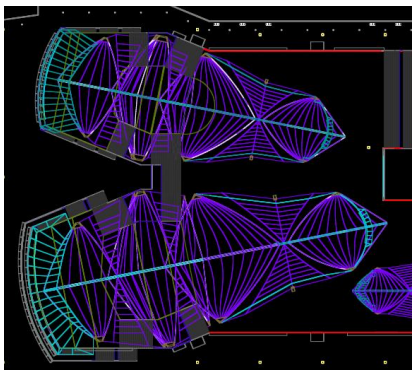
7 3D Drawing Files and BIM Models

7.1 Overview

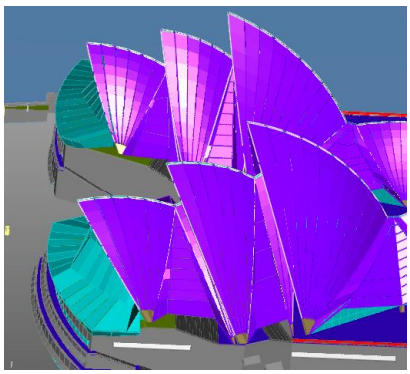
It is important to differentiate between BIM models and 3D Drawings.

Traditional 2D and 3D CAD programs use vector graphics to replicate the human process of drawing on paper. Vector graphics is the use of geometrical primitives such as points, lines, curves and shapes or polygons, which are all based on mathematical equations, to represent images.

Regardless of whether it is rendered in 2D or 3D, a vector based CAD drawing like the following example of an AutoCAD® DWG™ file is simply a collection of lines, arcs and text.



2D Plan View in CostX®



3D View in CostX®

Because they are based on geometric data, these graphical models cannot describe the physical attributes of the entities they represent, nor the relationship of the entities to each other. To overcome this limitation, design-related industries have developed object-based data model applications, specific to their operating environment, that can represent the physical and performance attributes of entities in addition to their graphical properties.

In the case of the AEC industry this translates to a data model built around building entities and their associated inter-relationships. The interface remains graphic, but geometry is only one of the properties of the entities, which will also contain physical and performance data such as spatial relationships, geographic information, quantities and properties of the building components.

The process of optimizing the design by interrogating and analyzing the data within the model is referred to as Building Information Modelling (BIM). Consequently, the data model for a building is referred to as a "BIM model".

CostX® is able to view BIM models in DWF™, DWFx™ and IFC format and access the database to extract information, with several extraction methods available. The opportunity therefore exists to use this dimensional data for quantification purposes, instead of measuring the quantities. This greatly improves productivity, and consequently reduces response times.

Issue of data-rich BIM model files therefore enables the CostX® user to collaborate in the design effort far more effectively, and designers can respond to this change by increasing the amount of object data held in the database. However, for estimating or scheduling purposes it will generally be necessary to augment the BIM data with additional measurement from 2D or 3D drawing views, particularly with early design intent models.

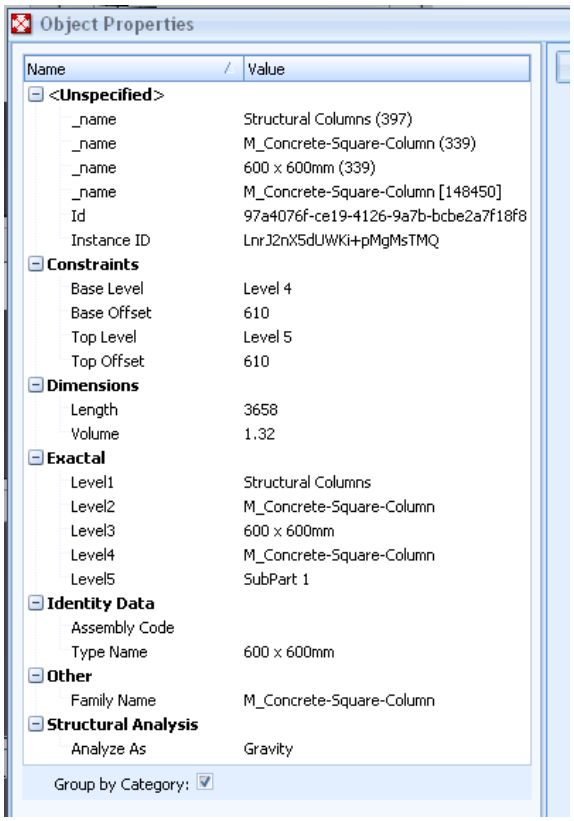
7.2 Methods of data extraction

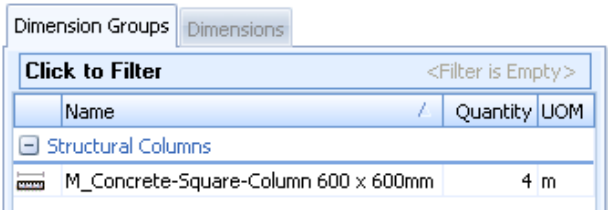
There are three options available to CostX® users for data extraction from BIM models:

- by use of CostX® BIM Templates;
- by use of Model Maps;
- by creation of special object-based Dimension Groups.

7.3 BIM Templates

CostX® ships with a selection of BIM Templates. These templates are XSLT files which have been written specifically to extract and sort data from 3D DWF™ and DWFx™ model files. The default template, called "Revit® General", categorises the data in accordance with the Revit® object hierarchy of Element Category, Family name and Family type. By using the "Import Dimensions Using BIM Template" button and selecting the "Revit® General" template, CostX® will create a list of dimension groups using the Revit® Category to name the Dimension Group folder, and the Revit® Family Name + Family Type to name the dimension group. The quantity will generally be drawn from the first dimension property. An example is shown here, to the right and below.





The import routine is automatic and works on whatever model objects are being viewed on the CostX® screen at the time. This means that users can filter the view to limit the import to selected objects, or they can view the entire model in which case the import will provide them with a complete schedule of Dimension Groups listing the quantities of every object in the model, all at the single click of a button.

An optional alternate BIM Template called "by QSID or ELEMENT CODE" will search for a text parameter called QSID or ELEMENT CODE within the model and use this to group the Dimension Groups. These parameters need to be added into the model as Shared Parameters (see Section 9.6) if this option is to be used.

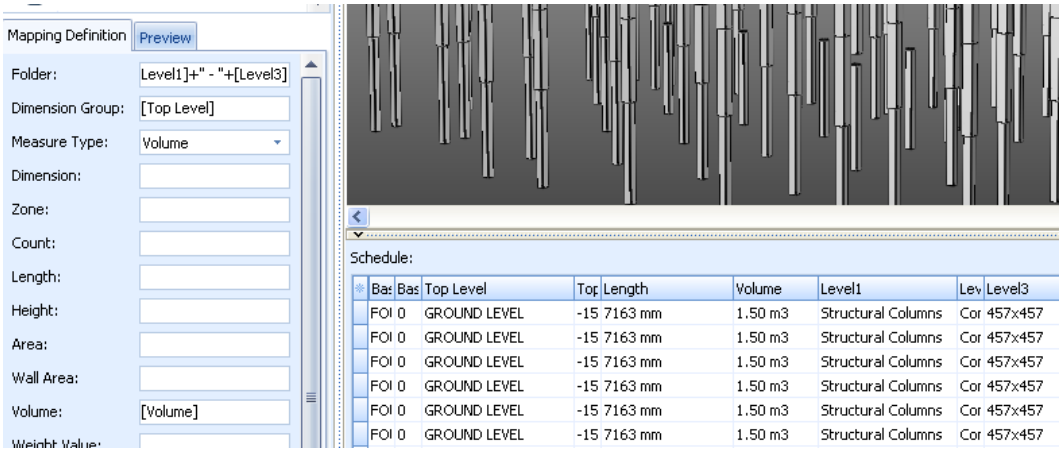
These templates are written around model data being presented in standard Revit® family categories and will generally only produce satisfactory results when used with DWF™ and DWFx™ files exported from Revit®. For IFC files, Model Maps or object-based Dimension groups will be used.

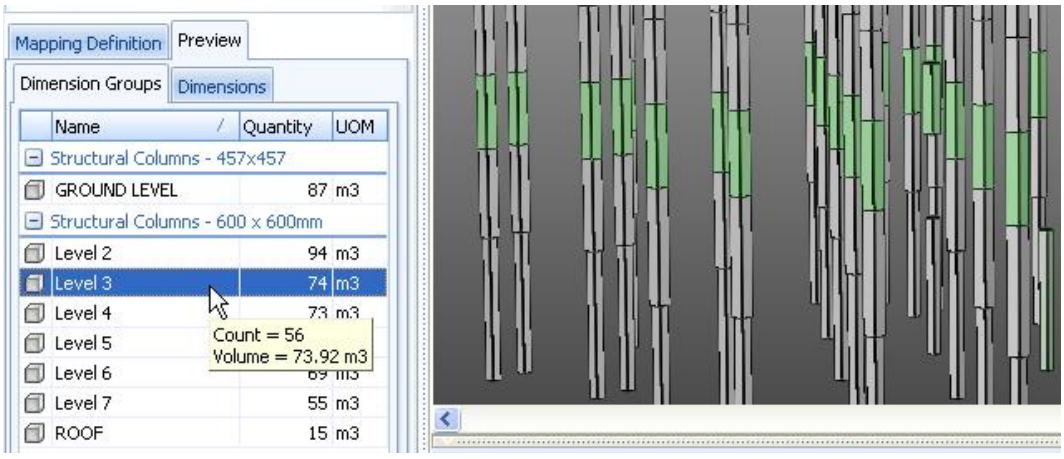
7.4 Model Maps

A Model Definition Tool allows CostX® users to view the model data in a schedule format and configure a Model Map to extract data from the model using any combination of object properties. This means that instead of generating quantities using the standard CostX® BIM templates, users have the option to define Model Maps to customise the quantities extraction. This provides an opportunity to provide additional data within the model to facilitate the model mapping process.

To assign the Model Definition, the CostX® user filters the model view to the required branch of the model tree, and then drags and drops the required data from the Schedule into the corresponding field in the Mapping Definition tab. Free text in quotes may also be entered.

In the example below, the data from the columns in the Schedule headed Level 1 and level 3 will be combined to name the dimension group folder, the Top Level data will categorise the dimension group, and the Measurement Type will be volume, using the data from the Volume field in the Schedule.





Model Maps are highly effective for DWF™, DWFx™ and IFC files. Similar to BIM Templates, they automate high-volume extraction of model data, but in a custom configuration.

7.5 Object-based Dimension Groups

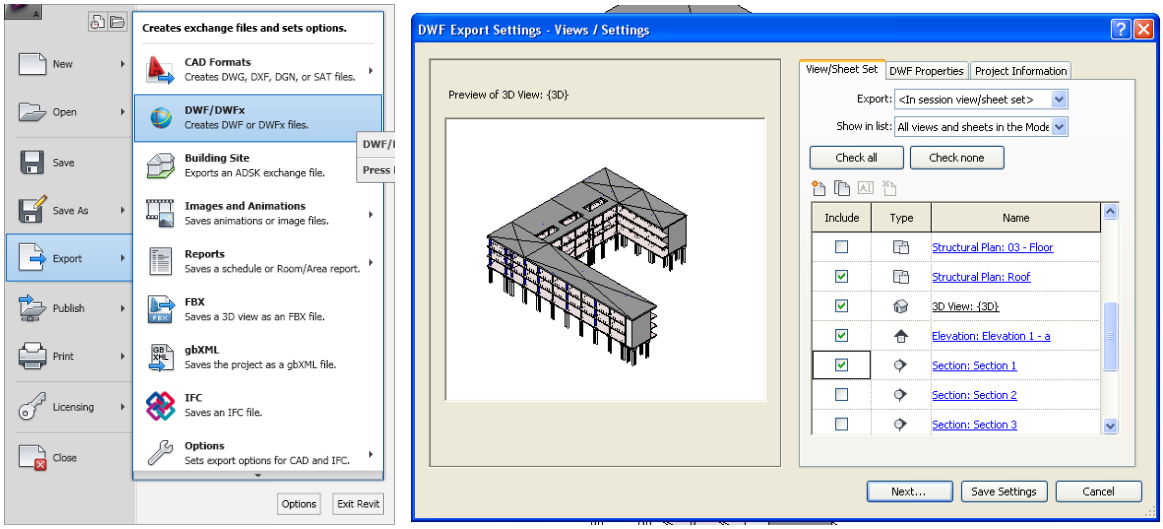
These work in a similar way to Model maps but are individually created for specific objects or groups of objects.

8 3D DWF™ and DWFx™ Files from Revit®

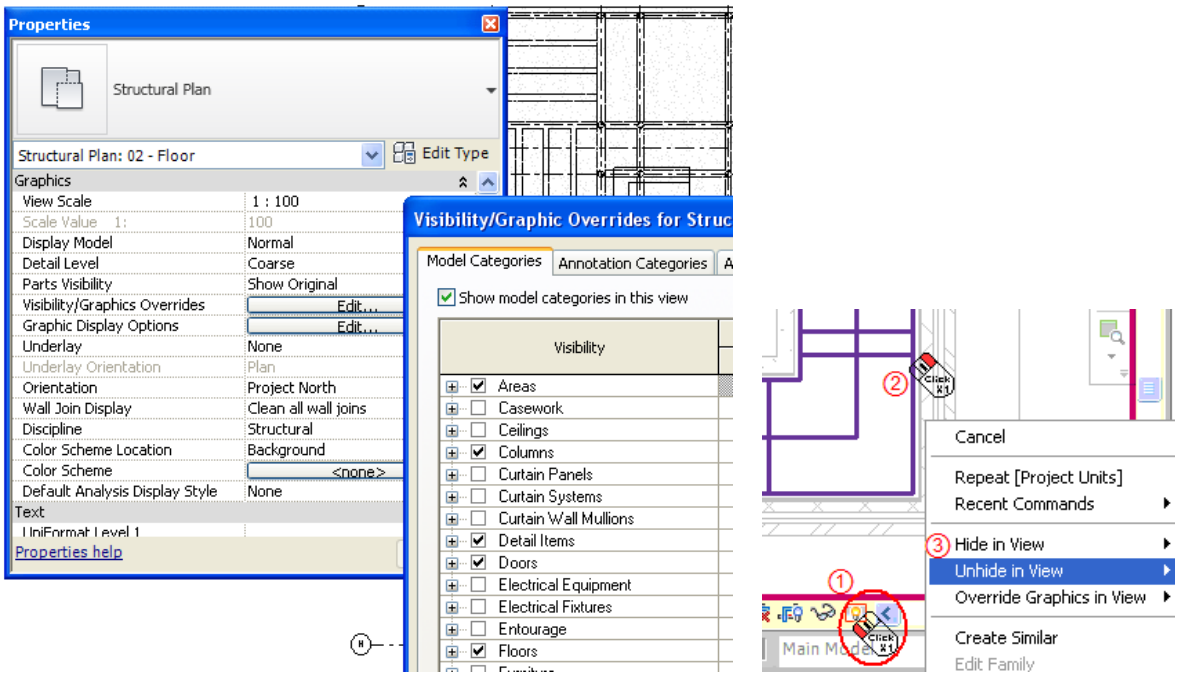
The following tips will help to facilitate data extraction from DWF™ and DWFx™ files.

8.1 Export Settings

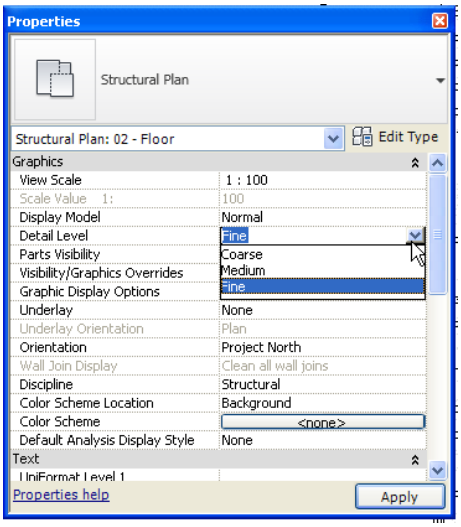
- Provide a multi-sheet DWFx™ export containing the 3D view (or views) and the 2D views and sheets of all plans, elevations and sections etc. The 3D views will be used to import BIM dimensions, and the 2D views and sheets will be used to check and augment the quantities.Some users may also request the 2D sheets and views separately as DWG™ files or the source Revit® RVT file.



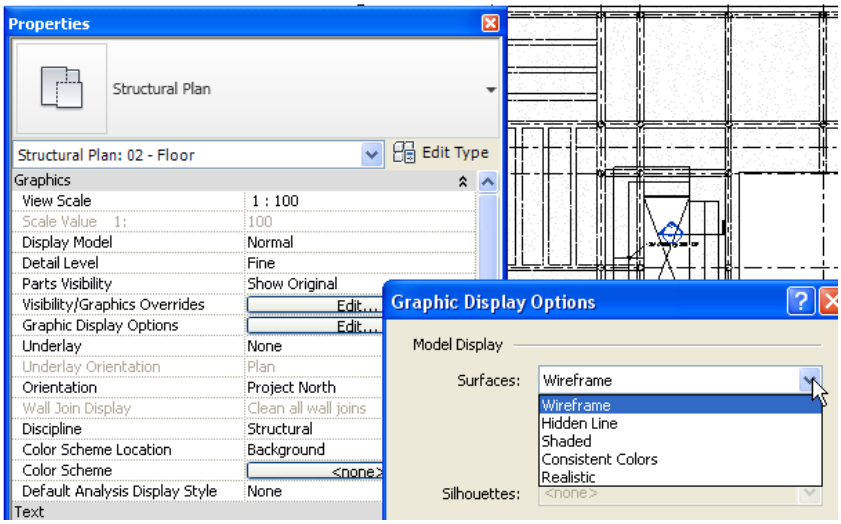
- Review the visibility settings and verify all intended / required objects are not hidden in view before exporting the file.



- Select a detail level on views / sheets etc. as fine to allow additional information to be available in the 2D DWF™ files.



- Select a hidden line or wireframe Graphic Display Option for views as appropriate for the content.

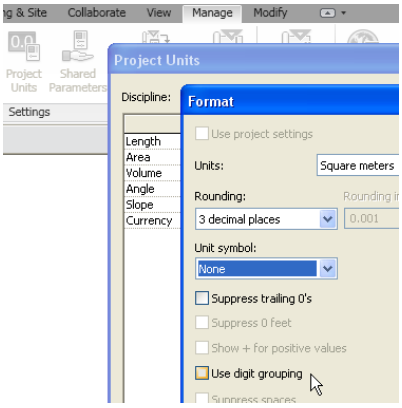


- Set the view range / clip settings appropriately on views / sheets.

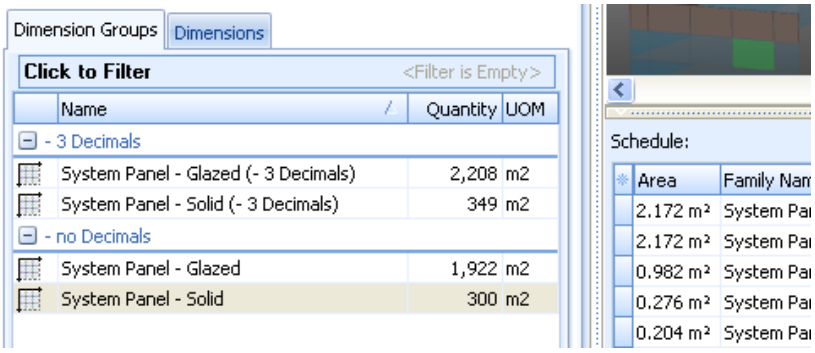
- If the model contains linked CAD files with multiple instances of a typical object or group of objects, the multiple instances may all have the same object ID. With duplicate IDs, the quantities imported into CostX® from the DWFx™ will derive from the source file, and not from the multiplicity of instances. For example, if a typical apartment is repeated twenty times in a model and the IDs are duplicated, the quantities will only relate to one apartment, not twenty. For this reason the Revit® project should be bound before exporting the DWFx™ to remove the duplicate IDs. If it is preferred not to bind the project, then copy the project, bind the copy, and export from the copy.

8.2 Project Units

The total quantity of each object type is the cumulative value of the dimensions of each individual object. If the Project Units in Revit® are set to whole numbers (which is the default setting), each dimension will be rounded off which will affect the cumulative total. Therefore the Project Units need to be set to two or preferably three decimal places to provide an accurate cumulative total.



Set Project Units to three decimal places

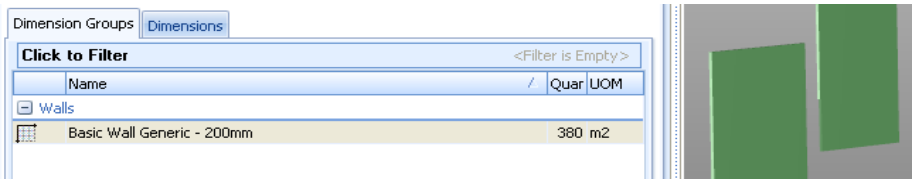


Difference in quantities in CostX® if Project Units set to three decimals instead of no decimals in same model

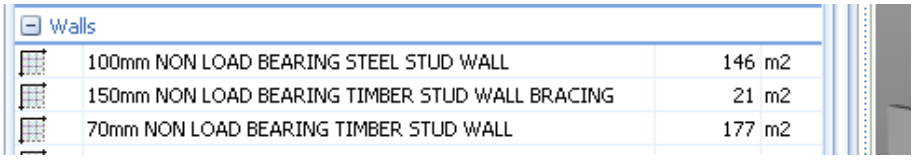
8.3 Family Naming Conventions

CostX® extracts dimension data (quantities) from the Revit® object properties exported in the DWFx™ file. The default CostX® BIM Template (Revit® General) groups and sorts the quantities according to the family naming structure of the model.

Therefore, a more descriptive family naming convention can greatly improve communication.

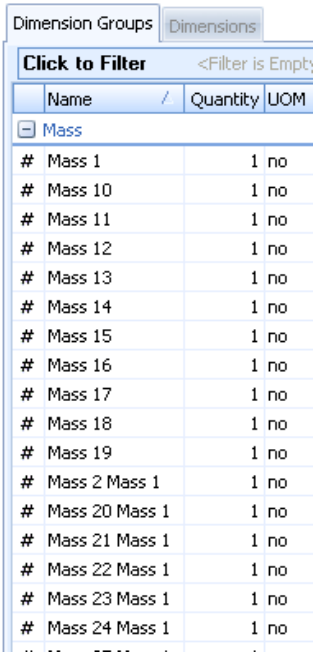


Default naming – minimal detail



Descriptive naming

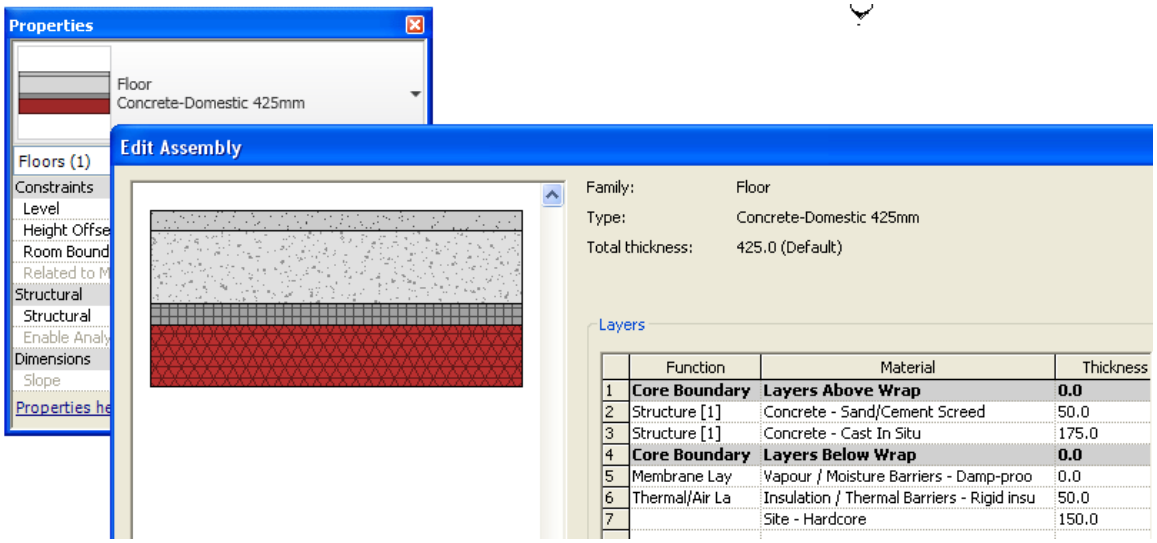
In view of the above, try not to use mass or generic model families for objects in detailed models, and do not group disparate objects into a single mass or generic family, as this severely compromises the usefulness of the output data. Select an appropriate element category for each individual object.



Mass naming

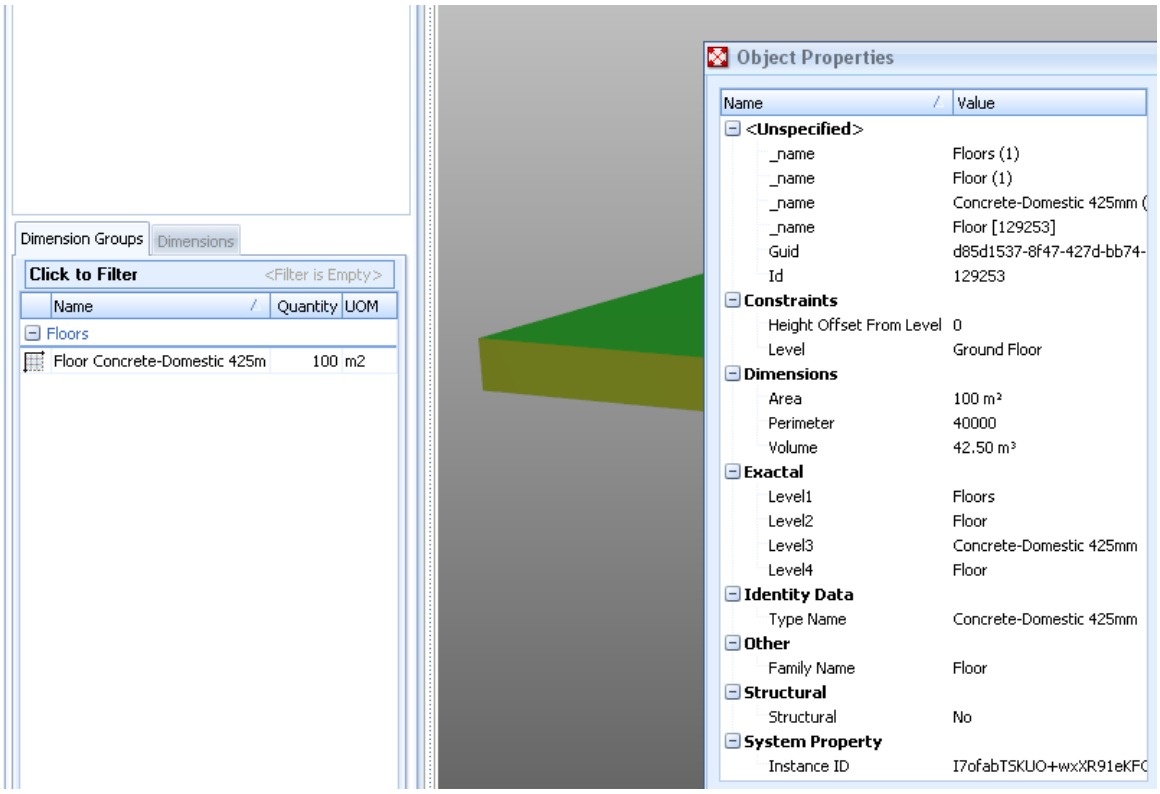
8.4 System Assemblies

In Revit® multiple elements can be combined into a single assembly that can be independently scheduled, tagged, and filtered. Most model elements can be included in assemblies and layered elements such as walls, floors, flat roofs, etc are invariably modeled as assemblies.



Floor Assembly in Revit 2012®

When exported to a DWFx™ an assembly such as the floor shown above appears as a composite whole and its component parts, or layers, are not separately identified within the 3D DWFx™ view and are not represented on 2D views and sheets.



CostX® screen shot of composite slab assembly

It is very important that the component details are communicated in full, and to assist in this one or more of the following solutions could be considered:

- Providing assembly information as a text or “Description” parameter.
- Using more descriptive Family / Type naming conventions.
- Providing detail sections as 2D sheets.
- Providing schedules detailing system assemblies.

Another option is to use the Revit® “Parts” function which will break the layered assembly into its component layers.

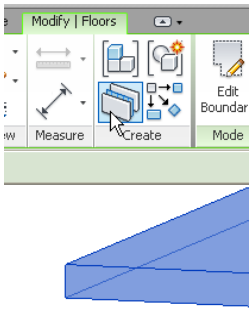
8.5 Parts

In Revit®, many elements can be divided into discrete parts that can be independently scheduled, tagged, filtered, and exported. The Part function is designed to support aspects of construction workflows, such as pour schedules for example, by enabling a slab to be separated into areas or zones based on the pour sequence. Parts can also be generated from elements with layered structures, not just to separate the layers but also to allow the layers to be individually manipulated or sub-divided. Parts are dependent to elements and are automatically updated and regenerated when the original element from which they are derived is modified. Each part can also be independently scheduled and the schedule will also update when parts are modified.

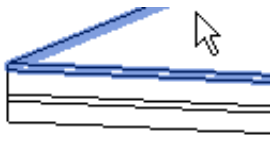
If a layered assembly is separated into its constituent layers, the layer data will be available in a DWF/DFWx™ export. Typically this might apply to elements such as:

- Walls (excluding stacked walls and curtain walls)
- Floors (excluding shape-edited floors)
- Roofs (excluding those with ridge lines)
- Ceilings
- Structural slab foundations

In the drawing area, select the elements from which you want to create parts, then in the Create tab of the Modify ribbon click on the Create Parts button to separate the layers. The DWF/DWFx™ can now be exported with each layer of the assembly as an individual Part with its own discrete Object Properties.

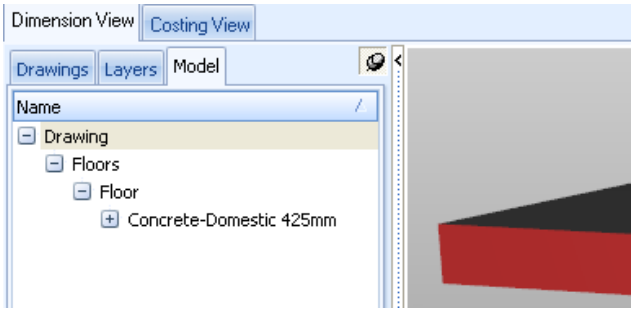


Alternatively, to avoid disassembling your working model view, create a new default 3D view, select all elements in the view and click on the Create Parts button. Export the DWF/DWFx™ file from this view.

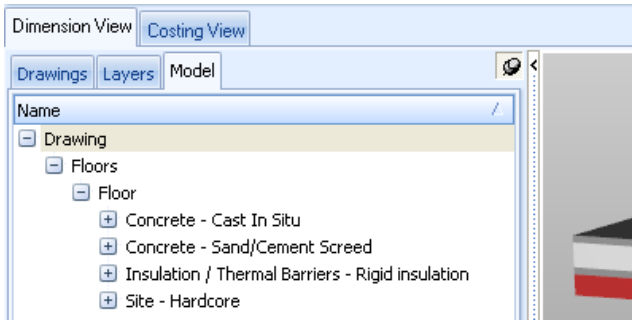


For each part, the Identity Data properties have been expanded to contain details of the individual layer and this data is available for CostX® to create the separate Dimension Groups.

The Parts properties can also be viewed as branches of the Model Tree.

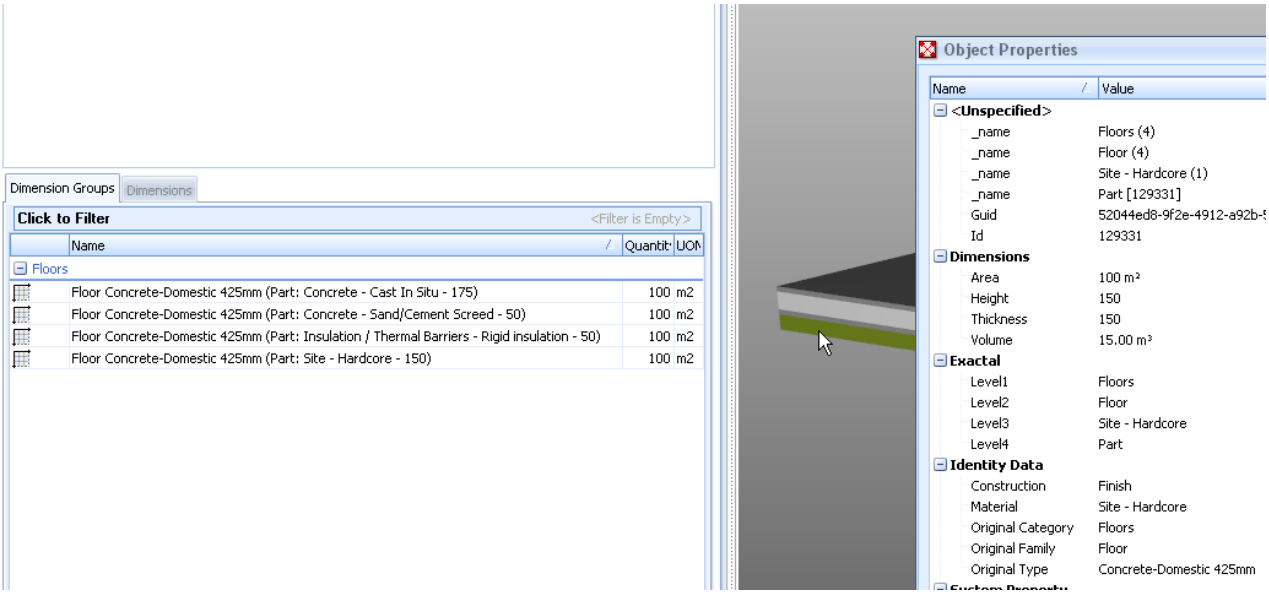


Model View in CostX® – Assembly only



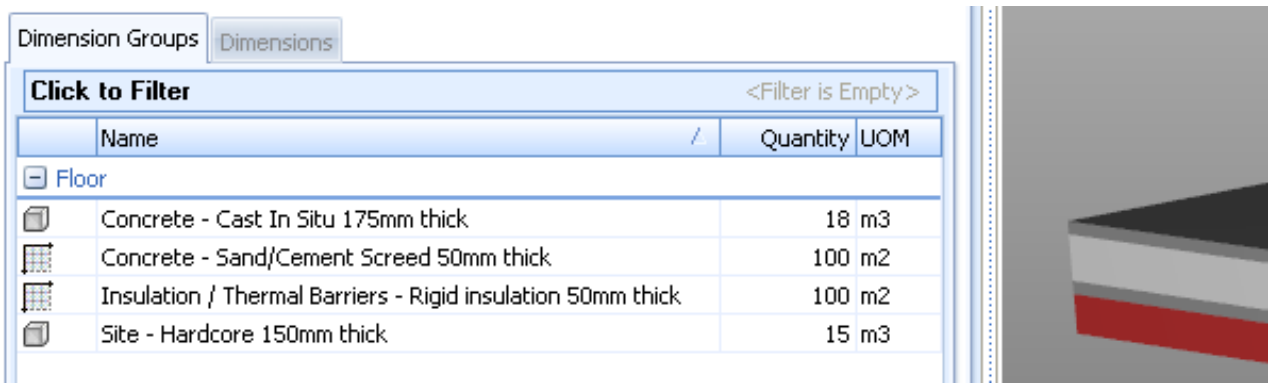
Model View in CostX® – Parts

The disassembled slab will now import with the "Revit® General" BIM Template in separate constituent Parts.



CostX® screen shot of disassembled slab Parts – dimensions imported with "Revit® General" BIM Template

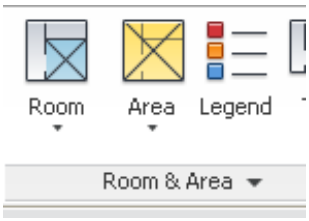
The Parts properties can readily be used to create mapping definitions for Model Maps.

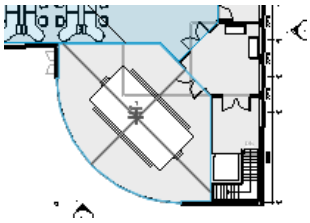


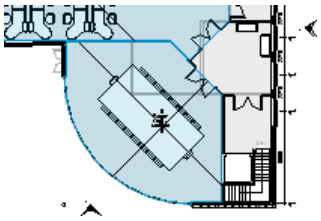
CostX® screen shot of disassembled slab Parts – dimensions imported with Model Map

8.6 Areas/Rooms

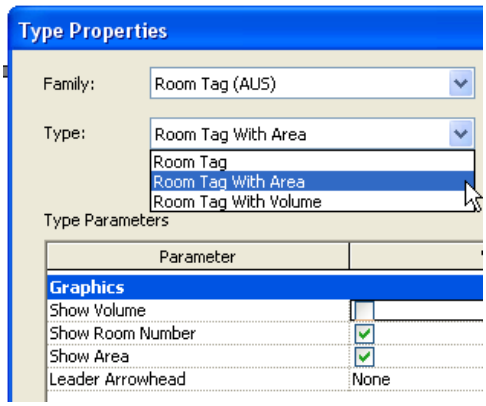
Room and area data is very useful for estimating purposes, particularly during the earlier design stages when composite rates/m2 or ft2 are used to develop budget estimates. Use the Room and Area tools to include this in models.

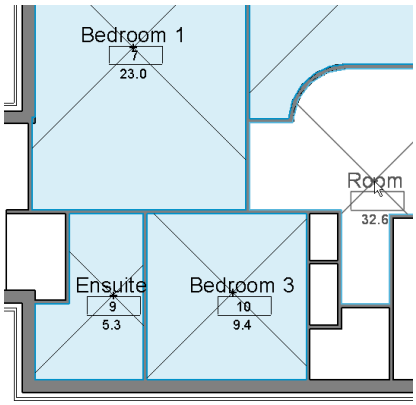




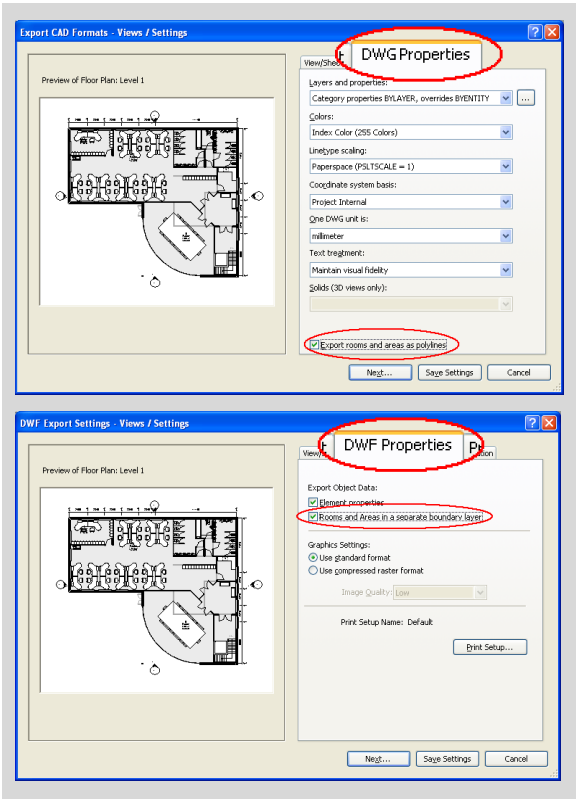


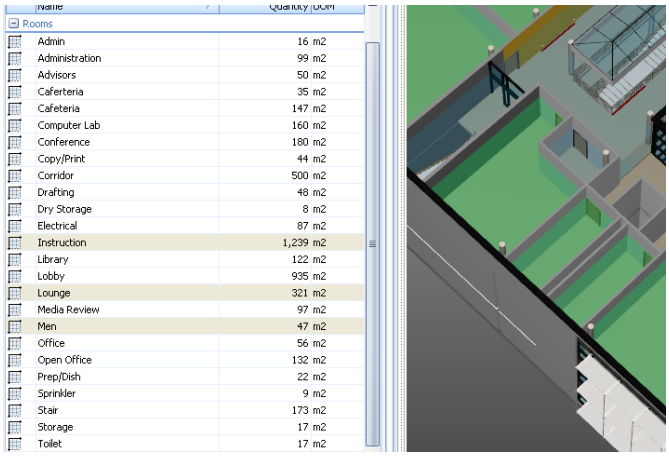
Edit the Area Type Properties to show area data.





When exporting the file, open the DWG™ or DWF™ Properties tab in the export dialogue window and tick the "Export rooms and areas as polylines" checkbox (if exporting a DWG™) or the "Rooms and Areas in a separate boundary layer" checkbox (if exporting a 2D or 3D DWF™ view). The room data will now be exported with the file.

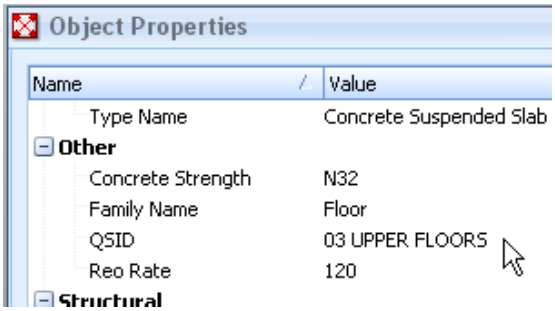


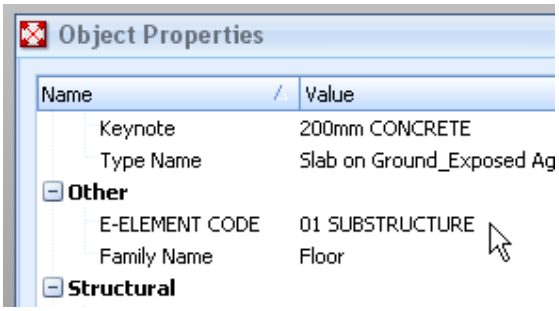


Room data in DWFx™ shown in CostX®

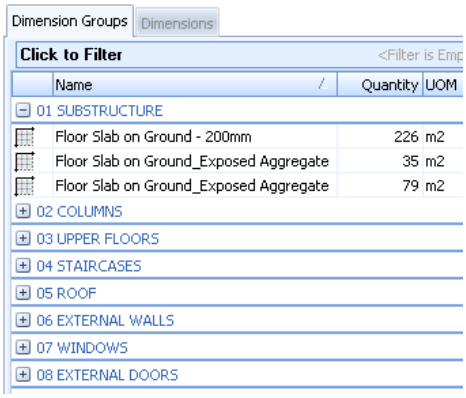
8.7 Shared Parameters

Additional Shared Parameters may be added within Revit® to enrich the data included in the DWF(x)™ file. This data can then be accessed via Model Maps. Additionally there is a BIM Template available for elemental coding called “by QSID or ELEMENT CODE”. This requires a text Shared Parameter to be created with the name QSID or ELEMENT CODE.

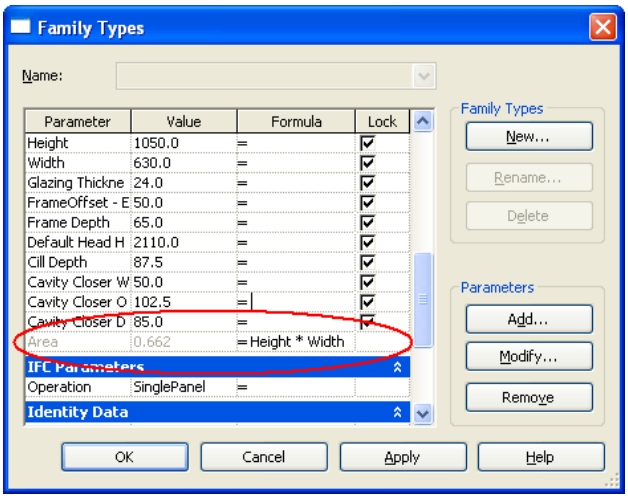




If this is included in the model, the BIM template “by QSID or ELEMENT CODE” will sort the dimensions into QSID or Element folders instead of by Category.



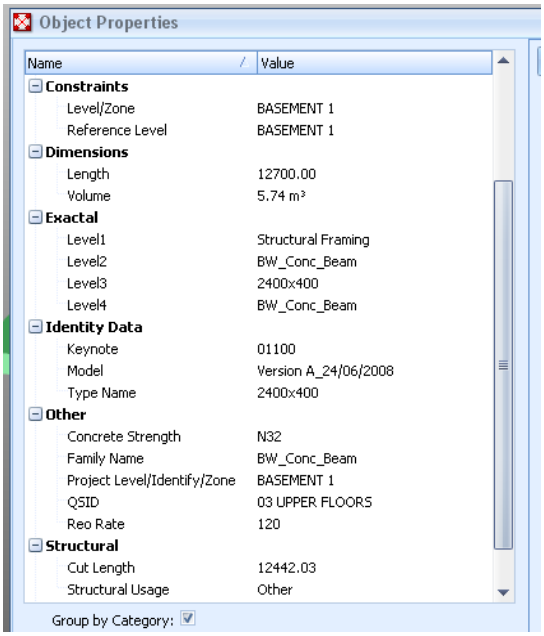
Formula-based parameters can also be added to provide additional measurement data such as window areas or downpipe lengths.



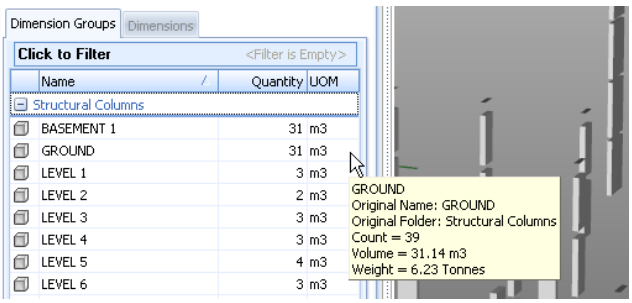
Parameters should generally be added as Instance Parameters because not all Type Parameters get written to the DWF(x)™ file. Refer to Appendix A for details on how to add Shared Parameters into Revit®. Use Autodesk® Design Review to review the content of DWF(x)™ files.

The following examples are all taken from a single model in which the designer had added the following Shared Parameters based on advice from his estimator:

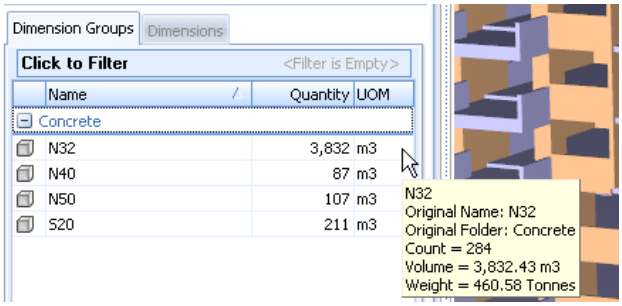
- A Building Level/Zone to allow the quantities to be grouped by location.
- A concrete mix strength to allow the quantities to be grouped by concrete strength.
- A reinforcement factor (Reo Rate) expressed in kg/m3 to allow an approximate reinforcement tonnage to be automatically generated.
- Also, ensure that concrete structural framing includes a length dimension in addition to volume to allow for calculation of additional estimate items such as formwork.



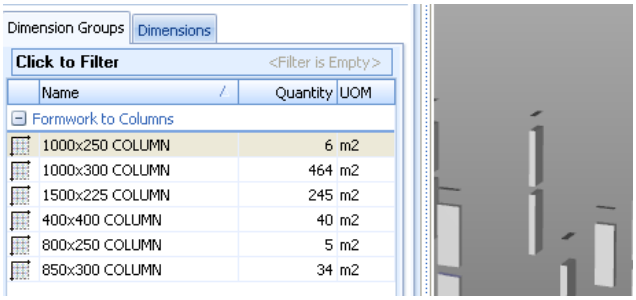
Object properties viewed in CostX®



Volume of concrete and weight of steel grouped by CostX® into Building Level



Volume of concrete and weight of steel grouped by CostX® into Concrete Strength



Column formwork derived from length dimension in CostX®

9 IFC Files

9.1 The IFC Standard

The current IFC release is IFC 2x3 Edition 3 (Feb. 2003) as amended by IFC 2x3 TC (Technical Corrigendum) 1 (July 2007). TC1 did not amend the IFC 2x3 exchange file and both versions can be used.

IFC4 (formerly called 2x4) was released on 12 March 2013, published as ISO Standard 16739. It will be the basis for upcoming IFC solutions and incorporates numerous improvements and enhancements over the current IFC 2x3 release. Implementations will start appearing in authoring applications from 2014 onwards.

IFC cannot replicate the authoring functions of the various proprietary BIM applications, nor is that its intention. It is a file format whose purpose is to facilitate cross-discipline data sharing and exchange by providing a broadly based, vendor-neutral repository for data relating to building objects.

The process of sharing data via the IFC format is termed an IFC Exchange. In practical terms, the need to convert the host data to IFC format and the fact that the IFC is structured to support a multiplicity of data types across a wide range of disciplines can lead to a high level of complexity in the IFC model. IFC exchanges therefore follow what is termed an “Exchange Requirement” which specifies the data that needs to be present in any given exchange and thereby limits the scope of the exchange to more manageable proportions.

The buildingSMART® Standard for Processes, formerly called the IDM (Information Delivery Manual), defines typical exchange requirements for a given discipline or scenario, so that different audiences can focus on the data relevant to them. An associated IFC View Definition, or MVD (Model View Definition) defines a subset of the IFC schema that will satisfy the specified exchange requirements. In other words, when you export an IFC governed by an MVD, you are only exporting selected parts of the information which goes to make up the entire data model.

The MVD provides implementation guidance for all IFC concepts (classes, attributes, relationships, property sets, quantity definitions, etc.) used within the subset. It thereby represents the specification for the IFC export by BIM applications, so that their exports satisfy the exchange requirements.

The official buildingSMART® MVD for the AEC industry is the IFC2x3 Coordination View Version 2.0. This can be extended with add-on model view definitions to support additional exchange requirements including:

- The Quantity Take-off add-on view which adds the ability to transmit Base Quantities for spatial, building, building service and structural elements.
- The Space boundary add-on view - it supports the use of BIM in thermal and energy analysis by adding building element to space relationships.
- The 2D Annotation add-on view - it supports the exchange of additional 2D element representations and annotations of building models
- The IFC2x3 Structural Analysis View
- The IFC2x3 Basic FM HandOver view

Work is currently underway in defining the first IFC4 based BIM work flow support definitions (MVD).

For further information refer to http://buildingsmart-tech.org/specifications/ifc-view-definition and for further details refer to www.buildingsmart.tech.org

9.2 Quantities in the IFC 2x3 Coordination View v2.0

When exporting an IFC file, IFC-compliant architectural BIM software maps the IFC export to the requirements of the IFC2x3 Coordination View v2.0 model definition. The main purpose of the Coordination View is to allow sharing of model data between the architectural, structural and MEP disciplines for coordination purposes. The standard does not specify requirements for export of dimensions (termed "out of view").

Quantity	Quantity	
IfcPhysicalComplexQuantity	Quantity	0
(ABS) IfcPhysicalQuantity	Quantity	n
(ABS) IfcPhysicalSimpleQuantity	Quantity	n
IfcQuantityArea	Quantity	0
IfcQuantityCount	Quantity	0
IfcQuantityLength	Quantity	0
IfcQuantityTime	Quantity	0
IfcQuantityVolume	Quantity	0
IfcQuantityWeight	Quantity	0

Legend:
GREY y(es) : **Abstract Entity** Entity in View
GREY n(o) : **Abstract Entity** Entity out of View
GREEN (1): **Entity** in View respectively in Exchange
RED (0): **Entity** out of View respectively out of

Quantity Properties Out of View (buildingSMART® IFC 2X3 Coordination View Definition v.2.0)

Generally, this will mean that a standard IFC exported from architectural BIM software will not include explicit quantity data, unless the Quantity Take-Off add-on view extension has been used to include Base Quantities in the export (see 10.3 below). Note that some IFC Viewer software such as Solibri® Model Viewer calculates quantities and displays them as entity properties. These quantities are not an attribute of the IFC file, and have been separately calculated by the Viewer program from the IFC geometry. Consequently, the same IFC opened in CostX® (or other IFC Viewers such as Data Design System® DDS-CAD) will not have those quantities. Because the quantity values have not been explicitly defined and recorded, based on the original model and intentions of the model author, their accuracy is entirely dependent upon the calculations undertaken by the Viewer program and the data it uses as the basis of the calculations.

Property Sets

Some properties of an object are absolute. These fixed properties are termed Attributes. Other properties are more variable because they may be seen or interpreted differently by different parties, or may be contextual, or assigned to an object by a relationship. These types of properties can be grouped together as a "Property Set" and added to the object as additional parameters to suit particular situations. The properties within a set can be either standard (conforming to the rules of the IFC schema) in which case the set name will begin with the prefix "Pset_" or they can be custom, which means they are created by the exporting application and the names of these sets will normally include the name of the exporting application.

Proxies

When BIM applications export to IFC, the data has to be mapped from the host schema into the IFC schema. Many architectural object classifications have direct IFC counterparts and will be mapped accordingly, eg. an object having a Wall-subtype in ArchiCAD® will be classified as IfcWall. If an object has no corresponding IFC element type it will be exported as a Proxy. The default setting is to export the objects as a general solid object in a generic IfcBuildingElementProxy element. As a general solid object, it has geometry but no properties which is obviously undesirable and therefore to be avoided. It is possible to map objects to alternate IFC elements prior to export, to reduce the number of proxies, or proxies can be defined with geometry and property sets to behave like regular entities.

IFC Files and CostX®

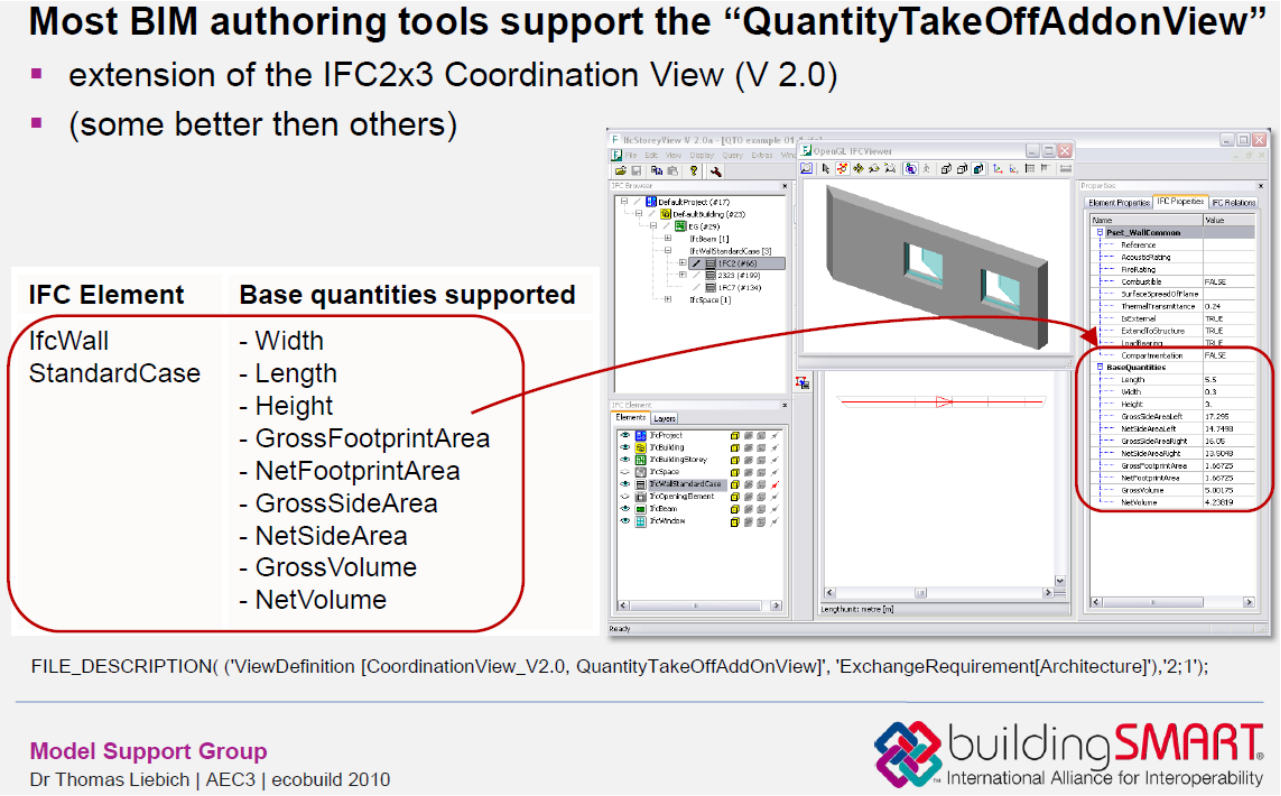
Owing to differences in IFC implementation by the various authoring applications and the multiplicity of supported data types, IFC file configuration and data content will differ between projects. Consequently it is difficult to define a standard for automatic quantities extraction via a CostX® BIM Template. Data extraction from an IFC file is therefore supported with Model Maps and Object-based Dimension Groups (see Section 8 above).

Whilst the IFC is structured to accommodate proprietary data models, the responsibility for creating them lies with the authoring application that exports the IFC. If the correct associations are not explicitly made in the source file, they cannot proceed in the IFC and hence may not appear in a downstream application. Thus, how a model file is prepared for export to IFC is extremely important and is a critical factor in the ultimate success of the IFC exchange process.

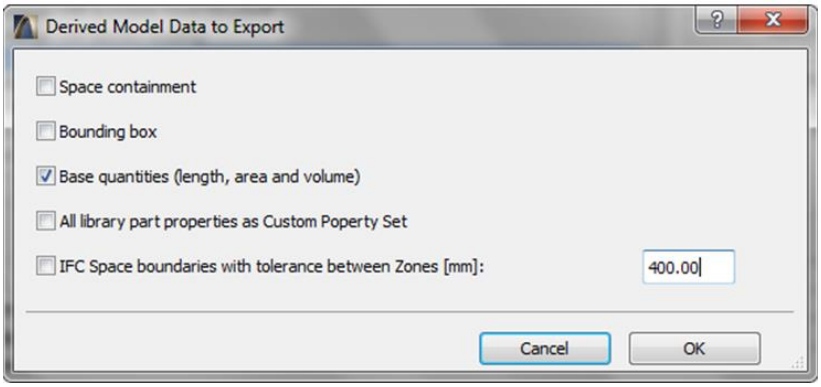
9.3 Base Quantities

In 2006 buildingSMART® commenced work on a definition of model-based quantities to create an open standard for quantification of building spaces and elements, termed “Base Quantities”. These are described in the document “Information Requirements for Model-based Quantities - Definition of Base Quantities” dated 2010-12-08.

To augment the IFC 2x3 Coordination View definition, the Quantity Take-off add-on view adds the ability to transmit Base Quantities for selected spatial, building, and structural elements.



Currently, Base Quantities can generally be included in an IFC export as a tick-box option. They will however be an integral part of the forthcoming IFC 2X4 release.



Graphisoft® ArchiCAD® 15

IFC Translators

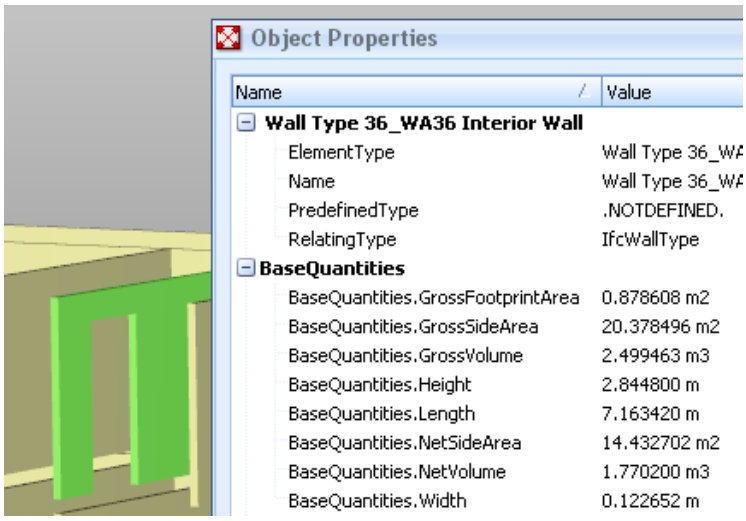
- **Base quantities (length, area and volume)**
  Check this box to add Quantity Takeoff parameters to Wall, Column, Beam, Slab, Roof (slab) and Zone elements in the IFC file. This data is useful in the Interoperability with cost estimation applications.
  For example, the following quantities (IfcElementQuantity) can be exported together with a Wall:
  - Height,
  - Perimeter,
  - Gross volume,
  - Net volume (volume reduced e.g. by columns embedded into the wall),
  - Gross Floor Area (doors are not considered),
  - Net Floor Area (area reduced by door footings),
  - Gross Wall Area (openings are not considered),
  - Net Wall Area (area reduced by openings).

IFC 2X3 Reference Guide for ArchiCAD® 15

Base Quantity definitions have only been written for selected elements, and Base Quantities are only included in the export for those elements. The elements are:

- Spaces
- Walls
- Openings
- Windows
- Doors
- Slabs
- Beams
- Columns
- Members
- Coverings
- Curtain Walls
- Ramps
- IfcRailing

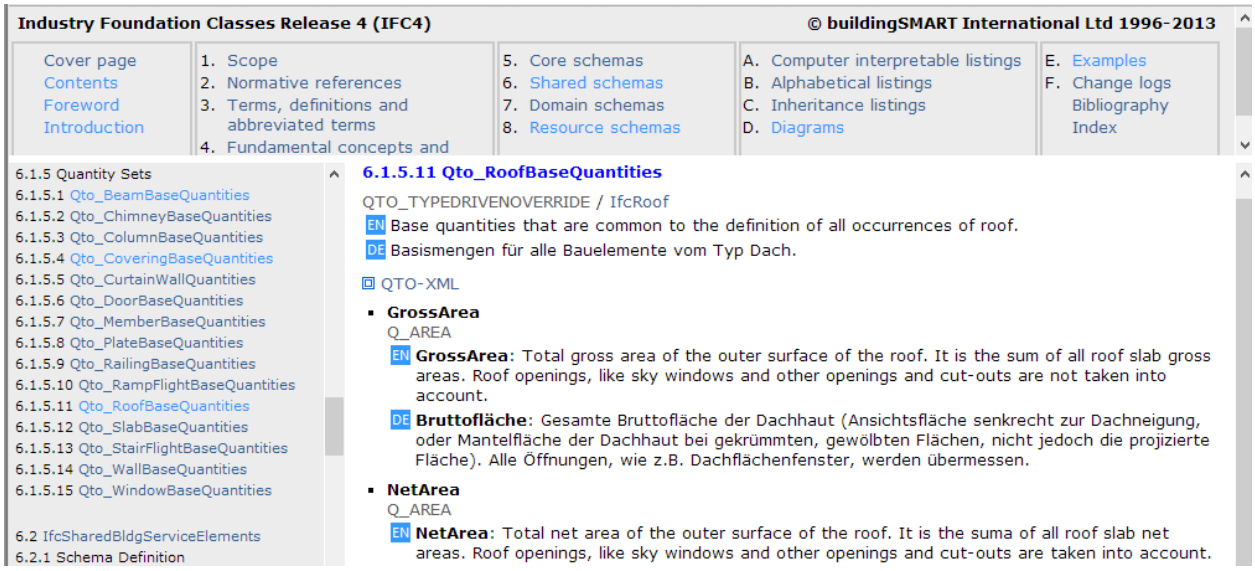
No Base Quantities are provided in the IFC for excluded elements such as Footings, Roofs, Casework and Plumbing.



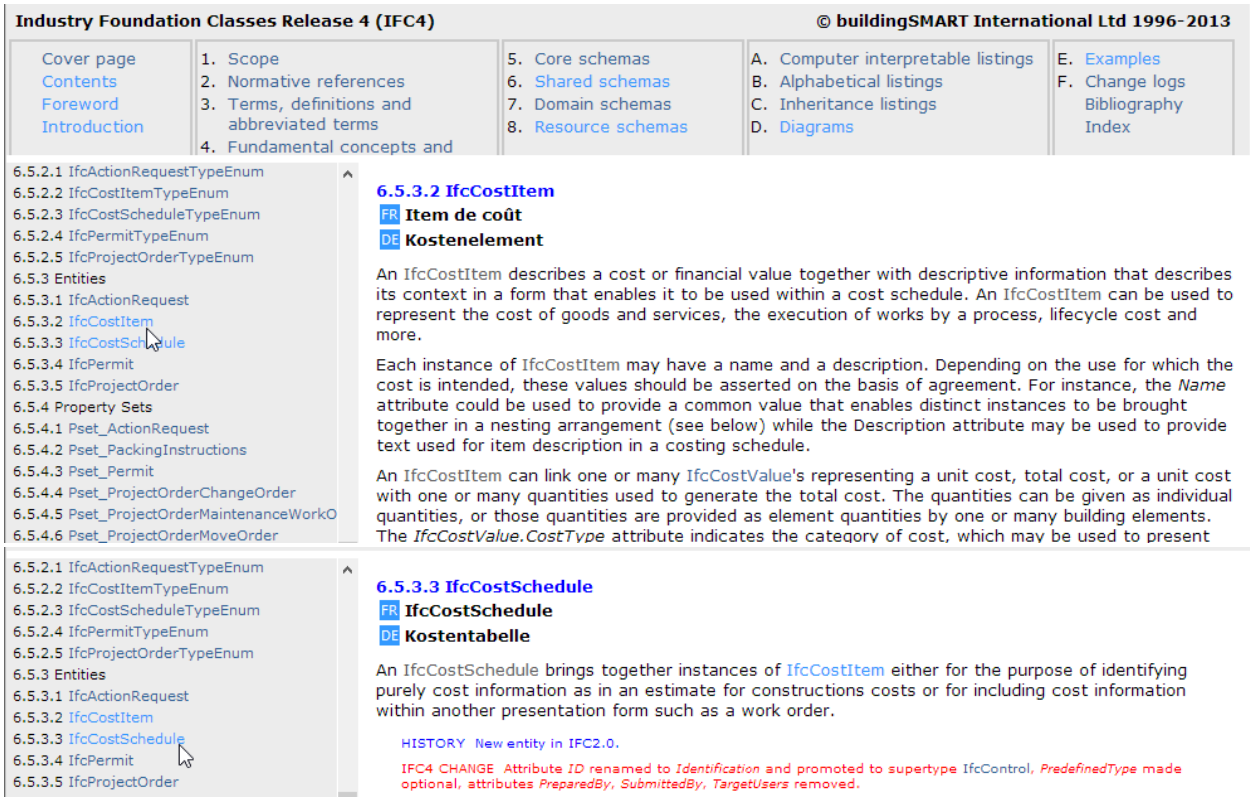
9.4 Quantities in IFC4

For details of the new IFC4 standard, refer to http://www.buildingsmart-tech.org/specifications/ifc-releases/ifc4-release/buildingSMART_IFC4_Whatisnew.pdf. Two changes relating to support for new BIM workflows and 5D model exchanges which should appear in IFC4 implementations are stated as:

- *Standardized quantities for QTO - Definition of international base quantities, defined as separate XML schema + configuration files linked to IFC spec. T*his includes the welcome addition of a BaseQuantities Definition for IfcRoof Element.



- *Major efficiency improvement for 5D - Similar rework for cost items and construction resources, now linked to schedule and BIM.* This relates to the definition of cost items within 4D schedules.



9.5 IFC Files - Issues to Consider

- IFC is an open standard data specification. The responsibility for populating the data model with the appropriate parametric properties and relationships lies with the authoring application that exports the IFC.
- As an open standard, IFC by definition cannot exactly replicate a closed proprietary system, since the proprietary data schema is not publicly available. Hence an IFC is not an exact copy of a proprietary data model, but is an alternate representation based on its own open geometry standard (STEP).
- Proprietary data models need to be mapped to their corresponding IFC categories which may involve translation routines, override settings, and creation of additional IFC-specific parameters.
- Objects that do not have corresponding place-holders in the IFC schema may need to be manually mapped to an alternate IFC element prior to export. If this is not done they will be exported as a general solid object Proxy (IfcBuildingElementProxy), which means that the geometry gets exported but not the properties.
- Different standards of IFC implementation by the various authoring applications can lead to data loss in the IFC exchange.
- Export of quantities is not part of the IFC 2X3 Coordination View definition. Consequently, a standard IFC export from most IFC-compliant applications in the AEC industry will not include quantity data unless the Base Quantity add-on is used. A MVD for IFC4 has not yet been written but when published is expected to include Base Quantities by default.
- Base Quantity definitions have currently only been written for selected building elements and spaces, and the quantities included in a Coordination View IFC with Quantity Take-Off add-on will be limited to those elements.

9.6 IFC Files - What to Provide

If the design package is Revit®, provide a multi-sheet DWFx™ export as described in Section 9 above. With Revit®, DWF(x)™ files are preferred to IFC owing to their tighter integration with the host application..

If ArchiCAD® has been used, provide an IFC 2X3 Extended Coordination View export with Base Quantities as described in Section 11 below. Prior to export ensure that objects are mapped to their correct IFC categories, which may involve override settings and creation of additional IFC-specific parameters.

Review the resultant IFC by use of an IFC Viewer such as DDS-CAD Viewer. Bear in mind that some IFC Viewer software such as Solibri® Model Viewer calculates quantities and displays them as entity properties. These quantities are not an attribute of the IFC, and have been separately calculated by the Viewer program from the IFC geometry. Consequently, the same IFC opened in CostX® will not have those quantities.

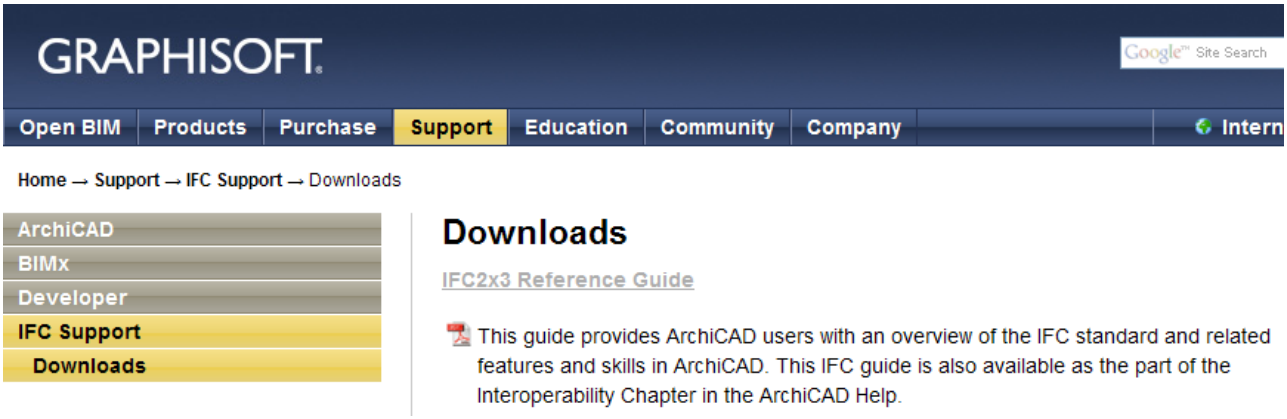
In addition to the IFC, provide a full 2D set of plans, sections, elevations and details in 2D DWG™ format as described in Section 7 above. 2D DGN™ files are also supported by CostX®. The IFC will be used to import BIM dimensions, and the 2D views and sheets will be used to check and augment the quantities.

10 IFC files from ArchiCAD®

10.1 Sources of Information

The Graphisoft® website is a good source of IFC-related information.

The IFC 2x3 Reference Guide for ArchiCAD® 15 is an essential reference for information on IFC management when using ArchiCAD®. It covers IFC file types, IFC functions, IFC import, export, and revision control, IFC Translators, Model filtering and advanced IFC skills. It may be downloaded from the Graphisoft® website.

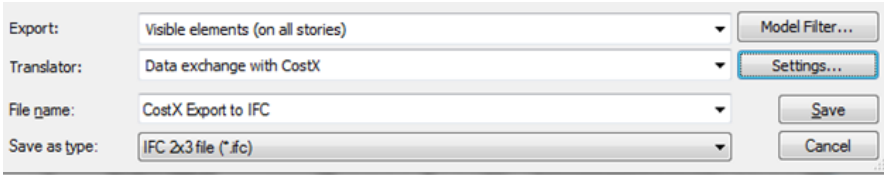


The chapter “Export: save as IFC” on pages 19-21 and the section “Export options” on pages 34-40 within the chapter “IFC Translators” (pages 28-40) provide guidance on the steps that need to be taken when preparing an IFC file for use in CostX®. The section “Derived Model Data to Export” on pages 39-40 deals with the key requirement of Base Quantities.

The following pages contain some suggested settings to help optimize IFC files exported from ArchiCAD® for use in CostX®.

10.2 IFC Export Settings

From the main File menu select Save as…. In the menu dialogue there are a number of selections to be made.

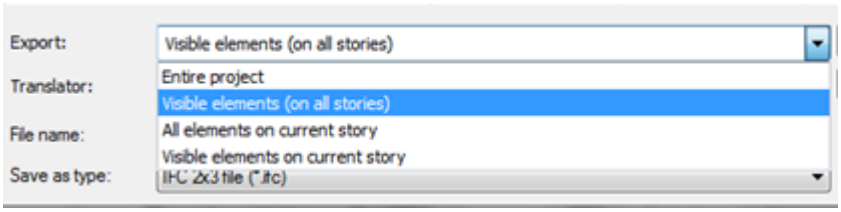


In the Save as type: field, select IFC 2x3 file (*ifc)

In the File name: field, enter a name for the IFC file

In the Translator: field, there are a number of configuration options for mapping the ArchiCAD® elements to their corresponding IFC elements. The default General Translator can be used, or the Settings… button can be used to edit the translator or create a new Translator (see 11.3 below).

The Export: field can be used to filter the elements for the current export so that the content of the IFC can be limited to the specific requirements of the information exchange. The reason for filtering the elements rather than including all of them is to keep the IFC file size down and make model navigation easier for the recipient. These settings can be fine-tuned with the Model Filter…options.



Owing to their potential complexity, IFC files can reach very large file sizes leading to problems with file transmission and the hardware capabilities of the recipient.

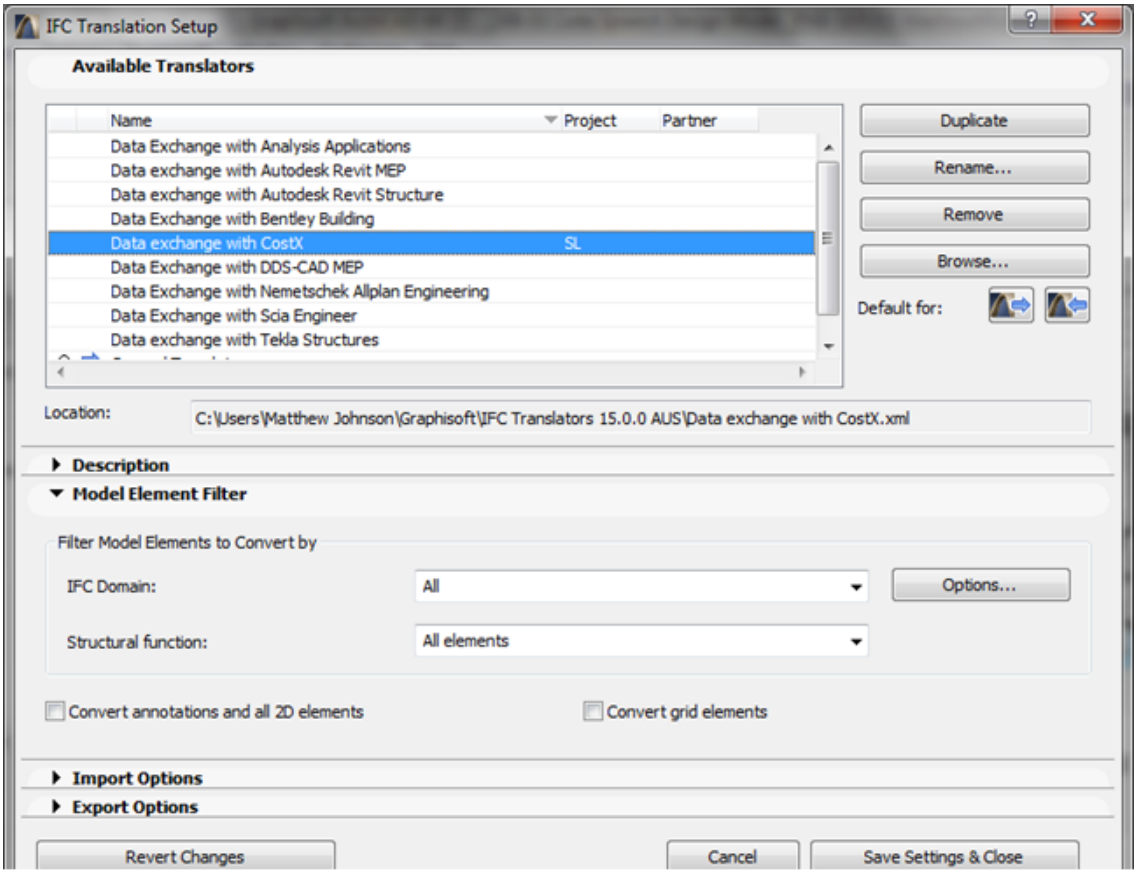
Consequently, it may be necessary to create a set of IFC files with each one limited to particular elements or disciplines.

IFC files can be zipped to reduce their size for transmission purposes. They can also be further compacted by use of a utility such as Solibri® IFC Optimizer, described as a lossless IFC optimizer that purges redundant data from the IFC. The concern with such a process is the potential effect on data integrity and whether required information is lost or reformatted so that it is not recognised or processed correctly by downstream applications.

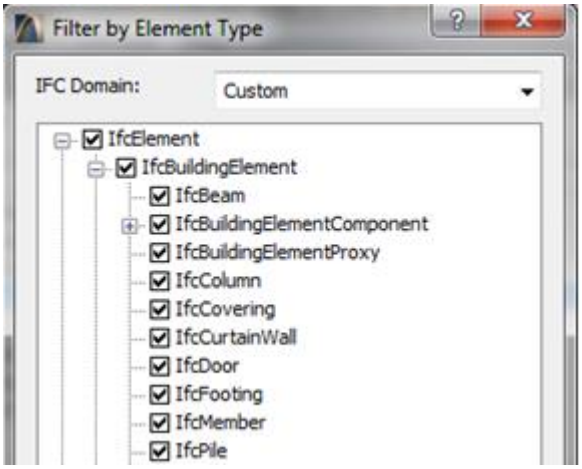
10.3 IFC Translators

Although the Export settings can be used to modify the content of an IFC, exports generally will be governed by the settings of the selected Translator. These settings can be configured within the IFC Translation set-up to suit the requirements of the intended recipient and filter the IFC to limit its file size.

In the example below, a new Translator has been created called Data Exchange with CostX®.

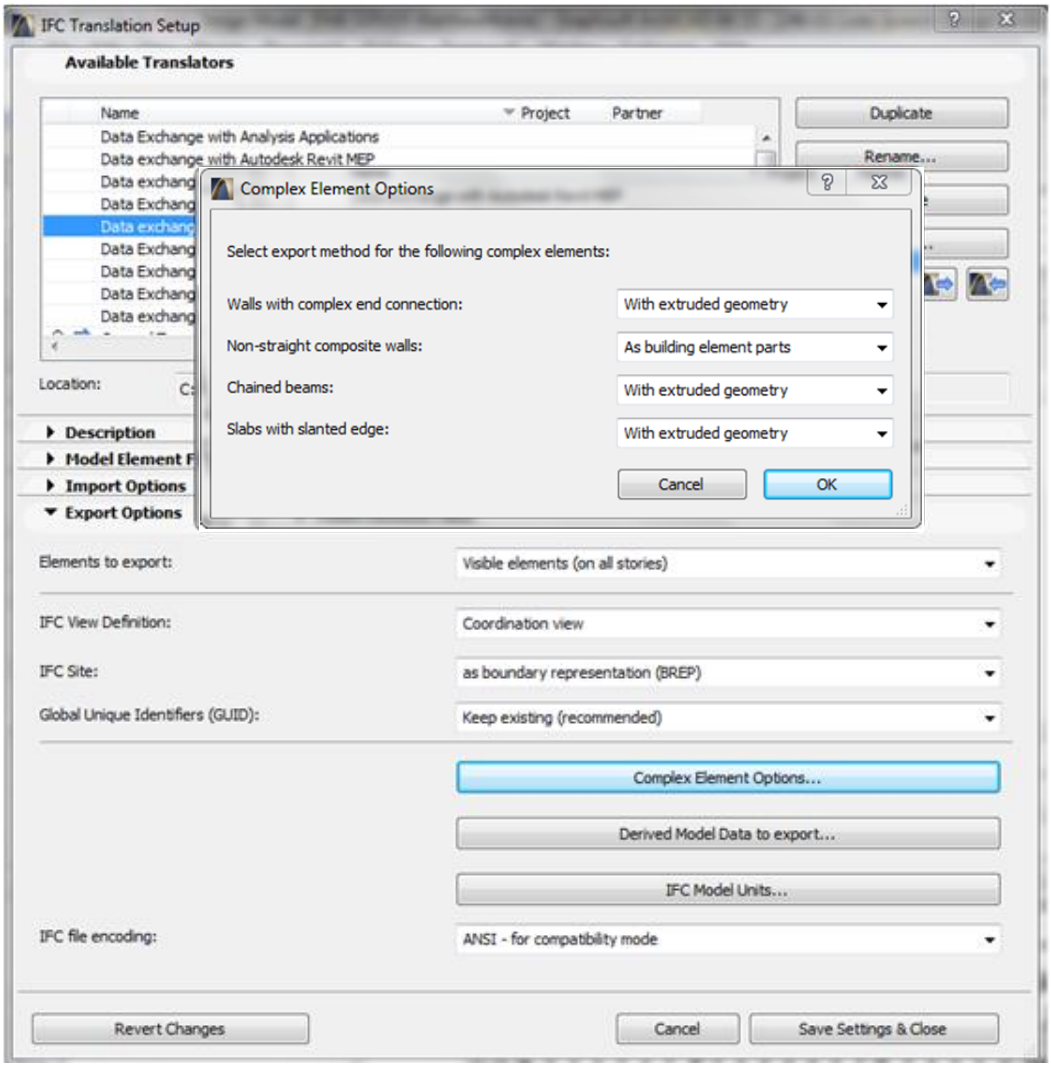


The Model Element Filter determines which elements will be included in the export.

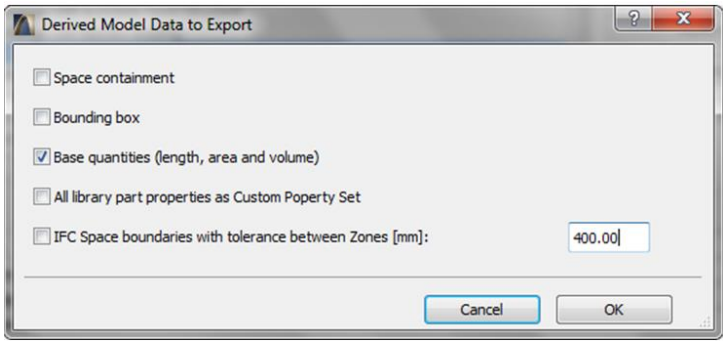


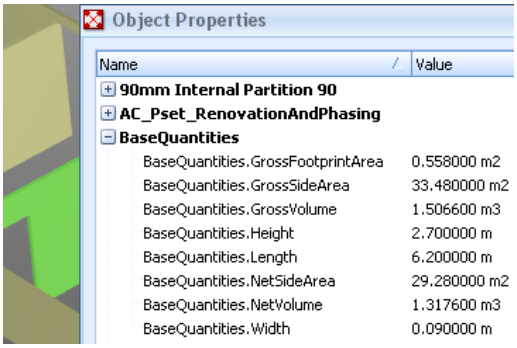
Under Export Options there are a number of key settings. The Coordination View option should be selected as the IFC View Definition. The alternate BREP option provides more exact geometry but the object

properties are lost, consequently there would be no data for CostX® to use for model mapping. Within the Complex Element Options, select With extruded geometry.

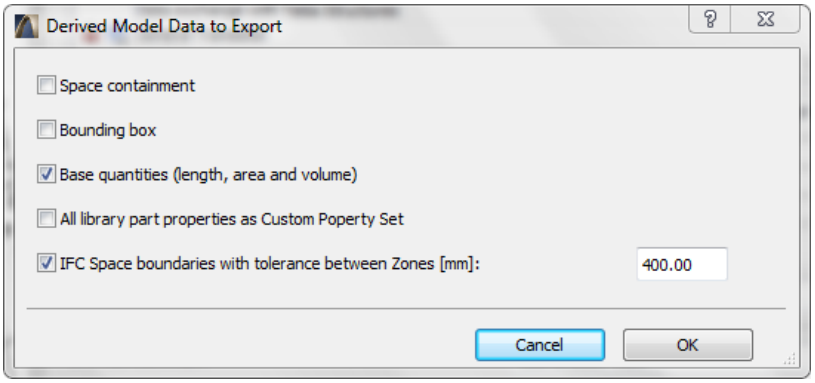


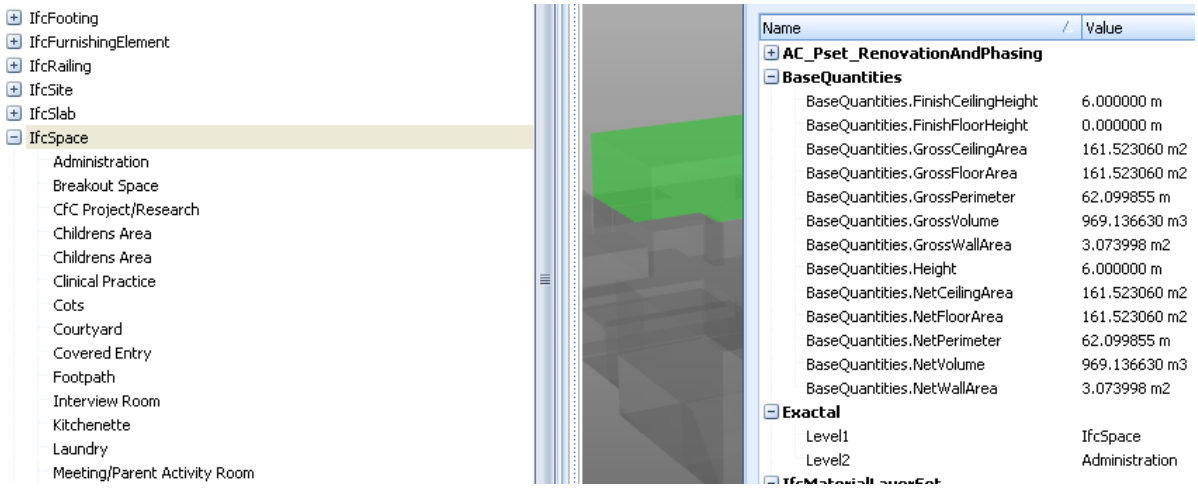
The Derived Model Data to export... options include the key attribute of Base quantities. Ensure that the Base quantities (length, area and volume) check box is ticked.





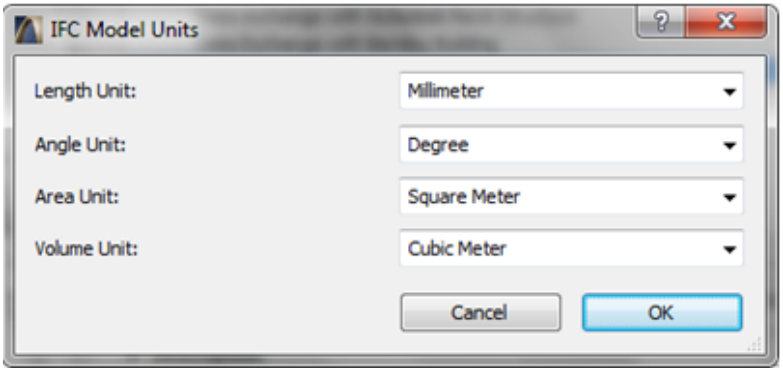
In addition to the Base quantities box, tick the IFC Space boundaries... box to include space (room) area and quantity data.





The All library part properties as Custom Property Set box should not be ticked.

In the IFC Model Units menu, select appropriate units. Standard metric units would be as shown below.



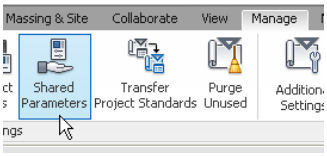
Appendix A – Shared Parameters in Revit®

Shared Parameters in Revit®

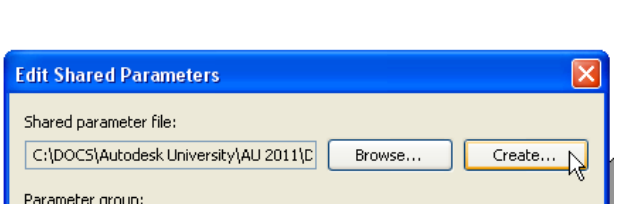
Object property data can be enriched to include additional information by the creation of new Shared Parameters for measurement and estimating purposes. A Shared Parameter which contains UniFormat coding, for example, would allow the object dimensions and quantities to be extracted from the DWFx™ and presented elementally. (This is different to UniFormat Assembly Coding covered in 4 below). Formula-based parameters can also be added to provide additional measurement data such as window areas or downpipe lengths.

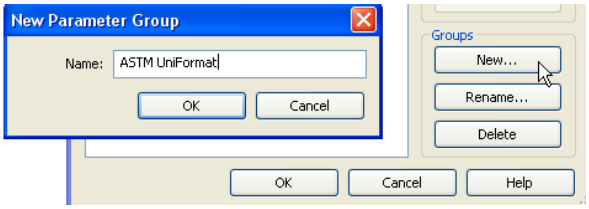
1 Creating a New Shared Parameter

In the **Manage** ribbon menu click on **Shared Parameters**

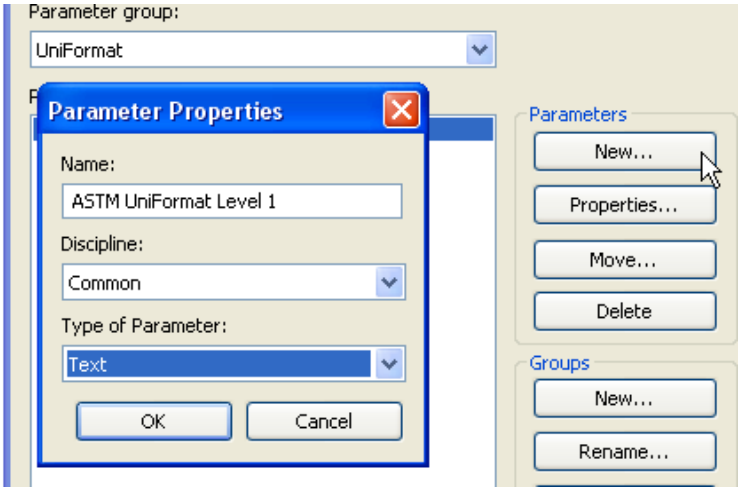


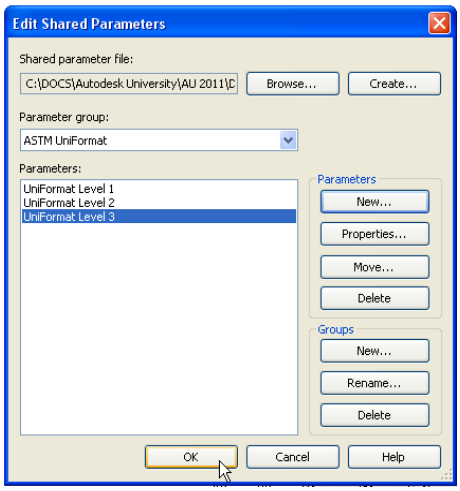
In the Edit Shared Parameters box, create a folder (in this case called *ASTM UniFormat*) to hold the parameter file in a suitable location. In the Groups section of the Edit Shared Parameters window click **New** to create a new parameter group. Enter a name for your group (in this example, *ASTM UniFormat*) then click **OK.**





Still in the Edit Shared Parameters window click **New** under the Parameters section. This will create a new shared parameter within the previously created parameters group. Enter a name (in this example *UniFormat level 1*), leave the discipline as Common and use the drop-down menu to select a type of parameter (in this example *Text*). Click **OK**.

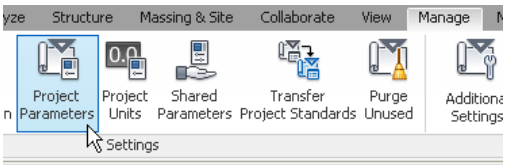




The new Shared Parameter(s) wll be listed in the Edit Shared Parameters window. Click **OK** to complete the configuration.

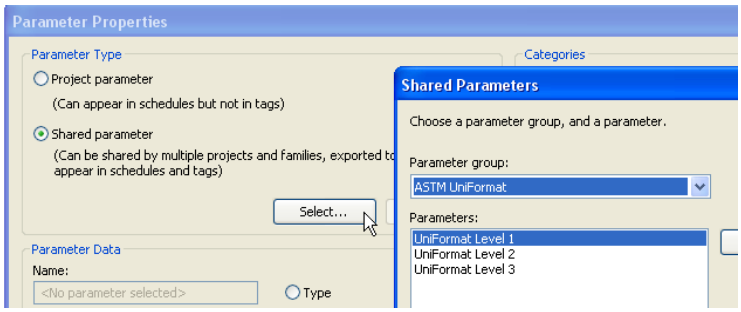
2 Adding the Shared Parameter to the Project

The new Shared Parameter needs to be added to the project, so from the **Manage** ribbon click on the **Project Parameters** button.



In the Project Parameters window click **Add**.

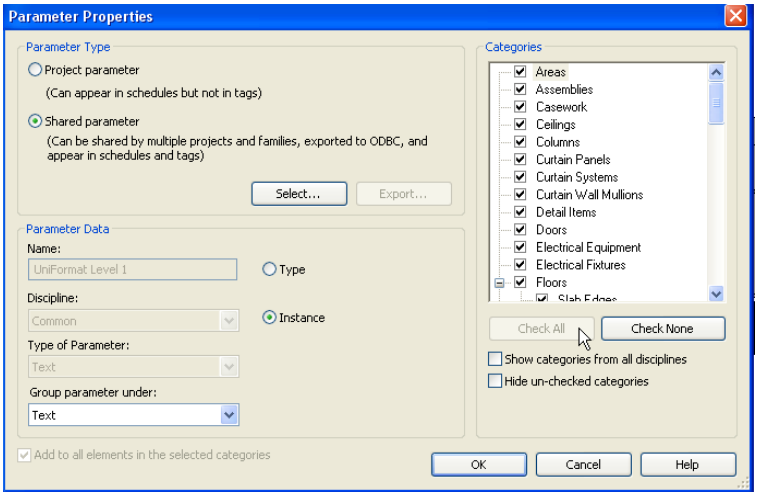
In the Parameter Type section of the Parameter Properties window select the **Shared parameter** option then click **Select**.



The Shared Parameters window will open. Use the drop-down menu to select the **Parameter group** (in this example *ASTM UniFormat*) then select the Parameter (*UniFormat Level 1*) and click OK.

Ensure that the Instance option button is selected, then In the Categories section, use the checkbox to select those categories that the parameter applies to (In this example the parameter will be applied to all objects so click the **Check All** button). Click **OK**.

Select any other parameters and then click **OK** in the Parameter Properties box. Then click **OK** in the Project Parameters window to create the new parameters in the project.



The new Shared Parameters are now available to be applied to the objects within the model.

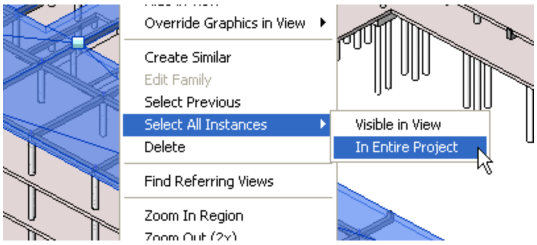
3 Applying Shared Parameters to Objects in the Model

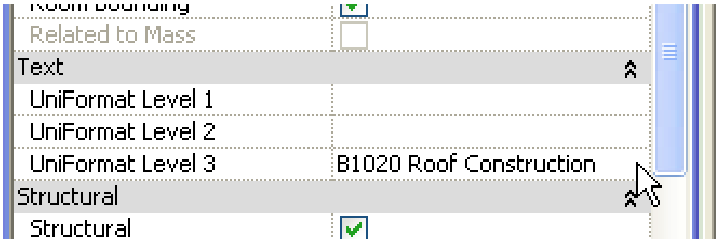
Option 1 – Edit the instance properties

Select an object in the model to display its Instance Properties in the task pane. (In this example the *UniFormat Levels 1, 2 and 3* shared parameters will be listed under the Text heading.)

If there are more than one instance of the same object in the model click the right mouse button and use the Select All Instances option to update them all in one operation.

Click into the field beside the shared parameter (in this example *UniFormat Level 3*). Type in a suitable entry for the selected object(s) and click Apply.

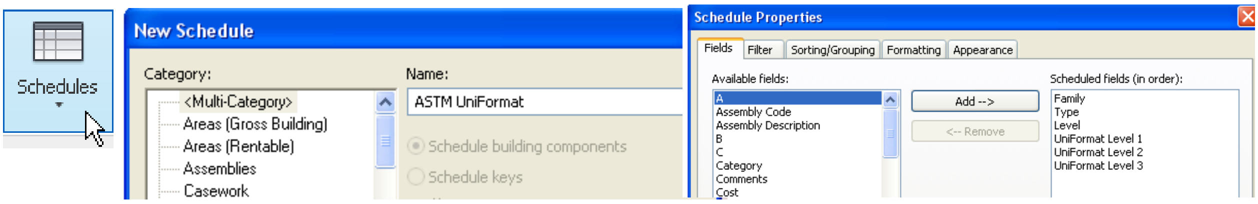




Repeat this process for all objects in the model for which the additional shared parameter information is to be applied.

Option 2 – Enter the parameters in a schedule

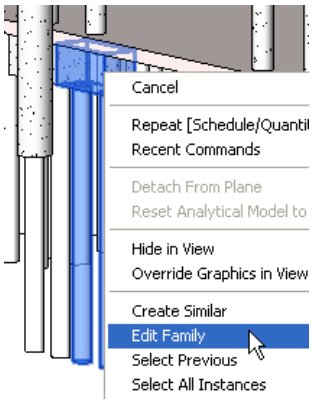
In the View ribbon, reate a new Schedule, assign the required properties and enter the relevant details against the objects

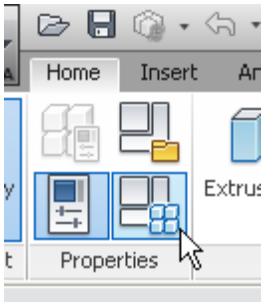


ASTM UniFormat					
Family	Type	Level	UniFormat Level 1	UniFormat Level 2	UniFormat Level 3
M_Concrete-Round-Column	450mm	01 - Entry Level			
M_Concrete-Round-Column	450mm	01 - Entry Level			
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
UC-Universal Column-Column	356x368x129UC	01 - Entry Level	B SHELL	B10 Super Structure	B1020 Roof Construction
M_Concrete-Rectangular Beam	400 x 800mm				

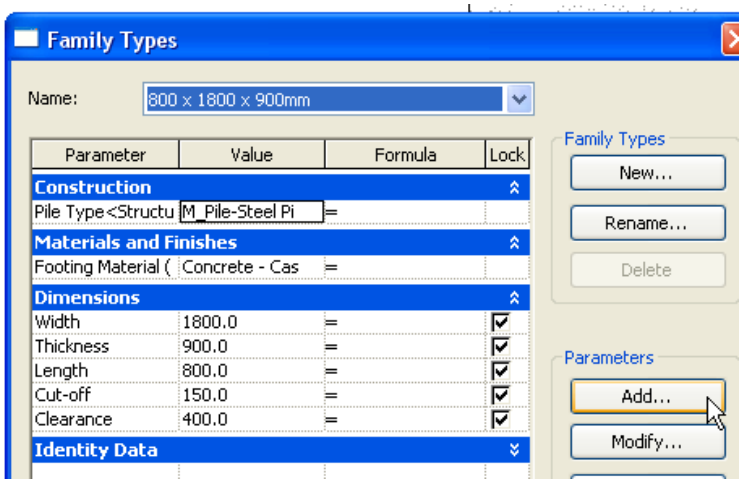
Option 3 – Edit the Family Type to set default Instance Parameters

Select an object, right click and select Edit Family. The Edit view for the Family will open. Click the Family Types button in the Properties section of the ribbon.

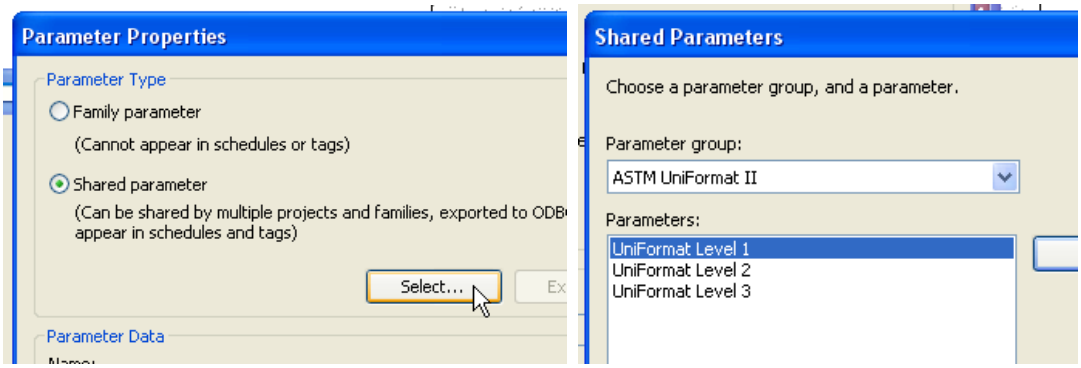




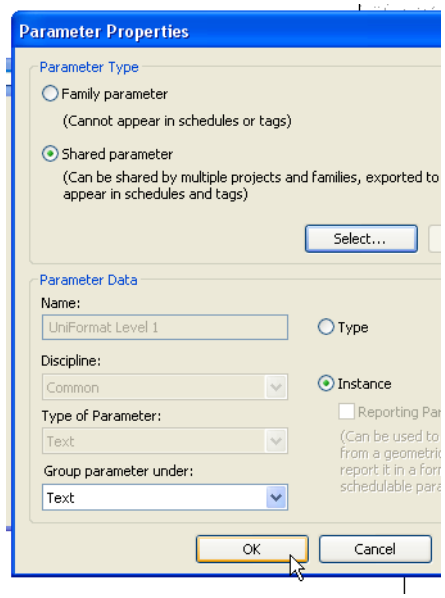
The Family Types edit box will open. Click the Add button in the Parameters section.



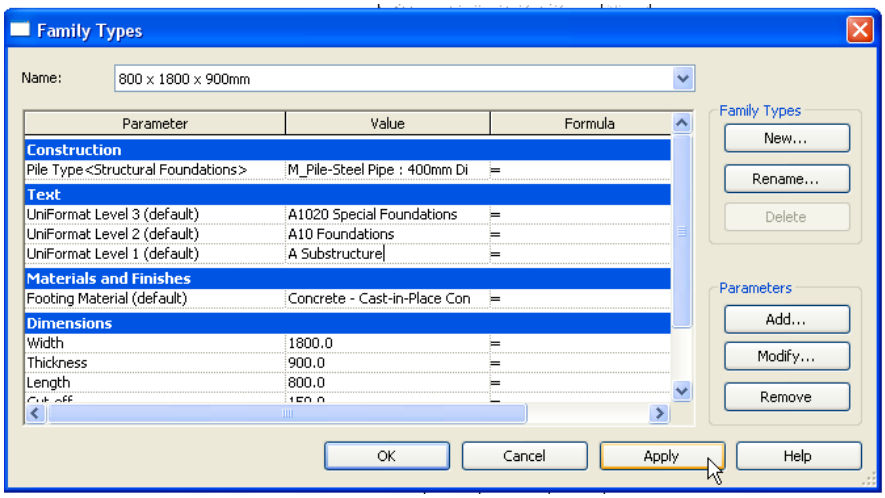
In the Parameter Properties box, check Shared Parameter and click the Select button, then select the required Parameter and click **OK.**



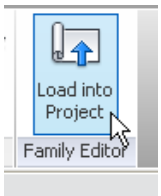
You will return to the Parameter Properties box and the parameter data will be shown. Make sure the Instance option is selected. Click **OK**.

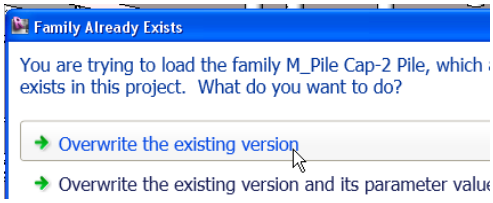


In the Family Types box, enter the values and click Apply and **OK**.

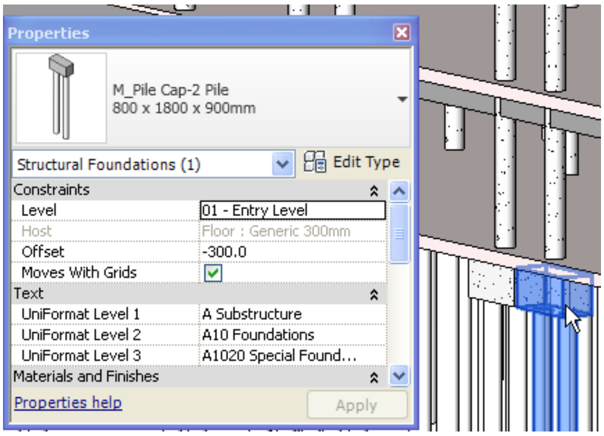


Now click the **Load into Project** button in the Family Editor section of the ribbon, and Then click **Overwrite the Existing Version**.





The data has now been added to every instance of the Family Type.



Individual instances which require to have different parameter values can now be edited either by selecting the object and editing its instance properties, or in the schedule.

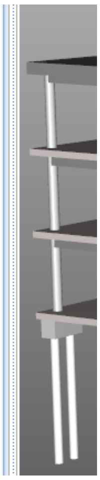
M_HSS-Round Structural Tubing	HSS114.3X8.6				
M_HSS-Round Structural Tubing	HSS114.3X8.6				
M_HSS-Round Structural Tubing	HSS114.3X8.6				
M_Pile Cap-2 Pile	800 x 1800 x 900m	01 - Entry Level	A Substructure	A10 Foundations	A1020 Special Foundations
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile Cap-2 Pile	800 x 1800 x 900m	01 - Entry Level	A Substructure	A10 Foundations	A1020 Special Foundations
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile Cap-2 Pile	800 x 1800 x 900m	01 - Entry Level	A Substructure	A10 Foundations	A1020 Special Foundations
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile Cap-2 Pile	800 x 1800 x 900m	01 - Entry Level	A Substructure	A10 Foundations	A1020 Special Foundations
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			
M_Pile Cap-2 Pile	800 x 1800 x 900m	01 - Entry Level	A Substructure	A10 Foundations	A1020 Special Foundations
M_Pile-Steel Pipe	400mm Diameter	01 - Entry Level			

The dimensions may now be extracted and sorted by UniFormat codes.

Dimension Groups | Dimensions

Click to Filter <Filter is Empty>

Name	Quantity	UOM
A10 Foundations		
A1020 Special Foundations - M_Pile Cap-2 Pile	62	m3
A1020 Special Foundations - M_Pile-Steel Pipe 400mm Diameter	573	m
A1020 Special Foundations - M_Pile-Steel Pipe 500mm Diameter	721	m
A1030 Slab on Grade - Generic 300mm	1,741	m2
B10 Super Structure		
B1010 Floor Construction - Generic Concrete 300mm	3,101	m2
B1010 Floor Construction - M_Concrete-Rectangular Beam	355	m3
B1010 Floor Construction - M_Concrete-Round-Column	81	m3
B1020 Roof Construction - Concrete Deck - Tapered Insulation	1,621	m2
B1020 Roof Construction - M_Concrete-Rectangular Beam	15	m3
B1020 Roof Construction - M_Concrete-Round-Column	34	m3
B1020 Roof Construction - M_HSS-Round Structural Tubing HSS	35	m
B1020 Roof Construction - UB-Universal Beam 254x102x28UB	22	m
B1020 Roof Construction - UB-Universal Beam 305x165x40UB	30	m
B1020 Roof Construction - UC-Universal Column-Column 356x3	25	m
B20 Exterior Enclosure		
B2010 Exterior Walls - Exterior - 300mm Concrete	426	m2



Dimension Groups | Dimensions

Click to Filter <Filter is Empty>

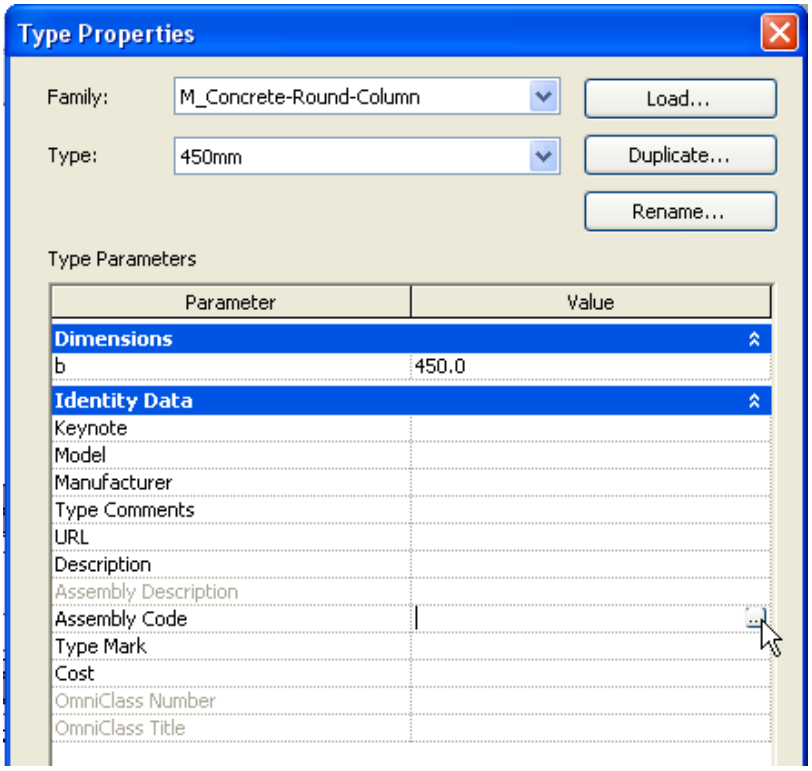
Name	Quantity	UOM
Floors		
Floor 160mm Concrete With 50mm Metal Deck	71	m2
Floor Concrete Deck - Tapered Insulation	1,621	m2
Floor Generic 300mm	1,741	m2
Floor Generic Concrete 300mm	3,101	m2
Structural Columns		
M_Concrete-Round-Column 450mm	718	m
M_Concrete-Round-Column 750mm	25	m
UC-Universal Column-Column 356x368x129UC	25	m
Structural Foundations		
M_Pile Cap-2 Pile 800 x 1800 x 900mm	62	m3
M_Pile Cap-4 Pile 2000 x 2000 x 900mm	107	m3
M_Pile-Steel Pipe 400mm Diameter	72	m3
M_Pile-Steel Pipe 500mm Diameter	142	m3
Structural Framing		
M_Concrete-Rectangular Beam 400 x 800mm	1,835	m
M_Concrete-Rectangular Beam 600 x 900	158	m
M_HSS-Round Structural Tubing HSS114.3X8.6	35	m
UB-Universal Beam 254x102x28UB	22	m

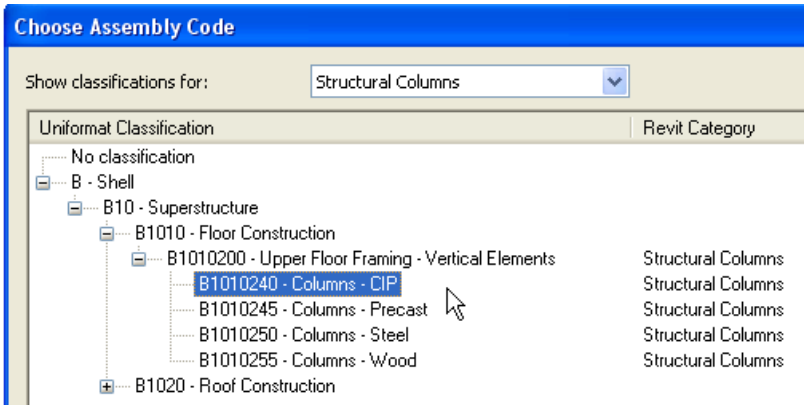
Quantities in CostX® by UniFormat code

4 UniFormat Assembly Codes

All model elements in Revit® include fields for Assembly Code and Assembly Code Description properties. You can populate these fields from a hierarchical list of UniFormat codes drawn from a data file held in the Revit® 2012 Program directory (uniformat.txt).

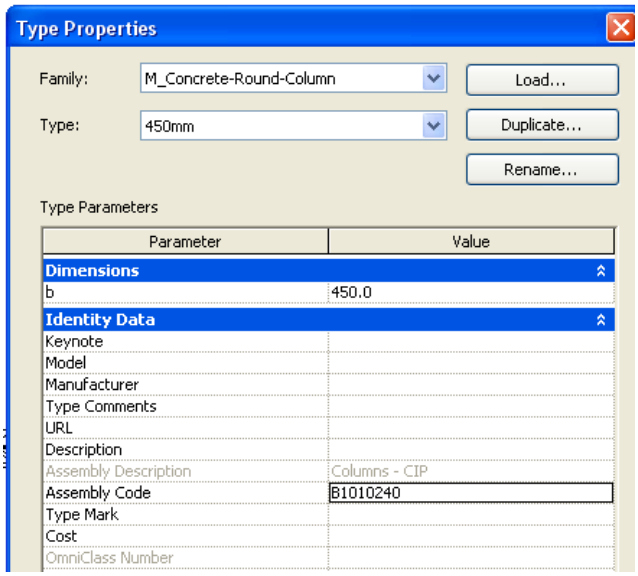
- Select an object in the model and click on the Edit Type button.
- In the Type Properties box, click the Assembly Code value box, then click on the menu button to open the UniFormat Classification hierarchy. Select a code and click OK.





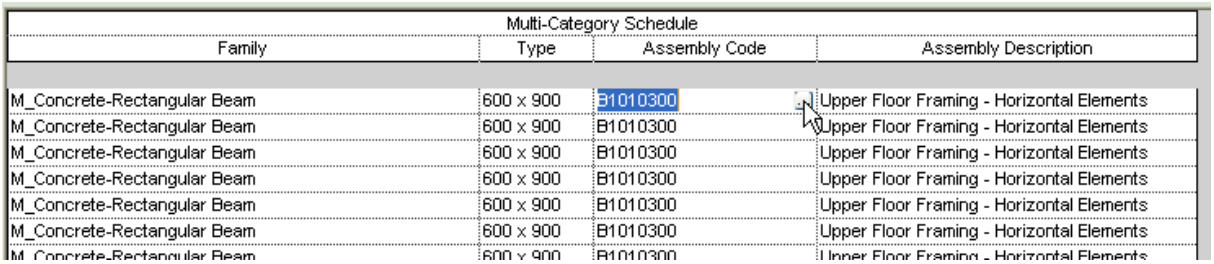
- Alternate classifications are available in the drop-down at the top of the dialog.

- The Assembly Code and its associated Assembly Description will be added into the Type Properties.

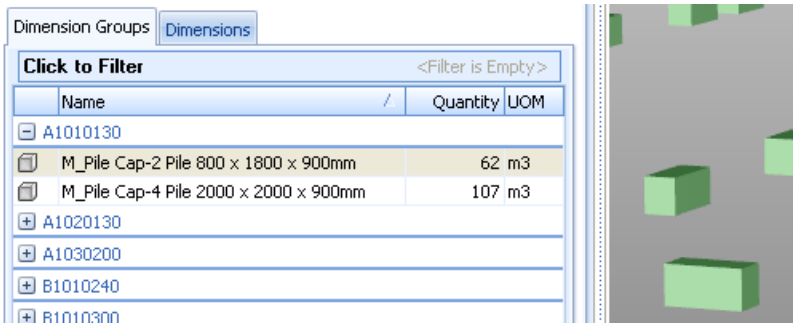


- Click Apply to update the Type properties of all applicable objects then OK to exit the dialog.

- Create a Schedule to check that all objects have been assigned a code. Codes can also be assigned within the Schedule.



- A DWFx™ file exported from the model will include the Assembly Code (but not the Assembly Description) which can be used in CostX to group the dimensions.



Model dimensions grouped by CostX® into UniFormat Assembly Codes