



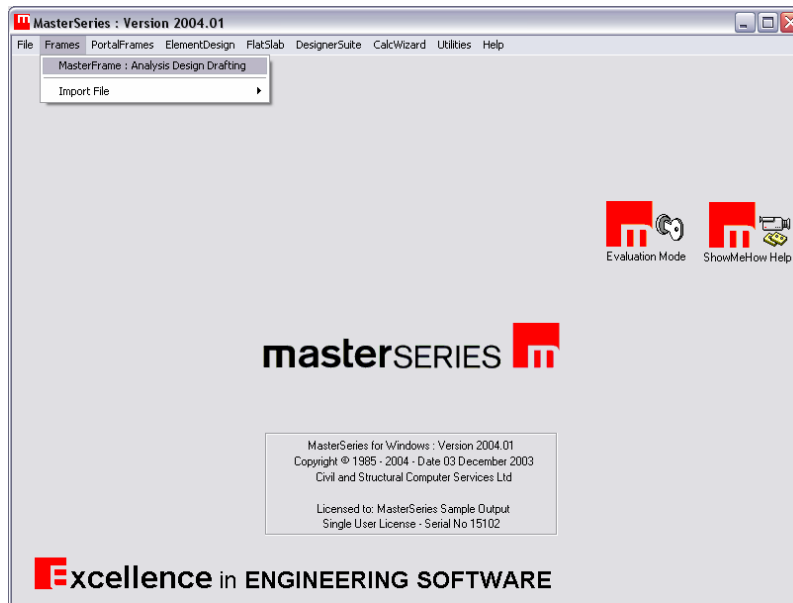
## T12.2 Install Breve Software

If you haven't already done so you are required to install the Breve application from the MasterSeries CD. Place your MasterSeries disc in your CD drive (D in the example below)

☞ Select **Start > Run > Type "D:\BREVe2\SETUP.EXE"**

☞ Click **OK** Follow the on-screen instructions

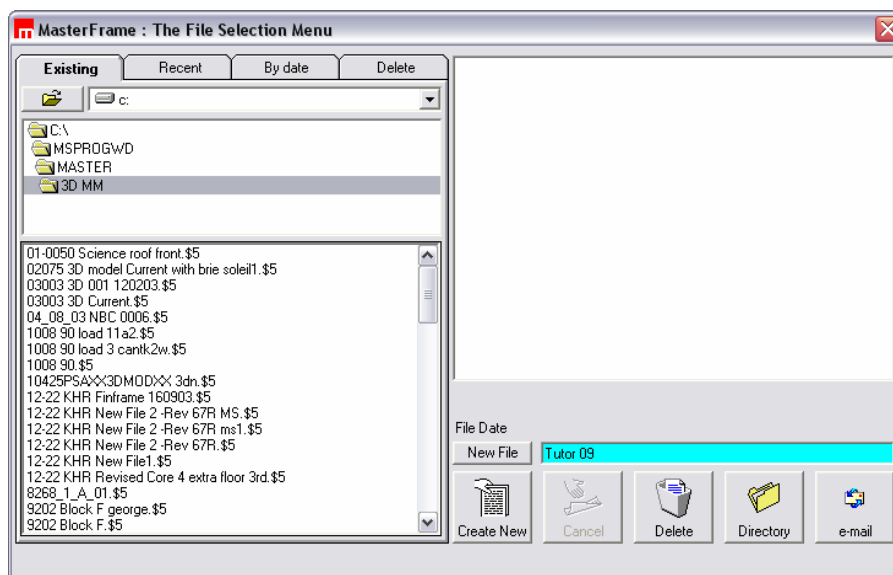
## T12.3 Loading MasterFrame



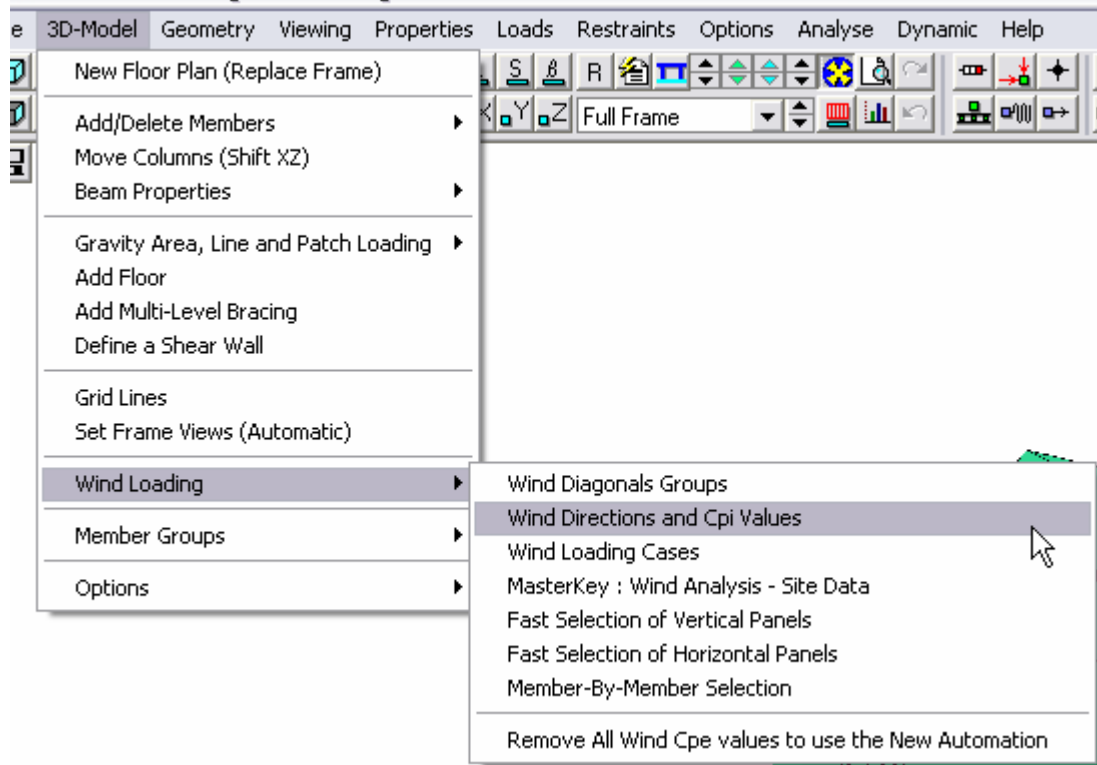
☞ Select **'Frames'** from the top menu and then **'MasterFrame : Analysis Design Drafting'** from the drop down menu.

The MasterFrame File Selection menu will now be displayed.

This menu enables you to load existing files or create new data files. As each existing file is selected, a picture of the frame is displayed in the window to assist your selection.




- ☞ Browse to the **C:\MSPROGWD\Samples** directory and select the **“3D Model Manager Wind Loading.\$5”** file.
- ☞ Click the **‘Get File’** button.



The Wind Loading Sub Menu above provides a step-by-step guide to the use of the MasterKey Wind Analysis. We shall show now work through this menu.

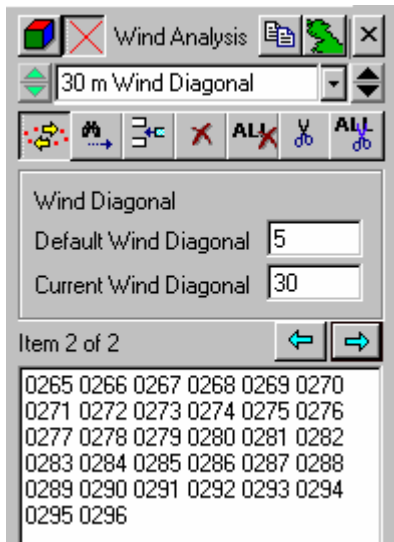
### T12.4 Turning on the 3D Model Manager

- ☞ Select **‘3D-Model’ > ‘Gravity Area-Line & Patch Loading’ > ‘Area Loading defaults’** option from the menu.
- ☞ Select  to use area loading


### T12.5 Define Wind Diagonal Groups

- ☞ Select **‘3D-Model’ > ‘Wind Loading’ > ‘Wind Diagonal Groups’** option from the menu.

BS 6399 Pt 2 (cl. 2.1.3.4) makes use of a size effect factor  $C_a$  for the determination of the wind pressure values. This has the effect of designing members which are locally loaded by wind (such as cladding members) for a larger wind pressure than members which are globally loaded by wind, e.g. vertical bracing members. Set up the wind diagonals for the individual members (defaults to 5m) and for the bracing systems e.g., 30m representing the wind loading coming onto the various bracing systems.



All members will use the default diagonal value (program defaults to 5m) unless placed into a wind diagonal group. For example, create a new

definition using the  button, giving it a relevant title. Insert the Current Wind Diagonal length and then select the members which have this wind diagonal length.

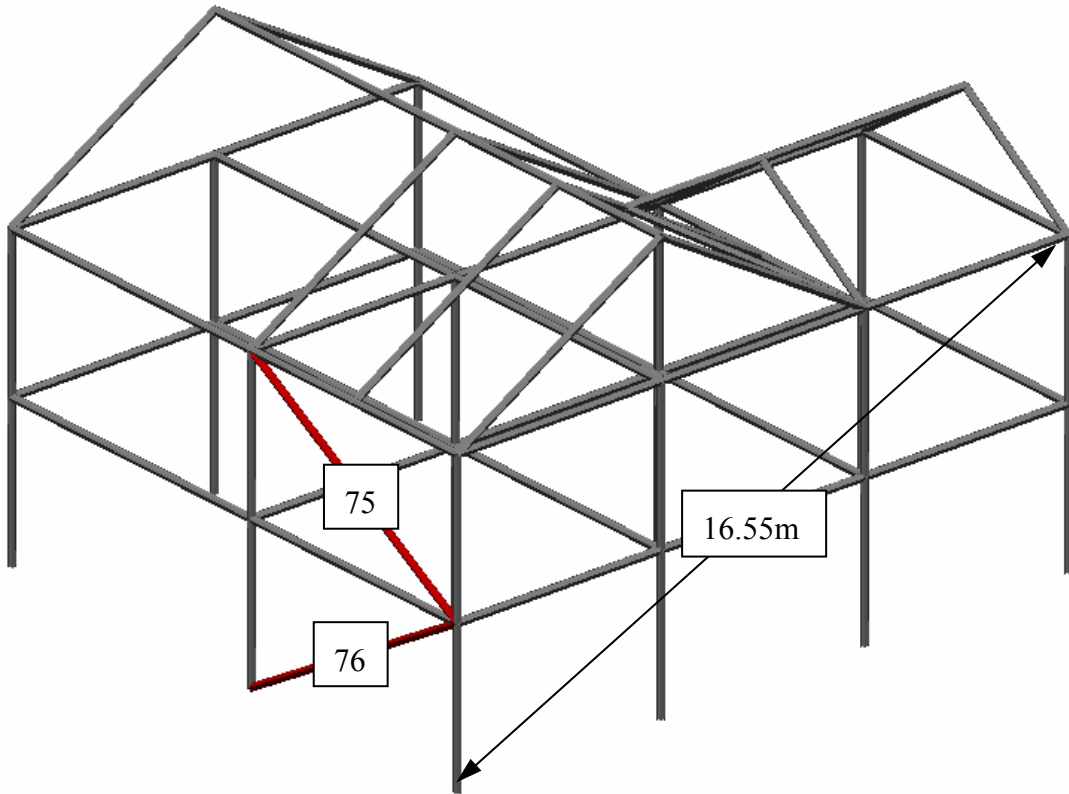
Tip – use the member viewing options in the top right to select, say, the inclined (I) members only. You can then box around these members to add them to this diagonal group. Switch back to All (A) members to see the full frame.

**Note** – The definition of wind diagonals will result in a more efficient design, however because the program defaults to a conservative value of 5m, specific diagonal definitions are not absolutely necessary. If you do wish to specify wind diagonal values, then it is recommended to keep the number of additional diagonals to a minimum since each diagonal value will have its own set of wind loading cases. Hence if many wind diagonals are defined, the number of loading cases would become very large, resulting in a much increased analysis time. For many circumstances it would be adequate to have only two diagonal values, i.e. the 5m default diagonal and one larger diagonal value to cover all members that will attract force due to wind load but are not locally wind loaded. The additional larger value should be the lowest diagonal of these types of members.

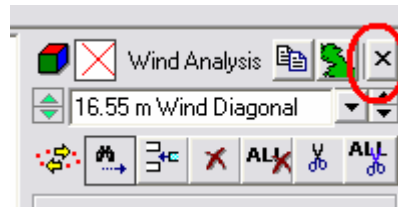
In this example member 75 and 76 are vertical bracing members which we might apply a larger than default diagonal to since they are not locally loaded by wind.



- ☞ Ensure that you are in 'Add/Remove members' mode
- ☞ Click on member **75** and **76**
- ☞ Enter a Current Wind Diagonal of **16.55** (as illustrated below)



Click on the 'x' button to close



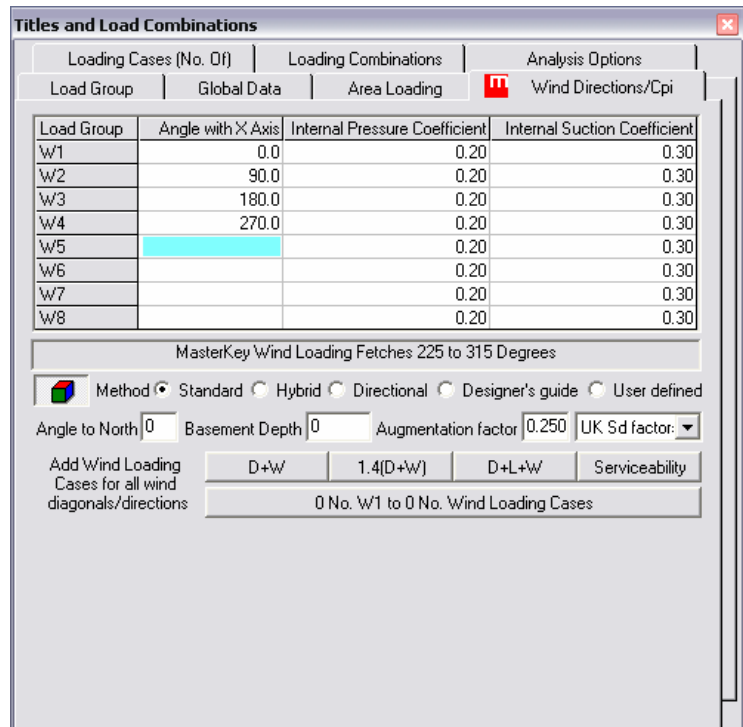
## T12.6 Define Wind Directions, Cpi (internal pressure) and Csi (internal suction) values

☞ Select '3D-Model' > 'Wind Loading' > 'Wind Directions and Cpi values' option from the menu.

☞ Select  to turn on the MasterKey Wind Analysis options

☞ Enter the four wind directions as shown in the 'Angle with X axis' column

☞ Double click on the titles 'Internal Pressure Coefficient' and 'Internal Suction Coefficient' to automatically assign the standard 0.2 and 0.3 to all wind directions.



Load Group	Angle with X Axis	Internal Pressure Coefficient	Internal Suction Coefficient
W1	0.0	0.20	0.30
W2	90.0	0.20	0.30
W3	180.0	0.20	0.30
W4	270.0	0.20	0.30
W5		0.20	0.30
W6		0.20	0.30
W7		0.20	0.30
W8		0.20	0.30

MasterKey Wind Loading Fetches 225 to 315 Degrees

Method  Standard  Hybrid  Directional  Designer's guide  User defined

Angle to North  Basement Depth  Augmentation factor  UK Sd factor:

Add Wind Loading Cases for all wind diagonals/directions:

0 No. W1 to 0 No. Wind Loading Cases

**Important!** Give consideration to the Dynamic **Augmentation Factor** (Cr). This is defaulted to 0.25 which probably quite conservative for most buildings. Refer to figure 3 in BS 6399 pt 2 1997. A more typical value might be 0.1.

☞ Change the Augmentation Factor to **0.1**

## T12.7 Define Wind Loading Cases

If not already in the Wind Direction area (above) we could Select 3D-Model>Wind Loading >Wind Loading cases, however in this case we do not need to do this.

☞ Add Wind Loading cases by clicking on '**D+W**' then '**1.4(D+W)**' then '**D+L+W**' and '**Serviceability**'

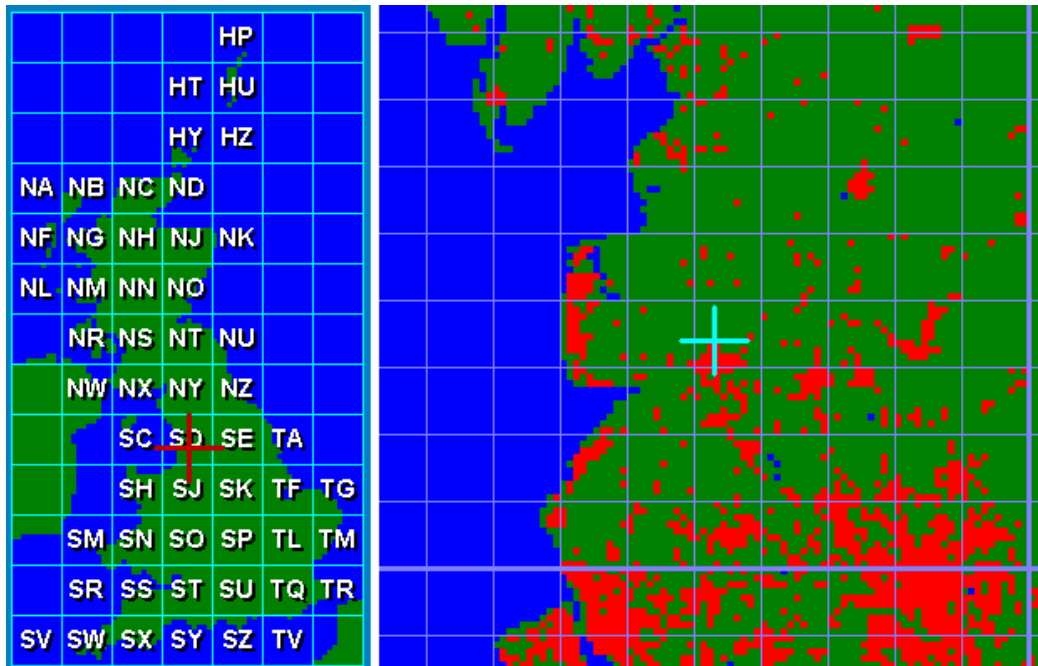
☞ Click on '**5 No. W1 to 64 No. Wind Loading Cases**' to generate all wind cases for all directions

☞ Move to the '**Load Combinations**' tab to view the loading cases generated in more detail

☞ Close 'Titles and Load Combinations' by clicking on the '**x**' icon

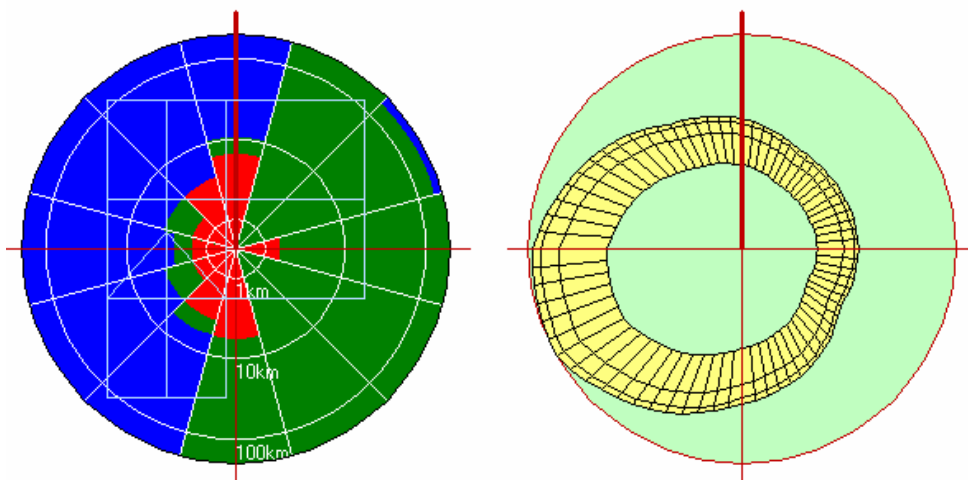
## T12.8 Site Location

☞ Select '3D-Model' > 'Wind Loading' > 'MasterKey: Wind Analysis – Site Data' option from the menu.

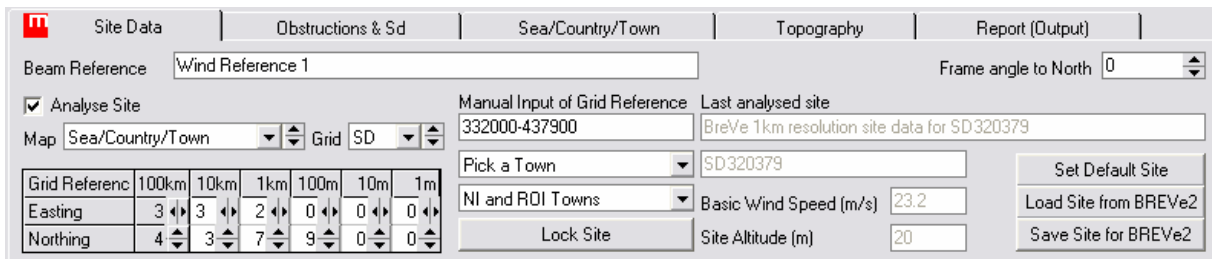


☞ Click on any location within the larger scale map shown on the right above, to select your building location

You can change to any location you wish by first clicking into one of the grid squares on the main UK map (left). Then you can refine the location by clicking the cross hair at the desired site on the zoomed grid square to the right. Exact values of Northings and Eastings can be entered in the 'Manual Input of Grid Reference' in the Site Data tab at the bottom left of the screen. These can be obtained from [www.multimap.com](http://www.multimap.com) for a given post code.



☞ Select the **Site Data** tab



☞ In the '**Frame angle to North**' box, type '**130**' degrees, to specify the anti-clockwise angle between the frame Z axis and magnetic north.

Note: If you do not know the exact direction (orientation) of your building, then, you must leave the angle to 0 AND set the sd factor to 1.

Obstructions	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Height (m)	12.50	2.50	2.50	12.50	2.50	2.50	12.50	12.50	12.50	12.50	12.50	12.50
Spacing (m)	20.00	4.00	4.00	20.00	4.00	4.00	20.00	20.00	20.00	20.00	20.00	20.00

With every change made in the data the program automatically calculates all required “q” values for the frame at the various building levels. Obstructions and topography data is automatically determined for the chosen site location and can be examined in their separate tabs.

☞ Use the scroll bar on the right of the screen to move down to see the wind pressure values.

**MasterFrame Wind Pressure Values**

**Dynamic Pressure Values, q (N/m<sup>2</sup>) for a = 5**

Wind Direction to X Axis	0	90	180	270
q (N/m <sup>2</sup> ) for H = 3.5	797.2	743.3	467.5	598.1
q (N/m <sup>2</sup> ) for H = 7	983.5	917.0	576.8	737.8
q (N/m <sup>2</sup> ) for H = 9	1054.6	983.4	618.5	791.2
q (N/m <sup>2</sup> ) for H = 10	1084.9	1011.6	636.2	813.9

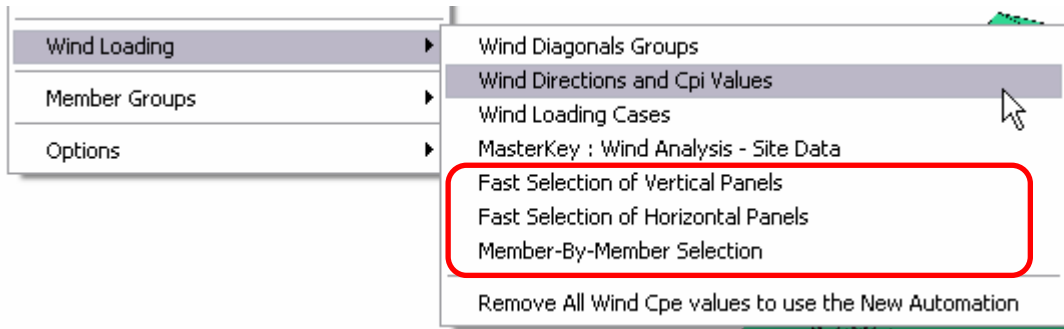
**Dynamic Pressure Values, q (N/m<sup>2</sup>) for a = 16.55**

Wind Direction to X Axis	0	90	180	270
q (N/m <sup>2</sup> ) for H = 3.5	725.1	676.1	425.2	544.0
q (N/m <sup>2</sup> ) for H = 7	894.6	834.2	524.6	671.2
q (N/m <sup>2</sup> ) for H = 9	959.3	894.5	562.6	719.7
q (N/m <sup>2</sup> ) for H = 10	986.9	920.2	578.7	740.4

☞ Select '**Exit MasterKey Wind Design**' from the **File** Menu

**T12.9 Define Wind Panels**

The remaining three items in the Wind Loading sub menu deal with the generation of the wind panels. Each wind panel describes a planar wind loaded surface of the structure. This is the most involved task of the entire process.

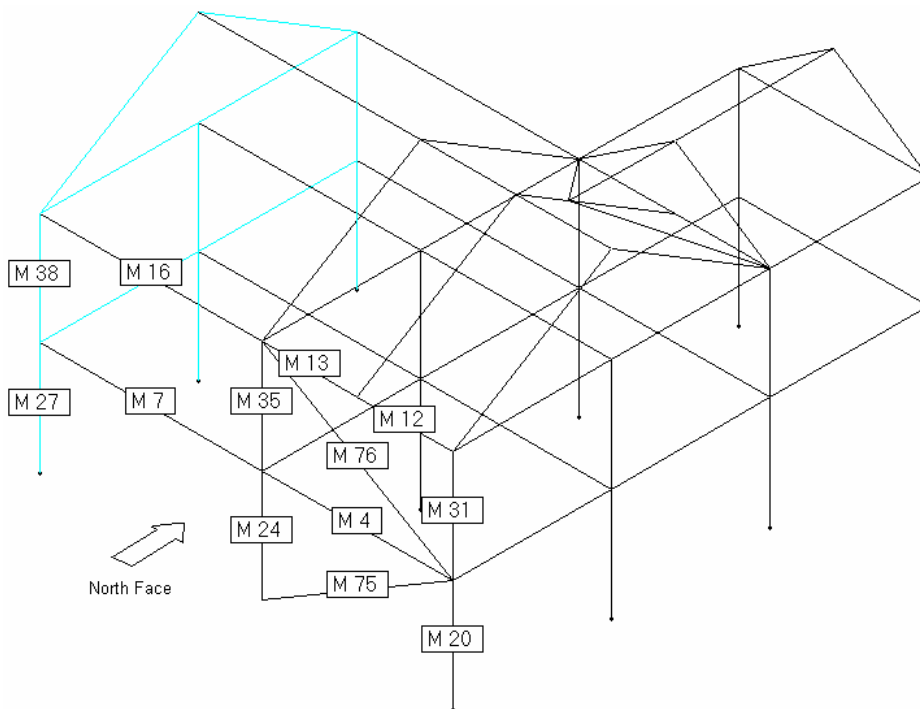



Each item provides a different method for defining the wind panels. In this tutorial we will look at all three methods.

### Member by Member Selection

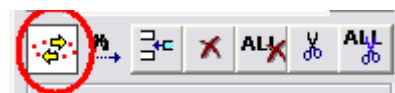
☞ Choose the **'Member by Member Selection'** option from the above menu.

Taking the example shown above we shall demonstrate the procedure for setting up an additional wind loaded surface for the north face of the building.



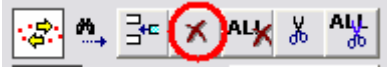
Generally to define a new panel we would click on the  button to define a new wind loading group. Since this is the first wind panel an empty definition is available for use.


☞ Ensure that you are in **'Add/Remove members'** mode




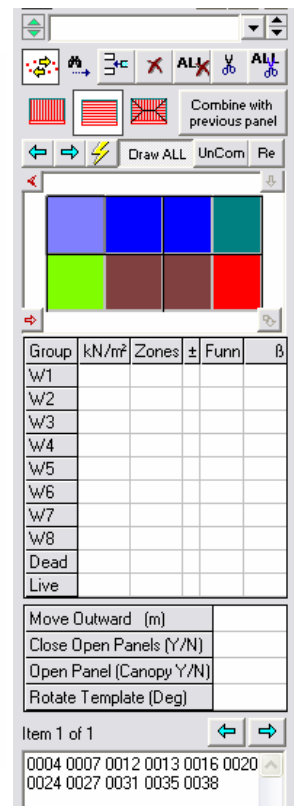
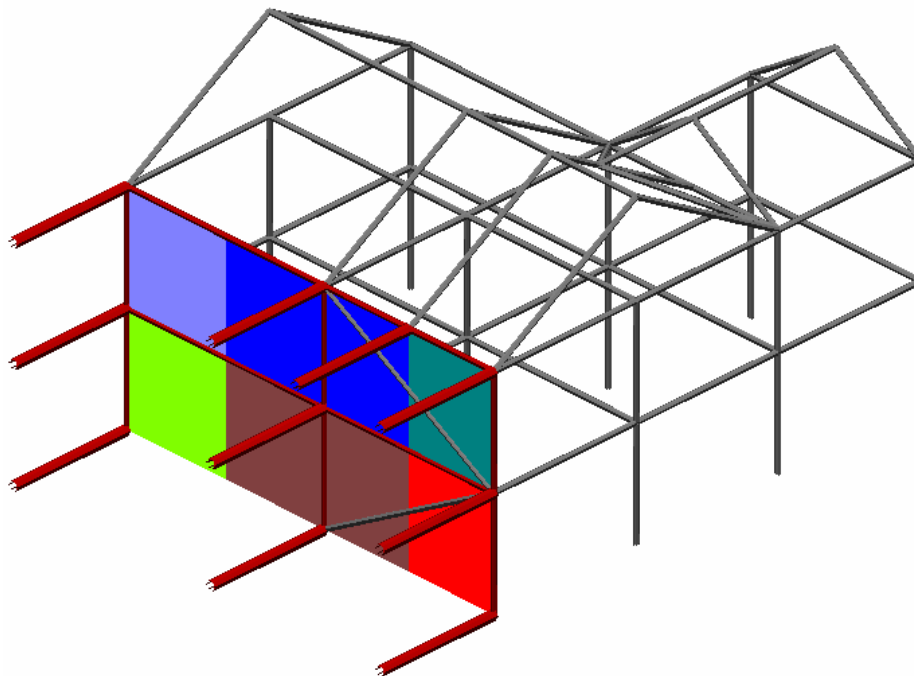
☞ Select all the members **which define the panels** in the surface. In this case it is all the members shown labelled except members 75 and 76 which are bracing members.





- If you make a mistake in the selection of members you can click on the incorrect members again to exclude them, or you can reset the current panel member selection by clicking on the 'clear current group' button

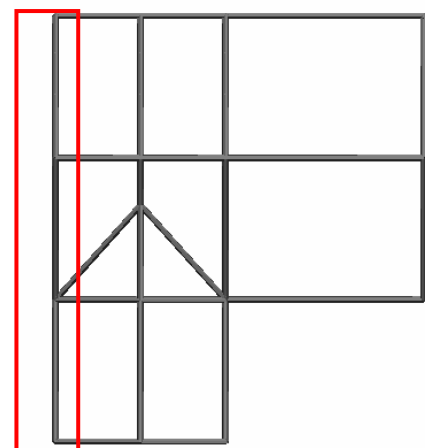


**Important!** Ensure that the panel is in the correct orientation. The red lines drawn normal to the surface indicate the side of the surface on which the +ve direction wind load is applied. **These should always be on the outside of the building in order for the calculated Cpe values to be correct.** If these are on the wrong side of the panel, click on the  button to change the direction of the arrows.

- The vertically spanning option is selected by default. In this example we will change to the horizontally spanning option .



- Click on the  button to define a new wind panel
- Place the structure on plan using the  on the top left of the tool bar
- Window all the members in the west elevation as shown to the right
- Place the structure back in isometric view 
- Again ensure the arrows are going the correct way and use the  button if necessary to change this



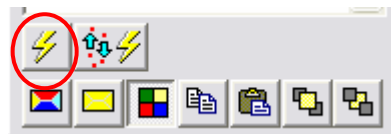
Note that we are still horizontally spanning

We have now created two wind panels using the Member-by-Member selection technique.

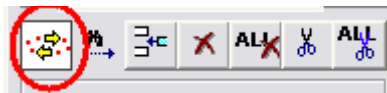
### Fast Selection of Horizontal (or any) Panels


In fact this method can be used to quickly select a panel of any orientation. The principal is instead of having to select all the members in a surface you simply pick on two or more of the members which are on opposite diagonal corners of the panel. The program then uses this information to automatically select all members within this range and plane. *The members selected must be on the same planar surface; otherwise no action will be taken.* This mode avoids having to individually select the members, or cross windowing groups of members where window selection is difficult.

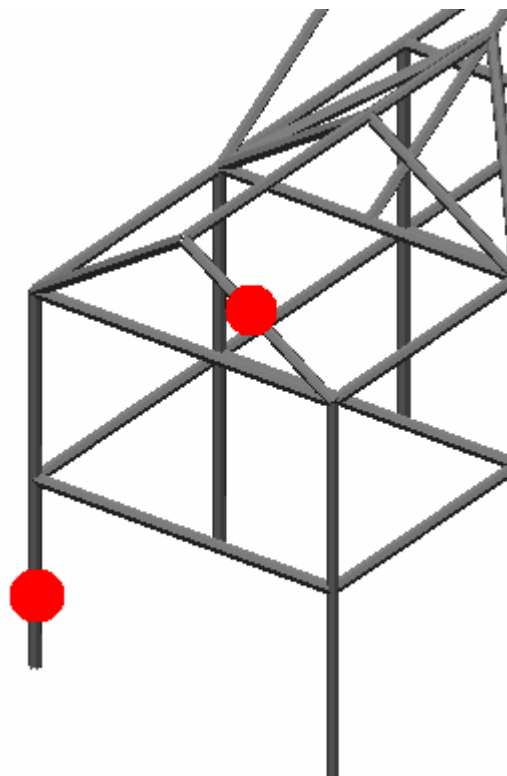
You enter this mode by selecting the appropriate menu item. It can also be turned on using the lighting flash button at the bottom right of the screen.



- ☞ Click on the above button at the bottom right of the screen to enter the Fast Selection mode
- ☞ Ensure that you are in 'Add/Remove Members' mode



- ☞ Click on the  button to define a new wind panel
- ☞ Click on the two members highlighted in the frame to the right
- ☞ In this mode click on any member in the panel. You will see the direction of the red normal lines changing. Ensure they are on the outside of the structure.



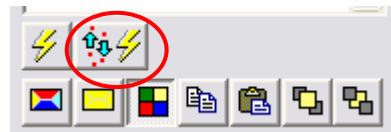
This method is most useful for creating panels that are in non-orthogonal orientations and contain a large number of members.

**Tip!** Once you are finished the fast selection mode, remember to turn it off by clicking on the lightning flash button again.

## Fast Selection of Vertical Panels

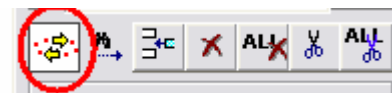
This mode is similar to the above Fast Selection method, in that you are only required to pick two members to define a panel, however the panel then generated by the program includes all members in the entire vertical plane. The two members selected must be on the same vertical plane, i.e. form a straight line on plan. If the wall panel is of a single member width then only one member need be selected. The recommended way to use this method is to place the building on plan, then pick a member at one end of the wall, then the other end, to create the panel. Again if the red direction arrows are on the inside of the building, click anywhere on the wall to change the direction.

You enter this mode by selecting the appropriate menu item; however, it can be turned on using the indicated lighting flash button at the bottom right of the screen.



Click on the above 'Fast Selection of Vertical Panels' button

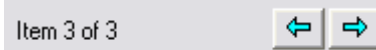
Ensure that you are in 'Add/Remove Members' mode



Place the structure on plan using the  on the top left of the tool bar

Turn on the member numbers using the 'M' button on the top tool bar

Note that the number of panel is currently 3



Click on member 50

This will create a wall panel in this plane. You will see now item 4 of 4. You can switch to a 3D isometric view to see this more clearly. We shall remain in plan.

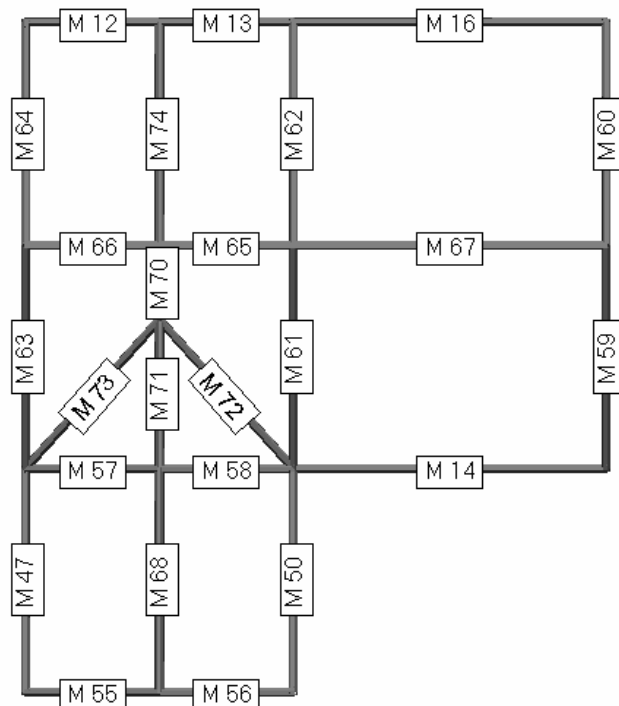
Click on member 14

Click on member 14 again to change the direction arrows to the outside of the building

Creates a new panel, 5 of 5.

Click on members 59 and 60

Creates panel 6 of 6. Note that because member 59 and 60 form a straight line they are one panel definition.



Note that it was not necessary to click the 'Add New' button during this process. Each time a member is selected that is not in the same plane as the current wind panel a new wind panel definition is automatically added.




This completes the wind panel definitions for the walls.

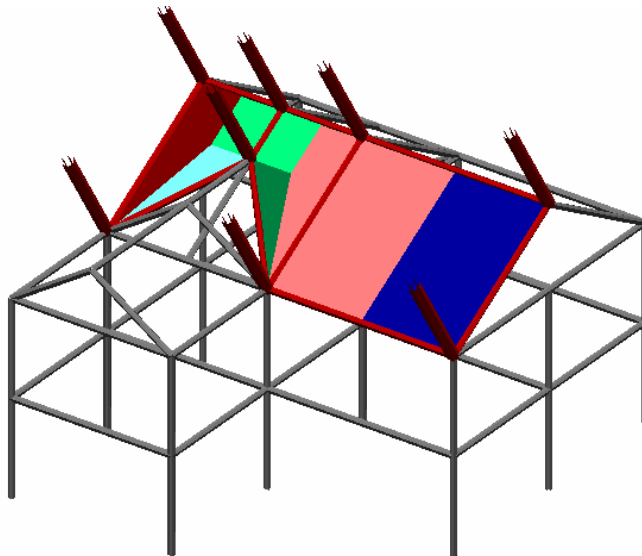
- Click on the 'fast vertical selection' button to turn it off.



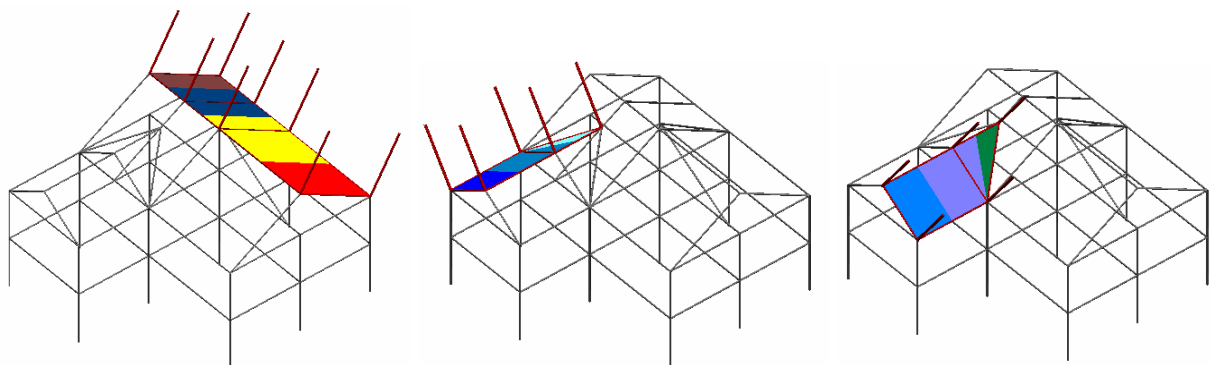
At this stage you should only have 6 wind panels. If you have more then you should go through each panel to investigate and modify or delete as appropriate.

Now let's create the remaining four panels in the roof

- Place the structure back in isometric view 
- Click on the  button to define a new wind panel
- Using 'member by member' selection create the panel shown below
- Ensure that the red normal lines are on the outside of the building using the  button if necessary to change this



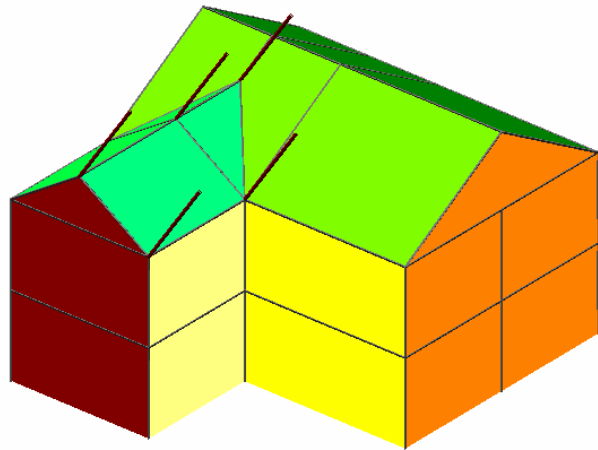
- Continue to add the remaining three panels in the same way



☞ Select  from the bottom right tool bar to draw all the wind loaded surfaces

☞ Select  from the bottom right tool bar to draw each surface in a separate colour

All your wind panels are now defined! Each panel definition is shown in a different colour.




☞ Close the Wind Panel editing area by clicking on the 'x'  icon at the top right of the screen.

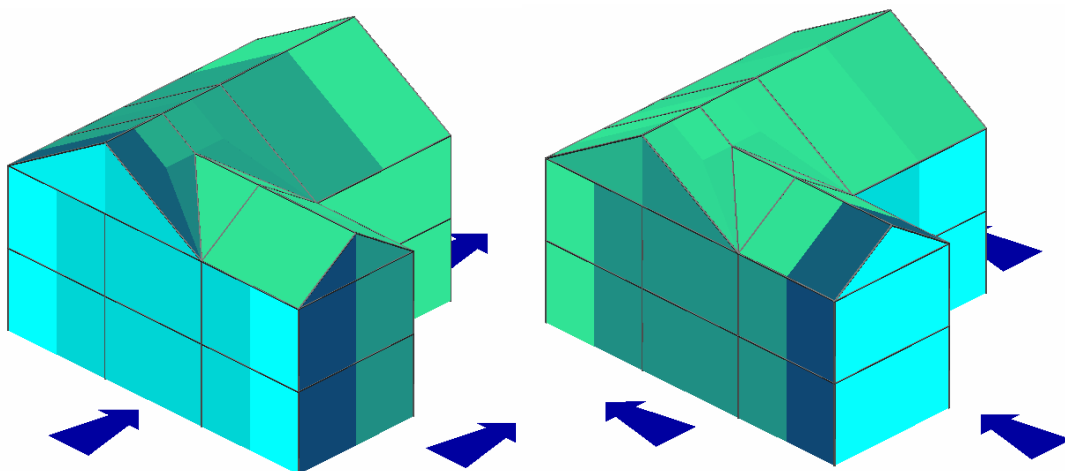
The wind loading application on this structure is now complete! The frame is fully automatically wind loaded, complete with all load cases for 4 wind directions.

All Panels are now Defined and the building location and orientation chosen!

## T12.10 View Wind Cpe & Zoning

☞ Depress the following buttons  in the top tool bar to see the Wind applied to the frame. The default view is W1-W8 which shows defined panels.

☞ Using the drop list 'W1-W8' at the right of the top tool bar, scroll through W1,W2,W3,W4  to see the 4 Wind Directions applied to the frame.

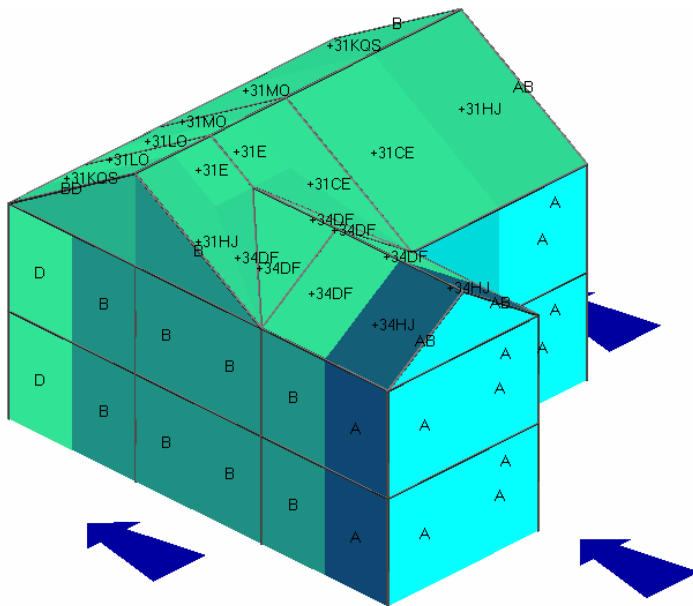


W1

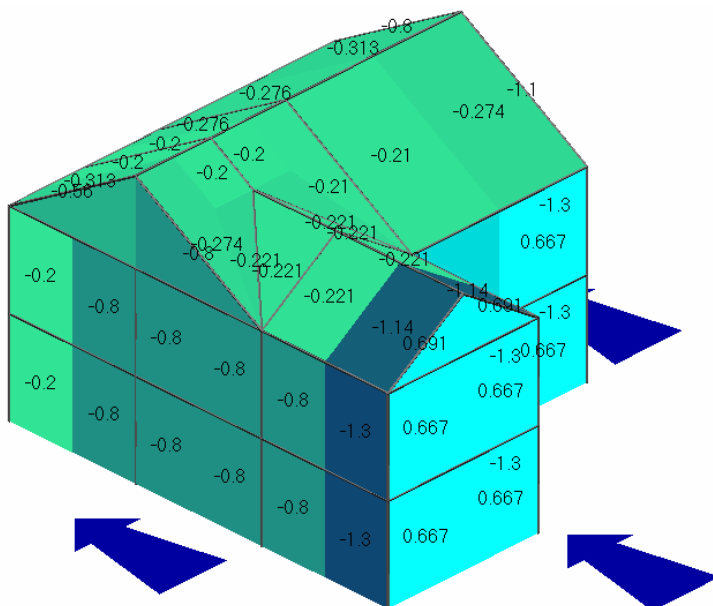
W2

See the Wind Pressures in Blue and Suctions in Green. Darker shades of each colour represent larger Cpe values.

☞ Switch on Wind Zoning letters using the **W** button in the top tool bar.



☞ Switch off **W** Wind Zones and switch on Cpe Values **Cp**



☞ Switch off **Cp** Cpe Values and switch on the final panel pressures **q**

This displays the panel pressure according to the equation  $0.85(1+Cr) \times Cpe \times q$ .

Where Cr is the dynamic augmentation factor specified in section 12.6 of this tutorial and q is the dynamic site pressure values established in section 12.8.

This concludes the MasterKey Wind Analysis tutorial. In this example we have seen how wind loading can be easily, automatically and accurately applied to a frame with vertical and inclined surfaces. MasterKey Wind Analysis will perform equally as well with structures comprising horizontal surfaces, inset storeys and much more.