VELVENTI
USER MANUAL

CADS

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Contents

Introduction

Welcome to *VelVenti* wind and snow load calculator developed by CADS. VelVenti enables the rapid calculation of peak wind velocity, wind pressure and site snow load in accordance with a number of structural design standards.

VelVenti is presented as a standalone application but also works integrated with CADS SMART Portal software. You start by specifying a site location and continue to review and refine the default wind factors before finally printing the calculated wind pressure(s) as a report. The results may then be processed to apply the wind and snow loads to a structural model. The wind calculations are done for a number of sectors at various heights. Results are presented in the form of tables and graphs.

VelVenti provides particular benefits when connected to the internet, when information such as the site altitude and details of the surrounding topography are determined automatically. The site wind velocity, distance to the shoreline are also automated for sites within the United Kingdom, Republic of Ireland and the United States. Distance inside town terrain and ground snow load are automated for sites within United Kingdom, Republic of Ireland.

VelVenti's wind calculator supports design standards for the following countries:

- UK – BS EN 1991-1-4 with UK national annex or BS 6399-2;
- Ireland – IS EN 1991-1-4 with Irish national annex or BS 6399-2;
- USA – ASCE 7-10 (with imperial units);
- Rest of the world – EN 1991-1-4 with Eurocode recommended parameters.

VelVenti's snow load calculator supports design standards for the following countries:

- UK – BS EN 1991-1-3 with UK national annex or BS 6399-3;
- Ireland – IS EN 1991-1-3 with Irish national annex;

VelVenti runs on the following operating systems:

- Windows Vista;
- Windows 7;
- Windows 8 and 8.1
- Windows 10.

Working online vs offline

This section gives an overview of the differences between working with VelVenti online (connected to the internet) and offline (not connected to the internet).

When the software is online and the site is within the British Isles, a directional wind calculation is provided that is completely automated (expect for terrain roughness), but may be edited if required. At the other extreme, where the software is not connected to the Internet and the site is outside of the British Isles the calculation will consider the worst case wind direction only, with manual inputs.

Feature	British Isles		North America		Elsewhere	
	Online	Offline	Online	Offline	Online	Offline
Site specific wind velocity	✓	✓	✓	✓	×	×
Automated site altitude	✓	×	✓	×	✓	×
Directional wind calculation	✓	✓	✓	✓	×	×
Automated (directional) site topography/orography	✓	×	✓	×	✓	×
Automated (directional) distance to shoreline	✓	✓	n/a	n/a	×	×
Automated (directional) detection of site terrain (town/country/sea)	✓	✓	×	×	×	×

Site and building information

Site and building information

In this section of the program the user defines the site location and reviews those wind factors which are direction independent. Topics in this section include the following:

Specifying a site

Site reference

Design code

Wind velocity

Site altitude

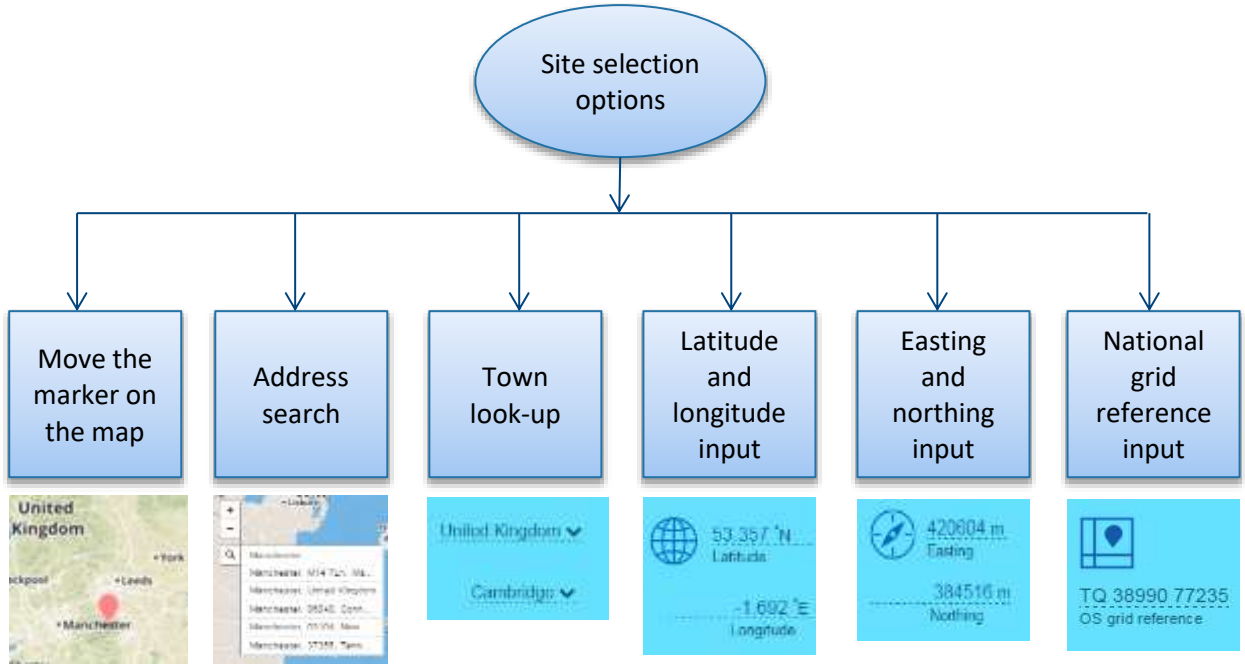
Structure height

Design life and probability factor

Exposure period and seasonal factor

Structure orientation from North

Specifying a site



Options for site selection

The table below presents a summary of the different options available for locating a site depending on internet connectivity and the country in which the site is located.

S.No.	Input	Connected to internet				Not connected to internet			
		Site in the UK	Site in Republic of Ireland	Site in the USA	Any other location	Site in the UK	Site in Republic of Ireland	Site in the USA	Any other location
1.	Map	✓ Online map	✓ Online map	✓ Online map	✓ Online map	✓ Offline map	✓ Offline map	✓ Offline map	✓ Offline map
2.	Address search	✓	✓	✓	✓	×	×	×	×
3.	Town look-up	×	×	×	×	✓	✓	×	×
4.	Latitude & longitude	✓	✓	✓	✓	✓	✓	✓	✓
5.	Northing & easting	✓	✓	×	×	✓	✓	×	×
6.	National grid reference	✓	✓	×	×	✓	✓	×	×

Back to site and building information

Map

Online map showing the marker

Offline map

Drag / move the marker on the map to locate a site for which the design wind pressure needs to be determined. The map displayed will vary depending upon whether your device is connected to the internet or not. The map will be less detailed when not connected to the internet.

Zoom and pan:

You can use the + and – on-screen buttons to zoom in and out of the current site location.

If you want to zoom another location place the cursor over it and use the mouse wheel to zoom in or out.

Similarly you can use the mouse wheel to pan the map - press and hold it down and then move the mouse to manipulate the map.

Note that on a touch screen you can use pinch-zoom – pinch around the area you wish to zoom to.

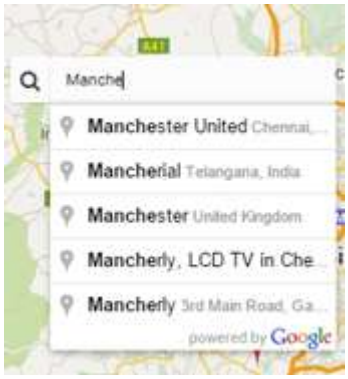
Satellite view: When connected to the internet, satellite view can be switched on using the option on the map.

Satellite view

Back to specifying a site

Address search

When connected to the internet it is possible to locate a site using the address search facility as shown below.



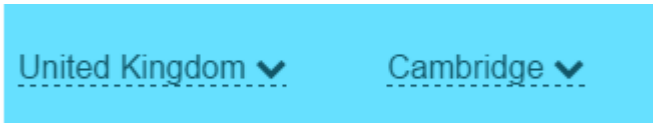
Online address search

Typing relevant text or postcode brings up a dropdown list of possible locations. Select the entry from the list that most nearly represents the site. Click on the search icon to close the dropdown. The map will show the selected location and you can then use the zoom and marker to locate the site more closely.

Back to specifying a site

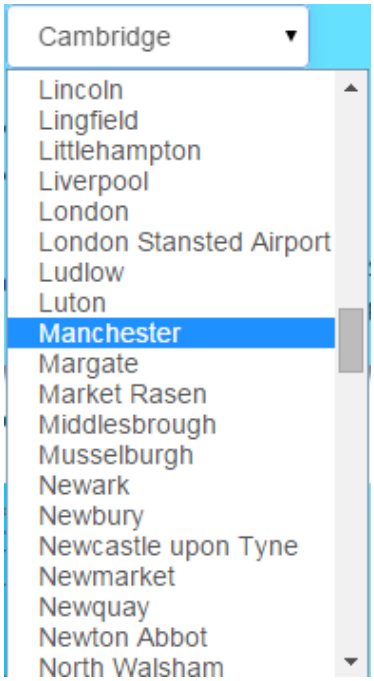
Town look-up

The address search option will be replaced with the town look-up facility when not connected to the internet. Select the country and then the city or town from the dropdown lists. This list is currently available only for the United Kingdom and Ireland.



Town lookup

Select country



Select town

Back to specifying a site

Latitude and Longitude

Latitude and longitude

The site latitude and longitude will be automatically calculated by the application based on the site marker position whether connected to the internet or not. When these inputs are manually modified all related inputs are automatically updated. This includes the site marker on the map (red/blue balloon), site reference, easting and northing (if applicable for the country), national grid reference (if applicable for the country) and the design code (when applicable). All the derived wind parameters are also updated as a result of updating the site location.

Click on the dotted line to turn the field into edit mode. Two input boxes will be displayed for latitude and longitude respectively. Once modified click on the tick mark  or press *Enter* to accept the changes.

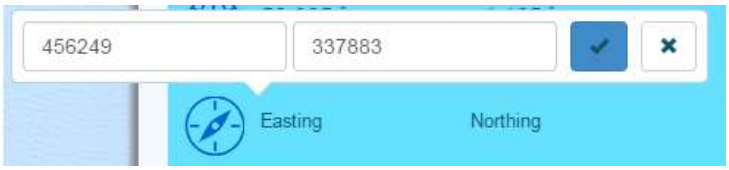
Editing Latitude and Longitude

Back to specifying a site

Easting and Northing

Easting and Northing

The easting and northing will be automatically calculated by the application based on the latitude and longitude and the grid referencing system of the country in which the site is currently located. This option is currently applicable for UK and Republic of Ireland only. When these inputs are manually modified all related inputs and derived wind parameters will be automatically updated similarly to when changing latitude and longitude.



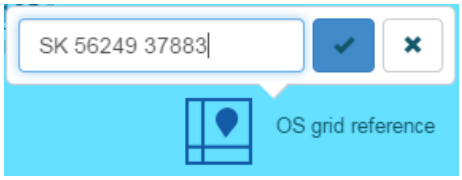
Editing Easting and Northing

Back to specifying a site

National grid reference

Grid reference

The national grid reference refers to the Ordnance Survey (OS) grid reference for sites within the UK and the Irish grid reference for sites within the Republic of Ireland. The field will not appear when the site is in any other country. As with other location fields the grid reference can be directly entered to locate a site and the related inputs and derived wind parameters will be updated accordingly.



Editing grid reference

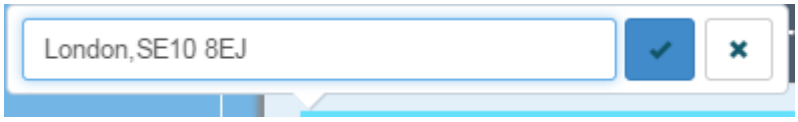
Back to specifying a site

Site reference or postcode

When connected to the internet a relevant site reference and postcode is automatically displayed by the software whenever a location input is changed. It is possible to add more specific details by clicking

on the field which turns it into edit mode. Enter required text and click on the tick mark. Note that it is possible to input misleading or spurious text here so please edit responsibly. Editing the postcode will not change the site location.

Default site reference



Site reference in edit mode

Site reference text after user update

The user edit will be retained until the site location is modified. Any change to the site location will override the user edited site reference.

The site reference should be manually input when not connected to the internet.

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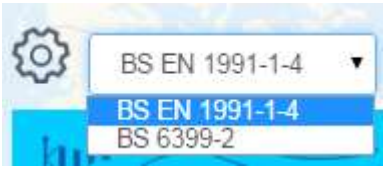
Design code

VelVenti supports wind pressure calculations in accordance with up to 3 different design codes but the available design code will be based on the site location:

- BS EN 1991-1-4 and BS 6399-2 for sites in the UK;
- IS EN 1991-1-4 and BS 6399-2 for sites in the Republic of Ireland;
- ASCE 7-10 for sites in the USA;
- EN 1991-1-4 for sites in rest of the world.



Design code for the UK

BS EN 1991-1-4 represents EN 1991-1-4 as modified by the UK national annex; IS EN 1991-1-4 represents EN 1991-1-4 as modified by the Irish national annex and EN 1991-1-4 represents the Eurocode itself with its recommended parameters.

The design code will be automatically defaulted when the site location is modified.

BS 6399-2 calculation methods

For BS 6399-2 a further option is available to select the calculation method:

- Standard method;
- Directional method.

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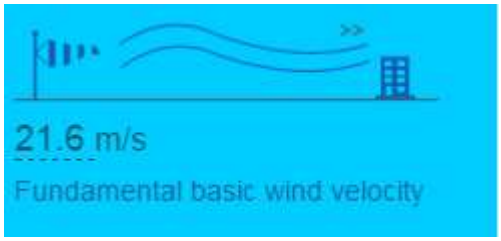
Wind velocity



Basic wind velocity

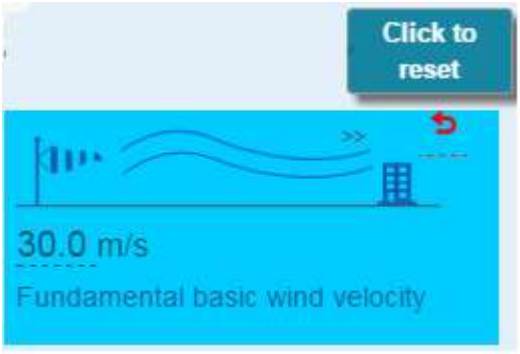
The input depends upon the design code and the site location.

Site location	Design code	Input field	Remarks
USA	ASCE 7-10	Basic wind speed, V	Determined automatically based on Figure 26.5-1A except for special wind regions which require manual input
UK / Ireland	BS EN 1991-1-4 / IS EN 1991-1-4	Fundamental basic wind velocity before altitude correction $V_{b,map}$	Determined automatically based on Figure NA.1 of the national annex.
UK / Ireland	BS 6399-2	Basic wind speed, V_b	Determined automatically based on Figure 6 of BS 6399-2
Any other location	EN 1991-1-4 with Eurocode recommended parameters	Fundamental basic wind velocity with altitude correction, $V_{b,0}$	User input

Note that the Channel Islands are currently not considered to be part of the UK for this purpose hence will be treated as any other location with the design code set to EN 1991-1-4 and Eurocode recommended parameters.

Editing the basic wind velocity

The calculated basic wind velocity can be overridden by clicking on the field, entering the user defined value and clicking on the tick mark. The user edit will be notified in the report.



Resetting the basic wind velocity

An undo symbol is displayed indicating the user has overridden the calculated value. Click on the symbol to reset to the program calculated value.

User input for sites other than the UK / USA and Ireland

All fields which require an input from the user are marked with a star at the right corner of the field and a question mark placed against the input field.

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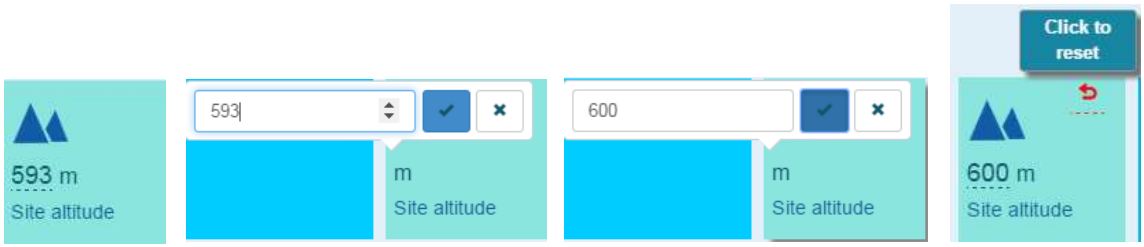
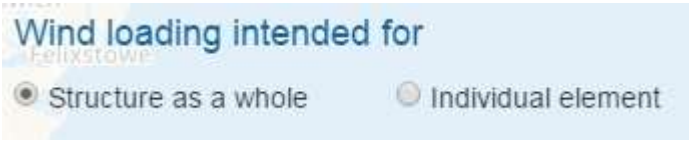
Site altitude

The site altitude is automatically determined when connected to the internet using the Google web service. The calculated site altitude may be overridden similarly to any other field. Click on the undo symbol to reset to the program calculated value.



Site altitude

The site altitude along with the *wind loading intended for* input influences the calculation of the altitude factor when the design code is BS EN 1991-1-4 / IS EN 1991-1-4.



Wind loading intended for

When *wind loading intended for* is set to *structure as a whole* the height used for altitude factor calculation is taken as 0.6 times the structure height in accordance with the UK NA to EN 1991-1-4 clause NA.2.5 otherwise it is taken as the structure or component height (figure 6.1a of EN 1991-1-4).

Site altitude is not used with other design codes (EN 1991-1-4 and ASCE 7-10) and is for information only.

Note that when the building is on sloping ground it may be advisable to perform 2 sets of calculation to determine the most onerous or appropriate wind pressure for designing the structure. See influence of sloping ground under examples.

Site altitude input in offline mode

Site altitude should be manually input when not connected to the internet (offline).

Back to site and building information

Structure height

Structure height

In addition to calculating the wind pressure at the structure height, it is also calculated in predefined intervals up to the structure height. The pressure graph and the pressure variation across directions display results at these intervals. Please refer to Graphical results for more information on the results display.

BS EN 1991-1-4, IS EN 1991-1-4, EN 1991-1-4 and BS 6399-2	ASCE 7-10
5 m,	16 ft,
10 m,	33 ft,
20 m,	66 ft,
30 m,	98 ft,
50 m	164 ft
and structure height	and structure height

Predefined intervals at which the wind pressure is calculated

Back to site and building information

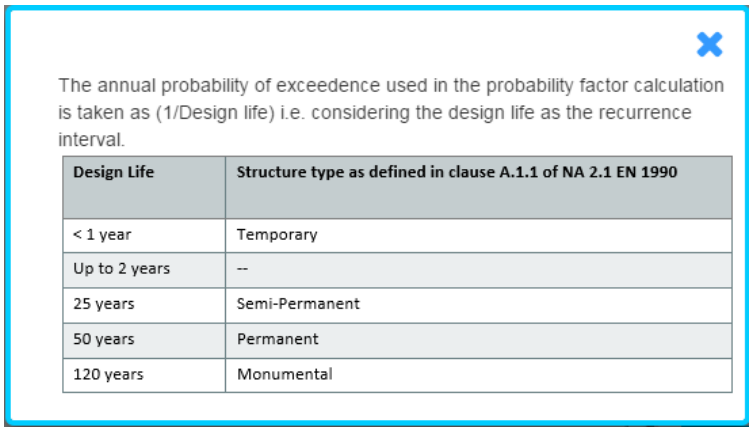
Design life and probability factor

BS EN 1991-1-4, IS EN 1991-1-4, BS 6399-2 and EN 1991-1-4

Design life and probability factor

Drag the slider to modify the design life. When the design life is set to <1 year the structure is assumed to be temporary (eg scaffolding) and options for the seasonal factor are presented.

Clicking the information icon displays the following:



The annual probability of exceedence used in the probability factor calculation is taken as (1/Design life) i.e. considering the design life as the recurrence interval.

Design Life	Structure type as defined in clause A.1.1 of NA 2.1 EN 1990
< 1 year	Temporary
Up to 2 years	--
25 years	Semi-Permanent
50 years	Permanent
120 years	Monumental

EN 1991-1-6 Actions on structures – General actions – Actions during execution: table 3.1 gives recommended return periods for transient design situations such as the verification of temporary bracing for a retained façade. It is not considered in this application.

Under the Eurocode options, the probability factor c_{prob} is calculated according to expression 4.2 of EN 1991-1-4 with K = 0.2 and n = 0.5. Under the BS 6399-2 option the probability factor S_p is calculated according to expression D.1

ASCE 7-10

The design life and probability factor inputs are not applicable to the ASCE 7-10 code hence will not appear when the site is in the USA.

Back to site and building information

Exposure period and seasonal factor

BS EN 1991-1-4, IS EN 1991-1-4, BS 6399-2

Seasonal factor

Exposure period and seasonal factor inputs appear when the design life is less than one year and the site is in the UK or Ireland. On specifying the start and end months the application will automatically produce the seasonal factor in accordance with the selected code. Alternatively it is possible to override the calculated seasonal factor as with any other calculated fields and any such user edits will be marked in the output and on the screen.

With BS EN 1991-1-4 and IS EN 1991-1-4 the seasonal factor c_{season} is calculated according to table NA.2.7 and with BS 6399-2 the seasonal factor S_s is calculated according to table D.1 based on the selected exposure period.

ASCE 7-10

The seasonal factor input is not applicable to the ASCE 7-10 design code hence will not appear when the site is in the USA.

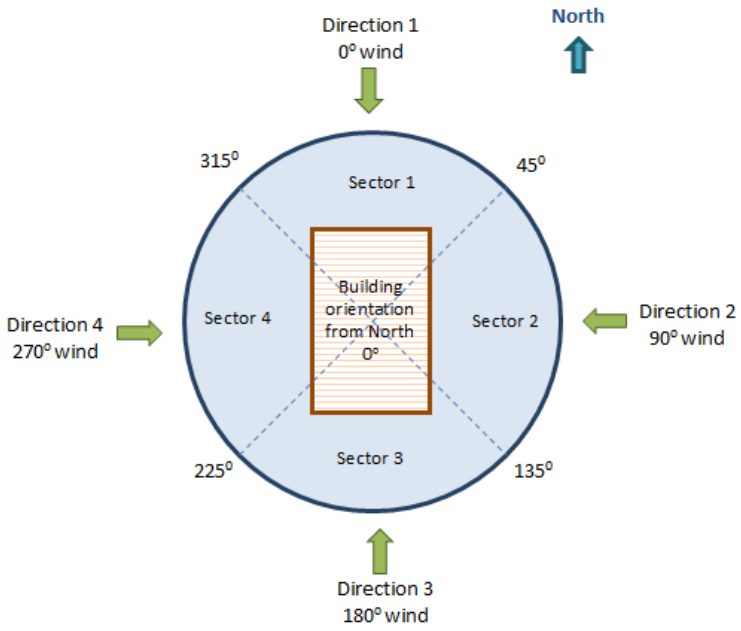
EN 1991-1-4

When the site is located outside the UK / Ireland / USA the seasonal factor should be input manually.

Back to site and building information

Structure orientation from North

The wind velocity and pressure is calculated at various heights in different wind sectors as selected by the user. By specifying the structure orientation from North it is possible to orient/align the wind sector to suit the structure. Examples with 4 sectors are shown below. The building orientation is irrelevant when the number of wind sectors is set to 1. An example with 12 wind sectors is available as an appendix.



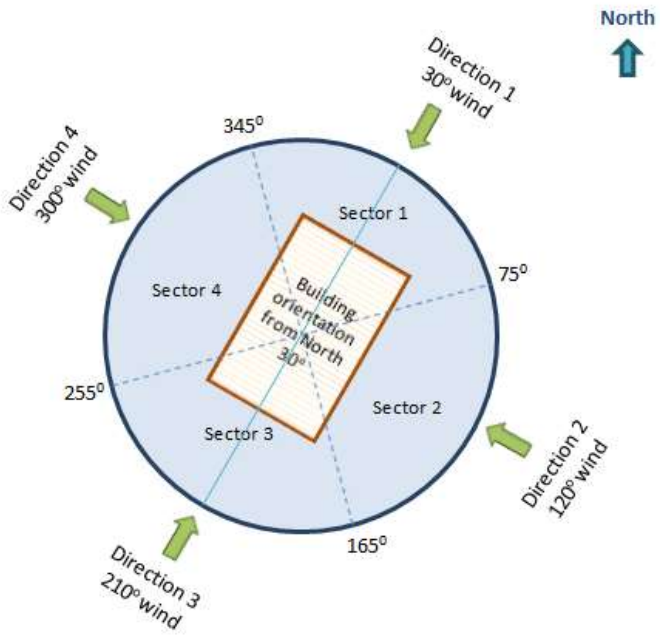
Example: 1

Number of wind sectors = 4

Orientation from North = 0°

Sector range:

- Sector 1 = 315° to 45°
- Sector 2 = 45° to 135°
- Sector 3 = 135° to 225°
- Sector 4 = 225° to 315°



Example: 2

Number of wind sectors = 4

Orientation from North = 30°

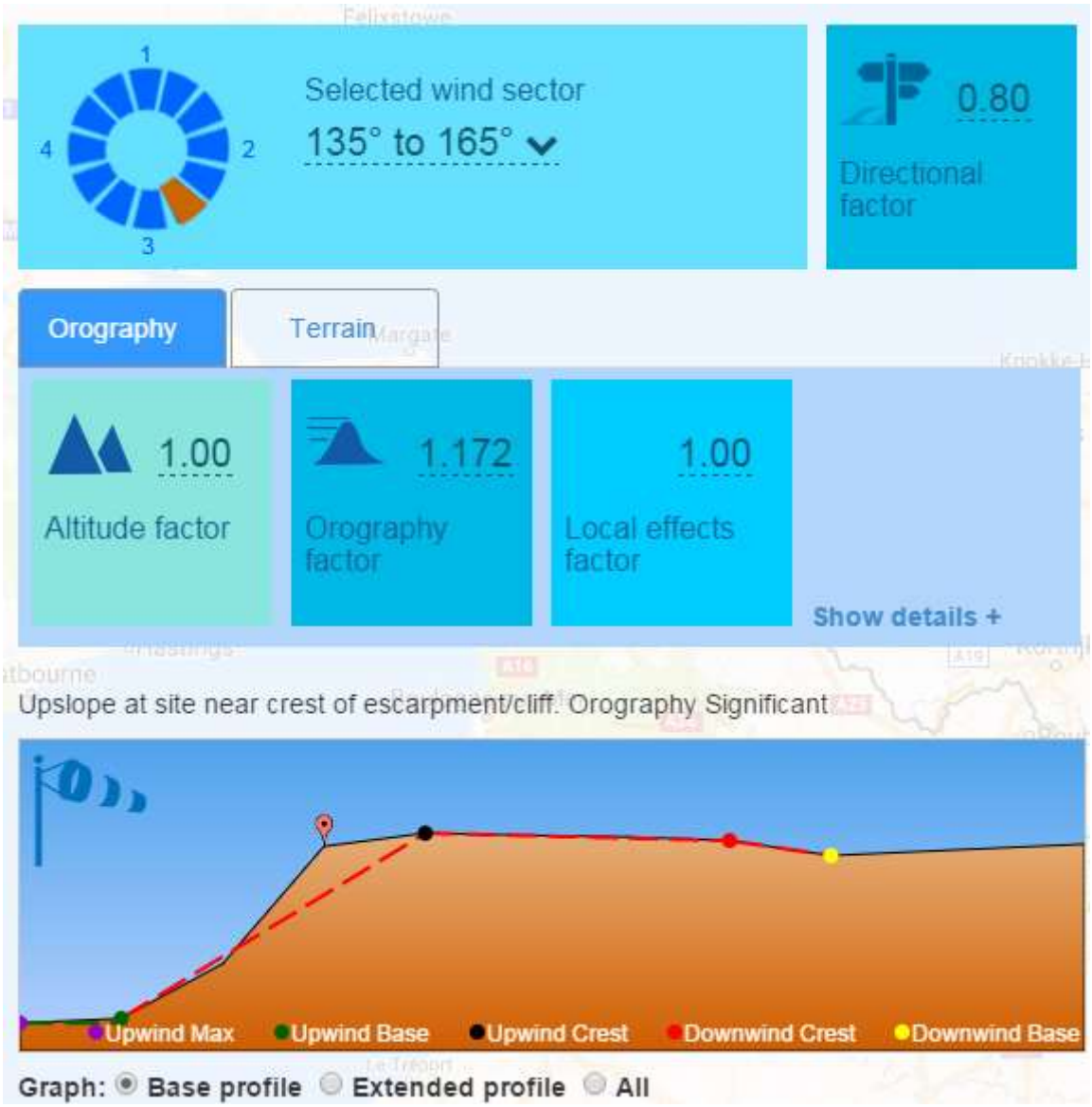
Sector range:

- Sector 1 = 345° to 75°
- Sector 2 = 75° to 165°
- Sector 3 = 165° to 255°
- Sector 4 = 255° to 345°

Structure orientation from North

Back to site and building information

Wind sector information



Wind sector information

In this section of the program the user specifies the number of wind sectors and reviews the factors for each of those sectors. Topics in this section include the following:

Wind sectors

Directional factor

Altitude factor

Orography / Topography

Local effects factor

Terrain / Exposure

Wind sectors

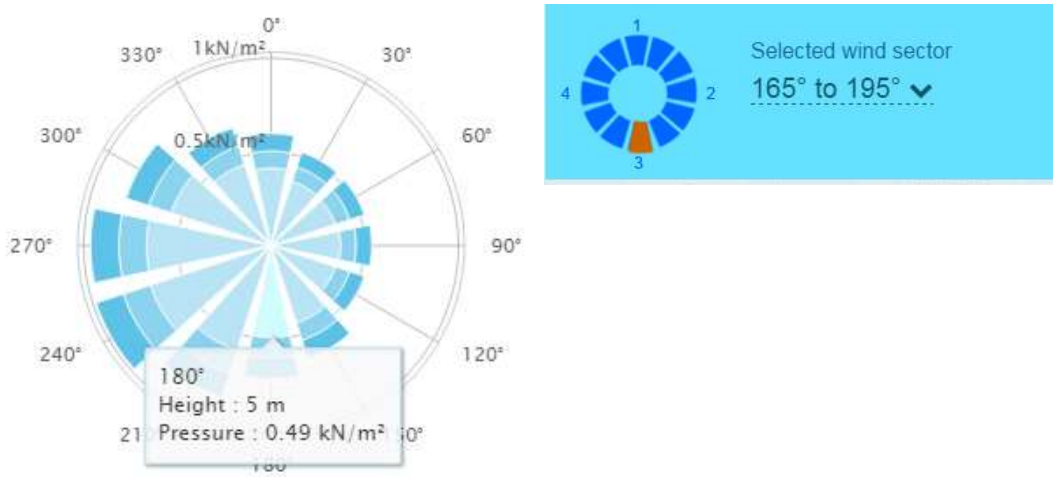
Number of wind sectors

VelVenti does directional calculations and allows the user to specify the number of sectors for calculation. The available number of sectors depends upon the design code selected.

Design code	Options for number of wind sectors
ASCE 7-10	8, 4, 1
BS EN 1991-1-4 / IS EN 1991-1-4	12, 8, 4, 1
BS 6399-2	12, 8, 4, 1
EN 1991-1-4 with Eurocode recommended parameters	1

The direction dependent factors can be viewed / edited one sector at a time. The current wind sector is selected either through the dropdown or graphically by clicking on the compass rose or on the pressure variation display which is accessed via the  button. Note that the sector numbers refer to the building and the degree directions are relative to North 0°

Select the wind sector through the dropdown or compass rose.



Select the wind sector by clicking on a sector from the report graphic showing pressure variation across compass directions

The numbers 1/2/3/4 on the graphics represent the building faces and the default selection on the graphics indicates the face of the building that is in the dominant wind direction. The dominant wind direction is that which produces the greatest peak velocity pressure (or dynamic pressure in BS 6399-2).

Building face and dominant wind direction

In the example shown above with the default structure orientation of 0° face 4 of the building includes 3 sectors including the dominant 240° wind direction whereas with an 180° orientation face 2 of the building includes the dominant wind direction. Note that the building face numbers move to suit the orientation but the compass direction remains constant. Please refer to the appendix for an example on how the 12 directions are mapped to building faces.

Back to wind sector information

Directional factor

BS EN 1991-1-4, IS EN 1991-1-4 and BS 6399-2

The directional factor is automatically calculated by the program for each of the wind sectors.

It is based on table 3 for BS 6399-2 and Table NA.1 for BS EN 1991-1-4 / IS EN 1991-1-4. If the number of wind sectors is less than 12 the largest value within the sector is defaulted.

The user can override the calculated directional factor. Edited factors will be indicated in the output by an asterisk.

Direction factor displayed corresponds to the selected wind sector only.

EN 1991-1-4

The directional factor is defaulted to 1.0 in all directions for EN 1991-1-4. The user can edit it if required. This will be indicated in the output by an asterisk.

ASCE 7-10

Directionality factor with ASCE 7-10

Section 26.6 of ASCE 7-10 states that directionality factor shall be included in determining wind loads when load combinations specified in section 2.3 and 2.4 are used for design. Since the load combination information is not available in VelVenti the value is defaulted to 1.0 for all wind sectors. The user can edit the value based on table 26.6-1 which is based on the structure type.

Back to wind sector information

Orography/Topography

Altitude factor

The altitude factor is applicable only for sites within the UK and Republic of Ireland. If the site location is other than the UK or Ireland it is assumed the altitude correction is already accounted for in the basic wind velocity hence the altitude factor field will not appear.

Altitude factor

When applicable the altitude factor is automatically calculated by the program. The value displayed is for the currently selected wind sector only. If the site orography (topography in BS 6399-2) is significant the upwind base altitude is used for the calculation hence the factor can vary in different wind sectors. The user can override the calculated altitude factor. This will be indicated in the output by an asterisk. The altitude factor is automatically recalculated whenever the site altitude or the upwind base altitude is modified.

For BS EN 1991-1-4 and IS EN 1991-1-4 the altitude factor c_{alt} is calculated based on NA.2.5 expression NA.2a. The alternative expression from NA.2b is used when 'z' is greater than 10 m.

Wind loading intended for input and altitude factor

Note that 'z' is taken as structure or component height when the *Wind loading intended for* option is set to `individual element' whereas 'z' is taken as 0.6 times structure height (based on figure 6.1 a of EN 1991-1-4) if *wind loading intended for* input is set to `structure as a whole'.

For the BS 6399-2 standard method the altitude factor S_a is calculated based on clause 2.2.2.2 and for the directional method expression 25 or 26 is used based on topography significance.

Altitude factor displayed corresponds to the selected wind sector only.

When the Orography category is flat and the user edits the orography factor to greater than 1.0 site altitude will be used instead of upwind base altitude for altitude factor calculation.

Wind sector ground profile idealisation and orography/topography factor

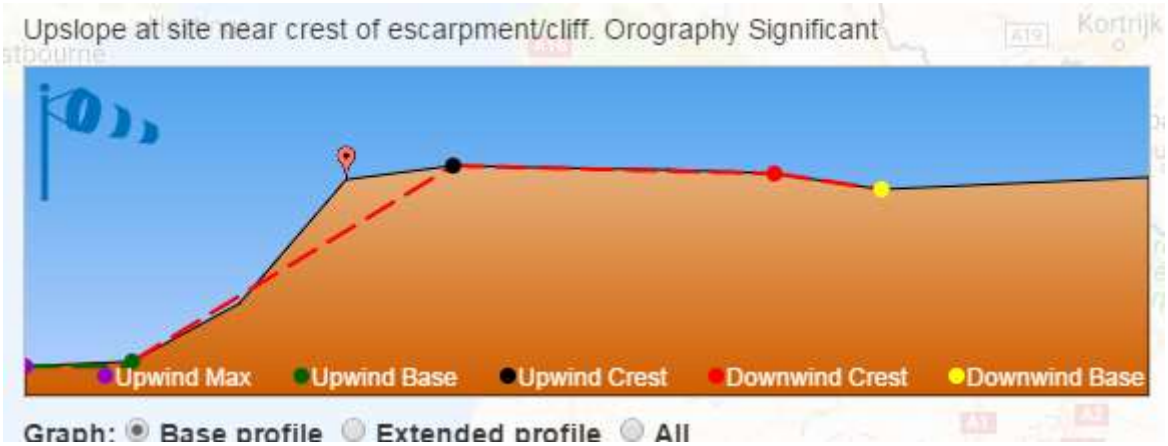
EN 1991-1-4, BS EN 1991-1-4, IS EN 1991-1-4 and BS 6399-2

When connected to the internet, ground surface profiles are obtained for each of 12 wind direction sectors centred on the site location using Google data. The software attempts to match the actual ground profile for each sector to the idealised profiles given in EN 1991-1-4 figs A2 and A3 and BS 6399-2 fig 7. Based on comments in SCI P394 *Wind actions to BS EN 1991-1-4* section 5.3 - stage 13 a search radius of 4 km is used in the software with altitude data obtained for the varying range of intervals shown below.

Interval no	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Horizontal distance from site in metres	50	100	150	200	250	375	500	675	750	1000	1250	1500	2000	2500	3000	4000

The sector is classified as Nominally flat or sheltered, Hill or Ridge, Cliff or Escarpment based on the idealised slope profile fitted to the actual profile. A more detailed description is also given. In the illustration the orography/topography classification is *Cliff or escarpment* and the detailed description

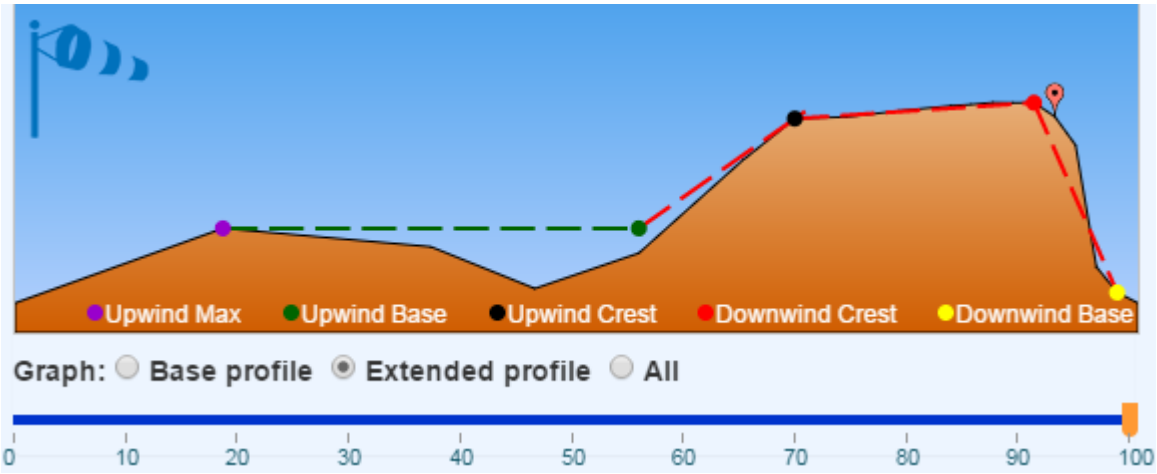
is *Upslope at site near crest of escarpment/cliff Topography significant.* The equivalent feature is defined by 4 dots as shown in the example graphic below. The dots are joined by broken red lines.



The four dots respectively indicate:

- The base of the upwind slope if present. [dark green dot]
- The crest of the upwind slope if present.[black dot]
- The downwind crest if present. [red dot]
- The base of the downwind slope if present. [yellow dot]

A fifth purple dot indicates the upwind point of maximum altitude if a slope is fully or partially sheltered by higher ground upwind and a broken green line is drawn to indicate the shelter effect as shown in the illustration below:-



Note that the idealised profile may include both upwind and downwind crest points and therefore implies a summit length. This is to cater for the fact that most ridges and hills in the UK and Ireland do not have sharp peaks but are more or less rounded or flattened. The software generally follows the recommendations of *BRE Digest 346 part 5: Assessment of wind speed over topography* (BRE 1989) to distinguish between ridge/hill and cliff/escarpment categories.

Note that there are three radio button options for viewing the ground profile:

- *Base profile* includes the four main points of the idealised profile
- *Extended profile* also includes the maximum upwind point giving shelter if present.

- *All* includes the whole ground profile between 4 km upwind and 4 km downwind of the site.

There is also a slider control so that vertical scale can be reduced if the user considers that the default vertical scale is is too exaggerated for credible presentation.

Note that the printout and preview profile graphics will be governed by the above settings and so will be a direct copy of the screen image.

Note that the wind direction is always left to right as shown by the VelVenti wind sock symbol.

The calculated slope parameters can be viewed by clicking on the *Show details* option as illustrated below:

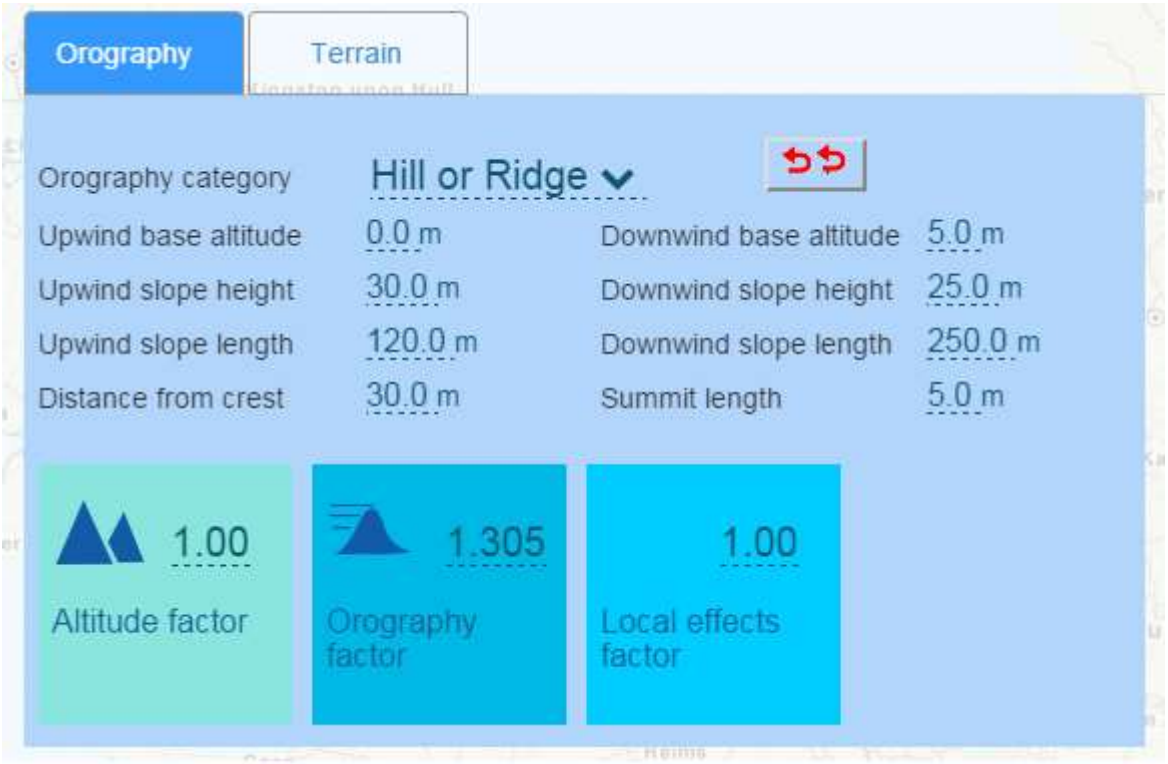
Orography /topography details

In the current version of the software It not possible to override the calculated slope parameters although this is planned for a future version. However if the user is not satisfied with the calculated and displayed idealisation the orography factor (topographic increment in BS 6399-2) may be edited.

Saved user editing will be indicated in the output by an asterisk.

For the Eurocode options the orography factor C_o is calculated based on the procedure described in Annex A.3. For BS 6399-2 the topography location factor's' is calculated based on Annex G.

When the software is used off-line it is not possible to obtain altitude data from the internet and so the user must input more information for any known topographical feature affecting the wind at the site using the orography / topography details as indicated by the diagram below. The software will then calculate the orography factor or topographic increment as appropriate for the selected code.

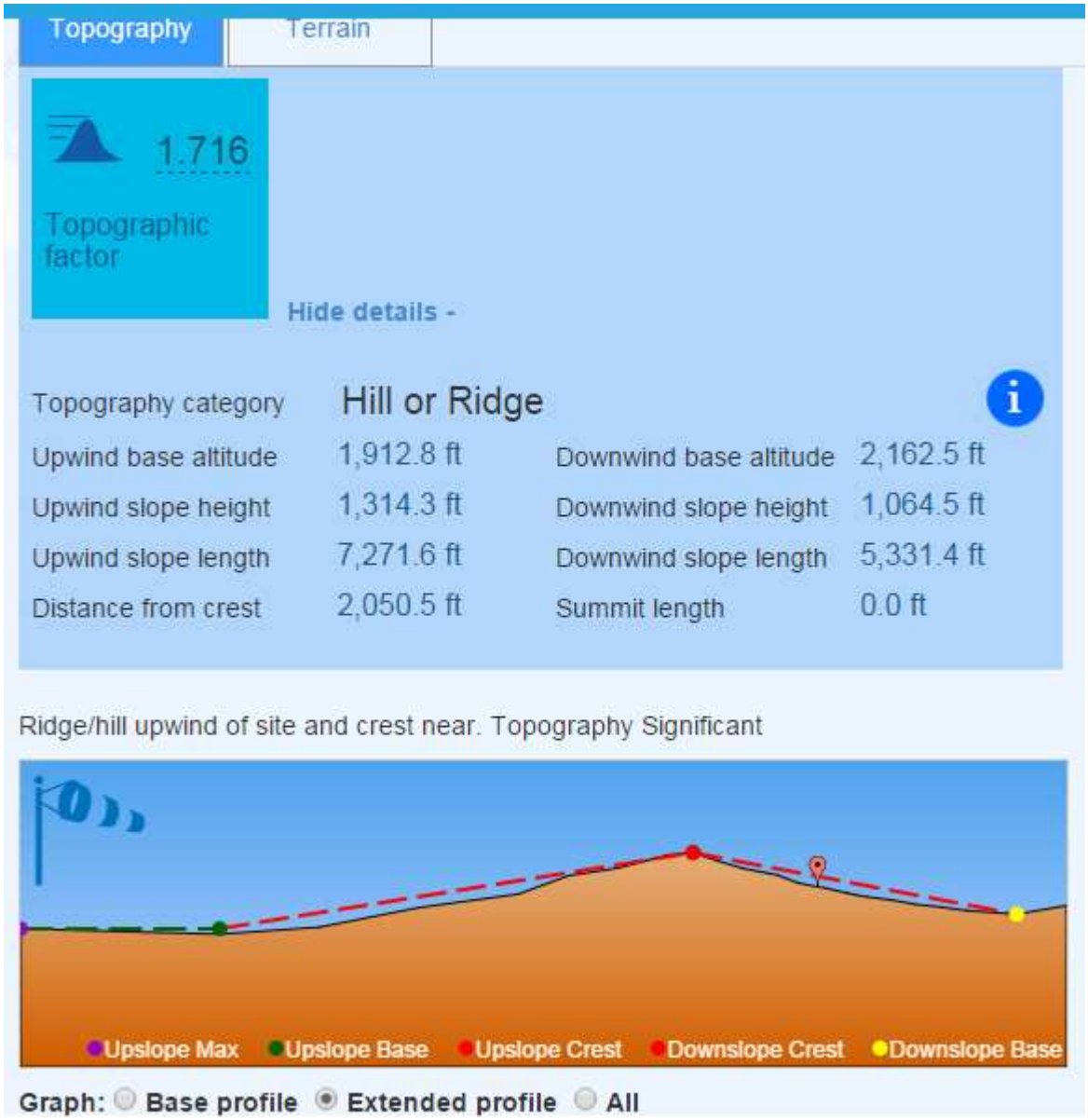


Editable orography display when not connected to the internet

ASCE 7-10

When connected to the internet the site is automatically assessed and slope parameters obtained using the procedure outlined above for BS EN 1991-1-4 and BS 6399 . Based on the slope parameters the sector is classified as Nominally flat, 2D ridge or 2D escarpment in accordance with ASCE-7-10. The calculated hill parameters can be viewed by clicking on the *Show details* option. It is possible for the user to manually change the topography category to 3D axisymmetric hill or override the calculated topography factor.

The ASCE 7-10 topographic factor K_{zt} is calculated based on clause 26.8.2.



Topographic factor for ASCE 7-10

Local effects factor

This input field allows you to make allowance for local orographical/topographical conditions for which there is no published guidance. You may enter a value between 0.80 and 1.20 which will be applied as a simple multiplier to the basic wind velocity. A value greater than the default value (1.00) may be input to allow for acceleration of the wind blowing up the longitudinal axis of a steep sided valley. A value less than 1.00 might be used to allow for favourable sheltering effects within a totally enclosed valley or `bowl'.

Back to wind sector information

Terrain / Exposure

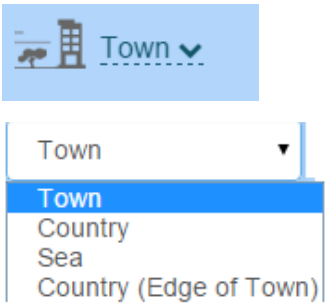
The factors relating to terrain / exposure are presented in this section of the software.

EN 1991-1-4, BS EN 1991-1-4, IS EN 1991-1-4 and BS 6399-2

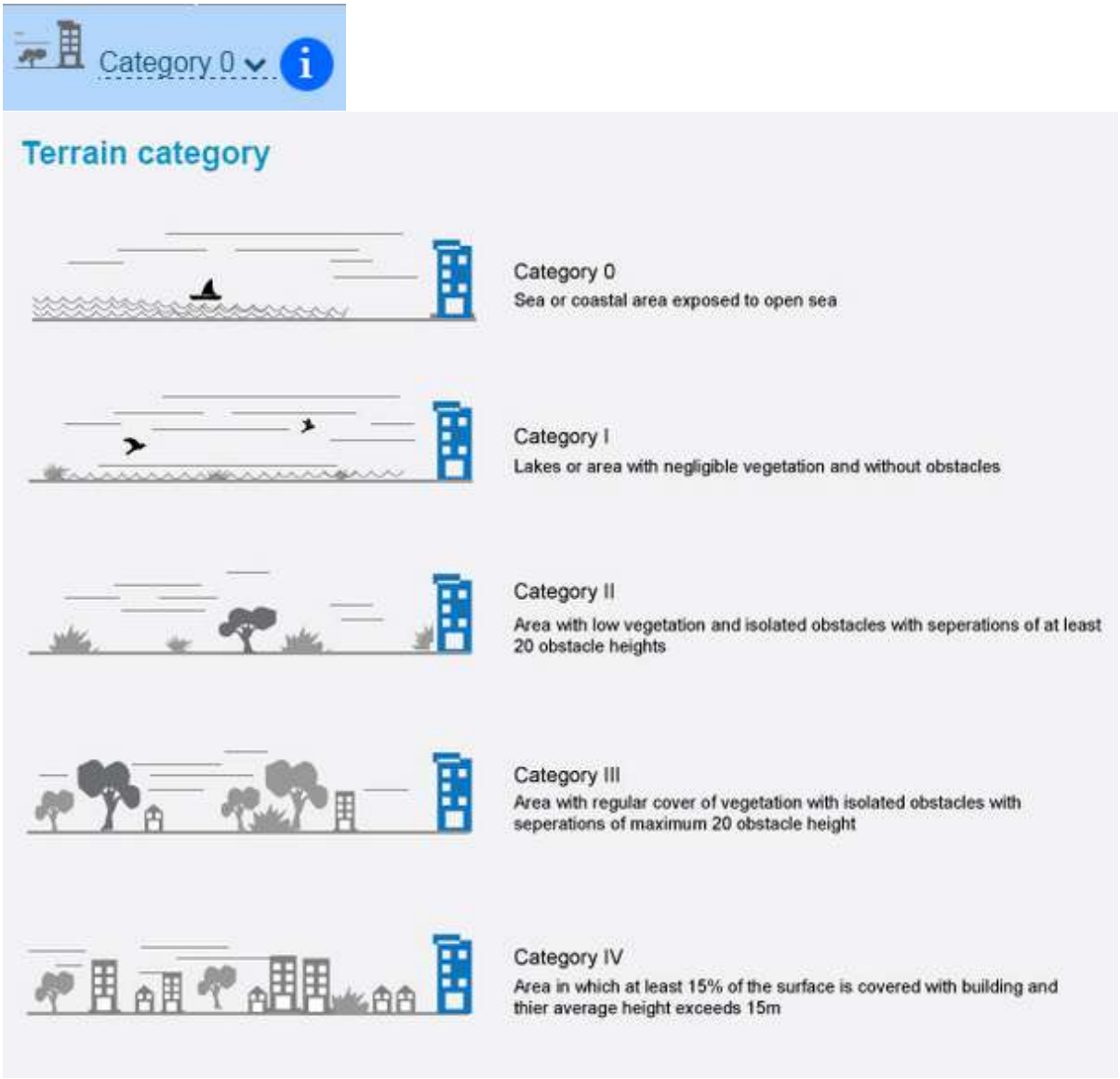
The inputs under this group include the following:

- Terrain category
- Option to use the specified terrain category for all wind sectors
- Distance to sea
- Distance inside town terrain
- Option to include sheltering effects and related inputs
- Option to consider the influence of taller neighbouring buildings and related inputs
- Exposure and exposure correction factor
- Roughness and roughness correction factor
- Turbulence intensity and turbulence correction factor

Terrain category - Terrain category is automatically assessed by VelVenti. The available categories are: *Country*, *Sea, Town and Country (Edge of Town).* However, the user can adjust the terrain category where applicable [in light of local knowledge or judgement]. It should be noted that for sites located at the edge of town, VelVenti will show the terrain category as *Country (Edge of Town)*.

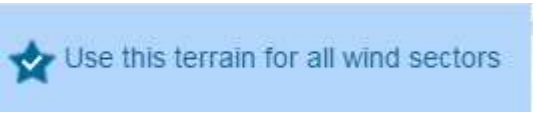


Terrain category input and options for BS EN 1991-1-4, IS EN 1991-1-4 and BS 6399-2



Terrain category information for EN 1991-1-4

Use this terrain for all wind sectors – Selecting this option will apply the input terrain category to all wind sectors.

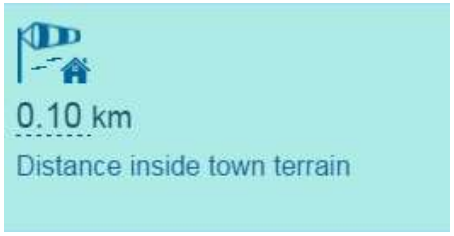


Terrain category input for all sectors

Distance to shoreline is evaluated automatically when the site is in the UK but manually set for other locations.

Distance inside town is evaluated automatically when the site is in UK town.

Distance to sea



Distance inside town terrain

Sheltering effects of surrounding buildings – In a particular wind sector, when the structure is in town terrain additional sheltering effects can be included optionally by specifying the average height of surrounding buildings and the average distance to the surrounding buildings. The calculation of the displacement height used in assessment of the exposure factor as noted in BS EN 1991-1-4 is done in accordance with Annex A3. Similarly in BS 6399-2 the relevant clause is 1.7.3 and Annex E3.

Sheltering effects of surrounding buildings

Details of obstructions (Average height of surrounding buildings and Average distance to surrounding buildings) are manual inputs even when connected to the internet.

The values displayed are just defaults and not automatically calculated.

Consider influence of a tall neighbouring building

The influence of a taller neighbouring building can be included optionally as specified in Appendix A.4 of EN 1991-1-4 by inputting the relevant details.

Influence of tall neighbouring building

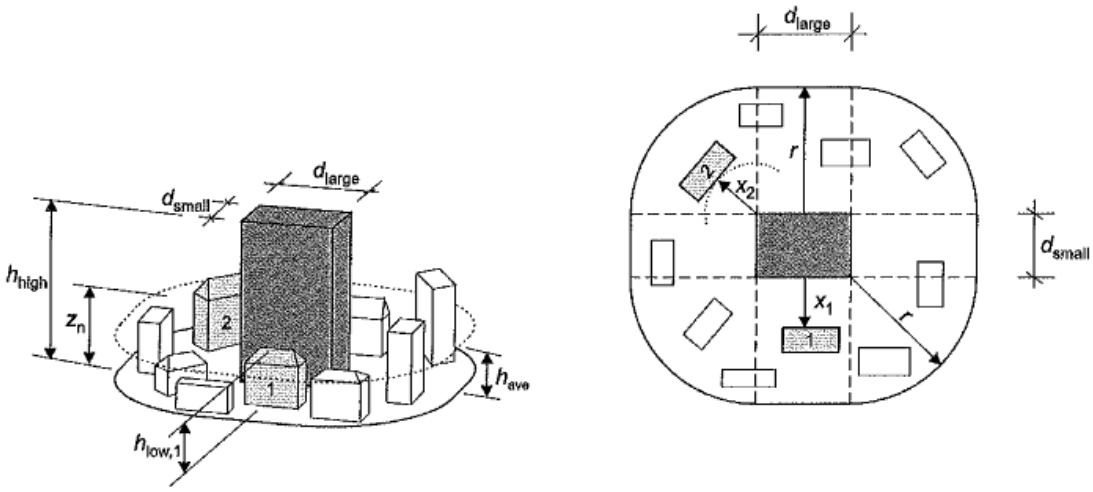


Figure A.4 – Influence of a high rise building from EN 1991-1-4:2005+A1:2010

According to Appendix A.4, if a building is more than twice as high as the average height of the neighbouring buildings then design of the neighbouring buildings should be based on the peak velocity pressure at an effective height z_n defined in expressions A.14.

When this option is selected and details of the nearby high rise structure are input the software automatically calculates the z_n value and uses it as the effective height to evaluate the factors for peak velocity pressure calculation.

Details of any tall neighbouring building should be manually input.

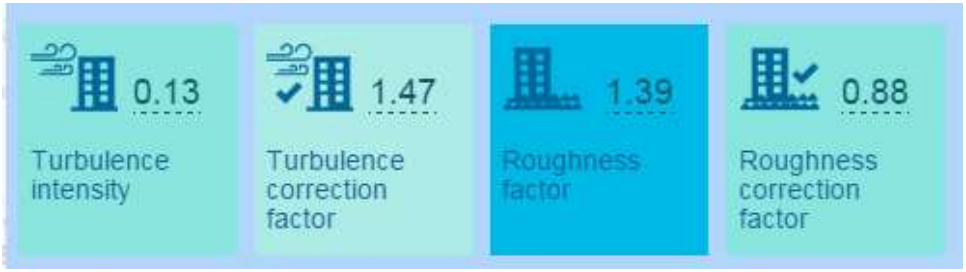
Exposure factor

Exposure and exposure correction factor

When the structure height is less than 50 m the exposure factor will be automatically calculated by the software based on the terrain category, distance to shoreline and effective height. Similarly the exposure correction factor will also be automatically calculated based on the distance inside town terrain and effective height.

Note: The default exposure factor shown for the EN 1991-1-4 design code option is based on the UK national annex in the absence of any specific EN recommendation.

Roughness and Turbulence factor



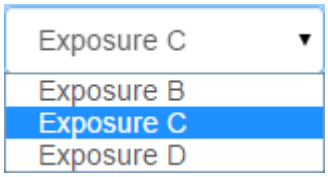
Roughness and Turbulence factors

When the structure height is greater than 50 m and the orography is significant, the turbulence intensity, turbulence correction factor (for town terrain only), roughness factor and roughness correction (town terrain only) factors are evaluated to determine the peak velocity pressure. It is possible to override these calculated factors. Note that the correction factors apply only when in town terrain (Terrain categories III and IV in EN 1991-1-4).

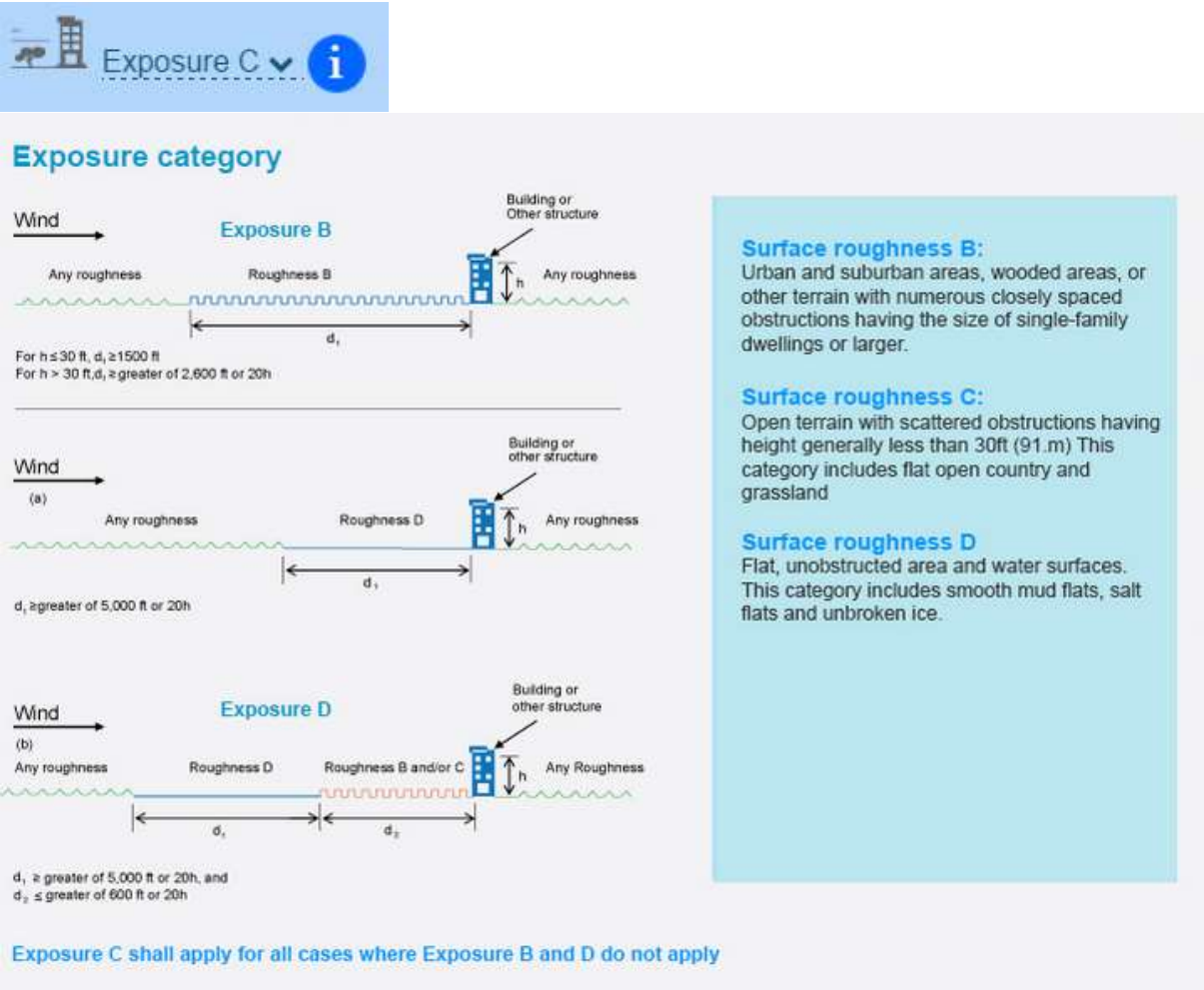
The defaults displayed for the EN 1991-1-4 design code are based on the UK national annex in the absence of specific EN guidance.

ASCE 7-10

Exposure category - The exposure category is not automatically assessed and must be manually input. The definition of the exposure categories is displayed in a pop-up accessible through the information icon.



Exposure category options for ASCE 7-10



Exposure category information for ASCE 7-10

Use this terrain for all wind sectors – Selecting this option will apply the input exposure category to all wind sectors.

Velocity pressure exposure coefficient Kz - is calculated by the software based on clause 27.3.1 of ASCE 7-10 using the exposure category and structure height.

Velocity pressure exposure coefficient

Back to wind sector information

Snow load

In this section of the program the user can review the snow load for sites in UK/Ireland. For sites in other locations snow load section will be hidden.

VelVenti does snow load calculations in accordance with

- BS EN 1991-1-3 and BS 6399-3 for sites in the UK;
- IS EN 1991-1-3 for sites in the Republic of Ireland;

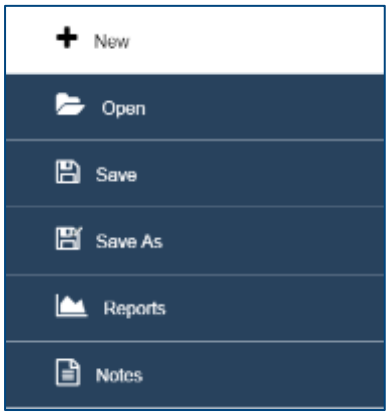
Snow load code is based on the design code chosen in site and building information tab. The appropriate snow load code will be displayed in this section for review which will be hard wired.

Back to wind sector information

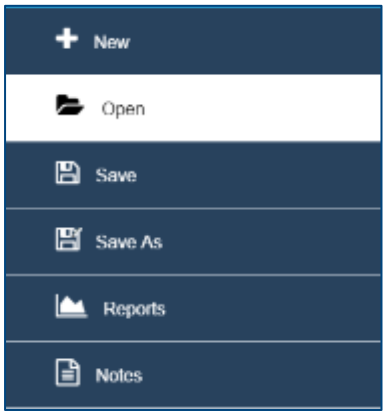
File operations

New, Open and Save

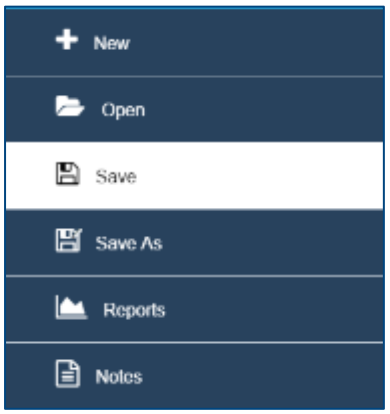
Clicking *New* will close the current site file and create a new project file with default site data. The application will prompt to 'Save' any changes to the currently open site file prior to launching the new default site file.

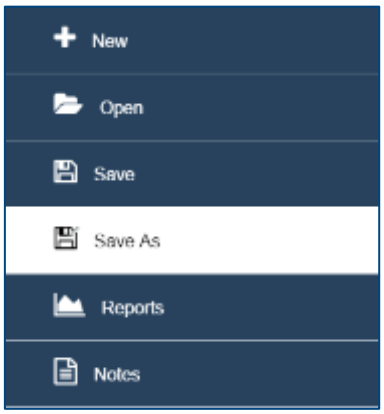


Clicking *Open* will launch the standard Windows file open dialog to open a previously saved site file.



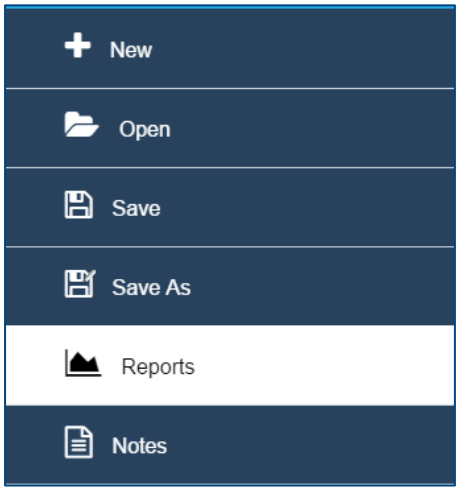
Clicking *Save* will save changes to the current site file with a user specified name and path. *Save As* allows data to be saved to a different file after initial save when necessary.





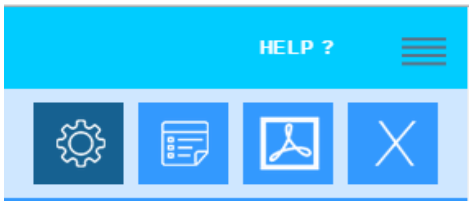
Reports

Selection of *Reports* enables a preview of printed output and is accessed through the option in the main menu.

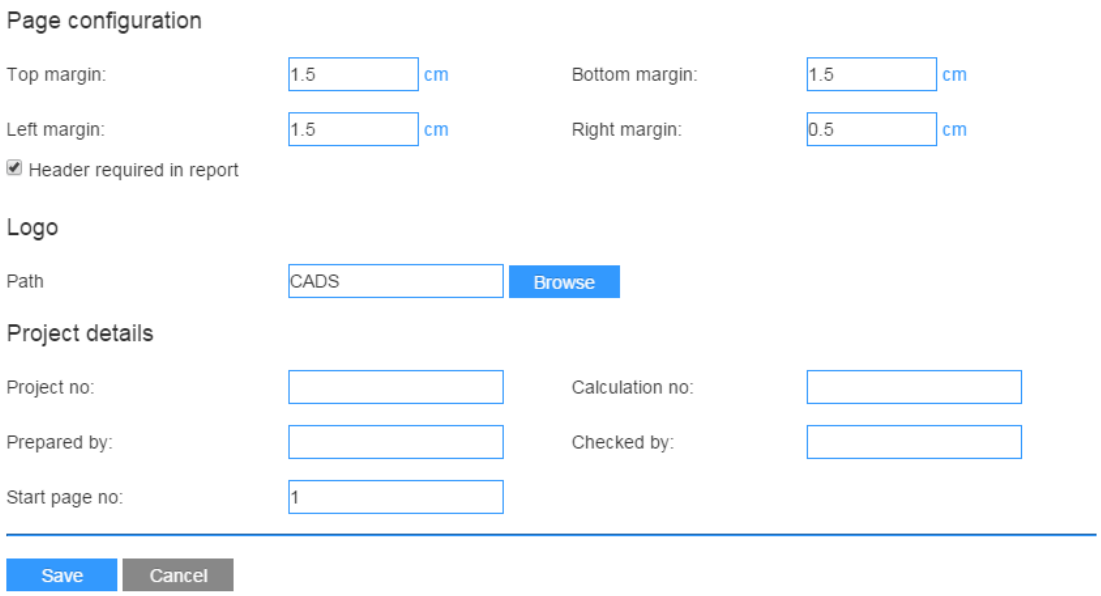


VelVenti Reports

Report settings



Settings for the report are accessed by clicking on the report settings  icon. It includes a mix of global and project specific settings.



Report settings

Report settings such as margins, logo and header depth can be saved as a global configuration by clicking on the *Save* option. The current saved settings will be used every time a report is generated by the computer thereafter until such time as the settings are changed and saved anew.

Project specific information such as project number, calculation number, prepared by, checked by and start page number are saved with the job hence need to be specified separately for each project.

Report options

Report options

It is possible to choose between brief and detailed reports and optionally include the pressure graph and orography details. A brief report is displayed by default. The available report options are shown above and listed as follows:

- Brief report
- Detailed report
- Show pressure curve
- Show location map
- Show orography details
- Show profile of dominant wind sector
- Show profile of selected wind sector
- Snow loads

Brief report and *Detailed report* are mutually exclusive selections. *Show orography details* is only available if a *Detailed report* is selected. The other options can be selected with either brief or detailed reports. *Show profile of selected wind sector* is only available if a wind sector other than the dominant wind sector is selected in the user interface. The dominant wind sector is the one which produces the highest peak velocity pressure (or dynamic wind pressure under BS 6399-2).

Brief report

The *Brief report* lists the factors and peak velocity pressure/dynamic pressure for the dominant wind direction at structure height (or component height) and the graph of pressure variations across compass directions as shown in the illustration below.

GLOBAL CONSTRUCTION SOFTWARE AND SERVICES

Project no: 1234 **Calculation no:** 1
Prepared by: RCH **Date:** 23-09-2016
Checked by: DV **Page no:** 1
Site reference: Martello Park, Poole, BH13 7BA

Peak velocity pressure calculation to BS EN 1991-1-4:2005+A1:2010 and UK national annex

VelVenti v1.0 (build 77) Copyright © 2016 Computer and Design Services Ltd.

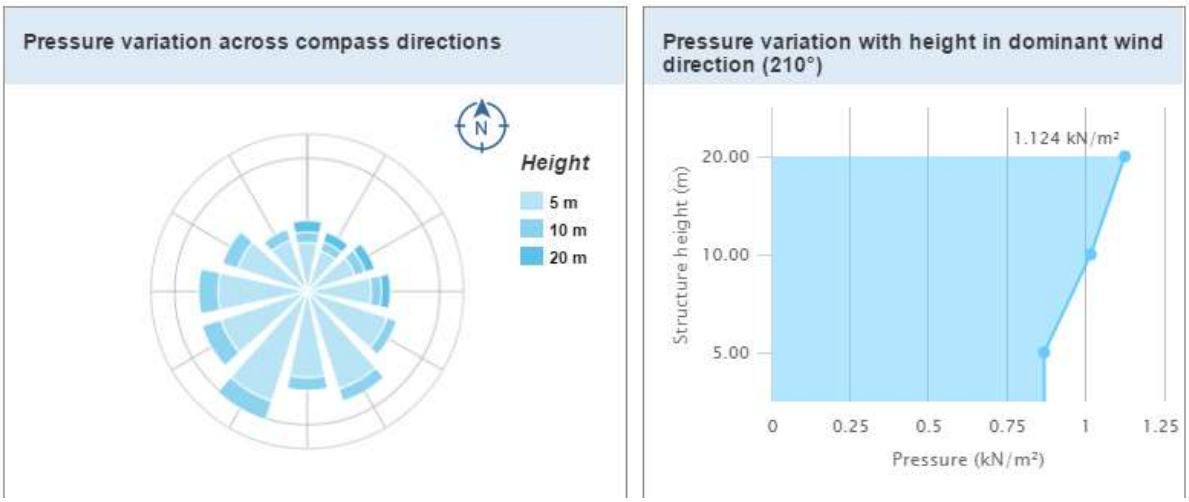
Description	Value	
Site location	50.704°N -1.915°E	
Fundamental basic wind velocity, $V_{b,map}$ (m/s)	21.9	(Figure NA.1)
Site altitude, A (m)	36	
Seasonal factor is based on all year.		
Probability factor, C_{prob}	1.00	(NA.2.8)
Altitude factor, C_{alt}	1.003	(NA.2.5)
Orography	Significant	
Distance to shoreline (km)	0.4	
Zone for size factor, C_s	A	(NA.8)
Peak velocity pressure, q_p (kN/m²)	1.124	(NA.2.17)

Description	Value	
OS grid reference	SZ 06065 89414	
Structure height, h (m)	20.0	
Structure orientation from North (°N)	0	
Seasonal factor, C_{season}	1.00	(Table NA.2)
Directional factor, C_{dir}	0.93	(Table NA.1)
Local effects factor, K_f	1.00	(A.3(4))
Orography factor, C_o	1.273	(A.3)
Exposure factor, C_e	3.21	(Figure NA.7)
Peak velocity, V_p (m/s)	42.8	(2.2.3)

Pressure variation across compass directions

Show pressure curve

Selection of the option *Show pressure curve* causes the graph of peak velocity pressure (BS EN 1991-1-4) or dynamic pressure (BS 6399-2) against height for the dominant wind sector to be displayed alongside the graph of pressure variations across compass directions as shown in the illustration below:-



Pressure variation across compass directions and pressure graph formats

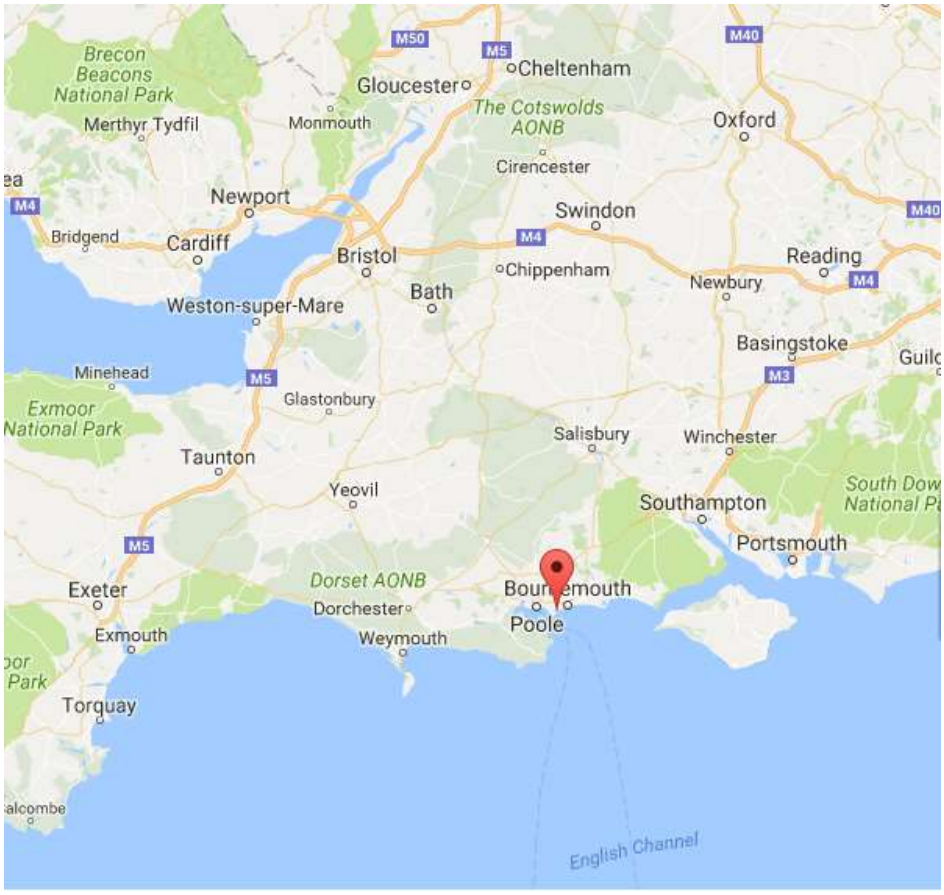
If *Detailed results* have been selected the pressure variations with height will be displayed for all wind sectors as illustrated below:-

Peak velocity pressure variation with height across all wind directions

Structure height/Direction	Peak velocity pressure (kN/m²)											
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
5.0 m	0.365	0.320	0.379	0.483	0.634	0.771	0.647	0.867	0.687	0.673	0.553	0.403
10.0 m	0.445	0.389	0.462	0.560	0.712	0.868	0.744	1.015	0.837	0.820	0.674	0.491
20.0 m	0.531	0.465	0.537	0.628	0.615	0.739	0.834	1.124	1.000	0.980	0.805	0.587

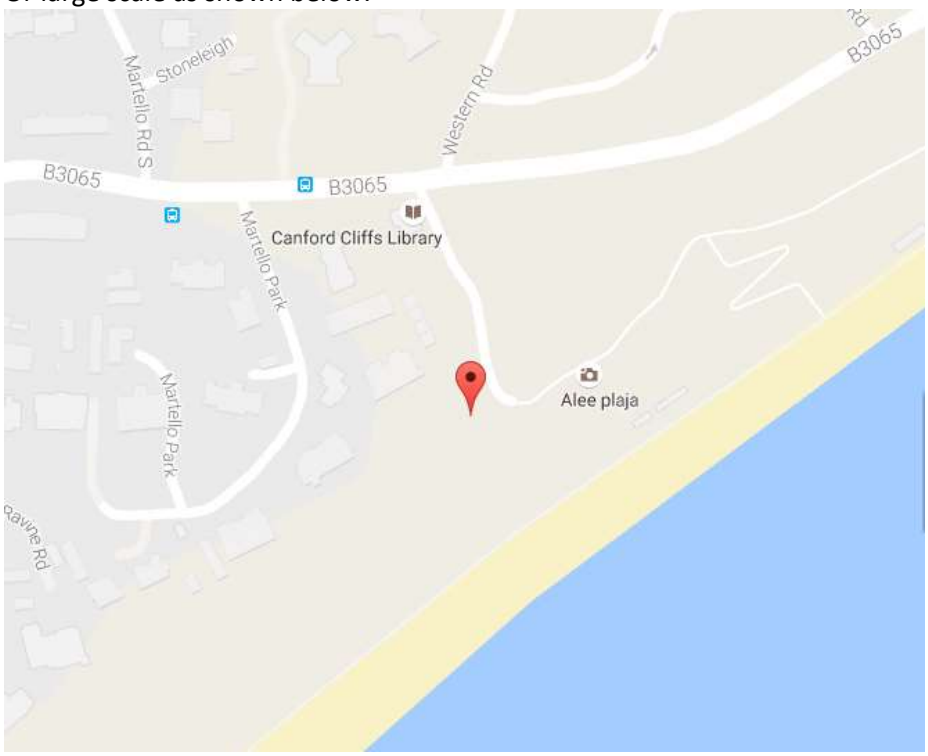
Show location map

By selecting this option, the Google map as currently displayed will be included in the report.
The map can be at small scale as shown below:



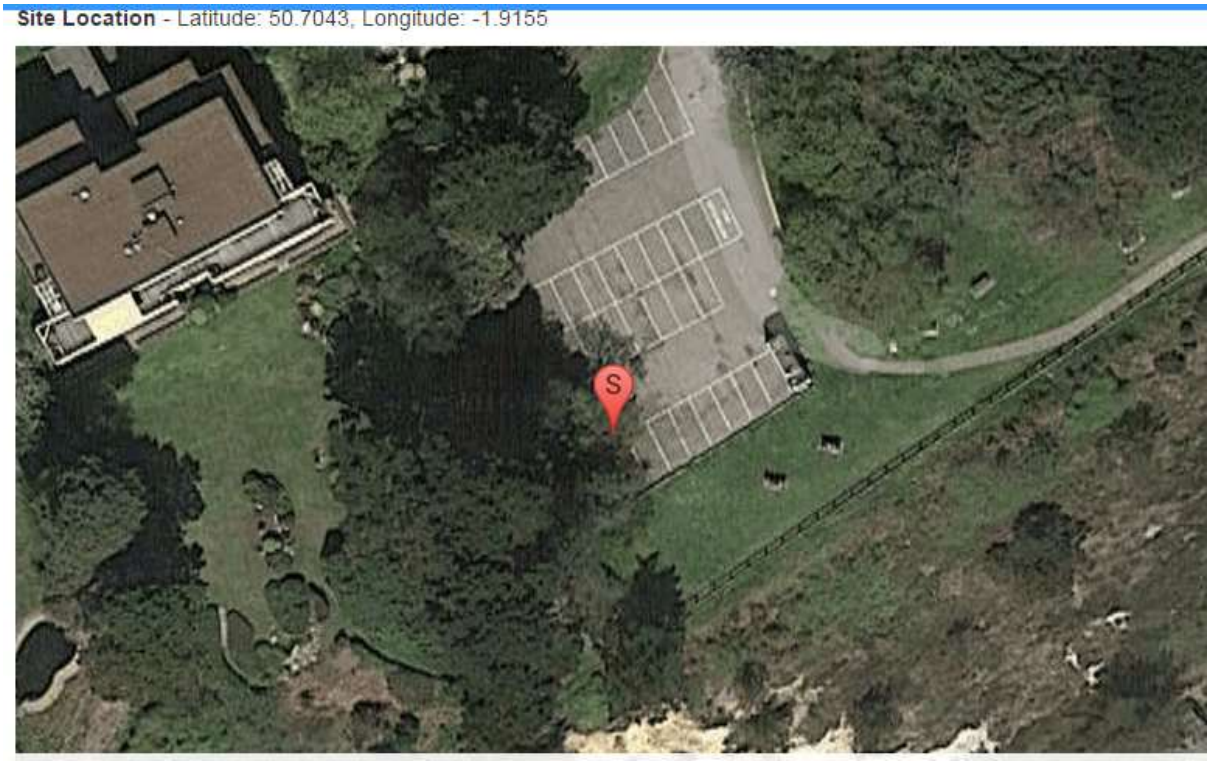
Small scale site location plan.

Or large scale as shown below:-



Large scale site location plan obtained by zooming the small scale map

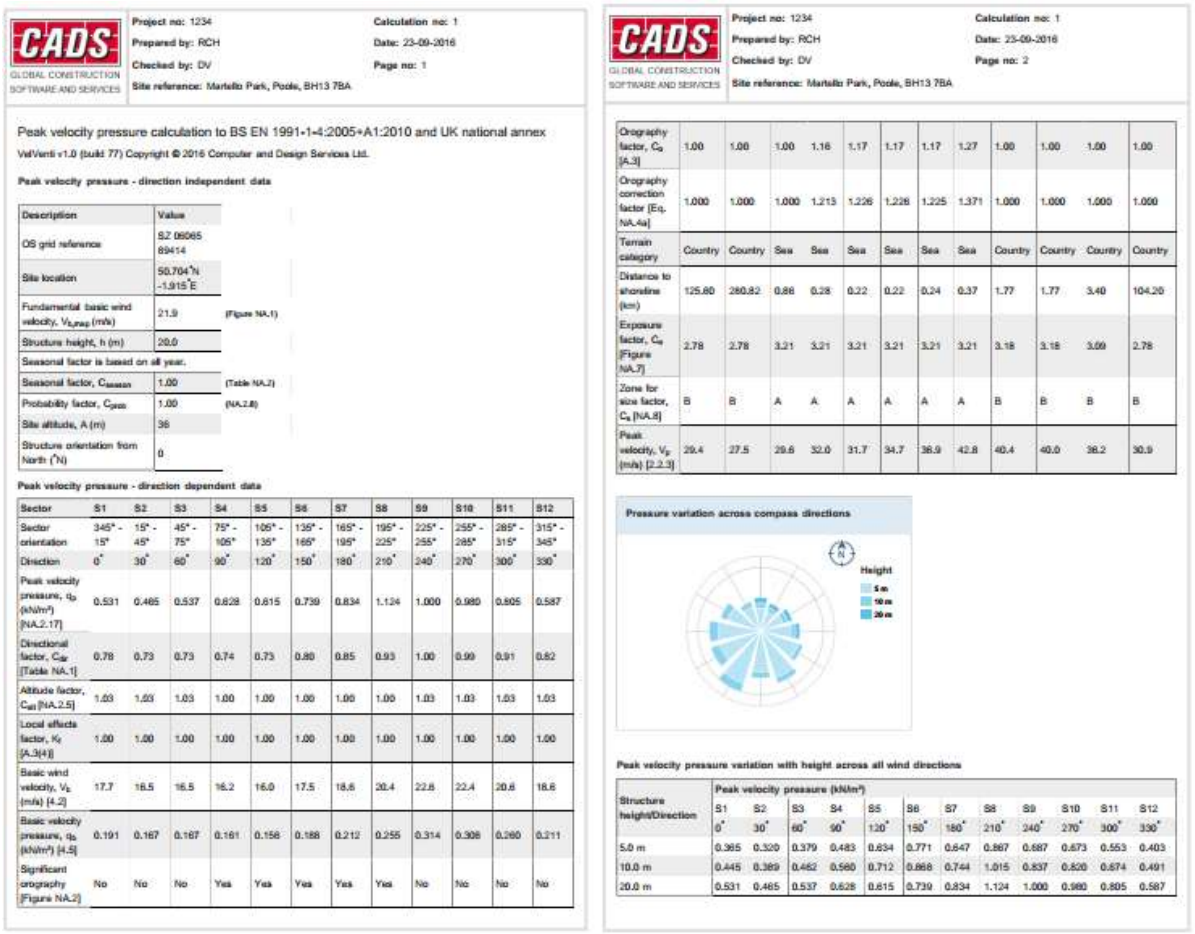
The alternative satellite view will be shown if selected in the main view:-



Satellite view

Detailed report

The detailed report lists the wind parameters and the peak velocity pressure for all wind sectors at structure height as illustrated below.



CADS GLOBAL CONSTRUCTION SOFTWARE AND SERVICES

Project no: 1234 | Calculation no: 1
Prepared by: RCH | Date: 23-09-2016
Checked by: DV | Page no: 1
Site reference: Martello Park, Poole, BH13 7BA

Peak velocity pressure calculation to BS EN 1991-1-4:2005+A1:2010 and UK national annex

VelVenti v1.0 (build 77) Copyright © 2016 Computer and Design Services Ltd.

Peak velocity pressure - direction independent data

Description	Value	
OS grid reference	SZ 06065 89414	
Site location	50.704°N -1.915°E	
Fundamental basic wind velocity, $V_{b,map}$ (m/s)	21.9	(Figure NA.1)
Structure height, h (m)	20.0	
Seasonal factor is based on all year.		
Seasonal factor, C_{season}	1.00	(Table NA.2)
Probability factor, C_{prob}	1.00	(NA.2.8)
Site altitude, A (m)	36	
Structure orientation from North (°N)	0	

Peak velocity pressure - direction dependent data

Sector	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Sector orientation	345° - 15°	15° - 45°	45° - 75°	75° - 105°	105° - 135°	135° - 165°	165° - 195°	195° - 225°	225° - 255°	255° - 285°	285° - 315°	315° - 345°
Direction	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Peak velocity pressure, q_p (kN/m²) [NA.2.17]	0.531	0.485	0.537	0.628	0.615	0.739	0.834	1.124	1.000	0.980	0.805	0.587
Directional factor, C_{dir} [Table NA.1]	0.78	0.73	0.73	0.74	0.73	0.80	0.85	0.93	1.00	0.99	0.91	0.82
Altitude factor, C_{alt} [NA.2.5]	1.03	1.03	1.03	1.00	1.00	1.00	1.00	1.00	1.03	1.03	1.03	1.03
Local effects factor, K_f [A.3(4)]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Basic wind velocity, V_b (m/s) [4.2]	17.7	16.5	16.5	16.2	16.0	17.5	18.6	20.4	22.6	22.4	20.6	18.6
Basic velocity pressure, q_b (kN/m²) [4.5]	0.191	0.167	0.167	0.161	0.156	0.188	0.212	0.255	0.314	0.308	0.260	0.211
Significant orography [Figure NA.2]	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No

CADS GLOBAL CONSTRUCTION SOFTWARE AND SERVICES

Project no: 1234 | Calculation no: 1
Prepared by: RCH | Date: 23-09-2016
Checked by: DV | Page no: 2
Site reference: Martello Park, Poole, BH13 7BA

Orography factor, C_o [A.3]	1.00	1.00	1.00	1.16	1.17	1.17	1.17	1.27	1.00	1.00	1.00	1.00
Orography correction factor [Eq. NA.4a]	1.000	1.000	1.000	1.213	1.226	1.226	1.225	1.371	1.000	1.000	1.000	1.000
Terrain category	Country	Country	Sea	Sea	Sea	Sea	Sea	Sea	Country	Country	Country	Country
Distance to shoreline (km)	125.80	280.82	0.86	0.28	0.22	0.22	0.24	0.37	1.77	1.77	3.40	104.20
Exposure factor, C_e [Figure NA.7]	2.78	2.78	3.21	3.21	3.21	3.21	3.21	3.21	3.18	3.18	3.09	2.78
Zone for size factor, C_s [NA.8]	B	B	A	A	A	A	A	A	B	B	B	B
Peak velocity, V_p (m/s) [2.2.3]	29.4	27.5	29.6	32.0	31.7	34.7	36.9	42.8	40.4	40.0	36.2	30.9

Pressure variation across compass directions

Peak velocity pressure variation with height across all wind directions

Structure height/Direction	Peak velocity pressure (kN/m²)											
	S1 0°	S2 30°	S3 60°	S4 90°	S5 120°	S6 150°	S7 180°	S8 210°	S9 240°	S10 270°	S11 300°	S12 330°
5.0 m	0.365	0.320	0.379	0.483	0.634	0.771	0.647	0.867	0.687	0.673	0.553	0.403
10.0 m	0.445	0.389	0.462	0.560	0.712	0.868	0.744	1.015	0.837	0.820	0.674	0.491
20.0 m	0.531	0.485	0.537	0.628	0.615	0.739	0.834	1.124	1.000	0.980	0.805	0.587

Detailed report

Orography details

Selection of this option causes further details of the orography/topography calculation to be included in the report as illustrated below:

Orography details in each wind direction

Sector	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Direction	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Upwind base altitude, A_u (m)	N/a	N/a	36.8	2.1	2.2	0.9	0.0	3.4	N/a	14.4	10.7	49.3
Upwind slope height, H_u (m)	38.5	N/a	1.4	36.6	36.4	37.7	38.5	32.6	N/a	21.2	23.4	11.5
Upwind slope length, L_u (m)	200.0	N/a	31.9	200.0	150.0	150.0	200.0	200.0	N/a	305.9	500.0	1000.0
Downwind base altitude, A_d (m)	0.0	N/a	27.8	9.6	14.1	34.1	21.8	17.2	N/a	2.1	2.2	0.9
Downwind slope height, H_d (m)	38.5	N/a	8.5	25.9	13.4	3.0	15.2	16.9	N/a	36.6	36.4	37.7
Downwind slope length, L_d (m)	200.0	N/a	125.0	375.0	250.0	50.0	225.0	175.0	N/a	200.0	150.0	150.0
Distance from crest, X (m)	4000.0	N/a	2500.0	-50.0	-50.0	-50.0	-50.0	0.0	N/a	625.0	2000.0	3000.0
Summit length, L_s (m)	3950	N/a	2750	575	950	150	100	200	N/a	575	1950	2950
Effective slope, Φ_e	0.19	N/a	0.04	0.18	0.24	0.25	0.19	0.16	N/a	0.07	0.05	0.01
Effective length, L_e (m)	200.0	N/a	N/a	200.0	150.0	150.0	200.0	200.0	N/a	305.9	N/a	N/a
Orography location factor, s	0.00	0.00	0.00	0.44	0.34	0.34	0.44	0.84	0.00	0.19	0.00	0.00

Orography details

Show profile of dominant wind sector

Selection of this option causes the graphic of the ground profile for the dominant wind sector together with the idealisation of any significant topographical feature relevant to the site to be shown in the report. The principal dimensions of the feature if relevant are also shown in tabular form as illustrated below:

CADS GLOBAL CONSTRUCTION SOFTWARE AND SERVICES

Project no: 1234 **Calculation no:** 1
Prepared by: RCH **Date:** 23-09-2016
Checked by: DV **Page no:** 4
Site reference: Martello Park, Poole, BH13 7BA

Orography details in dominant wind direction (210°)

Upslope at site near crest of escarpment/cliff. Orography Significant

Orography category	Cliff or Escarpment
Upwind base altitude (m)	3.4
Upwind slope height (m)	32.6
Upwind slope length (m)	200.0
Downwind base altitude (m)	17.2
Downwind slope height (m)	16.9
Downwind slope length (m)	175.0
Distance from crest (m)	0.0
Summit length (m)	200.0
Effective slope	0.16
Effective length (m)	200.00

Orography/topography profile and idealisation details for the dominant wind direction.

Show profile of selected wind sector

This option is made available if a non-dominant sector has been selected in the main user interface.

Snow load

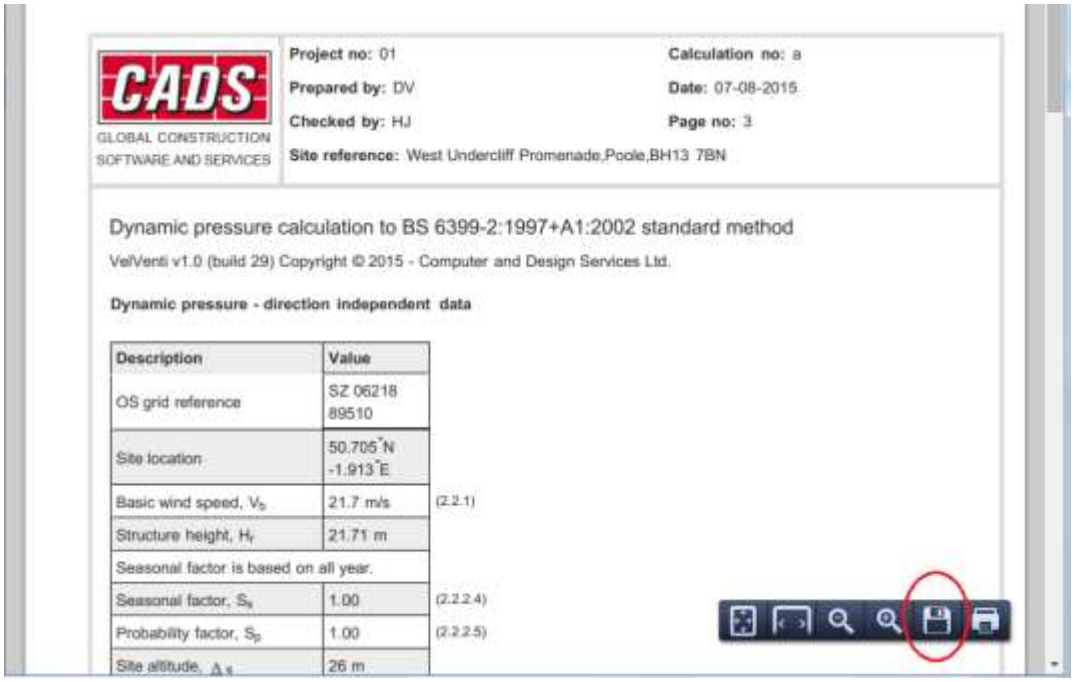
This option will be made available if snow load is calculated by the program. By selecting this option, snow load table will be displayed

Snow load according to BS EN 1991-1-3 A1:2015 and UK national annex

Description	Value
Ground snow load (kN/m²)	0.50
Characteristic ground snow load , S_k (kN/m²)	0.50

Printing

The report is displayed on the screen based on the option selected. Click on the  icon to export to PDF. The report needs to be exported as a PDF for printing.



Saving the report as PDF

Close

Click the  icon to close the report.

Units

Imperial units are used for sites in the USA and Metric units for sites in the rest of the world. It is not possible for the user to modify the units.

Notes

It is possible to add notes relevant to the site as you go along.

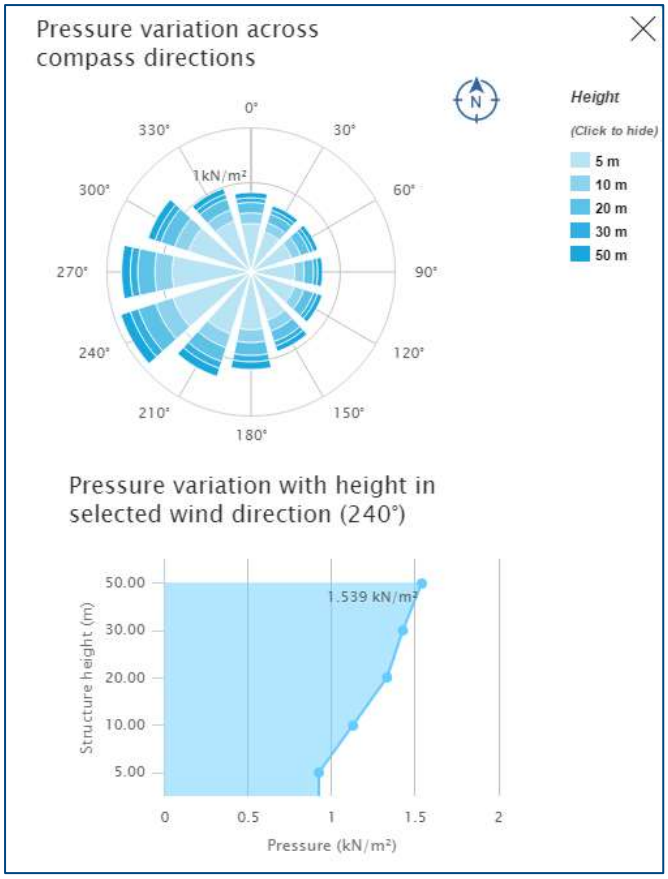
Notes can be appended to the calculation report or just saved with the job for future reference. Notes are accessed from the main dialog and also through the option in the Report.

Selection of notes

Clicking on the *Notes* option will launch the notepad area to type in the required text and save it. Clicking on Cancel will exit to the main report without saving any changes.

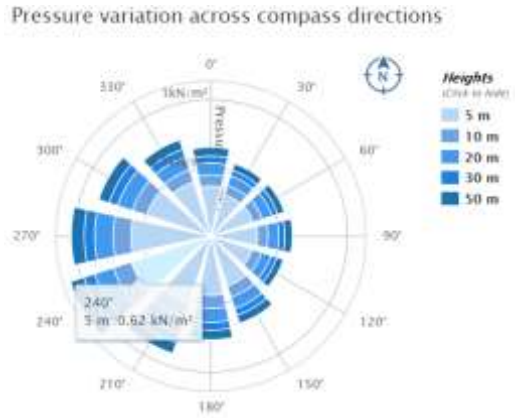
Graphical results

The results of the wind pressure calculation may be presented in the form of circular chart and a graph. Click the graph icon next to Help to view it.

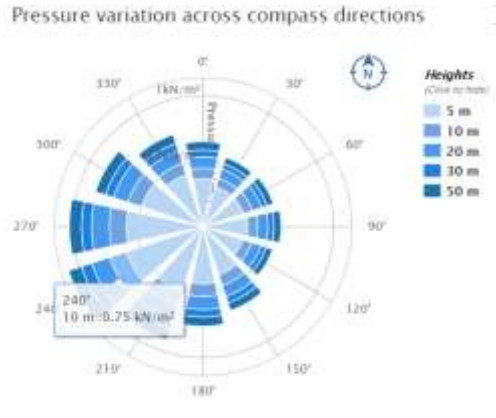


Graphical results

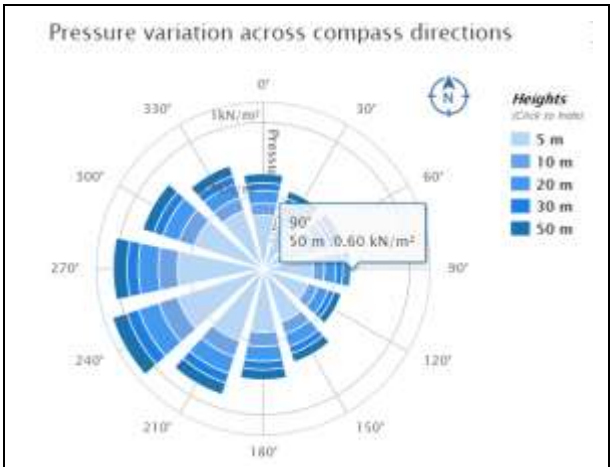
Pressure variation across compass directions is a circular display of effective or peak velocity wind pressure blowing from each direction for various heights. Moving the mouse over the diagram brings up a tooltip displaying the pressure. See examples below.



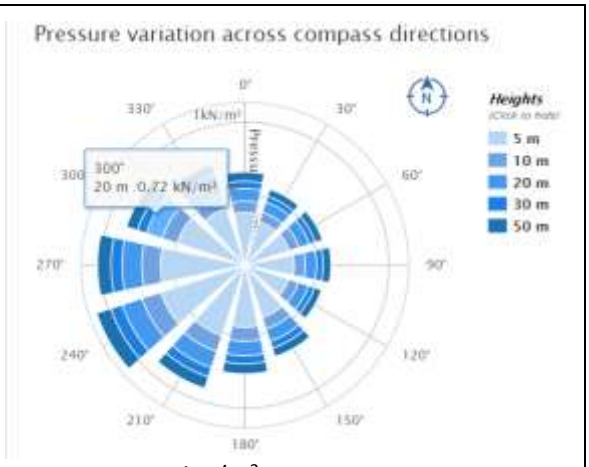
0.62 kN/m^2 @ 5 m in 240^o



0.75 kN/m^2 @ 10 m in 240^o

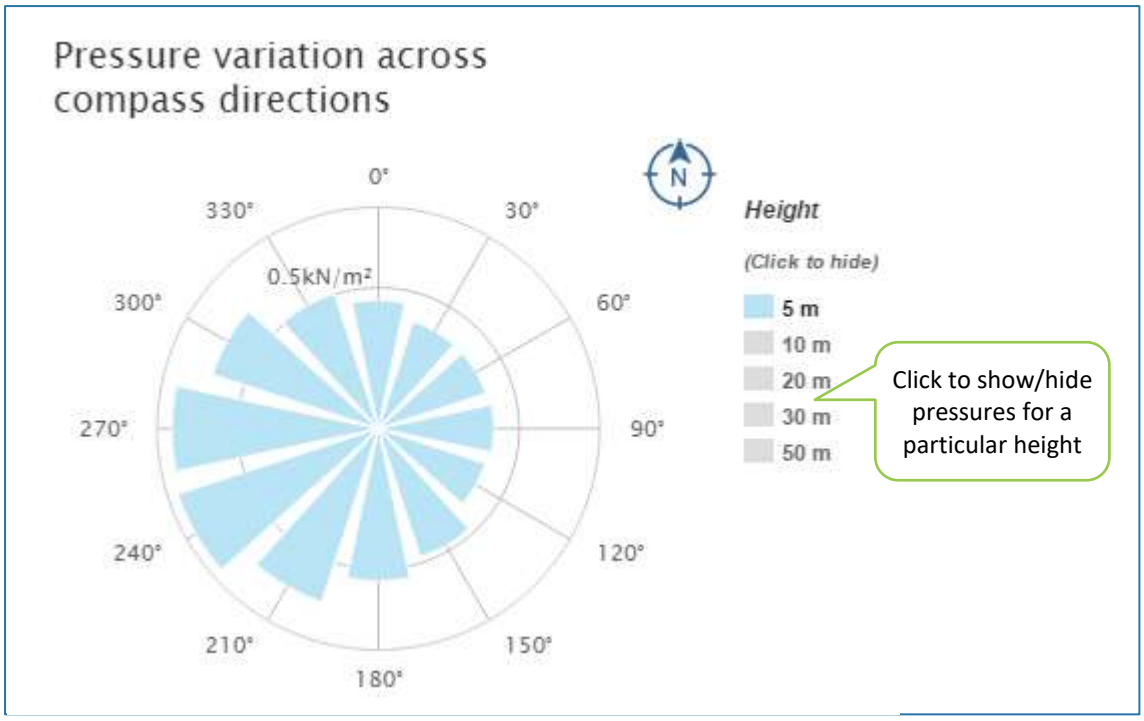


0.60 kN/m^2 @ 50 m in 90^o



0.72 kN/m^2 @ 20 m in 300^o

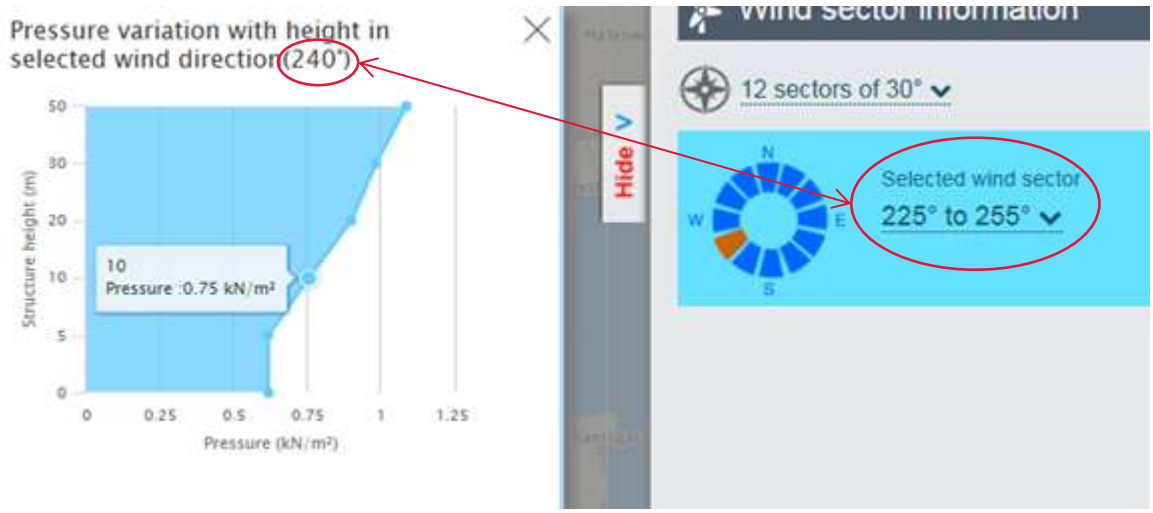
It is possible to view the pressure variation for a particular height just by hiding the other heights by clicking on the key.



Pressure variation across compass directions – view at a particular height

The figure displayed is for the selected wind sector. Simply click the sector on the pressure variation diagram to change. Alternatively select through the dropdown menu or the compass rose in the wind sector information part of the the main interface.

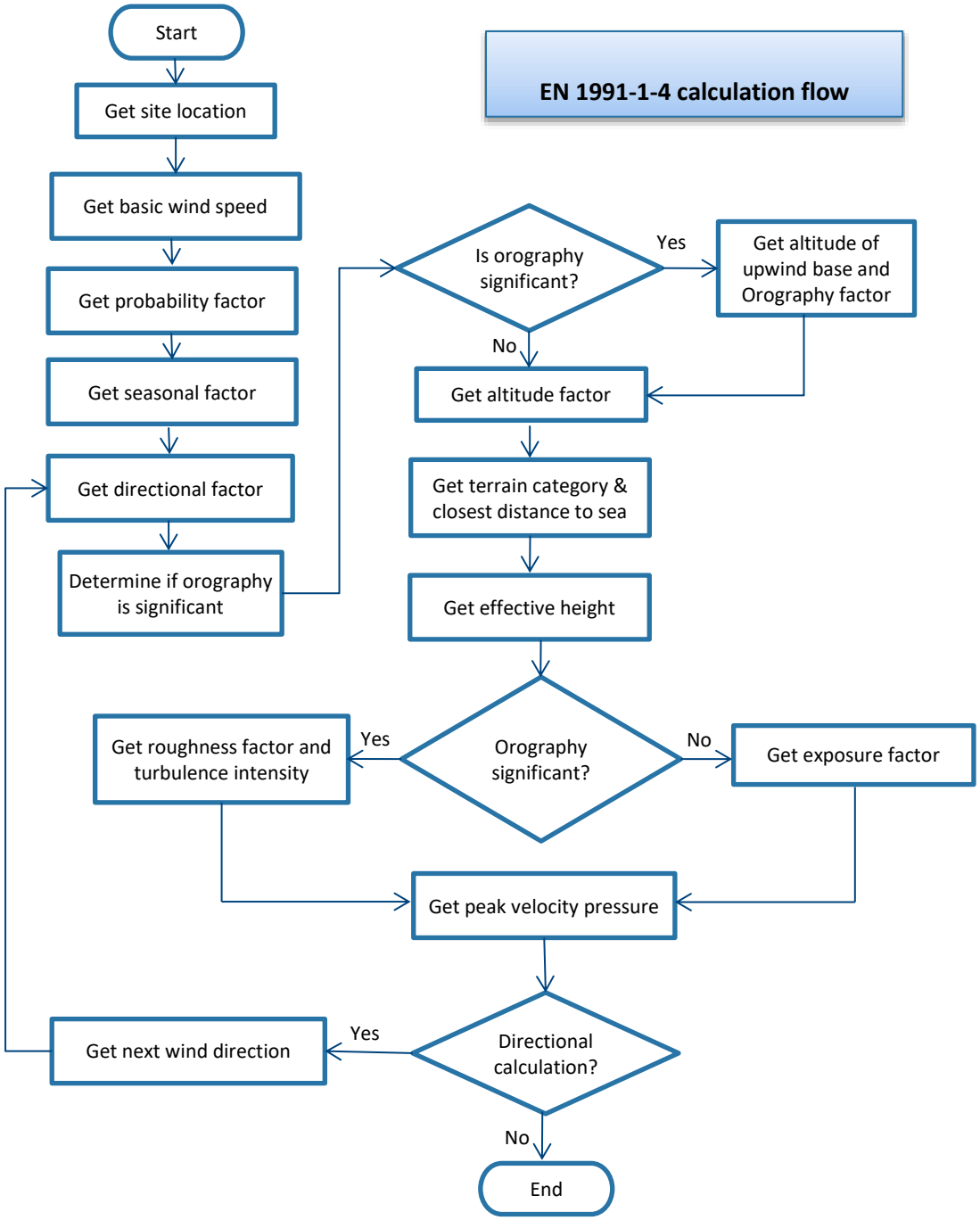
The pressure variation across compass directions is not available if only one sector has been selected.

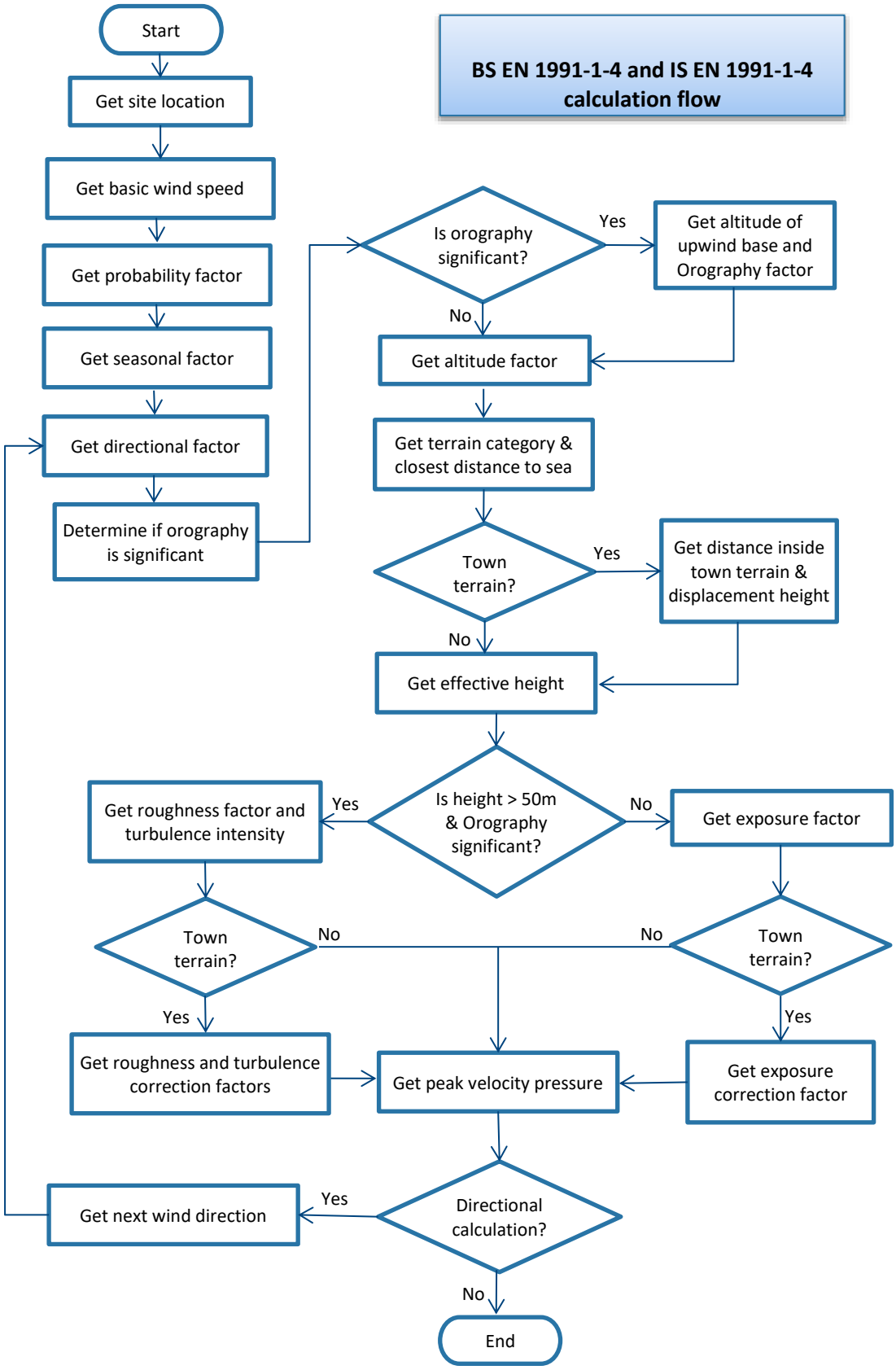


Pressure graph

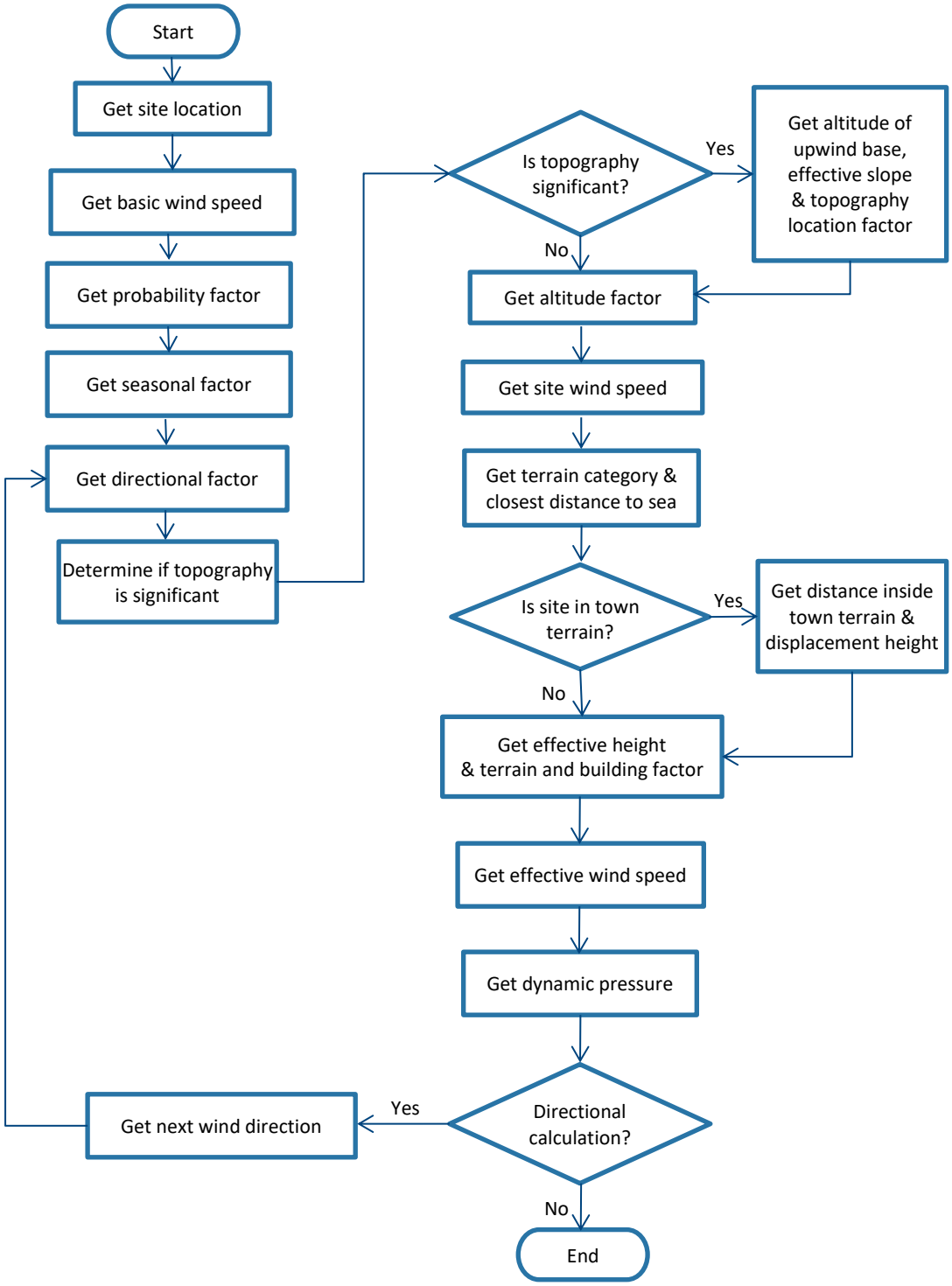
To close the graphical results display simply click on the X mark in the top right corner.

Calculation flow

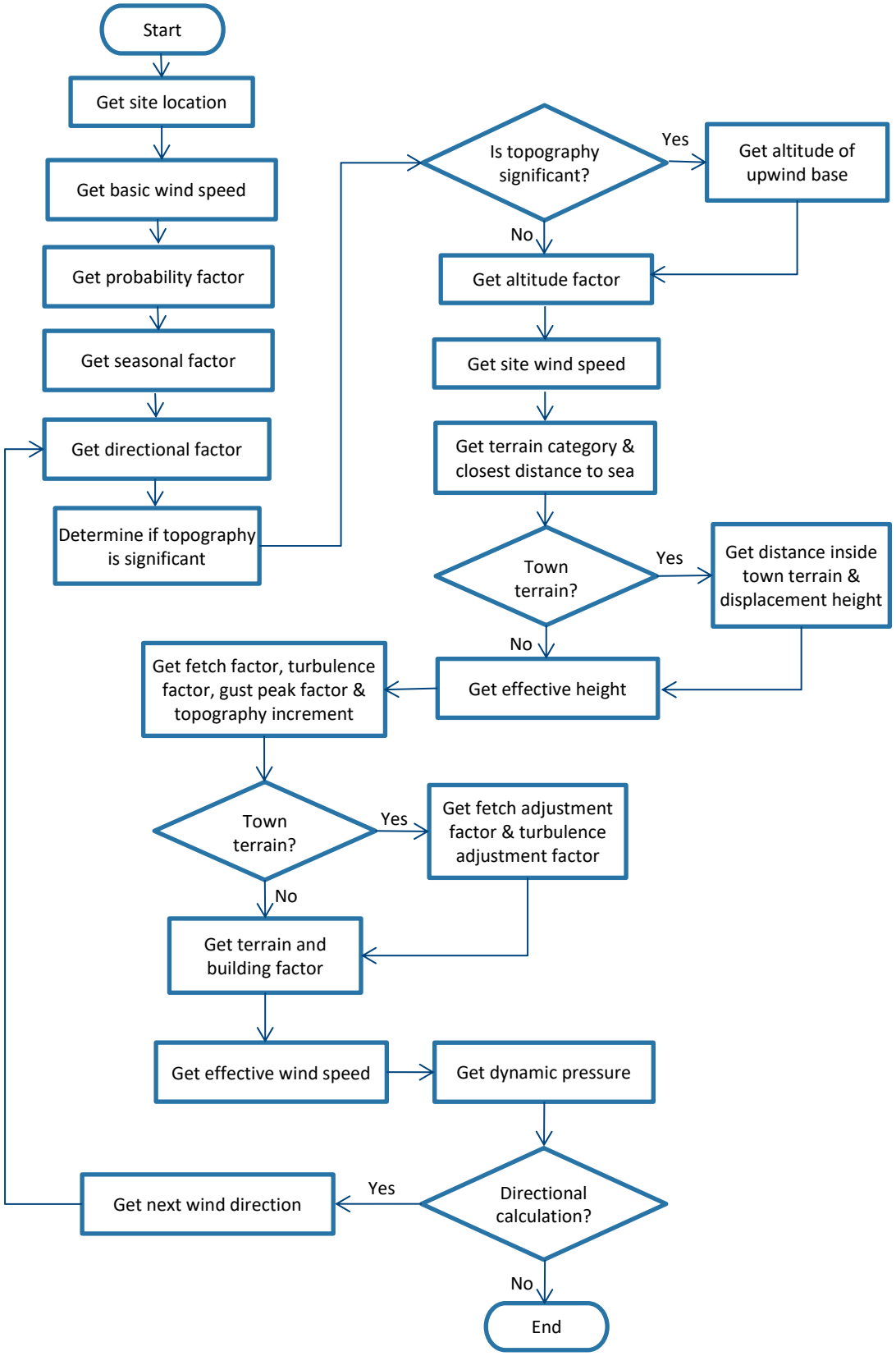




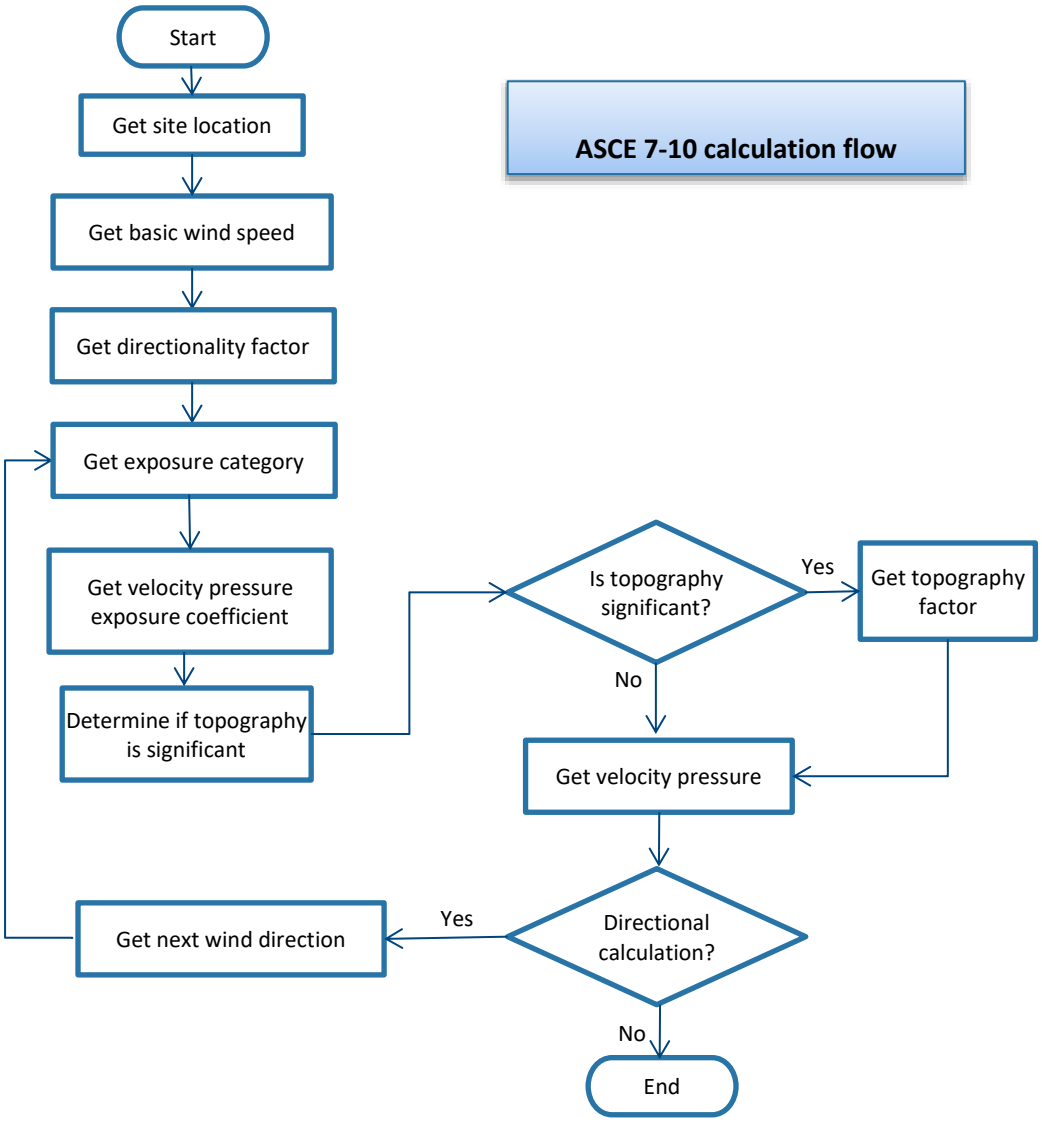
BS 6399-2 standard method calculation flow



BS 6399-2 directional method calculation flow



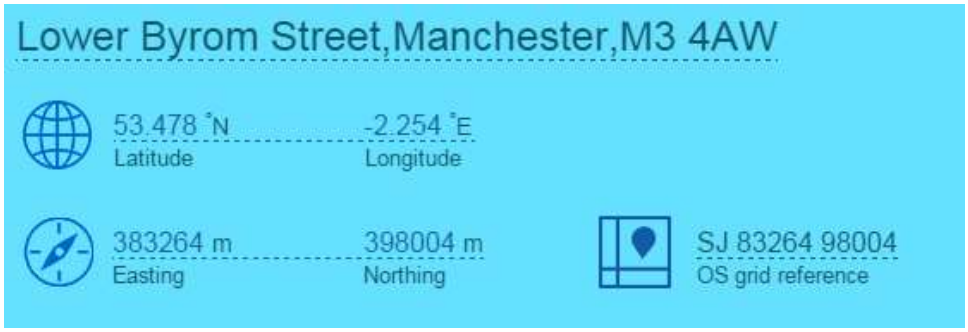
ASCE 7-10 calculation flow



Examples

Example 1: Manchester

Site information:



Design code: BS EN 1991-1-4

Structure height: 20 m

Description	CADS VelVenti	BREVe 3.2	Remarks
Fundamental value of the basic wind velocity before altitude correction $v_{b,map}$	22.7 m/s	22.7 m/s	-
Site altitude	36 m	49 m	Site altitude in BREVe is set to the maximum altitude within the site range (which is usually 1 or 0.5 sq km)
Probability factor	1.00	1.00	-
Seasonal factor	1.00	1.00	-
Dominant wind direction	240°	240°	-
Directional factor	1.00	1.00	-
Orography	Not significant	Significant	The difference in the assessment of topography is mainly due to the assumption by BREVe that the site is at the highest point in the local square and that the slope base is at its lowest point.
Orography factor	1.00	1.150	Due to differences in orography analysis as noted above
Altitude factor	1.03	1.024	Due to rounding in VelVenti
Distance to shoreline	47.55 km	155 km	VelVenti treats the Mersey estuary as a significant body of water. BREVe ignores it

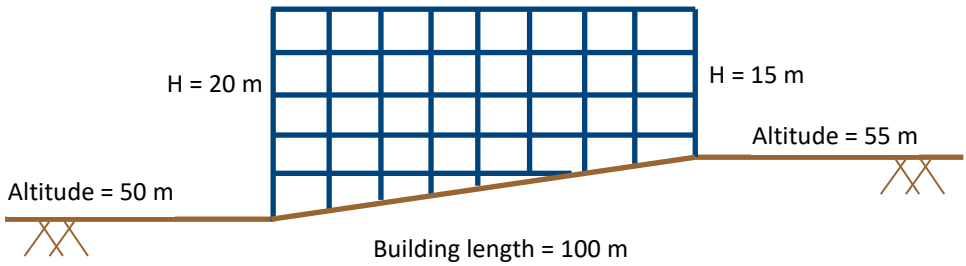
			and finds the Welsh sea shore in Cardigan bay.
Distance inside town terrain	6.5 km	6.5 km	Manual input in CADS application.
Effective height	12 m	12 m	Sheltering effects included and obstruction height and spacing manually input in CADS application.
Exposure factor	2.49	2.44	Due to difference in distance to shoreline noted above
Exposure correction factor	0.83	0.83	-
Peak velocity pressure	0.70 kN/m^2	0.79 kN/m^2	Due to differences noted above.

Orography analysis differences:

CADS VelVenti	**BREVe 3.2**
Altitudes are obtained at varying intervals for up to 4 km upwind and downwind based of SCI 394 guidelines.	Altitudes are obtained at 200 m resolution for up to 2 km upwind and downwind for initial analysis.
VelVenti considers potential slopes upwind of the site (if any) considering sheltering by higher ground upwind (if any) selecting the slope which produces the greatest orography factor. • **No adjustment is done. The actual site location is used.** • **VelVenti checks for `resumed slopes'.**	Upwind base altitude is taken as the first dip in the upwind direction. • Site location is adjusted to be at the crest of the assumed slope (unless site range is manually modified to zero by the user). • The first dip upwind / downwind defines the assumed slope.

Example 2 - Influence of sloping ground on peak velocity pressure

This example demonstrates the influence of site altitude on peak velocity pressure for a large building on sloping ground.



Assumed ground slope = (55-50)/100 = 1/20 hence orography not significant.

Assuming a basic wind velocity of 22 m/s and all other parameters as 1.0 (i.e. directional, orography, seasonal, probability).

Altitude factor with 50 m site altitude = 1+(50/1000) = 1.05
Altitude factor with 55 m site altitude = 1+(55/1000) = 1.055

Exposure factor for an effective height of 20 m and site adjacent to sea = 3.2
Exposure factor for an effective height of 15 m and site adjacent to sea = 3.07

Case 1: Peak velocity pressure at 20 m from the ground and site altitude of 50 m

$= 0.613*(22*1.05)^2*3.2/1000 = 1.047\ kN/m^2$

Case 2: Peak velocity pressure at 15 m from the ground and site altitude of 55 m

$= 0.613*(22*1.055)^2*3.07/1000 = 1.014\ kN/m^2$

For a building on sloping ground it may be advantageous to try 2 sets of calculations as shown above to determine the most favourable / onerous wind pressure.

Note that in reality the distance from the sea will vary in each direction and the difference in exposure factor will be less with increasing building height.

Using VelVenti with other applications

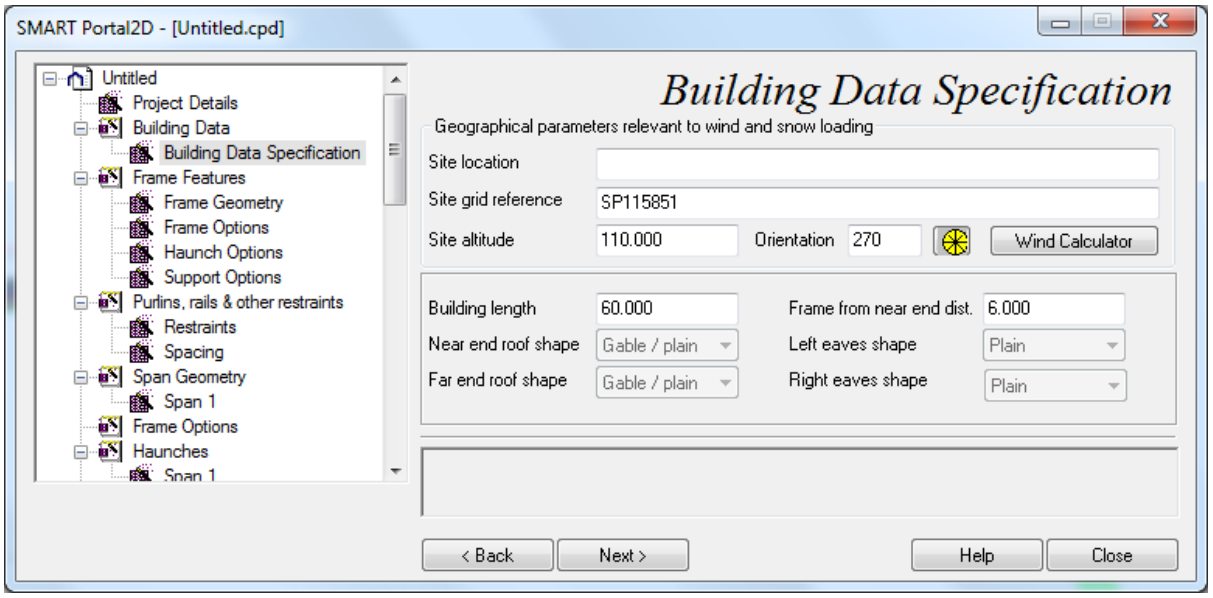
This section of the document gives guidance on using VelVenti with other analysis and design applications.

VelVenti and SMART Portal

VelVenti is accessed through the wind calculator button in SMART Portal. The site data (grid reference, altitude, orientation and portal apex height) specified in the building data specification page of SMART Portal is automatically transferred to VelVenti. Alternatively it is possible to specify the inputs directly in VelVenti.

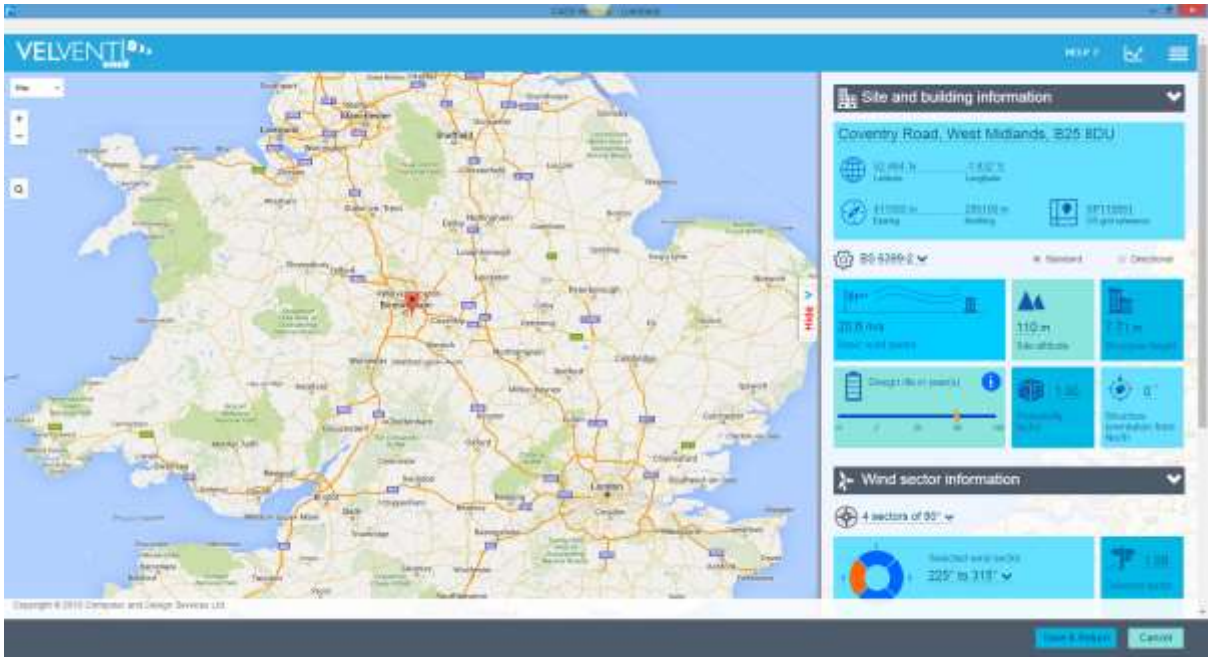
Note: In SMART Portal the default orientation (270°) is with the left face of the building facing west.

The far face therefore faces north (0°) and corresponds to 0° orientation in Velventi. Therefore Orientation from North in VelVenti = Orientation of the Left face in SMART Portal -270°



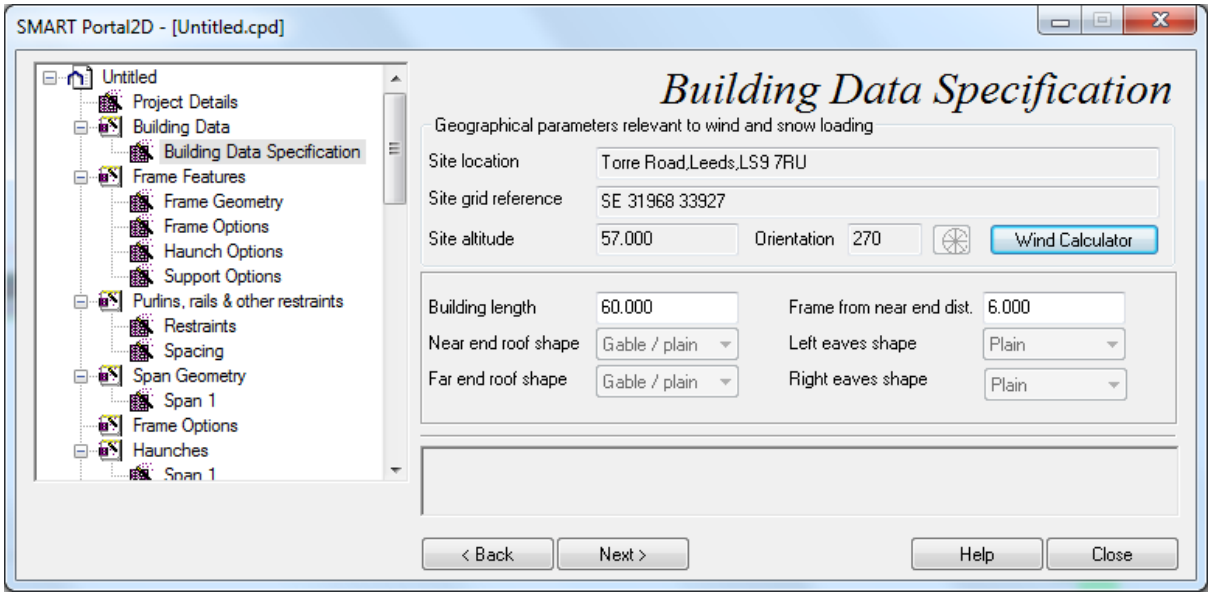
Building data specification page in SMART Portal

When VelVenti is launched from SMART Portal, two additional buttons (Save & Return and Cancel) appear at the bottom of the VelVenti screen. Review the inputs, the intermediate calculation results (i.e. orography and terrain factors) and the final results in VelVenti. Once you are happy with the calculated effective wind speed (in BS 6399-2) or peak velocity (in EN 1991-1-4) return to SMART Portal by clicking on the *Save & Return* button at the bottom of the screen.



VelVenti launched from SMART Portal

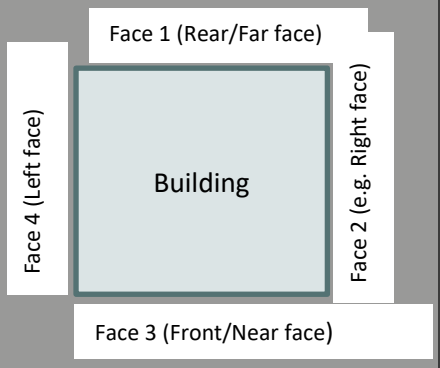
The site data (grid reference, altitude, orientation and portal apex height) in the building data specification page in SMART Portal will be displayed as non-editable inputs indicating it is linked to VelVenti. The data can be changed any time from within VelVenti.



Building data specification page with VelVenti data

When you close VelVenti with *Save & Return*, a confirmation message will be displayed to indicate the effective wind speed / peak velocity is updated in the portal job and it can be verified from the *Wind parameters* page.

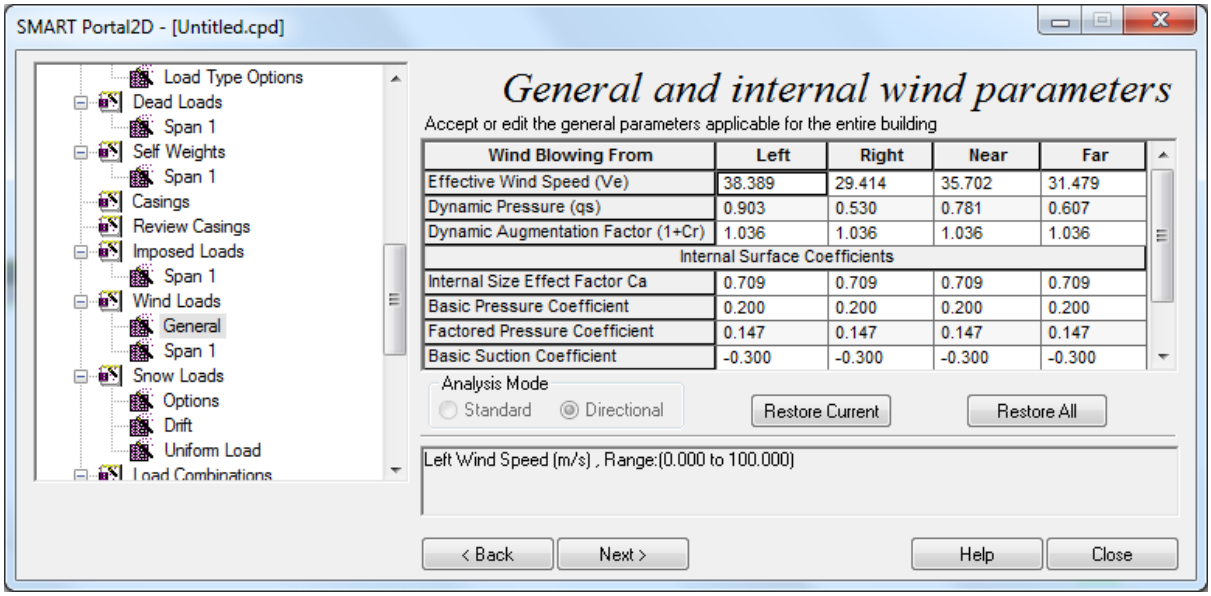
Using wind sector results in SMART Portal



Building face numbered clockwise from geographical North

Wind direction	Peak velocity pressure to be used
Wind from far (Face1/rear)	Sector S1 if calculated with 4 wind sectors
	Maximum from sector S12, S1, S2 if calculated with 12 wind sectors
Wind from right (Face 2)	Sector S2 if calculated with 4 wind sectors
	Maximum from sector S3, S4, S5 if calculated with 12 wind sectors
Wind from near (Face 3/front)	Sector S3 if calculated with 4 wind sectors
	Maximum from sector S6, S7, S8 if calculated with 12 wind sectors
Wind from left (Face 4)	Sector S4 if calculated with 4 wind sectors
	Maximum from sector S9, S10, S11 if calculated with 12 wind sectors

Note that sector orientation will depend on building orientation from North.



Wind parameters page with results from VelVenti

Please refer to SMART Portal help for more details.

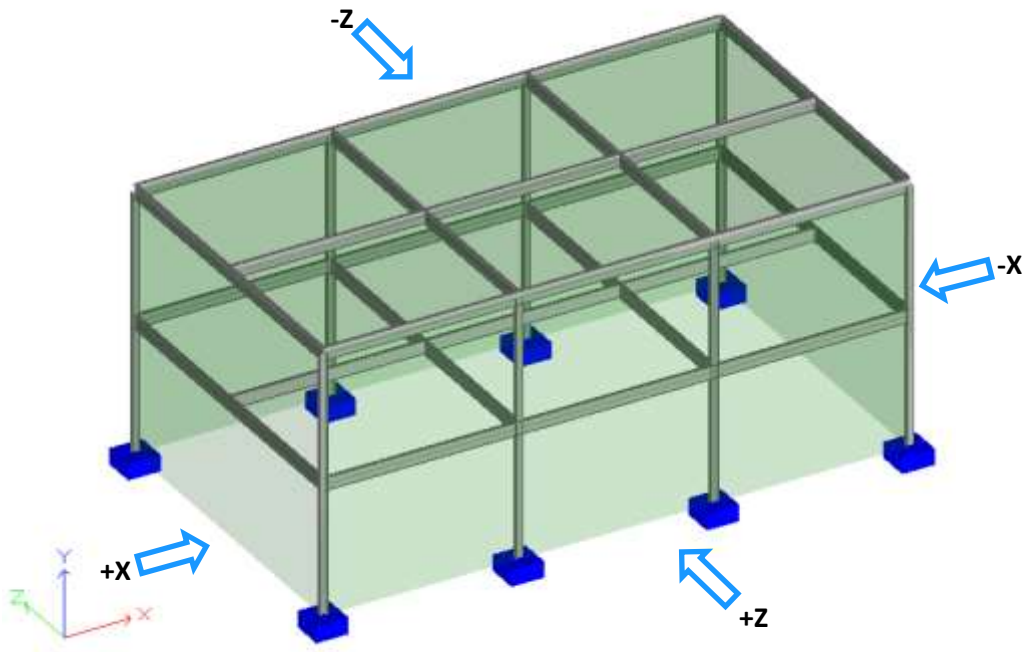
VelVenti and A3D MAX

Wind loads are mostly applied as area loads on A3D MAX panels. The area loads are calculated as peak velocity pressure (or dynamic pressure for BS 6399-2) times the surface coefficient. When the peak

velocity pressure/dynamic pressure is obtained from VelVenti v1.0 the surface coefficient will need to be manually obtained and it will vary in respect to panel location and wind direction.

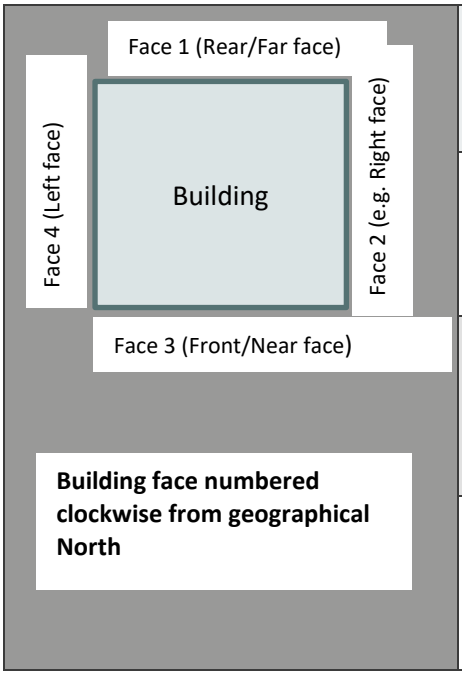
A simple rectangular frame with panels applied to the outer surfaces is shown below.

Considering 4 wind directions, the peak velocity pressure from VelVenti can be mapped to the wind directions as given in the table below.



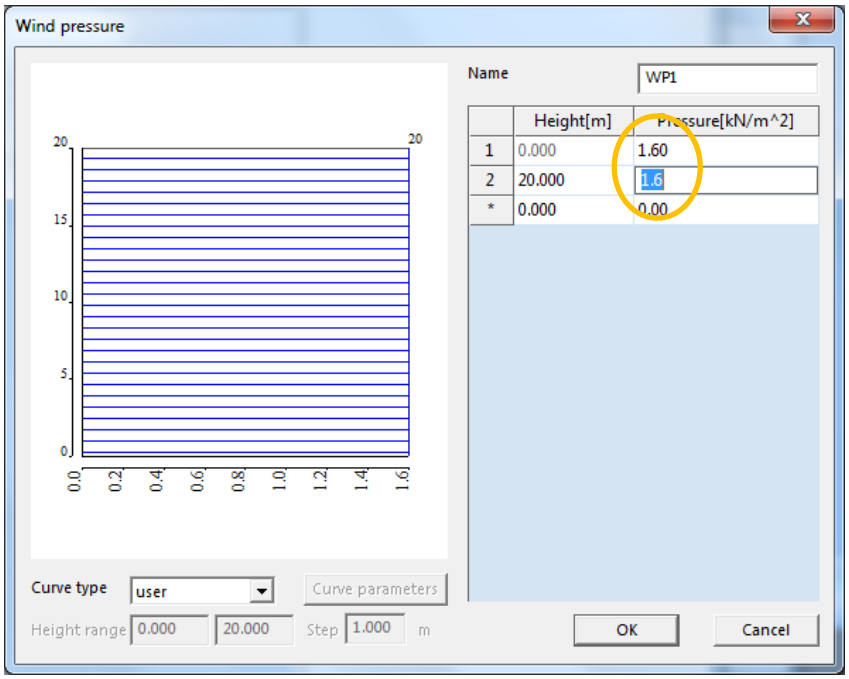
Example frame in A3D MAX

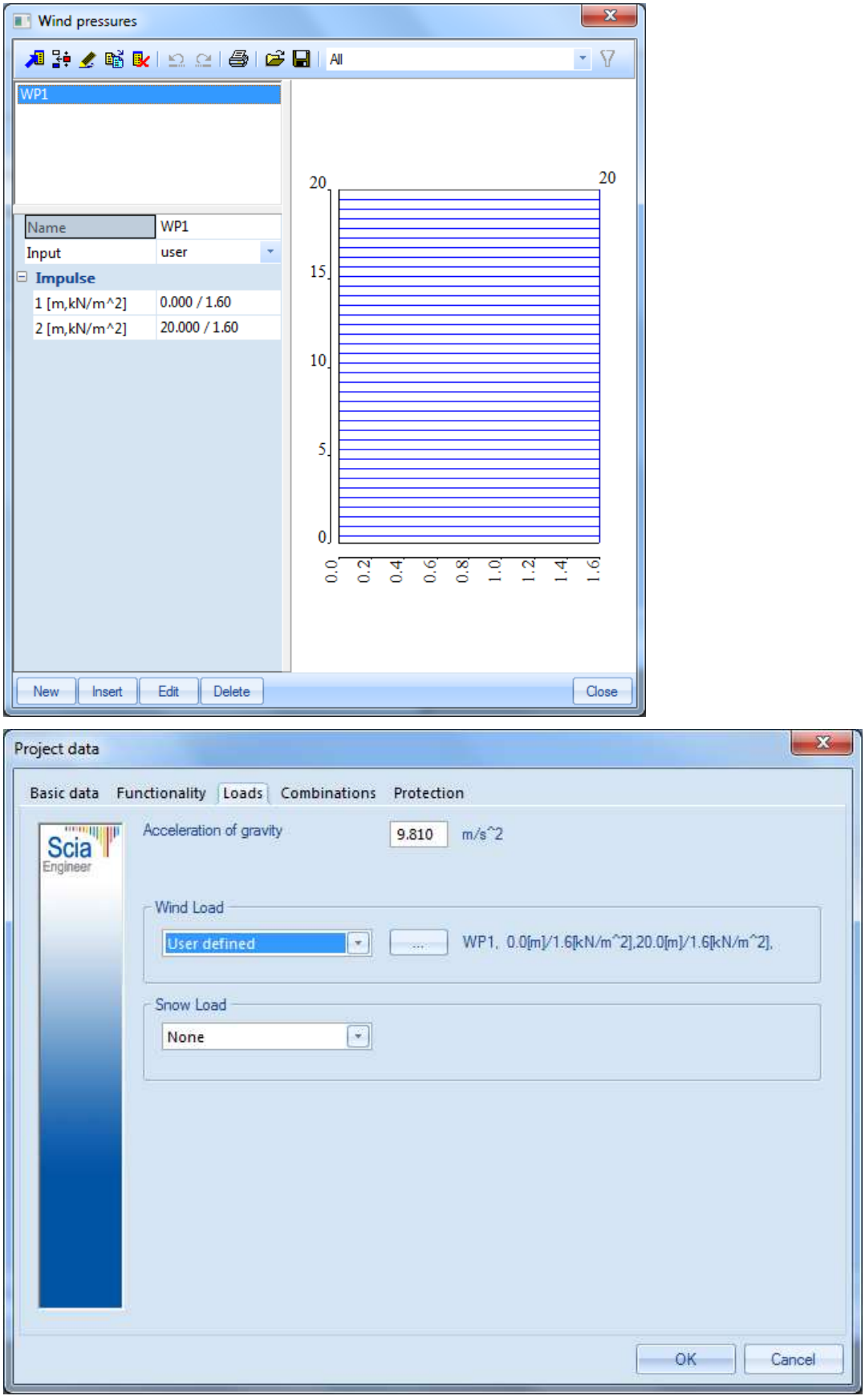
Using wind sector results in A3D MAX		
	Wind direction	**Peak velocity pressure to be used**
		Sector S1 if calculated with 4 wind sectors

<table>
<tr>
<td rowspan="6"> 
</td>
<td>Wind from -Z direction
(Face 1 / Rear / Far)</td>
<td>Maximum from sector S12, S1, S2 if calculated with 12 wind sectors</td>
</tr>
<tr>
<td rowspan="2">Wind from –X direction
(Face 2/Right face)</td>
<td>Sector S2 if calculated with 4 wind sectors</td>
</tr>
<tr>
<td>Maximum from sector S3, S4, S5 if calculated with 12 wind sectors</td>
</tr>
<tr>
<td rowspan="2">Wind from +Z direction
(Face 3/Front/Near)</td>
<td>Sector S3 if calculated with 4 wind sectors</td>
</tr>
<tr>
<td>Maximum from sector S6, S7, S8 if calculated with 12 wind sectors</td>
</tr>
<tr>
<td rowspan="2">Wind from +X direction
(Face 4/Left)</td>
<td>Sector S4 if calculated with 4 wind sectors</td>
</tr>
<tr>
<td>Maximum from sector S9, S10, S11 if calculated with 12 wind sectors</td>
</tr>
</table>

VelVenti and SCIA Engineer

In the simplest form the maximum peak velocity pressure from all wind sectors could be input as a user curve in SCIA Engineer for automatic wind loading.

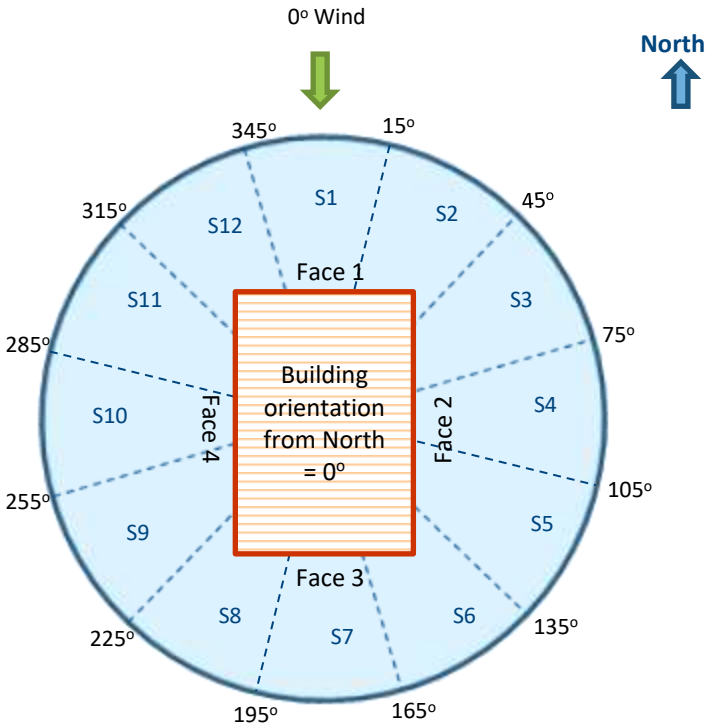




User defined pressure curve in Scia Engineer

Appendix

Orientation from North example with 12 wind sectors



Example: 1

Number of wind sectors = 12

Orientation from North = 0°

Sector range:

- Sector 1 = 345° to 15°
- Sector 2 = 15° to 45°
- Sector 3 = 45° to 75°
- Sector 4 = 75° to 105°
- Sector 5 = 105° to 135°
- Sector 6 = 135° to 165°
- Sector 7 = 165° to 195°
- Sector 8 = 195° to 225°
- Sector 9 = 225° to 255°
- Sector 10 = 255° to 285°
- Sector 11 = 285° to 315°
- Sector 12 = 315° to 345°

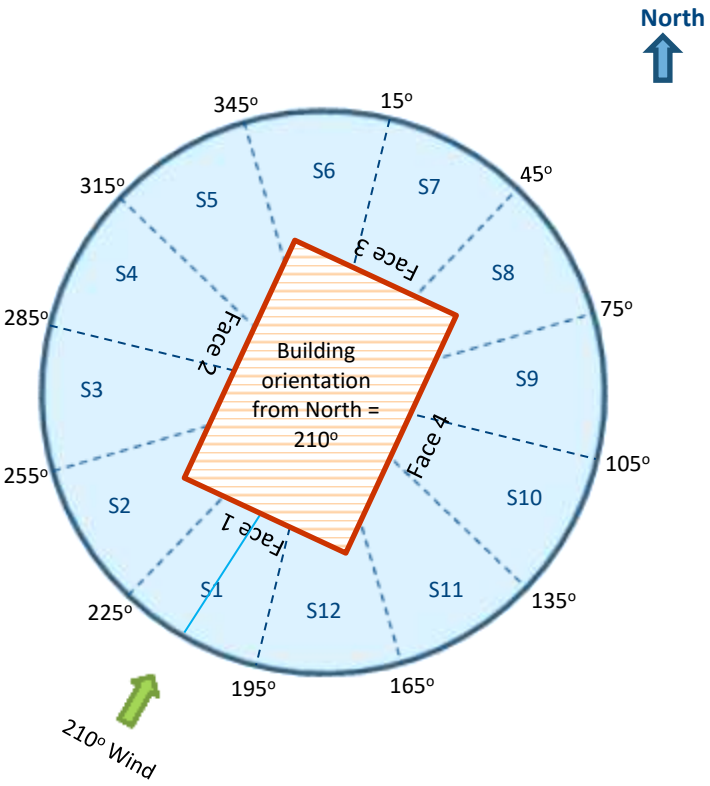
Example of mapping sector results to building faces:

Maximum from sector S12, S1, S2 (315º to 45º) → Wind from face 1 (eg. Far)

Maximum from sector S3, S4, S5 (45º to 135º) → Wind from face 2 (eg. Right)

Maximum from sector S6, S7, S8 (135º to 225º) → Wind from face 3 (eg. Near)

Maximum from sector S9, S10, S11 (225º to 315º) → Wind from face 4 (eg. Left)



Example: 2

Number of wind sectors = 12

Orientation from North = 210°

Sector range:

- Sector 1 = 195° to 225°
- Sector 2 = 225° to 255°
- Sector 3 = 255° to 285°
- Sector 4 = 285° to 315°
- Sector 5 = 315° to 345°
- Sector 6 = 345° to 15°
- Sector 7 = 15° to 45°
- Sector 8 = 45° to 75°
- Sector 9 = 75° to 105°
- Sector 10 = 105° to 135°
- Sector 11 = 135° to 165°
- Sector 12 = 165° to 195°

Example of mapping sector results to building faces:

Maximum from sector S12, S1, S2 (165° to 255°) → Wind from face 1 (eg. Far)

Maximum from sector S3, S4, S5 (255° to 345°) → Wind from face 2 (eg. Right)

Maximum from sector S6, S7, S8 (345° to 75°) → Wind from face 3 (eg. Near)

Maximum from sector S9, S10, S11 (75° to 165°) → Wind from face 4 (eg. Left)

Structure orientation from North

References

1. BS EN 1991-1-4:2005+A1:2010, *Eurocode 1. Actions on structures. General actions. Wind actions*;
2. NA to BS EN 1991-1-4:2005+A1:2010, *UK National Annex to Eurocode 1. Actions on structures. General actions. Wind actions*;
3. PD 6688-1-4:2009, *Background information to the National Annex to BS EN 1991-1-4 and additional guidance*; [Note that clause 2.4.2 and fig 2 are not used in VelVenti because of limited applicability]
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7. BS 6399-2-1997 Incorporating Amendment No. 1 (2002) *Loading for buildings – Part 2: Code of practice for wind loads*
8. ASCE 7-10 *Minimum Design Loads for Buildings and Other Structures*

Technical support

The CADS Technical Support Department will be pleased to assist you with any problems you may encounter in using the program. You may contact the department on:

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