WHEN A CALCULATED RESPONSE IS REQUIRED!

Of all the loading that a building is likely to encounter over its life, the wind has the greatest potential to cause damage to the cladding and even to the building structure. However, with the correct design and specification of the roof and wall cladding systems and their fasteners, it should be possible to ensure that no new or refurbished building built in the UK suffers such damage.

Wind damage: Proper attention to design and detailing will avoid an outcome like this

Wind loading is site and building specific due to the many factors that influence the wind speed at a given location. The calculation of wind loading is complicated and requires the services of a qualified engineer or the use of software by an appropriately experienced person. However, it is essential that the wind loads are calculated for each and every building; since if not designed for, the force of the wind can cause failure of the cladding, secondary components or even the building structure.

It is therefore necessary to perform wind loading calculations specifically for the building envelope in addition to those undertaken by the structural engineer for the structural frame. In the event where a structural engineer is not involved in the cladding design process, or when the roofing/cladding systems have been specified by a contractor or architect, it is essential that structural calculations for the specified systems are carried out and this is often the responsibility of the installer or specialist subcontractor…or in many cases just overlooked!

In an ideal world the main contractor will demand provision of calculations for the roof sheeting and wall cladding and these will be reviewed and/or approved by the structural engineer. In these situations it is vital that the contractor or specialist subcontractor has the knowledge and ability to perform the calculations and certainly identify and assess potential difficulties and issues before problems and costly complications occur. If in doubt, MCRMA members can provide this service and, in some cases, software is also available as part of the packages offered by manufacturers.

Wind loading is dependent on several factors relating to the location of the site and the geometry and orientation of the building. The main factors that influence wind speed are:

- Location
- Altitude
- Distance to sea
- Town or country
- Topography
- Wind direction
- Building height
- Building shape
- Wind forces on elements of the building envelope

Until March 2010, the code of practice for wind loading in the UK was BS 6399-2, but this has since been replaced by BS EN 1991-1-4 (although the former is still widely used). The latter standard is one of the structural Eurocodes and is applicable across the European Union, although each member state has its own National Annex that must be used when designing for that country. In order to design or specify the envelope elements correctly, it is necessary to estimate the maximum magnitude of wind loading that the building is likely to encounter over its life.

To support the design and specification team and the installation contractors, MCRMA has developed a dedicated page on its web site where a range of specialist web-based resources are available to assist with the calculation process. Reference to the MCRMA web site at www.mcrma.co.uk/wind-loadings-guidance/ provides access to the roof and wall calculations produced to BS EN 1991-1-4 (see www.SteelConstruction.info).

The web page also provides a series of links to other sites for specific input data, which is needed to complete the calculation and provide output data. The accompanying links provide an altitude or elevation finder, distance calculator for establishing distance of the building from the sea, weather maps of wind strength and direction plus links to UK weather stations for reports and historical data showing principal wind directions and frequency.

While software removes the labour from the calculation process, it does not remove the responsibility for assessing all of the site and building factors noted above and ensuring that the calculation is fit for the building under consideration.

MCRMA Guidance Document GD15, *Guidance for wind loadings on roof and wall cladding,* provides more detailed information about the calculation process and the factors which need to be considered when assessing the performance of individual buildings at different locations.

As a general rule the ridges and corners of roofs and the corners of walls are especially vulnerable to high wind loads. While it is important not to ignore the high wind zones, care should be taken to avoid over-complicating the specification to the point where mistakes are likely to be made on site. A standard quantified fastener regime may be specified for most of the envelope with an increased frequency of fasteners in high wind zones.

The information provided in the guidance document and the web-based resources should be considered as informative and although care has been taken to ensure that the calculated results are correct, users should verify the output. Additional advice can be obtained from any of the independent roofing and cladding inspectors featured on the MCRMA web site.

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