Wind Guidance Note for Working at Height

Association of Technical
Lightning and Access Specialists

ASG: 005
July 2019

WIND GUIDANCE NOTE

FOR WORKING AT HEIGHT IN THE

STEEPLEJACK AND LIGHTNING CONDUCTOR

ENGINEERING INDUSTRIES

ISSUED BY:

THE ASSOCIATION OF TECHNICAL LIGHTNING & ACCESS SPECIALISTS (ATLAS)

Document Issue/Amendment Certificate

Date	Author	Revision	Amendment
15.04.19	M.J. Fuller	Draft 000	For comment and technical review.
02.05.19	J. Burns & W. Murry		Safety & Access Committee comments.
24.05.19	M.J. Fuller	Draft 001	Issued for final comment.
	J. Burns & W. Murry		Safety & Access Committee. Minor amendments incorporated.
05.06.19	ATLAS Council	Issue 001	Document approved for publication.
31.07.19	ATLAS Secretariat	Issue 001	Document issued to members.

We have verified the document for technical accuracy. We confirm that the supporting references are appropriate and that the information in them has been correctly extracted. We have verified this document for typographical and grammatical correctness. We have verified that the conclusions are supported and correct and, where judgments have been made, they appear reasonable. We are satisfied that this document is fit for purpose.

Whilst this guidance note has been produced for the use of those primarily working in the steeplejack and lightning conductor engineering industries, it may have applications elsewhere, and may be freely used.

Please note that any advice is given in good faith with the aim of providing general guidance on best practice. ATLAS and the individuals and organisations responsible for the advice do not accept any liability arising in any way from relying upon it. If you require advice on a specific issue, you should seek your own independent professional advice.

Requests to use any part of this guide, unless noted as being freely available from the **ATLAS website**, should be made in writing to:

Association of Technical Lightning & Access Specialists (ATLAS),
5th Floor,
6-8 Bonhill Street,
London,
EC2A 4BX.

Table of Contents

Introduction

This Guidance Note is intended to help site staff, employers and clients understand the importance of taking wind effects into account in their everyday assessment of activities whilst working at height.

The guidance is intended to:

- Assist with understanding wind and its behaviour
- Be a simple everyday guide for basic understanding
- Provide an on-site point of work risk assessment
- Provide supporting information and tools for measuring wind and recording, including links to sources of further information.

The appropriate law is the Work at Height Regulations 2005 which states under regulation 4:

Organisation and planning
(1) Every employer shall ensure that work at height is—
(a) properly planned;
(b) appropriately supervised; and
(c) carried out in a manner which is so far as is reasonably practicable safe, and that its planning includes the selection of work equipment in accordance with regulation 7.
(2) Reference in paragraph (1) to planning of work includes planning for emergencies and rescue.
(3) Every employer shall ensure that work at height is carried out only when the weather conditions do not jeopardise the health or safety of persons involved in the work.

The **Health and Safety Executive (HSE)** published a guidance note **HSG33: 2012 (Health and safety in roof work)** and other organisations, plant manufacturers and trade associations have published guidance on their plant and equipment use (some of these are listed in **Appendix 1**).

Whilst some of this guidance is helpful when carrying out roof sheeting or repairs, using a Mobile Elevated Work Platform (MEWP), erecting and dismantling scaffold etc., it is of little help at the top of a chimney, tall structure, on a cliff face or working on or inspecting lightning conductors on a high level roof.

ATLAS member companies who also have industrial rope access trained personnel will be aware of **BS 7985:2013 (Code of practice for the use of rope access methods for industrial purposes)**, which contains further information on this topic.

By issuing this guidance note it is hoped that all those involved in working at height will have a better understanding of how to keep themselves and others safe, and have a process to support the decision they make on the day.

Understanding Wind

The following is extracted from the Met Office web site and can be found **here**.

The movement of air around the earth from high pressure to low pressure is what brings about wind. The direction given for the wind refers to the direction from which it comes. For example, a westerly wind is blowing from the west towards the east.

Measurements of wind strength are made at 10 metres (33 feet) above the ground. A specified height has to be used so that all the measurements taken across the world can be compared, and because at ground level there are lots of obstacles like trees and buildings that can cause the wind strength to fluctuate (*see **Vortexing** below).*

In the UK winds are measured in knots (nautical miles per hour). However, forecast winds are often given in miles per hour (where 1 knot is equivalent to 1.15 mph) or in terms of the Beaufort scale. *(see **Beaufort scale** below).*

Gusts are rapid variations in the speed of the wind. Gusts are higher inland than over the sea or windward coasts, although the mean wind speeds tend to be lower inland. Typically, gusts can be 60% higher than the mean speed, although in the middle of cities this can reach 100%. Northerly winds tend to be gustier than southerly ones. In general, the weather is strongly influenced by the wind direction, so information about the wind provides an indication of the type of weather likely to be experienced:

- **Northerly winds** tend to bring relatively cold air from Polar Regions to the British Isles.
  As cold polar air moves southwards over an increasingly warm sea, the heating of the air by the sea causes cumulus clouds to form. These clouds may grow sufficiently for showers to develop and, consequently, winds from the north-west, north or north-east usually bring cold, showery weather to the British Isles
- **Southwesterly winds** bring warm air from the tropics, which is cooled from below as it moves northwards over a gradually cooling sea. Sometimes the cooling is sufficient for sea fog or a thin layer of stratus to form. The cloud can become thick enough for drizzle, especially on windward coasts and over high ground. In general, winds from the west or southwest are associated with overcast, wet weather
- **Winds from the south and southeast** mainly occur in summer and these bring warm, dry weather. However, southerly winds can sometimes bring hot, thundery weather
- **Easterly winds** in winter bring very cold air to the British Isles. The characteristics and path of the air determine whether it is cloudy (with perhaps rain, sleet or snow) or fine and sunny. In summer, an easterly wind will mean it is cool on the east coast but warm elsewhere, usually with clear skies.

Topography

Topography is a broad term used to describe the detailed study of the earth's surface. This includes changes in the surface, such as mountains and valleys, as well as features, such as rivers and roads.

The wind speed and direction at a given location will be affected by the topography of the surrounding land features e.g. a coastal site with sea to one side, and hills and valleys on the other, will have different wind patterns and speeds depending on the direction of the wind.

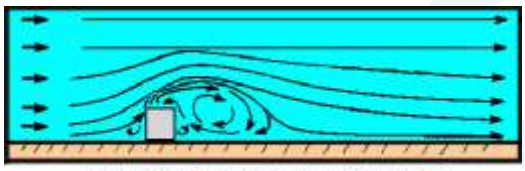
Therefore being aware of the ‘lie of the land’ and wind direction is an important factor to be considered.

Vortexing, Funnelling and the Lee Side

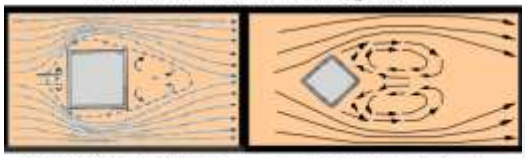
Vortexing and funnelling are the terms used to demonstrate wind turbulence caused by structures and their positions.

Funnelling is the effect of wind blowing between structures and causing what many call 'windy corners' where the obstructions accelerate wind speed between them. **Vortexing** is a swirling of the wind caused by obstructions and can be combined with funnelling causing increased wind turbulence. Similarly the layout of the site, coupled with the wind direction, will have an effect on not only wind speed but what the wind could be carrying with it e.g. process exhaust gases and deposits.

Vortexing and funnelling examples:

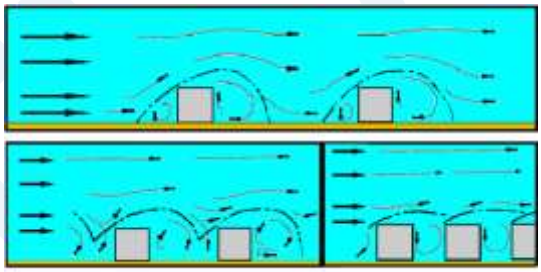


Flow Pattern: Side View Wind Against Face

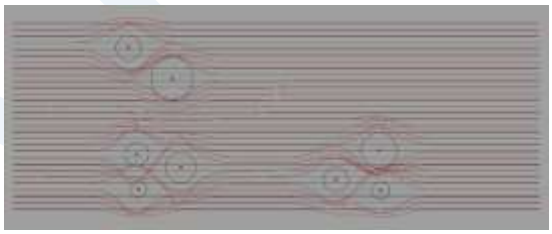


Flow Pattern: Top View Wind Against Face

Flow Pattern: Top View Wind Against Edge



Urban Wind Flow Patterns With Various Simple Building Shapes and Spacings



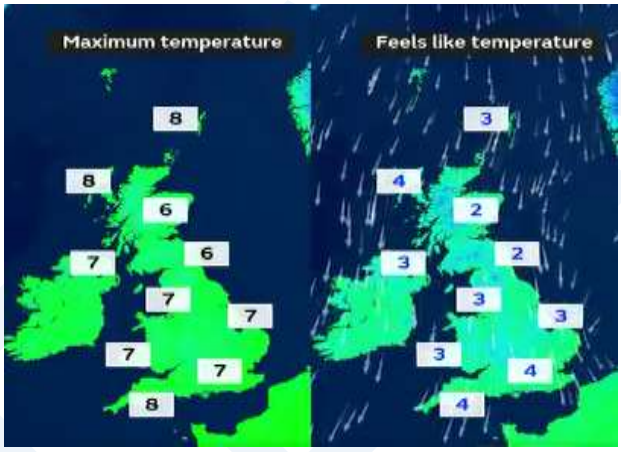
The lee side of an obstruction, building or structure, sometimes known as the sheltered side, provides opportunities for working at height provided the location can be accessed safely. In some circumstances wind at height can be lower than a congested or complex topography at lower levels.

Wind Chill Factor

The 'feels like' temperature is different to the actual air temperature shown on a weather forecast. The 'feels like' temperature measures the expected air temperature, relative humidity and the strength of the wind at 1.5 metres (5 feet - human height), as well as an understanding of how heat is lost from the human body during cold and windy days.

The 'feels like' temperature is especially important on windy days due to the effect of wind on the evaporation speed of moisture from skin, the stronger the wind, the faster the cooling of the skin. This has the effect of moving heat away from the body and making the surrounding air feel colder than it actually is.

'Feels like' temperatures throughout the year are particularly influenced by wind. An example of this is in winter, when winds blowing to the UK from a north-easterly direction make the 'feels like' temperatures colder than the actual air temperature. On a calm day, our bodies insulate us with a boundary layer which warms the air closest to the skin. If it is windy, the wind will take the boundary layer away and the skin temperature will drop making us feel colder.



When the wind speed is low in periods of high temperatures, the 'feels like' temperatures become more impacted by the humidity level. When a human perspires, the water in the sweat evaporates leading to the cooling of the body as the heat is carried away. When humidity is high, this evaporation reduces resulting in 'feels like' temperatures that appear warmer than the actual air temperature.

Information from the Met Office website and is available **here**.

Be aware of the wind chill factor and take the necessary precautionary measures to keep warm (or cool).

How Wind Speed is Measured

Wind speed is measured on the Beaufort wind force scale devised by Sir Francis Beaufort in 1805. It is known as the **Beaufort scale** and relates to wind speed and observed conditions at sea or on land, so that by observing the reaction to things that are happening around us we can have a fair idea of the wind speed. This is only one more important factor to be considered as detailed previously.

The Beaufort scale is recognised as the base line and has been adapted over the years to make it easier to use in particular situations and for guidance in many activities.

Beaufort scale

Wind force	Description	Specifications	mph	km/h	m/sec
0	**Calm**	Smoke rises vertically	< 1	< 1	< 1
1	**Light air**	Direction shown by smoke drift but not by wind or weather vanes	1-3	1-5	1-2
2	**Light breeze**	Wind felt on face, leaves rustle, wind or weather vanes move	4-7	6-11	2-3
3	**Gentle breeze**	Leaves and small twigs in constant motion, light flags extended	8-12	12-19	4-5
4	**Moderate breeze**	Raises dust and loose paper, small branches moved	13-18	20-28	6-8
5	**Fresh breeze**	Small trees on leaf begin to sway; crested wavelets form on inland waters	19-24	29-38	8-11
6	**Strong breeze**	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty	25-31	38-49	11-14
7	**Near gale**	Whole trees in motion; inconvenience felt when walking against the wind	32-38	50-61	14-17
8	**Gale**	Twigs break off trees; generally impedes progress	39-46	62-74	17-21
9	**Strong gale**	Slight structural damage (chimney pots and slates removed)	47-54	75-88	21-24
10	**Storm**	**Seldom experienced inland**; trees uprooted; considerable structural damage	55-63	89-102	25-28
11	**Violent storm**	**Very rarely experienced**; accompanied by widespread damage	64-72	103-117	29-32
12	**Hurricane**	Devastation	73+	118+	33+

The shading on the chart above follows the traffic light colours where green is safe, yellow is be aware and red is considered to be unsafe, and is similar to guidance from HSE (see Appendix 2) and CITB (GE700/19 and GE706/19).

Wind Increases with Height

The current relevant code for wind is **BS EN 1991-1-4:2005+A1:2010**.

Nothing in wind codes past or present actually refers to the safety of humans, they refer to the safety of structures, probabilities of events, topography etc.

What the code does give is a basic wind speed (gust or mean) with factors which increase with height therefore a wind speed of say 10m/sec at 10m height could be 11.4m/sec at 50m and 12m/sec at 100m, and topography of the surrounding land to give a design wind speed, but a probability factor is also added.

By looking at the chart below we can compare the Beaufort scale with the figures in the paragraph above and from previous Codes of Practice (CP3: Chapter V: Part 2:1972) by way of guidance.

Height above ground	Wind force	Description	mph	km/h	m/sec
2m	5	Fresh breeze *between 30-50% at less than at 10m*	7-11	12-18	3-5
		Gusts can be 60 -100 % greater			
10m	5	Fresh breeze	22	36	10
50m	6	Strong breeze	26	41	11.4
100m	6	Strong breeze	27	43	12

How do we Manage Excessive Wind Speed and Who is Responsible?

The responsibility for the safety of both the workforce, who are to ascend, and other people, who may be affected, lies with <u>the person in charge of the project</u> – whatever the size of job, from a quick inspection, to a long term project – and height is just one of the considerations, as gusting winds at low level can be just as harmful as high winds at height.

Today there are considerable resources available, from various sources, for measuring not only the wind speed and the wind chill factor, but other factors such as gusting. Some of these resources can be seen in the Appendices.

All projects must be managed by close liaison with the Client (building/site owner/occupier etc.) and consideration must be given to time deadlines due to outages, shutdowns, and hand-over dates.

Weather conditions should be recorded in the site diary as appropriate.

Many large industrial sites, including power stations, have weather stations and/or anemometers (wind speed indicators) which are of some help in assessing the current and past, but not the future. In addition where large cranes or MEWPs are used often they have anemometers attached.

Conversely many sites e.g. churches, factories, blocks of offices or flats, historic buildings or cliff faces, will have nothing in terms of help or guidance from the Client.

On the basis that there is a potential for high winds, the management of providing a safe place of work has to be carried out on a continuous basis of monitoring the weather – this means:

a. Taking into account the time of year and its history
b. Watching the various broadcasting channels for the weather forecast (before work commences)
c. Using information from the site (if available)
d. Continuous monitoring of the weather conditions by broadcasting channels and/or on-line data (See Appendices for examples)
e. Setting up a portable weather station either hand held or static (See Appendices for examples)
f. Recording findings to demonstrate that point of work risk assessment has been carried out and delays to job completion are justified because of conditions beyond contractor control.

Where there are site restrictions on using mobile phones (or no signal), a local hand held or static weather station should be used as appropriate to the site.

<u>We recommend that on site risk assessment includes a section on weather conditions (example shown in Appendix 5).</u>

Appendix 1 - MEWP and Crane Information

MEWPs are generally designed to operate in wind speeds not exceeding a maximum of 12.5 m/s or 28 mph, unless marked differently. Not all MEWPs are designed to be wind speed rated for outdoor use. Always refer to the MEWP's identification plate/operations manual typically illustrated below.

The only truly accurate way to record wind speed is from the platform of a MEWP using an anemometer. Relying on the limited visual Beaufort scale is often impractical for MEWP operators. 12.5m/s or 28 mph relates to Force 6 (a strong breeze).

The **International Powered Access Federation's (IPAF)** advice on operating MEWPs in wind can be accessed **here**.

Further information is also available in the form of HSE's guidance note **GEIS6 – The selection, management and use of mobile elevating work platforms**.

For **cranes** including man riding, the **Construction Plant-hire Association (CPA)** has published a mobile crane technical information note **TIN No. 101 – The Effect of Wind on Mobile Cranes in-service**, which gives useful guidance for those using mobile and tower cranes for this activity.

Further guidance documents from the CPA are available **here**.

Appendix 2 - HSE's - HSG33 - Health and Safety in Roof Work

HSG33 – Health and Safety in Roof Work is free-to-download. The web-friendly version (Fourth edition, published 2012) has been adapted for online use from HSE's current printed version.

The aim of this book is to help all those involved in construction – specifically roof work activities (including activities often not considered as roof work, such as maintenance and surveying) – to identify the main causes of accidents and ill health, and to explain how to identify the hazards and prevent or control the risks. The guidance is simple and will have general relevance to everyone in the construction process, but particularly to those directly involved in roof work. It will refer to other documents, some relevant to particular groups, depending on the subject they address.

Note: *Whilst this publication may be of use to those handling large items at height, it may not be of great value to some work undertaken by ATLAS Members.*

Appendix 3 - Measuring and Recording Weather Conditions

Where time is important to the Client, adverse weather can have consequences in terms of delays, potentially resulting in financial penalties being applied. Please look at terms and conditions in contracts and challenge any that do not recognise that adverse weather is a safety matter - workers should not be put at risk to meet deadlines.

There are several instruments available on the market for checking the wind speed, and others that will measure direction, wind chill and altitude amongst other functions. Some instruments also have the capability of recording data which can be downloaded onto a computer - this could be used in a case where delays, due to adverse weather conditions, are a factor for negotiation.

One brand (**Kestrel Weather Instruments**) has been selected to demonstrate the range of options (other brands are available). **Richard Paul Russell** (the official UK distributor for Kestrel Weather Instruments and **fixed wind and weather monitoring stations** using Gill Instruments ultrasonic sensors, their own data logging technology and cloud data storage solution, **WeatherFile**) offers ATLAS Members a 10% discount off all Kestrel units, accessories, Gill sensors and complete weather stations. Members should contact **ATLAS** for the discount code.

A top of the range instrument's specification is shown below for illustration purposes, but guidance should be sought from manufacturers on specific requirements.

Kestrel 5000 and Weather Station

The Kestrel 5000 Environmental Meter is a compact yet powerful measuring and data logging tool. It can be used for research, safety, expeditions, agriculture and any other profession or activity where accurate on-the-spot conditions monitoring is key.

Current weather conditions can be viewed over the large high-resolution screen that is clear and easy to read with built-in dual colour backlight. The screen is constructed from high-strength polycarbonate.

The Kestrel 5000 also calculates and logs over 10,000 sets of time-stamped data.

There are two versions of Kestrel 5000:

- The standard Kestrel 5000, where data can be transferred using the K5000 USB Data Transfer Cable (sold separately) to a Windows/Mac device. The free of charge Kestrel LiNK App will allow you to view and hold all data as well as download it into .csv format
- The Kestrel 5000 LiNK version has Bluetooth connectivity allowing you to transfer data wirelessly to an iOS (iPhone, iPad) device or Android smartphone or tablet when within range using the appropriate Kestrel LiNK App. You can also transfer data wirelessly to a Windows or Mac computer using the optional Kestrel Bluetooth USB Dongle (sold separately). Data can be viewed live on the App up to 100 feet away (line of sight).

When combined with the Kestrel Vane Mount and Kestrel Tripod the Kestrel 5000 becomes a stand-alone monitoring station as the large wind vane and precision pivot keep the Kestrel oriented into the wind for continuous measurement and logging of wind speed and all other key environmental parameters.

Mil-SPEC-810G drop tested with an IP67 waterproof rating the Kestrel 5000 is designed and constructed to withstand the harsh working environment it will encounter. The unit comes with a five-year warranty and certificate of conformity as standard

Measures:

- Dew point
- Heat stress index
- Relative humidity
- Current wind speed/maximum wind gust/average wind speed (mph, km/h, ft/min, m/s, knots and Beaufort)
- Temperature (air, water, snow)/wind chill (Fahrenheit and Celsius)
- Barometric pressure (inHg and hPa (mb))
- Pressure trend
- Altitude (feet and metres)
- Density altitude
- Wet bulb temperature
- Exterior temperature, humidity and pressure sensors for fast and accurate readings.

Features:

- Large easily read high resolution, high contrast display with backlight
- Time and date
- Customise screens to display user-selected measurements
- Graph and recall trends
- Minimum, maximum and average values
- Automatically store measurements, when powered on or off
- Manually store measurements with the press of a button
- Customisable data storage - 10,000 data points
- Data charting
- Optional LiNK connectivity powered by Bluetooth® low energy provides wireless communication to mobile devices and computers
- Data upload to iOS and Android phones, and tablets
- Data upload to Windows or Mac computers with optional USB data cable
- Data upload to Windows and Mac computers via wireless Bluetooth (LiNK enabled meters only with the optional Kestrel Dongle)
- Standard user-replaceable AA lithium battery (Average life 400 hours)
- Drop tested to MIL-STD-810G standards (10 drops from 4’).

Appendix 4 - Other Sources of Wind Information Available

- Local news stations and weather forecasts
- Web linked apps for mobile devices:
    - WindCompass
    - Altimeter
    - Met Office
    - BBC Weather
    - *Search for 'wind app'.*

Appendix 5 - Example On Site Risk Assessment Including Weather Conditions

POINT OF WORK *Risk Assessment*

PART 1 *STOP*	**Task:**	**Site/Plant Location:**	Date: Job no:

PART 1 *STOP*	YES	NO	N/A
Before you start (tick appropriate box)			
Are you at the correct site/item of plant/location?			
Do you have the right documentation for the job?			
Do you have the right PPE for the job?			
Are power tools and leads and plant tested?			
Are scaffolds and ladders inspected (access safe)?			
Is lifting equipment inspected?			
If you have answered NO to any of the above, take required action or report to your supervisor **IF IN DOUBT ALWAYS ASK!**			

Safety assessment If the hazard is present tick the box

PART 2 - *THINK*			
Slips, trips or falls on the same level		Entry into a confined space	
Falls from height		Dust	
Falling/flying objects		Fumes	
Chemicals/harmful substances		Noise	
Heat/fire/explosion		Vibration	
Asphyxiation/drowning		Electricity	
Risk to plant		Residues	
Contact with stationary object		Poor lighting	
Object overturning/collapsing		Temperature (high/low)	
Manual handling		Adverse weather	
Stored energy or insecure load		Uncertified equipment	
Risk to you from your work or others' work		Risk to others from your work	
Underground services			

Others (specify)

You must have a RESCUE PLAN IN PLACE please provide brief details:

(you must always be able to provide a way of safe escape in the event of something going wrong)

Circle any ticks above for hazards that are significant and for which there are no (adequate) controls

……

……

……

……

If you have circled any hazards. Part 3 needs to be completed and appropriate control measures put in place before work commences

POINT OF WORK *Risk Assessment*

PART 3 - *ACT*

Additional safety assessment

Hazard (circled from overleaf)	Controls Measures/Precautions	Remaining Risk (High, Medium or Low)

PART 4 - REVIEW

End of Job Review

Are there any lessons for next time? (see below)	**YES**	**NO**
Has the work created any new hazards?	**YES**	**NO**

If you have answered YES to either or both of these questions, make a brief note below and tell your supervisor.

Signature: **Date:**

Lessons learnt and future site/location visit advice

List here any information that would make the next visit safer and include contact details if appropriate

Acknowledgements

ATLAS would like to thank the following for their contributions to the development of this guidance document:

- Beaumont Specialist Contracting
- Churchill Specialist Contracting
- Cuttings
- Delta International
- Horizon Specialist Contracting
- M. J. Fuller & Associates
- Omega Red Group
- Richard Paul Russell.