



# ROOFING & CLADDING IN WINDY CONDITIONS

3rd Edition

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## FORWARD

Roofers must always be made aware of and understand the hazards which can overtake them whenever work is attempted or continued in windy conditions. This applies particularly when working upon industrial buildings where large area sheeting materials are being handled. The risks are increased considerably when gusts occur during periods of high average wind speeds. Edge protection provides very little security when the roofer is being carried away by a 'flying' roof sheet. A sheet in a high wind can be as out of control and as dangerous as a car on a slippery road.

It is not only in industrial building that care must be taken in windy conditions. The slater and tiler cannot work in safety when leaning against a high wind and a roll of roofing underlay caught by the wind can become extremely mobile, flexible and very dangerous. In Flat Roofing, reinforced bitumen membranes and single ply membranes are equally affected and the effect of high wind upon hot bitumen when it is being poured can be extremely dangerous.

The responsibility placed upon the roofing contractor is not always easily understood, when it is necessary to stop or prevent roofing activities from taking place under conditions which are often acceptable for other building activities, e.g. Bricklaying, drain laying, plastering.

For the roofing contractor, there has always been a requirement for a code of practice or a practical guide, to which reference could be made to assess the effects of high wind when working at heights. This guide should provide a satisfactory means of substantiating claims for extension of time.



**IT IS RECOMMENDED THAT A REFERENCE TO THIS PUBLICATION IS MADE IN THE COMPANY SAFETY POLICY.**

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## DESIGN AND PLANNING OF ROOFING WORKS

A fundamental principle behind good roofing design is protection of the contents and inhabitants against wind forces. When wind strikes a building, it creates a positive pressure on the windward face and negative pressure over the roof and in the lee of the building. Distribution of pressure over a complete roof is far from uniform, still less the roof on a partially constructed building as all designers are aware. Particular consideration should be given by designers to relating the roof system to the terrain, location and sometimes the season in which roof construction is anticipated to take place so that the roof can be constructed in a safe and efficient manner.

When designing a roof structure or covering, it is imperative that the issue of 'buildability' is raised. At design stage, all Designers have a legal duty to reduce all risks that may be imposed upon operatives who construct, maintain or demolish roof structures.

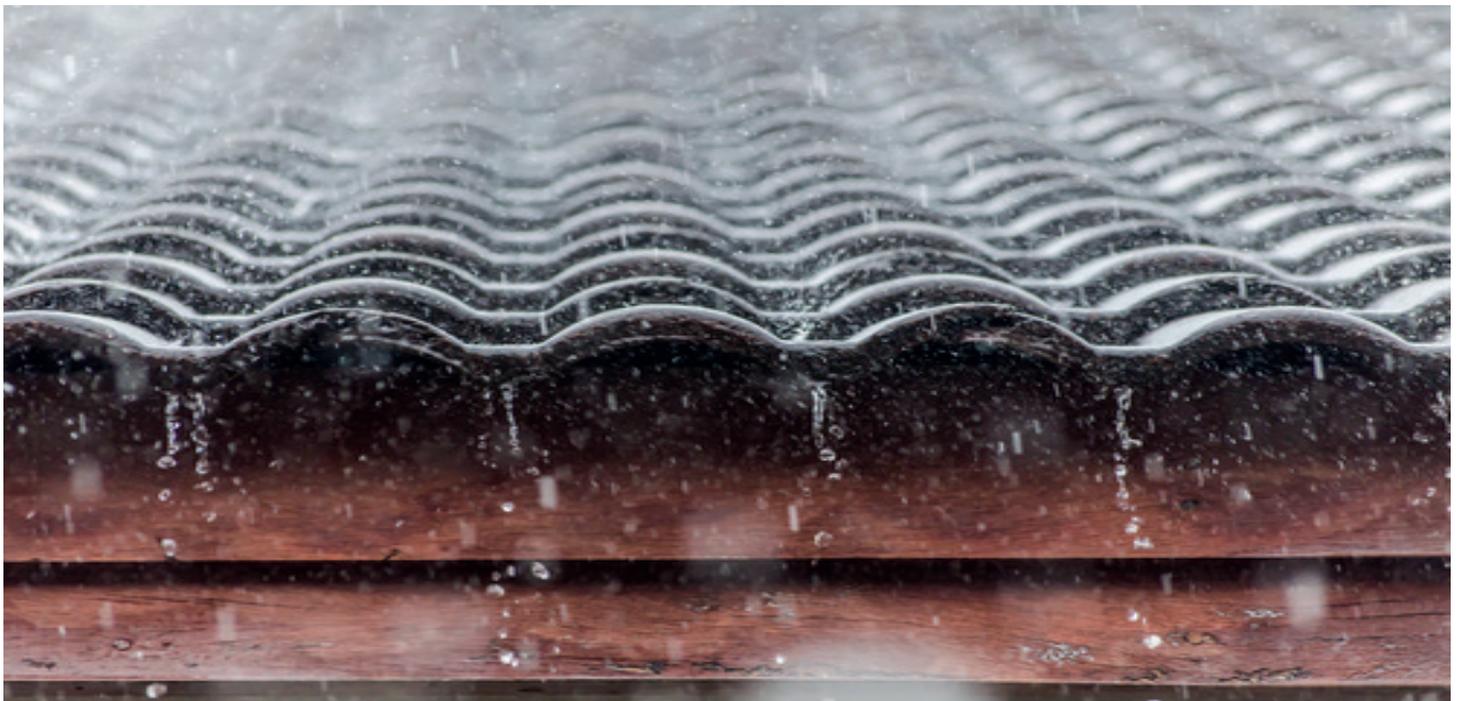
The responsibility placed upon the roofing contractor is not always easily understood, when it is necessary to stop or prevent roofing activities from taking place under conditions which are often acceptable for other building activities, e.g. Bricklaying, drain laying, plastering.

To enable the preparation of the guide to take place, information was gathered from member companies. In collating and evaluating the information, technical assistance has been given to the Committee by The Met Office, the Building Research Establishment and the Health & Safety Executive; this publication is the result.

The information contained in this document should be read in conjunction with the NFRC Safety Passport which covers many Health and Safety issues of site activities.

HSE publication 'Health and Safety in Roofwork' HSG 33, ISBN 0717614255 provides industry guidance and valuable information to anyone involved in Roofwork; whether a Designer, Contractor or Roofer. This guidance while not compulsory provides suggested courses of action when planning and undertaking roofing and following the guidance will normally be enough to comply with the law.

Additional guidance can also be found in HSE information sheets and NFRC Profiled Sheet Roofing and Cladding – The Guide to Design and Best Practice, which provides further advice relevant to industrial sheeting projects.



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## 1. APPRECIATION OF THE PROBLEM

The problems which arise when a Roofing Contractor is expected to continue to work on, Site under windy conditions are not always appreciated by the Architect, Engineer, Principal Contractor, Developer, Tenant or Client.

## 2. PURPOSE OF THE PUBLICATION

The purpose of this publication is to lay down conditions under which working is not practicable or possible from the point of view of complying with current Safety Standards applied by the Health & Safety Executive. From detailed investigations the following recommendations are made.

## 3. ROOFING WORK

### 3.1 Miles Per Hour, Knots, Metres per Second and the Beaufort Scale

The **Table 1** below gives comparable speeds.

M.P.H	KNOTS	METRES/ SEC	FORCE
17	15	7.7	4
23	20	10.3	5
26	23	11.8	6
29	25	12.9	6
35	30	15.5	7

### 3.2 Sheeting and Decking

a) All laying or handling of profiled single skin sheets at roof level should cease when the (average) mean wind speed reaches 23 mph (gusting to 35 mph or over).

b) All laying or handling of sheets, longer than 5 m, at roof level should cease when the (average) mean wind speeds reach 17 mph (gusting to 26 mph or over).

c) Where multi-skin constructions are in progress, all laying or handling of lightweight materials such as glassfibre, insulation boards, liner trays, etc., at roof level should cease when the mean wind speed reaches 17 mph (gusting to 26 mph or over).

d) Special consideration must be given to the laying and handling of sheets exceeding 20 m in length. The above maximum wind speeds may be too high, as the surface area of the sheet may make it unwieldy in lower wind speeds.

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### 3.3 Slating and Tiling

- a) All laying or handling of slates, tiles, battens and felt at roof level should cease when the (average) mean wind speed reaches 23 mph (gusting to 35 mph or over).
- b) When handling rolls of felt at roof level, extreme care should be taken when the mean wind speeds are in the region of 17 mph (gusting to 26 mph or over).

### 3.4 Reinforced Bitumen Membranes (RBM)

- a) All laying or handling of membranes and hot bitumen at roof level should cease when the mean wind speeds reach 23 mph (gusting to 35 mph or over).
- b) When handling rolls of lightweight membranes and/or working with 'hot bitumen' extreme care is necessary when the wind speeds are in the region of 17 mph (gusting to 26 mph or over).

### 3.5 Mastic Asphalt

- a) All laying or handling of mastic asphalt at roof level should cease when the mean wind speed reaches 23 mph (gusting to 35 mph or over).
- b) All laying or handling of felt, Insulation boards or hot bitumen at roof level should cease when the mean wind speed reaches 23 mph (gusting to 35 mph or over).
- c) When handling rolls of lightweight felt and /or working with hot bitumen, extreme care is necessary when the mean wind speed is in the region of 17 mph (gusting to 26 mph or over).

### 3.6 Single Ply Roof Membranes

- a) All laying or handling of single ply membranes should cease when the mean speed reaches 23 mph (gusting to 35 mph or over).
- b) Laying or handling of lightweight vapour control layers and (inverted roofs only) water-flow reducing layers should cease when the roof level mean wind speeds reaches 17 mph (gusting to 26 mph or over).

Decking panels of steel or timber composite (plywood or Oriented Strand Board) must not be laid when the roof level mean wind speeds reach 23 mph (gusting to 35 mph or over). Note that the load on a 2.4 m x 1.2 m sheet of plywood at 14 m/s (31 mph) is approximately 38 kg.

### 3.7 Liquid Applied Waterproofing

All laying or handling of liquid applied systems at roof level should cease when the roof level mean wind speeds reaches 17 mph (gusting to 26 mph or over).

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### 3.8 Insulation Boards

The handling of insulation boards on a roof in windy conditions is especially dangerous as the board will act as a sail to catch the wind and could cause serious injury to the operative and the public work involving the handling of insulation boards should cease as soon as the boards become difficult or dangerous to handle. This may well be lower than the 17 mph that applies to other materials.

## 4. VERTICAL WORK

### 4.1 Cladding

- a) All fixing or handling of sheets more than 2 m above ground level should cease when the mean wind speed reaches 23 mph (gusting to 35 mph or over).
- b) All fixing or handling of sheets longer than 5 m when more than 2m above ground level should cease when the mean wind speeds reach 17 mph (gusting to 26 mph or over).
- c) Where multi-skin constructions are in progress all fixing or handling of lightweight materials such as glassfibre, Insulation boards, liner trays etc., more than 2 m above ground level should cease when the mean wind speeds reach 17 mph (gusting to 26 mph or over).
- d) Special consideration must be given when fixing or handling cladding sheets that are of exceptional length. The above maximum speed may be too high, as the surface area of the sheet may make it unwieldy in lower wind speeds.

### 4.2 Slating and Tiling

- a) Provided that this work is carried out from a safe working platform or safe scaffolding it should be possible to afford additional protection at the position of work which should render the limitations of working in windy conditions less significant than in the roofing situation. Although every situation should be considered individually as local conditions may increase the hazards.
- b) Where work is exposed and protection is not possible, then it will be necessary to apply the recommendations given under sections 3.3(a) and (b).



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## **5. SAFETY ASPECTS**

### **5.1 Wind Speed Variations at Height**

Fixing operatives must be made fully aware of the variations of wind speeds relative to the height at which work is being carried out. It is quite normal for wind speeds at ground level to be relatively low compared with wind speeds at other heights.

### **5.2 Wind Speed Readings Taken at Place of Work**

Bearing in mind the comments in 5.1, it is imperative that wind speed readings are taken at the actual place of work (e.g. at the eaves, at the ridge, 20 m high up the side elevation of a high structure, etc.) and the decisions taken in view of the conditions that prevail at that location.

### **5.3 Wind Direction**

Particular attention should also be given to the wind direction; there are many instances where surrounding buildings can create particular wind problems due to:

- a) additional wind pressure
- b) additional wind suction
- c) gusting winds higher than normal
- d) eddies or whirlpool effects
- e) aircraft vortex effects in proximity to airports, (e.g. greater vigilance required when landing and take off patterns change).

In situations such as the above more time should be spent in assessing wind speeds as they apply /prevail at that location.

### **5.4 Gusting**

Companies must ensure that the fixers are made fully aware that gusts of wind can be significantly higher than the average wind speed (up to 1½ times the average speed in open, level country and as much as twice the average speed in city centres).

### **5.5 The Principal Contractor**

Companies should make sure that the Principal Contractor understands, before any work commences, the order in which the workforce will carry out the operations required in relation to the prevailing winds on site.

### **5.6 Working With One Common Aim**

It is in the very best interest of the industry and in particular for the safety of the operatives, that everyone works together with one common aim to apply these minimum standards, which are agreed as reasonable by the Health & Safety Executive and the Building Research Establishment.

## 5.7 The Beaufort Scale of Mean Wind Speeds

For general information, set out in Table 2 are the relationships and descriptions of wind forces on The Beaufort Scale, at 10 m above ground level. These relate to mean wind speeds.

Description	m.p.h		knots		m/ sec.	
	Min	Max	Min	Max	Min	Max
<b>Force 0 - Calm</b> Calm; smoke rises vertical	0	1	0	1	-	-
<b>Force 1 - Light Air</b> Direction of wind shown by smoke drift, but not by wind vanes.	1	3	1	3	0.5	1.8
	<b>Mean:</b> 2		<b>Mean:</b> 2		<b>Mean:</b> 1.1	
<b>Force 2 - Light Breeze</b> Wind felt on face; leaves rustle; ordinary vanes moved by wind.	4	7	4	6	1.9	3.3
	<b>Mean:</b> 5.5		<b>Mean:</b> 5		<b>Mean:</b> 2.6	
<b>Force 3 - Gentle Breeze</b> Leaves and small twigs in constant motion; wind extends light flag.	8	12	7	10	3.4	5.4
	<b>Mean:</b> 10		<b>Mean:</b> 8.5		<b>Mean:</b> 4.4	
<b>Force 4 - Moderate Breeze</b> Raises dust and loose paper; small branches are moved. Special care should be taken handling/ fixing materials over 5 m long - approaching critical limit. Care should be given when handling light weight insulation materials.	13	18	11	16	5.5	7.9
	<b>Mean:</b> 15.5		<b>Mean:</b> 13.5		<b>Mean:</b> 6.7	
<b>Force 5 - Fresh Breeze</b> Small trees in leaf begin to sway; crested wavelets form on inland water. Special care should be taken in roof and vertical work. Mean wind speed approaching critical limit when all work must cease.	19	24	17	21	8	11
	<b>Mean:</b> 21.5		<b>Mean:</b> 19		<b>Mean:</b> 9.5	
<b>Force 6 - Strong Breeze</b> Large branches in motion; whistling heard in telegraph wires, umbrellas used with difficulty. No fixing work anywhere should be in progress.	25	31	22	27	11.1	14.1
	<b>Mean:</b> 28		<b>Mean:</b> 24.5		<b>Mean:</b> 12.6	

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## **6. PRACTICAL ASPECTS**

### **6.1 Hand Held Wind Meters (anemometer)**

In order to ascertain wind speeds it is recommended that Supervisors and Foremen are provided with hand held wind meters. There are a variety of wind meters on the market.

### **6.2 Readings at Place of Work**

Reference to paragraphs 5.2 and 5.3 indicate that wind speed readings should be taken at the place of work. This is imperative; see comments in 5.1 wind speeds relative to height.

### **6.3 Taking Wind Speed Readings**

Care must be taken to ensure that the manufacturer's Instructions are fully observed for the instrument in use.

### **6.4 Obtaining Average (Mean) Wind Speeds**

In use, the windmeter is held with its axis vertical at arm's length and with the arm at right angles to the wind direction to ensure that the disturbance of the airflow, caused by the observer's body, is reduced as much as possible.

At least two readings of mean wind speed (each reading being taken over at least 15 seconds) should be taken within the overall period of observation. When the readings differ by less than 10 mph the average is recorded. Should the readings differ by more than 10 mph then a third reading should be taken and the average of all three readings recorded as the mean wind speed.

### **6.5 Gusting Again**

Gusting can be 50% - 100% higher than average (mean) and due allowance must be made when laying or handling materials at any height 2 m or more above ground level. Maximum gusting speeds should be recorded during each reading.

### **6.6 Local Weather Forecasts**

The local area weather forecast can be obtained from Weathercall (an automatic telephone service) supplied by the Met Office. The forecast can be used for guidance about prospects for the day's work (and up to 5 days ahead) and whether it will be necessary to make any wind speed checks on site. Further information is available at [www.metoffice.gov.uk](http://www.metoffice.gov.uk). This information, however, should only be used for guidance.

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## **7. GENERAL SAFETY**

### **7.1 Other Trades**

Operatives must be made aware that when handling materials at height in windy conditions, there is an added responsibility to make sure that materials being handled and fixed cannot be blown from the roof creating safety hazards for other persons at ground level. Unfixed material left unattended should be secured. It should be remembered that sheet material blown from a roof can, in high winds, land on the ground at a considerable distance from the point at which it left the roof.

## **8. CONTRACTUAL ASPECTS AND RECORDS**

### **8.1 Keeping of Records**

It is necessary to make sure the roofing operatives keep wind records as described whenever they cannot work for these reasons. The operatives should be issued with printed forms in duplicate, onto which can be recorded the date, the time, the number of fixers standing, wind conditions at both ground and roof level, and finally a signature. For an example, **see table 2**.

### **8.2 Daily Records to Principal Contractor**

A copy of the form referred to in 8.1 should be given to the site agent on the day following the day in question, with the remaining copy being sent into the roofing contractor's office.

## **9. CONCLUSION**

### **9.1 All Working Together**

If the whole construction industry can work together on the subject of 'Safety in Windy Conditions', apply the rules laid down, prepare the documentations suggested, then the result is bound to be fewer accidents due to windy conditions, an increase in safety awareness and a general contractual benefit for all concerned.

Health and safety concerns and Construction Safety should take precedence over normal contract conditions. The National Federation of Roofing Contractors does not accept any responsibility for any situations which may arise following the recommendations and suggestions given in this publication. This booklet is published in the belief that it meets an need in the roofing industry. It is intended to assist roofers 'in their tasks by serving to identify the wind conditions which make roofing work both impractical and hazardous to the safety of roofs, site personnel and members of the public.



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