

Guide for the use of ropes in vertical work



Produced by:

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In collaboration with the Working Group on Health and Safety - Vertical work.

AEE would like to show its appreciation to all participating companies that have actively collaborated in the development of this guide

1. Background

The use of rope work access and positioning techniques have become increasingly widespread over recent years and, for various reasons, are particularly favoured by the wind sector.

Due to the limitations posed by Royal Decree (RD) 2177/2004 on this type of work, the wind and rope work sectors got together to draw up a series of recommendations to be published in a specially adapted guide for the wind sector.



Source: Asaken

2. Objective

The use of rope work for access and positioning as a practice for carrying out sporadic work at height is referred to in RD 2177/2004 as follows:

“4.1.3 The use of rope work access and positioning techniques will be limited to those circumstances in which a risk assessment indicates that such work can be carried out safely and, also, providing that the use of other safer equipment is not viable”.

In November 2011, and in compliance with RD 2177/2004, the National Institute for Health and Safety in the Workplace (Instituto Nacional de Seguridad e Higiene en el Trabajo-INSHT) published the new edition of the *Technical Guide to the assessment and prevention of risks related to working equipment*. The guide contained recommendations for the use of equipment for sporadic work at height, including vertical rope work.

The present Guide sets out to establish criteria for rope work access and positioning techniques in the wind sector based both on the INSHT guidelines and on consensus between the wind sector and the National Association of Vertical Work Companies (Asociación Nacional de Empresas de Trabajos Verticales-ANETVA).

From those criteria, the aim is to establish basic guidelines and recommendations (beyond those of the technical guidelines set by RD 1215/1997) to help wind sector companies determine when rope work techniques should be used.



Source: Asaken

3. Justifying the use of rope work access and positioning techniques

Taking into account both RD 1215/1997 and INSHT guidelines, the use of rope work techniques for access and positioning for sporadic work at height is justified as follows:

Above all, and as a basic principle, the result of the risk assessment must provide guarantees that the work can be carried out safely.

1. It is not technically possible to carry out the work using other equipment.

Such a case might occur within confined spaces, like inside a wind turbine tower, where there is not enough room for using or mounting other types of equipment.

2. The mounting or use of other types of equipment involves higher risks than using rope work access and positioning.



Source: Asaken

Such a case might arise for access work, when the turbine base does not offer the proper safety conditions for installing or using other working equipment.

- 3. The work to be carried out either requires a short period of time or is urgent and the use of equipment other than rope work access and positioning equipment would take much longer to deploy. In such cases, the speed of deployment is the determining factor for the safety of people, especially if they are in need of aid, rescue or protection.**

Such a case might arise during short inspection or repair work or urgent repair work to avoid exacerbating an anomaly.

The use of rope work access and positioning techniques are recommended when the work at hand is short, that is to say of no more than two weeks' duration for each turbine. It is also recommended when the situation requires urgent intervention and the time needed to deploy alternative working equipment would be much longer. The determining factor governing the speed of deployment is personal safety, especially if people are in need of aid, rescue or protection.



Source: Asaken

4. Recommended activities for rope work access and positioning techniques

Activities where rope work access and positioning techniques are recommended include the following:

- Work inside the tower, not accessible from fixed platforms.
- Blade inspection.
- Short duration blade repair.
- Urgent blade repair.
- Work on tower and nacelle exteriors.

The rope worker may carry material and tools weighing up to 10 kg in total when suspended. When total weight of tools and material exceeds 10 kg, an auxiliary rope must be used.

The maximum time of uninterrupted suspension is four hours. The worker must always carry a rope worker seat.



Source: Asaken

5. Weather condition considerations

Weather conditions affect all types of work carried out on both the interior and exterior of wind turbines, regardless of the working equipment being used (elevators, scaffolding and rope work, among others). The present document makes reference to the recommendations applicable to rope work techniques only. Similar recommendations are applicable to work with other methods and equipment not mentioned here.

The main weather factors to be taken into account are:

- Wind.
- Temperature.
- Precipitation.



Source: Asaken

5.1 Wind

As a rule, the maximum wind speed permissible for rope work is 12 m/s and the rotor must always be blocked in the position of least resistance.

The following table shows the range of wind speeds, up to the maximum permissible for rope work, always providing the security measures indicated in the Risk Assessment are adopted.

ROPE WORK ACCESS TECHNIQUES		
WIND FORCE	m/s	RISK ASSESSMENT
0	0 - 0.2	Safe Operation Work may be carried out without danger from the wind
1	0.3 - 1.5	
2	1.5 - 3.3	
3	3.4 - 5.4	
4	5.5 - 7.9	Wind range with possible dangers Work is possible as long as proper safety measures are carried out in accordance with the Risk Assessment
5	8 - 10.7	
6	10.8 - 12.0	
7	>12.0	Danger. All work must be halted, equipment dismantled and the danger site abandoned immediately

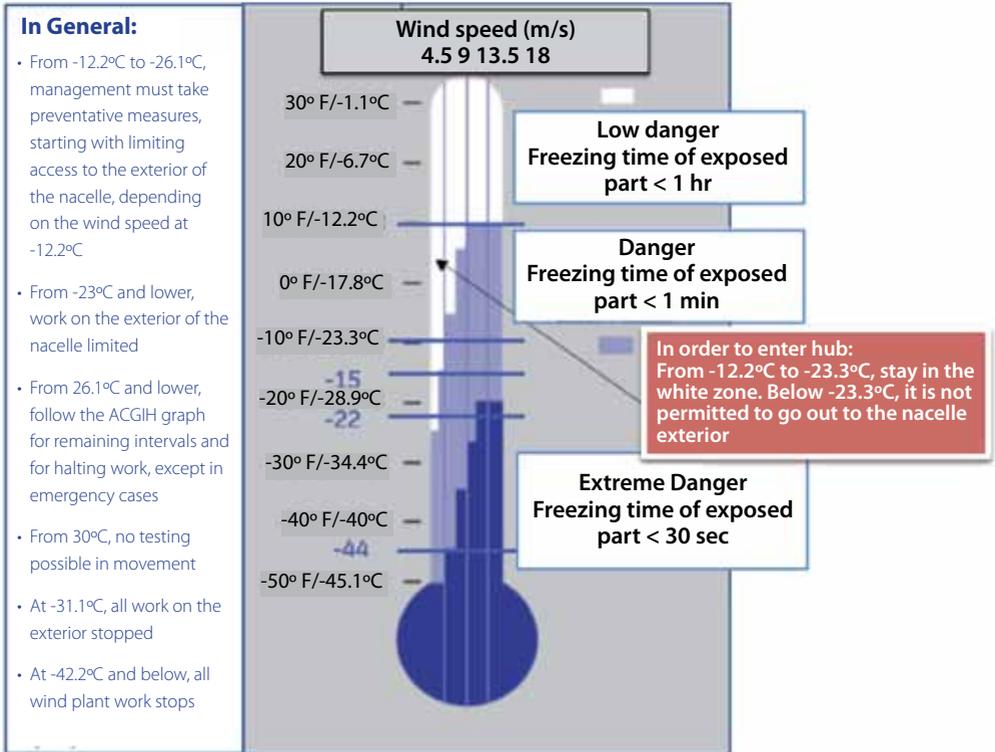
In all cases, the maximum time period for uninterrupted suspension must not exceed four hours.

5.2 Temperature

High or low temperatures must be taken into account in the risk assessment, in order to determine the time duration of the work and the necessary protection and prevention measures.

5.2.1 Low temperatures

The following graph proposes work limits taking into account low temperatures and wind speeds:



5.2.2 High temperatures

The following table shows the recommended limits for work at high temperatures and in accordance with the heaviness and demands of the work:

Screening Criteria for Heat Stress Exposure (WBGT values in °C) for Eight-hour Work Day (five days per week with conventional breaks)								
Work Demands	Acclimatised				Unacclimatised			
	Light	Moderate	Heavy	Very heavy	Light	Moderate	Heavy	Very heavy
100% work	29.5C/ 85.1F	27.5C/ 81.5F	26.0C/ 78.8F	-	27.5C/ 81.5F	25.0C/ 77F	22.5C/ 72.5F	-
75% work; 25% rest	30.5C/ 86.9F	28.5C/ 83.3F	27.5C/ 81.5F	-	29.0C/ 84.2F	26.5C/ 79.7F	24.5C/ 76.1F	-
50% work; 50% rest	31.5C/ 88.7F	29.5C/ 85.1F	28.5C/ 83.3F	27.5C/ 81.5F	30.0C/ 86.0F	28.0C/ 82.4F	26.5C/ 79.7F	25.0C/ 77F
25% work; 75% rest	32.5C/ 90.5F	31.0C/ 87.8F	30.0C/ 86.0F	29.5C/ 85.1F	31.0C/ 87.8F	29.0C/ 84.2F	28.0C/ 82.4F	26.5C/ 79.7F

* For unacclimatised workers, the permissible heat exposure TLV should be reduced by 2.5°C

** To determine whether workers are acclimatised, it should be noted that acclimatisation is reached by most people between 4 and 16 days of regular work in heat conditions for two hour a day

Examples of work load: (the first references are taken directly from the ACGIH table; the examples within brackets are specific to work on wind turbines)

Light work – sitting or standing to control machines, performing light hand or arm work

Moderate work – walking about, with moderate lifting and pushing (wind examples: ascents, pitch battery changes, cleaning)

Heavy work – pick and shovel work, digging (wind examples: changing bigger components, tensioning the yaw friction system, repairing gearbox)

Adopted from: 2001 TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists, 2001. p. 171-172.

5.3 Precipitation

Precipitations, by way of rain or snow, should be taken into account as part of the risk assessment in order to determine the viability of carrying out rope work on the wind turbine exterior, regardless of the working equipment used.

It should be noted that the weather conditions in question will affect all types of work carried out on the wind turbine, regardless of the working equipment used.

6. Capacity and competence requirement of workers for using rope work access and positioning equipment and techniques

Vertical rope work access and positioning techniques within the wind sector are subject to basic mounting and operation guidelines.

Rope workers must have specific theory and practical training in installing and handling the equipment and materials used in order to ensure safety and efficacy. Guidelines include techniques for rescuing a suspended worker.

Regulation requires rope work to have a Preventative Resource agent present throughout the execution of work.

Apart from a basic ORP qualification, that agent must possess advanced training in the work procedure application, the mounting systems, PPE to use, rescue techniques and first aid.

Both the basic and advanced training must be supported by certificates. The established training certificates from the Associations of Vertical Work Companies (i.e. ANETVA, IRATA and FISAT, among others) are a point of reference.



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