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Vestas Occupational Health, Safety & Environment Manual



Vestas

Classification: Restricted

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History of this document

Version	Description of changes
January 2016	New version
November 2017	Update based on input to the OHSE Committee. Changes are marked with grey.
February 2019	Update based on input to the OHSE Committee. Changes are marked with grey.

Table of contents

1	INTRODUCTION	3
2	TRAINING	7
3	EMERGENCY RESPONSE PLAN AND PROCEDURES.....	13
4	INCIDENT REPORTING AND INVESTIGATION	23
5	FIRE PROTECTION AND PREVENTION	28
6	CODE OF SAFE PRACTICES	32
7	EXTREME WEATHER.....	52
8	ANIMALS AND INSECTS.....	68
9	PERSONAL PROTECTIVE EQUIPMENT	70
10	WORK AT HEIGHTS	93
11	CONFINED SPACE	99
12	CONTROL OF HAZARDOUS ENERGY	103
13	ELECTRICAL SAFETY.....	107
14	WORKING WITH CHEMICALS	113
15	WORKING WITH DANGEROUS GOODS.....	117
16	MACHINE GUARDING	119
17	TOOLS AND EQUIPMENT	123
18	VEHICLES AND HEAVY EQUIPMENT	129
19	CONTRACTOR/SUBCONTRACTOR SAFETY	134
20	CONSTRUCTION SITE INDUCTION /ORIENTATION	137

1 Introduction

At Vestas we do not compromise on safety.

Safety is an area that affects everyone at Vestas and we must never forget that we are working for what serves Vestas best – and that is always to put safety first.

It is the intent and policy of Vestas to have an effective Occupational Health, Safety and Environmental Management System in place. Irrespective of where in the company we may work, irrespective of the task we may be working on, we must never compromise on safety.

We all must think '**safety first**' in all our activities to prevent employees and contractors/subcontractors from being tempted or feeling obliged to ignore safety regulations. It is essential to Vestas that we continually work to improve safety and that you, as an employee, show awareness and speak up and notify your manager or your safety representative whenever you notice things that need to be improved, or that you back out if you feel that safety is being compromised in any way. It is not just a question of your safety, but also the safety of your colleagues on site.

As safety is everybody's responsibility, all employees in Vestas can request changes to Vestas Occupational Health, Safety and Environment Manual using the OHS&E Teamsite. The changes in the Manual have been requested from colleagues in Construction, Service, Power Solutions or other parts of Vestas. In other words, the Manual is kept alive by the business and this is what makes it a success. I would like to encourage you all to continue to contribute to the development of the Manual.

Date: February 2019

Neil Jones
Senior Vice President

Global QSE
Vestas Wind System A/S

1.1 Scope

This manual describes the general occupational health and safety requirements for the following activities associated with a wind turbine:

- Installation of the turbine components
- Commissioning of the installed wind turbine
- Operation of the wind turbine
- Service of the wind turbine
- Repair and replacement of the components
- De-commissioning of the wind turbine

The Vestas OHS&E Manual outlines the general requirements for ensuring safe working practices based on requirements in global procedures and is mandatory to comply with on the same level as global procedures.

A set of safety-related documentation consists of the Vestas OHS&E Manual, turbine-specific safety manuals, specific work instructions, and site-specific environmental and safety plans from the sales units.

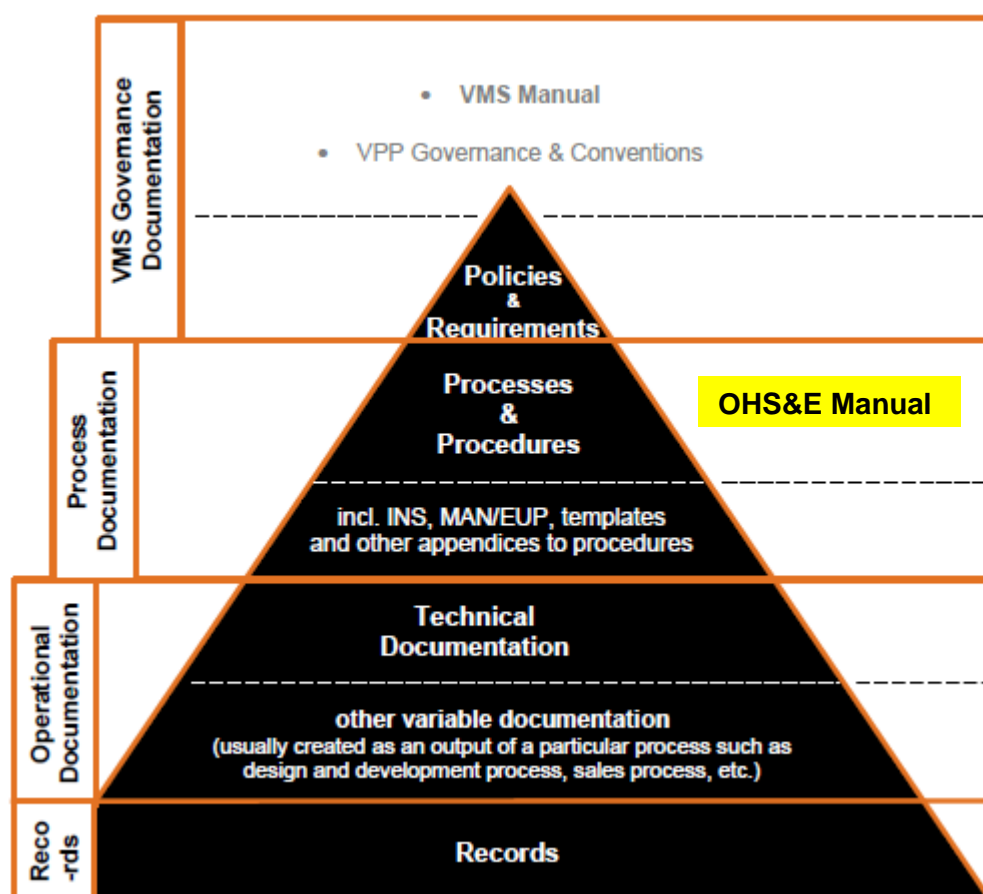


Figure 1-1: The Vestas hierarchy of documentation

All Vestas employees and Vestas contractors/subcontractors are subject to the relevant requirements in the Vestas OHS&E Manual in connection with the turbine activities mentioned above.

The Vestas OHS&E Manual is the authoritative source for safety information unless specific environmental or safety requirements (country, state or regional requirements) differ and override the more general requirements stated in the Vestas OHS&E Manual. In these cases, the highest requirement standard must be followed.

1.2 Vestas Quality, Health, Safety and Environmental Policy



Vestas Quality, Health, Safety and Environmental Policy

We deliver best-in-class wind energy solutions and set the pace in our industry to the benefit of our customers and our planet. We operate a certified integrated management system to manage risk and drive continuous improvement of business performance through innovation, benchmarking, and learning from experience.

We satisfy applicable legal and voluntary requirements and ensure transparency in our Quality, Environmental, Health and Safety performance through disclosure of the annual external statement available at Vestas.com

We will live up to our policy by:

Health and Safety:

- Preventing injury and work related illness through management commitment.
- Demonstrating Safety First by considering health and safety in developing, planning, and execution of our operations, products and services.
- Meeting or exceeding our Health and Safety standards by engaging employees, contractors, suppliers, and other stakeholders.
- Ensuring Safety is a prerequisite of doing business at and with Vestas.

Quality:

- Adherence to processes, specifications and procedures in order to achieve Customer Satisfaction.
- Preventing defects through proactive quality assurance and fact-based continuous improvements.
- Reducing risk and associated cost of poor quality by focusing on quality across the value chain.
- Ensuring a life cycle approach to our products and services by focusing on levelized Cost of Energy.

Environment:

- Demonstrating commitment to preventing pollution and protecting the environment in everything we do.
- Demonstrating environmental vigilance by having a life cycle approach in developing, planning, and execution of our operations, products, and services.
- Meeting or exceeding our environmental standards by engaging employees, contractors, suppliers and other stakeholders.

On behalf of Vestas
 Anders Runevad
 President and Chief Executive Officer

Figure 1-2: Vestas Quality, Health, Safety and Environmental Policy

VPP

Please find Vestas Quality, Health, Safety and Environmental Policy in the VPP under Global Policies.

1.3 Responsibilities

1.3.1 Management

- Ensure implementation of requirements described in this manual.
- Provide adequate resources and support to carry out responsibilities and obligations.
- Ensure annual review of the present manual and local instructions.
- Provide appropriate supervision at work sites.
- Ensure a safety representative is appointed from among the employees.
- Ensure that both legal and internal requirements are complied with.
- Ensure contractor/subcontractor involvement in the safety process according to SUS-SAF-CON Contractor Health & Safety Management in Site Construction VPP.
- Conduct regular safety checks of all Vestas workplaces to show that procedures and rules are being complied with and to identify areas of improvement.

1.3.2 All Vestas Employees

- Comply with all requirements in this manual as well as in the installation and service documentation.
- Observe activities of fellow employees and contractors/subcontractors to ensure their safety and the safety of those around them, and to correct unsafe acts in a proactive, positive manner to prevent an incident or near-miss from occurring.
- Respectfully refuse to perform work when unsafe conditions exist or when unable to perform the task competently.

1.3.3 Employee Safety Representative

- Ensure that precautions are taken to protect the health and safety of all employees.
- Report to management all health and safety concerns at the work site.
- Help implement and facilitate global as well as site/facility safety instructions.

2 Training

The purpose of this chapter is to outline the training requirements for various Vestas employees and contractors to ensure they have the required knowledge and training to safely perform work, visit and access Vestas-managed facilities.

Ensure that all personnel working on site have the minimum defined safety training required for the task.

2.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit

Table 2-1: Abbreviations

Term	Explanation
Competent person	<p>A person who:</p> <ul style="list-style-type: none"> Is competent because of knowledge, training and/or experience to perform the work Is familiar with the health and safety regulations that apply to the work, and Has knowledge of any potential or actual danger to health or safety in the workplace
Site/construction manager or authorized supervisor	The designation 'responsible manager' is used for the manager who is responsible for the specific activity or workplace. The responsible manager has different titles depending on the geographical location and whether the specific activity is a service or installation activity.

Table 2-2 : Explanation of terms

2.2 Roles and Responsibilities

Site/construction manager or authorized supervisor is responsible for:

- Ensuring only competent persons are assigned work tasks. This includes ensuring the employee has the skills, physique and knowledge to safely execute the work task.

Employees are responsible for:

- Storing personal training documentation and bringing relevant documentation of training to site.

2.3 Global Min Training Requirements for On-Site Activities

In addition to the site-specific induction/orientation, contractors/subcontractors shall meet the following training requirements below based on their scope of work:



<div></div> <div>Global Minimum Training Requirements</div> <div>Installation Contractors/ Subcontractors ^{a)}</div>	Type of training												
	General safety			Electrical safety & LOTO	Installation (D)	Installation (C)		Crane Operations	Service Lifts, Ladders & Rails (ONLY IF BRAND PRESENT)				
				1 person per team performing the task			(ONLY IF LDST PRESENT)	1 person per Riggering/Slinger banksman team performing the task	1 person per installing team performing the task				
	GWO Basic Safety ^{e)} /Local Legal Equivalent	GWO Basic Safety ^{e)} /Local Legal Equivalent (Exception: Working at heights)	Safety Introduction for Technicians (SIT) ^{f)}	Elect. Safety for Qualified Elect. Persons ^{g)} & Lockout Level 2 ^{h)}	Level D Basic Installation or GWO BTT: Mechanical & Installation Modules + BTT Installation GWO Vestas ADD ON (e-learning)	Level C Installation (All) ⁱ⁾	Level C LDST ^{j)}	Rigger training as per DMS 0049-0574 ^{k)} / Local Legal Equivalent	Installation of Avanti Ladder and Rail	Installation of Avanti Service Lift	Installation of Power Climber Service Lift	Operation of Avanti Service Lift	Operation of Power Climber Service Lift
Installation Manager/Supervisor ^{b)}	x		x		x	x						x	x
Core team ^{c)}	x		x	x	x		x	x	x	x		x	x
Support team ^{c)}		x	x										
HSE Professional	x		x										
Employees working solely in administrative areas		x	x										
X = 100% of team members must have training unless otherwise specified													
<p>a) Equivalent level of qualifications approved by Vestas Regional QSE can be applied.</p> <p>b) INSTALLATION MANAGER: Overall responsible for contractor/subcontractor crew.</p> <p>INSTALLATION SUPERVISOR: Person in charge of a specific Installation task, that will ensure the task is done according to the Work Instruction.</p> <p>c) CORE TEAM: Employees responsible for the execution of the following installation activities under the supervision of an Installation Supervisor: Uploading & incoming inspection, preparation, repair, lifting, tightening, cable work, finishing and preservation & storage. All members of this team must have job-specific training (Installation D as a minimum).</p> <p>d) SUPPORT TEAM: Employees supporting the Core Team that are not executing any of the installation activities described for the Core Team. Examples of tasks performed by this team are:</p> <ul style="list-style-type: none">• Manitou / Cherrypicker Driving• Checking completeness of delivered components, tools, parts etc.• Site preparation work (e.g. Tool organization) <p>Provided close supervision by the Installation Supervisor, the Support Team members can support the Core Team in the installation activities, except for work performed at heights above 2 meters. The designated Installation Supervisor will be responsible for ensuring the safety of the Support Team as well as the quality of work performed by the Support Team.</p>						<p>e) GWO Basic Safety Trainings: Fire Awareness, First Aid, Manual Handling & Working at Heights (valid for 2 years)</p> <p>f) Safety Intro for Technicians (SIT) is valid for 2 years. Refresher course can be taken by passing an online test. If failed classroom training is required.</p> <p>g) All employees performing Electrical Work on Energised Systems / Components (valid for 2 years)</p> <p>h) Person in Charge of the Lockout - Responsible for Lockout Tagout of all Hazardous Energies (valid for 2 years)</p> <p>i) This course will cover platform specific installation courses</p> <p>j) LDST: Large Diameter Steel Tower</p> <p>k) Global Crane Safety Program</p> <p>Note: If validity is not specified the certification does not expire.</p>							

Table 2-3: Training Matrix – Installation Contractors/Subcontractors

<div></div> <div>Global Minimum Training Requirements</div> <div>Service Contractors/ Subcontractors ^{a)}</div>	Type of training													
	General safety		Electrical safety & LOTO	Service (D)	Basic Turbine Operations (BTO)	Turbine Operations (TO_C)	Service (C)		Blade Repair	Bolt Tight.	Service Lifts			
			(only Lead Technician)		(only Lead Technician)	(only Lead Technician)	(only Lead Technicians – minimum 50% of team)				(ONLY IF LIFT BRAND PRESENT)			
	^{d)} GWO Basic Safety/Local Legal Equivalent	^{e)} Safety Introduction for Technicians (SIT)	^{f)} Elect. Safety for Qualified Elect. Persons & Lockout Level 2 ^{g)}	Level D Service or GWO BTT + Vestas ADD ON for GWO BTT	BTO (Turbine Specific) ^{h)}	TO_C (Turbine Specific) ⁱ⁾	Level C Service (Turbine Specific) ^{j)}	Level C Inspection of Anchor Points	Basic Blade Repair ^{k)}	Bolt Tightening ^{l)}	Operation of Avanti Service Lift	Operation of Power Climber Service Lift	AVANTI Service & Inspection	Power Climber Service & Inspection
UNSUPERVISED ACTIVITIES ^{b)}														
Blade repair	x	x	x		x				x	x	x	x		
Bolt tightening	x	x	x		x					x	x	x		
Cleaning & painting	x	x	x		x						x	x		
Lift service & annual inspection	x	x	x		x					x	x	x	x	x
Liquid change	x	x	x		x					x	x	x		
Turbine safety inspections ^{m)}	x	x	x		x					x	x	x		
Scheduled maintenance ⁿ⁾	x	x	x	x		x	x				x	x		
SUPERVISED ACTIVITIES ^{c)}														
Blade repair	x	x							x	x				
Bolt tightening	x	x								x				
Cleaning & painting	x	x												
Lift service & annual inspection	x	x								x			x	x
Liquid change	x	x								x				
Turbine safety inspections ^{m)}	x	x								x				
Scheduled maintenance ⁿ⁾	x	x		x										
X = 100% of team members must have training unless otherwise specified														
a) Equivalent level of qualifications approved by Vestas Regional QSE can be applied					f) All employees performing Electrical Work on Energised Systems / Components (Valid for 2 years) g) Person in Charge of the Lockout - Responsible for Lockout Tagout of all Hazardous Energies (Valid for 2 years) h), i) & j) See tables below k) Exemption form and process available for experienced Blade Repair specialists l) If any bolt tightening is to be done as part of the job, this module will be required m) Turbine safety inspections include inspection of fall arrest and anchor points etc. n) To be able to perform a full schedule maintenance, other trainings will be required on top... i.e. HV training, Service Electrical Chain Hois (C)... Note: If validity is not specified the certification does not expire.									
b) Working independently														
c) Supervised by Vestas Technician (minimum C level) responsible for the activity being performed														
d) GWO Basic Safety Trainings: Fire Awareness, First Aid, Manual Handling & Working at Heights (valid for 2 years)														
e) Safety Intro for Technicians (SIT) is valid for 2 years. Refresher course can be taken by passing an online test. If failed classroom training is required.														

Turbine Specific Courses
h) Basic Turbine Operations (BTO)
V105-V136 3.3/3.45, V80/V90 1.8/2 MW Mk8, V100 2MW Mk9, V100-V110 2.0/2.2 MW Mk10
VMP 6000: V90 3MW
VMP Global: V80/V90 Mk 5.1, 6 & 7 and V100 1.8/2MW Mk7
VMP 5000: V52, V66, V80-V90 (Mk 1-5)
TAC II: NM52, NM54, NM64, NM72, NM82 and V82
VMP 3500: V39-47
i) Turbine Operations (TO_C)
TO_C TAC II: NM64/NM72/NM82 1.5 MW, NM72/NM82 1.65 MW, NM72 2.0 MW and V82 1.65MW Mk2-
TO_C VMP 5000: V52, V66, V80-V90 1.8/2.0 MW (Mk 1-5)
TO_C VMP 6000: V90 3MW Mk3-9 & V100 2.6MW
TO_C VMP Global: V80 2MW/V90 1.8/2.0MW Mk5.1, Mk6, Mk7, Mk7.1-7.4 & V100 1.8/2.0 MW Mk7, Mk7.1-7.4 & Mk7H
TO_C VMP Global Mk10: V100/V110 2.0 MW Mk10A, Mk10B & Mk10C
TO_C V112 & Gridstreamer: V80 2.0MW Mk8 & Mk9, V112 3.0MW Mk0, Mk0E, Mk1A & Mk1B, V112/V117/V126 3.3/3.45 Mw Mk2A, Mk2B & Mk2C
TO_C V112 Mk3 Cubepower: V105/V112/V117/V126/V136 3,45/3.6 MW, Mk3A, B & D
VMP 3500: V39-47
j) Service_C
Level C Service - V90 3MW
Level C Service - 2MW
Level C Service - V82
Level C Service - V52

Table 2-4: Training Matrix - Service Contractors/Subcontractors


 Global Minimum Training Requirements Crane & Balance of Plant (BoP) Contractors/Subcontractors ^{a)}	Type of training			
	General safety			Electrical safety & LOTO
	^{b)} GWO First Aid / Local Legal Equivalent	Fire Awareness (GWO) / Local Legal Equivalent	Working at Heights (GWO) / Local Legal Equivalent ^{c)}	^{d)} Elect. Safety for Qualified Elect. Persons & Lockout Level 2 ^{e)}
Crane driver/operator	x	x		
Crane boom erection crew	x	x	x	
Civil works	x	x		
Electrical works	x	x		x
Erecting of transmission lines	x	x	x	x
Met mast installation and maintenance	x	x	x	
X = 100% of team members must have training unless otherwise specified				
a) Equivalent level of qualifications approved by Vestas Regional QSE can be applied				
b) GWO Basic Safety Trainings: Fire Awareness, First Aid, Manual Handling & Working at Heights (valid for 2 years)				
c) Working at height is defined as work inside or outside the turbine above 2 meters (6 feet) in height				
d) All employees performing Electrical Work on Energised Systems / Components (Valid for 2 years)				
e) Person in Charge of the Lockout - Responsible for Lockout Tagout of all Hazardous Energies (Valid for 2 years)				

Table 2-5: Training Matrix - Crane & Balance of Plant Contractors/Subcontractors


 Global Minimum Training Requirements Transport Contractors/Subcontractors	Type of training						
	General safety	Introduction Courses		Road Transport		Sea & Stevedoring	Storage
	Safety Rules & Right Behavior at Vestas Premises and Sites (eLearning) ^{e)}	Introduction to handling of Wind Turbines (eLearning)	Forces & Center of Gravity (eLearning)	Road: Project Transport	General Transport (eLearning)	Sea & Stevedoring incl. Lifting & Handling	Storage (Transport Pipeline)
Truck driver - project transport ^{a)}	x	x	x	x			x
Truck driver - general transport ^{b)}	x	x	x		x		
Stevedore/Crane crew	x	x	x			x	x
Transport Coordinator at supplier	x	x	x	x	x	x	x
Escort driver ^{c)}	x	x	x	x			
Other office people ^{d)}							
X = 100% of team members must have training unless otherwise specified							
a) Transport suppliers handling trucking of nacelles, blades, towers, etc. in between factory, harbor and construction sites. b) Transport suppliers handling non-project related cargo e.g. all transport to factories, spareparts to sites etc... Only relevant for full loads and non-palletized cargo. c) Recommended to take "Storage (Transport Pipeline)" course to understand Vestas safety requirements and transport challenges d) Key Accounts, HSE contacts or other office people not directly involved in the planning and operational activities are recommended to take all courses to understand Vestas safety requirements and transport challenges. e) Safety Rules & Right Behavior at Vestas Premises and Sites (eLearning), (valid for 2 years)							
Note: If validity is not specified the certification does not expire.							

Table 2-6: Training Matrix - Transport Contractors/Subcontractors

NOTE For Vestas employees, the technician training development plan made by Technical and Safety Training can be found in Vestas Technician Pipeline [under About Vestas, Our Organization, Global Service, Training, Education Tree, Vestas Technician Pipeline on the HUB.](#)

2.4 Local Requirements

Refer to the BU local requirements (if available) for additional information.

3 Emergency Response Plan and Procedures

The purpose of this document is to ensure that emergency preparedness and response plans and scheduled prevention exercises for all Vestas locations will be prepared, followed, and continually improved.

The emergency preparedness and response plans shall ensure that all Vestas locations are capable of effectively responding to anticipated and unexpected events and/or emergencies involving personal or environmental health and safety issues.

3.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
ERP	Emergency Response Plan
SDS	Safety Data Sheet
LOTO	Lockout-Tagout

Table 3-1: Abbreviations

Term	Explanation
Access	Access is the predefined route for the movement of people, but it should also consider movement of tools and materials
Emergency stop button	On large industrial machines, an emergency stop button is typically located on control panels and, possibly, on several other areas of the machine. This accessibility provides a rapid means to disconnect the energy source of the device to protect workers.
Escape	Escape means the process of leaving the WTG in an emergency situation when you are unable to use the predefined access route/system. It is a last resort method of getting out of the WTG.
Evacuation	Evacuation means the process of leaving the WTG in an emergency situation when you are able to use any of the predefined access route/system.
Rescue	Rescue is an operation to retrieve injured persons out of the WTG.
Runaway turbine	For the purpose of this manual, runaway is defined as an overspeed situation where the safety systems fail to shut down the turbine and it is not possible to control rotation of the drive train.

Term	Explanation
Lockout-Tagout (LOTO)	Lockout-Tagout is a safety procedure involving the use of a sequence of physical locks and warning tags to ensure that an electrical or mechanical device cannot be accessed or energised. LOTO is used in industry and research settings to ensure that dangerous machines are properly shut off and not started up again prior to the completion of the maintenance or service work.
Live circuit/system	An energised device and/or component with voltage (electricity) that may cause injury to personnel.

Table 3-2: Explanation of terms

3.2 Roles & Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- When preparing the ERP ensure all potential risks have been identified and taken into consideration to mitigate risk exposure to the lowest possible level.
- Providing a documented that is:
 - Available for the individual wind turbine site/location.
 - Available in local language(s).
 - Reviewed annually and updated periodically with input from relevant parties.
- Performing ERP tests/drills at least once every two years for the identified potential risks (e.g. evacuation, fire, chemical spill, confined space).
- Preparing an ERP drill evaluation report and implementing adjustments to the ERP as needed.
- Ensuring that all employees and visitors within the manager's area of responsibility are informed of and fully understand the emergency response procedures.
- All employees must receive training to the degree of their involvement in emergency response activities when found relevant in order to ensure the efficiency of the emergency response plan. Training must be documented.
- Ensure all personnel are aware of the location of the emergency stop buttons.

3.3 Emergency Response Plan (ERP)

The ERP must as a minimum cover the following:

- Safety accidents
- Fire
- Environmental accidents
- Turbine incident

- Escape routes and rally/muster/assembly points
- Evacuation and rescue procedures for turbine
- Locations of equipment such as:
 - Fire extinguishers
 - First aid kits
 - Eyewash stations or showers
 - Environmental spill kit
 - Emergency lighting unit
 - Rescue devices
 - Stretcher
- Shelters for severe weather events/earthquakes/lightning
- Other emergencies, if relevant
 - Bomb threat
 - Civil disturbance
 - Kidnapping
- Emergency alarm procedure including:
 - Communication system (radio, cellular phones, etc.)
 - List of relevant phone numbers for:
 - Police
 - Emergency services
 - First Aid services
 - Vestas management
 - Power company
 - Local environmental authorities
 - Other relevant parties
 - Location of turbine

VPP

Please see **SUS-IEM-EMR Plan and Check Emergency Response** procedure for more information on the content of an emergency response plan.

3.4 Crisis Management

In case of a crisis situation for example a fatal incident or similar, the emergency response plan must ensure that escalation is made to relevant line management as well as to: **crisis@vestas.com**.

Please include the name of the person reporting, description of the incident, site/location name and address and if the incident is ongoing or has been stopped.

HUB

For further information or escalation please go to the **Crisis Hub-page** by typing **"crisis"** in your browser when on Vestas network or on VPN.

3.5 Accidents (Excluding Electrical)

When accidents occur, the general emergency response procedure is as follows:

1. Attend to the injured person as required to prevent additional injuries and ensure that no other personnel are put at risk in the process.
2. Perform first aid as soon as possible.
3. Call for help and inform the responsible manager and other relevant personnel at the scene/site of the accident.
4. Inform responsible manager/personnel of what has happened and where the accident occurred.
5. Send one person to the designated emergency entrance/exit to guide the rescue team/ambulance to the accident site.
6. When the rescue team/ambulance arrives on the site, they must give applicable first aid to the accident victim(s). The responsible manager must provide any needed assistance to the rescue team.

NOTE

The rescue team decides whether to use the rescue equipment or not. Only trained Vestas personnel are permitted to use the rescue-from-height equipment.

7. Do **not** resume work before an investigation has been conducted showing that the work area is safe.

NOTE

The investigation must provide a concise report of the cause of the accident, corrective actions and a review of working procedures and documentation that confirms equipment has been inspected for any damage. Please follow the guidelines in the Incident Management System.

8. Do **not** disturb anything at the accident site unless it is essential to do so to assist the injured person or in the interests of general safety.
9. Inspect the site for any factors that may assist the investigation and/or identify the cause of the accident.

All accidents, near-misses and unsafe conditions must be reported so that corrective and preventative measures/procedures can be implemented to prevent future recurrence.

VPP Refer to **SUS-IEM-IMA Incident Management** procedure for further information on how to complete an accident investigation

3.6 Accidents Caused by Electric Shock



Electrical shock from a live circuit/system!

- ⊗ **Do not** touch the injured person before all power has been shut off to the circuit/system.
- ▶ Complete LOTO procedures to remove the power from the circuit/system.
- ▶ Ensure no contact is made with the injured person until all power is shut off and LOTO steps have been performed.

If there is suspicion that an accident has occurred from electric shock, the following general emergency response procedure must be carried out:

1. Switch off all power.
2. Verify that all power has been switched off.
3. Lock power in the off position to prevent other personnel from accidentally switching on the power.
- VPP** 4. Follow the “**Electrical Shock**” instruction, DMS No. 0049-3509 attached to the **SUS-IEM-IMA Incident Management** procedure..
5. Do not restore power to the equipment until it is fully determined that it is safe to do so.

3.7 Turbine Incidents

3.7.1 Establishing a Temporary Clearance Area

When establishing a temporary clearance area in the event of a turbine incident (i.e., fire, runaway turbine or debris separation), rope off or otherwise temporarily clear an area with a minimum radius of 500 meters (1,640 feet) measured from the base of the turbine. If the radius of 500 meters cannot be reached due to the surroundings, the maximum possible radius should be cleared.

Best judgement and common sense should always be employed when establishing a temporary clearance area. If a turbine incident is identified, but the situation appears to be mitigated, the establishment of a temporary clearance area may not be required.

3.7.2 Fire

In case of fire in or near a turbine:

1. Push the emergency-stop button. If it is physically safe to do so and it will not delay your exit from the turbine, disconnect the turbine at the main high-voltage circuit breaker. Personnel outside the turbine should not approach the turbine to push the emergency-stop button.
2. Immediately exit the turbine, only using fire-fighting equipment to ensure a safe escape route from the wind turbine.
3. Establish a temporary clearance area and move upwind outside the clearance area, or seek shelter, if appropriate.
4. Notify the site office who can contact local emergency responders if assistance is required to extinguish the fire.

3.7.3 Runaway Turbine

In case of a runaway:

1. Push the emergency-stop button. If it is physically safe to do so and it will not delay your exit from the turbine, disconnect the turbine at the main high-voltage circuit breaker. Personnel outside the turbine should not approach the turbine to push the emergency-stop button.
2. Immediately exit the turbine and establish a temporary clearance area, if appropriate.
3. Move upwind outside the clearance area or seek shelter, if appropriate.
4. Notify site office who can contact local emergency responders if assistance is required to address the situation.

3.7.4 Debris Separation

In case of debris separation:

1. Push the emergency-stop button. If it is physically safe to do so and it will not delay your exit from the turbine, disconnect the turbine at the main high-voltage circuit breaker. Personnel outside the turbine should not approach the turbine to push the emergency-stop button.
2. Immediately exit the turbine and establish a temporary clearance area, if appropriate.
3. Move upwind outside the clearance area, or seek shelter, if appropriate.
4. Notify site office who can contact local emergency responders if assistance is required to address the situation.

NOTE If debris separation is identified, but the situation appears to be mitigated, following the steps above may not be necessary. Best judgement and common sense should always be employed. Consult with your site/construction manager or authorized supervisor for guidance.

3.8 Emergency Descent from Nacelle

A rescue and descent device must always be available. Depending on WTG type the rescue and descent device can either be in the nacelle or brought by the technicians.

- In case of fire in the nacelle, evacuate the turbine inside the tower via the tower ladder. Do not use the service lift
- In case of fire/smoke in the tower, prepare for immediate escape from the nacelle using the rescue and descent device **outside the tower**.

Sufficient descent devices must be provided to enable all personnel working at height to evacuate the turbine within an acceptable time limit. The guidance limit is 10 minutes (see below additional considerations). In case of fire escape of the wind turbine should be completed as quickly as possible.

NOTE A lot of rescue ropes are not fire resistant. In case of fire set up the rescue devices as far away from the fire as possible.

A risk assessment/job safety analysis should be carried out taking into consideration the below:

10 minutes equals 600 sec

- Setting up equipment: approx. 120 sec
- Average descent time is 0,8 m / sec
- Replace worn out descent device **(in accordance with manufacturer's specifications: approx. 60 secs to replace and install)**

Example: 80 m hub height descent equals 100 secs

3.8.1 Number of Descent Devices

A risk assessment must be made to identify the number of rescue devices needed. Considerations must be made to:

- Hub height (total descent distance)
- Number of technicians (taking individual and combined weight into consideration)
- Descent device type (performance criteria). The manufacturer's instructions and capabilities of the rescue device must be complied with to prevent device failure.
- Number of suitable locations to which the descent device can be attached to. The descent devices must be attached to anchor points placed in different locations in the turbine.

NOTE Be aware of the risk of entanglement when using multiple devices by using different anchor points in the turbine and keeping as much distance between the descent devices as possible.

NOTE The absolute maximum number of people, who can be present in the turbine (nacelle, hub and tower **(excluding basement)**) is 8, however, it can be less depending on the turbine type and the work activities.

NOTE Further information on appropriate rescue devices, techniques and equipment is taught during the GWO climbing and working at height and evacuation training. Refer to the turbine-specific manual and/or the manufacturer's user manual for specific details on rescue and use of the rescue equipment.

3.9 Emergency Stop Buttons

3.9.1 Turbine

For safety reasons it is important to know the location of the emergency stop buttons in the wind turbine.

3.9.2 Lift (Optional)

Installed lifts have, at minimum, one emergency stop button. These buttons only stop the lift. Emergency stop buttons elsewhere in the turbine do not apply to the lift.

3.9.3 Internal Crane

The crane is equipped with an emergency stop button. These buttons only apply to the crane. Emergency stop buttons elsewhere in the turbine do not apply to the crane.

3.10 Chemical or Hazardous Spills

Any required clean-up must be started promptly as required by the relevant manufacturer's instructions (SDS) and the ERP.

Always follow the local laws and regulations when there is a chemical or hazardous waste spill.

Follow this general emergency response procedure when chemical or hazardous waste spills occur:

1. Stop the spill if possible without exposing yourself to danger.
2. Always wear proper PPE when working with any chemical or hazardous spill.
3. Contain the incident as much as possible without exposing yourself or others to danger.
4. Keep people and animals away from the accident site.
5. Take immediate preventive action that can be performed safely to control the situation and prevent environmental consequences/contamination.
6. Use any available absorbent material or sand to absorb the spill.
7. Contact the site/construction manager or authorized supervisor for further actions regarding the spill.
8. Report the event immediately to emergency services.

VPP

Refer to **SUS-IEM-IMA Incident Management** procedure to complete an investigation

Report all spills as environmental incidents in the Incident Management System.

3.10.1 Impact on Soil

This general emergency response procedure must be followed when a chemical or hazardous waste spill impacts soil.

1. Excavate contaminated soil and store in designated waste bins.
2. Collect soil samples, if required, for documentation of clean-up.
3. Dispose of contaminated soil as hazardous waste per local requirements.

3.10.2 Impact on Water

This general emergency response procedure must be followed when a chemical or hazardous waste spill impacts water (e.g., ocean, lake, or river).

- Request and establish floating barriers, if possible.
- Keep people and animals away from the accident site.
- Take immediate preventive action that can be performed safely to control the situation and prevent further environmental consequences/contamination.

Absorb the chemicals from the water surface only if it can be done without exposing yourself to danger. Dispose the contaminated liquid as hazardous liquid as per local requirements.

3.11 Local Requirements

Refer to the BU local requirements (if available) for additional information.

4 Incident Reporting and Investigation

The purpose of incident reporting and investigation is to establish a system and structure to report and take effective decisions in the event of an incident and to prevent them from reoccurring.

4.1 Abbreviations and Technical Terms

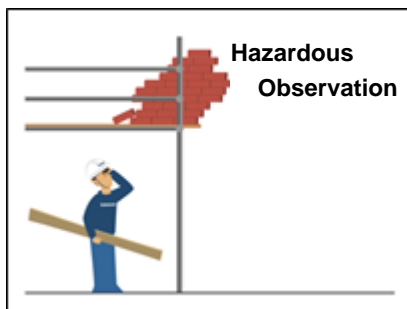
Abbreviation	Spelled-out form / explanation
BU	Business unit
PPE	Personal protective equipment
VPP	Vestas Process Portal

Table 4-1: Abbreviations

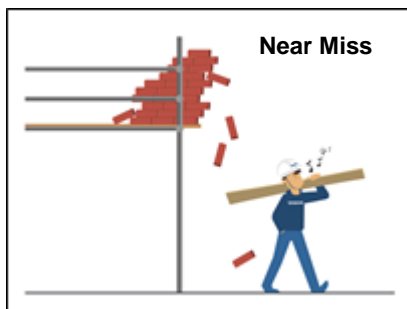
Term	Explanation
Incident	Hazardous observation, near miss, industrial injuries or environmental accidents.
Environmental accidents	Accidental and irreversible release of hazardous substances that can affect the following: <ul style="list-style-type: none">• Human health• Land• Vegetation• Water bodies• Ground water

Table 4-2: Explanation of terms

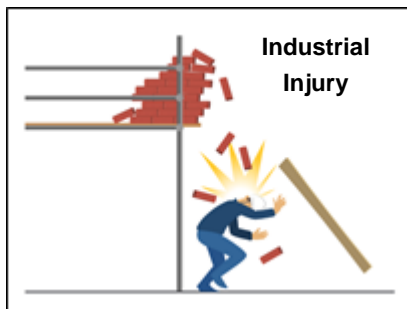
4.2 Definition of Hazardous Observation, Near Miss and Industrial Injury



An observation of a dangerous situation, which might cause material or environmental damage or could cause a personal injury or illness but mitigated before an incident could occur



An unplanned and unexpected event or sequence of events that did not result in injury, illness or damage to environment, assets or property, but had the potential to do so.



An injury is caused by trauma (physical harm) from an external force.

It affects a specific part or function of the body.

It has an identifiable time and place of event.

It elicits injury within a short period of time (i.e. a single shift).

Figure 4-1: Definition of incidents

An occupational illness is defined as:

- Any condition not defined as an injury
- A condition that prevents the body or mind from functioning normally
- An abnormal condition that affects the body

The incidents falling into the Injury/illness to person category are divided into different sub-categories based on the severity of the incident and/or the treatment provided:

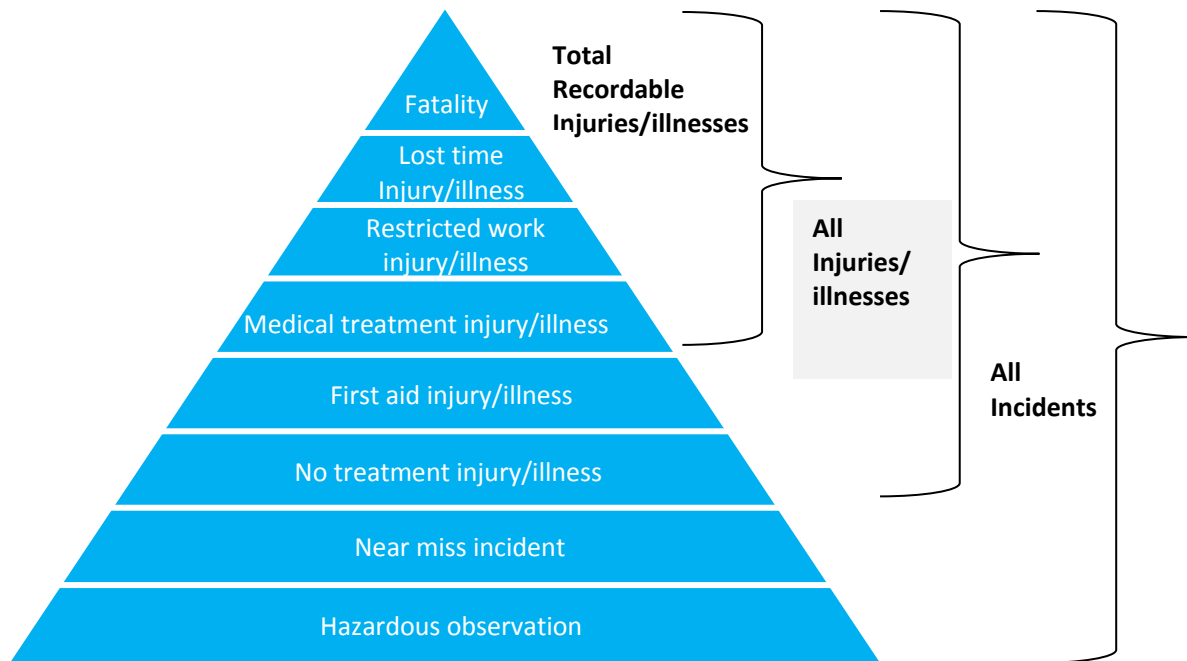


Figure 4-2: Incident subcategories

Environmental Incidents, Near Misses and Hazardous Observations must also be reported in the Incident Management System.

VPP

For more information and descriptions of the categories please see the instruction “**Incident Definitions**” (DMS No 0041-0451) in **SUS-IEM-IMA Incident Management** .

4.3 Roles and Responsibilities

The Site/construction manager or authorized supervisor is accountable for safety, incident reporting and investigation. This includes:

- Ensuring that all incidents are managed and reported in the Incident Management System.
- Following local reporting procedures.
- Involving the person or persons witnessing or involved in the incident to assist in the investigation and report preparation.
- Involving the safety representative in the investigation.

Any employee can report an incident without fear of reprimand.

4.4 Reporting Procedure

All safety and environmental accidents, hazardous observations, industrial injuries and near-misses must be reported and investigated so that corrective and preventive measures can be taken to prevent future recurrence.

VPP

This reporting procedure must be completed according to **SUS-IEM-IMA Incident Management**. Access to the Incident Management System type “IMS” in your browser (open with explorer and use VPN connection).

In addition to reporting safety and environmental accidents, industrial injuries, near misses and hazardous observations, an internal investigation must be carried out. The internal investigation is documented in the Incident Management System and must include an analysis of the root cause for the incident.

The investigation must follow the Incident Management Procedure as a minimum requirement.

4.5 Crisis Management

In case of e.g. a fatal accident or other similar serious incident, communication must be made to relevant line management as well as to the following mailbox for further handling: **crisis@vestas.com**.

Please include the name of the person reporting, description of the incident, site/location name and address and if the incident is ongoing or has been stopped.

HUB

For further information or escalation please go to the **Crisis Hub-page** by typing “**crisis**” in your browser when on Vestas network or on VPN.

4.6 Corrective and Preventive Actions

Corrective actions must be implemented to develop ways to minimise the risks of a similar event occurring. Based on the result of the root cause analysis, the Investigation Lead is responsible for ensuring that corrective and preventive actions are identified for each root cause.

Corrective and preventive actions must be identified, following the hierarchy of effectiveness where feasible, and must be reasonably adequate to match the risk level. Actions must follow the below prioritization:

- Eliminate the hazard/aspect.
- Substitute with equipment, processes, materials or procedures that are less hazardous for the environment or for safety.
- Isolate hazards so as to protect the whole workforce.
- Engineering controls (safety devices/emergency stops).

- Reduce the hazard by minimizing exposure time, numbers of people at risk or similar activities.
- Utilize safe systems of work by using procedural or other controls including work permits, inspection regimes, preventative maintenance, or similar activities.
- Personal protective equipment (PPE).

All corrective and preventative actions must have a target date set for completion and an assigned person responsible for completing the action.

4.7 Local Requirements

Refer to the BU local requirements (if available) for additional information.

5 Fire Protection and Prevention

The purpose of this chapter is to ensure that Vestas employees are properly protected by preventing fire hazards including when performing HOT WORK which includes, but is not limited to welding, burning, grinding, heating bearings with open flames or using bearing heaters and have a clear understanding of the hazards involved and the proper way to control them.

5.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
PPE	Personal protective equipment

Table 5-1: Abbreviations

Term	Explanation
Hot work	Welding, metal cutting or burning operations etc.
Fire watch	A person observing the actual welding, metal cutting or burning operations ensuring there are no fires on the job site.
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Unserviceable	Damaged or defective

Table 5-2: Explanation of terms

5.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Approve the Hot Work Permit before hot work is performed.
- Ensure new and/or re-assigned employees on-site are trained in the Hot Work requirements and completion of the Hot Work Permit.
- Coordinate Hot Work operations in the event contractors/subcontractors and/or visitors are exposed hot work hazards.
- Ensure Fire Watches are trained in their responsibilities.

5.3 General Rules

The work environment and the task must be risk assessed prior to beginning any work. Personnel must complete the following:

- Assemble the necessary firefighting equipment to meet the task.
- Assess work area for potential fire dangers.
- Know the location of firefighting equipment.
- Identify safe escape routes in the event of fire.

- Materials will be stored in a manner so as not to obstruct access to fire protection equipment, control valves, fire doors, alarm devices etc.

NOTE All personnel on the work site must be instructed in correct fire procedures and know the location of fire extinguishers.

All firefighting equipment must be located so that it is easy to spot and easily accessible. The equipment must be checked and maintained at scheduled intervals.

An alarm system, e.g., the telephone (landline or mobile), radio calls, sirens, etc., must be established for alerting all employees on-site and local emergency services in the event of an emergency.

Telephone numbers and fire reporting instructions must be readily available in the site offices.

Fire occurrence on the site must be prevented. Follow the guidelines listed below to minimise/limit the risk of fire:

- Comply with the site-specific smoking rules.
- Place combustion engine powered equipment (e.g., portable generators) in such a way that the motor exhaust is not entering an occupied space.
- Exhaust gases should be directed away from any flammable materials.
- No equipment will be fuelled while the engine is running.
- Minimise the use of flammable liquids.
- Separate any combustible compressed gas cylinders and oxidisers.
- Comply with good housekeeping principles for combustible materials i.e. rags, paper towels etc.
- Store oily rags in waste containers suitable for the purpose and labelled (preferably metal container with a lid).
- Never discard oily rags in ordinary rubbish/trash bins or buckets.

5.4 Hot Work

Always follow state and local requirements before starting any hot work. Any hot work carried out in the wind turbine must have prior authorisation.

Only competent **or qualified** personnel are allowed to carry out hot work.

5.4.1 Performing Hot Work on Site

Before starting any hot work on site, complete the following:

- Inspect the condition of the tools to be used and ensure they are properly grounded / earthed.
- Ensure that proper personal protective equipment (PPE) for hot work is worn, including shirts with long sleeves that can withstand sparks and heat.
- A suitable fire extinguisher must be located within the hot work area.
- Ensure that the hot work area is well-ventilated.

- If use of mechanical equipment is needed, mechanical ventilation may also be required.
- The work area surroundings must be protected against impact from hot work to reduce the risk of fire i.e. covering combustible materials with fire blankets.
- Employ a fire watch if welding, metal cutting and burning operations using open flame torches or grinding in an area where combustibles or flammables are present.

5.4.2 Fire Watch Duties

The fire watch must comply with the following procedures/duties:

- Ensure that sparks or molten metal **do not** come in contact with combustible material stored in the area or comprising part of the structure.
- Ensure that sparks **do not** travel to an area where combustible material is present.
- Ensure that work is stopped if combustible materials such as crates, cartons, packing material, paints, solvents, etc., are brought into the area during hot work.
- Ensure that additional fire extinguishers are present as supplement to the existing turbine extinguishers and near the hot work site.
- Be fully trained in the handling and operation of a fire extinguisher.
- Be familiar with the location of the nearest fire alarm or available telephone.
- Devote full attention to watching the actual welding, cutting, or other hot work as it is performed.
- Complete a fire check of the area when the hot work is complete and when needed as regular follow up check in the hours after the finished hot works must be completed.

All hot work activities must have a fire watch assigned and present.

NOTE

When working outside it is important to be especially aware of the wind as well as dry weeds, fuel tanks and any other types of flammable material.

5.5 Fuel, Diesel and Petrol

Comply with the following if fuel, diesel or petrol is stored on-site:

- Store in a secure area in approved packaging and labelling.
- Store all containers in a spill tray.
- Acquire approval from the site/construction manager or authorized supervisor for storing flammable and combustible liquids on site.
- The location of flammable and combustible liquids must be stored in accordance with local legislation.
- Tankers must be properly earthed and have a suitable spill kit available for the necessary quantities.

- Care should be taken when decanting chemicals on site to avoid spillage. In case of a fuel, diesel or petrol spill or leak, refer to the Emergency Response Plan for chemical or hazardous spills.

Always follow the local laws and regulations when there is a chemical or hazardous waste spill.

NOTE If a fuel, diesel or petrol tank or container is defective, it must be flushed out and clean-up material(s) must be safely disposed of per local laws.

5.6 Local Requirements

Refer to the BU local requirements (if available) for additional information.

6 Code of Safe Practices

All employees must follow the code of safe practices as defined in this document and report all unsafe conditions and/or practices to the responsible site/construction manager or authorized supervisor.

Being safety conscious at all times enhances the Vestas workplace for all personnel.

Vestas expects all employees to follow the **5 safety principles**:

1. All injuries can be prevented
2. Every hazard can be managed
3. Management is accountable for safety
4. People are the most critical factor in a safety effort
5. Working safely is a condition of employment

Vestas expects all employees to be aware of and adhere to the **Vestas Life Saving Rules**:



#1 Safety device

Do not remove, override, disable or bypass safety device.



#5 Falling objects

Prevent objects falling from heights.



#2 LOTO

Always **Lock Out Tag Out** before work and test before touch.



#6 Operating equipment

Only operate vehicle or equipment in accordance with the requirements.



#3 Working at heights

Always use fall protection when working at height.



#7 Stop!

STOP – if you're in doubt.



#4 Danger zone

Always secure the area and stay out of danger zones.

Wind turbine installation and commissioning, service, maintenance and decommissioning have certain elements of danger. Exercising proper caution, following applicable documentation, and adhering to the dangers and cautions (within documentation) help in preventing hazards and accidents.

You have the right to **STOP** the work if you feel it is unsafe. If you are uncomfortable raising a safety issue with your manager or other company support functions, you can contact Vestas EthicsLine by using this [LINK](#).

6.1 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
PPE	Personal protective equipment
LCTU	Lightning Current Transfer Unit
JSA	Job Safety Analysis
RA	Risk Assessment
SWI	Service Work Instruction
SWL	Safe Working Load
WTG	Wind Turbine Generator

Table 6-1: Abbreviations

Term	Explanation
Code of safe practices	Applicable guidelines, bulletins, laws, regulations and company policies and procedures that personnel must follow to prevent injuries and serious accidents.
Lone work	When a single technician is the only one present at a turbine site or in a wind turbine (at the bottom of a tower). A person working alone within a wind turbine.
Residual current device	An electrical device that disconnects a circuit and/or system if the current is not balanced between the energised conductors and the neutral conductor.
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Rescue Plan	A plan to safely extract and remove a technician from any part of the turbine, e.g. from the hub, blade, basement etc..
Serviceable	Without damages or defects
Shore	Bracing an excavation and/or trench to prevent cave-ins. Also, a safe area around the excavations and/or trenches.
Spill kit	Materials available to absorb chemical spills and store polluted soil.
Visitor	Individual who has not attended GWO training. The individual is no longer considered a visitor if having to visit a turbine

Term	Explanation
	more than 4 times a year. In this case GWO training is required.

Table 6-2: Explanation of terms

6.2 Risk Assessment (RA) or Job Safety Analysis (JSA)

All operations and activities must be covered by a work instruction, which is based on a risk assessment, in order to ensure that risks are managed so that work can be performed safely.

If it is an unplanned/non-routine job which is not covered by a work instruction, a risk assessment or job safety analysis is required.

Work must not be performed until a work instruction or a risk assessment/job safety analysis, have been completed.

VPP

A risk assessment must be performed according to **SUS-ASM-HRA Identify Hazards and Assess Risks**.

A Job Safety Analysis must be performed according to **INS SUS-SAF CON Job Safety Analysis**.

6.3 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for complying with all requirements in this manual as well as in the installation and service documentation

6.4 Housekeeping

Keeping the workplace clear of obstructions is an important part of any safety program.

All employees are expected to:

- Keep the work area clean, organised and clear of any trip hazards (especially tools, parts and equipment).
- Ensure that all tools, parts, equipment, and any other items are used correctly and removed from the work area upon job completion.
- Keep all escape routes clear of stored material.
- Keep roads, paths and pedestrian areas free of stored materials.
- Keep the work area free from oil and liquids. In case of any oil or liquid spillage while working, clean it immediately.
- Bring first-aid, rescue and descent equipment as well as firefighting equipment if not placed in the turbine.

- Switch-off unnecessary equipment in order to avoid exposure to noisy environment while working.
- Ensure the turbine is left in safe condition, when work tasks are not completed.
- To ensure housekeeping is considered as an integral part of the work process in turbine, housekeeping is to be discussed at the toolbox talks.

6.5 Two-Person Teams

Normally any work task is assigned to a team of at least two competent persons.

To ensure suitable safety support, a minimum of two persons must be present while performing service and installation activities on a wind turbine.

A technician is permitted to go up tower and perform basic operations for example yawing the turbine or hoisting tools from below. However, a second technician must always be at the turbine location.

Team members should adhere to the following:

- If team members work in isolation from each other and do not have visual contact during the work, there must be a clear procedure about communication among them.
- Team members must be in possession of two-way communication equipment which, at a minimum, has battery capacity for the duration of the work.
- A team member must never leave the work area inside the turbine without informing the other team member(s).
- Work in the hub requires that at least one assigned person stays in the nacelle until the person working in the hub has finished and returned to the nacelle.

6.6 Working Alone in the Turbine

Personnel are only permitted to work alone in exceptional cases and only at ground level of the tower.

Only trained and qualified personnel are allowed to carry out lone work. Communication between the lone worker and a contact/base person must be established. An emergency response plan must be agreed on between the lone worker and the contact/base person.

NOTE Planning of lone work must be based upon a thorough risk assessment/job safety analysis which demonstrates that the lone work does not introduce hazardous conditions that cannot be controlled to an acceptable level.

The WTG must be put in pause when the employee is working under the rotor (outside the tower, etc.).

6.6.1 Emergency Response Plan for Lone Work

Before Starting any Work

The technician working alone must complete the following:

- Contact the base/contact person when arriving at the site and before starting the task.
- Ensure that communication lines work properly.
- Agree on call intervals with the base/contact person.
- Go through the emergency response plan with the base/contact person before starting the task.

During Work

The technician working alone must complete the following:

- Contact the base/contact person within the agreed-upon time intervals.
- Contact the base/contact person if the technician has to leave the turbine unexpectedly.

The base/contact person must complete the following:

- Contact the technician working alone if the technician does not call within the agreed-upon time interval.
- Start the emergency response plan if the technician working alone cannot be reached.

Finishing Work

The technician working alone must complete the following:

- Contact the base/contact person when the task is finished.
- Contact the base/contact person before leaving the site.

6.7 Turbine Safety Requirements

This section provides safety information on the following:

6.7.1 Wind Turbine Site

All personnel must follow the site-specific wind turbine safety rules, emergency response plans, signs and regulations.

All personnel must familiarise themselves with the site-specific wind turbine rules before beginning any work.

The site/construction manager or authorized supervisor is responsible for enforcing all site rules and regulations.

All personnel at a wind turbine site must know the assigned safety representative.

6.7.2 Using the Service Lift or Climbing the Ladder

Technicians must ensure the following:

- Stop the wind turbine according to the wind turbine specific manual or work instruction.
- Switch off any remote access to the wind turbine. Special precautions must be taken if the work requires the remote control to be switched on.
- Only qualified technicians are authorized to use the service lift.
- A pre-use check of the lift (max 3 meters/10 feet off the ground) must be carried out. The check can be done while the turbine is in the run mode.
- Ensure that the service lift inspection is in date.
- Only serviceable lifts can be used.
- If any faults are identified the service lift must be isolated (locked out) and labelled quarantined to prevent unauthorized use.
- All faults identified must be reported.

NOTE

For further details refer to the service lift manufacturer's manual.

6.7.3 Nacelle and Components

If an operating wind turbine must be inspected from the ground, never stand under the rotor plane.

For unattended turbines, the access door to the turbine must be locked to prevent unauthorised persons from accessing the turbine.

All personnel must know the location of the emergency stop buttons in the wind turbine.

Before descending from the nacelle, observe the following:

- Ensure that all tools, parts and equipment are removed from the work area.
- Ensure that the red emergency stop buttons are reset.
- Close and lock the nacelle skylight and service hatch and turn off any lights.

Before leaving the turbine ensure that the turbine is safe and secure.

Do not stay in the nacelle while the wind turbine is in operation unless there is a special task to be performed and a special instruction to follow to complete the task. Special safety precautions must be taken according to documentation (RAs and SWIs).

6.7.4 Working in the Hub

Working in the hub and access to the hub requires activation of the rotor lock. Check local legal requirements to identify if the hub is considered a confined space.

A rescue plan must be established prior to entry into the hub.

NOTE For detailed information, see the turbine specific 'Safety Regulations for Operators and Technicians' document and the 'Rotor Lock' document in Techdoc.

For turbines equipped with LCTU, do not touch the LCTU and the blade lightning band when accessing the hub from the nacelle through the hub hatch.

6.7.5 Working with Blades

Working in the blade and access to the blade require activation of the blade pitch lock.

Check local legal requirements to identify if the blade is considered a confined space.

A rescue plan must be established prior to entry into the blade.

NOTE For detailed information, see the turbine specific 'Safety Regulations for Operators and Technicians' document and the 'Blade Pitch Lock' document in Techdoc.

For turbines equipped with LCTU: In the event of missing or damaged LCTU, discharge the static electricity in the blade before performing any work in the blade. For detailed information, see turbine specific safety documentation.

6.8 Construction Site Arrangements

6.8.1 Location of Buildings/Temporary Facilities

New employees, when arriving at any Vestas site, are given a site induction indicating the locations of the following:

- Buildings / temporary facilities
- Emergency equipment
- Emergency exits

6.8.2 Access to Site

Only authorised personnel are allowed access to a construction site.

Access to the site must only take place through established roads and gates to the site. Vehicle movements are restricted to the designated access tracks of land and roads.

NOTE Any deviations of vehicle movements from the designated access tracks of land and roads must be pre-approved.

Where access is required to cross open space, movement must be confined to a single route to minimise impact on farmland, the environment and possible cultural heritage sites.

Vehicle operators must respect all posted traffic, speed, parking and safety regulations in addition to national legislation regarding driving on public and on-site roadways.

6.8.3 Access to Turbine

Only authorized technicians are allowed access to a wind turbine generator. While working in the turbine the door should be closed. The door must not be locked unless a specific site risk assessment or job safety analysis is in place and documented in the emergency response plan.

6.8.4 Driving and Pedestrian Routes

The map of the construction site must show established and/or designated driving routes and access roads to the construction site.

Pedestrian routes should be established on the site to provide safe access to and from the parking, laydown, and work areas for employees.

6.8.5 Excavations (Trenches)

Underground utilities must be mapped prior to any excavation. Call the local utility company before digging on any site. The utility company will map all underground cables and lines.

Warning Signs and Vehicles

High visibility barricades and warning signs must be placed around an excavation site. Warning lights, a flagman or a watchman must be used.

Vehicles or other equipment are not allowed in close proximity to the excavations and/or trenches. Keep vehicles and equipment away from the marked edges of the excavations and/or trenches.

Shore Area

Stay within the shore area (at a safe distance from the excavations and/or trenches) and be aware of changing ground conditions.

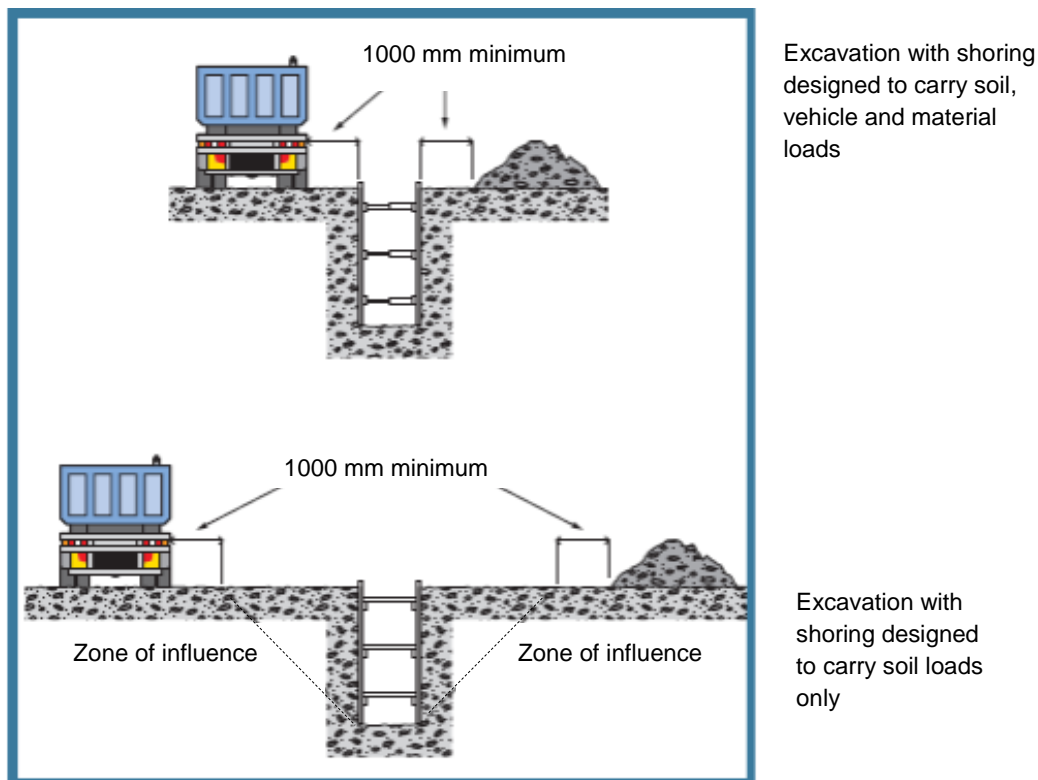


Figure 6-1: Excavated material and loads near excavations.

Figure 6-1 shows an example of:

- An excavation with shoring that has been designed to carry vehicle and material loads – this may be required where there is a limited space around the excavation for vehicle movement and/or material storage.
- An excavation with shoring that has been designed only to carry the load of the excavated faces and the related zone of influence.

NOTE

Vehicles and heavy equipment must keep a safe distance (e.g. 2 m/6.6 feet) from all excavations to prevent subsidence or vehicle sinking/overturning.

Slope or shore (brace) all sides to prevent cave-ins. Inspect all excavations and/or trenches very carefully after rain and/or flooding or other hazard-increasing occurrences.

NOTE Sides of any excavations and/or trenches must be shored (braced) if vertically deeper than 1.5 metres (5 feet).

Ensure personnel are not present under any area being excavated, e.g., when work is near the top of a slope, bank, or cliff.

Bridges with handrails must always be installed across excavations.

Working at Height

Working at height procedures must be established and followed when working in the vicinity of deep excavations and foundations to prevent personnel falling.

6.8.6 Foundations

Only authorized and competent personnel are allowed to go near the turbine foundations while they are under construction.

NOTE Foundations must be constructed according to the global document “Gravity Foundation Construction Guideline (DMS 0005-8491).”

The following must be established:

- Cave - in prevention.
- Appropriate ingress and egress requirements.
- Edge protection (barriers, warnings, signs, etc.).
- Permitting and inspection requirements.









The following safe working practices must be followed:









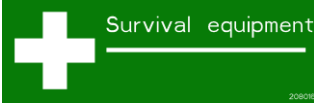


- Use appropriate PPE and barricades to prevent anyone falling/driving into the construction pits.
- Use safe access ways to enter the foundation/construction pit.
- Ensure the angle and stability of the bank.
- Clearly mark deep foundations/construction pit.
- Keep a safe distance of vehicle (crane/truck) to the bank.











6.9 Safety Signs in Wind Turbines and Documentation



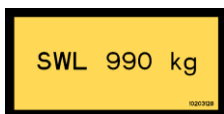




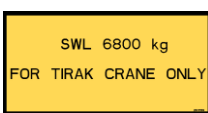
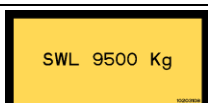



Table 6-3: Safety signs, identifies some of the safety and warning signs used in wind turbines, manuals and work instructions.







The current safety signs can be found in Overview of Safety Signs in the Vestas wind turbines (DMS 0057-8511). An overview of previous safety signs used in Vestas turbines can be found in Warning Signs used in Technology (0002-0209).

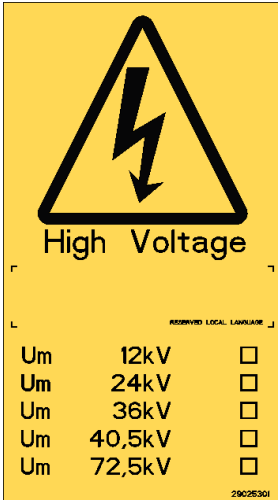
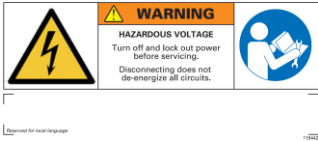
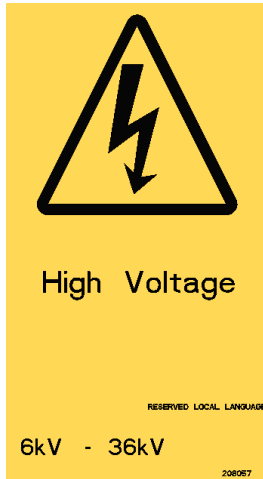


Vestas Item no.	Text	Pictogram	Standard	Where used
208001	Wear ear (hearing) protection		M003 ISO/EN 7010: 2011	Tower
208028	Wear eye protection		M004 ISO/EN 7010: 2011	Tower, Hub
208004	Wear Safety footwear		M008 ISO/EN 7010: 2011	Tower
208005	Wear head protection		M014 ISO/EN 7010: 2011	Tower
208006	Wear a safety harness		M018 ISO/EN 7010: 2011	Nacelle, Tower, Hub
208027	Rotor Lock Required		Vestas design	Nacelle
208003	No Access For Unauthorized Personnel		Vestas design & ISO/EN 7010:2011	Tower
208007	Fire extinguisher		F001 ISO/EN 7010: 2011	Nacelle, Tower




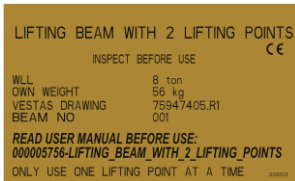
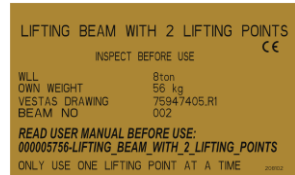
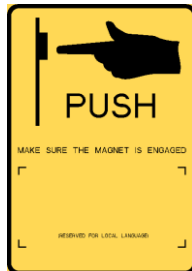
Vestas Item no.	Text	Pictogram	Standard	Where used
208008	No Smoking		P002 ISO/EN 7010: 2011	Tower
208009	No Photography		P029 ISO/EN 7010: 2011	Trafowall, Electrical cabinet, PCM
208029	Do not walk or stand here		P024 ISO/EN 7010: 2011	Generator, Gearbox
10207092	Lift only when empty		Vestas design	Hydraulic tank (Gravitati on tank)
70531701	Direction of rotation(Right)		Vestas design	Generator
23975	Direction of rotation(Left)		Vestas design	Generator
70531373	No lifting (to secure load during transport)		Vestas design	Generator
208010	First Aid Kit – Eye Rinse		Vestas design	Nacelle, Tower
208016	Survival Equipment		Vestas design	Tower
208020	Rescue Equipment		Vestas design	Nacelle, Tower
208021	Arrow		E006 ISO 7010:2011	Nacelle

Vestas Item no.	Text	Pictogram	Standard	Where used
208022	Rescue Point		Vestas design	Nacelle, Hub
208011	Emergency exit (left hand)		E001 ISO/EN 7010: 2011	Nacelle, Tower
208015	Emergency Exit (Down)		Vestas design & ISO/EN 7010: 2011	Tower, Nacelle, Hub
29082436	Emergency Exit (Up)		Vestas design & ISO/EN 7010: 2011	Nacelle
29041371	Overhead crane hazard		W015 ISO/EN 7010: 2011	Tower entrance
208014	Max Load 1 Ton		Vestas design	Tower platform
208098	Max Load 1.5T on intern platform		Vestas design	Tower platform
208099	Max Load 2T on intern platform		Vestas design	Tower platform
208100	Max load 1.2T on inter plat-v164		Vestas design	Tower platform
208101	SIGN MAX LOAD 8T ON INT PLATF-V164		Vestas design	Tower platform

Vestas Item no.	Text	Pictogram	Standard	Where used
29086831	SWL 250 kg		Vestas design	Nacelle crane
208019	SWL 800 kg		Vestas design	Nacelle crane
10203128	SWL 990Kg		Vestas design	Nacelle crane
29061325	SWL 1500Kg		Vestas design	Nacelle crane
29015854	SWL 1600Kg		Vestas design	PCM crane
29001360	SWL 3000 kg		Vestas design	Nacelle crane
208055	SWL 6400 kg		Vestas design	Nacelle crane
29017189	SWL 6800 kg		Vestas design	Nacelle crane
10203108	SWL 9500Kg		Vestas design	Nacelle crane
208018	SWL 12 T		Vestas design	Nacelle crane
208017	Warning Counter rotating rollers		W025 ISO/EN 7010: 2011	Nacelle, Drive train, Tower
29022813	Disengage Turner Gear		Vestas design	Turner Gear

Vestas Item no.	Text	Pictogram	Standard	Where used
208053	Only one person on the ladder		Vestas design	Tower
208058	Only one person on the ladder in each tower section		Vestas design	Tower
29001135	Ball Valve Warning		Vestas design	Hub
208023	Warning: Hot surface		W017 ISO/EN 7010: 2011	Gear box, Generator, Tower control cabinet
208013	Warning; Electricity		W012 ISO/EN 7010: 2011	Nacelle, Electrical cabinet, Tower control cabinet, Generator
118934	Electrical warning, universal		Vestas design	Nacelle Electrical Cabinet

Vestas Item no.	Text	Pictogram	Standard	Where used
29025301	Warning: High voltage		Vestas design	Trafowall
119442	Hazardous voltage - LOTO procedures required		Vestas design	Nacelle, Tower, Hub and Yaw control cabinet,
208057	High Voltage 6kV – 36 kV		Vestas design	Trafowall , Tower
29082540	Trip hazard		Vestas design	Tower
75948875	SWL 1875 Kg		Vestas design	Tower

Vestas Item no.	Text	Pictogram	Standard	Where used
29087973	Warning: Risk of fall		Vestas design	Nacelle
29089433	Only for fall protection chain		Vestas design	Nacelle
29099910	NO LIFTING: Only for one Person fall arrest		Vestas design	Nacelle
208102	Lifting Point for Beam 1		Vestas design	Tower
208103	Lifting Point for Beam 2		Vestas design	Tower
20116604	Sign Push Door Magnet Lock		Vestas design	Nacelle



Vestas Item no.	Text	Pictogram	Standard	Where used
29118231	LABEL CORROSIVE SUBSTANCES		W023 ISO/EN 7010: 2011	Nacelle
29118232	LABEL ACUTE TOXICITY		W016 ISO/EN 7010: 2011	Nacelle

Table 6-3: Safety signs

NOTE Requirements regarding the application of signs can be found in 0000-4619 Application of the Warning and Safety Signs (2MW) and 0026-9755 Applying Safety Signs (3MW).

6.10 Working at Night

Any work activity during the hours of darkness in area where general illumination/lighting is required.

- All points of exit, pathways, and muster points shall be clearly illuminated and marked.
- Ladder access and egress shall be clearly illuminated.
- Where bayonet type light bulbs are used as stringers for illuminating passageways and stairways, cages shall protect them.
- Lights provided for this purpose shall be located to avoid glare and spaced to provide adequate illumination for the areas covered.
- Tower lighting shall be located in a manner that illuminates all work areas.
- Lighting should be provided in confined spaces, and back-up lighting shall be provided in case of power failure.
- Lightning poles and other metal poles shall be earthed (grounded) and the circuit fitted with residual current devices.

- Cables supporting temporary lighting shall be routed to ensure they do not present a hazard.
- All lighting fixtures shall be installed in a secure manner to prevent accidental movement or falling.
- Temporary installations shall meet all local requirements.
- Temporary lighting strings shall consist of nonconductive lamp sockets and connections permanently moulded to the conductor insulation.
- Bulbs attached to lighting strings and extension cords shall be protected by lamp guards.
- Broken or defective bulbs shall be promptly replaced.
- All lights used for illumination shall be protected from accidental contact or breakage. Metal-case sockets shall be grounded.

6.11 Alcohol and Drugs

Consumption of drugs and alcohol is strictly forbidden. Where domestic facilities are provided i.e. canteens and rest rooms, sleeping quarters, etc. local instruction and guidance will be given by the site/construction manager or authorized supervisor.

Employees must not report to work under the influence of alcohol or drugs. If an employee is taking prescribed medication, which may affect work performance he must inform his supervisor immediately prior to any work activity taking place.

Employees must ensure that any over-the-counter medication does not affect their work performance.

6.11.1 Drug & Alcohol Testing

A drugs testing program may be implemented on your site.

If reasonable suspicion exists, the site/construction manager or authorized supervisor will safely remove the employee from site and immediately contact P&C to determine further action to be taken.

6.12 Rules for Visitors

Before visitors arrive on the site, the site/construction manager or authorized supervisor for the site must be provided with the following information for each anticipated visitor:

- Visitor name
- Company name
- Purpose of visit

Upon arrival, visitors must report to the site/construction manager or authorized supervisor.

- Appropriate site orientation and induction training must take place depending on the areas to be visited.
- All visitors must comply with applicable site rules and regulations concerning health and safety on site.

VPP

Refer to **SUS-SAF-RSA Request for Site Access (DMS 0081-3010)** for further information about requirements for site visits at locations outside own superior manager's area of responsibility.

NOTE

Visitors are **not** allowed to enter restricted areas (for example, areas where crane work or excavation is being carried out). Visitors are only allowed access to the wind turbine after receiving permission from the site/construction manager or authorized supervisor responsible for the site. Visitors must be accompanied by qualified personnel and max 2 visitors per 2 qualified personnel when climbing a turbine.

6.13 Local Requirements

Refer to the BU local requirements (if available) for additional information.

7 Extreme Weather

The purpose of this chapter is to prevent exposure to hazards while working in extreme weather conditions, and to identify hazards and restrict work where necessary to ensure the safety of Vestas employees.

7.1 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
COLD	Cover, overexertion, layers, and dry
PPE	Personal protective equipment
LOTO	Lockout-Tagout

Table 7-1: Abbreviations

Term	Explanation
Chilblain	Chilblains are caused by the repeated exposure of skin to temperatures just above freezing to as high as 15°C.
Frost bite	Frost bite is an injury to the body that is caused by freezing.
Heat stroke	The result of the body's inability to control core temperature due to prolonged exposure to extremes of heat. Symptoms include sweating cessation, severe headache, high fever, and/or hot dry skin. <ul style="list-style-type: none"> In extreme conditions, body temperature may rise to 41°C (106°F) or higher within 10–15 minutes. Heat stroke can cause death or permanent disability if emergency treatment is not given.
Hypothermia	A potentially fatal condition which occurs when body temperature falls below 35°C (95°F).
Lockout-Tagout (LOTO)	Lockout-Tagout is a safety procedure involving the use of a sequence of physical locks and warning tags to ensure that an electrical or mechanical device cannot be accessed or energised. LOTO is used in industry and research settings to ensure that dangerous machines are properly shut off and not started up again prior to the completion of the maintenance or service work.
Lone work	When a single technician is the only one present at a turbine site or in a wind turbine (at the bottom of a tower). A person working alone within a wind turbine.

Table 7-2: Explanation of terms

7.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

Planning

- Recognize environmental and workplace conditions that lead to potential hazards, illnesses or injuries and take measures to mitigate those risks.
- Perform site risk assessments for site-specific weather conditions and communicate information to all affected persons.
- At the beginning of the work shift, give an overview of the working conditions and weather concerns to the work group.
- Carefully schedule the work to avoid heavy perspiration by employees. In cold weather conditions plan to perform work during the warmest part of the day.
- Allow a period of adjustment to hot weather conditions before embarking on a full work schedule and permit employees to set their own pace and take extra work breaks when needed.
- Schedule an appropriate work-rest regime and ensure a heated shelter for relief from the cold is be provided.
- Plan work to consider the additional weight and bulkiness of clothing that may affect work performance. Standing still or sitting still for long periods should be minimized.
- Plan to avoid work being performed in windy, drafty or unprotected areas to the extent possible.
- Include a thermometer and chemical hot packs in the first aid kit.

PPE, Clothing, food and drinks

- Select and supply proper PPE and clothing for applicable weather conditions.
- Ensure contractors/subcontractors supply required, approved PPE and equipment for their personnel as required.
- Provide appropriate and suitable clothing. In cold conditions clothing should consist of a base layer, intermediate layer and appropriate out garments.
- Ensure dry work clothing is available for each employee.
- Ensure warm, non-alcoholic drinks and / or soups are available.

Training

- Train all employees in the recognition of symptoms, treatment of cold stress disorders and wind-chill index.
- Ensure all personnel under Vestas supervision have received training in these requirements and have adequate knowledge and skills to perform their tasks.
- Ensure all personnel under Vestas supervision adhere to all requirements related to extreme weather conditions.

Vestas employees are responsible for the equipment as follows:

- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do as first aid.
- Immediately notify the site/construction manager or authorized supervisor of any known health condition that is likely to be aggravated due to exposure to extreme weather conditions.
- Appropriate PPE must be worn and adequate fluid available per person for existing and anticipated weather conditions
- Participate and review site risk assessments (JSA/RA) for job specific hazard controls where weather conditions are a concern.

7.3 Weather Conditions

7.3.1 Before Starting any Work

Technicians must complete the following before starting any work on the turbine site or inside the wind turbine:

- Obtain periodic forecast updates of the weather conditions as necessary.
- Make a risk assessment/job safety analysis for the working condition and environment based on the weather forecast.
- Consider local regulations regarding weather-related work restrictions.

7.3.2 During Work

Technicians must be aware of the following while working on a wind turbine:

- Obtain periodic forecast updates of the weather conditions as necessary.
- Site locations can have site-specific weather conditions.

NOTE For example, gusts of strong wind can arise in mountainous areas. Temperatures can increase drastically in arid regions or decrease significantly in mountainous areas.

7.4 Wind Speed Limits

Always check the wind speed limits in the Safety Regulations for Operators and Technicians and specific work instructions and ensure the required work tasks can be performed in a safe environment. For each type of installation and service work, technicians and safety representatives shall reference the regional wind speed limits. These values must not be higher than the maximum permitted wind speed values described in the appropriate turbine specific Safety Regulations for Operators and Technicians. The documents can be found in Techdoc, Standard Documentation, turbine type and safety.

For turbine types, where the wind speed limits are not defined in the turbine specific Safety Regulations for Operators and Technicians, a risk assessment/job safety analysis must be completed before operating the service crane if the wind speed is 15 m/s or above and corrective measures must be identified and implemented.

NOTE Entering a site or wind turbine in wind speeds exceeding 25 m/s is prohibited. If on site when wind speeds exceed 25 m/s shelter can be taken in a suitable site office/vehicle.

NOTE Do not work on a wind turbine when the wind speed exceeds the maximum capacity values of the mechanical design of the locking system as described in the wind turbine specific manual.

For wind turbines that cannot be locked mechanically (LOTO), a risk assessment/job safety analysis of the work task must be completed, and corrective measures identified and implemented so that the health and safety risks are reduced or eliminated.

7.4.1 Storms

In storms and extreme winds, access to the turbine site area is strictly prohibited.

NOTE If on site and a storm occurs activate the Emergency Response Plan.

7.5 Working in Cold and Freezing Conditions

Low temperatures can affect health and safety in a number of ways. In particular, it can affect the way people behave. It is more difficult to concentrate when feeling cold. Therefore, errors of judgment are more likely to occur, and these errors can lead to serious accidents. People may also take shortcuts to avoid the cold, resulting in non-adherence to site procedures and rules.

Low temperatures affect manual dexterity which is important when operating machinery and other manual tasks. For example, those operating machinery may start to lose some dexterity at temperatures lower than 13°C and the risk of accidents will increase in such temperatures. In extreme circumstances, frost bite, chill blain and hypothermia may occur.

Other hazards may also be apparent in cold weather. For example, there may be additional slipping hazards due to ice or snow on working platforms and ladders. Plant and equipment may malfunction due to cold and ice. The safety of mechanized lifting operations may be jeopardized by unstable loads. Manual

handling may be riskier due to the effects of a cold environment with slippery loads and surfaces.

7.5.1 Working with Tools, Equipment and PPE in Low Temperatures

The following temperature limits must be observed when working with tools, equipment and PPE, meaning that it is not allowed to work at lower temperatures than the temperature limits. The temperature is to be measured, where the work is being performed.

Work must be stopped when reaching the below temperature limits for the listed work to be performed	Equipment / PPE / Work to be performed (This list is not exhaustive)
Below 0°C/32°F	Air-Purifying Respirators (APRs) must not be worn at temperatures below 32°F (0°C) without a nose cup.
Below -4°C/25°F	Powered Air-Purifying Respirators (PAPRs) must not be used in temperatures below 25°F (4°C) because of the wind chill created in the face piece.
Below -15°C/5°F	<u>Finish work / mechanical completion</u> <ul style="list-style-type: none"> Cable work. Some materials may lose flexibility and deteriorate. Plastic insulated material may crack, exposing the conductive material. See Figure 7-1: Cracks at shrink tube of HV cable.
Below -15°C/5°F	Check lift specific temperature limits in user manual.
Below -20°C/-4°F	<u>Lifting equipment for installation</u> <ul style="list-style-type: none"> Shackles Steel lifting components (unless otherwise specified in the manual)
Below -20°C/-4°F	<u>Bolt torque / final torque</u> <ul style="list-style-type: none"> Tightening/torqueing bolts (bolts must have the same temperature as the part they are connecting to). Mechanical activities <p>The safety risk arises when torqueing below -20 as this may cause a component failure.</p>
Below -25°C /-13°F	<ul style="list-style-type: none"> Mobile cranes – all types
Below -25°C /-13°F	<ul style="list-style-type: none"> Avoid working at temperatures below -25.
Below -30°C/-22°F	<ul style="list-style-type: none"> Safety Helmets. Operating specifications will be exceeded (unless otherwise specified in the helmet).
Below -30°C/-22°F	<ul style="list-style-type: none"> No work to be performed Turbine is not designed to operate below this

	temperature.
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Table 7-3: Temperature limits for tools, equipment, PPE and work

For further details on temperature requirements consult the relevant turbine specific manuals and task specific work instructions.

NOTE In the Vestas Standards (type SIV in the browser) you search for the standard number, which is visible on most tools and equipment. In most of the standard you can find the temperature limits.



Figure 7-1: Cracks at shrink tube of HV cable.

7.5.2 Snow and Ice Hazards

Observe the following snow and ice hazards:

- In cold weather and heavy snow, there is a risk of ice and/or snow falling from the wind turbine.
- When a turbine starts up, especially after a period with cold weather, there is a risk of ice and/or snow falling from the blades and the nacelle.

If it is necessary to approach a turbine when there is a risk of falling ice and/or snow, take precautions and approach with the wind from behind.



Figure 7-2: Accumulation of ice on the blade and on the CoolerTop®

7.5.3 Stored Parts

Large amounts of ice and/or snow can build up on blades and nacelles when stored on-site. Additionally, ice and/or snow can build up on the inside and outside of the tower sections.

Observe the following precautions when turbine parts are stored on the ground:

- Always check the wind turbine parts thoroughly.
- Clear off all ice and/or snow both inside and outside of the wind turbine parts before lifting parts off the ground.

NOTE

When storing materials and components precautionary measures should be taken in accordance with Vestas requirements to prevent weather conditions / climatic conditions damaging the components.

7.5.4 Driving in Freezing Weather Conditions

Driving should be limited in freezing weather conditions. When any commuting needs to be performed, the site/construction manager or authorized supervisor must assess the risk involved and ensure considerations are taken to the likelihood of heavy build-up of snow or sleet (snow that partially melts as it falls) on the road.

The road should be cleared and sanded before the start of the commute. The vehicle should be adequately equipped for winter driving conditions i.e. with snow tires and other emergency equipment. Driving behaviour should be adjusted to suit the road and weather conditions and extra caution should be taken with lower driving speeds and gentle braking as possible.

7.5.5 Hypothermia

Cold stress can result as a prolonged exposure to lower than normal temperature. When exposed to cold temperatures, your body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up your body's stored energy. The result is hypothermia, or abnormally low body temperature.

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and colour in the affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. In extremely cold temperatures, the risk of frostbite is increased for employees with reduced blood circulation and among employees who are not dressed properly.

Chilblains are caused by the repeated exposure of skin to temperatures just above freezing to as high as 15°C. The cold exposure causes damage to the capillary beds (groups of small blood vessels) in the skin. This damage is permanent, and the redness and itching will return with additional exposure. The redness and itching typically occurs on cheeks, ears, fingers, and toes.



Figure 7-3: Frostbite and chilblains

Employees should familiarize themselves with the early symptoms of various cold stress injuries and be prepared to inform the supervisors, seek shelter and treatment immediately.

Some employees may have at an increased risk if they have predisposing health conditions such as cardiovascular disease, diabetes and hypertension or if they are in poor physical condition, have a poor diet, or are older.

Hypothermia can be most effectively prevented by following the COLD rule (Cover, overexertion, layers, and dry). Table 7-4: COLD Rule and Explanation, provides an explanation of each part of this rule.

Rule	Explanation
Cover	Wear protective covering, hood or balaclava, to prevent body heat from escaping the head, face and neck. Ensure the helmet is refitted securely.
	Cover hands with mittens instead of gloves if possible. Cover extremities of the body adequately.
	Note: Mittens are more effective because they keep fingers in close contact with one another.
Overexertion	Avoid activities that cause excessive sweating.
	Note: The combination of sweating and cold weather can cause rapid loss of body heat.
Layers	Wear loose-fitting, layered, lightweight clothing.
	Wear outer clothing made of tightly woven, water-repellent material (best for wind protection).
	Wear wool, silk or polypropylene inner layers to maintain body heat (these provide better insulation than cotton).
Dry	Stay as dry as possible.
	Get out of wet clothing as soon as possible.
	Be especially careful to keep hands and feet dry at all times.

Table 7-4: COLD Rule and Explanation

NOTE Ensure sufficient food and drink is brought to the work site for prolonged working hours in cold conditions.

7.5.6 Cold Stress Index

When air temperatures drop below 10°C and as wind speed increases, the weather condition known as wind chill can accelerate the onset of hypothermia and lead to serious health problems.

The cold stress index below may be used to identify the effective temperature based on the air temperature and the wind speed.

THE COLD STRESS EQUATION



U.S. Department of Labor
 Occupational Safety and Health Administration
 OSHA 3156
 1998

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.

Hypothermia can occur when *land temperatures* are **above** freezing, or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.

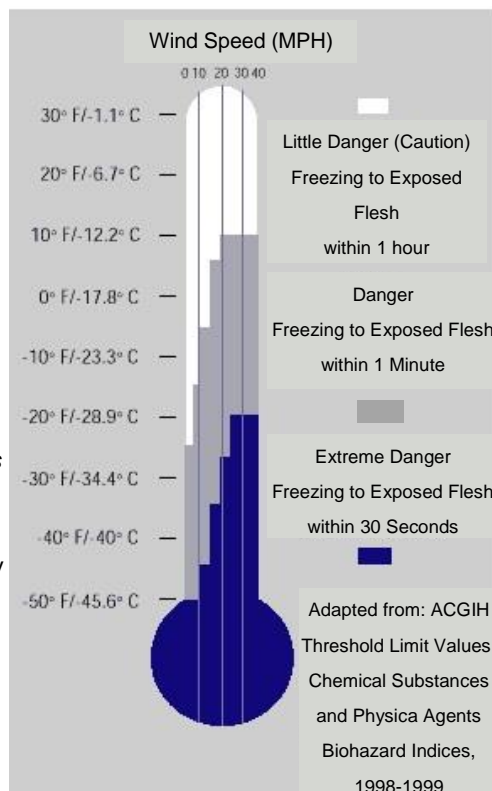


Figure 7-4: Cold Stress Index

7.5.7 Precautions

Personnel working in or around a wind turbine site during cold and freezing weather conditions must take the following precautions:

- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Drink water often to replace water lost in respiration and urine, and most importantly to prevent dehydration.
- Protect extremities of the body adequately.
- Avoid touching cold metal surfaces with bare skin. Cover bare metal equipment controls, seats, etc. with not-conducting materials.
- Use the buddy (work in pairs) system at all times and monitor each other's physical condition. Personnel are expected to take care of each other's health and safety.

7.6 Working in High Temperature Conditions

7.6.1 Preventing Heat Stroke

It is possible to avoid the ill effects of heat-related disorders by taking a few simple precautions. Table 7-5 provides instructions for preventing heat stroke.

Precaution	Description
Hydrate	Keep body well hydrated.
	Drink plenty of water before, during and after exposure to heat.
Ventilate	Stay in a place where there is plenty of air flow which helps the body to cool itself.
	Sit in a shaded, wide-open area which offers a slightly cooler than ambient temperature.
Appropriate clothing	Wear loose-fitting clothing which allows the body to stay cooler.
Limit yourself	Heatstroke can occur in less than an hour.
	Limit exposure time in hot temperatures.
	If feeling warm or lightheaded, rest in a shaded area and hydrate.

Table 7-5: Heat Stroke Prevention

Be aware of the warning signs of heat-related illness. They include the following:

- Light-headedness
- Mild nausea
- Confusion
- Sleepiness
- Profuse sweating

Other preventive measures:

The following precautions should be taken to avoid heat related illness:

- All employees will be trained in the recognition of symptoms, treatment of heat related illness and recognition of the heat stress index.

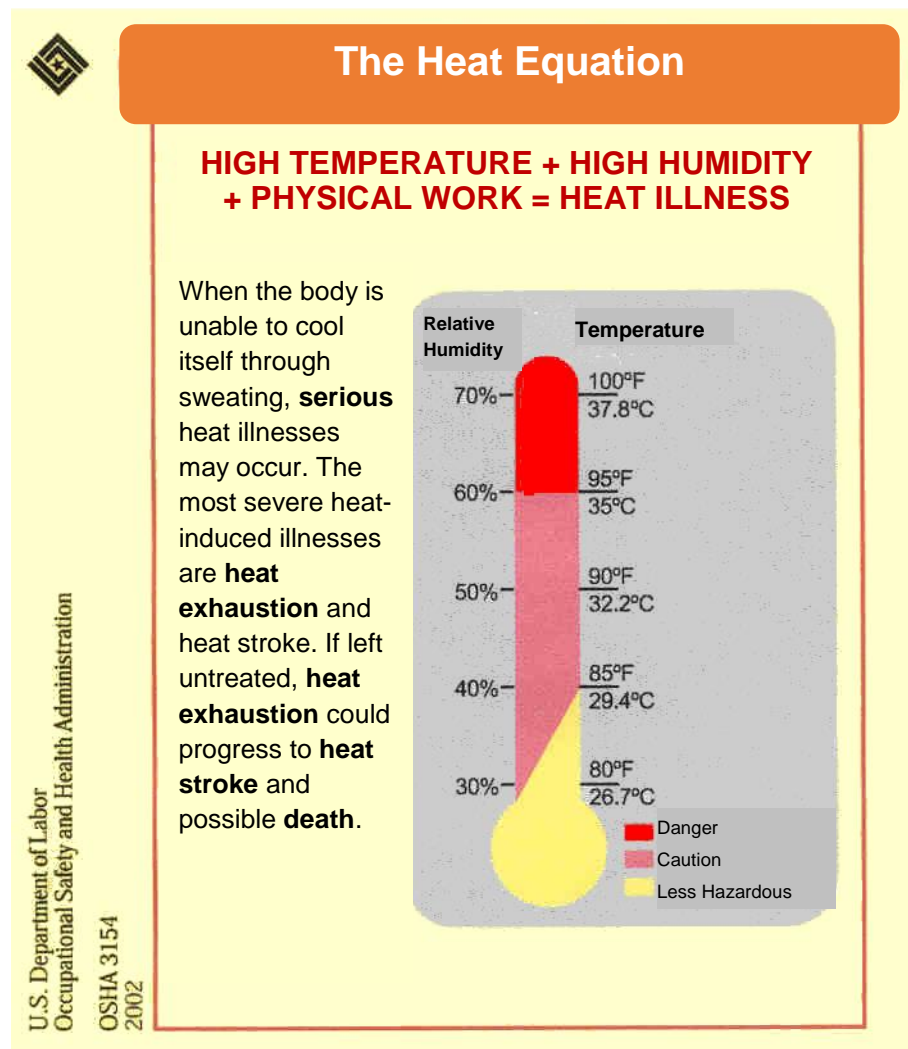


Figure 7-5: Heat Stress Index

- Provide sufficient drinking water during work.
- Recommend that employees drink 500 ml of water before beginning work in the morning and after lunch.
- Ensure that adequate shelter is available to protect personnel from heat, as well as cold, rain, or snow, which can decrease physical efficiency and increase the probability of both heat and cold stress.
- Employees should immediately report any skin problems to their managers.

NOTE Always work as a team in high temperatures. Have each team member monitor co-workers for signs of heat stroke.

7.7 Working in Sunny Conditions

7.7.1 Precautions

Working many hours in the sun can injure the eyes and skin and also result in heat stroke.

Humidity and direct sunlight (known as the heat index) may cause the perceived temperature to be significantly higher than the temperature indicated by a thermometer.

Personnel working in or around a wind turbine site during hot and sunny conditions must take the following precautions.

- Drink plenty of water
- Use sun protection lotion
- Use sunglasses to protect the eyes
- Wear a hat/cap or helmet (PPE) to protect the head from the heat
- Find shade whenever possible

NOTE If a person does not feel well, take that person to a shaded and open area. Offer water to hydrate and cool. Cool the head and body with water, as needed. If necessary, seek immediate professional medical attention.

7.8 Thunder and/or Lightning Storms

Work in thunder and lightning storms is prohibited.

If exposed to thunder and lightning while working on a wind turbine site, all personnel must adhere to the following:

- Immediately leave the nacelle, hub or blade

- Do not work in turbines
- Do not work with cranes
- Do not stand close to wind turbines
- Do not work with overhead power lines
- Do not stay in lattice towers
- Do not touch the high-voltage cable
- Only enter the substation if switchgear cabinets are isolated in a separate locked room and technicians cannot be exposed to an electrical hazard.
- Do not use the substation telephone
- Stay away from pools, lakes and other bodies of water
- Don't stand near tall objects

Evacuate the site or immediately proceed to nearest safe location:

- A permanent site building
- A vehicle
- A tubular tower platform without any electrical components

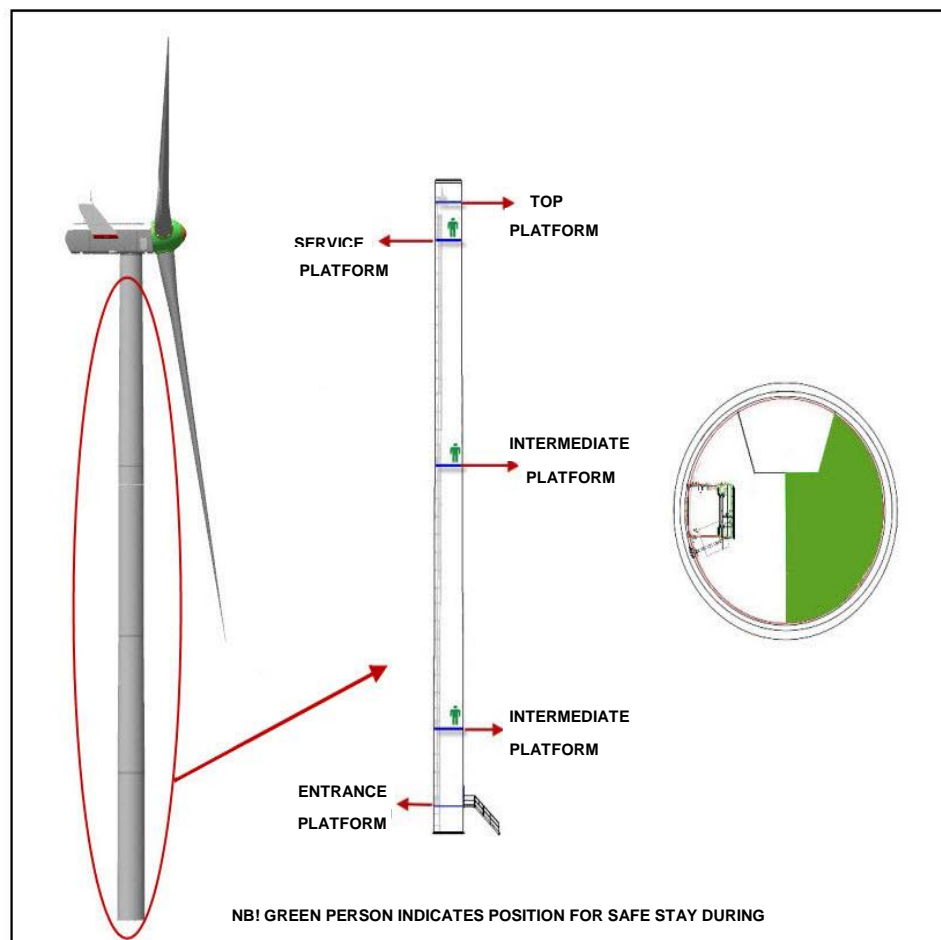


Figure 7-6: Safety stay during lightning

7.8.1 Thunder Storm Monitoring

- The Site/construction manager or authorized supervisor must ensure thunder/lightning monitoring and warning.
- It is recommended to download a reliable local App for monitoring thunder/lightning activity however, be aware thunder and lightning can start at any time.
- If thunderclaps/cracklings are heard or lightning is seen from the turbine/site evacuation must be carried out. Hair standing, sparks/humming from the air termination system and turbine structure requires that evacuation is initiated.
- If lightning strikes are registered within a 20 km/12 miles warning radius from the turbine, the Site/construction manager or authorized supervisor must alert all people on site and ensure evacuation of the turbines.
- For sites that have a lightning advisory system installed the warning radius may differ. Follow site-specific instructions.

7.8.2 Thunder Storm Clearance

Before leaving the safe location, it must be ensured that the threat has passed:

- This can be a clearance from the local metrological facilitator (or other reliable local services or App) if no lightning activity has been in the 20 km/12 miles radius for at least 30 minutes.
- The Site/construction manager or authorized supervisor must ensure a clearance for the site.
- If lightning activity has stopped but there is still severe weather in the area, the Site/construction manager or authorized supervisor has authority to keep the lightning stand down in effect until he/she feels it is safe to resume normal operation.
- When there has been a lightning storm there is an increased likelihood that it will come back. Therefore, remain alert and continue to monitor the weather conditions.

7.8.3 Struck by Lightning

If the turbine is struck by lightning and visible damage is found, perform or adhere to the following:

- Disconnect the power supply and place the turbine in safe mode if possible.
- Do not re-enter the wind turbine until it has been confirmed that the storm has passed.
- Contact the site/construction manager or authorized supervisor to carry out a lightning strike inspection.

- Do not approach the wind turbine until at least one hour after the storm has passed.
- Do not approach the wind turbine if there are rustling or hissing sounds coming from the turbine blades due to static electricity.

NOTE If lightning strikes a wind turbine during service and/or maintenance, take the applicable precautions, and notify the site/construction manager or authorized supervisor as soon as possible of any suspected damage or unfamiliar sounds.

7.9 Local Requirements

Refer to the BU local requirements (if available) for additional information.

8 Animals and Insects

Wind farms are generally positioned in isolated remote areas. Check and research the flora and fauna you may be exposed to. In the site-specific emergency plan and induction include details on how to avoid contact with relevant insects, mammals, reptiles and poisonous plants as well as information on how to act if confronted with this flora and fauna and the immediate first aid, medical evacuation plan and local hospital details.

8.1 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
ERP	Emergency Response Plan
PPE	Personal Protective Equipment

Table 8-1: Abbreviations

Term	Explanation
Insects	Wasps, bees, mosquito including arachnid, scorpions & spiders, etc.
Mammals	Vertebrates including birds, marsupial, kangaroos, etc.
Plants (poisonous)	Water Hemlock, Deadly Nightshade, White Snakeroot, Castor Bean Rosary Pea, Oleander are some examples
Reptiles	Snakes, lizards, frogs etc.

Table 8-2: Explanation of terms

8.2 General Guidelines

You may be confronted with insects, mammals, reptiles and poisonous plants when on site. Below are the general precautions to take.

General precautions

- Identify the hazardous flora and fauna prior to arrival on site.
- Include control measures in the emergency response plan and site-specific induction. Include pictures of animals or plants for easy recognition.
- Include the closest hospitals/medical centres for receiving emergency medical treatment in the site-specific ERP and site induction.
- Ensure hospitals have suitable treatment available to deal with bites, stings, injuries, allergic reactions, etc.
- Avoid an encounter with hazardous flora and fauna.
- Don't touch or remove plants unnecessarily.
- Have appropriate first aid trained people and resources.
- When necessary and authorized have appropriate antivenom available.
- Have as robust emergency response and evacuation plan.

8.3 Snakes, Scorpions and Spiders

Below are the precautions to take in case of a bite.

Precautions to avoid bites:

- Use the required PPE to avoid bites before entering a work area.
- Avoid leaving parts of your legs and hands exposed and unprotected.
- Adequately review stockpiling areas before handling any stockpiled items. Use e.g. a bar to check areas where there is a risk of encountering dangerous animals (gaps under stockpiles or branches, dark and wet areas, etc.). This applies especially upon starting work or at dusk, because in warm climates such animals are most active in the evenings and at night.
- If you encounter a snake, scorpion or spider, it is crucial to remain calm and not make any sudden movements. Many attacks occur because the animal feels threatened.

In the event of a bite

- Move away from the animal quickly but without making any sudden movements, as the initial bite generally contains less poison than subsequent bites.
- Try to identify the type of snake, scorpion or spider by taking a photo or remembering its colour, the shape of its head, body, etc.
- Seek immediate medical advice.
- Inform the site/construction manager or authorized supervisor as soon as possible.
- Reassure the injured person and keep them calm.
- Don't move the injured body part.
- Note down the time of the bite and how the affected part of the body looks.
- Drive the injured person to the relevant hospital or medical centre as soon as possible.

NOTE

Any snake bite, poisonous or not, must be treated as a medical emergency and the affected person must be taken to hospital without delay.

8.4 Local Requirements

Refer to the BU local requirements (if available) for additional information.

9 Personal Protective Equipment

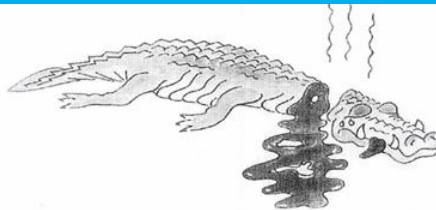
Vestas provides approved personal protective equipment (PPE) to minimise anticipated hazards at the workplace. PPE is required to reduce personnel exposure to hazards when engineering and administrative controls are not feasible or effective in reducing exposure to acceptable levels.

VPP Before starting any work a risk assessment/job safety analysis must be performed according to **SUS-ASM-HRA Identify Hazards and Assess Risks**.

It must always be remembered that PPE is the last resort in the safety hierarchy of control measures and every effort should be made to eliminate, remove and control the risk to reduce it to a reasonable level to avoid exposure to the risk before relying on PPE.

The best method (1)

Eliminate the hazard in the design phase



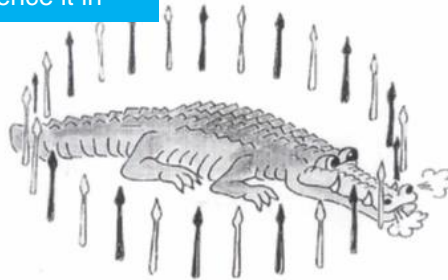
The second best method (2)

Remove the person from the hazard



The third best method (3)

Fence it in



The last resort (4)

Use of protective equipment

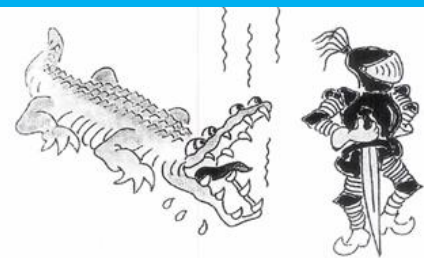


Figure 9-1: Prioritization of operational control of hazards

9.1 Abbreviations and Technical Terms

Abbreviation	Explanation
ANSI	American National Standards Institute
BU	Business Unit
dB(A)	An acoustic reference for sound pressure
EN	European Norm (a standard)

Abbreviation	Explanation
ISO	International Organisation for Standardisation
JSA	Job Safety Analysis
PFPE	Personal Fall Protective Equipment
PPE	Personal Protective Equipment
RA	Risk Assessment
WTG	Wind Turbine Generator

Table 9-1: Abbreviations

Term	Explanation
Approved PPE	Such as ear protection, safety boots, harness, hand protection, and such like.
Authorised anchor point	An authorised anchor point is a reliable anchor point described in wind turbine manuals or other instructions.
EN standard	European Norm
Inspection	Examination done according to supplier's instruction by a qualified person(s) to confirm that the equipment is suitable for use until next inspection. Note: Equipment must be tagged, and a record must be kept of all equipment inspections.
Pre-use check	Examination of equipment completed by the user to determine if the equipment is safe for use.
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Reliable anchor point	An element (or elements) permanently secured to a structure to which an anchor device (e.g. anchor connector, fall arrester) for PFPE can be attached.
Vestas best practices	Essential procedures and mitigations based on Vestas requirements, risk assessments, and legal requirements that minimise the anticipated hazards of the workplace.

Table 9-2: Explanation of terms

9.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Ensure PPE is issued and freely available to all employees and visitors.
- Verify that PPE is approved for the hazards presented and fully protects the user.
- Ensure PPE is worn.
- Ensure individual items of PPE is compatible with all other Vestas issued PPE.
- Ensure contractors/subcontractors supply required, approved PPE for their personnel as required by the site hazard assessment
- Ensure all personnel have received training/information from an **accredited training provider**/competent person and have adequate knowledge and skills to perform their tasks using required PPE.
- Ensure an annual inspection (at minimum) of PPE by a **qualified** person.
- Ensure PPE is tagged with annual inspection so that the validation period of the inspection is visible. Equipment that has not been tagged or that exceeds the validation period must not be used.
- Immediately quarantine any unserviceable PPE (defective PPE with reduced strength and functionality).
- Report unserviceable PPE or PPE related concerns to QSE and ensure replacement.
- Ensure the in-use life of the PPE specified by the manufacturer is not exceeded.

Employees are responsible for the equipment as follows:

- It is the responsibility of each individual to ensure they have been issued with and wear appropriate PPE for the task they are performing.
- Wear PPE in accordance with the manufacturer's instructions.
- Complete a pre-use check of PPE as per the manufacturer's instructions.
- Not all PPE is covered by a requirement for an annual inspection in such cases the user has to ensure the in-use life specified by the manufacturer has not been exceeded.
- Ensure that the provided PPE is kept clean, fit for purpose and is not misused.
- Consult the site/construction manager or authorized supervisor in case of unserviceable PPE.

9.3 Selecting PPE

Personnel protective equipment has developed greatly over the last few years. In addition to its protective values it is now designed better for specific risks, is more comfortable, lightweight and in most cases more fashionable. PPE that meets all these requirements is more likely to be worn.

Where practicable employees (safety committees etc.) should be involved in the selection process of PPE for specific tasks. A reasonable choice of each item should be presented for trial and the employees given options to select the appropriate equipment.

This involvement encourages employee participation and ownership and will also promote buy-in of the employees into wearing the PPE.

Once selected employees must be informed/trained on how to wear PPE correctly, when and where it should be worn and the limitations of use of each particular item as well as how the PPE should be stored and where/how it should be disposed of correctly.

Review the use and performance of PPE periodically and seek employee feedback, to help check that the PPE is performing correctly.

9.4 Mandatory Requirements

Appropriate eye protection, safety glasses or goggles, helmet, and safety boots, with ankle support, suitable gloves for the activity being performed must be worn at all times by Vestas employees, contractors/subcontractors and visitors when working on site or when in a turbine.

NOTE PPE must meet local legal requirements. In the absence of local legal requirements, EN, ANSI, or ISO standards apply.

NOTE When climbing and working in the turbine a suitable head torch/lamp should be fitted to the helmet. The head torch is used in poor light conditions and if the WTG lighting system is isolated or off.

PPE Requirements on Service sites Specific site PPE signs must be complied with	Long pants, long sleeved shirt*	Long Pants, Short sleeved shirt*	Safety boots with ankle support, toe and sole protection	Safety Helmet	Eye protection (Task/condition specific)	High Visibility Vest	Hand PPE (Task specific)
Administrative areas (where applicable)	X	X					
Parking lot (dependent on the terrain)	X	X	X				
Site based warehouse, shops and stock areas	X	X	X		X		X
On site (outside a turbine) including on turbine pad, when multiple activities are ongoing	X	X	X	X	X	X	X
Crane/Hoist work (external crane)	X	X	X	X	X	X	X
Ascending/ descending tower	X	X	X	X	X		X
In the nacelle or in the hub	X	X	X	X	X		X
Crane/Hoist work in nacelle or hub	X	X	X	X	X		X
Working near pressurized hydraulics	X		X	X	X		X
Electrical troubleshooting	X		X	X	X		X
NOTE: This matrix is a Vestas general guideline; check legal/ Vestas requirements/ regulations applicable for the site. * Where both are ticked you have the option to use either.							
Safety Helmets: Safety Helmet requirements in workshop and warehouse areas is task specific, i.e. overhead hazards with fork operation.							
Hand PPE: Task Specific (i.e. climbing, work with chemicals, sharp and rough edges)							
Safety boots with ankle support: Required at all times, except at the start and end of the day when going to or from the parking lot to the admin areas.							
High Visibility Vests: Required when on site, working near mobile equipment and when carrying out lifting operations. Hi Visibility clothing may also be required in poor visibility or bad weather conditions.							
Additional PPE: Additional PPE may be required at times and will be identified in the work instructions for the specific task. Examples are High Voltage PPE, face shields, respiratory protection and working at height PPE. This list of additional is not all inclusive.							
Non-melting clothing: Personnel standing or working in the base of the turbine while the electrical cabinets are energized are required to wear non-melting, all natural fibre clothing in according to Vestas Standard for Electrical Safety (DMS 0017-5311). All personnel working in areas where electrical hazards are present shall use protective equipment that is designed and constructed for the specific part of the body to be protected and for the work to be performed.							

Table 9-3: PPE requirements for service sites

PPE requirements on Construction sites Specific site PPE signs must be complied with	Long pants, long sleeved shirt*	Long Pants, short sleeved shirt*	Safety boots with ankle support toe and sole protection	Safety Helmet	Eye Protection (Task/condition specific)	High Visibility Vest	Hand PPE (Task specific)
Administrative areas (where applicable)	X	X					
Parking lot (dependent on the terrain)	X	X	X		X	X	
Site based warehouse, shops and stock areas	X	X	X	X	X	X	X
On site (outside a turbine) including on turbine pad	X	X	X	X	X	X	X
Crane/Hoist work	X	X	X	X	X	X	X
Ascending/ descending tower	X	X	X	X	X		X
In the nacelle or in the hub	X	X	X	X	X		X
Crane/Hoist work in nacelle or hub	X	X	X	X	X		X
Working near pressurized hydraulics	X		X	X	X		X
Electrical troubleshooting	X		X	X	X		X
NOTE: This matrix is a Vestas general guideline; check legal/ Vestas requirements/ regulations applicable for the site. * Where both are ticked you have the option to use either.							
Safety boots with ankle support: Required at all times, except at the start and end of the day when going to or from the parking lot to the admin areas.							
Safety Helmet: Required at all times except while in work vehicle and while in admin buildings/offices and parking lot.							
Safety Glasses: Eye protection is required at all times except while riding in work vehicle or while in admin buildings/offices.							

Table 9-4: PPE requirements for construction sites

NOTE Refer to the Safety Data Sheets for further details on suitable PPE when working with chemicals.

NOTE For more information about the use of Personal Protective Equipment (PPE) when working in high-risk areas in wind turbines see the Personal Protective Equipment Sheets in Techdoc (DMS 0001-0410).

9.4.1 Eye Protection

Eye protection is always required when the risk of eye injury is possible due to flying particles, work involving dust, chemicals, pressurised hydraulic tools etc.

Eye protection is required at all times except while riding in work vehicle or while in admin buildings/offices.

Side shields are only required for high risk operations e.g. welding, cutting and grinding or if another risk is identified.

NOTE The lenses must be clear and free from scratches that may obscure vision safety glasses must be fitted correctly to prevent them falling off.

If prescription lenses are required these should be either integrated into the safety glasses lens (non-shattering) or appropriate cover over eye protection for normal prescription glasses must be worn to eliminate the eyes being exposed to the risk of glass lenses shattering.

		
Clear lens	Smoked lens	Amber lens
		
Over-the-Glasses Safety Glasses		Googles
		
	Fitted helmet visors	Wrap around safety glasses

Figure 9-2: Examples of suitable eye protection

9.4.2 Ear Protection

All personnel must wear appropriate ear protection when working with or around equipment with noise levels at or above 85 dB (A), unless local legislation is more restrictive. A risk assessment/job safety analysis must be carried out to identify to ensure compliance with the relevant exposure limits to the noise.

9.4.3 Respirator Protection

All personnel must wear approved respirators or filter masks when working in an environment or work area with dust, mist, fumes, gases or other atmospheric impurities that can be harmful to a worker's health.

When working with respiratory protection it is important to select the respiratory solution suitable for the task. There are several options for respiration system and filtration.





			
Self-breathable respirator for aerosol and particulate protection	Self-breathable respirator with replaceable filters for vapour and gas protection. Shown with A1 filter	Powered respirator with replaceable filter units	Air supplied respirator connected via regulator to an external breathable quality compressed air supply (dual mode model including filters shown)
Note Appropriate respirator and filters/cartridges must be chosen for the chemical, the task and the environmental conditions in question. Always follow the manufacturer's guideline and regulatory requirements.			

Table 9-5: Examples of respiratory equipment. Source www.3mdenmark.dk

Self-breathable

The air is inhaled using your lungs and the filters in the mask itself are replaceable. If working with a self-breathable filter mask for several hours daily either a battery driven mask or a fresh air supplied mask should be considered. It is important to be aware of facial hair that may hinder the mask from having a close fit to the skin and thereby proper protection.

Battery driven

The air is sucked through the filters using a battery driven ventilator which is connected to a head mask.

Fresh air supplied

The air is supplied to a face mask via a compressor that is specifically designed for providing high quality fresh and clean air. Air supplied filter masks are used in situations where there may be lack of oxygen (i.e. confined spaces), where appropriate filters are not available or where the harmful concentration is too high for filter masks.

Filters

Choosing the correct filter is important to protect correctly against the hazard. Refer to the user manual to find guidance on the durability of the filter.

Filters must be stored in a closed container.

Each filter protects from different hazards and different filter combinations can be applied:

Particle filters: Protects against solid and aerosol particles i.e. smoke, dust fibers, aerosols, microorganisms i.e. bacteria and virus. P1 is the least effective and P3 is the most effective. The air resistance grows as filter is used.		
P1 (FFP1), P2 (FFP2), P3 (FFP3) (White)		Solid and aerosol particles

Table 9-6: Particle filters

Gas/Vapor filters: Protects against vapors and gasses but not particles. Class 1 is the smallest type and class 3 is the largest type. The duration depends on use and concentration of the contaminant.		
A (Brown)		Vapors and gasses of organic compounds with a boiling point above 65°C.
AX (Brown)		Vapors and gasses of organic compounds with a boiling point below 65°C.
B (Grey)		Inorganic vapors and gasses e.g. chlorine, hydrogen, sulphide.
E (Yellow)		Sulphur dioxide, hydrogen chloride




K (Green)		Ammonia and amines
Hg (Red)		Mercury vapor
NO (Blue)		Nitrous gasses including nitrogen monoxide
Note: EU EN 141 colour code and labelling are reflected here, other colours and labels may be applied in other regions i.e. NIOSH marking in US.		

Table 9-7: Gas/vapor filters

9.4.4 Hand Protection

The most effective and reliable way to prevent skin problems is to design and operate processes to avoid contact with harmful substances.

Take all reasonably practicable steps to achieve this before resorting to the use of protective gloves.

Protective gloves tend to be less effective than other control measures but if avoiding contact is impractical or is not enough to protect employees then gloves may be needed. When you select protective gloves, base your choice on the work, the wearer and the environment they work in.

Consider the following factors:

- Identify the substances handled
- Identify all other hazards including vibration
- Consider the type and duration of contact/exposure
- Consider the user - size and comfort
- Consider the task.

NOTE Gloves differ in design, material and thickness. No glove material will protect against all substances and no gloves will protect against a specific substance or wear indefinitely.

NOTE **Water/"wet work"**

Prolonged or frequent contact with water, particularly in combination with soaps and detergents, can cause dermatitis. "Wet work" is the term used to describe tasks in the workplace that can cause this.

To protect the hands from “wet work” choose a glove that meets the relevant local standards and guidance e.g. European Standard EN374-2. Identifies that the gloves are waterproof.

All personnel must always wear suitable gloves in the following situations:

- When hands will be exposed to rough or uneven surfaces
- Where gloves will improve the grip and reduce vibration
- When the risk exists of handling chemicals
- When carrying out manual handling activities

Size and Comfort

Consider the user - size and comfort. Gloves should fit the wearer. Tight gloves can make hands feel tired and lose their grip. Too large gloves can create folds; these can impair work and be uncomfortable. Use sizing charts to identify the correct fit.

Size	Women's	Men's
5	X-Small	
6	Small	
7	Medium	Small
8	Large	Medium
9	X-Large	Large
10		X-Large
11		XX-Large

Table 9-8: Women's and men's glove size

Here are the dimensions in inches (in) and centimetres (cm). For perimeter measure around the widest part of your hand EXCLUDING the thumb. Length is index finger to end of palm.

Size	6	7	8	9	10	11
Length (in/cm)	6.3 / 16	6.7 / 17	7.2 / 18	7.6 / 19	8 / 20	8.5 / 21
Perimeter (in/cm)	6 / 15	7 / 18	8 / 20	9 / 23	10 / 25	11 / 28

Table 9-9: Length and perimeter of gloves sizes

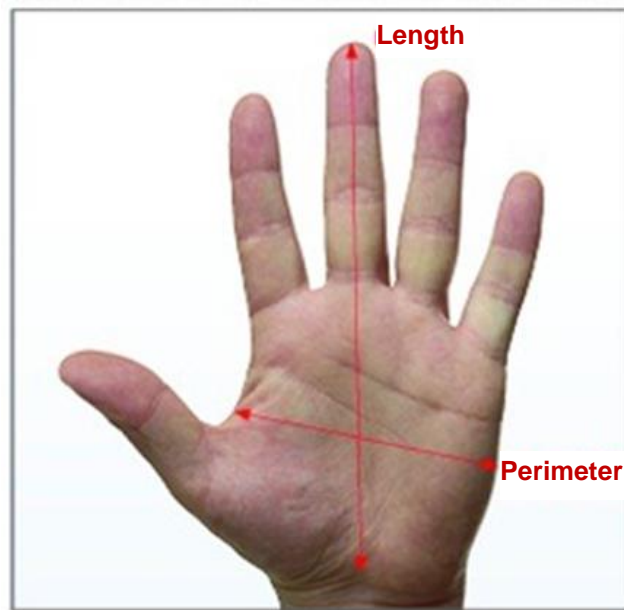


Figure 9-3: Considerations to size and comfort of hand protection

Hands can sweat inside gloves making them uncomfortable to wear. In these circumstances allow staff to take glove breaks, removing gloves for a minute or so before hands get too hot and sweaty, can help air the hands. Also consider supplying separate cotton gloves to wear under protective gloves. These can increase comfort by absorbing sweat.

Gloves should not hamper the task. If wet/oily objects are handled, choose gloves with a roughened/textured surface for good grip. Select gloves that balance protection with dexterity. Ensure the gloves selected meet any standards required for the task, e.g. mechanical, chemical, heat hazards. Consider whether colour is important, e.g. to show up contamination.

Open bladed knives (Stanley knives) are not permitted for use

- Alternative tools as described below are to be used.
- Extra-ordinary tasks that cannot be performed with alternative tools/safety knives, shall be risk assessed and approved by the site/construction manager or authorized supervisor.
- Cut resistant gloves minimum level 3 are to be used for all tasks where there is a risk of injury to the hands. This includes all manual handling, performing mechanical works and any task that could pose a threat from sharp edges or blades.
- When planning a task identify the correct gloves to be used and worn for the task.

Below is a guide (European) on how to identify the correct gloves for a specific task:

Test	Level 1	Level 2	Level 3	Level 4	Level 5
Abrasion Resistance (# of cycles)	100	500	2000	8000	-
Blade Cut Resistance (Index)	1,2	2,5	5,0	10,0	20,0
Tear Resistance (Newton)	10	25	50	75	-
Puncture Resistance (Newton)	20	60	100	150	-
Blade Cut Resistance Score	See below				
Impact Protection	See below				

Mechanical Hazard Pictogram

The rating below the pictogram refers to the glove's protection with respect to: Abrasion (1-4), Cut (1-5), Tear (1-4) and Puncture (1-4), Cut (TDM-100 Test) (A-F) and Impact Protection (P=Passed, F= Failed, X=not tested).

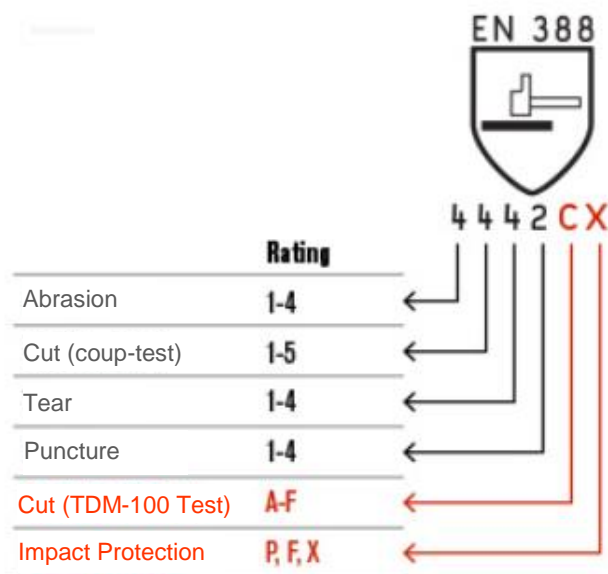


Figure 9-4: Guide for identifying the correct glove for the specific task.



Figure 9-5: Cut protection level

Please look at below examples of alternative tools to use.

Examples of substitutes to use instead of Stanley knives (open blades knives)












	For cutting cardboard boxes, nylon strip, foil		Stripping of large cables
	For cutting Securing tape, heat shrinkable tubing.		For cutting strips
	For shortening of large cables		For stripping cables
	For unpacking/cutting metal bands		Storage for used cutting blades
	For shortening of black pipe		Wurth Safety Knives
			Fish Tail

Figure 9-6: Substitutes to use instead of Stanley knives

9.4.5 Clothing

All personnel must wear appropriate clothing when working on site or when in wind turbines. Appropriate clothing can protect personnel from the weather, burns, splinters, scratches, abrasions, light bruises and it is a first line barrier to contamination exposure.

All personnel must wear the appropriate clothing for the actual task/work to be performed and weather conditions/environment.

NOTE All personnel must wear non-melting long trousers/pants and shirts with long sleeves for hot work or electrical work.

When working at height, ensure that the clothing is well fitted to prevent a snag or entanglement hazard.

The actual weather and wind conditions can be different from those on the ground. For example, winds are typically stronger at a height of 60–70 metres than at ground level. The wind chill factor must be assessed to identify the appropriate clothing for the task and weather conditions

Every effort must be made to keep the body dry. Wear appropriate wet weather clothing. If the body becomes wet, the body temperature drops 25 times faster than dry skin that is in contact with surrounding air. If there is a risk of getting wet at any job site, personnel are encouraged to have a change of dry clothes available

9.4.6 Safety Helmet

An appropriate safety helmet must be worn at all times by Vestas employees, contractors/subcontractors and visitors when working out on site or in a turbine.

NOTE A safety helmet protects the head from strikes and objects that are dropped from height, (for example from a tower nacelle or lifting operation). The safety helmet can also prevent head injuries if a person bumps into sharp edges or hard components while working on a wind turbine and in the nacelle.

NOTE All personnel must wear a properly fitted climbing helmet with a chinstrap securely fastened when ascending or descending a wind turbine or when working at height if there is a risk of a fall.

Selection of a Suitable Safety Helmet

Safety helmets come in a variety of designs and it is important that the right type is provided for the work to be carried out. A properly fitting safety helmet should

have the right shell size for the wearer and an easily adjustable headband, nape and chin strap.

The helmet must be selected for the hazards identified. Vented helmets have limited performance when working with High voltage. When working at height the chin strap designed to limit risk of losing helmet during a fall.

Safety helmets can be equipped with additional accessories, such as a head torch, hearing protection or a face shield.

Manufacturer's advice should be sought to identify the appropriate helmet for the work activity.

**VERTEX® ST**

Comfortable helmet for industry. Ideal for construction sites and groundwork.

5-point chin harness to ensure helmet is secure. No peak enabling constant looking up if required

**VERTEX® BEST**

Comfortable helmet for work at height and rescue. Ideal for climbing, work at height and rescue. 5-point chin harness providing additional buckle resistance to prevent the helmet coming off in a fall or rescue situation.



Construction/ manufacturing helmet.
For ground work.

Single chin strap to be worn when there is a danger of the helmet coming off. Long peak makes it difficult for work which requires constant looking up.

**VERTEX® VENT**

Comfortable ventilated helmet for work at height and rescue. Chin strap designed to limit risk of losing helmet during a fall (strength greater than 50 daN).

Although suitable for working at height this helmet is not suitable for working when there is a risk of dropped items or where electrical insulation is required

Figure 9-7: Examples of suitable safety helmets

Maintenance

Safety helmets must be maintained in good condition. They should:

- Be stored in a safe place, e.g. on a peg or in a cupboard.
- Not be stored in direct sunlight or in excessively hot, humid conditions because long-term exposure can weaken/degrade the shell.
- Be checked regularly for signs of damage or deterioration.
- Have defective parts replaced (if the model allows this). Parts from one manufacturer cannot normally be interchanged with those from another.
- Have the sweatband cleaned regularly or replaced.

Damage

Damage to the shell of a helmet can occur when:

- Objects fall onto it.
- It strikes against a fixed object.
- It is dropped or thrown.
- Certain chemicals can weaken the plastic of the shell leading to rapid deterioration in shock absorption or penetration resistance.
- Chemicals which should be avoided include aggressive cleaning agents or solvent based adhesives and paints.
- Where names or other markings need to be applied using adhesives, advice should be sought from the helmet manufacturer.

Replacement

Normally, helmets should be replaced at intervals recommended by the manufacturer. They will also need replacing when the harness is damaged or if it is likely that the shock absorption or penetration resistance has deteriorated; for example, when the shell has received a severe impact, or if deep scratches occur (i.e. to a depth greater than 25% of the shell thickness) or if the shell has any visible cracks.

Some do's and don'ts for safety helmets

Do

- Wear the helmet correctly as per manufacturer's instructions.
- When working at height the helmet must be fitted correctly and secured in place by the 5-point climbing helmet chin Harness/strap
- Wear a chin strap/harness if you have to bend forward or down, look up, work where it is windy or at all times when climbing and working at height.
- Wear the helmet so that the brim is level when the head is upright, i.e. don't wear it sloping up or down as this may significantly reduce the protection it can provide.

- Keep a spare supply of helmets for visitors on site or at the facility. These should be checked before each issue.
- Ensure that site induction stickers do not cover up any defects or the expiry date stamp.
- Keep stickers on helmets to a minimum. Only put on the site induction stickers for active sites, you work on.
- Only site induction stickers and any stickers with personal medical information can be put on the helmet.

Don't

- Don't use your helmet as a carrying bucket, it is designed to fit on your head. Keep it clean inside.
- Don't paint it or use solvents to stick labels to it, or scratch an identification mark onto it: the shell could weaken and rapidly deteriorate.
- Don't store them in heat or direct sunlight, such as in the rear window of a car. Excessive heat and sunlight can quickly weaken the plastic.
- Don't modify, cut or drill your helmet.
- From a hygienic perspective don't share your helmet with anyone else.

9.4.7 Safety Boots

Safety boots with ankle support are mandatory and must always be worn by all personnel, including but not limited to the following:

- Service technicians
- Employees on construction sites
- Truck drivers
- Crane drivers
- Visitors

NOTE

Safety boots may have many shapes and styles. They must be worn to protect feet from injuries like ankle sprains and lower limb injuries for example caused by dropped objects, exposure to rough terrain, penetration of the sole by sharp objects and the discomfort caused when climbing or standing on steelwork or a ladder rung for prolonged time periods. Safety boots must be water resistant and resistant to chemicals according to the SDS and be able to keep feet dry and warm.



This boot offers ankle **support**, they are for use in rough terrain areas where the ankle could easily be twisted, regularly working on ladders or different levels. They are generally lace up and should be worn correctly.

Figure 9-8: Example of a safety boot with ankle support

Damaged safety boots must not be worn; the damage should be evaluated by the Supervisor before replacement.

9.5 Personal Fall Protective Equipment (PFPE)

PFPE is hazard-specific PPE all personnel must use on any platform, scaffold or ladder where there is a risk of falling 2 metres or more (unless local legal requirements specify more stringent requirements). PFPE consists of the following devices (within this section):

- Lanyard with energy absorber
- Positioning rope
- Full-body harness
- Fall Arrester for Wire or Rail Systems

All personnel must comply with the following PFPE requirements:

- Wear PFPE when working at height.
- Be properly trained in the use of the equipment.
- Follow supplier's instruction on the use of the equipment.
- Ensure that the equipment is in a serviceable condition and always stored in a clean and dry location.
- Keep equipment out of contact with oil, chemicals, and other substances that can cause deterioration.
- Ensure that PFPE is inspected according to local legislation.

NOTE

If the equipment comes in contact with oil or any other chemical, or if the equipment becomes wet, follow the supplier's instruction to clean and make the equipment serviceable. If in doubt of the equipment's serviceability remove it from use immediately. Quarantine bag it and return to stores.

9.5.1 Lanyard with Energy Absorber

The lanyard protects the user from serious injury in the event of a fall and must always be used when working and/or climbing in places where there is a risk of falling. The lanyard has two (2) connectors/snap hooks for attaching to anchor points. In the event of a fall, the energy absorber reduces the arresting energy to an acceptable level (maximum level is 6 kN). The lanyard must always be secured to the harness with the termination connector into the A-point on the body harness (thoracic or dorsal D ring).



Figure 9-9: Attachment of lanyard hook to harness

When the lanyard is not in use, the lanyard hook must be attached to the harness in such a way that an uncontrolled arrest is avoided in case of a fall for example attached to an appropriate rest point/quick release clip.

Special attention must be made to ensure the compatibility of a lanyard and all rescue equipment components.

NOTE Lanyard and fall situation

Lanyard with an energy absorber that has been used in a fall situation and has thereby been fully loaded must be removed from use immediately, quarantined and destroyed.

When working at height in a turbine before disengaging the fall arrester from the wire or rail on the ladder, the lanyard hook must be attached to an anchor point.

NOTE

The lanyard must always be attached to an anchor point as high as possible to minimise the fall distance. See the specific wind turbine manuals for additional information on anchor points.

NOTE Anchor points

The specific wind turbine manuals and other instructions outline the certified anchor points.

Other elements/devices that are permanently secured to a structure can be used by the service technicians as anchor points. This requires that the service technician has the skills and competence to determine if the element/device is an unquestionably sound reliable anchor capable of stopping a person's fall.

When available, prioritise the use of the clearly marked inspected anchor points in the work area first before attempting to secure to other structures.

The harness must be worn and the lanyard with energy absorber must always be attached to the lift's anchor point. This is mandatory **when using service lifts**.

9.5.2 Positioning Rope



Use of positioning rope!

- ⊗ **Do not** use any positioning rope as an extension to a lanyard with an energy absorber.
 - ▶ Always use the positioning rope correctly and attach to the proper device.
-

The positioning rope is used as an extra support placed around a solid structure and attached to the full body harness waist d rings to support the body and allow the climber to use both hands.

The positioning rope can, for example, be used on the tower ladder in a working or emergency situation where it gives the user extra support and a good working position.

The positioning rope must be attached to the full-body harness with the termination connector attached to the ring on the hip support.

9.5.3 Full-Body Harness

The full-body harness is the central part of the fall arrest equipment. The harness must be Inspected, serviceable, the correct size and be well-adjusted to properly fit the person who is to wear the device.

NOTE

All personnel must follow the supplier's instruction for the use and adjustment of the full-body harness. The wearer must be competent in its use.

The best method to verify that the full-body harness is correctly adjusted to fit the user is to carry out the buddy system and get a competent colleague to check the fitting of the harness is correct.

The body harness should do the following for the user:

- Provide the body with good overall support.
- Fit properly if all adjustments on the harness are not too tight or too loose.
- Provide secure support in the hip and seat strap areas.

NOTE

A body harness that has been involved in a fall must be taken out of service quarantined and returned to stores for disposal

9.5.4 Fall Arrester for Wire or Rail Systems

Different types of fall arrest systems may be installed on ladders. All personnel must refer to the certification label on the fall arrest system in use on the specific ladder. A compatible fall arrest trolley must be attached to the wire or rail. The complete system must be compatible and inspected annually.

A fall arrest system must be used at all times when working at heights or exposed to the risk of falling.

9.5.5 Retractable Lanyard

Retractable lanyards may be used in accordance with the relevant manufacturer's guidance or the work instructions for the task.

The retractable lanyard must be registered as PFPE approved for one person use only and it must be in compliance with the legislative requirements of the country where used.

Personnel required to climb and work at height must have successfully completed the appropriate industry recognised training course e.g. the Global Wind Organisation working at Height and Rescue Course.

9.6 Assessing the Risk

If identified through thorough written RA or JSA (0004-6293/0051-7108) by the local site management that Personal Protective Equipment constitutes a greater burden to safety, they may be removed for a limited period specified and communicated by the management team during a toolbox talk.

Some examples of this are when a task requires the helmet to be removed, using safety glasses and heavy rain or artificial light obscures vision or glasses steam up, or when using a tag line to control the load and the ground is wet and muddy, suitable waterproof boots could be worn instead of safety boots.

In all cases every effort must be made to engineer the situation out using different tools.

This agreed local decision must be recorded on file and reviewed at regular intervals throughout the working day.

NOTE Any deviation from the PPE requirements above must be documented in a RA or JSA.

Under no circumstances can a person be exposed to a significant risk by the removal of any previously identified PPE.

9.7 Local Requirements

Refer to the BU local requirements for additional information on PPE (if available).

10 Work at Heights

The purpose of this chapter is to define fall protection requirements for personnel exposed to potential fall hazards. Every effort should be made to avoid working at heights and the exposure to a fall risk whenever possible.

This section provides information on emergency descent equipment, using the full-body harness and ladder fall arrest system. Work must be performed in teams of at least two technicians.

10.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
JSA	Job Safety Analysis
PFPE	Personal fall protective equipment
PPE	Personal protective equipment
RA	Risk Assessment

Table 10-1: Abbreviations

Term	Explanation
Man basket	A liftable work platform used to provide temporary access for people or equipment to inaccessible areas, usually at height. Approved for the purpose and or certified as per local legislation.
Personal fall protective equipment	PPE all personnel must use on any platform, scaffold or ladder where there is a risk of falling from a height of 2 metres or more.
Personal protective equipment	Appropriate and approved personal protective equipment, e.g., eye protection, hearing protection, full-body harness, etc., that is used to minimise the anticipated hazards of a workplace.
Personal Fall Arrest System (PFAS).	A system that arrests/stops a fall before the worker contacts a lower level. Consists of a body harness, anchorage, connector and lanyard, may also include a Personal fall arrester, lifeline, or a suitable combination.
Rescue Transfer Unit (RTU)	A pulley system used to efficiently transfer a casualty horizontally enabling safe access to a Vertical emergency descent route.
Anchor point	A point or structure used to attach a connecting device (lanyard) for fall arrest equipment. Designated anchor points are painted yellow. Certain installations such as structural beams or permanently installed components, e.g., crane gallery supporting beams, gearbox, generator, etc., can also be used as anchor points in connection with a PPE sling.

Term	Explanation
Unserviceable	Damaged or defective

Table 10-2: Explanation of terms

10.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Ensure all personnel under Vestas supervision adhere to all requirements related to the use, care and storage of personal fall arrest and restraint equipment.
- Assess the site hazards and provide the required Personal Fall Protection System and equipment for all Vestas personnel and visitors.
- Ensure contractors/subcontractors supply required, approved personal fall restraint equipment for their personnel as required by the site hazard assessment.
- Ensure all personnel under Vestas supervision have received training from a competent person and have adequate knowledge and skills to perform their duties using the required Personal Fall Arrest System (PFAS).
- Ensure timely reporting to QSE of unserviceable personal fall arrest equipment, restraint or other PPE-related concerns.
- Conduct scheduled and random inspections of personal fall arrest systems and components to make sure all is in good condition.
- Take immediate action to repair and/or replace defective personal fall arrest systems.
- Make sure the use of personal fall arrest equipment does not endanger the user.
- Ensure that all required fields in the Job Safety Analysis Form pertaining to Fall Protection Plan are filled out daily in all worksites.
- Ensure Rescue Transfer Unit (RTU) Descent Device Inspection Records are completed annually for each Descent device in use on site.
- Assign a competent person to perform and document a candidate tower climb practical test.

Employees are responsible as follows:

- Ensure all loose items are tethered to prevent the risk of objects falling from height.
- Never work directly below someone working at height.

10.3 Emergency Descent

Emergency descent equipment must be available in the immediate vicinity of the workplace at all times while working at height. Personnel must have easy access to the descent equipment to ensure immediate evacuation.

- ▶ Refer to chapter 3.8 Emergency Descent from Nacelle for further information about requirements to emergency descent equipment.

10.4 Full-Body Harness

The following are requirements for use of the full-body harness when working at height and exposed the risk of falling:

- The full-body harness must fit each person correctly.
- The full-body harness must be worn when working at height higher than 2 metres.
- The full-body harness must be worn when a person enters the tower and needs to climb the ladder.
- The full-body harness must be worn when personnel use the tower lift.
- The full-body harness must be compatible with the climb assist system ensuring that the performance of the fall arrest system is not compromised.

NOTE

Personnel must always be attached to a reliable anchor point if the work involves a risk of falling. Attaching to anchor points ensures personal safety.

In addition to PFPE, personnel must also wear appropriate and approved PPE when performing maintenance or service on a wind turbine.

10.5 Ladder Fall Arrest System

Different fall arrest systems may be mounted on tower ladders. Personnel must refer to the site safety manual for the correct fall arrester to be used in the wind turbine tower.

The following are requirements for use of the fall arrester when working at height:

- The fall arrester must be compatible with the system on the tower ladder.
- The fall arrester must be attached to the wire or the rail systems on the ladder.
- The fall arrester must be attached directly to the recognized fall arrest on the chest D-ring on the harness. No additional links should be used.
- D-rings located at the waist may only be used for work positioning devices.

NOTE Personnel should always test their full-body harness and fall arrester before climbing the wind turbine tower.

11 Refer to chapter 8 Animals and Insects

Wind farms are generally positioned in isolated remote areas. Check and research the flora and fauna you may be exposed to. In the site-specific emergency plan and induction include details on how to avoid contact with relevant insects, mammals, reptiles and poisonous plants as well as information on how to act if confronted with this flora and fauna and the immediate first aid, medical evacuation plan and local hospital details.

11.1 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
ERP	Emergency Response Plan
PPE	Personal Protective Equipment

Table 8-1: Abbreviations

Term	Explanation
Insects	Wasps, bees, mosquito including arachnid, scorpions & spiders, etc.
Mammals	Vertebrates including birds, marsupial, kangaroos, etc.
Plants (poisonous)	Water Hemlock, Deadly Nightshade, White Snakeroot, Castor Bean Rosary Pea, Oleander are some examples
Reptiles	Snakes, lizards, frogs etc.

Table 8-2: Explanation of terms

11.2 General Guidelines

You may be confronted with insects, mammals, reptiles and poisonous plants when on site. Below are the general precautions to take.

General precautions

- Identify the hazardous flora and fauna prior to arrival on site.
- Include control measures in the emergency response plan and site-specific induction. Include pictures of animals or plants for easy recognition.
- Include the closest hospitals/medical centres for receiving emergency medical treatment in the site-specific ERP and site induction.
- Ensure hospitals have suitable treatment available to deal with bites, stings, injuries, allergic reactions, etc.
- Avoid an encounter with hazardous flora and fauna.
- Don't touch or remove plants unnecessarily.
- Have appropriate first aid trained people and resources.
- When necessary and authorized have appropriate antivenom available.
- Have as robust emergency response and evacuation plan.

11.3 Snakes, Scorpions and Spiders

Below are the precautions to take in case of a bite.

Precautions to avoid bites:

- Use the required PPE to avoid bites before entering a work area.
- Avoid leaving parts of your legs and hands exposed and unprotected.
- Adequately review stockpiling areas before handling any stockpiled items. Use e.g. a bar to check areas where there is a risk of encountering dangerous animals (gaps under stockpiles or branches, dark and wet areas, etc.). This applies especially upon starting work or at dusk, because in warm climates such animals are most active in the evenings and at night.
- If you encounter a snake, scorpion or spider, it is crucial to remain calm and not make any sudden movements. Many attacks occur because the animal feels threatened.

In the event of a bite

- Move away from the animal quickly but without making any sudden movements, as the initial bite generally contains less poison than subsequent bites.
- Try to identify the type of snake, scorpion or spider by taking a photo or remembering its colour, the shape of its head, body, etc.
- Seek immediate medical advice.
- Inform the site/construction manager or authorized supervisor as soon as possible.
- Reassure the injured person and keep them calm.
- Don't move the injured body part.
- Note down the time of the bite and how the affected part of the body looks.
- Drive the injured person to the relevant hospital or medical centre as soon as possible.

NOTE

Any snake bite, poisonous or not, must be treated as a medical emergency and the affected person must be taken to hospital without delay.

11.4 Local Requirements

Refer to the BU local requirements (if available) for additional information.

Personal Protective Equipment for additional information on PPE.

11.5 Climbing the Wind Turbine Ladder

Personnel climbing the wind turbine ladder must comply with the following:

- Climb the ladder at each person's own pace.
 - **Wire system:** Allow only one person at a time to climb the tower ladder.
 - **Rail system:** Allow only one person at a time to climb the tower ladder between platforms, provided that the platform hatches are closed.
- Actively prevent falling objects (Life Saving Rule #5). Do not carry loose parts, tools or items in hands or open pockets which may create a fall or drop hazard when climbing. When working at height caution must be taken to prevent all items including tools, parts, mobile phones, radios, cameras etc. from falling. Small tools and items must be tethered or attached via lanyard to the technician. Tethers and lanyards should be short to prevent causing an entanglement hazard. A suitable Vestas approved sealed bag of max 5 kg/10 pounds can also be used for carrying small items if securely attached to the harness.

NOTE

Personnel can carry small equipment in a closed tool bag up to a max of 5 kg/10 lbs on their back or attached to the full-body harness if it is designed for the purpose.

11.6 Working Outside the Wind Turbine

Work during extreme weather conditions (e.g. high wind speeds, lightning and thunder) is not allowed.

The turbine must be made safe when working in or on the nacelle. Always lock the rotor when working on the roof.



Figure 11-1: Working on top of the nacelle

Any person working at height of higher than 2 metres must use fall arrest equipment to prevent a fall. Fall arrest equipment includes a full-body harness, a lanyard with energy absorber, a work positioning rope, a fall arrester and connectors.

Refer to Figure 11-1, p. 97 for an example of a technician working on top of the nacelle roof.

11.6.1 Precautions When Using Tools

Technicians working outside the wind turbine must comply with the following precautions for tool use:

- Tools and parts must be fastened when working outside the wind turbine and there is a risk of dropping items.
- Caution should be taken when handing tools from one person to another.

11.7 Working Inside the Wind Turbine

Work during extreme weather conditions (e.g., high wind speeds, lightning and thunder) is not allowed.

The drive train must be locked before beginning any work inside of the wind turbine on parts capable of rotation.

First aid, descent and firefighting equipment must be available in the working area.

11.8 Anchor Points for PFPE

Anchor points for PFPE are placed in several different areas in the tower, in the nacelle and on the outside of the nacelle and the hub. Anchor points for PFPE are normally marked or painted yellow. The following are requirements for use of anchor points when working at height:

- The hook on the lanyard with energy absorber must be hooked into a reliable anchor point if there is a risk of falling.
- Only reliable anchor points must be used for the fall arrest equipment
- Anchor points are to be used for one person only. Anchoring more than one person in the same anchor point is not allowed.
- Anchor points must be checked for damage before use.
- Anchor points for fall arrest equipment must never be used as lifting points.

11.9 Local Requirements

Refer to the BU local requirements (if available) for additional information.

12 Confined Space

Most deaths in confined spaces are a result of an unknown or unforeseen hazardous atmosphere. Too often, in the event of a confined space emergency, the rescuer also becomes a victim of the hazardous conditions in the space.

VPP Before starting any work a risk assessment/job safety analysis must be performed according to **SUS-ASM-HRA Identify Hazards and Assess Risks** to identify any potential hazards due to hazardous atmosphere.

12.1 Abbreviations and Technical Terms

Abbreviations	Spelled-out form / explanation
BU	Business unit
IDLH	Immediate Danger to Life or Health
LEL	Lower Explosive Limit
PPE	Personal Protective Equipment

Table 12-1: Abbreviations

Term	Explanation
A confined space is one that is:	<ul style="list-style-type: none"> • Enclosed or partially enclosed; and • Is not intended for continuous human occupancy; and • Has limited means for entry and exit that may complicate the provision of first aid, evacuation, rescue or emergency response; and • Is large enough that a worker can enter and perform work.
Confined spaces requiring a permit to enter	<p>A confined space that has potential hazards that could result in serious injury or death. A confined that:</p> <ul style="list-style-type: none"> • Contains or could contain a hazardous atmosphere; or • Contains a material that could engulf an entrant; or • Possesses an internal configuration that could trap or asphyxiate and entrant; or • Contains any other recognized serious safety or health hazard.
Acceptable Entry Conditions	<p>To achieve acceptable entry conditions the following, at a minimum, should be met:</p> <ul style="list-style-type: none"> • Atmosphere test performed indicating acceptable results and documented on permit, if required by the Confined Space Hazard Assessment; • Space has been isolated (LOTO); • Means to summons First Responder(s)/Rescue Team is established; and • Proper training of the Entry Supervisor, Attendant and

Term	Explanation
	Entrant
Attendant	An individual stationed outside the confined space who monitors the entrants and can execute the emergency response plan in the event of an emergency
Engulfment	The surrounding and effective capture of an Entrant by a liquid or (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or exert enough force on the body to cause strangulation, constriction, or crushing. Examples: grain bins, liquid filled tanks, turbine damper tanks, etc.
Entrant	Persons who are authorized and trained of the confined space hazards and who will enter a confined space
Entrapment	Areas where walls or structures create narrow pinch points making escape difficult. Examples: blades
Entry Supervisor	An individual who is responsible to determine acceptable entry conditions and for overseeing the entry operations
Hazardous Atmosphere	A hazardous atmosphere in which an Entrant may risk death, incapacitation, the inability to self-rescue, injury, or acute illness if exposed to: <ul style="list-style-type: none"> • Flammable gas, vapour, or mist in excess of 10 percent of its LEL; • Airborne combustible dust the meets or exceeds LEL; or • Oxygen content below 19.5 percent or above 23.5 percent. • Immediately Dangerous to Life or Health (IDLH)
Immediate Danger to Life or Health	A hazardous atmosphere that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that interfere with a person's ability to escape unaided from the space. Vestas will never enter a space that is considered IDLH.
Hazard assessments	To be performed on all spaces to determine actual or potential hazards. The hazard assessments must be performed by a knowledgeable person and have the space, a summary of recognized hazards and list the hazard control procedures.
Mechanical, forced air ventilation	A process of introducing clean, respirable air into a space to maintain or create a safe atmosphere. The fresh air must come from an uncontaminated source from outside the space.
Rescue plan	A plan to safely extract and remove a technician from any part of the turbine, e.g. from the hub, blade, basement etc..

Table 12-2: Explanation of terms

12.2 Roles and Responsibilities

The below roles are part of a recommended setup to for how to handle risks related to confined space working.

The Entry Supervisor is responsible for:

- Understanding the actual and potential confined space hazards
- Ensuring acceptable entry conditions are met before approving a confined space entry
- Assessing the risks associated with a confined space entry and determine the number of emergency response personnel needed and their position for risky confined space entries

The Confined Space Attendant is responsible for:

- Preventing entry into the confined space by unauthorized personnel
- Understanding the actual or potential hazards in the confined space
- Communicating with the Entrant to ensure the safety of the Entrant
- Being on alert for signs or symptoms of a hazardous condition that may develop and order an evacuation of the Entrant
- Summoning the emergency response personnel if needed
- Not entering the confined space during an emergency

The Confined Space Entrant is responsible for:

- Understanding the actual or potential hazards in the confined space
- Using the correct PPE while in the confined space
- Alerting the Attendant if hazardous conditions develop
- Communicating with the Attendant
- Evacuating space immediately as required

NOTE The Entry Supervisor and Confined Space Attendant can be the same person.

12.3 Air Monitoring

Air monitoring should be carried out by competent and trained personnel.

Entry into a confined space with an actual or potential hazardous atmosphere should be tested with a hand held portable gas detector.

It is recommended to use minimum a three gas monitor to check for:

- Oxygen (O₂)

- Carbon Monoxide (CO)
- Lower Explosive Limits (LEL)

Ensure you are compliant with local confined space program.

12.4 Rescue Plans

Entry into a confined space that requires a permit should be accompanied by a rescue plan.

Rescue plans must include a reasonable response time for first aid provider to arrive at the scene.

If a hazardous condition occurs in the confined space when working in the space all entrants must immediately evacuate until the source of the hazardous condition is determined and corrected.

Each business unit should develop a confined space hazard assessment for each confined space in the business unit.

12.4.1 Rescue Practice

Rescues from confined spaces should be practiced in emergency response drills and documented for all persons engaging in confined space entries. Rescue practices should be from an actual space or one that closely resembles the conditions for which the rescue may take place.

It is recommended to use a rescue manikin. It is not acceptable to practice rescuing people from the nacelle and lowering to the ground unless this is coordinated by rescue professionals and performed with backup lifelines.

12.5 Local Requirements

Refer to BU local requirements (if available) for additional information.

13 Control of Hazardous Energy

This chapter holds a direct reference to the [Vestas Standard of Control of Hazardous Energy](#). The Standard can be found in [DMS 0017-5309](#) and is classified PUBLIC, thus it can be given to contractors/subcontractors and customers for reference and compliance.

The content of this chapter is only a concentrated extract of the Standard and anyone working under the scope of this chapter must be familiar with the Standard and must have the required competencies and training described in the Standard.

Vestas Standard for Control of Hazardous Energy specifies the minimum requirements for controlling hazardous energy. Hazardous energy is defined as any energy (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational force...) that could cause injuries to personnel.

The standard is not intended to cover normal use of electrical touch proof equipment such as computers, printers, vacuum cleaners or similar equipment when used in its intended environments.

13.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
LOTO	Lockout-Tagout
SDS	Safety Data Sheet
PPE	Personal protective equipment

Table 13-1: Abbreviations

Term	Explanation
Energised	The state of being connected to an energy source or containing residual or stored energy.
Energy-Isolating Device	A mechanical device that physically prevents the transmission or release of energy. These include manually operated circuit breakers, disconnect switches, blind flanges, blocks valves, chains, and similar devices used to block or isolate energy.
Lockout	The process of isolating all sources of energy, dissipating stored energy, verifying that the isolations have de-energized the equipment and locking the isolation devices.
Tagout	The placement of only a tag on an Energy-Isolating Device, where it is not physically possible to place a lock. Restrictions apply.

Table 13-2: Explanation of terms

13.2 Roles and Responsibilities

All personnel working under the scope of this chapter must be trained accordingly within one of the three categories:

- Energy Control Coordinator
- Lockout Specialist (LOTO Level 3)
- Person in Charge of the Lockout (LOTO Level 2)

Or be instructed as Basic Lockout User (LOTO Level 1)

13.3 Energized Work

Working on energised equipment is not permitted.

Exemptions and requirements are further described in the Standard clause 6.

13.4 Lockout Program

NOTE No person must operate any energy isolating device to which a lock or “DO NOT OPERATE” tag is attached or remove another person’s lock or tag without authorization.

13.5 Basic Lockout Rules

Lockout is the process of isolating all sources of energy, releasing stored energy, verifying that the isolations have de-energized the equipment and locking the isolation devices.

All personnel working on the equipment must be personally locked out. Only persons working under the lockout are allowed to apply a personal lock!

It is not allowed to rely on communications only (verbal, visual, written or radio) to perform a lockout.

13.6 Energy Isolation

Hazardous energy must be isolated at a lockout isolation point consisting of a positive lockout device such as disconnect switches, circuit breakers, block valves, and blocking pins, and must follow the requirements of the Standards clause 7.3.1

Lockout boundaries must be determined, de-energized and verified according to the Standards clause 7.3.2

Any accumulated or stored energy must be isolated or dissipated according to the Standards clause 7.3.3

13.7 Verification of De-energization

Verification of de-energization must be done at each isolation point and at the point of work.

For rotating equipment, it must be verified that it will not start on command.

The method of verification must be established in the lockout instruction.

13.8 Lockout Equipment

All locks used for lockout purpose must be keyed differently and must not be used for any other purpose.

Keys for personal locks must remain in the possession of the user for the whole duration of the lockout.

Keys for the control lock / locks must remain in the possession of the Person in Charge of the Lockout for the whole duration of the lockout.

Locks must be identified with a tag according to the Standards clause 7.6.5

13.9 Lockout Methods

The lockout method must be one of the established methods:

- Individual control
- Single point lockout
- Complex lockout (Optional solution)
- Lockbox lockout (Preferred option)

And follow the requirement of the Standards clause 7.7

Where required; a lockout Instruction must be made, reviewed and approved for use as stipulated in the Standards clause 7.7.

Tagout is only permitted as a substitute for a lockout if there is no physical means of attaching a lock and must follow the Standards clause 7.8

13.10 Absent Persons Lock Removal

Absent persons locks can only be removed following the requirements of the Standards clause 7.12, documented and recorded in the form found in DMS 0046-3424.

13.11 Radiation

Aerials (mobile phone antenna) and radar systems (**InteliLight**) must be isolated/turned off to prevent exposure to radiation or moving parts before entering the WTG.

13.12 Local Requirements

Refer to the BU local requirements (if available) for additional information.

14 Electrical Safety

Electricity can kill. Even non-fatal shocks can cause serious and permanent injury to personnel. Safety precautions must always be followed any time technicians are working on an electrical circuit and/or system.

This chapter holds a direct reference to the [Vestas Standard of Electrical Safety. The Standard can be found in DMS 0017-5311](#) and is classified PUBLIC, thus it can be given to contractors/subcontractors and customers for reference and compliance.

The content of this chapter is only a concentrated extract of the Standard and anyone working under the scope of this chapter must be familiar with the Standard and must have the required competencies and training described in the Standard.

Vestas Standard for Electrical Safety specifies the minimum requirements for controlling electrical hazards.

An electrical hazard is a dangerous condition such that contact with or proximity to energized circuit parts, or equipment failure can result in electric shock, arc flash burn, or arc blast.

The Electrical Safety Standard does not replace the need to conduct hazard identification and risk assessment/job safety analysis prior to beginning work.

The standard is not intended to cover normal use of electrical touch proof equipment such as computers, printers, vacuum cleaners or similar equipment when used in its intended environments.

14.1 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
HV	High voltage
LOTO	Lockout-Tagout
PPE	Personal protective equipment
RA	Risk analysis
RCD	Residual current device
SWI	Service work instruction

Table 14-1: Abbreviations

Term	Explanation
Earthing	Normally a reference point in an electrical circuit for which other voltages are measured. It can also be a common return path for electric current or a direct physical connection to the earth (thus, the term 'earthing' or 'grounding' in the US).

Term	Explanation
Electrically Safe Work Condition	A state in which an electrical conductor or circuit part has been disconnected from energised parts, its stored energy has been dissipated, its isolations have been locked/tagged in accordance with the Control of Hazardous Energy Program, it has been tested to ensure the absence of voltage, and grounded if determined necessary.
Energised	Electrically connected to, or is, a source of voltage.
High voltage	An elevated voltage level in electrical circuits and/or systems that requires technicians to follow safety procedures and use insulated gloves, clothes, and tools during maintenance. High voltage is anything over 1000 VAC or 1500 VDC. The US defines high voltage as anything over 600 V.
Lockout	The process of isolating all sources of energy, dissipating stored energy, verifying that the isolations have de-energized the equipment and locking the isolation devices.
Tagout	The placement of only a tag on an Energy-Isolating Device, where it is not physically possible to place a lock. Restrictions apply.
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Residual current device & Ground-Fault Circuit Interrupter	A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established for a Class A device. Class A ground-fault circuit-interrupters trip when the current to ground is 6 mA or higher and do not trip when the current to ground is less than 4 mA. This is similar to a Residual Current Device (RCD), which has a trip current of 10-100 mA.

Table 14-2: Explanation of terms.

14.2 Roles and Responsibilities

All personnel working under the scope of this chapter must be trained accordingly within one of the three categories:

- Ordinary Electrical Person
- Qualified Electrical Person - Instructed
- Qualified Electrical Person - Skilled

Training requirements are described in the Standards clause 5

Ordinary Electrical Persons will only have limited access to energised switching and have limited access inside the approach boundaries. See more specified information in the Standards clause 7

14.3 Electrical Safe Work Conditions

All electrical circuit conductors and circuit parts must be considered energised until the source(s) of energy is (are) removed and absence of energy is verified by:

- Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.
- After properly interrupting the load current, open the disconnecting device(s) for each source.
- Wherever possible, visually verify that all contact points of the disconnecting devices are fully open, or that draw-out type circuit breakers are withdrawn to the fully disconnected position.
- To mitigate for activation spring failure in circuit breakers equipped with spring activation, the spring must be released prior to opening the breaker or prior to using the breaker as isolation point.
- Where the possibility of stored electrical energy exists, this must be isolated or insulated. Where this is not possible the energy must be dissipated by earthing the phase conductors or circuit parts with an approved tool rated and designed for the purpose.
- Verify absence of voltage to verify that the circuit parts are de-energized. Following the three-point Test Method (Check-Test-Check)
- For high voltage circuits and low voltage circuits with possibility of induced voltage, apply short-circuiting earth connections rated for the fault current.

The Electrically Safe Work Condition must be verified by testing for absence of voltage by:

Test for Lockout:

- Each lockout isolation disconnect must be tested for voltage as close as possible to the disconnect.
- There can be no other components between the disconnect and the test point that might be temporarily opening the circuit. This includes fuses, contactors, thermal overloads and other disconnects.
- Non-Contact Voltage Portals are allowed, if an instruction of use is provided with the test point.

Test-Before-Touch:

- A Qualified Electrical Person must verify absence of voltage immediately after opening the electrical enclosure for the equipment to be worked upon.
- Test every conductor to be touched.
- Test at every location where conductors are going to be touched.
- When job continuity is broken, perform Test-Before-Touch before resuming work.

The voltage tests must follow the three-point test method:

- The voltage detector must be functionally checked before testing by using a known energised circuit.
- The absence of voltage must be tested in the order:
 - Test voltage on each phase, phase-to-earth
 - Test voltage on each phase, phase-to-phase
 - Test voltage from neutral to earth for single phase circuits
- The voltage detector must be functionally checked after testing by using a known energised circuit

14.4 Work on Energised Electrical Equipment

Any task that requires activities that will place the employee within the Restricted Approach Boundary of exposed energised parts is defined as work on energised electrical equipment. This includes any task for the purposes of Diagnostics or Repair. (See the Standards clause 7.2.2)

- Diagnostics work may be performed following the requirements for entering the Shock approach boundary
- Testing for absence of voltage may be performed following the requirements for entering the Shock approach boundary
- Repair work on energised electrical equipment will require an Energised Electrical Work Permit (see the Standards clause 7.4)

NOTE All repair work without an Energised Electrical Work Permit, must be done in an Electrically Safe Work Condition

14.5 Energised Visual Inspection

Visual inspection of normally-enclosed, exposed energised high-voltage equipment is prohibited.

Low voltage energised electrical equipment may be visually inspected without placing it in an Electrically Safe Work Condition under the conditions of the Standards clause 7.5

14.6 Lockout-Tagout (LOTO)

Electrically Safe Work Conditions includes applying the principles from the Vestas Standard “Control of Hazardous Energy” and the chapter 11 of this Manual.

14.7 General Working Conditions

Electrical work in areas with exposed electrical circuits must be adequately illuminated.

Electrical work in areas with exposed electrical circuits must never be done by blindly reaching into the cabinet or enclosure

Electrical work in areas with exposed electrical circuits must be considered with a body positioning that will prevent slipping, tripping or falling into energised equipment.

All cabinets and enclosures are to be securely closed and fastened after maintenance or inspections before re-energisation to reduce the chances of an arc flash.

14.8 Precautions for High-Voltage Work

NOTE This manual defines high voltage as anything over 1000 VAC or 1500 VDC. The US and Japan defines high voltage as anything over 600 VAC.

All high voltage work must be supervised by a High Voltage Operator designated as Person in Charge.

The High Voltage Operator is a Qualified Electrical Person with specific training in the job and experience in high-voltage.

All high voltage electrical enclosures with hinged doors or panels must be kept locked closed. This lock is not a lockout lock, but an access lock where the key is controlled either by the Energy Control Coordinator or the Grid Operator.

Access to a high voltage enclosure requires that the enclosure must be placed in an Electrically Safe Work Condition by a High Voltage Operator. Placement of short-circuiting earthing connections is required.

All work requiring access to a high voltage enclosure must require a high voltage work permit approved by the Energy Control Coordinator.

Normal operation of a high voltage switch does not in itself require the use of the high voltage work permit.

For further requirements on High Voltage Work see the Standards clause 8

14.9 Arc Flash Hazards and Protection

Arc flash hazards are present in Vestas factories and wind turbines. An arc flash event presents a dangerous, potentially fatal or life-altering hazard to the employee.

- An arc flash is most often initiated by human interaction with electrical equipment.

- Non-melting clothing must be worn by all personnel performing electrical work.
- Clothes must be worn with long legs and long sleeves.
- The requirement for non-melting clothing applies even when the equipment is locked out

14.10 Personal Protective Equipment

Service technicians must use approved PPE for electrical work. This includes voltage rated rubber insulating gloves, non-melting clothing and non-melting safety boots that cover the feet fully and safety glasses.

The suggested minimum arc rating for the faceshield is an Arc Threshold Performance Value (ATPV) of 8 cal/cm² per ASTM F2175.

The incident energy level should be visible on the front panel of the equipment.

Hearing protection (ear canal inserts) must be worn anytime an arc rated faceshield is used

Prohibited Articles: Conductive articles of jewellery, such as watch bands, bracelets, rings, necklaces, metal-framed glasses, PDA's, cell phones, pagers, fall-protection harnesses and oversized belt buckles must be removed from the employee's body whenever entering the Limited Approach Boundary

14.11 Tool Usage

Only approved insulated tools should be used that are strong enough to resist physical damage.

- When working within the Limited Approach Boundary of exposed energised conductors or electrical parts, employees must only use voltage-rated hand tools.
- Tools must be inspected frequently and removed from use if damaged and tagged with "Out of Service"
- Electrical portable power tools must be supplied through a ground-fault circuit interrupter (GFCI). If the socket is not GFCI-protected, then a portable GFCI must be used. If using an extension cord, the portable GFCI should be at the socket.
- A residual current device (RCD) rated for personal protection is also acceptable.
- Only insulating portable ladders must be used in electrical rooms or to perform electrical work

14.12 Local Requirements

Refer to the BU local requirements (if available) for additional information.

15 Working with Chemicals

The purpose of this chapter is to prevent harm to humans or environment and to meet or exceed legal requirements.

15.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
PPE	Personal protective equipment
SDS	Safety Data Sheet
SWI	Service work instruction
WKI	Work instruction
VPP	Vestas Process Portal











Table 15-1: Abbreviations

Term	Explanation
Chemical	Hazardous substances or mixtures (correct term) in the form of a liquid, solid or gas made of chemical element (consisting of one type of atom) or its compounds - E.g. Oil, lubricant, Paint, Cleaning agent, Solvent, Gas, Foam, glue or sealant, petrol etc. See section 2 and 3 in the SDS.

Table 15-2: Explanation of terms

15.2 International Pictograms

Below symbols are international pictograms developed by United Nations and implemented through the Global Harmonization System (GHS). The pictograms are used on safety data sheets and labels to indicate the type of hazard associated with the chemical.

GHS – Hazard Pictograms and correlated exemplary Hazard Classes					
Physical Hazards					
					
Explosives	Flammable Liquids	Oxidizing Liquids	Compressed Gases	Corrosive to Metals	
Health Hazards				Env. Hazards	
					
Acute Toxicity	Skin Corrosion	Skin Irritation	CMR ¹⁾ , STOT ²⁾ , Aspiration Hazard	Hazardous to the Aquatic Environment	

1) Carcinogenic, germ cell mutagenic, toxic to reproduction / 2) specific target organ toxicity

Figure 15-1: GHS – Hazard Pictograms

15.3 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for enforcing Vestas requirements for working with chemicals (hazardous substances or mixtures) as follows:

- Only use chemicals approved to be used for Vestas operations in the country in question. This is visible in the chemical database 3EOnline.
- Ensure SDSs in local language are available and known on site.
- Ensure employees and Vestas contractors/subcontractors working with chemicals are aware of the risks associated with their use and the importance of suitable control measures including PPE.
- Provide employees with appropriate PPE.
- Ensure suitable and sufficient facilities/equipment is easily accessible where needed to follow below requirements regarding proper storage, spill treatment, disposal and personal hygiene.
- Report any problem/issues/concerns regarding chemicals to management.

VPP

Chemicals must be approved to be used for the purpose and country according to **SUS-CHM-CRP Release Chemical for Purchase**.

15.4 Personal Protective Equipment

When handling or working with or near chemicals, suitable PPE must be worn to avoid inhalation of mist or vapour, skin contact or with eyes.

VPP Before starting any work a risk assessment must be performed according to **SUS-ASM-HRA Identify Hazards and Assess Risks**.

Always refer to the SDS and the specific work instruction to ensure that the appropriate PPE is used.

Typical Vestas PPE includes:

- Suitable work clothing for protection against skin contact.
- Gloves for protection against skin contact.
- Protective goggles or face shield for protection against contact with eyes.
- Respiratory protection for protection against inhalation.

► For further details on usage of PPE see chapter 8 Animals and Insects

Wind farms are generally positioned in isolated remote areas. Check and research the flora and fauna you may be exposed to. In the site-specific emergency plan and induction include details on how to avoid contact with relevant insects, mammals, reptiles and poisonous plants as well as information on how to act if confronted with this flora and fauna and the immediate first aid, medical evacuation plan and local hospital details.

15.5 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
ERP	Emergency Response Plan
PPE	Personal Protective Equipment

Table 8-1: Abbreviations

Term	Explanation
Insects	Wasps, bees, mosquito including arachnid, scorpions & spiders, etc.
Mammals	Vertebrates including birds, marsupial, kangaroos, etc.
Plants (poisonous)	Water Hemlock, Deadly Nightshade, White Snakeroot, Castor Bean Rosary Pea, Oleander are some examples
Reptiles	Snakes, lizards, frogs etc.

Table 8-2: Explanation of terms

15.6 General Guidelines

You may be confronted with insects, mammals, reptiles and poisonous plants when on site. Below are the general precautions to take.

General precautions

- Identify the hazardous flora and fauna prior to arrival on site.
- Include control measures in the emergency response plan and site-specific induction. Include pictures of animals or plants for easy recognition.
- Include the closest hospitals/medical centres for receiving emergency medical treatment in the site-specific ERP and site induction.
- Ensure hospitals have suitable treatment available to deal with bites, stings, injuries, allergic reactions, etc.
- Avoid an encounter with hazardous flora and fauna.
- Don't touch or remove plants unnecessarily.
- Have appropriate first aid trained people and resources.
- When necessary and authorized have appropriate antivenom available.
- Have as robust emergency response and evacuation plan.

15.7 Snakes, Scorpions and Spiders

Below are the precautions to take in case of a bite.

Precautions to avoid bites:

- Use the required PPE to avoid bites before entering a work area.
- Avoid leaving parts of your legs and hands exposed and unprotected.
- Adequately review stockpiling areas before handling any stockpiled items. Use e.g. a bar to check areas where there is a risk of encountering dangerous animals (gaps under stockpiles or branches, dark and wet areas, etc.). This applies especially upon starting work or at dusk, because in warm climates such animals are most active in the evenings and at night.
- If you encounter a snake, scorpion or spider, it is crucial to remain calm and not make any sudden movements. Many attacks occur because the animal feels threatened.

In the event of a bite

- Move away from the animal quickly but without making any sudden movements, as the initial bite generally contains less poison than subsequent bites.
- Try to identify the type of snake, scorpion or spider by taking a photo or remembering its colour, the shape of its head, body, etc.
- Seek immediate medical advice.
- Inform the site/construction manager or authorized supervisor as soon as possible.
- Reassure the injured person and keep them calm.

- Don't move the injured body part.
- Note down the time of the bite and how the affected part of the body looks.
- Drive the injured person to the relevant hospital or medical centre as soon as possible.

NOTE Any snake bite, poisonous or not, must be treated as a medical emergency and the affected person must be taken to hospital without delay.

15.8 Local Requirements

Refer to the BU local requirements (if available) for additional information.

► Personal Protective Equipment.

15.9 Storage

Comply with the following when storing chemicals:

- Transport, store and handle any chemicals in accordance with the manufacturer's instructions (to be found in the SDS) and local legislation.
- Identify the content of every chemical container and the hazards of the chemical.
- If the chemical is poured from its original container into a new container, label the new container properly, labels can be printed from **3E Online**.
- Store chemicals with controlled access, adequate ventilation and protected from weather impact.
- Store chemicals to prevent leakage to environment (especially to water), by using spill trays or similar solution at all times (incl. fuel handling).
- Store materials so that incompatible chemicals do not present a hazard from dangerous reactions or mixtures.
- Ensure spill kits are kept at key locations on site to be able to manage spills.

15.10 Disposal

Comply with the following when disposing of chemicals and materials soiled by chemicals:

- Collect and contain any waste oil and/or chemical in a secured area prior to offsite disposal or recycling.

- Label all containers with waste according to local legal requirements.
- Size and prepare the collection area to store sufficient containers so that the offsite transport and disposal is efficient.
- Dispose of all hazardous waste in accordance with Vestas processes concerning waste handling and in accordance with local legal requirements.
- Ensure the relevant legal checks are done, which are usually required to confirm that the receiver has permits in order and can responsibly dispose of waste.
- Retain documentation as required to support legal compliance and facilitate tracking of waste amounts, treatment and disposal method.

VPP When Vestas is responsible for waste handling, waste management should be implemented according to **SUS-ENV-WST Manage Waste Streams**.

15.11 Spills

- For further details on how to handle chemical spills see chapter 3 Emergency Response Plan and Procedures

VPP An emergency response plan must be implemented on Vestas construction sites according to **SUS-IEM-EMR Plan and Check Emergency Response**.

15.12 Personal Hygiene

Comply with the following for personal hygiene practices:

- Always practice personal hygiene when working with chemicals and clean any exposed skin after completing chemical work.
- Avoid contamination of clothes and if it happens; clothes contaminated with chemicals must be changed immediately.
- Don't allow smoking, drinking or eating in areas where work with chemicals is carried out.
- Be aware of and respect exposure limits as described in SDS and legislation.

15.13 Local Requirements

Refer to BU local requirements (if available) for additional information.

16 Working with Dangerous Goods

The purpose of this chapter is to ensure that legal requirements are met when handling dangerous goods.

16.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
PPE	Personal Protective Equipment
SDS	Safety Data Sheet
VPP	Vestas Process Portal

Table 16-1: Abbreviations

Term	Explanation
Certified employees	A person qualified to manage transport of dangerous goods according to local legislation.
Dangerous goods	A hazardous substance, mixture or material which is to be transported as Dangerous Goods in accordance with the United Nations definitions for dangerous goods transport. See section 14 in the SDS.

Table 16-2: Explanation of terms

16.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for enforcing Vestas Requirements for managing dangerous goods as follows:

- Ensure only certified employees are allowed to transport and prepare shipments of dangerous goods.
- Ensure awareness of what materials are classified as dangerous goods as provided in manufacturer's information (SDS) and legislation
- Pay special attention to identify hidden dangerous goods like mounted batteries since they constitute a significant risk in case of air shipment.
- Retain documentation as required to support legal compliance and facilitate tracking shipment content and transport provider.

16.3 Transport

Comply with the following when transporting dangerous goods:

- Internal transportation of dangerous goods shall be done in compliance with legal requirements for training, labelling and documentation. Be aware that exemptions are common for transportation of dangerous goods in limited amounts and/or material needed to perform the work tasks.

Prepare and keep documentation available during transport as required to support legal compliance.

VPP All transports of dangerous goods need to be prepared and performed according to **SUS-CHM-HCH Handle Chemicals and Dangerous Goods**.

16.4 Local Requirements

Refer to BU local requirements (if available) for additional information.

17 Machine Guarding

The purpose of this chapter is to establish uniform guidelines and ensure all guards or protective devices are on machines, at the danger points such as those created by point of operation, ingoing nip points, flying chips and sparks.

17.1 Abbreviations and Technical Terms

Abbreviation	Explanation
BU	Business unit
VPP	Vestas Process Portal
WTG	Wind Turbine Generator

Table 17-1: Abbreviations

Term	Explanation
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Rotating parts	Any turbine component that rotates or has the potential or design capable of producing rotation or movement.
Sky Climber	The Sky Climber is, in principle, a basket that can be elevated up and down the tower. The basket is mechanically elevated by use of wires that are secured in the nacelle. One wire is the main wire, one is a help wire and one is a security wire. The elevating procedure is controlled from the basket.

Table 17-2: Explanation of terms

17.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Shall insure that all of the equipment and machinery operators are trained and qualified for the equipment they operate.
- Train and qualify technicians to operate new and existing WTG and facility machinery.
- Shall conduct safety inspections and determine that machinery and work conditions are compliant with requirements.
- Ensure defective machinery, is immediately removed from service, tagged out of order and quarantined.

17.3 Guidelines for Work Involving Rotating Parts

NOTE In addition to following the general requirements listed in this manual, it is important to assess any additional requirements for each specific situation when carrying out work on parts that can rotate.

The following requirements must be met prior to work on rotating parts:

- The wind turbine must be stopped.
- The brake must be applied.
- The rotor must be locked and tagged.
- Do not wear loose clothing, harness, or any items that may get entangled with the rotating parts

The following requirements must be met when carrying out work on parts that can rotate:

- Power must be switched off, locks and tags applied, and the work area verified de-energised before shields/covers can be removed.
- Shield/covers that have been removed during work must be replaced before turbine start-up.
- Work must not be carried out on the turbine when the wind speed exceeds the limit values of the mechanical design of the locking system as described in the turbine-specific 'Safety Regulations for Operators and Technicians' document.
- All personnel must stay clear of the rotating parts during tasks that require components to be rotated, for example, during rotation of the drive train when lubricating the bearings.
- Manual rotation of the components is not allowed unless the rotation can be controlled by one hand (unassisted) without the risk of entanglement or crushing.

17.4 Using the Mechanical Rotor Lock

VPP Before starting any work a risk assessment must be performed according to **SUS-ASM-HRA Identify Hazards and Assess Risks**.

The risk assessment must be signed by the site/construction manager or authorized supervisor.

Table 17-3: Service tasks that require activation of the mechanical rotor lock, shows the various service tasks that are not permitted until the turbine has been mechanically locked or a risk assessment has been carried out and safety and health measures implemented.

Component(s)	Service tasks requiring activation of the mechanical rotor lock
Hub and the blades	Entering the blade, hub, and nose cone.
Gearbox and the gear oil system	<ul style="list-style-type: none"> Disassembling and adjusting the mechanical parts. Retightening the bolts. Activating the shrink disc. Inspecting the internal components, unless it is a visual inspection.
Coupling and the brake system	<ul style="list-style-type: none"> Disassembling and adjusting the mechanical parts. Retightening the bolts. Inspecting the coupling. Lubricating the bearings.
Generator	<ul style="list-style-type: none"> Disassembling and adjusting the mechanical parts. Retightening the bolts. Working on the slip ring systems/units.
Hydraulics for pitch system and the brake system	<ul style="list-style-type: none"> Disassembling the mechanical parts. Hydraulic pumps requiring replacement.
Outside the turbine	<p>In addition to locking the rotor, the turbine must be secured against automatic yawing and pitching if work involves:</p> <ul style="list-style-type: none"> Using the external crane. Using a man basket or Sky Climber Using other lifts or scaffolds. <p>Manual yawing and pitching must be risk assessed to avoid collision.</p>
Components close to unshielded rotating parts	Replacing of the components.
Yaw system	<ul style="list-style-type: none"> Disassembling the mechanical parts. Deactivating the yaw brakes.

Table 17-3: Service tasks that require activation of the mechanical rotor lock

NOTE For V112-3.3 MW, V117-3.3 MW, V126-3.3 MW, V112-3.0 MW, V100-2.6 MW and V90-3.0 MW, it is permitted to work on the hydraulic system in the nacelle (excluding the brake system) without setting the rotor lock if all rotating parts are shielded.

17.5 Local Requirements

See the BU local requirements (if available) for additional information.

18 Tools and Equipment

The purpose of this chapter is to describe safe work practices when utilizing electrical, pneumatic and hydraulic operated hand tools as well as the inspection, use and storage of specialised equipment such as scaffolding, ladders and compressed gasses.

18.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
PPE	Personal Protective Equipment
VPP	Vestas Process Portal

Table 18-1: Abbreviations

Term	Explanation
Qualified person	A person who, by possession of a recognized education/degree holds a certificate of professional standing.
Unserviceable	Damaged or defective

Table 18-2: Explanation of terms

18.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Ensure that all individuals who operate or use machinery, tools or equipment shall have the appropriate skills, training, accreditation and/or certification according to legal requirements, manufacturer's requirements or Vestas requirements.
- Assess the tools and equipment hazards and provide required controls and PPE for all Vestas personnel and visitors.
- Ensure an annual inspection (at minimum) by a qualified person to ensure proper condition and calibration
- Report unserviceable tools and equipment.
- Take immediate action to repair and/or replace unserviceable tools and equipment.
- Appoint a designated person (function) in charge of the overall control of machinery, tools and equipment.

Employees are responsible as follows:

- Always use the correct tools for the work
- Always ensure you have been trained to use the equipment.
- Complete a pre-use check before each use.

- Use the tools according to the manufacturer's manual or instruction
- Never use unserviceable tools or equipment
- Report unserviceable equipment immediately

18.3 Maintenance

The Maintenance and Inspection programme shall include maintenance of machinery, tools and equipment where lack of maintenance or inspection can result in a health and safety risk or have a negative environmental impact.

Machinery, tools and equipment owned, borrowed, rented or leased by Vestas falls under the scope.

All Vestas sites shall be covered by a written Maintenance and Inspection Programme for machinery, tools and equipment.

The maintenance instruction shall as a minimum include:

- Maintenance/inspection interval
- Maintenance/inspection method
- Control measurements
- Required parts to replace
- Required competence for doing the maintenance/inspection

It shall be ensured that machinery, tools and equipment are marked with a unique identification number and registered for identification purposes.

For machinery, tools and equipment where periodical inspection or maintenance is required, it shall be possible for the user to identify the validation period of the inspection.

The identification shall as a minimum include:

- Serial no. or similar identification number
- Next inspection/or validation period of last inspection (date or colour code)

VPP

For further information refer to the instruction [Maintenance and Inspection of Machinery, Tools and Equipment DMS 0028-3920](#). The instruction is part of the process [QMA-QAP-HIN Handling of Inspection](#).

18.4 Tools and Other Equipment

18.4.1 Electrical, Pneumatic and Hydraulic Tools

Before operating electrical, pneumatic and hydraulic tools ensure the following:

- A risk assessment of the operation must be carried out.
- All personnel must wear appropriate PPE.

- All safe guards shall be in place before operating the tool.
- Check the immediate surroundings before operating any tool. When using power tools, the work area shall be kept free of any trip hazards or slippery conditions.
- Warn other personnel in the work area before operating any tool or / and ensure personnel are moved safely away from the area of tool operation before beginning any work.
- Personnel operating a tool must be prepared for a situation when a tool may jam and stop completely.
- Personnel must always have stable footing and good balance when operating a tool.

Employees shall not wear loose-fitting clothing or jewellery and long hair kept tied back.

NOTE Refer to the manufacturer's instructions for further details on operating the tool.

Electrical Tools

The following are requirements for electrical tool use:

- Use only earthed or double-insulated tools.
- Make a pre-use check for the following:
 - Defects
 - Loose parts
 - Altered safety devices
 - A defective power supply
 - Defective cords/wires
- **Do not use tools** if altered or defective.
- Immediately report defective tools to the responsible manager.
- Unplug or disengage tools from the power supply or depressurise, if applicable, after use.
- Store tools in a safe place protected from weather, dirt or moisture.

All portable and stationary grinders must be equipped with guards. No one is allowed to alter, disengage or remove any protective device(s) from any tools.

Pneumatic Tools

The following are requirements for pneumatic tool use:

- Shut off air hose and bleed down pressure before disconnecting the air tool(s).
- **Do not** use tools to clean oneself or clothing.

Hydraulic Tools

The following are requirements for hydraulic tool use:

- Calibrate tools as required by Vestas and supplier/manufacturer.
- Hydraulic torque wrenches must be equipped with a compatible safety handle for safer operation

18.4.2 Ladders

Ladders should only be used for temporary work. Eliminate the use of ladders whenever possible. Select the appropriate size and design for specific tasks.

Always make a pre-use check for the following:

- Split side rails.
- Missing or defective rungs.
- Any signs of wear and tear.
- Oil, grease and other substances that may cause a person to slip and fall.
- A metal spreader or locking device to hold the front and back sections open (must be mounted on all stepladders).
- Paint or alteration (wood ladders).

NOTE Identification or warning labels must only be placed on one face of one side rail on wooden ladders.

Mark any unserviceable ladder as 'defective' and remove the ladder from service and the work area immediately.

Technicians must only use a ladder that extends 1 metre (approx.3 rungs) above the work area. Technicians must never overextend body parts (especially when reaching to complete work) while working on a ladder.

18.4.3 Scaffolds

Always make a pre-use check for the following:

- Each scaffold has to meet the local legal requirements.
- Planking is secured to prevent slipping.
- Scaffolds have handrails and toe-boards.
- Handrails and toe-boards are secured.
- Scaffolds designed to move by rolling should be moved at the base, not from the top.
- After moving into place, the wheels must be locked.

Always remove all tools and equipment/materials from the scaffolding before moving the unit to a new location.

Never climb the scaffolds or the scaffold bracing. Always use a ladder for platform access.

18.4.4 Compressed Air/Gas Cylinders

Pre-use check

Always make a pre-use check for the following:

- Corrosion
- Pitting
- Dents
- Cuts
- Holes
- Bulging containers
- Arc and blowtorch burns
- Damaged or corroded valve caps
- Correct labelling/markings to identify the contents of the cylinder

NOTE Report any deviations/damage to the responsible manager immediately.

Storage

Complete the following when storing compressed gas cylinders:

- Place unit in an upright position (empty or full units).
- Secure the cylinders to prevent the units from falling or tipping over.
- Remove regulators.
- Ensure that the cylinder valve is closed tightly.
- Cap the cylinder after use and always during storage.

Moving

Complete the following when moving compressed gas cylinders:

- Place unit in an upright position (empty or full units).
- Secure the cylinders (with blocks and ties) to prevent the units from falling or tipping over during transport.
- Remove regulators.
- Cap the cylinder before transport.
- Never use slings or hooks to move cylinders.

NOTE If a crane or any hoisting device must be used to move a cylinder, use a cradle or similar approved lifting equipment.

Work involving cylinders to be installed in a wind turbine in a horizontal position (on its side) must be described in an approved work instruction.

18.4.5 Internal Hoist

A visual pre-use check of the hoist equipment must take place prior to each use. Refer to the manufacturer's instructions for hoist check criteria of before each use.

18.4.6 Lifting Bags

Vestas approved lifting bags must always be used for lifting operations.

- The proper and appropriate lifting bag for the task must be used e.g. nitrogen bottle bag.
- Only use lift bags that are rated for lifting and have the required label and ID number per local standards.
- Lifting bags must be subject to a pre-use check prior to each lifting operation.
- If local legislation requires lifting bags to be registered as lifting equipment they should be registered and subject to regular inspection by a qualified person.



VT732744



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Figure 18-1: Examples of Vestas lifting bags

18.5 Local Requirements

Refer to the BU local requirements (if available) for additional information.

19 Vehicles and Heavy Equipment

The purpose of this chapter is to establish requirements by which employees formally acknowledge and accept the responsibilities when operating a Vestas owned, leased, rented and non-owned vehicle.

To ensure that Vestas employees who operate heavy equipment have adequate knowledge to protect themselves and others from accidents and injuries.

19.1 Abbreviations and Technical Terms

Abbreviation	Spelled-out form / explanation
BU	Business unit
RA	Risk assessment

Table 19-1: Abbreviations

Term	Explanation
Crane operator	A trained and certified operator of a crane.
Danger zone	Danger zone is the area where the person may get crushed or injured in case of dropping the load or unexpected movements.
Lifting eye	A circular opening (or 'eye') for the insertion of a pin, hook, rope, etc.
Lifting accessory	Component or equipment which is not an integral part of the lifting machinery, allowing the load to be held, which is placed between the machinery and the load or on the load itself.
Load	Any item including lifting accessories which is attached directly or indirectly to the lifting machinery.
Plant	A large, heavy machine or vehicle used in industry, for building roads, etc.
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Residual Risk	The risk that remains after controls are taken into account (the net risk or risk after controls).
Rigger	A person responsible for attaching and detaching the load and for using the correct lifting equipment in accordance with the Lift Plan.
Slinger / Banksman / Spotter / Signal person	A person who directs the operation or movement of the crane using various types of communication (radio and/or hand signals) to the crane operator.
Supported load	Any load which is attached to lifting machinery and fully supported but not fixed in a permanent position.

Term	Explanation
Unserviceable	Damaged or defective

Table 19-2: Explanation of terms

19.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Maintain records certifying that employees operating heavy equipment have successfully completed relevant safety training and practical evaluation.
- Ensure employees who use heavy equipment are authorized and **qualified** to do so.
- Ensure the employees are completing the heavy equipment Inspection form.
- Ensure periodic/proper maintenance and repairs of the heavy equipment are carried out per manufacturer's instructions.
- Maintain inspection records on site in accordance with local requirements.
- Perform a facility/building risk assessment.
- Ensure the manufacturer's manual is available on vehicle/heavy equipment.
- Ensure heavy equipment can only be operated by a **qualified** person.

Employees are responsible as follows:

- Ensure you are trained to operate the heavy equipment.
- Possess a valid motor vehicle operator's license of the proper class with registration form for the vehicle they will operate.
- Immediately notify the site/construction manager or authorized supervisor whenever the license is suspended or revoked.
- Complete a pre-use check prior to use and inspections.
- Check all vehicles at the beginning of the shift to ensure that parts, equipment and accessories are in safe operating condition and free of damage which could cause failure while in use.
- Wear seat belts and require all vehicle occupants to wear them at all times when on a heavy equipment site, work site or on company business unless prevented by unique operating considerations.
- Report unserviceable or damaged vehicles as soon as is reasonably practicable.
- Unserviceable or damaged vehicles must not be used.
- Follow all local rules and regulations for vehicle use.

19.3 General Rules for Lifting Operations

Lift and handle all components in accordance with work instructions during assembly, transportation, installation, service, maintenance and disassembly activities.

Always consider environmental influences such as wind direction and velocity, terrain, snow and ice when planning lifting operations.

Comply with the following rules for lifting operations:

19.3.1 Communication

- Ensure there is a common signalling language between the crane operator and the signal person.
- Always use standardised and uniform signalling (verbal and non-verbal).
- Only one person at a time is permitted to signal (provide instructions) to the crane operator.
- All personnel involved in the lifting operation have the authority to stop the lift any time if a safety issue has been identified.
- Discuss planned lifting operations with the crane operator and the lifting team (toolbox talk).
- Set up a communication plan including specific standardised commands and signals.
- Identify and assign signalling roles.

NOTE

For more information about crane safety see the Global Crane Safety Program DMS 0049-0574.

Refer to DMS 0077-2691 for an overview of standard hand signals for crane operations.

19.3.2 Risk Assessment/Job Safety Analysis

- The lifting operation must always be documented by a RA or JSA and a work instruction taking into account the work environment.
- All personnel must be instructed in their tasks and the residual risk within the RA.
- Vestas site/construction manager or authorized supervisors are responsible for ensuring safety requirements are followed for any lifting operations.

19.3.3 Supported Loads

Working under a supported load may be permitted only after verifying that the load is fully supported using suitable materials capable of withstanding the load indefinitely.

19.3.4 Suspended Loads

Working besides a suspended load while guiding it into or out of the nacelle during changes of main components with the use of an external crane may be permitted only after verifying that the load is securely suspended using approved lifting equipment.

On multi legged sling lifts the verification should also assess the potential movement of the load should any of the individual slings or attachments break during the lift. Where possible solid or permanent steelwork should be used as a barrier between the personnel and any potential load swing (as per steelwork in the below picture). All personnel involved in the lift should be included in the job hazard analysis and a tool box talk carried out to communicate/discuss any recognized potential hazards. Working beneath any load or exposed to any potential crush hazard is strictly forbidden.



Figure 19-1: Guiding transformer into the nacelle

19.3.5 Lifting Equipment

Lifting equipment is considered suspended load. Working with lifting equipment must be carried out according to the directions in the work instruction.

19.3.6 Use of Tag Lines

Tag lines must be utilized whenever they do not pose a hazard for personnel or the load being lifted.

When a hazard is identified, an appropriate mitigation plan must be implemented and documented in the JSA outlining the safest course of action.

Exception

In wind speeds less than 5 m/s on a 10 min Ave., a tag line is recommended but optional when the load is away from the wind and not cover the stairs or other

structure in the **danger** zone. If during the course of the job, wind speeds rise above 5 m/s, the exception no longer applies, and a tag line must be used.

When not in use, a tag line shall be:

- Collected into the nacelle
- Left on the ground, or
- Candy canned around the tower (if yawing is not required)

NOTE If a tag line is to be dropped to the ground, due to the inability to collect it into the nacelle or safely return it to the ground, it may be dropped inside the **danger** zone, provided all personnel and equipment are clear of the area and wind speeds are less than 10 m/sec. Dropping of the tag line must be documented in the JSA.

19.4 Heavy Equipment

Heavy equipment is defined as forklifts, front-end loaders, telescopic lifts, and bulldozers.

Only trained and certified personnel may operate heavy equipment. Current certifications must be provided on request to Vestas and/or site/construction manager or authorized supervisor.

Audible alarms must be provided on heavy equipment when reversing.

NOTE Forklifts must never be used to lift employees unless cages or platforms (with guard rails) are installed and approved for such use

Comply with the following when using heavy equipment:

- When operating heavy equipment, always check that the direction of travel (including overhead) is clear before and while moving.
- Be aware of the danger of overturning on banks, steep slopes and deep fill edges.
- Forks must be spread as far apart as possible.
- Check the stability of the load before moving it.
- Reverse when carrying a load down grades/slopes.
- Roll over protection devices must be installed on the equipment.
- Manufacturer's seat belts when provided must be used at all times.
- Forks and shovels must be lowered as far as safely possible before moving the equipment.
- Forks and shovels must be completely lowered before leaving the equipment.

19.5 Local Requirements

Refer to the BU local requirements (if available) for additional information.

20 Contractor/Subcontractor Safety

The purpose of this chapter is to ensure alignment between Vestas and its contractors/subcontractors. Any discrepancies between the Vestas Safety requirements and that of its contractors/subcontractors shall be discussed and remedied prior to contractor/subcontractor work on site.

20.1 Abbreviations and Technical Terms

Abbreviations	Spelled-out form / explanation
BU	Business unit
HSE	Health, Safety & Environment
GWO	Global Wind Organisation
SDS	Safety Data Sheet
PPE	Personal protective equipment
VPP	Vestas Process Portal

Table 20-1: Terms and abbreviations

Term	Explanation
Contractor	A company which, through a legal contract, engages its employees to complete activities/work for Vestas.
Subcontractor	A company, hired by a contractor, having a legal contract with Vestas which engages its employees to complete activities/work for Vestas.

Table 20-2: Terms and abbreviations

20.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Supervise the work of the contractor/subcontractor to ensure Vestas requirements are adhered to.
- Ensure a site induction is provided to all contractors/subcontractors and that the process is documented.
- Ensure safety related issues brought up during safety/toolbox meetings are properly addressed.
- Initiate an incident investigation whenever contractor/subcontractor personnel are involved.
- Monitor, evaluate and document contractor/subcontractor performance during and immediately following the completion of the contract.
- Enforce Vestas disciplinary action procedure

- Ensure contractor/subcontractor:
 - has received prequalification training in accordance with GWO and Vestas technical requirements.
 - has adequate competencies to perform their duties.
 - completes required Vestas documentation.
 - maintains written plans or procedures that, at a minimum, comply with all local regulations that apply to the site/facility.
 - Exercise the ability to stop work at any time safety is being questioned and/or compromised.

Contractors are responsible for:

- Compliance with these HSE requirements and to ensure they are incorporated in subcontractor's agreements and compliance monitored (given use of subcontractors is approved by Vestas).
- All relevant legislation regarding occupational health, safety and environment is observed.
- Their employees undergo induction program before they start work.
- Their employees have received and are current with the training required for the scope of work as identified below.
- Employees are fit to carry out the work and who have medical/health check according to local legislation or other requirements.
- To report deviations from Vestas requirements as well as HSE legislation applicable to Vestas.
- They are registered, and the information is up to date in Vestas' Meercat contractor/subcontractor evaluation system.
- All employees follow safe driving practices. This includes all drivers have valid driver's license, seat belts are available and used, no use of radios hand held units/mobile phones while operating a vehicle or piece of mobile equipment, no driving under the influence of drugs/alcohol, passengers are only allowed to sit the operating cabs of vehicles and must wear a seat belt where fitted to the vehicle.
- No children or pets can leave the truck in areas where operation takes place.
- Contacting Vestas immediately if damage to Vestas' property takes place during work.

NOTE Further details on Contractor requirements can be found in DMS 0045-7770 Global Minimum Contractor HSE Requirements.

VPP Further details on disciplinary action see [INS Contractor Disciplinary Action DMS 0053-4563](#) in [SUS-SAF-CON Contractor Health & Safety Management in Site Construction](#).

20.2.1 Subcontractors

Contractors must ensure that all their subcontractors follow the same requirements as Vestas employees and are informed of the health, safety and environmental risks that can be encountered when performing the contracted work.

20.3 Local Requirements

Refer to the BU local requirements (if available) for additional information.

21 Construction Site Induction /Orientation

The purpose of this chapter is to ensure that all personnel assigned to or visiting a Vestas managed site are given a site induction/orientation to get familiar with potential hazards, emergency actions to be taken and use of emergency equipment.

The site induction presentation provides guidance and minimum requirements regarding content for Vestas construction site induction/orientation. It serves to help those responsible (e.g. site managers, site supervisors and site HSE professionals) in the process of preparing and delivering site induction/orientation.

It is essential that ALL personnel receive an appropriate site induction before they commence work on any site. The site induction/orientation communicates essential information regarding the site, the working methods and health, safety and environmental management.

Please take time to plan what will be communicated. Not all the slides in this presentation may be applicable to the project and site management will have to consider what additional site-specific information is required.

Ensure ALL attendees of the site induction sign a register to confirm their attendance, their agreement to abide by the Vestas and/or the principal contractor's policies, procedures and rules and to follow the agreed method of working.

If further guidance, additional instruction or information is required please contact your local QSE department.

NOTE The global standard site induction/orientation can be found in DMS 0051-8450. Safety flyers with the main safety rules can be found in DMS 0051-7141.

Language versions for the site induction/orientation and safety flyers can be found in VPP in the **SUS-SAF-CON Contractor Health & Safety Management in Site Construction**.

NOTE The topics covered in this basic site induction/orientation are not exhaustive. Further training may be required for any additional high-risk activity to be carried out on site. The OHS&E Manual should be referred to for any additional relevant training. Should the OHS&E manual not contain the required additional information the local QSE department must be contacted for advice.

HUB A construction **site induction/orientation safety video** can be found in the **Training Tube** in the Site Construction channel or on the **HUB** (open with explorer).

The film is used as a supplement to the site induction/orientation given by the site/construction manager or authorized supervisor or an authorized deputy on their behalf.

21.1 Abbreviations and Technical Terms

Abbreviation	Spelled out form / explanation
BU	Business unit
COSHH	Control of Substances Hazardous to Health
JSA	Job Safety Analysis
LOTO	Lockout-Tagout
PPE	Personal protective equipment
SDS	Safety Data Sheet
RA	Risk Assessment
VPP	Vestas Process Portal
WTG	Wind Turbine Generator

Table 21-1: Abbreviations.

Term	Explanation
Lockout	The process of isolating all sources of energy, dissipating stored energy, verifying that the isolations have de-energized the equipment and locking the isolation devices.
Qualified person	A person who, by possession of a recognized education/degree, holds a certificate of professional standing.
Tagout	The placement of only a tag on an Energy-Isolating Device, where it is not physically possible to place a lock. Restrictions apply.

Table 21-2: Explanation of terms

21.2 Roles and Responsibilities

The site/construction manager or authorized supervisor is responsible for the following:

- Ensure all personnel working on or visiting a Vestas site/facility receives a site-specific induction/orientation that outlines hazards, rules and expected behaviours.
- All induction/orientation training is recorded and kept on file.

21.3 Content of the Site Induction/Orientation

In addition to global health, safety, environmental policies, the global site induction/orientation cover the below topics:

21.3.1 Safety Principles and Site-Specific Information

- Vestas 5 Safety Principles video
- Site organization and organization chart
- Maps / Access to site
- Compound layout
- Site-specific information / conditions
- Sign in and sign out toolbox talk

21.3.2 Vehicles on Site

- Speed Limit – 30 km/h or 20 MpH or as specified by the customer or general contractor
- Keep a safe distance from the vehicle in front
- Banksman/spotter must be used for all heavy vehicle reversing operations. For reversing operations with other vehicles, a RA or JSA must be done to identify the need for a banksman/spotter. Stay on the road, don't take shortcuts! Use designated roads!
- No Mobile phone use whilst operating any plant or vehicle on site
- Use marked meeting spaces.
- Reverse parking only (where instructed).
- Use vehicle beacons where required by local legislation or customers.

21.3.3 Emergency / Evacuation

- Do not panic. Proceed in an ordinary manner. Leave quickly by the nearest exit.
- Help co-workers and visitors along the way.
- Once outside proceed quickly to the designated assembly point.
- Begin roll call immediately. Notify supervisor of the missing.
- Remain at the assembly point until the all clear is given.
- Location of first aid kits, fire extinguishers, assembly point, hospital, name of first aiders.

21.3.4 Personal Protective Equipment

Mandatory PPE at ALL times:

- Hard hat
- Hi-viz vest
- Safety boots with ankle support

- Safety glasses

Use the correct PPE for your task!

- Safety harness
- Hearing protection
- Gloves/masks/ear muffs...
- Etc.

21.3.5 Alcohol and Drugs / Smoking Policy

- No alcohol, no drugs on site.
- We use breathalyser now and then.
- Zero Tolerance.
- For being intoxicated – red card
- If you feel not able to participate in works (hangover), stay home. You risk someone's life!
- Smoking is only allowed at the designated area.

21.3.6 Weather Conditions

- Always check the weather forecast
- Extreme Weather Condition
 - Wind speed – Storm
 - Foggy weather
 - Snow/Ice or Blizzard
 - High and Low temperatures.
- In case of a storm or lightning abandon the turbine A.S.A.P and inform all your colleagues. You should NOT start your work before clear sign from Vestas Personnel and not earlier than one hour.
- Always work according the turbine specific wind speed limits.

21.3.7 Incident Reporting

- **ALL** accidents, near-misses and hazardous observations have to be reported **IMMEDIATELY** to the Vestas Site Manager.
- It is the project manager/site manager/supervisor responsibility to ensure all incidents are investigated.
- Incidents involving contractors/subcontractors shall be immediately reported to their own organisation according to their own processes and copy of the report shall be sent to Vestas Site Manager.

21.3.8 Waste Management

- Recycle wherever possible!
- Always segregate waste properly.
- Use the designated waste bins.
- Mark the containers with the correct signs.
- Remove all packaging and rubbish from site – daily.
- Register and save waste transport documents.

21.3.9 Chemicals on Site

- Only chemicals approved by Vestas are allowed to be used on site. Never buy locally!
- Spill trays are always to be used for storing chemicals, including fuel.
- Spill kits are kept at key locations on site (erection area, chemical storage area).
- Documentation - Safety Data Sheet (SDS) are available in English and local language where the chemicals are stored and used – COSHH and Tools containers.
- Appropriate PPE for the task.

21.3.10 Disciplinary Procedure

- Verbal correction
Up to two verbal corrections can be given for violations against low-risk protective measures.
- Written reprimand
Is given for the 1st and 2nd yellow card and for the red card.
- Sending an employee home
Is done for the 2nd yellow card and for the red card.

Minor Safety Breaches

- Give the employee a verbal correction.
- Send a letter to the general management of the contractor/subcontractor to give the employee a written warning and send him to basic safety training.
- Send a letter to the general management of the contractor/subcontractor to give the employee a second written warning and send him to a basic safety training again and ban the employee from the site for 3 months.

Serious Safety Breaches

Send a letter to the general management of the contractor/subcontractor to ban the employee for 6 months from Vestas sites.

NOTE

For further information on the disciplinary procedure for Vestas employees please consult DMS 0044-9333.

For further information on the disciplinary procedure in the Contractor Safety Program see DMS 0053-4563.

For guidance determining the proper and sensible assignment of discipline to be administered see DMS 0078-6426.

21.3.11 Hand and Power Tools

- Ensure that all hand and power tools are appropriately maintained and safe to use.
- Always use the correct tools for the work being undertaken and use according to any manual or instruction.
- Always ensure that you have been appropriately trained to use the equipment – if not STOP.
- Inspect all equipment before it is used - NEVER use defective equipment and REPORT defects immediately.

21.3.12 Portable Generator

- Portable generators should always be standing on spill tray and be properly earthed.
- Generator should be tested at least once a day with „TEST” button if the protection relay is working or not.

21.3.13 Plant and Machinery

Plant & Machinery must:

- Be properly maintained.
- Have relevant evidence of inspection or thorough examination, where required.
- Have the Operator's manual available on vehicle or piece of plant.
- Only be operated by a **qualified** person (e.g. proof or evidence of training, license and/or certification).
- Must undergo a pre-use check prior to use and/or regular inspections.

21.3.14 Lifting Operations

- Lifting plan always available and followed
- Do not stand/work under suspended load!
- Only authorized personnel can use and operate lifting equipment.
- Safety/exclusion zone (a minimum distance equal to the length of the main lifting crane's boom plus 40 m measured from the centre of the main crane) during lifting operations for unauthorized people.
- Only people directly involved in the lifting operation to be in the working area.

- Make people aware of the safety/exclusion zones.

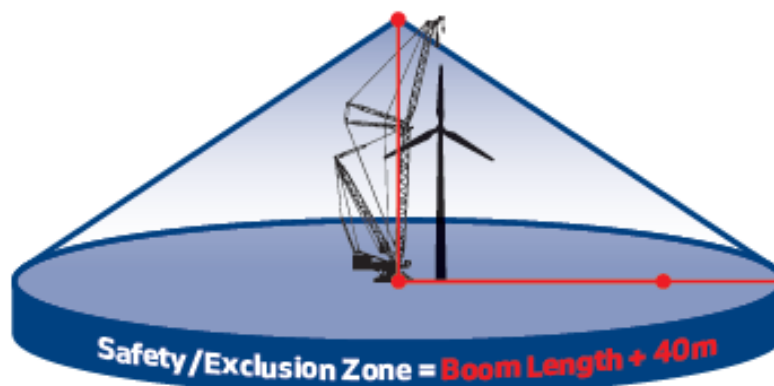


Figure 21-1: Safety/Exclusion Zone

21.3.15 Working at Height

- Only qualified personnel are allowed to climb and work at height.
- Permanent attachment is mandatory when exposed to the risk of falling.
- A suitable climbing helmet must be securely fitted and worn at all times when climbing.
- Working at Height Safety Equipment must be stored correctly, worn in accordance to the manufacturer's instructions, registered, Inspected and subject to a pre-use check.
- WTG Ladder fall arrest systems must be used with serviceable, compatible fall arrest devices/slider/glider.

21.3.16 Electrical Works / LOTO

- Lock out Tag out, Personal Lock
- Personal locks must always be tagged with:
 - “**DANGER – DO NOT OPERATE**”
 - Name
 - Phone number (+country code)
- Never apply or remove another person's lock.
- You must remove your own lock when work is completed

21.3.17 Housekeeping

All employees are expected to practice good housekeeping. **A job is not complete until clean-up is done.**

Good practices

- Return things to the proper place.
- Keep tools, materials and equipment safely stored.
- Wipe up spills immediately – oil, water etc.
- Sharp objects (scrap metal, glass, bottles etc.) shall be stored in appropriate containers.
- Do not place debris or other obstacles in roadways, walkways, aisles, or otherwise obstruct travel routes.
- Segregation of vehicles and pedestrians.

21.3.18 Construction of Foundations

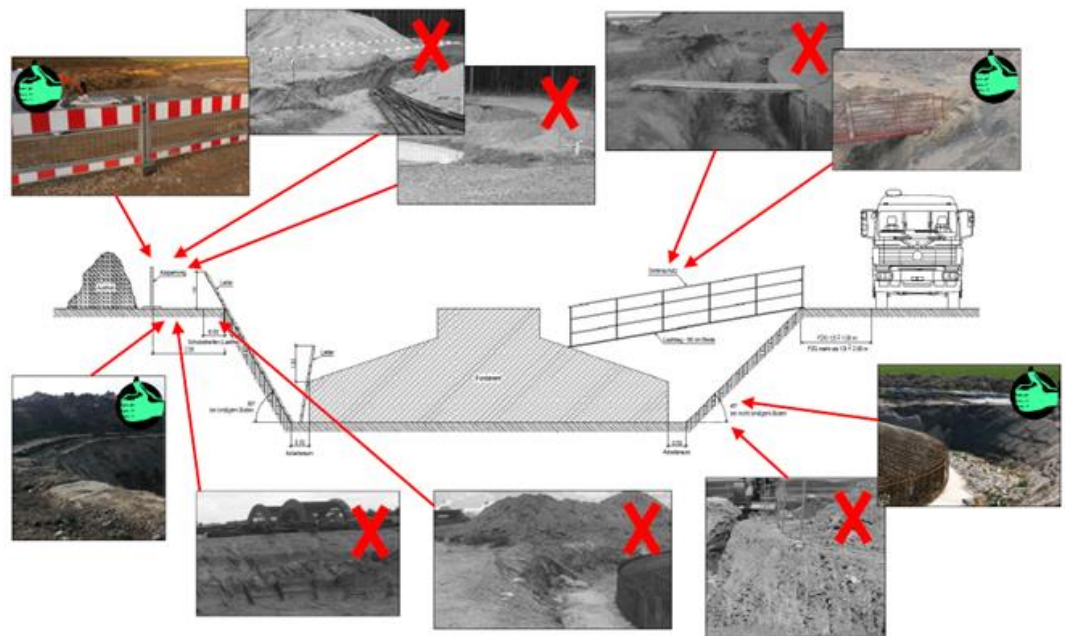


Figure 21-2: Construction of foundations

21.4 Local Requirements

Refer to the BU local requirements (if available) for additional information.