

EXHIBIT A TURBINE INFORMATION

Exhibit A-2a Gamesa 2.5MW GW 114 Product Brochure

G114-2.5 MW

Boosting production in medium wind sites

The goal to continually reduce the Cost of Energy in the 2.0-3.0 MW market segment is central to Gamesa's product design philosophy and has led the evolution within the 2.0 MW platform with the introduction of the G114-2.5MW wind turbine.

With the offer of a larger rotor for medium wind sites, new tower options and a power boost to 2.5 MW, the G114-2.5 MW Class II turbine complements the 2.0 MW product series and promises to become a mainstay of Gamesa's growing product portfolio.

- ▶ PROVEN TECHNOLOGY
- ▶ OVER 29% MORE ENERGY PRODUCTION*
- ▶ 10% NOMINAL REDUCTION IN CoE*

* As compared to the G97-2.0 MW.



GLOBAL TECHNOLOGY
EVERLASTING ENERGY



NEW G114-2.5 MW

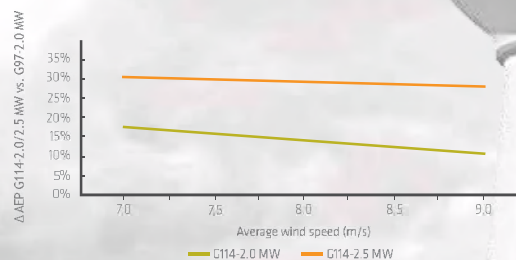
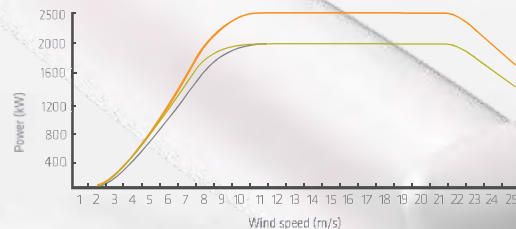
Boosting production in medium wind sites

As part of the evolutionary development process of the Gamesa 2.0-2.5 MW platform, the G114-2.5 MW turbine will inherit the technologies, components, and subsystems previously deployed and proven through the reliable operation of 15,000 MW of Gamesa's high-performing 2.0 MW turbines.

Features of the G114-2.5 MW include:

- ▶ Variable pitch and speed technology for maximum energy capture.
- ▶ Active yaw system for optimum adaptation to complex terrain.
- ▶ Gamesa SMP predictive maintenance system.
- ▶ Gamesa NRS® noise control system to minimize noise emissions.
- ▶ Gamesa Windnet® remote control and monitoring system.

By incorporating technology enhancements, including a new 2.5 MW generator and Gamesa's new 56m reinforced blade, the G114-2.5 MW Class II turbine promises to deliver nearly 30% more energy along with a 10% nominal reduction in Cost of Energy, making it one of the most profitable solutions available in the market today.



SPECIFICATIONS

General Details

Rated power	2.5 MW
Wind class	IIA
Rotor diameter	114 m
Swept area	10,207 m ²
Power density	244.93 W/m ²
Control	Pitch and variable speed
Gearbox	3 stages
Generator	Doubly fed
Frequency	50 Hz / 60 Hz

Blades

Length	56 m
Airfoil	Gamesa

Towers

Height	80, 93, 125 m and site-specific
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EXHIBIT A TURBINE INFORMATION

Exhibit A-2b Gamesa Safety Manual


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PS code it replaces: PS-MM.1 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.1 Revision 01 of Multitecnología and Made				
Manufacturer:	ALL			
Model:	ALL			
<p>This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.</p>				Approved by: L. P. (Signature and Date)

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1. TRAVELLING TO AND WITHIN A WIND FARM

- **PPE Required:** all persons accessing the wind farm, at the time of leaving their transport vehicles, should wear working clothes, a safety helmet with chinstrap, safety boots, protective goggles and a high visibility vest, (in the case of reduced visibility).
- It is forbidden to consume alcohol or drugs or to smoke in the workplace, and to carry out work or drive under the influence of alcohol or drugs or medicines which so advise. The driver of the vehicle should have the necessary driving licence, and the vehicle must have all the valid documentation (transport cards, inspections, insurance, etc.).
- When travelling by public roads, the rules established by traffic authorities must be fulfilled at all times.

ROADS ►			
VEHICLES ▼	Dual Carriageways and Motorways	Conventional roads marked as suitable for motor vehicles	Other out-of-town roads
Cars and motorbikes	120 km/h	100 km/h	90 km/h
Light commercial vehicles, multipurpose vehicles	100 km/h	90 km/h	80 km/h
Lorries, trucks, vans, articulated vehicles, motor vehicles with trailer weighing up to 750 kg.	90 km/h	80 km/h	70 km/h
Motor vehicles with trailer weighing more than 750 kg.	80 km/h	80 km/h	70 km/h

- Traffic patterns, both pedestrian and for vehicles, should always be observed.
- While driving, the use of mobile phones and any other means or system of communication is forbidden, except if communication can be established without using the hands, headphones or similar devices.
- When travel takes place within the farm, the traffic rules and signs established by the Owner must be respected. If there are no such rules or they are less restrictive than those established by Gamesa, the latter must be observed, which are:
 - Maximum traffic speed for heavy-duty vehicles in the yard is limited to 20 km/h.
 - Maximum traffic speed for light vehicles in the yard is limited to 40 km/h. During adverse weather conditions, or if the road surface is in poor condition, the speed limit must be 20 Km/h.
- For long trips, the driver must be well rested before setting out, resting approximately every 200 km or after every two hours' driving.
- The vehicle must be equipped with a first-aid kit, fire extinguisher and snow chains (when there is a likelihood of adverse weather such as ice and snow).
- Ascent and descent to and from the vehicle must be upon firm ground without obstacles. The loading and unloading area must be free of obstacles and materials.
- The equipment and vehicles that must circulate through the construction site will keep far enough from the slope borders, in order that their weights do not cause landslides; generally, this distance will not be less than 2 m, increasing in low stability terrains. When a vehicle needs to approach a slope or the border of an excavation, security stops must be placed, firstly checking the terrain's resistance to the vehicle's weight.

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- Whenever a stopped vehicle or machine initiates a sudden movement, it must be alerted by an acoustic signal. When the movement involves circulating in reverse or when the driver lacks visibility, another operator must direct the manoeuvre from outside the vehicle.
- When workers need to move around the wind turbine yard, check the ground for areas in poor condition that could cause falls, sprains, etc. Use the routes designed to access the wind turbine door, avoiding the use of embankments, etc.

1.1. FAUNA-ASSOCIATED RISKS

- Because Wind Farms are usually on top of hills or on open plains, you will almost certainly come across local fauna. Whenever you are going to install a Wind Farm and, once assembled, carry out maintenance work, before commencing you must conduct a study to identify and assess the risks associated with coming into contact with the fauna and being attacked thereby in order to take the necessary preventive measures (placing barriers to prevent them accessing the work area, vaccinations against stings or bites, etc.). The general guideline should be:
- Identify those animals that present a hazard and that you may encounter. If the result is positive, a procedural protocol must be established specific to the site and which encompasses the following:
 1. Identification of all dangerous species that present a risk for workers. It is useful to include graphic material (photos) to make it easier to recognise them and tell them apart from harmless species.
 2. Location of the closest medical centres for receiving medical treatment, whether specific (e.g. antidotes) or general (e.g. a bite). Ensure they have suitable treatment available (as regards both time and form) to deal with attacks by the dangerous species identified.
 3. The specific control measures for preventing an attack by the species identified as dangerous, as well as the specific first-aid measures that must be performed on-site in the event of an unavoidable attack.
- Make workers aware of the presence of these animals as well as the established protocol, including the control measures, the first-aid measures and medical centres.

General rules:

- Never walk barefoot: around 80% of all bites occur between knee and foot and 50% occur on feet. Wear short-leg boots or even gaiters in areas of thick vegetation. When spending the night outside, keep all footwear in sealed bags during the night.
- Keep all areas close to the substation, huts, tents etc. free from vegetation, litter and objects.
- Wear gloves when picking up objects from the ground.
- Never place hands into holes in the ground or in trees. In general terms, take extra care before putting your hand into places or holes when you cannot see what it contains as an animal may be inside.
- Keep an eye on the ground when walking and, whenever possible, always use footpaths or well-trodden trails.
- Before stepping over fallen trees or branches, always look behind them.
- Take a good look before sitting on the ground.
- Avoid walking at night as this is the most active time for many animals (e.g. poisonous snakes).
- If you encounter a dangerous animal, warn your companions immediately and move away slowly, avoiding any sudden movements: Animals instinctively think you are invading their territory.
- Never touch an animal even when it is dead, as it could still bite in a reflex action.

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Procedural protocols when in the presence of poisonous snakes, scorpions or spiders:

Preventive actions to avoid bites:


- Use the specific established protective equipment (gaiters, gloves, etc.) for avoiding bites before entering a work area.
- Avoid leaving parts of your legs and hands exposed and unprotected, as such areas are most prone to possible attacks.
- Make sure there is reliable coverage for your mobile phone in the area where you are to carry out tasks. Otherwise, carry a walkie-talkie or other efficient means of communicating with on-site work supervisors.
- Always make your way to the work area in the company of another person.
- Adequately review stockpiling areas before handling any stockpiled items. If necessary, use a bar (or similar element) 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 and we do not know how to move away correctly.



Protective gaiters are recommended for all workers

Response in the event of a bite:

- First and foremost, we should move away from the animal quickly but without making any sudden movements, as the initial bite generally contains less poison than subsequent bites.
- If possible, 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.
- We should warn an on-site supervisor as soon as possible.
- It is essential to calm down the injured person so that their heart rate remains as low as possible. Prevent the bitten part of the body from moving.
- Note down the time of the bite and how the affected part of the body looks.
- Wash the affected area with soap and water.

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- Apply compressive bandaging, avoiding the use of tourniquets as they can ultimately prove harmful. The bandaging must allow arteriovenous circulation.
- Remove any rings, watches and tight clothing to prevent swelling.
- If possible, keep the bitten or stung area in a raised position.
- Drive the injured person to a hospital or medical centre as soon as possible, of which you will be informed during the Site Induction talk and subsequent daily talks.


What not to do:

- Do not cut the bitten area as this will increase bleeding and risk of infection.
- Do not use a tourniquet as this impedes blood flow and, consequently, does more harm than good.
- Do not use ice, as this would worsen the local injuries caused by the venom.
- Do not administer electric shocks of any kind.
- Do not treat the patient with any kind of chemical substance or plant or animal extract as the effectiveness of such treatment has yet to be scientifically proven.
- Do not supply alcoholic drinks.
- Do not perform suction with your mouth as this would increase the rate of infection around the bite and may prove dangerous if you have any kind of exposed injury or tooth decay. What is more, you cannot be sure how much venom is removed in this way.

Common symptoms in the event of snake bites or stings from any other poisonous animal:

- **Local Symptoms:** Bloody discharge from the wound, fang marks on the skin and swelling around the bite, intense localised pain, colour change, swollen lymph nodes in the affected area, burning/stinging sensations and blood blisters.
- **Systemic Symptoms:** Convulsions, dizziness, sleepiness, weakness, blurred vision, thirst and excessive sweating, fever, lack of muscle coordination, difficulty swallowing, difficulty talking, nausea, vomiting, diarrhoea, numbness and tingling, rapid pulse, altered mental state, shock, bleeding gums, blood in the urine or lack of urine flow (oligoanuria), breathing difficulties, paralysis and death.

IMPORTANT: It is essential to bear in mind that any snake bite, whether it appears poisonous or not, must be treated as a medical emergency, whereby the affected person must be taken to hospital without delay. Even if a snake bites you without injecting poison, it will still release microbial contaminants and so the wound must always be surgically cleaned.

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2. ACCESSING WIND TURBINES

- Upon arriving at the wind farm and prior to starting any operation: go to the substation to indicate your presence and the operation to carry out.
- From the moment of leaving the transport vehicle for all operations of construction or maintenance at the wind farm until re-entering the vehicle, all workers must wear protective goggles. It is a minimum requirement that the goggles have a universal frame for protection against mechanical risks and anti-fog treatment for continuous wear. For other specific tasks, it may be necessary to wear an alternative type of eye protection (for example: work posing an electrical hazard, pressurised flying liquids, non-ionising radiation, etc.). In such an event, it is mandatory to use protection as specified for the particular task.
- The following equipment is necessary for any operation in the wind turbine:
 - **PPE Required:** Work clothing, safety helmet with chinstrap, safety boots, protective goggles, protective gloves against mechanical injuries, harness with sliding fall arrest device, two ropes with energy absorber device and wide mouth hook, and all equipment established as the safe practice for the different jobs.
 - **Recommended PPE:** Lumbar protection
- The personnel responsible for performing each task must have read and been trained on the content of the different applicable documents before beginning the work. They must also be familiar with the risk evaluation of the tasks to perform. In addition, personnel must know about the safety and protection equipment of the wind turbine.
- NEVER start work if you are unsure of equipment operations. It is preferable not to start work rather than risk an accident.
- All operators must inform the manager of any unsafe conditions observed at the worksite and report materials or tools which are in poor condition.
- When accessing the tower via the tower ladder, or when climbing down it to the wind turbine yard, you must use the handrail on the ladder (where applicable). If the rungs are covered in snow, ice, mud, oil, etc., they must be cleaned before use.
- It must be guaranteed that the distance from the yard to the first rung is less than or equal to 250mm. Otherwise, the terrain must be adapted, brick steps installed in the yard or rungs added to the ladder to comply with the aforementioned distance.
- Before work commences, the operations must be coordinated to ensure that the required fire extinguishing resources are available at all times. Once in the nacelle, check that there is a fire extinguisher there and that it is in good condition. Otherwise, an extinguisher must be brought up before continuing work.

2.1 PRESENCE OF WATER ON THE FOUNDATION RING

- If when accessing the wind turbine there is water underneath the Ground platform, it is absolutely forbidden to perform tasks underneath this platform. During work in other wind turbine areas, the following requirements must be met to check whether there are risks involved for workers:
 - The first requirement to fulfil is to have the guarantee that the cables underneath the lower platform of the tower are in perfect condition and keep their insulating capacity.

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- Once the previous requirement has been met, the tasks to perform in the wind turbine will be limited by the height reached by the water in the ring.
 - o If the water comes into contact with the switchgear and/or the electrical cabinets, or if it does not come into contact with these but the distance between these elements and the water does not guarantee dielectric rigidity, no work may be performed on the wind turbine.
 - o Even if the water does not come into contact with the electrical equipment and the distance between the water and those elements guarantees there is the necessary dielectric rigidity to prevent electrical arcing, the presence of water in the ring could cause humidity. Therefore, before starting work inside the electrical cabinets on the ground tower platform, it is essential to observe the considerations set out in the specification Electrical Checks before Energising for the specific wind turbine. In the absence of this specification, the checking and megging of the cables must still be performed. If no operations are going to be carried out inside the electrical cabinets on the lower tower platform, work can be still carried out on the wind turbine while there is water in the ring, although a solution to this situation must be found as quickly as possible.
- Any installation or maintenance procedure shall ALWAYS be done by a **minimum of two duly trained and instructed persons** for the task to perform. If all workers are not in the same work area, they should nevertheless be in communication with each other at all times via walkie-talkies, and an operations coordinator must be appointed. The coordinator shall communicate every 10 minutes with all workers involved in the operation to check on their condition, and must receive a reply from each worker working in other areas (a reply from a single worker will suffice if several are together in the same place). If it is necessary that the work be performed by a single worker, there must be a specific protocol in place.

2.2 WIND TURBINE DEACTIVATION

- Operations required to stop the Wind Turbine may only be carried out by personnel properly trained to do so (maintenance personnel employed or subcontracted by GCT) and are strictly forbidden for any personnel not meeting these requirements.
- Follow the sequence of steps defined in Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine to **stop a wind turbine** safely.
- Ensure the **disconnection of communications** of the wind turbine with the remote control system according to the sequence of steps defined in Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.


2.3 ACCESS TO THE NACELLE

- Before climbing the tower ladder and whenever tasks requiring physical exertion are to be carried out, perform a series of stretching and warm-up exercises to help prevent muscular-skeletal injuries during the operations. These exercises are described in the "Warm-up and Stretching Exercises" section.
- Before climbing up the ladder, check whether the wind turbine has an lift and, if so, whether it runs alongside the ladder (the ladder may even support and guide the lift) which could lead to personnel becoming trapped by the ladder should the lift start up. If so, it is strictly **forbidden** to use the ladder except in the following situations:
 - The lift breaks down during use, requiring it to be evacuated. The lift must be prevented from operating during evacuation by pressing the emergency push button or by any other means provided by the manufacturer (e.g. service keys).

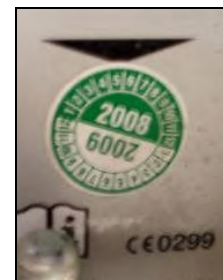
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- Parts of the tower and/or nacelle need to be accessed while the lift is out of service or maintenance tasks have to be carried out that require use of the ladder. In such cases, to climb up and down the ladder safely, it is mandatory to disconnect, lock and tag the main switch of the lift system.
- Whenever the nacelle is to be accessed, the wind turbine must be stopped unless the work to be conducted (tests, predictive maintenance, etc.) requires the wind turbine to be operating. A safety harness and sliding fall arrest device fastened to the ladder's lifeline, as well as a helmet with chinstrap, protective gloves against mechanical injuries and two ropes with an energy absorber device and wide mouth hook must be worn when climbing up or down the tower ladder.
- In general terms, only one person at a time may be attached to the lifeline while the ladder is being used, unless signs placed in the wind turbine, the lifeline manufacturer's instructions or the wind turbine Instruction Manual specifically state that the lifeline can be used by more than one worker at the same time.
- Two workers must never coincide on the same section of ladder unless there are closed hatchways between them, except when tasks are being carried out on the ladder requiring the joint presence of more than one worker; in this case, the situation must be analysed in order to implement the relevant safety measures required for the tasks.
- When climbing up the ladder to the nacelle from the top tower platform and when climbing back down, take care not to fall by properly placing your feet on the rungs before making any movements
- During ascent and descent, the worker must use both hands and not carry any type of tool or load (unless the conditions described in the section on load hoisting and lowering inside the wind turbine are met, in which case the worker carrying the load must be last in line during the ascent and first in line during the descent). In cases where it is necessary to use tools inside the tower or to hoist or lower materials inside the tower, the procedure for hoisting loads described in the aforementioned section must be observed.
- If, when climbing up the tower ladder, a worker feels fatigue, increased heart rate, dizziness, muscle cramps, etc., temporarily stop at the platforms provided along the tower sections, as well as at the resting platforms located along the ladder's vertical path.
- Each hatchway passed during the climb must be closed once having passed through it. To access the upper platform from the ladder, proceed in one of two ways:
 - If the lifeline is installed in such a way as to allow access to the platform and then close the hatchway once you are there without having to release the sliding fall arrest device, then this shall be the way to proceed
 - If the installation makes it necessary to release the sliding fall arrest device from the lifeline without yet having accessed the platform and closed the hatchway, the worker must remain attached by means of a lanyard with energy absorber device and wide mouth hook to a fixed, resistant point before releasing the lifeline. This allows you to access the platform and close the hatchway while remain attached to the lifeline at all times. When ready to exit the platform and access the ladder, perform this operation inversely.
- The fixed vertical ladders of the wind turbines must be equipped with lifelines which must be inspected as indicated in the maintenance manual. The lifeline can only be used with fall arrest devices approved for use with this lifeline.
- Depending on the company that regularly inspects the lifelines, different notices informing that these inspections have been completed may be posted in the wind turbine. The lifeline inspection status must always be checked before the lifeline is used.

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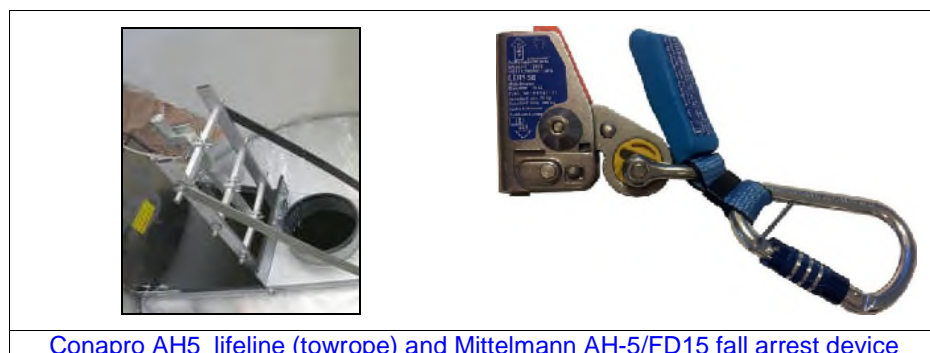


Examples of information


- If the lifeline installed in the wind turbine is not officially approved, or when officially approved but not certified for use, the way to climb up and down the ladder shall be by using a harness with a sliding fall arrest device tied to the uncertified lifeline while simultaneously being tied to a fixed and resistant point (rungs with threaded bars or ladder support) by one of the ropes with the energy absorber device and wide mouth hook so that one remains fastened, at all times, to at least two points. The distance to be climbed up or down in a single stretch shall be that allowed when releasing the safety line that remains below or above the worker (depending on whether ascending or descending) once having moved along the ladder, and always bearing in mind that it is **PROHIBITED** to release the rope without having tied a second one above or below the worker (depending on whether ascending or descending).
- Temporarily stop at the platforms provided along the tower sections or resting platforms that may be provided along the ladder's vertical path when experiencing fatigue, increased heart rate, dizziness, muscle cramps, etc., while climbing up the tower ladder.
- Once the ascent is complete, the sliding fall arrest device must remain attached to the tower lifeline.
- Examples of fall arrest devices and lifelines that may be installed in a wind turbine:



Flexible lifeline (towrope) and Somain SKC-H04 fall arrest device.



Conapro AH5 lifeline (towrope) and Mittelmann AH-5/FD15 fall arrest device

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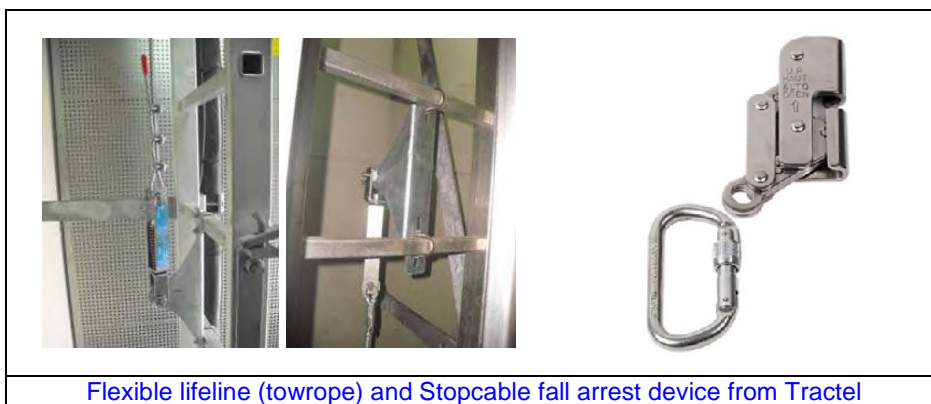
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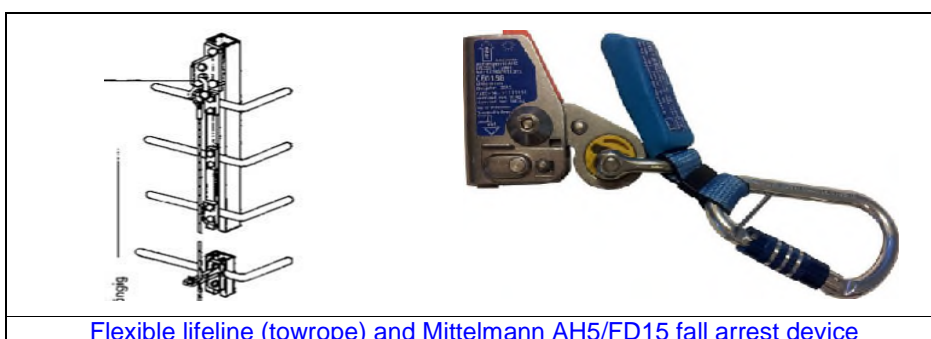
Rigid lifeline (rail) and rigid fall arrest device from EQUIPAMIENTOS EOLICOS



Flexible lifeline (towrope) and Söll Vi-Go de Miller (Sperian) fall arrest device



Flexible lifeline (towrope) and Stopcable fall arrest device from Tractel



Flexible lifeline (towrope) and Mittelman AH5/FD15 fall arrest device

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Rigid lifeline (rail) and fall arrest device from Avanti



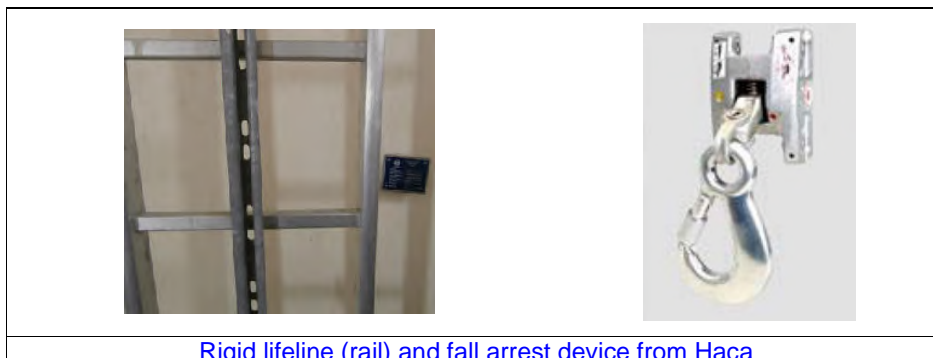
Flexible lifeline (towrope) and Cabloc fall arrest device from Protecta (Capital Safety)



Flexible lifeline (towrope) and Igema VRB fall arrest device

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Rigid lifeline (rail) and fall arrest device from Haca



VECTALINE® LDV AGUERRI lifeline and SKC-G KAR fall arrest device

- When climbing up the ladder to the nacelle from the top tower platform and when climbing back down, take care not to fall by properly placing your feet on the rungs before making any movements
- Before climbing up to the nacelle from the upper platform, the sliding fall arrest device must be placed somewhere on this platform where there is no risk of its falling off the tower, thus facilitating an emergency evacuation.
- The first operation performed when carrying out work in the nacelle (unless it is accessed merely for tasks such as resetting the circuit breakers, differential switch, etc.), must be hoisting the **RESCUE KIT** (unless this is already installed in the nacelle) together with the necessary tools. If no tools need to be included, add a (± 20 kg) weight to prevent the wind from rocking the equipment or, in the event of strong winds, guide the load using a rope to prevent it from colliding with the tower.
- The Rescue Kit equipment used must be suitable for the job in question, comply with current legislation and bear the corresponding markings (e.g. the CE marking in the European Union), declaration of conformity to the applicable regulations and operating instructions. The operating instructions must come with the device and be accessible without needing to unseal the device if it has been sealed. Workers must be completely familiar with the Rescue Kit equipment and the instructions for its use, and they must be trained for an emergency requiring evacuation.
- When performing any operation on the tower platforms, make sure the ladder access hatchway is closed, **NEVER** work on top of it and, when working nearby, remain attached to an anchor device with a harness and lanyard with energy absorber device and wide mouth hook.
- Prior to climbing the nacelle access ladder, check that it is in good condition and clean of oil or grease that could cause slipping during the ascent. When ascending and descending the ladder, make use of possible handles in the nacelle and if these are missing, hold on to a fixed, resistant part of the nacelle, for example, projections of the frame.

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2.4 CONTROL EQUIPMENT INSPECTION AND REPAIR OPERATIONS

- **PPE Required:** Work clothes, safety helmet with chinstrap, safety boots and protective goggles. Depending on the scheduled work: insulating stool or mat, face shield, insulating gloves against electrical injuries for the voltage in the work area.
- **Recommended PPE:** Lumbar protection and knee pads.

2.4.1 General Preventive Measures for all types of wind turbines:

- Carrying out these operations requires the presence of a Preventive Resource to guarantee that it is done at all times complying with the procedures and safety measures established by Gamesa.
- All work involving installation, putting into service, inspection and maintenance must only be carried out by personnel authorised by their company, in accordance with current legislation regarding worker protection against electrical risk of the country in which the wind turbine is installed.
- All general measures that may be applicable within this area (relating to the facility, country, etc.) must be observed, as well as the specific provisions in the Instruction Manual of the wind turbine, Operating and Maintenance Manuals, Work Instructions, Safe Practice for the specific wind turbine model, etc.
- Within certain compartments of the electrical cabinets, there may be resistors for maintaining the temperature inside the cabinets at the proper values. These heat resistors achieve high temperatures, therefore 5 minutes must be allowed before manipulating the inside of the same and attention paid to not enter into contact with them.
- Any work to be performed on this equipment, requiring a different procedure to that specified by Gamesa or the manufacturer, must be backed by a specific work instruction that Gamesa has previously approved.
- Even if the different compartment casings are open, at no time does this imply there is no voltage present. Therefore they can only be accessed by personnel authorised by their company, and such authorisation must be granted in accordance with regulations under current legislation protecting workers from electrical hazards in the country where the wind turbine is installed and observing the safety conditions set out in their Maintenance Manuals. Therefore, it is not always necessary when working on electrical cabinets to cut off voltage from the switchgear; rather, this depends on the working conditions included in the manuals of the different cabinets present in the wind turbine. Their maintenance manuals specify on which occasions it is necessary to suppress the tension from the switchgear and when it suffices to do so from another cut-off point.
- It is necessary to use a face shield for working with electrical hazards and electrically insulated insulating gloves against electrical injuries of the component to be checked for the presence or absence of voltage.
- It is recommended to keep the compartment doors closed whenever possible to avoid possible impacts from them.
- Never remove any casing or safety screen inside the electrical cabinets without first having de-energised the area protected by the casing.
- In the absence of specific documentation, to ensure the absence of voltage in the cabinet to be handled, the general power supply to these cabinets must be cut off through the cut-off devices that supply them.
- Due to improved design, equipment modifications, upgrades implemented, etc., you may see control equipment (cabinets or compartments) that is not identified in instruction manuals, maintenance manuals, technical instructions, safe practices, etc. In such cases, before working on this equipment, it must first be de-energised, consulting Gamesa technical and engineering services.

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- As a general rule, you must fully discharge the cabinets or compartments thereof where visual inspections are to be conducted in areas of high-level current (e.g. busbars, general connections, etc.) and which are not protected by barriers (e.g. Plexiglas screens, lattice metal grilles, etc.) or which may come into direct or indirect (arc flash) contact with live elements. You must identify the most suitable voltage disconnection points according to the wind turbine's electrical diagrams and, if necessary, disconnect the wind turbine's HV switchgear in order to cut off the power supply to these cabinets or compartments thereof. For electrical disconnections follow the instructions in the sections in Lockout and Tagout of Electrical Cabinets, and Discharge of the HV Installation and the indications of the Instruction Manual of the wind turbine and Safe Practice for the specific wind turbine model.

2.4.2 Types of WORK carried out on control cabinets

- Inspection: Examination method involving opening the doors of the electrical cabinet to perform visual inspections, with no physical contact with the components inside the cabinet.
- Handling: For tasks involving installation and/or replacement of elements (metal or methacrylate guards, electrical components, etc.) which require physical contact with the components inside the control cabinet.
- NOTE: The handling tasks do not include operations that use cutting tools (drills, radial saws, etc.). To perform these tasks it is necessary to follow a specific procedure.
- Manoeuvring; This applies to operations involving connection and disconnection of touchscreens in cabinets, configuration and data downloading of the predictive maintenance system, loading and configuring software and firmware, connecting a laptop in electrical cabinets, adjusting settings, physically connecting and disconnecting (disconnecting cables or switch cutting manoeuvres) communications with the remote control system and the connection and disconnection of circuit breakers.

2.5 DISCHARGING THE HIGH-VOLTAGE INSTALLATION

- To discharge the installation of the high voltage of the wind turbine, all indications in PS-MM.1, Safe Practices, the Instruction Manual for the wind turbine and Safe Practice for the specific wind turbine model regarding safety measures to be taken must be followed.
- High-voltage discharge must always be performed for any inspection or replacement of:
 - Elements in the low-voltage part of the transformer or electrical systems directly connected to it (e.g. the power section of electrical cabinets directly connected to the low-voltage side of the transformer). The switchgear must be connected to circuit breakers and earthed.
 - Any action requiring access to the compartment housing the high-voltage transformer.
 - Any operation that requires being below the platform below the tower (due to the proximity of the connections of cables from the transformer to the switchgear, if they are located at the base of the wind turbine).
 - Any operation in an electrical cabinet directly powered by the transformer without intermediate cut-off elements or a main switch in the electrical cabinet. In case of doubt as to the origin of the power supply to this cabinet, always discharge the switchgear.
 - Any operation on the main switch of an electrical cabinet directly powered by the transformer without cut-off elements. In case of doubt as to the origin of the power supply to this switch, always discharge the switchgear.
 - For any operation on components of an electrical cabinet directly powered by the transformer, without a circuit breaker for the voltage to these components, or existing main switch, the input of power to the circuit breaker is not completely protected, and could cause direct or indirect electrical contact. In case of doubt as to the origin of the power supply to this cabinet, always discharge the switchgear.

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WARNING: If the switchgear is at the base of the wind turbine, disconnection of the switchgear does not prevent the presence of voltage on the wind farm's high-voltage cable, in the switchgear intake sleeves and the line output sleeves. To guarantee the complete absence of voltage in these elements, disconnect and earth the cut-off device for the line that feeds the wind turbine according to the layout of the wind farm (e.g. output module from the switchgear of the preceding wind turbine, switchgear of the substation, etc.).

- High-voltage discharges must always be carried out while observing the 5 golden rules:

FIVE GOLDEN RULES


- DISCONNECTING**, opening all possible sources of voltage. Remember that condensers and other elements may contain voltage.
- PREVENT ANY POSSIBLE FEEDBACK**, the manoeuvring devices used to disconnect the installation must be protected against any possible feedback.
- VERIFY THE ABSENCE OF VOLTAGE**, the absence of voltage must be verified in all of the active elements of the electrical installation, or as close as possible to the work area.
- EARTH AND SHORT CIRCUIT**. in low-voltage installations which may accidentally become live due to induction or other reasons and always in high-voltage installations.
- CORDON OFF AND MARK THE WORK ZONE**.

2.6 ACCESSING THE TRANSFORMER

- Prior to entering the transformer compartment, it is advisable to wait at least 20 minutes after de-energising so as to allow it sufficient time to cool down. Be careful with the temperature of the flanges and windings.
- To access the transformer through the front windows, it is recommended that you use auxiliary measures such as stools, platforms... that provide better access, thus avoiding forced postures during the access.



- Follow the steps described in the Instruction Manual of the wind turbine and Safe Practice for the specific wind turbine model to access the transformer compartment safely.
- De-energising and earthing the high voltage installation.**
 - The first operation to be carried out in order to access the transformer site is to open the wind turbine HV switchgear where the work has to be carried out, earth it and then lock and tag it in accordance with the Instruction Manual of the wind turbine and Safe Practice for the specific wind turbine model. If the switchgear cannot be locked, the work must not be carried out and the person in charge of the wind farm must be informed.
 - When opening the switchgear it is necessary to use a face shield for work posing electrical hazards, insulating gloves against electrical injuries and an insulating stool or mat (depending on the voltage of the transformer station to be handled).

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- Once the switchgear is open, the absence of voltage should be verified in the enabled points depending on the switchgear model (connections of the three leads of the signaling module...)

WARNING: *The sole indication of the voltage presence indicating system present in the switchgear is not enough to ensure the system has no tension. In any event, the safety rules appropriate for tension works must be observed.*


- Once these operations have been performed, the switchgear will be earthed and it will be locked and signaled.
- It is mandatory to follow all instructions in the Instruction Manual for the wind turbine, Safe Practice for the specific wind turbine model and Safe Practice PS-MM.4 Energising/Discharging Wind Turbines.
- Conditions to operate the switchgear and de-energise the transformer:
 - o Personnel authorised by their company - this authorisation must be given in accordance with the requirements of current legislation protecting workers from electrical hazards in the country in which the wind turbine is installed.
 - o Have previous authorisation from the facility owner and follow the owner's discharge procedure.
- Once the HV switchgear has been opened, earthed, locked and labelled, you must then open, lock and label the corresponding circuit breakers according to the model of wind turbine to prevent any possible power supply coming from the wind turbine itself.
- Before you access the transformer area, check there is no voltage using a gauge and earth the primary transformer terminal, as explained below.

NOTE: When using the auxiliary power generator set, it will also be necessary to earth the secondary transformer terminal to prevent any undesired reestablishment of voltage.



- **Earthing the HV terminals of the transformer.**

- The HV terminals are always earthed whenever the transformer compartment is to be accessed.
- Unless otherwise stated in the Instruction Manual for the wind turbine and Safe Practices for the specific wind turbine model, the portable earthing mesh to connect to the phase terminals shall be of at least 35 mm² cross section with three inputs (length of each input: 1m, length from the earth connection to the root of the inputs: 2m).
- The operations must be carried out from outside the transformer compartment.

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- The required PPE to carry out the operation are: face shield for working with electrical risks, insulating gloves against electrical injuries, insulating mat, insulating pole and a voltage detector appropriate for the voltage of the transformer substation to be handled.
- The steps to take for earthing are as follows:
 - o To carry out the operations insulating gloves against electrical injuries, a face shield for work involving electrical risk and the insulating mat must be used at all times.
 - o Check that there is no voltage with an insulating pole with a voltage detector.

Mandatory instructions for using the insulating pole and the no-voltage detector:

1. Check the correct operation of the voltage tester, pushing the test button repeatedly and checking that the diodes switch on and that the sound alarm is activated.
2. Make sure there is no voltage in the high voltage terminals.
3. Check the correct operation of the voltage tester again, pushing the test button and checking that the diodes switch on and that the sound alarm is activated.


IMPORTANT: If any of these three steps is unsuccessful, do not continue the operation.

- o Fasten the common branch of the portable earthing mesh to the earth plate closest to the terminals to be earthed and then discharge all residual voltage remaining in the transformer by touching the HV terminals of the transformer with the insulating pole and one of the branches of the mesh.
- o Then use the insulating pole to place the three branches of the portable earthing mesh on the terminals of the three HV phases.

NOTE: if no auxiliary power generator unit is used, it will not be necessary to fit earth connections to the low-voltage terminals, but it will be necessary to check there is no voltage on the busbars connecting the cables of the transformer low-voltage phases, in the cabinets they supply.

• **Earthing the LV terminals (when using an auxiliary power generator unit).**

- The LV terminals are always earthed whenever the transformer compartment is to be accessed.
- Unless otherwise stated in the Instruction Manual for the wind turbine and Safe Practices for the specific wind turbine model, the portable earthing mesh to connect to the phase terminals shall be of at least 16 mm² cross section with three inputs (length of each input: 1m, length from the earth connection to the root of the inputs: 2,5 m; these lengths are a recommendation, and may be higher or lower depending on the location of the nearest blade plate to be used). With regard to the earth connectors, they should resist a short circuit current higher than 5 KA.
- Earth connections can be placed on the LV terminals of the transformer or on the busbars where the low-voltage phase cables are connected, in the corresponding electrical cabinet, if possible according to the model of wind turbine.
- The required PPE to carry out the operation are: face shield for working with electrical risks, insulating gloves against electrical injuries, insulating mat, insulating pole and a voltage detector appropriate for the voltage of the transformer substation to be handled.
- The steps to take for earthing are as follows:
 - o To carry out the operations insulating gloves against electrical injuries, a face shield for working with electrical hazards, and the insulating mat (for operations to be performed in the electrical cabinet supplied directly from the transformer secondary) must be used at all times.

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- Check the absence of voltage using the voltage detector on the busbars connecting the cables of the transformer low voltage phases in the electrical cabinet supplied directly from the transformer secondary.
- Place the portable earthing mesh in the transformer compartment or on the busbars connecting the cables of the three LV phases in the electrical cabinet where the cables from the LV side of the transformer are connected, first connecting the common branch of the portable earthing mesh to the earth plate nearest to the transformer low voltage terminals or to the electrical cabinet connection busbars and then placing the three portable earthing mesh branches on the plates receiving the LV cables in the electrical cabinet.

2.7 SAFELY ACCESSING THE NACELLE EXTERIOR

- To access the outside of the nacelle, it is mandatory to follow all indications in the Instruction Manual for the wind turbine and Safe Practice for the specific wind turbine model.
- In order to open the hatch in the nacelle roof, the wind turbine should be oriented in a direction where the wind does not cause the hatch to close unexpectedly, thereby preventing the worker from suffering injuries or entrapment when opening it. Once the hatchway is completely open, the nacelle can be positioned in the appropriate direction for carrying out the work.

2.8 SAFELY ACCESSING THE INSIDE OF THE ROTOR

- To access the inside of the rotor, it is mandatory to follow all indications in the Instruction Manual for the wind turbine and Safe Practice for the specific model of wind turbine.
- Refer to the Instruction Manual for the wind turbine or Safe Practice for the specific wind turbine model to check the possibility of electrostatic charges building up on the blades. If this is a possibility, before accessing the rotor, or for any task that requires contact with the rotor, earth the blades to discharge any possible accumulated static electricity according to the indications defined in these documents.
- All persons who access the rotor work inside it must remain attached to an anchor device. It is advisable to wear knee protectors to avoid discomfort or injuries caused by hard surfaces (metal, edges, objects, etc.). It is important to inspect the fibre and the elements of the cover-hub joint (if applicable in the wind turbine) to ensure that they are in good condition and to avoid falls from heights (no holes, cracks or breakage).
- The use of a head lamp when working inside the rotor is recommended to increase lighting.
- Extreme caution should be taken when travelling and while performing tasks in the rotor in order to avoid falls or injuries with the elements on the inside.
- Be especially careful with positioning the cable / strap of the retractable fall arrest device or safety line so they do not hinder the operations.
- The lack of space in the rotor, both to access it and inside it when carrying out work, means that workers are subject to ergonomic risks which must be mitigated by stopping for breaks during the task and/or active rest (task rotation system during the same job in order to rest the most fatigued muscle groups and use other more rested muscle groups).
- In order to reduce the duration of the tasks and, therefore, the positions the worker assumes inside the rotor, the use of automatic/hydraulic tools is recommended whenever possible.
- Whenever possible, the workers must use auxiliary means to handle loads (tractels, tools with the ability to move, etc.).

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2.9 ANCHOR DEVICES ON THE WIND TURBINE

- The wind turbine contains defined anchor points for workers to attach themselves to when necessary to avoid falling to another level. These points are defined in the Instruction Manual for the wind turbine or Safe Practice for the specific model of wind turbine.
- If these devices are not present or if it is necessary to create other anchor devices, fixed and resistant points located on the wind turbine's structure or components may be used. These points must be approved by GCT.
- The creation of such anchor devices must be done by means of an anchorage strap (for example, EN-795 Class B in Europe), whereby the anchorage strap is fitted to a fixed and resistant point and the fall arrest device employed is attached directly to the strap.
- The anchorage strap shall be fitted as follows:



3. WORKING INSIDE THE WIND TURBINE

- The following equipment is necessary for any operation in the wind turbine:
 - Working clothes, helmet with chinstrap (the helmet must be worn at all times both inside and outside the wind turbine), safety boots according to the task to be performed (protection against electrical and mechanical risks and with anti-skid soles), protective gloves depending on the task to be performed (protection against mechanical injuries and chemical injuries), harness, sliding fall arrest device appropriate for the installed lifeline and that meets the requirements of the applicable legislation of the country where the wind turbine is installed, two lanyards with energy absorber device and wide mouth hook, Rescue Kit, PPE depending on the task to perform.
 - As well as the mandatory PPE for each task, each pair of inspection/maintenance workers or work team must use the following:
 - Signs marking a danger area due to falling objects, in accordance with the section on "Placement of signs to indicate that there are personnel working on the turbine".
 - Signs prohibiting access to the tower, in accordance with the section on "Placement of signs to indicate that there are personnel working on the turbine".
 - Electrical lockout and tagout system in accordance with the section on lockout and tagout of electrical equipment: switchgear and operational.
 - Extinguisher (available in vehicles unless the task requires that they be available in the nacelle).
 - Mobile phone and intercom systems
 - A head lamp should be included with the ascent equipment, as well as hearing protection, depending on the work being carried out.

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3.1 PROCEDURE ON AN OPERATING WIND TURBINE

- **Wind farms under construction and in operation:**

- Wind turbines can only be switched on when they cannot be controlled remotely due to safety reasons (for the machine and people) if there are workers in the wind farm who can operate them locally, in accordance with the established operation protocols. When wind turbines have been operating for over three months and these cannot be controlled remotely, an exception to the above condition can only be made upon the evaluation of the wind farm's particular conditions and approval granted by the corresponding Gamesa Manager.

- **Wind farms in operation:**


- Access **to the wind farm** will be controlled so that only personnel assigned to carry out the required task and holding valid safety documentation can access the facility. Personnel control in the facility ensures that the location of each person assigned in a wind farm is known at all times. Therefore, whenever internal or external workers are about to carry out a task, they must notify the Gamesa farm supervisor and the Gamesa Operations Centre beforehand. Workers must go to the substation to notify the operator or manager of their presence and give proof of identity, if necessary. They must then go to the work site, and before commencing any work they must phone the assigned Remote Operations Centre (Gamesa, CORE, CCO or COC Operations Centre) to report their activity (work on tower or SET device) and request a WO (work order). If the activity involves changing the turbine status and this change is reflected in the remote control, workers will continue with the local or remote operator to report this circumstance, and that their activity is continuing.
- To **carry out the work**, maintenance workers must implement all necessary precautionary measures regarding the PLC (turbine with emergency push-button, turbine in Service Menu, etc.) ensuring that the wind turbine is in manual mode so that only the maintenance staff on site can change its status. Registration will be taken of the personnel present so that in the event of an emergency the last location of the pair of workers is known. Once the task is complete, the maintenance workers will reset the device to the final status and call the remote Operations Centre to report their departure, as well the device status. If a device needs to be left in a status other than that of normal operation, this decision and the reason for it must be reported straight away.
- If different entities (remote control stations) are **sharing** the operation, or different operators in the same remote control station, each time the operation control changes a transfer of responsibilities must take place, consisting of reporting the last status of the facility, machines, electrical devices, on site personnel, etc. as for passing over access to the remote control station.

- Smoking **inside** the wind turbine is strictly prohibited.

- When working on the wind turbine ladder, remain attached to a lifeline using the sliding fall arrest device, and to the ladder support or the rungs with threaded rod in the case of aluminium ladders, or directly to the rungs in the case of iron ladders, using the lanyard with energy absorber device and wide mouth hook.
- Extreme caution should be taken when moving in the nacelle to prevent blows and falls.
- When handling and moving objects and materials, use extreme caution not to place any parts of the body between the elements during movement and placement.
- While carrying out operations where there is a risk of entrapment (using hand tools, hydraulic tools, handling loads, etc.) and for handling enclosures with sharp edges, wear protective gloves against mechanical injuries 4543 with dorsal anti-impact protection.


	4 Resistencia a la abrasión (de 0 a 4)
	5 Resistencia al corte (de 0 a 5)
	4 Resistencia al desgarro (de 0 a 4)
	3 Resistencia a la perforación (de 0 a 4)



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- Falling material onto another level:
 - 1) Leave dismounted elements (tools, kits, etc.) in areas where they will not get in the way of tasks being carried out or the movement of the workers, and far from areas such as hatchways, holes, etc., through which they could fall.
 - 2) It is absolutely forbidden to work at different heights at the same time unless sealed surfaces can be guaranteed that prevent object and tools from falling on workers below.
 - 3) While working on tower platforms, close the ladder access hatchways (if applicable) and cover any holes, etc.
 - 4) When workers have to perform operations in areas where objects and tools could fall to lower levels, they must remain secured with an auxiliary anchoring system and use adequate tool bags or multipurpose bags to store all the components once they are removed. Do not leave elements used during the operations in areas where they could fall onto another level.
- Personnel falling onto the same level and a different level:
 - 1) If the work area is not accessible from the worker's location, ladders or work platforms should be used. It is prohibited to stand or sit on elements or components not meant for this purpose (components, cables, etc.).
 - 2) The work area must be kept clean of remains of materials and products used. Spare materials must be removed with the hoist or other appropriate lowering elements. Never throw them from the working area to the ground.
 - 3) Whenever it is necessary to access the tower platforms, always check first for oil on the platforms and clean up any oil before starting work, so that you do not slip or fall onto the same level or another level.
 - 4) When performing the operations, if workers must access the area below the frame and/or position themselves on the fibre elements, they must wear a harness attached by a retractable fall arrest device to an anchor device.
 - 5) When working on the nacelle without the cowling (removal or placement of machines and cowling or lifting/lowering tools), remain attached with a harness and lanyard with energy absorber absorber and wide mouth hook to an anchor device.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above shoulder level, reaching behind the body, pronounced inclination or turning of the back and neck, etc. Use lifting elements designed for this purpose and, insofar as possible, use mechanical tools. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.
- When cleaning the wind turbine, wear sealed protective goggles to protect against dust and liquid splashes and protective gloves against mechanical injuries. If chemical products are also used, gloves against chemicals injuries and respiratory protection must be used as per indication in the safety datasheet for the product used.
- When using any of solvents detailed in document GXX-000-31-00-00-0-400-0-F follow the measures given in ART-MTO GXX-000-31-00-00-0-400-0-F.
- When work with heat is necessary, a special work permit must be requested from Gamesa. Before performing this work, any oil residue must be cleaned from the area and a portable fire extinguisher and thermal blankets must be on hand.
- To open the hatchways hold them firmly, and remain attached via harness and lanyard with energy absorber device and wide mouth hook to an anchor device.
- Follow the indications given in the Instruction Manual for the wind turbine or Safe Practice for the specific wind turbine model for accessing and working on wind turbines and auxiliary installations at a wind farm.

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3.2 PLACEMENT OF SIGNS INDICATING THE PRESENCE OF PERSONNEL WORKING ON THE WIND TURBINE


- All teams of operators must use these when entering to work on any wind turbine belonging to GCT.
- When any operators, whether employed or subcontracted by GCT, are working on the turbine, it is possible that third parties unrelated with the installation may enter and suffer some type of harm (fall of materials, fall from a height, electrical risk, etc.). For this reason, it is required to use the signaling system to prohibit access for people not involved in the work and warn of the possible existence of these types of dangerous situations. Each team of workers will take a signaling system to be placed at the tower's entrance each time it enters a turbine.



- Most wind farms are in areas in which pedestrian traffic is rare. However, if due to the location and type of wind farm there is a risk of unauthorised intruders, the proprietor will be asked to take special measures to guarantee the safety of the wind farm personnel.
- If the measure taken is to lock the gate, it must be remembered that emergency services may need to access the wind turbine.

3.3 USING THE SAFETY HARNESS IN THE NACELLE

- The use of the harness in the nacelle is mandatory while performing the following operations, in which it is necessary to remain attached to an anchor device to avoid falls to another level:
 - 1) Accessing the interior of the rotor: to access inside the rotor and while working inside it, operators must wear a harness secured to an anchor device on the nacelle.
 - 2) In cases of wind turbines with anchor devices inside the rotor, workers may wear a harness tied to one of those points using a lanyard with energy absorber and a wide mouth hook, instead of using the retractable fall arrest device.
 - 3) Using the hoist: before opening the hatchway or door of the nacelle, the worker operating the hoist and all nearby workers must be anchored with safety harnesses to an anchor device.
 - 4) Access to the nacelle exterior: to access the exterior of the nacelle it is mandatory to wear a harness attached by lanyards with energy absorber device and wide mouth hook to the points indicated in the Instruction Manual for the wind turbine and Safe Practice for the specific WTG model.
 - 5) During operations requiring workers to remain on the fibre of the floor of the nacelle, workers must remain attached by a harness and lanyard with energy absorber device and wide mouth hook or retractable fall arrest device, to an anchor device, unless otherwise indicated in the Instruction Manual for the wind turbine and Safe Practice for the specific WTG model.
 - 6) Corrective maintenance operations: in corrective maintenance operations during which it is necessary to remove the nacelle cowling, workers must remain attached with a harness and lanyard with energy absorber device and wide mouth hook to an anchor device until the cowling is in place again, unless otherwise indicated in the Instruction Manual for the wind turbine and Safe Practice for the specific WTG model.

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- 7) Corrective maintenance operations: for corrective maintenance operations in which the removal of components means creating holes through which workers could fall to a different level, operators must remain attached by a harness and lanyard with energy absorber device and wide mouth hook until the new component is installed.
- The use of the harness in the nacelle is prohibited when workers are performing operations in the vicinity of moving elements, such as: locking the rotor, turning the rotor from the cardan, lubricating trestle bearings, and tasks which involve checking alignment in which it is necessary to take action on the cardan and turn it. In this case, the conditions specified in the following point must be met.
 - In order to carry out the rest of the operations, workers may remain in the nacelle without a harness, provided that one of the following two conditions is met:
 - 1) The workers accessing the nacelle have a rescue triangle (one per pair of workers), which will be used if it is necessary to evacuate a worker who has suffered an accident and who cannot wear the regular work harness defined by his or her company because of his or her condition.

The general steps for using the rescue triangle are:



Place the triangle next to the injured person.




Position the injured worker laterally and place the triangle along his back



Turn him 180° to completely place the triangle under his back



Place one of the triangle straps around an arm

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Place the other strap around the other arm



Connect the three ends of the triangle

NOTE: If the harness is not worn, it must be placed somewhere as close as possible to the work area, thus ensuring that both the harness and the fall arrest device (located on the nacelle access platform) are available to be used as quickly as possible in the event of an emergency evacuation.


3.4 LOCKING MECHANICAL COMPONENTS THAT COULD CAUSE ENTRAPMENT

3.4.1 LOCKING THE ROTOR

- This operation should be carried out **ONLY BY DULY TRAINED PERSONNEL** (routine maintenance workers pertaining to either GCT or a subcontracted company). Personnel not meeting this condition are strictly prohibited from performing this operation.
- When a maintenance operation must be carried out that requires the immobilisation of a moving part on the wind turbine (low-speed shaft, gearbox, transmission shaft, generator, etc.), first **LOCK THE ROTOR**, as defined in the Instruction Manual for the wind turbine and Safe Practices for the specific wind turbine model.

3.4.2 LOCKING BLADE MOVEMENT (VARIABLE PITCH WIND TURBINES)

- Before entering the hub to perform maintenance work or any other special activity that requires the blade yaw system to be locked, lock the rotor and notify the other operators that these tasks are to be performed so that they do not activate the emergency push-buttons or touch the wind turbine controls. Communication between the person who enters the rotor and the operator at the wind turbine control screen should be direct. The individual in the rotor should be in charge of the operation. This person will give the operator who controls the touchscreen or laptop computer (depending on the type of wind turbine) the necessary instructions at all times. Once the instruction is heard, the worker at the control screen will ask for confirmation from the person working in the rotor.
- The rotor must be locked before entering the hub to lock the blades.
- To perform blade lock follow the provisions defined in the Instruction Manual for the wind turbine and Safe Practice for the specific wind turbine model.
- **When to lock the blades:**
 - 2) When you have to work on the pitch control system.
 - 3) When you are going to leave the wind turbine disconnected from the grid for a long period (over 2 days), in the case of hydraulic pitch control systems.


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- In case of leaving the wind turbine unattended (no personnel present) the safety procedure to be followed on whether or not to lock the rotor and the blades will be the one indicated in the Instruction Manual for the wind turbine or Safe Practice for the specific wind turbine model.

3.5 LOCKOUT/TAGOUT OF ELECTRICAL EQUIPMENT

- Electrical systems must be locked by all workers (internal or subcontracted) carrying out work on wind turbines maintained by Gamesa and when, due to the nature of such operations, the electrical equipment must be interlocked to ensure that no one else can reconnect the power supply and expose the workers to the risk of electric shock.
- Any worker carrying out tasks during which they are exposed to electric shock must carry a locking and tagging system and position it when necessary. To reconnect the power supply, all of the workers must voluntarily remove their personal interlocking system. Depending on the operation to be performed, and the type of cabinets or switchgear in the wind turbine, the electrical equipment must be locked using specific elements such as safety locks, padlocks, signs, automatic lock devices, etc.
- All work requiring a different procedure for this equipment must be supported by a specific work instruction previously approved by Gamesa.
- Each time one of these devices is locked, a sign must be placed warning that it must not be removed, specifying the person who placed it, contact number, reason for locking, and the work start and end dates. Labels similar to those specified in the signalling equipment section must be used.
- **Locking requirements:**
 - Electrical Cabinets: disconnect the different cut-off switches as indicated in the instructions for the work to be carried out and the Instruction Manual of the wind turbine or Safe Practices for the specific wind turbine model.
 - Opening the H.V. Switchgear
 - The high voltage switchgear should be opened for any operation that requires entering the high voltage transformer compartment, any operation requiring workers to be under the tower entry walkway (due to the proximity of the power cables going to cabinets in the GROUND from the transformer, depending on the wind turbine model) if this configuration arises, and for any operation that requires checking the power cable or cables of the cabinets fed directly from the transformer, as well as checking or replacing components located in the same area of the cabinet where the cables from the HV transformer enter (unprotected area). Disconnection of the switchgear does not prevent the presence of voltage in the HV cable of the wind farm or in the intake sleeving to the switchgear and the output sleeving of the lines. Only by disconnecting and earthing the line switchgear of the previous wind turbine is it possible to guarantee total absence of voltage in these elements.
 - If one needs to access the area below the tramex, bear in mind that in accordance with the farm's layout, it may be necessary to disconnect the previous wind turbine, from the first one of the line or from the substation itself, depending on the High Voltage circuit of the wind farm.
 - The switchgear must always be locked in the earthed position (check diagram for the position of the earthing circuit breaker). Follow the instructions of the manufacturer of the high-voltage switchgear for carrying out the earthing and checking the absence of voltage. When checking the absence of voltage an appropriate voltage detector should be used.

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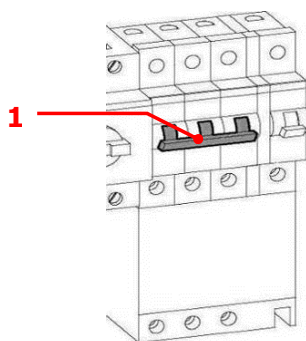
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3.5.1 LOCKING EQUIPMENT: TYPOLOGY AND USE

- Lock devices must be made in such a way as to ensure that excessive strain or special tools are not needed for their removal.
- Each padlock shall only have one key. Spare keys or master keys that open a given group of padlocks are prohibited. If a key is lost, the padlock must be removed and a new one ordered.

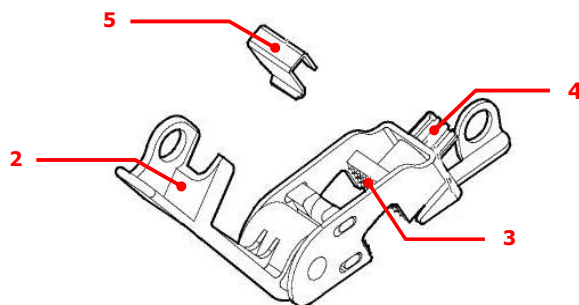
3.5.1.1 Three-pole earth leakage switches

- 1) Move the lever -1- of the three-pole earth leakage switch to the disconnected position (OFF).



Three-pole earth leakage switch


- 2) Open the red handle -2- of the 493B universal lock device.
- 3) Place the 493B universal lock device onto the three-pole earth leakage switch.



493B universal lock device.

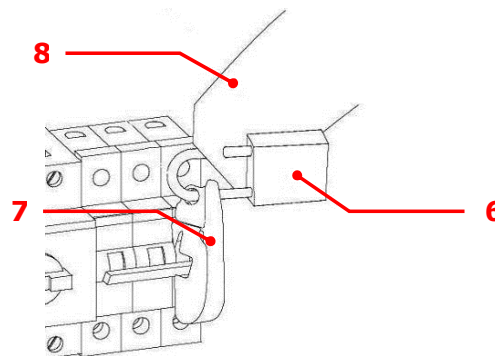
- 4) If the three-pole earth leakage switch has a metal connection bar on the lever: Fit the metal clips -5- onto the adjustable clamp -3- of the 493B universal locking device.
- 5) Thread the black knob -4- clockwise until the adjustable clamp -2- on the 493B universal lock device touches the lever of the three-pole earth leakage switch. Do not over tighten the black knob.

The adjustable clamps -3- tighten against the lever of the three-pole earth leakage switch when the red handle -2- of the 493B universal lock device is closed.

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- 6) Close the red handle -2- of the 493B universal locking device
- 7) Fit a lockout padlock -6- onto the rings on the 493B universal lock device -7- with the lockout tagout label -8-.

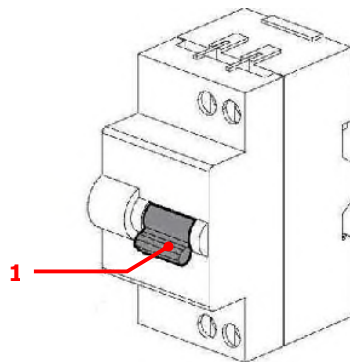


Locked three-pole differential switch

- 8) Check that the 493B universal lock device is correctly installed and that the lever -1- of the three-pole earth leakage switch cannot change to the ON position.


3.5.1.2 Two-pole earth leakage switches

- 1) Move the lever -1- of the two-pole differential switch to the disconnected position, OFF.

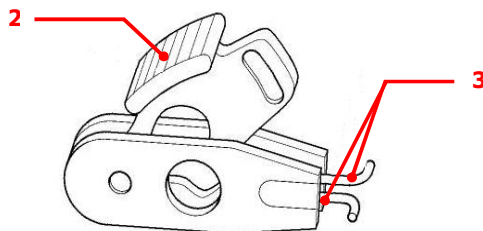


Two-pole differential switch

- 2) Open the red tab -1- on the 2391 universal locking device.
- 3) Press the metallic pins -3- of the 2391 universal locking device.
- 4) Place the 2391 universal locking device onto the two-pole earth leakage switch.
- 5) Close the red tab -2- on the 2391 universal lock device.

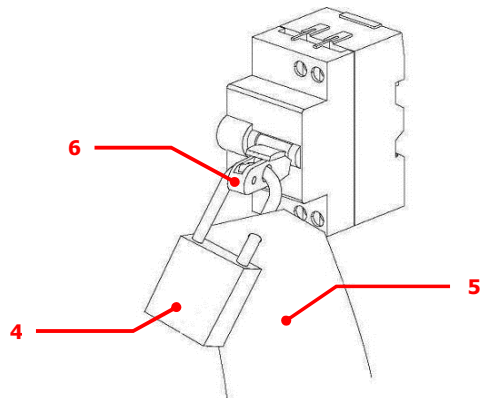
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4391 universal lock device

- 6) Fit a lockout padlock -4- onto the rings -5- on the 2391 universal lock device with the lockout tagout label -6-.




Locked two-pole differential switch

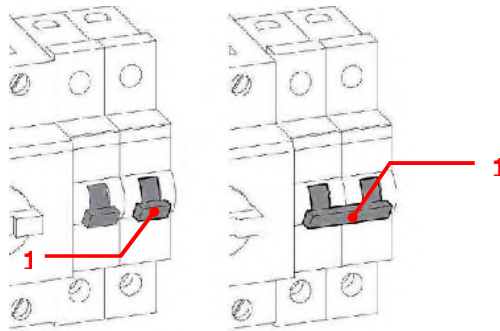
- 7) Check that the 2391 universal lock device is correctly installed and that the lever -1- of the two-pole earth leakage switch may not move to the ON position.

3.5.1.3 One and two-pole unregulated thermal-magnetic switches

- 1) Move the lever -1- of the unregulated one or two-pole thermal-magnetic switch to the OFF position.
- 2) Open the black tab -2- of the 2390 locking device.
- 3) Press the metallic pins -3- of the 2390 locking device.
- 4) Fit the 2390 lock device onto the lever of the unregulated one or two-pole thermal-magnetic switch.

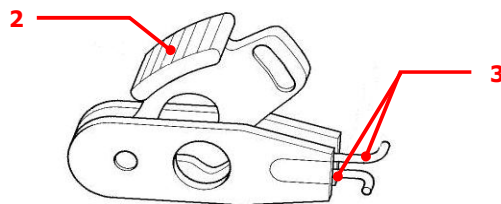
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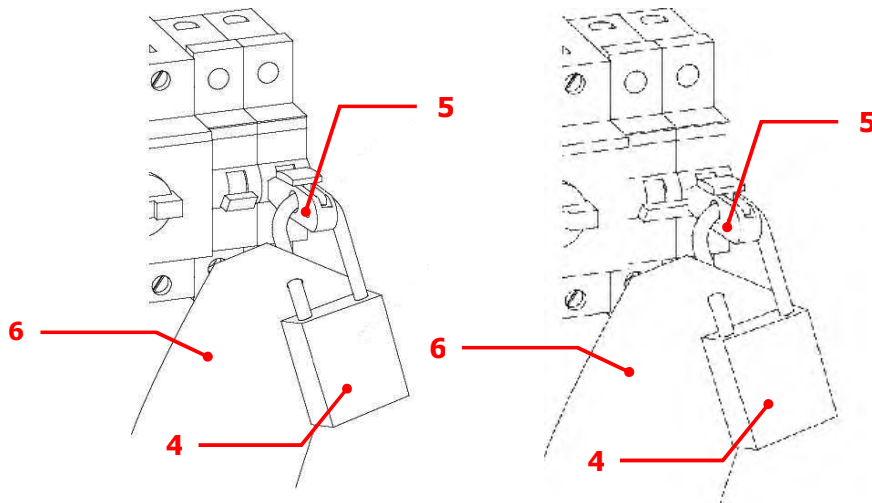
One and two-pole thermal-magnetic switch

- 5) Close the black tab -2- on the 2390 universal lock device.




4391 universal lock device

- 6) Place a lockout padlock -4- onto the rings on the 2390 universal lockout device -5- with the lockout/tagout label -6-.



Locked one and two-pole thermal-magnetic switch

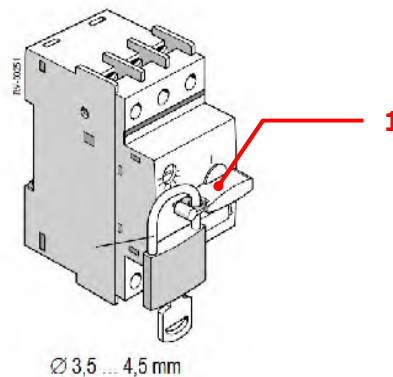
- 7) Check that the 2390 universal lock device is correctly installed and that the lever -1- on the unregulated one or two-pole thermal-magnetic switch cannot move to the ON position.

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3.5.1.4 Adjustable motor guards with rotary control

- 1) Move the rotary control -1- on the adjustable motor guard to the OFF position.

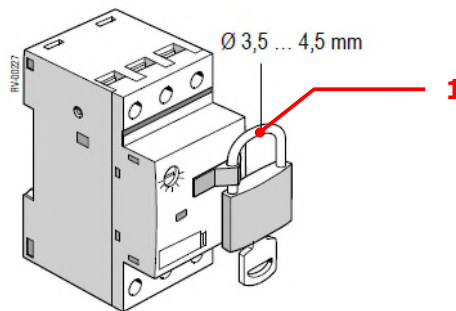


Motor guard with rotary control

- 2) Fit the lock device onto the adjustable motor guard with rotary control.
- 3) Fit the lockout padlock onto the locking device with the lockout tagout labels.
- 4) Check that the locking device is correctly fitted and that the motor guard's rotary control -1- cannot move to the ON position.


3.5.1.5 Circuit breakers with horizontal lever

- 1) Move the circuit breaker lever to the OFF position.



Motor guard with horizontal lever

- 2) Insert a lockout padlock with the lockout tagout label into the hole -1-.
- 3) Make sure that the circuit breaker cannot move to the ON position.

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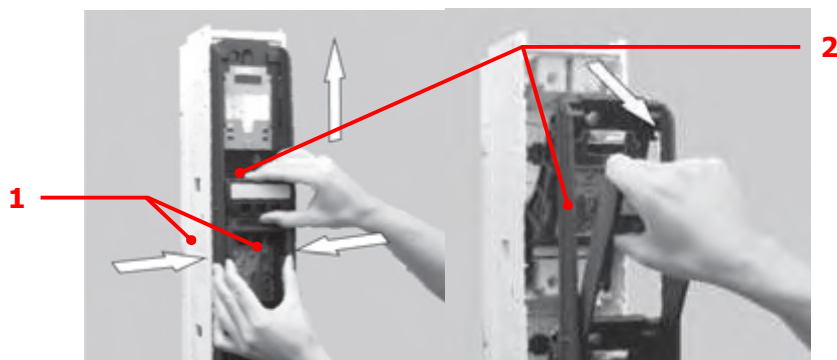
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3.5.1.6 Loaded fuse-holder isolators.

3.5.1.6.1 Type 1

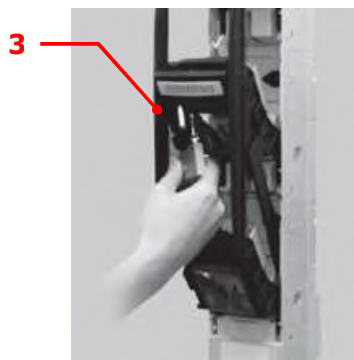
(e.g. 3Q2 in LVMD cabinet of GE1.5)

- 1) Press the side tabs -1- and pull down the lever -2-.



Removing fuses in type 1 isolator

- 2) Open the isolator by pulling down on the lever -2-.
- 3) Remove the fuses and leave them in a safe place.
- 4) Return the lever -2- to its original position.
- 5) Insert the locking clamp into the hole -3- that connects the lever -2- to the fixed part of the isolator.
- 6) Fit a lockout padlock onto the ring of the locking clamp with the lockout tagout label.




Locking the type 1 isolator

- 7) Check that the locking clamp is correctly fitted and that the isolator cannot be closed.

Unlocking:

- 1) Release the lockout padlock and then remove both the padlock and the lockout tagout label.
- 2) Remove the locking clamp.
- 3) Fit the fuses properly into their housing.

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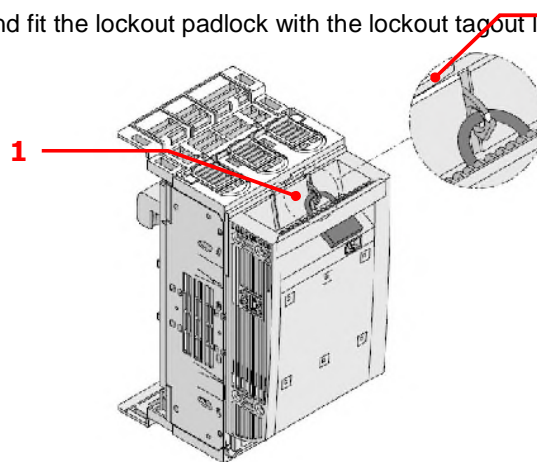
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- 4) Pull down sharply on the lever to close the isolator.
- 5) Return the lever to its original position.

3.5.1.6.2 Type 2

(e.g. 4Q3 in LVMD cabinet of GE1.5)

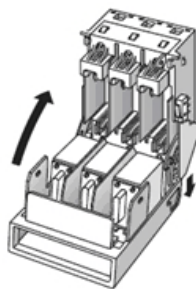
- 1) Open the isolator by pulling down on the front lever -1-.
- 2) Remove the fuses and leave them in a suitable place.
- 3) Re-close the isolator and fit the lockout padlock with the lockout tagout label -2-.




Locking the type 2 isolator

Unlocking:

- 1) Release the lockout padlock and then remove both the padlock and the lockout tagout label.
- 2) Fit the fuses properly into the isolator.
- 3) Close the isolator by sharply pushing the lever towards the fixed part of the isolator.



Closing the type 2 isolator

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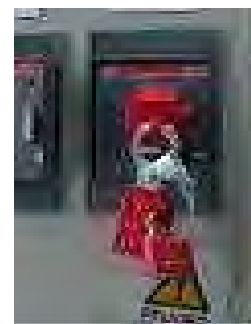
3.5.1.7 Other lock systems to be used:



Personal padlocks



Locking hasps



Single-pole circuit breaker lock devices with tabs



Multi-pole and single-pole circuit breaker lock devices




Thermal-magnetic switch lock device



Earth leakage switch lock device

3.5.2 TAGGING EQUIPMENT

- A white personal tagging adhesive label should be used to give the personal locking (padlock) equipment extra protection. The labels must be attached to the isolation devices individually.
- Only the worker who attached the white personal danger label can remove it, when:
 - The job has been completed.
 - The job has been reassigned.


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3.5.3 PROCEDURE FOR LOCKING/TAGGING ELECTRICAL EQUIPMENT

- The following measures must be factored in during these procedures:
 - Inspect the proposed work with the supervisor, job coordinator or team or facility manager. Agree on potential interference during the operation and whether an immediate shutdown is necessary to protect employees and/or the equipment.
 - Use normal shutdown procedures to stop the equipment (press stop buttons, open switches, etc.).
 - Label and lock (white label and padlock) the switch in the disconnected or safe position. Any workers involved in work with risk of electric shock are responsible for their own labelling/locking, even if only one person has put the equipment out of use. This also includes subcontracted workers. This personal protection cannot be delegated to other people, like team managers, group coordinators, etc.
 - Check power device insulation.
 - Test the circuit breaker or switch lever after locking to ensure it cannot move into the “on” position.
 - Test the turbine or equipment “on” controls after labelling/locking to ensure the main insulating device is open or in the safe position. You must do this before other employees who have labelled/locked start the work and while they are in a safe place.
 - Check there is no voltage between phases and between a phase and earth before commencing any work. Use a properly calibrated tester, insulating gloves against electrical injuries appropriate for the voltage and protective face shield for working with electrical hazards.
 - Only for labelling equipment personnel authorised by their company to work with electrical hazards may open an electrical cabinet and perform disconnection/connection tasks inside and verify the absence of voltage.

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- **Removal and lock**

- Employees shall remove their personal padlocks and danger labels when it is agreed that the work has been completed and after checking that the area is clean and that all tools are in their storage boxes.
- It is strictly forbidden to remove other people's personal danger labels or padlocks.
- When the worker who installed the labelling or locking device is not available to remove it, the device can only be removed at the orders of someone who has authority over that worker and is familiar with the equipment and work at hand. Before removing a padlock or label, check whether it is safe to remove it.
- Once it is safe to remove the absent worker's padlock and label (if necessary, they can be called at home to check that the person is not working in the danger area), a standardised procedure for removing labels/padlocks at the site must be followed.
- Padlock cutters or similar equipment can be used. The use of master keys or copies of keys for personal locks is strictly prohibited. Any key copy that may be supplied with the padlock must be destroyed before the personal protection equipment is delivered to the worker in question.
- Once a personal danger label and/or a padlock has been removed, the job supervisor, safety personnel and the worker himself must be notified. Workers whose padlocks and/or danger labels have been removed in this way must be informed before returning to work.
- Failure to comply with this procedure will result in disciplinary measures that could include dismissal. Inspection audits must be conducted when incidents or safety inspections reveal a lack of compliance with these instructions.

3.6 MARKING OFF WORK AREAS

3.6.1 Standard signposting

- Gamesa's activity requires lifting loads, from small loads using a hoist to heavy tonnage using cranes and at a great height. There is a risk of these falling on people in the area.
- Before suspending loads, the area will be cordoned off with a safety perimeter. This perimeter will be found by taking a 20m radius from the load hoisting point, bearing in mind its displacement.
- Depending on the work to be performed (preventive or corrective maintenance, assembly, etc.), the area of impact on which the load may fall will be greater, and this must be taken into account when positioning the signs.
- Each team of workers will have its own signalling system that must be set up every time loads that could fall onto personnel located in the area are to be suspended. This signalling shall be positioned before starting the lifting operations, using either hoist or cranes, and it will remain installed until they are finished.
- The signaling system (biodegradable tape, bars and warning signs, or plastic chains, cones and warning placards) must warn of the risk and delimit the area, prohibiting access to anyone not involved in the job.
- Personnel involved in the operations may access the area only when the work to be performed requires as such (securing the load to hooks or lifting equipment, receiving the load, etc.), although always respecting the regulations forbidding that they stand underneath suspended loads.

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Support bars-posts



Weighted cones



Signalling tapes



Plastic chains



Risk indication sign


3.6.2 Alternative signposting system

- The alternative signposting system specified below only applies when there is a risk of falling objects and/or tools (during the use of the hoist, carrying out operations outside the nacelle, work with the hatchway open, etc.) during start-up or preventive, predictive or minor corrective maintenance work. The stipulations in the above point on Standard Marking must be followed for any other type of operations.

PLACEMENT OF THE MARKING SYSTEM:

- Placement of two warning signs, each one of them positioned at 40m from the yard access, and on both travelling directions of the road.



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- Demarcation of access to wind turbine yard. Cones (at least 5) will be placed approximately 4m apart from each other for said demarcation. In order to ensure the stability of the cones and prevent them being turned over by the wind, grounding pegs should be placed in them and nailed into the ground. The number of stakes to place depends on the weather conditions at the time of marking off, but in general terms you can proceed by placing stakes on the end cones and then on every other cone. This allows a cone-to-cone chain to be placed cutting off access to the wind turbine yard.



ACTIONS FOR CARRYING OUT THE LIFTING AND LOWERING OF LOADS WITH THE HOIST:

- Follow the instructions in the Instruction Manual for the hoist, as well as the Instruction Manual for the wind turbine or Safe Practice for the specific wind turbine model of at all times when operating the hoist.
- When lifting and lowering loads with the hoist, it is a mandatory requirement for a worker to always be in the wind turbine yard when these works are taking place.
- Depending on the type of wind turbine, before opening the hatchway (floor opening), gate (side opening), extending the hoist arm (opening the cowling), etc., the worker that is going to handle the hoist must request permission from the worker positioned in the wind turbine yard, and may not continue the operation without confirmation.
- The worker located in the yard must be positioned outside of the safety perimeter, understood as a radius of 20m from the load hoisting point. Said worker must first ensure that there is no personnel within the safety perimeter and then give the permission requested to the worker in charge of handling the hoist.

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- In cases where people appear during the lifting or lowering operations, both in vehicles and on foot, travelling around the area of the wind turbine, and there is a possibility that they may enter into the risk area, the worker will approach said persons and inform them of the risk of falling suspended loads and of the prohibition of entering the safety perimeter.




- The worker that is located in the wind turbine yard may only leave his post when his colleague in the nacelle notifies him that the hoist, and the load that is being lifted are in the nacelle and the hatchway and gate have been shut, and the hoist arm withdrawn, etc.

3.7 LOAD HOISTING METHODS

3.7.1 Use of hoist

- General**
 - Follow the instructions in the Instruction Manual for the hoist, as well as the Instruction Manual for the wind turbine or Safe Practice for the specific wind turbine model, at all times when operating the hoist installed in the wind turbine.
 - The hoist must never be used to lift heavier loads than those specified on the nameplate.
 - Loads should always be lifted vertically, and never at an angle.
 - In icy weather, check for ice on the chain, the chain bag, the nose and the chain guide. In the event of ice, this should be removed before starting the crane. An unloaded trial run is recommended before using the crane to carry loads.
 - Immediately stop using the hoist if any part is not working correctly, if you suspect something is broken or if there are unusual noises.
 - Never use the hoist to lift, support or transport persons.
- Before working with the hoist**
 - The area must be marked as specified in the section on "Marking work areas". No worker must remain in this area during the load hoisting or lowering procedure. Personnel involved in the operations may access the area only when the work to be performed requires as such (securing the load to hooks), although always respecting the prohibition of standing underneath suspended loads.
 - Each team of workers will have its own signalling system that must be set up every time loads that could fall on personnel located in the area are to be suspended. This signalling will always be positioned before starting the lifting operations with the hoist and will not be removed until its use is complete and the nacelle door or hatchway has been closed.

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- Before opening the hatchway, gate, cowling, etc. of the nacelle (depending on the manufacturer and wind turbine model), the worker operating the hoist must be anchored with a harness to an anchor device.
- Before using the hoist, check that the entire chain or towrope is within the container used to store it, that the hoist chain or towrope is inside its guide, and that the entry pre-guide and the exit guide (end of the hook) are in perfect condition.
- Before hoisting any tools to the nacelle, make sure they are correctly attached to the hoist and verify that they are in good condition. Do not hold the chain or towrope with your hands to avoid being trapped between the chain and the hoist.
- When possible, there should be two operators in the nacelle during the operations.
- Do not use the hoist to lift loads when the wind speed exceeds the speed indicated in Safe Practice for the specific WTG model and/or in the Instruction Manual for the wind turbine, for the use the hoist. If the wind speed approaches this limit, ensure that the suspended load is at least 20 kg to prevent it from swaying, and use retention and guide lines if necessary.
- The tools, materials, etc. must be hoisted in approved, sufficiently sturdy containers, not exceeding the maximum working load limit (WLL) of the manufacturer. The tools and materials should not overflow from the container. The height of the containers will be such that once all the hoist chain is lifted, the container can be placed inside the nacelle without manually lifting it.



- Do not leave vehicles within the cordoned-off safety perimeter to avoid the need to enter the area and risk being hit by falling tools or materials.

• During operations

- The operator working with the hoist will pay particular attention to any abnormality detected, stopping the work immediately.
- The operator working the hoist must remain next to it to operate its control panel and check that the chain is correctly distributed in the deposit provided for this purpose. The hoist controls must not be locked using rotor shafts, bolts, flanges, adhesive tape or any other tool.
- If the hoist chain starts running out of the container or falling onto the floor of the nacelle during use, the operation will be immediately interrupted, the direction of movement of the chain reversed in order to collect it, and the necessary operations carried out to ensure the chain/towrope is grouped together/rolled up correctly in the container.

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- Where the chain/towrope slides at a greater speed than the hoisting speed, the operation is interrupted and the area abandoned, allowing the chain to fall to the ground. The hoist will be secured when the chain comes to a standstill. Under no circumstances will attempts be made to prevent the chain/towrope from falling using any body part or tool, as this may lead to entrapment.
- In the event of the hoist chain/towrope falling and the retention system being triggered, the hoist must not be used until the chain has been replaced because the stress withstood by it could have damaged it, decreasing its resistance.
- Before retrieving the load lifted with the hoist and before removing it where a load has been unloaded outside, make sure there is nobody at the base of the wind turbine upon whom the load could fall. The hatchway, door, etc. will only be open for these operations so that material cannot fall to the base of the wind turbine.

3.7.2 Pulley lifting system

- The hoisting system described in this section will be used for correctly hoisting and lowering loads both inside and outside the wind turbine when an electric hoist cannot be used.
- The load limits are related to the method used for hoisting and lowering:
 - 1) Maximum load for hoisting and lowering outside the tower when using a vehicle: 125 kg.
 - 2) Maximum load for hoisting and lowering outside the tower when using a manual method: 50 kg.
 - 3) Maximum load for hoisting and lowering inside the tower: 50 kg.

3.7.2.1 Hoisting and lowering loads outside the wind turbine:




Before carrying out any lifting operation with the hoist, the area must be properly signposted to indicate that access of unauthorised personnel is prohibited and to indicate the risk of falling suspended loads. Furthermore, always check the condition of the tools and their correct placement after their use.



Do not use the hoist to lift loads when the wind speed exceeds the speed indicated Safe Practice for the specific WTG model and/or in the Instruction Manual for the wind turbine, for the use the hoist. If the wind speed approaches this limit, ensure that the suspended load is at least 20 kg to prevent it from swaying, and use retention and guide lines if necessary.

HOISTING PROCEDURE

- **Mounting the upper anchor:**
 - 1) Climb the wind turbine following all the safety rules that apply, depending on the work to be done, and according to the indications in the Instruction Manual for the wind turbine or Safe Practice for the specific wind turbine model. Bring up the following materials for assembling the hoisting system:
 - Cord, approximately 4 mm
 - 2 carabiners
 - 1 swivel safety link
 - 1 pulley with brake or lock.

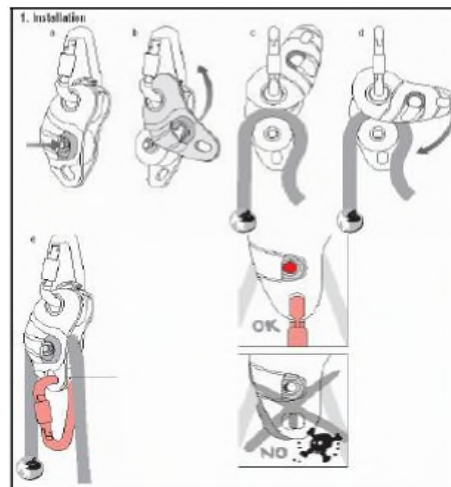
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- 2) Once up, correctly mount the pulley to a sufficiently sturdy fixed point, such as **the beams or the support arm of the electric hoist**:



Ensure the pulley is properly mounted and that you have placed another carabiner at the bottom joining the two holes, as shown in the following figure.




Placement of the rope in the pulley



Before opening the nacelle door, hatchway or cowling (depending on the wind turbine model) and during the load suspension operations, you must always remain attached to an anchor device.

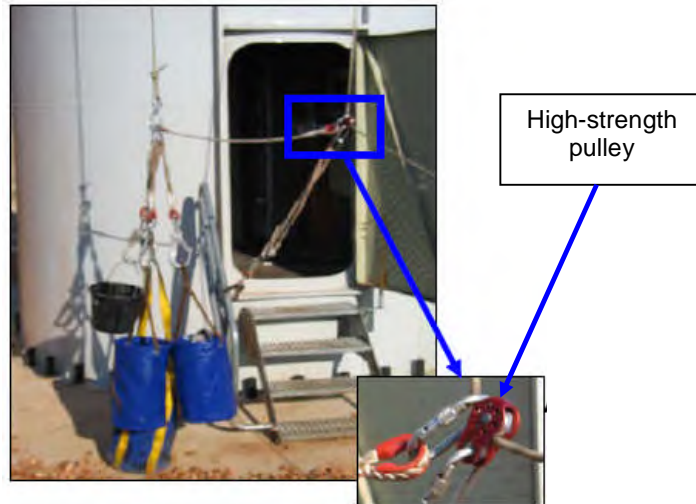
- 3) Once you have opened the door, hatchway or hood through which the load is going to be hoisted/lowered, unhook the cord so that the person at the bottom of the wind turbine can tie it to the hoisting rope, which will be 10.5 mm and preferably made from static nylon, thus making the drawback.
- 4) One end of the rope will be used to hook on the load (load line) and the other end will be the pulling line to pull or retain the load.

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- **Mounting the lower anchor:**

When the rope is threaded through the locking pulley there will be two lines running downwards. So that the pulling line works perfectly, a rope of approximately 1 m must be tied by one end to the tower access ladder, and by the other end to a safety pulley, through which the pulling line passes. This will make the pulling line more parallel to the ground so that it can be pulled more easily, either using a vehicle or manually (see the following figure).



Mounting the lower anchor

- **Securing the tools:**

At the end of the load line, fasten as many ropes with hooks and loads as you want to hoist (Maximum load: **125 kg.**).

Important: a fixed rope with a karabiner at each end must be fastened at the end of the load line, passing the pulling line through the karabiner on the other end. This allows the load to be hoisted in a controlled manner without swaying too much.



Placement of multiple ropes with hooks and guides ropes for the load


- **Hoisting the load using a vehicle:**



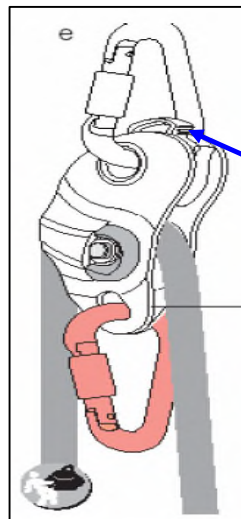
The load hoisting and vehicle transit area must be marked to prevent anyone standing underneath the suspended loads and being knocked over while the vehicle is moving.



Once the load to be lifted has been secured and before starting to hoist the load, the hoist system pulley safety latch needs to be repositioned so that during the process when no force is applied to the pulling line the load does not descend and become locked waiting for the next pull (see the following figure).

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Direction of rotation latch:
rotation in both directions
and rotation in a single
direction (load hoisting)

Pulley latch

The pulling line is secured to the vehicle in order to control the hoisting process. The load is hoisted by driving the vehicle in reverse. The descent control device between the pulling line and the vehicle's anchor should be used so that this anchor point does not come loose during load descent operations. The descent device will remain locked during the hoisting procedure, performing the same role as a carabiner.



Link with several carabiners

Front link


Descent control system



Placement of the rope on the vehicle



Keep in mind that in some vehicles the anchor of the connecting rope could be cut between the vehicle anchor point and the descent control system. One or two extra carabiners should be added to prevent this as seen in the image above.

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DESCENT PROCESS



The descent area must be cordoned off to prevent anyone standing underneath suspended loads.

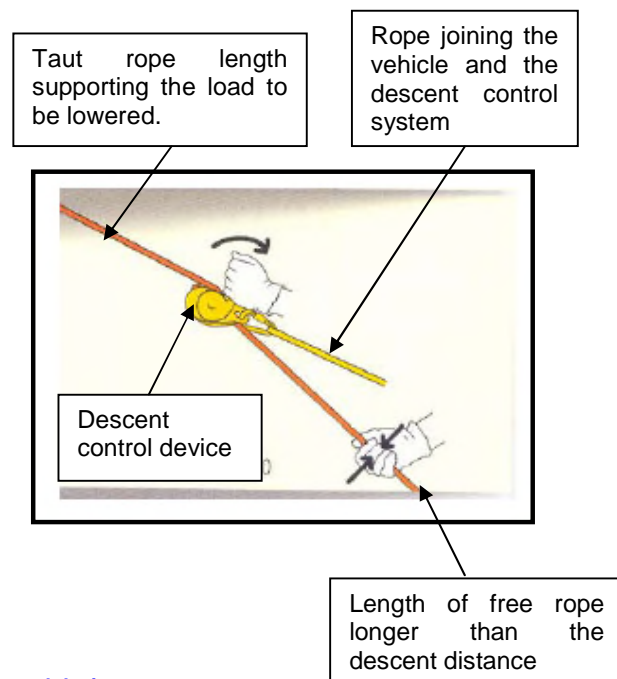
• Lowering the load

- 1) For lowering the load, a descent control device must be installed, handling it as follows:
 - The descent control device is operated via the handle, and the speed is adjusted by pulling more or less free rope with your hand. When the grip is released, the rope is locked.
 - It has an antipanic function which automatically locks it if the grip is pulled too hard; the rope's sway locks the device on the rope while performing a task.




Fig.9

Descent control device



Once the load has been fastened and before commencing the lowering procedure, make sure that the position of the pulley's latch permits rotation in both directions.

NOTE: if the load must be hoisted outside the tower manually, the procedure is the same as the one described above, with the exception that the descent control device is removed because a vehicle will not be used for lifting the load nor for retaining it while it is lowered. The load descent procedure will be the same as the one described in the Descent Procedure section, with the difference that this time the elements onto which the descent system is secured are not the ladder supports, but rather above the hoist trolley beams for the models. In this case, the maximum load during the hoisting and descent processes will be 50Kg.

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3.7.2.2 Load hoisting and lowering inside the wind turbine:

When climbing up the ladder, it is absolutely prohibited to carry any type of element or tool unless a closed, approved bag is used to keep the carried elements from falling. This bag must remain attached at all times to the harness worn by the worker who is climbing.



Before carrying out any lifting operation with the hoist, the area must be properly signposted to indicate that access of unauthorised personnel is prohibited and to indicate the risk of falling suspended loads. Furthermore, always check the condition of the tools and their correct placement after their use.



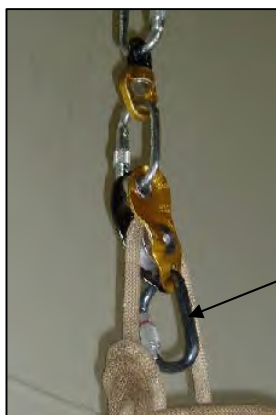
In order to perform the suspension of loads the wind speed must be equal to or less than that indicated in Safe Practice for the specific WTG model and/or in the Instruction Manual for the WTG.

HOISTING PROCEDURE

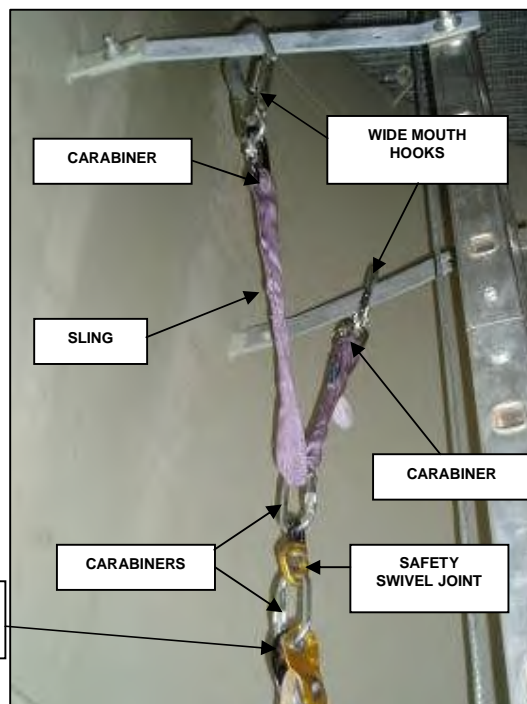
- Hoisting system installation procedure:**

- 1) Climb up to the wind turbine following all the applicable safety rules, depending on the task to be performed and take up the following materials for mounting the hoisting system:

- 1 Sling.
- 2 wide mouth hooks
- 5 Carabiners.
- 1 Safety swivel link.
- 1 Pulley with brake or lock.




CARABINER

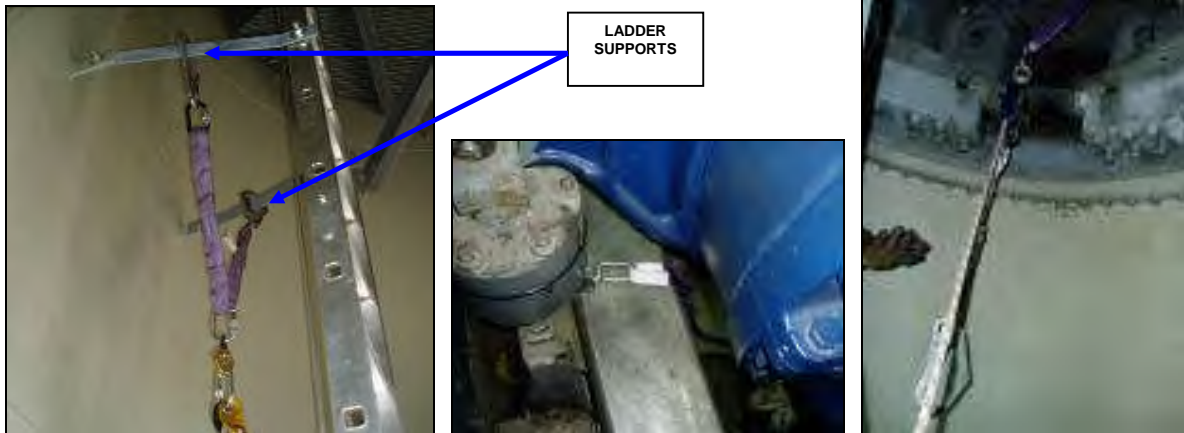


Mounting on the ladder supports and the safety carabiner on the pulley

- 2) The elements on which the hoisting system is going to be anchored will depend on the area of the wind turbine where the load is being hoisted and the type of wind turbine: fastening lugs on the vertical ladders (e.g. Gamesa and Nordex), platform railings (e.g. Ecotecnica), welded handholds on the platforms, etc. The pulley must always be centred over the ladder shaft.

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Examples of anchors to the ladder struts and components in the nacelle



Check that the pulley is properly mounted and that another carabiner has been placed at the bottom, joining the two holes.

All persons located on the various tower platforms while their hatchways are open must remain attached to an anchor device, except when there are collective protection measures (e.g. handrails).

- 3) Once you have opened the hatchways through which the load is to be hoisted/lowered, unhook the cord so that the co-worker inside the wind turbine can tie it to the hoisting rope, which will be 9 mm and preferably made of static nylon, for the drawback.
- 4) One end of the rope will be used to hook on the load (load line) and the other end will be the pulling line to pull or retain the load.


- **Securing the tools:**

At the end of the load line, fasten as many ropes with hooks and loads as you want to hoist (Maximum load: **50 Kg.**).

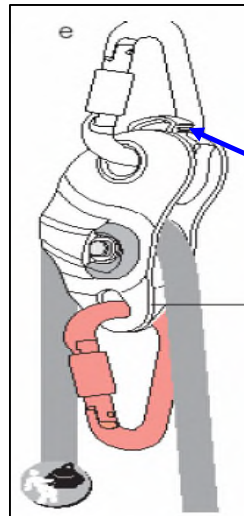
- **Hoisting the load:**



Once the load has been secured and before starting to hoist the load, the pulley safety latch needs to be repositioned so that during the process when no force is applied to the pulling line the load does not drop and become locked waiting for the next tug.

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Pulley latch

Direction of rotation latch:
rotation in both directions
and rotation in a single
direction (load hoisting)



No one must stand underneath suspended loads during the hoisting procedure.

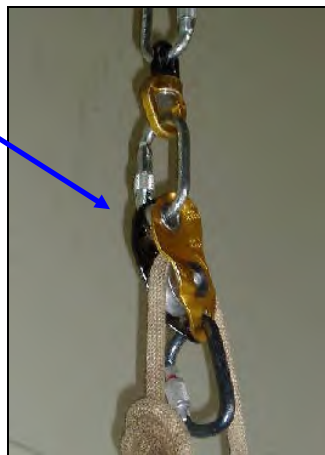
Hoist the load to the desired position.

DESCENT PROCESS

- Descent system installation procedure:**


The procedure for installing the descent system and for securing the tool is the same as for hoisting, except that the pulley with a brake or lock is replaced by the descent control device.

Pulley with brake
or lock



Descent control
device



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- **Lowering the load:**



No one must stand underneath the load descent path.

The descent will take place by operating the descent control device as specified in point “**Use of the descent control device**”.

3.7.3 USE OF THE LIFT FOR HOISTING LOADS

- Carrying of loads in the lifts with towropes, when personnel are present in the cabin, is only permitted when the evacuation onto the ladder is conducted through the front door, ensuring at all times that the maximum admissible load for the equipment is not exceeded and the wind speed limit for its use is respected.
- In the case of lifts with fixed guides, carrying of loads is permitted providing the maximum admissible load for the equipment is not exceeded, the wind speed limit for its use is respected and its movement is conducted in AUTOMATIC mode, with no personnel present inside, controlled by way of the control panel located on the lower platform of the wind turbine. This is because, if a worker uses the lift manually and there is a load inside, in the event that an evacuation is required the load being carried would block our exit from its lower section.
- In the case of rack-pinion lifts, carrying of loads is permitted providing the maximum admissible load for the equipment is not exceeded, the wind speed limit for its use is respected and all indications in the Instruction Manual for the lift, the Instruction Manual for the wind turbine and Safe Practice for the specific wind turbine model are followed. In all circumstances, workers shall observe the rule stating that the load must never hinder evacuation of the lift in the event of an emergency.

3.8 USE OF THE AUXILIARY POWER GENERATOR SET

- Follow the indications in the Instruction Manual for the wind turbine and Safe Practice for the specific wind turbine model for installing and using an auxiliary power generator set.
- In all cases:




The operation must be carried out by authorised personnel, and such authorisation must be in accordance with current legislation protecting workers from electrical hazards in the country in which the wind turbine is installed.

The power generator set must be positioned outside the wind turbine.

Workers who are to carry out work in the wind turbine must be equipped with a head lamp to be able to descend from the nacelle in case the power generator set is disconnected.

- For safety reasons, the 5 Golden Rules must be applied to all electrical disconnections that have to be carried out.
- Ensure that the Power Generator Set has an Id=30mA differential element as a protective measure against indirect contacts (before performing the operation check that the unit works correctly, by means of the test button), thermal magnetic for each output of the unit and that it is earthed with a cable and copper stake or with a cable and a clamp connected to the wind turbine earth.
- Clean the area where the power generator unit is going to be set up of materials and substances that can cause a fire. There must be a CO2 extinguisher near the Power Generator Set in case of fire.
- Having concluded the work, follow this sequence in reverse to leave the wind turbine in its initial condition.

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- Before turning on the power generator, ensure that the differential and thermal-magnetic elements are open. Once the power unit is switched on, before you close the differential thermal-magnetic of the voltage outlet that is going to be used, the worker who is going to make the connection must notify any workers who are or may be at risk of electric shock.


3.9 OTHER MEASURES TO BE TAKEN INTO CONSIDERATION WHEN WORKING INSIDE THE WIND TURBINE

- Gas Discharger**

- The dischargers, present in certain models of wind turbine, consist of sealed doors that are opened due to the excess pressure caused by a short circuit in the busbar area. These dischargers are installed to protect people from the risk of blows, burns and intoxication should the front cabinet doors burst due to this short circuit. They allow gases to be expelled through the rear part of the cabinet or the ground depending on their location, thus preventing operators from suffering aforementioned injuries. The expelled gases will be sent outside the nacelle through the ventilation system.
- The gases that the dischargers in the cabinets expel are caused by a combustion process (SOx, NOx, CO, CO2) and more specific gases due to the combustion of special materials from which the cabinet components are made. These gases are toxic and reach high temperatures, with the consequent risk of burns and the doors hitting people. For this reason, it is prohibited to walk around areas in which these dischargers are installed while the wind turbine is powered and there is a risk of falling tools, cabinet components, etc. which could come into contact with the wires and cause a short circuit or one of the connections coming loose (also resulting in a short circuit). The areas in which these dischargers are installed and which might be areas through which workers need to walk to access parts of the wind turbine are marked by no entry signs.
- If any of the dischargers is open, the wind turbine must be left without voltage, according to the de-energising procedure, an inspection run to check if there has been a short circuit, the dischargers must be re-sealed using a nylon bolt, and the wind turbine energised according to the re-energising procedure.

- Depressurising hydraulic units**


- Whenever carrying out handling operations on elements under pressure, pressure must be removed before performing these tasks.
- During the depressurising process, no worker must stand in front of the hydraulic unit. He should stand to the side of it to avoid being hit by flying fragments and jets of fluid.
- The mandatory protection equipment to be used by the worker that performs the operation of discharging the accumulators is: For depressurising the hydraulic equipment use a polycarbonate shield for protection against projections of oil and particles and protective nitrile-coated gloves against mechanical injuries, unless otherwise indicated in Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.
- Always follow the indications in Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine for depressurising the hydraulic equipment.

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4. WEATHER CONDITIONS

- The **wind speed limits** for carrying out tasks in wind turbines are shown in:
 - The specific work instructions for the tasks to perform.
 - The Instruction Manual for the wind turbine.
 - Safe Practice for the specific WTG model
- Wind Speed Limits** to hoist loads using a crane: in the event of a discrepancy regarding the wind speed limits as defined by GCT and as defined in the crane manufacturer's manual, the following procedure must be followed:
 - If this manual states that it is prohibited to suspend loads at lower wind speeds than those defined by GCT, the first wind speed determines the operation, because the crane has been designed considering that limit.
 - If the manual recommends that operations be limited to speeds lower than those specified by GCT, the prevailing criteria to follow for the operation shall be established by the crane operator, based upon the particular conditions, his work experience and expertise with the crane itself, nevertheless adhering to the limit established by the automatic load lifting limiter with which the crane is equipped..
- In the event of discrepancy between the wind speed shown on the wind turbine anemometer and the wind speed on the crane anemometer, the speed on the crane anemometer will be considered the valid one.
- When lack of visibility due to fog affects the suspension of loads with a crane, the situation must be evaluated to make sure that at all times there is sufficient visibility for hoisting the loads and in the storage areas or those along which the operation is to be carried out. The Manoeuvre Supervisor, Preventive Resource Supervisor and Crane Operator must agree that the operation can be carried out, bearing in mind that given the crane operator's experience, he will have the final say as to whether the operation can be performed or not.
- Thunderstorm:**
 - Even though the wind turbine is equipped with a lightning protection system, it is necessary to implement a series of preventive measures to guarantee safety in the event of any unexpected incident or failure.
 - In the event of being surprised inside the wind turbine by an electrical storm, comply with the steps given below:
 - Exit the wind turbine if there is risk of a lightning storm, and even exit the wind farm if the substation does not guarantee adequate safety conditions for shelter. As long as the storm has not yet started or is sufficiently far away, leave the wind turbine as quickly as possible without compromising the safety of the persons involved at any time. Enter the vehicles, close all of the windows and drive to the substation if it guarantees adequate safety conditions for seeking shelter there; otherwise, leave the wind farm.
 - If the storm is so close that leaving the wind turbine is not convenient, remain calm, as the wind turbine is equipped with protective measures against electrical discharge. Remain at a distance from electrical cabinets and move toward the closest tower platform as quickly as possible. Remain with one's feet together and do not touch anything until the storm moves away. Remain on the ladder as short a time as possible.
 - Do not remain in the yard or near the wind turbine. If lightning strikes the wind turbine, it is possible for a voltage gradient to be produced around the wind turbine which would be extremely dangerous.
- When opening the tower door, grasp the door firmly, do not stand within the door's aperture radius, and check that no other co-worker is either.
- Generic assembly and major corrective measures involving suspension of loads with cranes cannot be performed at wind speeds higher than those indicated in Safe Practice for the specific WTG model and/or the Instruction Manual for the WTG (for some operations the limit may be lower, see safe practices for corrective maintenance).
- For specific Preventive or Corrective Maintenance tasks, see the safe practices for the operation in question.

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4.1 WORKING WITH THE RISK OF THERMAL STRESS

4.1.1 THERMAL STRESS CAUSED BY COLD (HYPOTHERMIA AND FREEZING)

4.1.1.1 Measures against cold – preventive measures to be considered

- Cold weather conditions impose greater demands on the human body in three ways: due to the air temperature, due to the movement of air (wind speed) and due to relative humidity. In order to work safely, this increased demand must be countered with:
 - Adequate insulation (layers of protective clothing),
 - Physical activity,
 - Controlled exposure to cold (Planning of work times and warm-up exercises).
- At any temperature, wind chill increases with wind speed. The combined effect of air temperature and wind speed is called "equivalent chill temperature" (see Table 1), and this wind chill temperature may be used as a general guideline for determining the required work clothes and possible effects of the cold.

WIND CHILL CHART											
			Ambient Temperature (°C)								
			4	-1	-7	-12	-18	-23	-29	-34	-40
Viento (m/s)	Wind km/h	Velocity mph	Equivalent Chill Temperature (°C)								
Calma	0	0	4	-1	-7	-12	-18	-23	-29	-34	-40
0 (m/s)	0	0	4	-1	-7	-12	-18	-23	-29	-34	-40
2.2 (m/s)	8	5	3	-3	-8	-14	-21	-26	-32	-38	-44
4.4 (m/s)	16	10	-2	-8	-15	-23	-30	-35	-43	-50	-57
6.7 (m/s)	24	15	-6	-13	-20	-28	-36	-43	-50	-58	-65
8.9 (m/s)	32	20	-8	-16	-23	-32	-39	-47	-55	-63	-71
11.1 (m/s)	40	25	-9	-18	-26	-34	-42	-51	-59	-67	-76
13.3 (m/s)	48	30	-10	-19	-27	-36	-44	-53	-62	-70	-78
15.6 (m/s)	56	35	-11	-20	-28	-37	-46	-55	-64	-72	-81
17.8 (m/s)	64	40	-12	-21	-29	-38	-47	-56	-65	-73	-82

Adapted from: Threshold Limit Values (TLVTM) and Biological Exposure Indices (BEITM) booklet, published by ACGIH, Cincinnati, Ohio

Little danger in less than one hour exposure of dry skin

Maximum danger of false sense of security


DANGER – Exposure may result in frostbite

GREAT DANGER – Frost may freeze within 30 seconds

Table 1 – Wind chill temperature chart
Source: American Conference of Governmental Industrial Hygienists (ACGIH®)

4.1.1.2 Planning and Decision-making for Accessing a Wind Farm

- The Gamesa manager responsible for the tasks (Ex., Project Director, Services Centre Manager, CRO Manager, etc.) must evaluate the need for including in the project planning the elements required for performing tasks at low temperatures. Likewise, subcontractors must also be requested to consider working conditions at low temperatures when planning their activities.

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- Upon the coming of winter (given the geographical area and weather predictions), these managers must:
 - Hold a meeting with the Client to define and agree to the measures requiring implementation to ensure that access to the Wind Farm, platforms, etc., is done in proper conditions; this includes the use of equipment for removing snow, if necessary.
 - Hold a meeting with the Subcontractors to make sure that they are prepared (huts, vehicles, clothes, planning of tasks, etc.).
 - Inform personnel of decisions taken (Client, Gamesa Supervisors, Subcontractors and H&S personnel).
- Upon arrival of the low temperatures, the manager must implement the protocol for evaluating conditions and decision-making – The Director / Supervisor (of the Project or of the Wind Farm in operation), Equipment Supervisors of the Subcontractors, with support provided by the H&S personnel, are the most adequate persons for evaluating conditions and decision-making on procedures. Some aspects to be considered include the following:
 - Wind farm access roads and internal roads (snow, ice, visibility of the road limits).
 - Platforms (snow and ice on the platform and visibility of limits of platforms, trenches, and the like).
 - Wind turbine blades and crane parts (accumulated ice which may fall upon workers or others).
 - The roof of the nacelle and other work and circulation areas, such as the wind turbine access ladder, ladder for climbing the tower and the inside and outside of the hub (accumulated ice and snow).
 - Cranes and other work equipment (Check that all systems work properly and according to the manufacturer's instructions - including the anemometer).
- During coordination meetings, or at any other time, the careful planning of tasks must be assured in order to guarantee adhesion to the recommendations given in this guide.

4.1.1.3 Facilities

- In order to perform tasks at low temperatures continuously, it is necessary for the facilities to have adequate heating (buildings, huts, containers, tents, etc.). These facilities and services must offer workers hot drinks (hot drinks with sugar and soup are preferable to coffee, as coffee increases the loss of body heat). These facilities must also make it possible for workers to change their clothes if they become humid.
- Heaters must be available for workers to use in closed work areas, specifically in parts of the wind turbine like the nacelle, lower part of the tower or the middle platforms (since being surrounded by steel at very low temperatures increases the sensation and effects of cold). Make sure to use the heaters correctly and to implement a system for their periodical inspection, and always at the end of the work shift.

4.1.1.4 Personal protection equipment (PPE) and work clothes

- **Eye protection** - Important: Use goggles to protect the eyes when working at low temperatures, due to high wind speed (wind chill).
- **Head protection** – A wool cap or lining for the safety helmet may reduce excess heat loss (almost 50% of body heat is lost through the head).
- **Hand protection** – If the tasks do not require great manual dexterity, wear protective gloves against thermal injuries if the temperature falls below 4°C for light tasks and if it falls below -7°C for tasks requiring moderate physical exertion. When working at temperatures below -17°C, use mittens. Fine gloves or linings may be used under the thermal gloves or mittens.


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- **Safety footwear** – The best option is leather footwear, with felt lining and rubber soles and removable felt soles (because leather is porous, it allows shoes to breathe and sweat to evaporate). If tasks require working in areas with water or mud, waterproof boots must be worn (keep in mind that these boots prevent sweat from escaping and, therefore, socks may become wet more quickly and increase the risk of freezing the toes).
- **Work clothes** – Clothing must be selected bearing in mind the temperature and other environmental conditions (wind speed, rain, etc., physical exertion, task duration, and design of the work). Some recommendations for choosing work clothes are:
 - It is advisable to wear several layers of clothes (the air between layers provides greater protection than the clothing itself). In addition, this also allows for opening or removing items before sweating, or adding another layer when taking a break. Outer layers must be larger than the inner ones.
 - The layer closest to the skin must protect against cold and be capable of reducing the skin's humidity to keep it dry (polyester or polypropylene clothing is recommended for this layer).
 - Clothes must be easy to open or remove. The outermost jacket must be adjustable at the waist, neck and cuffs to help controlling retained or evacuated heat – Pockets and windows with meshing (with zipper or Velcro) may increase the possibilities for ventilation.
 - For working in conditions with water, the outermost layer must be waterproof. In windy conditions, a windbreaker that is easy to put on or take off should be worn. In extremely cold conditions, wear clothing with heating elements if the tasks to be performed may not be completed on days that are less cold.
 - Clothes must be kept dry. Remove humidity as much as possible by cleaning snow before entering heated huts. While working in heated areas, allow sweat to escape.
 - Cotton is not recommendable. It tends to become wet or humid quickly and loses its thermal protection effect.
- **Socks** – One pair of thick socks or one or two pairs (the inner pair of nylon or fine wool, and the outer pair of larger size, thicker, and of wool or similar). If the tasks allow, take an extra pair of socks to change these throughout the day.

4.1.1.5 Planning of work times and warm-up exercises

- Table 2 shows the break periods required when working at low temperatures, in addition to normal break periods. Any activity which is not an emergency must stop when the temperature reaches -43°C when there is no wind, or at the equivalent wind chill temperature (see Table 1).
- This planning applies to tasks entailing moderate or high physical exertion in 4-hour periods, and requires:
 - Warm-up exercises prior to starting work.
 - A lengthy rest period in a warm place at the end of the 4-hour period.
 - The breaks should guarantee at least 10 minutes in a warm location.
 - Workers must wear dry clothes.

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THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*											
Air Temperature Sunny Sky		No Noticeable Wind		2.2 m/s Wind		4.5 m/s Wind		6.7 m/s Wind		8.9 m/s Wind	
				5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
° C (approx)	° F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm breaks) 1		(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29° to -31°	-20° to -24°	(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25° to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease ↓	
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease ↓			
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease ↓					
-40° to -42°	-40° to -44°	30 min.	5	Non-emergency work should cease ↓							
-43° to below	-45° & below	Non-emergency work should cease									

*Source: Adapted from the book on Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) published by ACGIH, Cincinnati, Ohio, 2008. (ACGIH: American Conference of Governmental Industrial Hygienists (ACGIH®))
Table 2– Planning of work times and warm-up exercises


- For tasks demanding light physical exertion the limits are more restrictive and Table 2 is to be used as reference, at a more restrictive level. For example:

At -30°C with wind of about 15 mph (~ 6.7 m/s), the maximum time for each work period and number of breaks is:

- Maximum time of 40 minutes between breaks, with a minimum of 4 breaks per 4-hour work period, for tasks demanding moderate or high physical exertion.
- Maximum time of 30 minutes between breaks, with a minimum of 5 breaks per 4-hour work period, for tasks demanding light physical exertion (a more restrictive level).

Note: For wind speeds greater than 20 mph (~ 8.9 m/s), first use Table 1 to obtain the equivalent chill temperature and use this equivalent chill temperature to obtain the data (work and break times) of the first column ("No noticeable wind") of Table 2

- T≤-5°C: when the work area is within this temperature range, the planned works can only be conducted if the work clothes to be used are designed to protect against a temperature below the actual one while performing the operation, and if the equipment to be used is within the margin indicated by the manufacturer in its use and maintenance manual.
- In these weather conditions, breaks are recommended in order to drink hot beverages whenever necessary, after notifying the Wind Farm Supervisor and upon the granting of authorisation by the same.

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4.1.1.6 Other aspects to be taken into consideration

- Personal protective equipment and load hoisting equipment (textile slings, etc.) – Make sure that this equipment and other similar equipment is stored in places where it is not affected by the cold, according to the manufacturer's recommendations (this is even more important if the equipment is wet when stored). Do NOT use the equipment if it shows any signs of having frozen.
- Equipment design – Select work equipment designed with handles and grips of metal covered with material for thermal insulation. In addition, equipment and tools which may be used without removing one's mittens or gloves.
- Tracking and Monitoring – The work area must be equipped with thermometers and anemometers for monitoring temperature and wind speed at least every 4 hours.
- Emergency Procedures – Procedures detailing first aid and medical attention must be available. Have enough personnel trained in first aid procedures working on all shifts so that action may be taken in the event of an emergency.
- Education – Provide information/awareness on symptoms and adverse effects of exposure to cold, proper habits for using protective clothing and work procedures, requirements related to physical preparedness and emergency procedures in the event of injury caused by the cold.
- Planning of Tasks – Work in teams of at least two persons (alert to possible signs of hypothermia). The work pace must be adapted to avoid sweating excessively. Give new workers time to adapt to the cold and become used to the protective clothing before assigning them a normal work load. Avoid sitting or standing for prolonged periods of time.
- Food and Drink – Provide balanced meals and proper amounts of liquids; this is essential for maintaining body heat and preventing dehydration. Eat properly and frequently (working in the cold requires more energy than working in warmer temperatures). Drink liquids often, especially when performing tasks that require great physical exertion; it is recommendable to drink hot beverages without alcohol, or soups, to help one warm up.

4.1.1.7 Information on low temperature conditions

How does the body lose heat?

- Radiation – Due to the difference in temperature between the air and the body. The surface exposed to the cold is also important.
- Conduction – Loss of heat through direct contact with colder objects. The body may lose between 25 and 30 times more heat when in contact with wet objects than in dry conditions or when wearing dry clothes.
- Convection – Loss of body heat to the surrounding air, due to the movement of air in contact with the body. The heat loss ratio depends on air speed and the difference in temperature between the skin and the surrounding air. In general, at the same temperature, heat loss increases with an increase of air speed.
- Evaporation – Due to perspiring/sweating, breathing and unfelt sweating (the body sweats to maintain the humidity level around the skin; therefore, and particularly in cold and dry environments, a great amount of humidity may be lost in this way, without one being aware of sweating).
- The relationship between fluid level, fluid loss and heat loss is important. As body humidity is lost, the total volume decreases and may cause dehydration. This reduction of fluid level makes the body more susceptible to suffering hypothermia and other injury due to the cold.

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How does the body produce and retain heat?


- In order to survive and remain active in the cold, constant heat loss must be compensated by the production of an equal amount of heat. Important factors for producing heat include food, stored nutrients, fluid level, physical activity and ability to shiver (reflex by which the body increases the amount of heat produced during a short period of time).
- Any person working at low temperatures may be exposed to risk, but certain conditions increase the risk of suffering injury, such as age (older adults are more susceptible), illnesses related to the circulatory system, previous injuries caused by the cold, disorders such as Raynaud's syndrome, fatigue, alcohol or nicotine and some drugs or medications. Furthermore, women are, in general, exposed to greater risk than men are.

4.1.1.8 Effects on health and first aid

- Fingers of the hands and toes of the feet, ears and nose are the body parts of higher risk, since they lack much muscle capable of producing heat. In addition, the body preserves heat to protect, mainly, its internal organs and, therefore, reduce blood flow to the extremities (hands and feet tend to become cold faster than the torso). If the eyes are not protected with glasses in cold wind conditions, the cornea could freeze.
- Injuries due to cold
 - Chilblains – Areas of the skin are red and swollen, itchy and painful.
 - Trench foot – Symptoms include tingling, drowsiness; itching, pain, swelling of the legs, feet or hands; blisters. The skin may be red at first and then change to blue or purple.
 - Frostnip – The least serious type of injury due to freezing. Occurs when the ears, nose, cheeks or fingers are exposed to the cold and the outer layer of the skin freezes. The skin of the affected area turns white and feels as if it has fallen asleep.
 - Freezing – Caused by exposure to extreme cold or contact with extremely cold objects. In mild cases, symptoms include inflammation of parts of the skin, accompanied by minor pain. In severe cases, tissues may be damaged without one noticing pain, or noticing a burning or itching sensation which results in blisters. Frozen skin is highly susceptible to infections and may result in gangrene.

First aid for freezing, trench foot

- Seek medical attention.
 - If possible, move the victim to a warmer area.
 - Loosen or carefully remove tight clothes or jewellery which may inhibit circulation.
 - Cover the affected area with sterile gauzes. Place gauzes between the fingers of both hands and feet to absorb humidity and prevent the fingers from sticking to one another.
 - Immediately transfer the victim to a place where adequate medical assistance will be provided.
 - Do NOT try to unfreeze the affected area at the wind farm (but do try to keep it from becoming colder) – without proper facilities, the tissues may become warm and freeze again, resulting in even greater injury.
 - Do NOT rub the area and do NOT apply dry heat.
 - Do NOT allow the victim to drink alcohol or smoke.
- Hypothermia – In moderately cold conditions, body temperature does not usually fall more than 1 or 2 degrees below 37°C due to the body's capacity for adaptation. However, in intense cold without proper protection, the body is incapable of compensating heat loss and body temperature begins to descend.

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Phase	Body Temperature	Signs & Symptoms
Mild Hypothermia	37.2 - 36.1°C	Normal, one may begin to shiver.
	36.1 - 35°C	Sensation of cold, goose bumps, inability to perform complex tasks using the hands, shivering may be mild or major, sensation of hands falling asleep.
Moderate Hypothermia	35 - 33.9°C	Intense shivering, obvious lack of muscular coordination, slow and laborious movements, erratic pace, slight confusion, apparently alert. Perform the blood alcohol test; if one is incapable of walking 9 metres in a straight line, the person suffers hypothermia.
	33.9 - 32.2°C	Continuous violent shivering, difficulty speaking, erratic thinking, memory loss, erratic and heavy movement, inability to using one's hands, tripping frequently, signs of depression, isolation.
Hypothermia Severe	32.2 - 30°C	Shivering stops, exposed skin is blue or swollen, very poor muscular coordination, incapable of walking, confusion, incoherent or irrational behaviour, but able to maintain one's posture and apparently alert.
	30 - 27.8°C	Muscular stiffness, semiconscious, loss of attention and presence of others, decrease of breathing rate and pulse, possibility of atrial fibrillation.
	27.8 - 25.6°C	Unconscious, erratic heart rate and breathing, pulse may be difficult to detect.
	25.6 - 23.9°C	Pulmonary oedema, heart and breathing failure, death. Death may occur before reaching this temperature.

First Aid for Hypothermia: Hypothermia is a medical emergency. At the first signs of hypothermia, seek medical attention immediately. The victim's life depends on the co-workers' ability to recognise the symptoms of hypothermia. The victim is normally incapable of detecting one's own hypothermic condition.

- Seek medical attention immediately. Hypothermia is a medical emergency.
- Remove wet clothing.
- Wrap the victim in blankets (or towels, newspaper, etc.) to gradually increase body temperature. Body heat may help increase the victim's body temperature slowly. Make sure to cover the victim's head.
- Provide hot, sweetened drinks (without caffeine or alcohol) unless the victim is quickly losing consciousness, is unconscious or suffers convulsions.
- Immediately transfer the victim to a place where adequate medical assistance will be provided.
- Do NOT try to heat the victim at the wind farm (for example, do not use water bottles or electric blankets).
- Perform CPR (cardiopulmonary resuscitation) if the victim stops breathing. Continue applying CPR until medical help arrives. The body falls asleep when it is at a very low temperature and, in some cases, victims of hypothermia who were apparently dead were successfully resuscitated.


4.1.2 THERMAL STRESS DUE TO HEAT (HEATSTROKE)

- In the summer season, temperature and humidity inside of the wind turbine can be high due to: outdoor ambient temperature, heat given off by wind turbine components in operation, use of specific tools required for performing the tasks, and proximity to coastal areas. Under these conditions, it is possible for workers to suffer an imbalance of the body's thermoregulation mechanism, resulting in heatstroke.
- This is the most serious illness associated with thermal stress. It is a medical emergency and treatable cause of multiple organ failure (MOF). It is characterised by an increase in core body temperature above 40°C and central nervous system disorders where encephalopathy is predominant and comas are typical.
- The most likely causes of heat stroke under conditions of thermal stress due to heat are: continuous work by non-acclimated workers, poor physical fitness, individual susceptibility, chronic heart disease, the use of certain medications, obesity, alcohol, dehydration, heat exhaustion, etc.

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- The symptoms that allow this disorder to be diagnosed are:
 - Tachycardia.
 - Rapid, shallow breathing
 - High or low blood pressure
 - Reduced sweating
 - Irritability, confusion and fainting.
 - Central nervous system disorders.
 - Hot and dry skin, no longer sweating.
- One symptom of this illness is increased body temperature (rectal temperature can surpass 40.5° C), which can lead to death.
- To prevent workers from getting to this condition, there are a series of safety measures that must be taken into account when at the wind farm and while performing work on the wind turbines:
 - Organisational measures**
 - Inform and train workers regarding risks, effects and preventive measures. Train them to recognise the early symptoms of heat disorders in themselves and their colleagues as well as the administration of first aid.
 - Allow workers to adapt their work rate to their tolerance for heat.
 - Ensure there are cool, covered or shady rest areas and allow workers to rest whenever they need to, especially when they begin to feel unwell.
 - Provide cool water and instruct workers to drink often.
 - Provide mechanical means, when possible, in order to reduce physical exertion.
 - Bring down interior temperatures by enhancing natural ventilation through the use of fans, air conditioning, etc.
 - Organise the work to reduce the length or degree of exposure: establish regular breaks, or preferably allow workers to have breaks as and when they need them; adapt work times to the heat of the sun; ensure that jobs requiring the greatest physical exertion are carried out during hours of less heat; establish worker rotations, etc.
 - Ensure there is health monitoring specific to the workers, since those workers with diabetes or cardiovascular, breathing or kidney problems etc. are more sensitive to the effects of thermal stress.
 - Measures to be adopted by workers**
 - Workers must inform their superiors if they have ever had problems with the heat, chronic diseases they might have and whether they are taking any medication. Take into account that cardiovascular and respiratory illnesses, diabetes, skin diseases, sweat gland illnesses, kidney failure, gastrointestinal diseases, epilepsy and mental illnesses increase your vulnerability to thermal stress due to heat. The same is true of certain medications that work by altering the natural thermoregulation of the body (antihistamines, antidepressants, tranquilizers, etc.).
 - Adapt the work rate to their tolerance to the heat. When exhibiting disorders such as cramps, syncope, and feeling ill, cease physical activity and rest in cool places.
 - Rest in a cool place when they get too hot. If they feel unwell, stop working and rest in a cool place until they recover as continuing to work can be very dangerous. Avoid driving if they have not completely recovered.
 - Drink cool water frequently and in small quantities (every 15-20 minutes) during and after work. They should not wait until they are thirsty to drink. In cases where water or beverage containers etc. are taken to the wind turbine, they must be carried bags that are different than the ones to be used for tools and chemical products and they must be clearly marked in order to ensure that no worker handles them or uses them for a different purpose.
 - Avoid eating a lot and avoid greasy foods. Eat fruits and vegetables. Use salt on meals (in cases of hypertension, see a doctor).

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- It is forbidden to drink alcohol (beer, wine, etc.) or use drugs. Avoid caffeinated beverages (coffee, cola drinks, etc.) and also drinks with too much sugar.
- Insufficient rest increases the risk of being affected by thermal stress. Shower and cool down after work.
- Wear cool, loose summer clothing. Protect head from sun.
- Avoid driving if not completely recovered after having been exposed to a thermal stress situations.
- Go to work well rested. Shower and cool down after work.

- **Measures on wind turbines**

- Depending on the model of wind turbine and its configuration, it may be equipped with the High Temperature Kit. This system is composed of various specific subsystems for cooling the ambient temperature in the nacelle and in specific components (gearbox, generator, etc.) that can adopt various configurations. As a measure for lowering temperature, we propose using the wind turbine's control panel to activate the ambient cooling system to reduce the temperature inside the nacelle whenever it is higher than the outside temperature (as it is a ventilation system as opposed to air conditioning, at most this will equal out the two temperatures). When remaining inside the nacelle with the cooling system on, workers must use hearing protection.
- Create natural ventilation by opening the doors, hatchways and hatches. In situations where there is a risk of thermal stress, and based on the wind turbine type and model, while performing tasks inside the wind turbine the access doors, the hatches in the nacelle, etc., will be left open.
- Whenever possible, use mechanical means to reduce physical exertion while working.


- **Additional preventive measures for work outdoors, in summer and especially on very hot days:**

In addition to the measures described above (both organisational and for workers), when working outside it is even more difficult to alter the environmental conditions, so organisational measures must be developed even further to reduce the risks.

- Pay attention to the weather forecast to plan the daily work.
- Ensure that work is carried out in the shade whenever possible.
- Ensure that the more physically demanding tasks are done during those working hours of less heat. The hottest time of the day, in sunny conditions and on clear days, is considered to be between 2pm (12 noon solar time) and 5.30pm (3.30pm solar time).
- During the hottest times of the day, avoid performing heavy work, especially hazardous jobs.
- In regions where summers are very hot, modify summer working hours so that no work is done during the hottest time of the day, whenever the work procedure allows.
- Establish worker rotation for tasks where high levels of thermal stress may exist.

- When a worker suffers a heat stroke, the first aid measures to be administered are:


- Move the worker to a cool well-ventilated place.
- Take off unnecessary clothing and expose the worker to air.
- Cool the skin down by applying cold compresses to the head and wet the rest of the body with cool water. Stop if the worker starts to shiver.
- Fan the victim in order to lower the skin temperature.
- Place on back unless vomiting or convulsing, in this case, place sideways.
- Place a soft object (clothes, pillow, cushion...) under the head.
- If the worker is conscious and does not feel nauseous, give them liquids such as fizzy drinks without caffeine, sports drinks, or water with salt (one teaspoon per 500 ml or a little over ½ fluid quart).
- Take the worker to hospital.

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- Below is a list of heat-related health conditions that includes their causes, symptoms, first aid to apply and preventative measures to take into account :

HEAT-RELATED ILLNESS	CAUSES:	SYMPTOMS	PREVENTIVE MEASURES/ FIRST AID	
RASH	Wet skin due to excessive perspiration or excessive environmental humidity.	Red rash all over the skin. Can become infected. Intense itching. Discomfort that prevents or makes difficult working or resting well.	Preventive measures	Shower regularly using solid soap and dry the skin well. Avoid tight clothing. Prevent infections.
			First-Aid	Clean and dry the skin. Replace wet clothing with dry clothing.
CRAMPS	Excessive loss of salts due to heavy perspiration. Drinking large amounts of water without ingesting salts to replace those lost in perspiration	Spasms (involuntary muscle movements) and muscular pains in the arms, legs, abdomen, etc. May appear during work or afterwards.	Preventive measures	Sufficient ingestion of salt with meals. Ingest additional salt during acclimatisation to heat.
			First-Aid	Rest in a cool place. Drink water with salts or isotonic beverages. Perform gentle stretching exercises and massage the affected muscle. Do not do any physical activity until hours after they disappear. Call a physician if they do not disappear within 1 hour.
HEAT SYNCOPE (FAINTING)	Standing without moving around in a hot area for a long time means that not enough blood reaches the brain. This most often occurs in workers who are not acclimatised to the heat when they are first exposed to it.	Fainting, blurred vision, dizziness, weakness, weak pulse.	Preventive measures	Acclimatisation. Avoid being immobile for too long, move or perform an activity to facilitate venous return to the heart.
			First-Aid	Keep the person lying down with their feet elevated in a cool place.
DEHYDRATION	Excessive loss of water due to sweating a lot and not replenishing the lost water.	Thirst, dry mouth and mucous membranes, fatigue, confusion, tachycardia, dry wizened skin, infrequent urination and less urine that is dark and concentrated.	Preventive measures	Drink plenty of cool water often, even if you are not thirsty . Sufficient ingestion of salt with meals.
			First-Aid	Drink small amounts of water every 30 minutes.
HEAT EXHAUSTION	Under stressful temperature conditions due to heat: continuous work, without resting or losing heat without replenishing water and salts lost through sweating. Can lead to heat stroke.	Extreme weakness and fatigue, nausea, feeling unwell, dizziness, tachycardia, headache, loss of consciousness, but without confusion and blurred vision. Pale, cold and clammy skin . Rectal temperature may be higher than 39 °C.	Preventive measures	Acclimatisation. Ingest enough salt with meals and even greater amounts during acclimatisation. Drink plenty of water, even if not thirsty.
			First-Aid	Take the affected person to a cool place and position laying down with feet raised. Loosen or remove clothing and cool down by spraying with water and fanning. Give cold water with salts or cool isotonic beverages.
HEAT STROKE:	In conditions of thermal stress due to heat: continuous work by workers that are not acclimatised, in poor physical condition, individual susceptibility, chronic cardiovascular illness, taking certain medications, alcohol, obesity, dehydration, heat exhaustion, etc. It may appear suddenly with no prior symptoms. Failure of the body's thermoregulation mechanism. High central temperature and damage to the central nervous system, kidneys, liver, etc., with high risk of death.	Tachycardia, rapid shallow breathing, high or low blood pressure, reduced perspiration, irritability, confusion and fainting. Alterations of the central nervous system. Hot, dry skin, no longer sweating . Rectal temperature may be higher than 40.5 °C. RISK OF DEATH	Preventive measures	Prior medical supervision for tasks in conditions of thermal stress due to high heat. Acclimatisation. Special attention to heat waves and hot seasons. Changes in work hours, if necessary. Drink water frequently. Sufficient ingestion of salt with meals.
			First-Aid	THIS IS A MEDICAL EMERGENCY! As quickly as possible, remove the person from the heat, start to cool him down, and call a doctor immediately . Lie down in a cool place. Loosen or remove clothing and wrap in a blanket or a cloth that is soaked in water, and fan him, or place him in a bathtub with cold water or something similar.

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5. NIGHT WORK

- In general, any operation other than resetting the wind turbine will be prohibited from the lower tower platform. In particular, when due to force majeure it must be done, a risk assessment or Health and Safety Plan must be done to assess the operations and the preventive measures to be taken, bearing the following in mind at all times:
 - During night work, workers must have proper lighting to ensure safety.
 - Lighting at work areas must allow workers to have the proper conditions of visibility for moving around and carrying out their work without risking their health and safety.
 - The adjustment of lighting entails the provision of a level of light adequate for the activity to be performed but in addition other important aspects must be considered, such as controlling lighting, uniformity of the lighting, the balance of luminance in the visual field and the integration of natural sunlight.
 - Visual needs during the work are not the only factor to be considered when providing lighting. Some workers may have poorer than average visual abilities, and the negative consequences for safety caused by errors due to poor visibility must also be taken into account. This may require increasing light levels and adapting other aspects of lighting, according to the criteria explained further below.
 - Before commencing installation work at night, the level of light provided by auxiliary equipment must be assessed to ensure the minimum level of lighting in the work area complies with table 1 (Minimum levels of lighting).
- Night work regulations:
 - Comply with the provisions of the regulations for night work in local laws applicable in the places where the activities take place.
- Preventive Measures that guarantee lighting conditions:
 - The crane operator and workers involved in the operation must watch the handled load and the crane hook at all times; otherwise, the operation will be suspended.
 - The lighting in each area must be adjusted to the type of activity carried out there, bearing in mind:
 - Health and safety risks for workers depending on visibility conditions.
 - Visual demands of the tasks carried out.
 - Whenever possible, work places will have natural lighting, which must be backed up with artificial lighting when the natural light alone does not guarantee the necessary visibility conditions. In these cases, preferably general artificial lighting will be used, supplemented by localised lighting when higher levels of lighting are required in specific areas.
 - The minimum levels of lighting in work places are given in the following table:

TABLE OF MINIMUM LEVELS OF LIGHTING

DEMANDS OF THE TASKS	MINIMUM LEVEL REQUIRED (LUX)
Low	100
Moderate	200
High	500
Very high	1.000


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- These minimum levels must be doubled when the following circumstances concur:
 - a) In areas or premises for general use and on roads when, given their characteristics, condition and use, there are considerable risks of falls, blows or other accidents.
 - b) In areas where an error of visual judgement during the performance of a task could cause danger for the worker or for third parties, or when the luminance or colour contrast between the object and the background is very weak. However, these limits will not apply for tasks which by their very nature prevent it.
- Stricter limits may be required depending on the task to be performed and on legislation in effect. In this case, workers must use auxiliary lighting equipment (torch, head lamp, etc.)
- The level of light in the area where a task is performed will be measured at the height at which the task is carried out. In the case of areas for general use this will be 85 cm measured from the level at which the worker is standing, and on roads it will be at this level.
- The distribution and other aspects of lighting in work areas must fulfil the following conditions:
 - a) The distribution of lighting levels must be as uniform as possible.
 - b) The luminance and contrast levels must be adequate for the task's visual demands, avoiding sudden changes in luminance inside the operating area and between these and the surrounding areas.
 - c) Direct glare caused by sunlight or high-luminance artificial light sources must be avoided. These must never be placed in the worker's field of vision without eye protection.
 - d) Indirect glare caused by reflective surfaces in the operations or surrounding areas must also be prevented.
 - e) Light systems or sources that interfere with the perception of contrast, depth or distance between objects in the work area, cause a visual impression of intermittence or may produce stroboscopic effects must not be used.
- Work areas or part of them in which failed normal lighting could involve a safety risk for workers must have emergency exit and safety lighting. To guarantee perfect operations of the auxiliary equipment used (power generator set, generators, etc.), a designated person will be responsible for guaranteeing the sufficiency of the fuel supply and that the connections are in perfect condition and working.
- The lighting systems used must not cause risk of electric shock, fire or explosion and must comply with specific legal regulations in force.
- This auxiliary equipment must provide a minimum level of light so that the turbine can be evacuated in the event of a power cut, or all workers must wear personal equipment, such as head lights, to safely leave the machine.
- Any operation not analysed herein must comply with the following criteria before being granted authorisation by GCT:
 - 1) Assessment prior to commencing operations: The purpose of the assessment is to determine the areas and workstations that have insufficient lighting or glare, taking into account the opinion of the workers and inspecting all of the areas involved in the mounting procedures to be performed.

The following information must be gathered and recorded:


 - a) map of area layouts, lights, machinery and equipment;
 - b) description of work process;
 - c) description of workstations;
 - d) number of workers per work area.

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- 2) Evaluation: An evaluation of the levels of light in the areas or workstations should be made based on the assessment records.
- The levels of light should be evaluated on a work day in normal operations conditions. This evaluation can be done by work area, workstations or a combination of both.

ACTIVITY TO BE CARRIED OUT	MINIMUM LEVEL OF LIGHTING	TECHNICAL EQUIPMENT
Assembly/removal of main crane	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Assembly of hoisting cables	500 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Crane displacement	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Work inside wind turbine	200 lux	Tower lighting
Tower wiring	200 lux	Tower lighting
Torque values	200 lux	Tower lighting
Lift assembly	200 lux	Tower lighting
Section assembly	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Hoisting of sections	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Reception of sections	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Retention on ground	100 lux	2 lighting towers (6 lights per tower, 1500 W per light)
ACTIVITY TO BE CARRIED OUT	MINIMUM LEVEL OF LIGHTING	TECHNICAL EQUIPMENT
Mounting the nacelle	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Hoisting the nacelle	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Receiving the nacelle	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Retention on ground	100 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Rotor assembly	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Rotor assembly on the ground	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Hoisting of rotor	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Reception of rotor	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Retention on ground	100 lux	2 lighting towers (6 lights per tower, 1500 W per light)
Assembly of rotor blade by blade	200 lux	2 lighting towers (6 lights per tower, 1500 W per light)

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- **Start time of Operations:**

- The following is a rough estimate of the time taken to perform various operations so as to plan them within the work day established by legislation in force at the place where the wind turbine will be installed. It must always be taken into consideration that when natural lighting is not enough to perform the operation, the artificial lighting equipment defined above must be used.

OPERATION TO BE PERFORMED	DURATION OF THE OPERATION	OPERATION STATUS
Hoisting the Lower Section	1h	Section being hoisted
Hoisting the Lower Middle Section	1h	Section being hoisted
Hoisting the Upper Middle Section	1h	Section being hoisted
Hoisting the upper section + nacelle	3h	Section being hoisted
Hoisting the Hub	1h	Load being hoisted
Hoisting Complete Rotor (does not include tensioning)	2h	Tools positioned
Hoisting First Blade (Blade by Blade procedure)	3h 30min	Blades removed from container

- **Other Preventive Measures in the event of risk of falling material and collisions:**

- If the weather conditions or the duration of the work shift implies a decrease in visibility when moving along roads or platforms and whenever night has fallen, clothes with highly visible, reflective elements must be worn (specially designed clothes or vest). Wear a vest when stopping and exiting the vehicle on the road due to breakdown or similar reason.
- The tasks must be coordinated so that, whenever possible, civil engineering works are completed prior to starting the assembly process, or to ensure that one does not affect the safety of the other.
- When the work shift is extended, the Health and Safety Coordinator and the safety managers of the companies involved must be notified in order to coordinate activities, inspect the work area to check that there are no unprotected or unmarked horizontal openings (trenches, holes, overhead power lines, etc.) and to implement the necessary preventive measures in order to eliminate any risks.

6. WORKING IN THE PRESENCE OF ICE AND SNOW


When the client has established a procedure to carry out work in the presence of ice and snow, and once GCT has evaluated and approved this procedure, the work can be done in accordance with the instructions given in the aforementioned procedure. If the client does not have this procedure, the following protocol must be followed:

Standard access protocol with risk of impacts from ice fragments

(1) Initial evaluation

Identify the presence of ice on wind turbines by any available method, proceeding as follows:

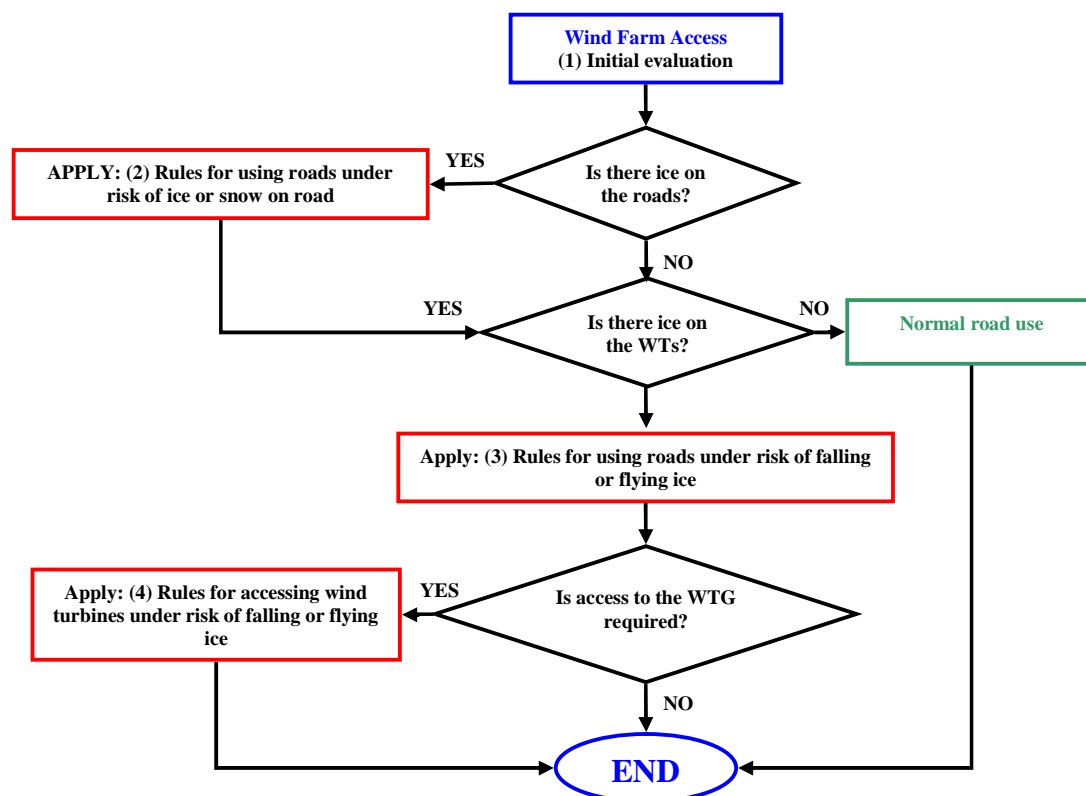
- If the presence of ice on wind turbines is positively identified by means of the available methods (see point [5]): proceed as per the flowchart, applying the corresponding steps.
- If the presence of ice on wind turbines is conclusively ruled out: proceed as per the flowchart, entering the wind farm in the normal manner.

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- If the presence of ice on wind turbines is INCONCLUSIVELY ruled out by means of the available methods: conduct a visual inspection using **binoculars** in the event of:
 - Positive or inconclusive identification: continue applying the access protocol under risk of ice as set out in flowchart 1.
 - Conclusive negative identification: gain access in the normal manner.

If a visual inspection cannot be conducted due to poor visibility, do not enter the wind farm



(2) Rules for using roads under risk of ice or snow on road

- **Snow** on the wind farm access roads: the wind farm must only be accessed with a four-wheel drive vehicle, **without using tyre chains**. They must however be carried aboard the vehicle and only used for evacuation of the wind farm if it is necessary to leave it due to worsening weather conditions (snow, ice, etc.).
- **Ice** on the wind farm access roads:
 - 1) Possible existence of patches of ice: the wind farm can be accessed, after having checked conditions, provided that the four-wheel drive vehicle has **special winter tyres** that ensure optimal road adherence and manoeuvrability of the vehicle.
 - 2) Evidence of large patches of ice (which can be seen or assumed due to extremely adverse climate conditions): access is not allowed unless previously validated special equipment is available.

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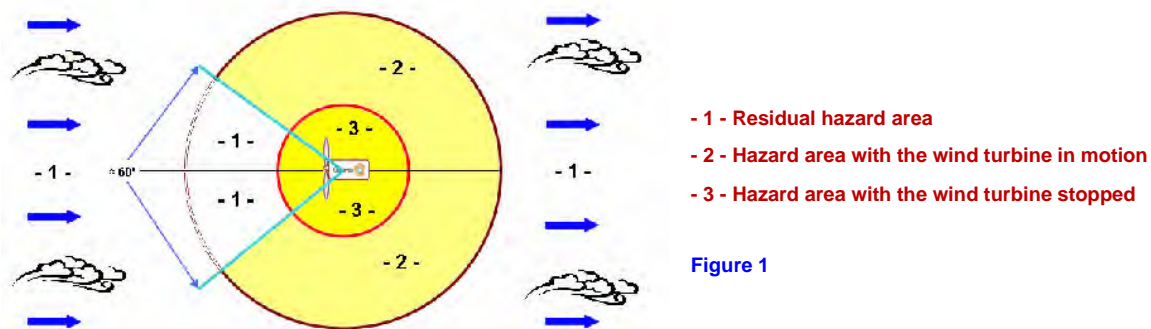
- Access to the wind farm is prohibited, even if possible by 4x4, when the edges of the roads are not visible due to snow, or even though part of the road has been cleared the edges of the cleared area are not visible.
- If an assembly or maintenance task is underway and a worsening of weather conditions is observed, which could result in potential risk when leaving the farm, operations must be suspended and the wind farm evacuated.
- When travelling around a wind farm in adverse weather conditions (fog, snow, heavy rain, ice, etc.), vehicle speed must not exceed 20 km/h.

(3) Rules for using roads under risk of falling or flying ice


- The safety (or residual hazard) area around wind turbines: this is the area beyond the circle whose radius is indicated in Table 1 and which is regarded as the danger zone.

This radius depends on 3 simple variables as shown in the table: the height of the tower, the length of the blades and the running or stopped status of the wind turbine. The radius is greater when the wind turbine is running, due to the fact that ice can fall or be thrown off by the rotating blades. Figure 1 shows the danger zones and safety areas.


Furthermore, as can be seen in Figure 1, if the wind turbine is facing into the wind and is running, the hazard area in front of the wind turbine is reduced (equal to the radius for a stopped wind turbine) due to the effect of the wind on falling ice fragments. This hazard area in front of the wind turbine narrows the closer you get to the tower.



- If the tower-height or blade-length values are not included in Table 1, use the most similar values that are greater (the more restrictive criteria).

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	RADIUS OF THE SAFETY AREAS												
	BLADE LENGTH (in metres)												
TOWER HEIGHT (in metres)		60	55	50	45	40	35	30	25	20	15	10	5
	140	260	125	250	120	240	120	230	115				
	130	250	120	240	115	230	115	220	110				
	120	240	115	230	110	220	105	210	105				
	110	230	105	220	105	210	100	200	100				
	100	200	100	210	95	200	90	190	90	180	90		
	90				180	85	170	85	160	80	150	80	
	80				180	80	170	80	160	75	150	70	140
	70				170	75	160	70	150	70	140	65	130
	60								140	65	130	60	120
	50									110	50	100	55
	40										90	40	80
	30											70	30
	20												50
		M	P	M	P	M	P	M	P	M	P	M	P

M: Running wind turbine = wind speed above 4 m/s
S: Stopped wind turbine wind speed less than 4 m/s

Table 1

- Workers gaining access must be in control of the wind turbines, both controlling and ordering start-up or shutdown depending on their location and itinerary, whereby they must be in constant communication with the substation or the Remote Operations Centre, from where all instructions issued by the workers shall be followed. The wind farm must not be accessed if:
 - Communication and, therefore, control of the wind turbines, is not possible.
 - It is necessary to pass through danger zones created by wind turbines at other wind farms not under your control.
 - The substation is located within the hazard area and remote control and shutdown of the wind turbines is not possible from facilities other than the substation.
- Travelling around inside the wind farm:
 - Using a **special vehicle**: A special vehicle is one that is able to withstand the impact of ice fragments weighing at least 2 kg and in the most unfavourable conditions. They may be vehicles pre-designed for such circumstances, or normal vehicles fitted with some form of certified protection¹ to prevent workers from being injured (e.g. roof and windscreen guards). When travelling in a special vehicle, you can drive freely around all areas of the wind farm.
 - Using a **normal vehicle**: You must not drive within the danger zones, although the zone may be reduced by shutting down the wind turbine if it is running, thereby decreasing the radii of danger zones.

¹ One criterion to be taken into consideration is Machinery Directive 2006/42/EEC, specifically that set out in Annex IV (23. Falling Object Protective Structure FOPS) and Annex V (15. Falling Object Protective Structure FOPS). FOPS = Falling Object Protective Structures

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(4) Rules for accessing wind turbines under risk of falling or flying ice

- Having reached the relevant wind turbine, in order to leave the vehicle and gain access to the wind turbine the following procedure must be applied to the specific wind turbine you wish to enter:
 - If the presence of ice on the wind turbine is positively identified by means of any available method: you must not access the wind turbine due to the risk of being hit by an ice fragment during said access.
 - If the presence of ice on the wind turbine is conclusively ruled out: you may access the wind turbine normally.
 - If the presence of ice on the wind turbine is inconclusively ruled out by means of the available methods: conduct a visual inspection using binoculars. In the event of:
 - Positive or inconclusive identification: you must not access the wind turbine.
 - Conclusive negative identification: you may access the wind turbine normally.
- If the above situations arise denying access to the wind turbine, and it remains necessary to gain access, this can be achieved providing a specially designed and installed barrier element is in place which prevents falling ice fragments from directly hitting workers while gaining access to the wind turbine (e.g. a fixed roof running from the wind turbine entrance to the vehicle, a portable barrier element, an extendible barrier element on the vehicle, etc.). Work must be limited to tasks in which the workers remain at all times underneath elements that ensure the impossibility of being hit by an ice fragment when they are outside the wind turbine. Once the tasks have been completed inside the wind turbine, the same elements must be employed when leaving the wind turbine and returning to the vehicle.
- Once workers are inside a wind turbine, only they may issue the order to re-start a wind turbine that has been paused.

(5) Ice detection methods


- Specifically-designed alarms:
 - Alarms activated by variations in the power curves due to a build-up of ice on the blades. This method does not work unless the wind turbine is in motion.
 - Alarms activated by way of calculations based on parameter measurements such as temperature, humidity, wind speed, etc.
- Forecasts provided by Meteorological Services: while such forecasts do not usually offer conclusive indications as to the presence of ice, they do provide guidance as to its likelihood, which increases the colder (temperatures below 4°C) and wetter (fog, drizzle, snowfall, etc.) the forecasts. Workers' past experience is a useful aid for recognising weather conditions similar to others that have occurred previously at the site and led to a verified build-up of ice.
- Ice observed on elements in such areas as the wind turbines themselves, nearby power lines, trees or electric pylons, among others. While observations are restricted greatly by lighting conditions, the number of such nearby elements, the distances involved and so on, once a positive identification has been made it is generally correct. Binoculars are useful when visibility is good.
- The noise produced by blades in motion: the noise level will be greater when ice has built up on the blades, although this is not a particularly reliable method. In this regard, workers' past experience proves very useful for recognising such changes in noise levels.

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7. WORKING IN CONFINED SPACES

- Work in confined spaces refers to work inside the hub, blades and work involving entering the connection boxes with poor natural ventilation, whenever the work carried out inside may generate toxic or flammable gases or oxygen depletion. If in doubt consult with the technical areas of Technology Services, the O&M Global Processes Area and the Health & Safety Department of GCT.
- Before commencing these operations, a specific risk evaluation must be performed and a Preventive Resource must be present during the operations. A written Work Permit establishing the working conditions for these tasks will also be required.
- Access to confined areas is restricted to AUTHORISED WORKERS.


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8. NEED FOR PREVENTIVE RESOURCE


- General activities:**

	PREVENTIVE RESOURCE
Road safety and material transportation	No
Tasks using a Basket	Yes
Powering / Discharging AEG Transformer Centre	Yes
Rope Access Work	Yes
Use of Lifts and Helpers	No
Hanging Lift Platforms	Yes
Start-up	Yes
Unloading, Storage and Hoisting of Material	Yes
Remote WTG Operation	No
Operations with exposure to dangerous chemical agents	<ul style="list-style-type: none"> - Operations involving the use of dangerous chemical agents that may pose a risk to the health and safety of workers due to their physical-chemical, chemical or toxicological properties. - In operations in which, due to insufficient or inefficient preventive and/or protective measures, there is no guarantee that health risks can be controlled and that the risk can be reduced or eliminated via set procedures and/or the use of specific equipment and work conditions, with deviations from the rules being unacceptable, a Preventive Resource must be assigned and present while the works are performed.
Hot work	<ul style="list-style-type: none"> - During operations that generate heat, sparks, flames or high temperatures near fibre, a Preventive Resource must be present. - During operations that generate heat, sparks, flames or high temperatures near liquids or flammable gases, a Preventive Resource must be present.
Operations with self-driven work machinery	<ul style="list-style-type: none"> - During operations with self-propelled equipment involving manoeuvres, especially in reverse, in poor visibility conditions, or when different self-propelled equipment is in close proximity to workers on foot in a small area, a Preventive Resource as well as an Operation Coordinator who is familiar with the manoeuvring signs and signals and in continuous communication via walkie-talkie with vehicle drivers, must be present. The same person can perform these roles.
Operations with load lifting equipment	<ul style="list-style-type: none"> - Operations with self-propelled moving cranes: during operations involving the use of load lifting equipment, an Operation Supervisor and Preventive Resource must be present (the same person can perform these roles). - During load lifting operations in which two or more work equipment must lift the load simultaneously, an Operation Supervisor and Preventive Resource must be present (the same person can perform these roles).

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PREVENTIVE RESOURCE	
Installing people lifting equipment	<ul style="list-style-type: none"> - Installing and operating suspended lifting platforms, mobile lifting platforms on a chassis and baskets secured to cranes: a Preventive Resource must be present during the installation of this work equipment. - Use of suspended lifting platforms, mobile lifting platforms on a chassis and baskets secured to cranes: a Preventive Resource must be present when using this work equipment.
Work with risk of falling from heights	<ul style="list-style-type: none"> - Work entailing the risk of falling from heights when the worker's protection cannot be guaranteed by collective protection and, therefore, requires personal protective equipment. The following are not included due to the wind turbine's built-in collective protection equipment: ascent/descent via the wind turbine's service ladder, use of the hoist, work on middle tower platforms and work from the service ladder. For work entailing the risk of falling from heights of more than 6 metres, a Preventive Resources must be assigned and present while the work is performed, e.g. exiting the nacelle. - Rope access work: techniques for working from heights based on the use of ropes, anchors and climbing equipment for accessing natural objects, subsoil, structures, along with their built-in accessories for carrying out a specific task. A Preventive Resource must be present while these works are performed.
Operations involving Electrical Risk	<ul style="list-style-type: none"> - Removal and re-instating of voltage: a Preventive Resource must be present while these works are performed. - Carrying out work under voltage: <ul style="list-style-type: none"> ▪ BT: a Preventive Resource must be present ▪ HT: the work will be carried out under the supervision of a Supervisor, who must be a Qualified Worker and assume the duties of a Preventive Resource. <p>If the size of the work area does not allow proper supervision, this person must be assisted by other Qualified Workers.</p>
Replacing fuses with voltage	<ul style="list-style-type: none"> - HV: the work will be carried out under the supervision of a Supervisor, who must be a Qualified Worker and assume the duties of a Preventive Resource.
Measurements, tests and checks	<ul style="list-style-type: none"> - HV: the work will be carried out under the supervision of a Supervisor, who must be a Qualified Worker and assume the duties of a Preventive Resource.
Local manoeuvres	<ul style="list-style-type: none"> - HV: the work will be carried out under the supervision of a Supervisor, who must be a Qualified Worker and assume the duties of a Preventive Resource.
Preparing for work in the proximity	<ul style="list-style-type: none"> - HV: the work will be carried out under the supervision of a Supervisor, who must be a Qualified Worker and assume the duties of a Preventive Resource.
Carrying out work in the proximity	<ul style="list-style-type: none"> - HV: the work will be carried out under the supervision of a Supervisor, who must be an Authorised Worker and must assume the duties of a Preventive Resource.

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- Assembly:

		PREVENTIVE RESOURCE
CIVIL WORKS	Civil engineering works	Yes
MECHANICAL ASSEMBLY	Reception, Unloading, add Assembly of Foundation Ring	Yes
	Unloading, Storage and Assembly of Lower Section	Yes
	Unloading, Storage and Assembly of Middle Section	Yes
	Upper section Unloading, Storage and Assembly	Yes
	UNLOADING, RECEIPT, AND MOUNTING OF THE NACELLE	Yes
	Rotor Unloading, Storage and Assembly	Yes
ELECTRICAL ASSEMBLY	Electrical Assembly	Yes
AUXILIARY ASSEMBLIES	Lifeline Assembly	Yes
	Lift assembly	Yes
	Disassembly of Cages	Yes
SUPERVISION / INSPECTION	Mechanical Assembly	Yes
	Electrical Assembly	Yes
	Start-up	Yes
OTHER	Works in Confined Spaces*	Yes

* Note: understanding this to be any operation that takes place inside the blades of the wind turbines, or tasks involving entering the inside of connection boxes with poor natural ventilation, whenever these may generate accumulated toxic or flammable gases or the atmosphere is oxygen-deficient.

- Maintenance:


		PREVENTIVE RESOURCE
PREVENTIVE MAIN.	Operations in the rotor	Yes
	Generator	Yes
	Transmission Shaft	No
	Gearbox	Yes
	Hydraulic System	Yes
	Pitch Position Sensor	Yes
	Brake Element replacement	Yes
	Torque, Light and Cables checks	Yes
	Reviewing the nacelle exterior	Yes
	Transformer	Yes
	Hoist	Yes
PREDICTIVE MAIN.	Predictive Maintenance	Yes

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			PREVENTIVE RESOURCE
CORRECTIVE MAIN.	MAJOR CORRECTIVE	Rotor replacement	Yes
		Nacelle replacement	Yes
		Replacing gearbox	Yes
		Replacing generator	Yes
		Control cabinet replacement in the nacelle	Yes
		Yaw Ring replacement	Yes
		Transformer replacement	Yes
		Switchgear replacement	Yes
		Ground Control Cabinet replacement	Yes
	MINOR CORRECTIVE ACTION	Gear motor replacement	Yes
		Anemometer and Wind Vane replacement	Yes
		Gearbox Bearing replacement	Yes
		Hoist replacement	Yes
		Electrical Components replacement (Cabinets)	Yes
SPECIFIC MAINTENANCE		Generator Inspection, Repair	Yes
		Gearbox Inspection, Repair	Yes
		Blade Inspection, Repair	Yes
		Control Equipment Inspection, Repair	Yes
		Yaw Ring Inspection, Repair	Yes
		Lift Inspection, Repair	- A Preventive Resource must be present when the equipment must be put into operation under conditions other than ordinary service, in order to carry out certain special repair or maintenance jobs or when workers must work near bare electrical conductors under voltage.
		Lifeline Inspection, Repair	Yes
SUBSTATION OPERATIONS		Manual Energisation/Discharge of Substations	Yes
		Remote Energisation/Discharge of Substations	Yes
		Preventive Maintenance	Yes
		Corrective Maintenance	Yes
OTHER		Works in Confined Spaces*	- A Preventive Resource must be present during tasks carried out inside the hub and/or blades when the activity may generate toxic or flammable gases or an oxygen-deficient atmosphere.

* Note: this is understood to be any operation performed inside the blades of the wind turbines.

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9. EVACUATION OF WIND TURBINE IN EVENT OF EMERGENCY



- In case of emergency follow the specific protocols of the wind farm, established for these situations.
- In the event that the emergency is out of control and the intervention of external emergency services is required it will be requested by calling the number indicated in the specific emergency protocols of the wind farm. Follow the instructions received from the external emergency services once they have taken command of the emergency situation.

9.1 Evacuation in the event of fire

- Follow the indications in the Instruction Manual for the wind turbine and Safe Practice for the specific WTG model for actions in case of fire.
- In the event of a fire inside the wind turbine, consider the possibility of fighting it, but only if this does not put people in danger. The magnitude of the fire as well as the resources available must be taken into consideration. Portable fire extinguishers available inside the wind turbine or vehicle are only effective during the initial stage of a fire. Once the fire reaches considerable proportions, they must not be used.
- The procedure for evacuating the wind turbine depends on the position of the people in relation to the fire. Whenever possible, the evacuation must be carried out through the usual access routes (tower ladder). Never use the lift in the event of fire as this could hinder the evacuation (in the case of rack-pinion lifts, it may have to be used if it is blocking the escape route - otherwise, remove the key before evacuating to prevent its activation).
- As a general rule, follow these criteria:
 - Fire on level zero of the wind turbine and personnel located on the same level. Evacuation is through the wind turbine's tower door.
 - Fire at the base of the wind turbine and personnel located on a level higher up (tower or nacelle). Evacuation is by accessing the nacelle as quickly as possible and using the emergency descent device. Protect your respiratory tract from smoke using the available means.
 - Fire in the nacelle and personnel located at a lower level. Evacuation is through the wind turbine's usual access routes.
 - Fire in the nacelle and personnel located at the nacelle. Leave the nacelle through the wind turbine's usual access routes. The use of the Rescue Kit or the emergency descent device is prohibited.
- In the event of fire, the affected wind turbine must be isolated from the electricity grid as quickly as possible, either by activating the smoke sensor which, in turn, automatically opens the wind turbine's switchgear, or if this does not happen automatically, by disconnecting the wind turbine from the electricity grid by acting directly through its switchgear, from the substation or from the switchgear of the wind turbine before the affected one in the same row.


9.2 Use of the evacuation equipment

- When the usual means (ladder or lift) of evacuation can not be used, whether because of breakage of its elements, evacuation of a person who has suffered an accident, or fire at a level lower than the nacelle, the equipment to be used for evacuation from the wind turbine is the emergency descent or rescue device. This equipment may be present in the nacelle or, if not, the first operation to be performed when carrying out work in the nacelle (unless it is accessed merely for tasks such as resetting the circuit breakers, differentials, etc.) is to bring up this equipment with the hoist, always making sure that the length of the device's rope corresponds to the height of the wind turbine.

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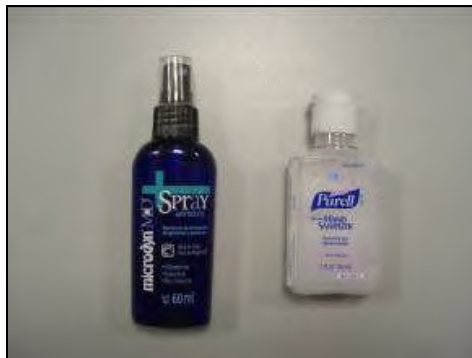
- The arrangement of the equipment depends on each model of wind turbine since the evacuation options (via the ground, roof or walls) as well as the points to which to secure the equipment and attach the ropes (thus varying the required elements: anchorage straps, protectors, etc.) varies for each model. Follow the indications in the Instruction Manual for the wind turbine and Safe Practice for the specific WTG model for emergency evacuation.
- Every time the equipment is used in an emergency, it must be inspected by the manufacturer or authorised company. The equipment must be checked according to the frequency established for the specific equipment even if it is unused. Therefore, in the event of any of these situations, the equipment must be delivered to the appropriate department so that it can be inspected by the manufacturer or authorised company.

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10. HANDLING CHEMICAL PRODUCTS

- PPE Required: The PPE specified in the Safety Datasheet for each case.
- Recommended PPE: The PPE specified in the Safety Datasheet for each case.
- Prior to using any chemical product, read its safety datasheet carefully. If this sheet is not available, request it from the Environmental or H&S Departments of Gamesa services. Furthermore, said safety sheets must be available to on-site workers so they can be referred to if necessary.
- Bear in mind the indications on the chemical product's packaging label (pictograms, R/H risk and S/P safety phrases). If the label is worn out or illegible, replace it with a new one.
- Whenever transferring products between two containers, the hazard information must be placed on the label of the new container. This new container must have the same characteristics as the original container.
- Maintain the product containers hermetically sealed, even when they are empty.
- Use the minimum amount possible of chemical products.
- Do not use chemical products to wash.
- Work/storage areas containing chemical products must be adequately ventilated. In cases of deficient ventilation, localised extraction or forced ventilation must be used.
- As a general rule do not eat or drink in the work areas. Only do so in areas specifically for this purpose, and after having removed one's protection equipment (clothes, gloves) and having washed one's hands with soap and water.
- In exceptional circumstances, when a split work shift is not possible or when weather conditions place workers at risk due to the possibility of suffering thermal stress, food and drink may be taken up to the nacelle, as long as the following conditions are met:
 - Each worker must transport their food and drink in a closed container (bag or case) with their personal details identified on it to prevent its handling by another worker by mistake or its coming into contact with chemical products, shavings, suspended particles, etc., present in the wind turbine.
 - Workers must carry an instant hand sanitizer to clean any dirt or chemicals from their hands before drinking or eating.



- Work must be planned so that tasks generating suspended particles (both liquid and solid) are carried out at the end of the work shift. This prevents workers from ingesting food and drink in these ambient conditions.
- If leaks or spills have occurred, clean all the affected surfaces immediately before starting or continuing any work in order to reduce the possibility of slips or falls.

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- Discard all cloths/papers impregnated with chemical products in closed containers; never leave them scattered about or in bin bags.




- Always obey the prohibition of smoking or lighting fires.
- Maintain all product containers closed, stored in cool, ventilated areas and away from heat sources.
- Store the products in an orderly fashion, keeping them separate from each other to avoid mixtures which may cause dangerous reactions.
- When **transferring** products between containers, the work area must be well-ventilated. It is required to use the PPE specified in the Safety Datasheets of the chemical products to be handled.
- The hoisting of the nitrogen bottles must be done in adequate containers to prevent them from falling. It is forbidden to hoist the bottle by the opening and closing valve. They must be stored in safe places inside the nacelle where they cannot get hit, roll, or fall to different heights through the openings in the nacelle.



10.1 SHIPPING AND TRANSPORT OF HAZARDOUS GOODS

- Comply with the provisions for shipping and transport of hazardous goods according to the laws applicable in the places where these activities occur.
- In Europe:** In accordance with section 1.1.3.1 c) of the ADR, the loading and carriage of hazardous substances by maintenance personnel using Gamesa vehicles is exempt from complying with regulations on transporting hazardous goods by road: "The provisions laid down in ADR do not apply to: (...) c) the transport undertaken by enterprises which is of a secondary nature to their main activity, such as deliveries to or returns from building or civil engineering sites, or in relation to surveying, repairs and maintenance, in quantities of not more than 450 litres per packaging and within the maximum quantities specified in 1.1.3.6. Measures must be taken to prevent any leaks under normal transport conditions. This exception does not apply to class 7 (Radioactive substances). However, carriage by those companies for supply or internal or external distribution will not be included in this exemption."
- For the shipping of hazardous goods for which there is a transport contract or for transport from central warehouses to a Service Centre observe the provisions in PMA-EOL-008.

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Hazardous goods affected:


Hazardous goods that are usually loaded in Gamesa vehicles for repair or maintenance tasks include:

- Gases: Nitrogen, oxygen and acetylene.
- Aerosols
- Paint and solvents
- Fuels: Petrol and gasoil.
- Adhesives
- Resins and catalysts

Loading the goods:

- **GENERAL GUIDELINES** for safe loading of hazardous goods:
 - When loading goods, the engine must be switched off and the vehicle immobilised.
 - Packages must be stowed in the vehicles in such a way that they cannot tip over or fall.
 - Labels and handling instructions must be observed.
 - Ensure that the packaging is in good condition and there are no leaks.
 - Comply with other obligations established by traffic regulations such as MOT certificate, warning triangles, etc.
 - It is forbidden to enter a vehicle with lighters.
 - Portable powder fire extinguisher with minimum capacity of 2 kg in the driver's cab.
 - Training for personnel involved in the loading and shipping of goods.
 - It is forbidden to smoke near vehicles or containers and inside them during handling operations.
 - Proper ventilation in covered vehicles. In this case, permanent ventilation with grilles is the most suitable and safest option.
 - Drivers and other crew members must not open packages containing hazardous goods.
 - Any Chemical Product handled and transported must firstly be approved by the GCT prevention department, and the conditions and requirements established.
- **SPECIFIC GUIDELINES to be taken into account when LOADING AND TRANSPORTING GAS BOTTLES:**
 - Gas bottles must not be thrown or banged about.
 - Bottles that are sufficiently stable or are transported in suitable devices protecting them from overturns can be stored upright.
 - Bottles lying on their side must be wedged firmly or secured or tied safely so that they cannot move.
 - Recipients should preferably be loaded in open or ventilated vehicles. If this is not possible, the loading doors in closed, unventilated vehicles must bear the following words, with the letters at least 25 mm high:

"WARNING
NO VENTILATION
OPEN WITH CARE"

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- In the event of a leakage inside the vehicle, this can only be re-used after it has been cleaned thoroughly and, if necessary, disinfected or de-contaminated. Goods and objects transported in this vehicle will be inspected in case they have been contaminated.


During carriage:

Drivers who transport hazardous goods in Gamesa vehicles must comply with the following rules:

- They must ensure that the vehicles are in good condition.
- Drivers must comply with all driving, traffic and road safety regulations.
- In the event of an accident, proceed as follows when possible:
 - Switch the motor off.
 - Call the emergency services (112 for Spain) to report the situation.
 - Contact the CCS Environment Department to report the incident.
 - Secure the accident site to avoid affecting other road users.
- If the authorities inspect the load, the declaration of hazardous goods or the document specifying that the carriage is exempt must be shown to these agents.

Unloading goods:


- The goods will be unloaded in accordance with the same general and specific rules relating to handling in the "loading goods" section.

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11. USE OF DRILLS


- PPE Required: Protective goggles against impacts of particles and snug-fitting protective gloves against mechanical injuries.
- Recommended PPE: Hearing protection
- Workers should wear tight-fitting clothes and tie back their hair. Taking off watches, rings, bracelets and so on is recommended when using drills.
- Never attempt to stop moving parts with your hands.
- Before changing a drill bit, it must be completely disconnected.
- Start machining at a slow pace.
- Never leave materials in close proximity to the drills. They may projected when the machine begins functioning.
- Check the condition of the cable and connection plug. If these are deteriorated, they must be repaired before using the drill.
- Always choose the adequate drill bit for the material to be drilled.
- Drilling should not be done in an inclined position: the drill bit could break.
- The orifices around the drill bit should not be enlarged by oscillating the drill: bits could fracture. To enlarge the hole, use drill bits of a larger size.
- Avoid overheating the drill bits as they could fracture.
- When drilling, always wear goggles to protect against the impact of particles.
- Never leave the drill lying around the floor or left connected to the electricity grid.
- Prevent unwanted start-up of tools by ensuring that the device is turned off before plugging it into the power socket.
- Any person in the work area where this tool is in use must wear the same personal protective equipment to protect against the risk of projected particles or fragments from both the tool and material being worked on.
- Remove adjustment elements and accessories before connecting the tool to prevent cuts from spinning elements.
- Before each use, check that accessories are in good condition and that they have been fitted correctly on the tool before use.
- Never attempt to stop the drill bit with the hands.
- Before changing an accessory, the machine must be completely disconnected.
- Inspect the machine. If there are any machine parts or connections in poor condition, these must be reported for repair.
- Do not handle cutting parts of the machinery with bare hands.
- Hold the tool firmly and keep the body and arms in an appropriate position to resist reaction forces that could occur if the tool jams or snags.
- Never tamper with safety systems.

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12. ELECTRICAL PORTABLE MACHINERY

- PPE Required: Protective goggles against the impact of particles and protective gloves against mechanical injuries.
- Recommended PPE: Hearing protection.
- Select the most adequate place for placing the equipment so that the cables are laid out over a distance as short as possible.
- Workers should wear tight-fitting clothes and tie back their hair. Taking off watches, rings, bracelets and so on is recommended when using the machinery.
- Never attempt to stop moving parts with your hands.
- Machinery should be completely disconnected before changing machining components.
- Inspect the machine. If there are any parts or connections in poor condition, this must be reported to maintenance for their repair.
- Machines with an extraction system must only be used with this system switched on.
- All safety devices on the machine (face shields, cutting and moving parts guards) should be kept in their position during the use of portable machinery.
- Do not handle cutting parts of the machinery with bare hands.
- Goggles to protect against the impact of particles should always be worn when using portable tools and machinery (sanders, trimmers, etc.).
- When using portable tools, cut-resistant gloves should be worn when handling the machining or cutting parts (sandpaper, saw discs, etc.).
- Use hearing protection when the noise level of the machinery is bothersome.
- Electrical portable machinery must only be connected to power supply grids that are protected by differential switches.
- If a portable electrical tool must be used inside a metal room, the following preventive measures must be taken:
 - Connect the tool to a safety transformer (48 V).
 - Connect the machine to an isolating transformer.
 In both cases, the transformer must be installed outside the room.
- Before using portable machinery that generates sparks, check that there are no chemical products in the vicinity, as contact with sparks could cause a fire.
- As a general rule, tools operated using a compressor must be used at a minimum distance of 10 m. Check that the connection elements are properly secured to the circuit.
- Electrical machines will be electrically protected by means of double insulation.
- Tools must be connected using plugs and adaptors if necessary. Cables must not be directly connected to the power socket.
- Broken or faulty machines must not be used, and must be repaired by specialised personnel.
- The use of machines or electrical tools is restricted to operators authorised by their company, in accordance with their experience and compliance with legislation, if applicable.

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- Do not expose an electric tool to the rain and prevent liquids from penetrating the interior. There is a risk of receiving an electrical discharge if certain liquids penetrate an electric tool.
- Do not use the power cord to carry or hang the electric tool, or pull on it to remove the plug from the power supply.
- Keep the power cord away from heat, oil, sharp corners or moving parts. Damaged or entangled power cords may cause an electrical discharge.
- Remove the mains plug before making any adjustments, changing accessories, or storing power tools. This preventive measure reduces the risk of accidentally connecting the electric tool.
- Before each use check the condition of the electric tool, of the cord and socket.
- Do not use the electric tools if any damage is detected. Do not open the electric tool. It may only be repaired by a professional.
- Do not use the electric tool if the cord is damaged. Do not touch a damaged cable, and disconnect the socket from the grid if the cable was damaged during the work.
- Select the most appropriate place to put the tool so that the cords run the shortest distance possible, away from heat, oil, sharp edges or moving parts.
- Inspect the machine. If there are any machine parts or connections in poor condition, these must be reported for repair.
- Check that cables and connection pins are in proper condition. Improvised splices are forbidden.

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13. MANUAL HANDLING OF LOADS

- PPE Required: Protective gloves against mechanical injuries, safety boots.
- Recommended PPE: Lumbar protection.
- Whenever possible, avoid manually handling loads and use auxiliary mechanical equipment. If not possible, reduce the weight of the load being handled.
- As a general rule, the maximum lifting load (in ideal handling conditions) is 25 kg. Nevertheless, if the operators are female, young, or elderly, or if a large part of the population is to be protected, loads heavier than 15 kg should not be handled. Under special circumstances, healthy and trained workers may handle maximum loads of up to 40 kg as long as the task in question is sporadic and is carried out in safe conditions.
- If it is necessary to manually manipulate large, heavy or irregular loads, seek help from one or more coworkers whenever possible.
- When performing manual loading, handle loads with the body in a stable position.
- When lifting loads manually, avoid making sudden movements, place your feet as close to the load as possible, slightly separated, with one foot in front of the other; grip the load with the palms of your hands and the bases of your fingers, not with your finger tips.
- Manual hoisting should be performed with your back straight while bending your leg muscles, without bending your arms or back.
- Load the material symmetrically (lift by straightening your legs with your back straight and your arms next to your body).
- When lifting loads, the arms must exert simple traction, in other words, must be stretched. The load must remain against the body, held with outstretched arms.
- When transporting material, keep the load (load centre of gravity) as close to your body as possible, taking short steps and keeping your body straight. Avoid twisting your torso while manually handling loads. If you need to turn while carrying it, move your feet and turn your whole body at the same time.
- Deposit the load by reversing the steps taken to lift it.
- Carry the load so that you can see in front of you, keep a firm grip on it and always carry it in front of your body, never to the side.
- To prevent ergonomic risks, do warm-up and stretching exercises before performing the task. Make an attempt to use body positions that are appropriate for the task to be performed. To do so, first use hoisting components designed for that purpose and mechanical tools as much as possible. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.
- You are advised not to travel long distances while carrying the load.
- Avoid bending or twisting your spine while carrying the load.
- Manual handling of loads should be performed preferably on stable surfaces, to avoid losing your balance.
- Avoid handling loads on hills, steps or ladders.
- If the temperature is elevated, appropriate rest breaks must be allowed for an adequate, physical repose.
- When the temperature is low, the worker must be appropriately dressed in warm clothing and must avoid making sudden or violent movement before having warmed up and stretched the muscles.
- Cold draughts must be avoided when working indoors and gusts of wind when outdoors, otherwise the handling procedure should be made safer through the use of mechanical aids.

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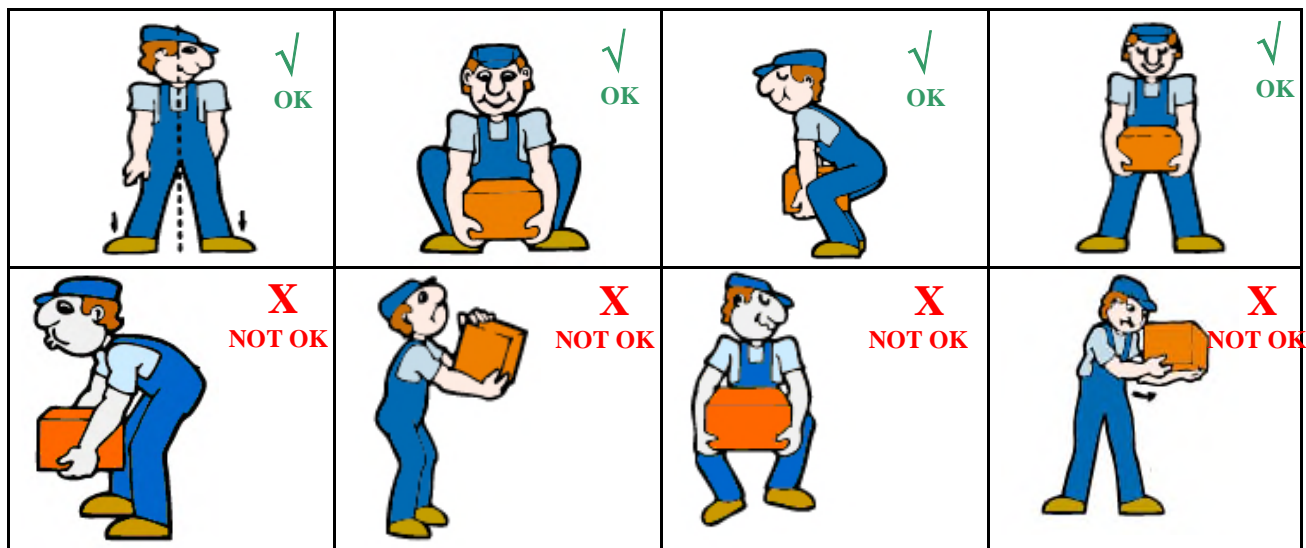
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- Personal protection equipment should not interfere with movement capacity, impede vision or diminish manual dexterity. Pockets, belts or other elements which may easily become hooked onto something else are to be avoided. Clothing must be comfortable and not tight.
- Maintain the area clean and free of slippery surfaces.
- Lighting must be sufficient and areas of sharp contrast which may blind the worker should be avoided.
- Workers must be trained in risk prevention and preventive measures to take to prevent lower back injuries.
- When materials must be moved by pushing or pulling, it is preferable to push rather than to pull.
- Technique to push or drag a load:
 - Stand behind the load and near it,
 - Bend your knees slightly to use your leg muscles,
 - Keep your back straight and tighten your abdominal muscles,
 - Use both hands to move the load,
 - Use your body weight to push or drag the load.


Whenever possible, use the mechanical equipment available (trolleys with wheels...) for moving objects.

- During load handling operations, the right technique must be used, the basic principle of which is keeping your spine in the right position.

This is shown in picture form below:



- Other Preventive Measures: - It is suggested to carry out stretching/warm-up exercises before performing tasks with high physical demands (load handling, overexertion) in order to acquire the appropriate muscle tone.-Avoid repetitive movements. If their elimination is impossible, establish a task rota system to avoid minor overexertion that may cause muscular-skeletal injuries. - While working, avoid forced postures that involve extreme positions or movements of the joints: arms over the shoulder level, reaches from behind the body, back and neck pronounced bow or torsion...preferably in load handling operations, - Introduce short pauses and breaks when performing high physical content/demand jobs, alternate tasks for active relief of different muscular groups

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14. WELDING AND HEATING EQUIPMENT


- PPE Required: Welding gloves and a welding screen.
- Recommended PPE: Leggings, apron and sleeves or welding clothes.

GENERAL, FOR ELECTRIC AND OXYCUTTING WELDING

- Select the most adequate place for placing the equipment so that the cables are laid out over a distance as short as possible and the gas bottles will not receive blows.
- Ensure that the work area has good ventilation. In the event the ventilation is insufficient, provide forced ventilation by the use of extractors.
- Prior to initiating welding or oxycutting, ensure that there are no flammable materials nearby or openings in the ground or walls through which sparks may enter.
- A CO2 extinguisher must always be at hand when welding or oxycutting to keep any fires which may result during these tasks under control.
- Never look directly at the weld source without wearing approved eye protection.
- While welding or oxycutting:
 - Do not touch any piece in the process of welding/cutting, or already welded/cut, with bare hands.
 - Wear gloves, apron, overalls and sleeves, or welding clothes.
 - Use a welding screen.

SPECIFIC INSTRUCTIONS FOR ELECTRICAL WELDING


- Ensure that the cables are perfectly isolated and the terminals have their corresponding fittings.
- Verify that the electrode holders are isolated at their clamps and external supports.
- Connect onto the welding equipment in the following order:
 - The cables to the electrode holder clamp.
 - The earth cable to the earth connection so as to avoid bypasses.
 - The earth cable to earth, checking that the connection is correct.
 - The power supply cable to the breaker terminals, which shall be in the open position.
- Connect the welding equipment to an installation protected by a highly sensitive differential (30mA).
- While welding:
 - Use a flame retardant blanket.
 - Do not drag the cables, especially the earth cable.
 - Rest the electrode holder only on the clamp holder, never on the piece to be welded.
 - Handle the clamp with extreme caution; direct it exclusively at the area to be welded and never towards people nearby.
- During welding operations, use localised extraction equipment to capture the smoke arising from the process; if this equipment cannot be employed, wear respiratory protection against smoke generated from the welding.

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SPECIFIC, FOR OXYCUTTING


- Handle the blowtorch with extreme caution; direct it solely to the cutting area and never towards persons in close proximity.
- Place the bottles in places where contact with grease or other chemical products is unlikely.

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15. WORK PLATFORMS / LADDERS


- PPE Required: Harness, safety helmet with chinstrap.
- Before using work platforms or ladders, they must be checked to ensure the good condition of the rungs, etc. In case any damage is observed on any of the components, it should not be used and instead substituted for one that is in good condition for use.
- Work platforms and ladders must be positioned on horizontal nonslip surfaces. In addition, ladders must extend at least 1m above the support surface and their angle must be between 70.5° and 75.5° to the horizontal.
- Fasten the top of the ladder to the upper support point. If this is not possible, ascents should be done with someone holding the base of the ladder.
- Ladders must be long enough to provide hand and foot support in all of the positions it is to be used so that, if operators must work from the ladder, they will have at least four free rungs above the position of their feet.
- Always move upwards facing forward, and one person at a time.
- Use a bag or belt to carry tools in order to keep one's hands free during the ascent and descent.
- For tasks more than 2 metres above the ground, wear a harness attached to an anchor device independent from the work platform or ladder.
- When a work platform or ladder is placed in an area where carts are used or behind a doorway, place signs or barriers to warn of the presence of these elements and to prevent them from being knocked by people or carts, or objects from falling onto workers moving through the area.
- Take the necessary measures to prevent the used resources (tools, instrumentation...) from falling, for example keeping them tied with special fastening systems (fastened to the wrist, toll bag or belt with extendable fastening elements, etc.).

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16. HANDLING MANUAL TOOLS

- PPE Required: Protective gloves against mechanical injuries 4543 with dorsal anti-impact protection. Recommended PPE: Protective goggles.
- Recommended PPE: Lumbar protection.
- Use tools with the most appropriate characteristics and sizes for the work to be performed and exclusively for the purpose for which they were designed: the improper use of tools can also cause the risk of accident. Workers must, therefore, know how to handle them properly. Improper use may also damage the tools, which then increases the risk of accidents.
- Do not use wrenches, pliers, tongs, etc. to strike objects.
- Do not use wrenches, screwdrivers, or the handles of pliers, tongs or hammers as levers.
- Use the right wrenches and screwdrivers for each nut and bolt. Do not use "aids" (tubes to extend the handle, plates to shorten the socket...) which increase the risk of accidents.
- Do not use pliers, scissors or tongs to screw, unscrew, tighten or loosen nuts.
- Prior to using any hand tool, check that it is clean and in good operating condition by inspecting that:
 - The tools with blades are sharp and without dents.
 - They do not have crushed heads, fissures or burrs.
 - The tool handles are clean of oil and grease, firmly fastened to the head, without fissures, and are of the appropriate shape and size.
- In case there are damaged tools, repair them if possible or discard them, replacing them with others in perfect condition.
- Transport them properly: some tools (cutting tools, sharp tools, etc.) may entail an extra risk if they are not transported properly. They must never be carried in pockets. Instead, carry them in bags, tool belts or sleeves.
- Hands and other body parts must not be placed in areas where the tools may reach them in the event of slipping, irregularities or faults in the material being worked on, etc.
- Do not use pliers to twist a screwdriver rod as this will force the screw and the screwdriver itself.
- To cut thick wire with pliers, turn the tool perpendicularly to the material.
- Do not use tongs or pliers to hold parts that are going to be drilled: there is a danger of projection and excessive strain on your arms. For this operation, instead of pliers or tongs, use suitable clamps.
- When possible, choose tools that can be used with either hand.
- Avoid tools that cause twisting of the wrist while using them (it is necessary to keep the wrist in a natural position, within your comfort angles; i.e., a tool must be selected whose design allows the wrist to remain within these comfort angles).
- Finger grooves on the tools should be avoided.
- The gripping surface should be made from compressible, anti-skid, non-conductive material and have the right length and thickness.
- The tool's centre of gravity must be near the centre of gravity of the grip to prevent the tool from moving
- When using hand tools, wear protective gloves against mechanical injuries 4543 with dorsal anti-impact protection.

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 4543	4 Resistencia a la abrasión (de 0 a 4)
	5 Resistencia al corte (de 0 a 5)
	4 Resistencia al desgarro (de 0 a 4)
	3 Resistencia a la perforación (de 0 a 4)



- When using hand tools in areas where there is a risk of the tools falling to another level, systems for anchoring tools must be used. They may be attached to the worker's body or the harness, thus preventing them from falling.




- Preventive measures for using the cutter:
 - Always observe the safety instructions provided by the manufacturer.
 - Wear protective gloves against mechanical injuries, and protective goggles against mechanical injuries when cutting materials that could be projected.
 - Never place the hand not activating the cutter in the path of the cut.
 - Make the cut so that the path of the cutter is away from your body, avoiding jerking and shaking.
 - Avoid using the cutter with a nicked blade or a deteriorated handle.
 - Do not use the cutter with the wet or greasy hands and always keep clean the tool.
 - Properly grasp objects that could move when cutting.
 - Do not carry the cutter with the blade extended or in the pockets of clothing.
 - Use only manual force to cut and refrain from using other means to exert an additional force.
 - Before making a cut, check that you have enough space to proceed comfortably, without having to adopt awkward postures, and that there is no risk of hitting other workers.

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17. USING RADIAL SAWS

- PPE Required: Protective goggles against the impact of particles, protective gloves against mechanical injuries and hearing protection.
- Select the most adequate place for positioning the radial saw so that its cables are laid out over the shortest distance possible.
- Workers should wear tight-fitting clothes and tie back their hair. Taking off watches, rings, bracelets and so on is recommended when using drills.
- Never attempt to stop the disc with your hands.
- Before changing a disc, the machine must be completely disconnected.
- Inspect the machine. If there are any machine parts or connections in poor condition, these must be reported for repair.
- Maintain all safety devices (guards) of the radial saw in their position.
- Do not handle cutting parts of the machinery with bare hands. Wear leather gloves when handling the saw discs.
- Goggles to protect against impacts should always be worn when using a radial saw.
- Whenever the sound level emitted by the radial saw causes discomfort, wear hearing protection.
- The radial saw must only be connected to power supply grids that are protected by differential switches.
- Before using the radial saw, check that there are no chemical products in the vicinity, as contact with sparks from the saw could cause a fire. Ensure that there is a CO2 extinguisher near the work area.
- Any person in the work area where this tool is in use must wear the same personal protective equipment to protect against the risk of projected particles or fragments from both the tool and material being worked on.
- Hold the tool firmly and keep the body and arms in an appropriate position to resist reaction forces that could occur if the tool jams or snags.
- Do not stand in front of or behind an operational cutting disc in line with the cutting path because the tool could jerk backwards if snagged.

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18. USING HYDRAULIC AND PNEUMATIC TOOLS

Pneumatic Tools:

- Always wear protective goggles against mechanical injuries, gloves against mechanical injuries 4543 with dorsal anti-impact protection and hearing protection while handling the equipment.
- Hands and other body parts must not be placed in areas where the tools may reach them in the event of slipping, irregularities or faults in the material being worked on, etc.
- Verify that the compressor pressure is compatible with the components or tools that are going to be used. No tools or equipment must be used if they do not have a nameplate or this has been rubbed out. If there is a pressure regulator, make sure that it has been set to an optimal value to ensure the equipment's safety and efficiency.
- Verify that the tool, connection hose and hose connections are all in good condition. Also verify that the length of the hose is sufficient and adequate.
- Ensure that all the hoses and accessories are of the correct size and are properly tightened.
- Personnel near the area where an impact tool is being operated must use the same personal protective equipment as the worker operating the tool.
- Periodically check the drive end of the tool to ensure that the bit retainer is working properly and the bits and drive ends do not show excessive wear that could allow the bit come out when rotating.
- Check that all of the accessories needed to carry out the job are available.
- If the hoses to be used must be laid out upon the ground, make sure that they are not placed under or run over by any other equipment and that they do not impose the risk of tripping.
- The right work clothes and personal protective equipment for the work at hand must be used. If gloves are worn, check they do not hinder or interfere with tool controlling operations.
- If the tool hose is not long enough to reach the object, do not pull on the hose, connect another one. Test the equipment before using it.
- Switch off the compressed air supply before changing any of the accessories.
- Take into account the following to avoid or reduce exposure to vibrations:
 - Limit the length and intensity of exposure.
 - Establish sufficient rest stops.
- Cut off the compressed air supply and purge the pipe before disconnecting the tool.
- Store the tool and its accessories in an appropriate box and place.
- Store the hose in an adequate place, safeguarded from abrasions, blows, etc.


Hydraulic Tools:

- Always wear protective goggles against mechanical injuries and against liquid splashes and nitrile-coated protective gloves against mechanical injuries 4543 with dorsal anti-impact protection while using the equipment.
- Hands and other body parts must not be placed in areas where the tools may reach them in the event of slipping, irregularities or faults in the material being worked on, etc.
- Improper use of the hoses may force the tubing and cause premature failure.
- Do not transport the tool with the hydraulic hoses connected. Do not pull on any of the hydraulic connections.

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- Before applying final pressure to the system, ensure the quick connectors are firmly connected. Under no circumstances should any of the sides of the quick connector be pressurised if it is disconnected.
- Never attempt to disconnect a connector while it is pressurised.
- Whenever it is possible, maintain a safe distance from the tool when it is pressurised.
- Store the tool and its accessories in an appropriate box and place.
- Store the hose in an adequate place, safeguarded from abrasions, blows, etc.

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19. USING HYDRAULIC TOOLS FOR TIGHTENING BY TORSION

19.1. DESCRIPTION OF THE PROCESS OF USING HYDRAULIC EQUIPMENT FOR TIGHTENING BY TORSION



Workers must have had general training on hydraulic tools and specific training on the hydraulic tool model and accessories they are going to use.



There are risks of entrapment during operations to tighten the bolted joints using pressurised hydraulic equipment, and therefore the control measures and indications given in this section must be followed.



There are risks of impacts and/or projection of fluids, particles, or fragments during operations to tighten bolted joints using pressurised hydraulic equipment.



Wear protective goggles against mechanical injuries against the impact of particles and liquid splashes.


Wear gloves to protect against mechanical aggressions.

19.2. OPERATIONS TO PERFORM BEFORE USING HYDRAULIC EQUIPMENT

- Properly identify all interchangeable elements to be used:
 - Hydraulic unit
 - Hoses
 - Torque wrenches
 - Bolt retention tool
- Transport the tool and its accessories (hoses, torque wrenches, etc.) in a suitable place and/or box protected from all abrasions, blows, etc., and store them there once the works are completed.
- Check the availability of the use manuals of the manufacturers of the equipment and accessories. These manuals must be available at all times to be consulted by the users of the equipment.
- Make sure that the equipment and its accessories have been maintained according to the indications of the manufacturers' use and maintenance manuals. If the equipment has not been suitably inspected and/or maintained, notify the supervisor so that timely corrective actions can be taken before performing the work.

19.2.1 Hydraulic unit

- The following actions must be performed:
 - Check that the pump connectors are clean and in good condition.
 - Check oil level: Ensure the horizontal position of the unit. If necessary, add oil as stated in the equipment manufacturer's use and maintenance manual.

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- Check that the fan cover has no dents and can function correctly.
- Perform the following operations before establishing the grid connection: pay attention to the grid voltage indicated on the specification plate, checking that it coincides with the supplied voltage, and if necessary use extension cords with the correct cross-section, length and voltage.
- Connect and turn on the equipment following the indications given in the manufacturer's Use Manual. Perform any actions and/or inspections established by the equipment manufacturer before use and/or once the equipment is running, regardless of the indications of this section.
- With the pressure regulator almost all the way open (with hardly any pressure), and with no load/wrench, test the pump to verify that is in working condition.
- If anomalies are detected, notify the supervisor so that timely corrective actions can be taken before performing the work.



Example: Tank plugs and oil level indicator:

19.2.2 Hoses

- The following actions must be performed before connecting the hoses:
 - Before connecting the hose, check that the hydraulic pump pressure is correct and corresponds to the work pressure.
 - Check the general condition of all hoses. Look for dents or rips in the protections, permanent kinks, leaks etc. If necessary, advise the assembly supervisor for possible replacements.
 - To ensure a good connection, check that the connectors are clean and implemented with an appropriate working radius, such that they do not force the metal hoses and have space to move.
 - Make sure that the length of the hoses allows the hydraulic unit pump to be properly positioned, allowing the tightening areas to be reached with the pump resting on the nacelle platform or the tower section platforms.
- If anomalies are detected, notify the supervisor so that timely corrective actions can be taken before performing the work.

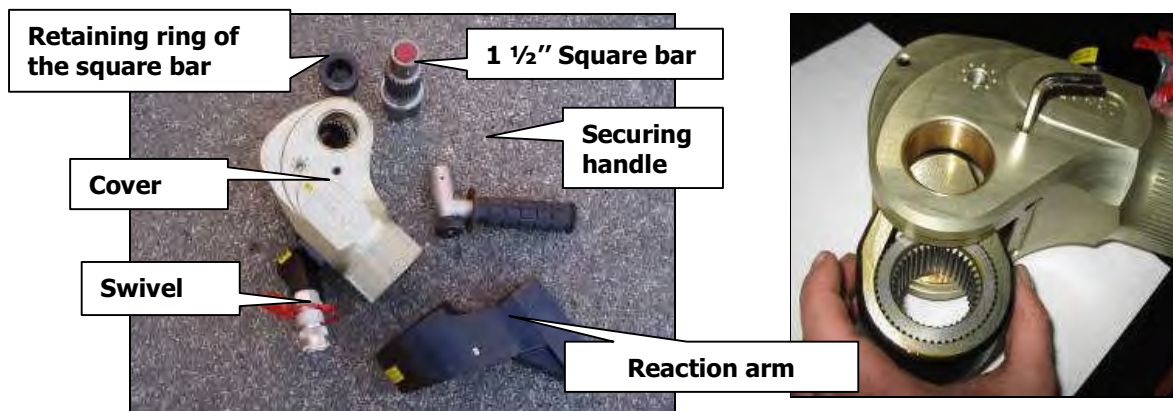
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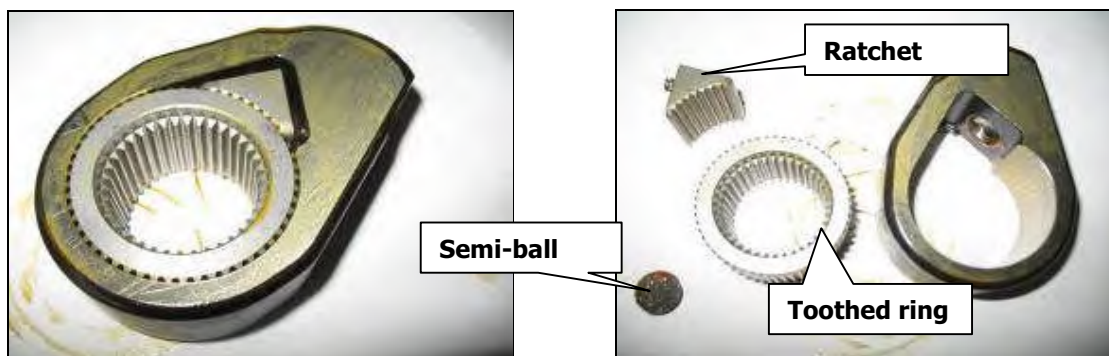
19.2.3 Torque wrenches

Note: The wrench model and accessories vary depending on the joint on which the hydraulic equipment is to be used.


- The following actions must be performed:
 - Identify the hydraulic wrench and check:
 - That all of the wrench components are present, including the lubrication kit.
 - That the reaction arm matches the wrench (depending on the type of wrench).
 - That the wrench securing handle is present.
 - Check that both the wrench connectors are clean and in good condition.
 - Before using the wrenches, verify that the wrench serial numbers match those of the calibration tables (from an approved laboratory) to correctly convert from bar to Nm (see attached example certificate).
 - Check that the wrench has a manual securing handle and that it is mounted.
- If anomalies are detected, notify the supervisor so that timely corrective actions can be taken before performing the work.



Example of torque wrench for Plarad sections and of disconnecting the drag lever



Example of drag lever with toothed ring and ratchet installed and internal pieces of the cover

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Example of flat torque wrench (Plarad)




Examples of grip handles (Plarad tools)



INSTRUMENTO PERFORADOR - GALEA S.L. EQUIPO HIDRAULICO PRESION - MOMENTO CAPACIDAD Maxima 7300 N.m		MANOMETRO TRANSDUCTOR X MARCA: PLARAD TYP DTM K NUMERO SERIE: 233023 CAMPO DE O A: 1000 bar DIVISION DE ESCALA: 1 bar																																																																											
Nº IDENTIFICACION 84-4029 (BOMBA) / 89-4029 (GATO)		Nº IDENTIFICACION 84-4029																																																																											
TIPO DE INSTRUMENTO MARCA: PLARAD MODELO: BSM T TS TS NUMERO SERIE: 84-4029 CAPACIDAD: 7300 N.m		TIPO DE INSTRUMENTO MARCA: PLARAD MODELO: VAX 1.2 W NUMERO SERIE: 84-4029 CAPACIDAD: 800 bar EXACTITUD TOLERADA: 5 %																																																																											
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Examples of wrench case and case with lubrication kit, and calibration table

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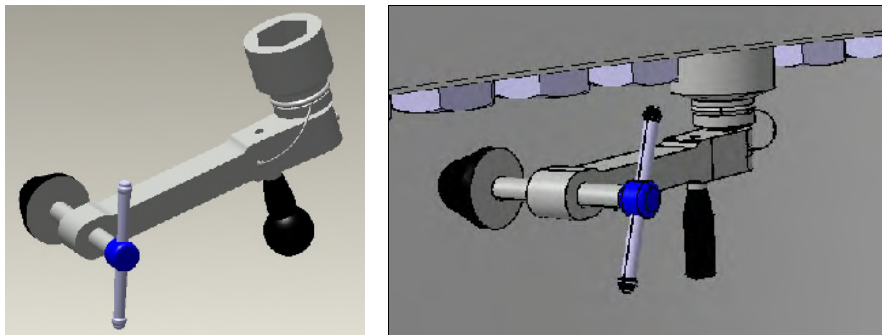
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19.2.4 Impact sockets

- Use the original sockets, which ensure correct support of the wrench.
- Verify that the metric to be use matches the one indicated for the task and that the socket fits correctly, completely and with no looseness.
- They must always be of the correct height and diameter if these are pre-set dimensions.

19.2.5 Bolt retention tool

- Use tools specifically designed to retain the bolt.
- The sockets used with these tools must meet the specifications given for impact sockets in the previous point.




Example of bolt retaining tool (GP135567)

19.3. USE OF THE HYDRAULIC UNIT

- Check the proper placement of the different parts before beginning work with the equipment. Before applying final pressure to the system, ensure the quick connectors are securely connected. Under no circumstances should any of the sides of the quick connector be pressurised if it is disconnected on one of its ends.
- Always put the available safety systems in place.
- Do not dent or puncture the connectors while connecting them or in order to connect them.
- Check that the reaction arm is installed correctly, making sure it rest correctly on the bolts (see the following sections).

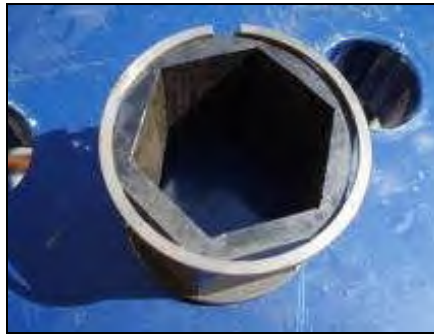


Example of hose connections and placement of reaction arm

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- If using a flat wrench with a reducer bushing, check the placement of the bushing and its fastening washer (circlip), making sure it is on the side opposite the bolt.



Example of reducer bushing with circlip

Note: according to the equipment model, the calibrated element is the pressure gauge transducer. Check that the values of the pump's digital controls are the same as the real values shown by the pressure gauge on the pump.


- Once everything mentioned in the previous points has been checked, adjust the pump to the desired pressure and begin tightening the bolts, following the indications of the equipment manufacturer's use manual.
- Also, take the following precautions:
 - Always wear protective goggles against mechanical injuries and protective gloves against mechanical injuries while using the equipment.
 - Do not transport the tool with the hydraulic hoses connected. Do not pull on any of the hydraulic connections.
 - Never attempt to disconnect a connector while it is pressurised.
 - Whenever possible, keep a safe distance from the tool when pressurised. Only personnel essential to the operation may remain near the tool.

19.4. OPTIMUM SUPPORTS FOR USE OF THE TOOL

- So that the tightening tool works in ideal conditions and is not hampered by poor supports, and also to keep the tool from breaking or slipping, pay special attention to the position of the reaction arm before beginning work with the equipment.

19.4.1 Wrench for sections

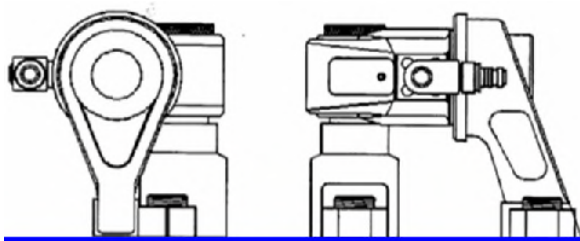
- Pay special attention to the base the support, making sure it is perfectly flat. The more support surface the foot of the reaction arm has, the better. The optimal position is 90° from horizontal (see image).
- Do not react outside of the reinforced plates.
- To avoid possible problems, tightening should be done resting the reaction arm on an already tightened bolt.
- Make sure the socket fits completely onto the nut and is not exerting force at an angle. The reaction arm must also be properly supported.

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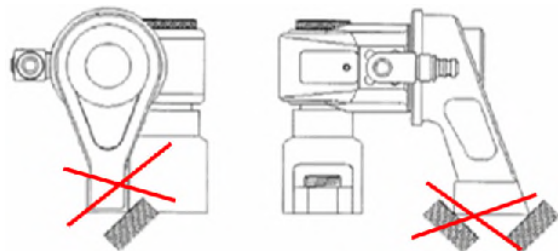
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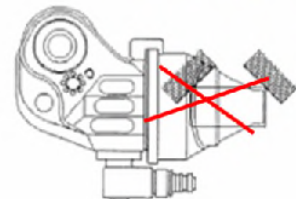
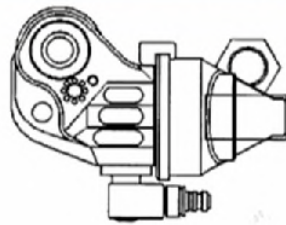
Never handle the spanner from the reaction arm. Adjust the reaction arm on the bolt or contact surface with an open palm, NEVER grasp the reaction arm with a closed hand near the support area.



Optimal position



Prohibited positions

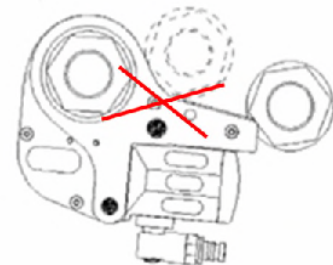
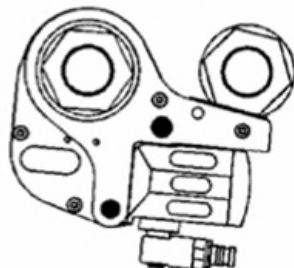
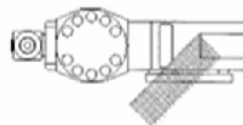


19.4.2 Flat Wrench


- Make sure the base of the support is perfectly flat. Make sure the wrench fits completely onto the nut.
- Do not react outside of the reinforced plates.



Optimal position



Prohibited positions

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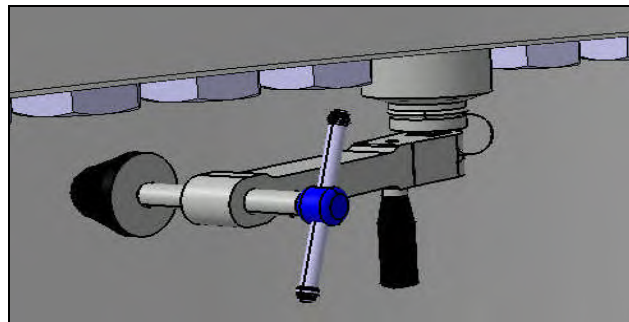
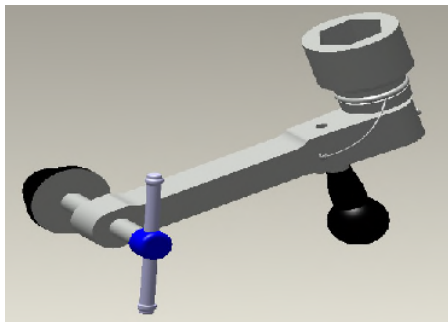
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19.4.3 Bolt retention tool



The tool must never be handled from the reaction arm. Adjust the reaction arm on the tower section wall or contact surface with an open palm, NEVER grasp the reaction arm with a closed hand near the support area.

- Use tools specifically designed to retain the bolt instead of fixed wrenches.
- Make sure the socket fits completely onto the nut and is not exerting force at an angle. The reaction arm must also properly rest against the tower section wall.



Example of bolt retaining tool (GP135567)

19.5. TIGHTENING PROCEDURE




To prevent ergonomic risks, establish regular rest periods during work and rotate positions between workers when strenuous physical effort is required.



When in use, hold the hydraulic wrench and retaining tool by the handle or grip to prevent entrapments. Never support it placing hands in areas where the tool can reach them due to slipping, irregularities, breakage, faults in the materials being worked on, etc.

When the tool is in use, personnel in the work zones must be extremely careful to not place hands and other body parts in areas where the tools may reach them in the event of slipping, irregularities, breakage or defects in the material being worked on, etc. The person activating or giving the order to activate the tool must ensure that all personnel present follow the above rule.

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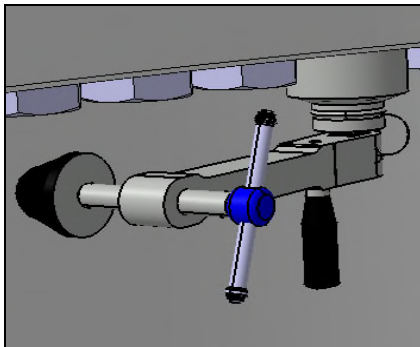
19.5.1 PLACING THE BOLT RETENTION TOOL



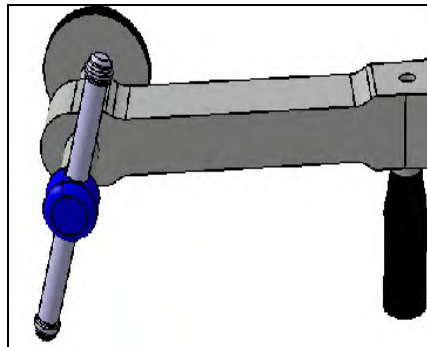
To prevent entrapments in the event of tool failure, breakage, slipping, etc, never place hands between the tool and the tower section wall.

Grip the tool by its handles.

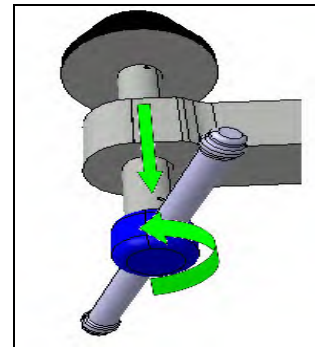
- Before beginning to tighten the structural bolt of the tower, place the tool + impact socket over the bolt head, following the indications of the tool manufacturer's use manual.
- The operator must firmly grip the tool throughout the entire tightening operation. Pay special attention to the start of the tightening process, since the bolt is most likely to turn at this moment.
- Example positioning setup for tool GP135567 fitted to the tower section wall:



Position of tool: resting on the tower section wall



Fitting to tower by threading from the handle




Removing the tool by turning the lever

19.5.2 TIGHTENING TOWER SECTION JOINTS WITH SECTION WRENCH



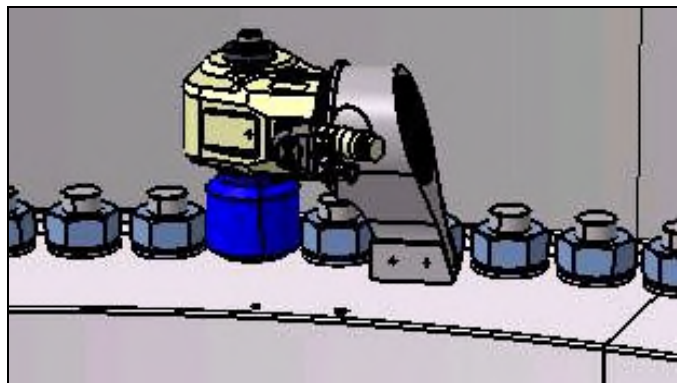
Do not move the tightening spanner and activate the pump control at the same time. Place the control in a safe place sheltered from accidental activation before handling the torque spanner.

- Bolted joints between sections should be tightened by two operators. One works with the wrench and activates the pump in order to tighten and the other is in charge of handling the retaining tool.
- Once all the operations and checks mentioned in the previous points are done, proceed with the tightening. The steps to follow are described below.
 1. OPERATOR 1: Place the control that activates the pump in a safe place. Place the torque wrench on the nut and tighten. Make sure that the torque wrench socket does not fall off while the tool is being moved
 2. OPERATOR 2: Place the retaining tool on the nut to be tightened.
 3. OPERATOR 1 / 2 Before activating the pump control, there should be agreement between both operators, ensuring that each one has correctly completed his part of the maneuver.

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4. OPERATOR 1: Once the wrench has been placed and the consent of OPERATOR 2 is given, he is in charge of activating the pump.
5. Once the joint is tightened, OPERATOR 1 places the pump activation control in a safe place, removes the wrench and places it on the next nut.
6. OPERATOR 2 changes the retaining tool to the next bolt.
7. Repeat Points 3, 4 and 5.




Example of the working position of the section wrench

19.5.3 TIGHTENING THE HUB - MAIN SHAFT JOINT WITH THE SECTION WRENCH

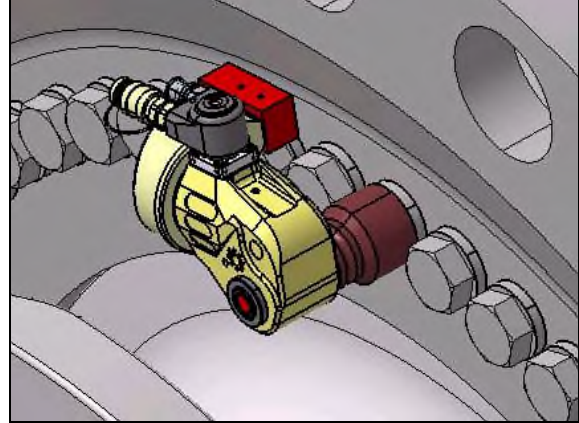
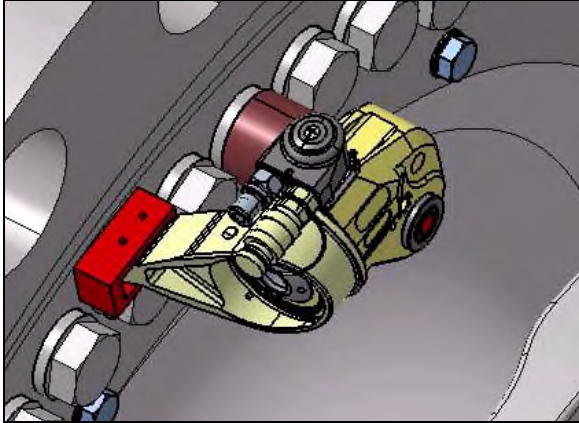


Never handle the spanner from the reaction arm. Adjust the reaction arm on the bolt or contact surface with an open palm, NEVER grasp the reaction arm with a closed hand near the support area

- The joint between the upper section and the nacelle should be tightened by two operators. One is in charge of handling the wrench and the other activates the pump.
- Once all the operations and checks mentioned in the previous points are done, proceed with the tightening. The steps to follow are described below.
 1. OPERATOR 1: Place the wrench on the bolt and tighten.
 2. OPERATOR 2: When operator 1 gives a clear signal, activate the pump.
 3. OPERATOR 1: Place the wrench on the next bolt.
 4. Repeat points 2 to 3 until the entire circumference is completed.

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Example of working position for the hub-main shaft joint.

19.5.4 TIGHTENING JOINTS WITH FLAT WRENCH




Do not move the tightening spanner and activate the pump control at the same time. Place the control in a safe place sheltered from accidental activation before handling the torque spanner.

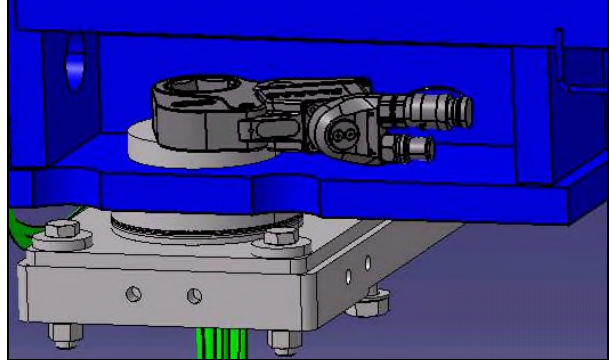
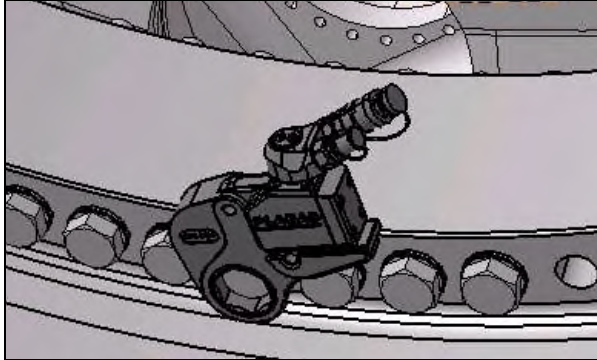


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- The joint between the upper section and the nacelle should be tightened by two operators. One is in charge of handling the wrench and the other activates the pump.
- Once all the operations and checks mentioned in the previous points are done, proceed with the tightening. The steps to follow are described below:
 1. OPERATOR 1: Place the wrench on the bolt and tighten.
 2. OPERATOR 2: When operator 1 gives a clear signal, activate the pump.
 3. OPERATOR 1: Place the wrench on the next bolt and tighten.
 4. Repeat points 2 to 3 until all joints are tightened.

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Example of working position for the upper section - nacelle and generator legs joint

19.6. PICKING UP MATERIAL


- Gather, clean and organise tools employed during this operation.
- After using the hydraulic tightening tools, gather them and clean them for later use.
- Check oil levels in the pump of each set of tightening/torque equipment according to the indications stated the manufacture's use and maintenance manual.
- After use, perform any checks established by the manufacturer in its use and maintenance manual and/or by Gamesa.
- Place the tool and its accessories (hoses, torque wrenches, etc.) in a suitable place and/or box protected from all abrasions, blows, etc. so that it can be transported and stored.

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20. USE OF PPE

- Personal Protective Equipment is for personal use, and each worker must look after it, clean it, maintain it and store it correctly.
- The protective equipment used should be adequate for the task to be performed, and comply with current standards and legislation of the country in which the work will be done, and if there is none, European legislation shall be observed.
- Personal protective equipment (PPE) must be installed in the place indicated for it.
- Each worker must use the PPE correctly and inspect it before use. It must be replaced if it shows any wear and tear that could affect the level of protection provided.
- If the equipment is wet after use, the manufacturer's instruction manual must be consulted. The equipment must be withdrawn if specified in the manual, or dried in accordance with the instructions given therein.
- Before using PPE, the manufacturer's instructions must be consulted and the conditions for use always observed.
- Respiratory protective equipment (face masks with filters, diving helmets, etc.), must only be taken to the areas of contamination when it is used, otherwise it will be kept away from these areas. Exposure when not being used shortens their life due to the saturation of the filters, considerably reducing their effectiveness.
- The filters must never be stored in areas of contamination because they will become saturated due to environmental exposure.
- The filters must be replaced when suspecting that they no longer provide effective protection.
- Protection equipment must not be modified (seams, tapes or straps on harness or safety ropes, guards of the energy absorber, etc.)
- Workers must report any defect, anomaly or damage observed in the PPE used, which at his/her judgement may imply a loss of its protective efficiency.
- Personal Protective Equipment must be used in the presence of the risk for which it is designed.
- Before choosing PPE to protect against a chemical product, the Product Safety Data Sheet must be checked to check whether it is appropriate.
- When using PPE, strict hygiene and cleanliness is essential to prevent problems caused by continuous contact.
- Whenever a worker uses Personal Protective Equipment to prevent an accident, it must be inspected to ensure its initial features are still intact and that the level of protection it must guarantee has not been lost.
- Equipment with signs of wear or tear or that has exceeded the manufacturer's established maximum service life must not be used.

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21. WARM-UP AND STRETCHING EXERCISES


- The following exercises are designed to reduce the risk of occupational injuries due to overexertion, pulled muscles, etc. These exercises are divided into two sections:
 - Warm-up exercises.
 - Stretching exercises.
- Work carried out in Wind Farms are usually physically demanding:
 - Forced back, next and arm postures are frequent.
 - Workers are also standing all day long and they may be exposed to excessive cold or heat, rain, etc.
 - Loads must often be handled or force applied.
- All of this means that the back, arm and leg muscles are subjected to demanding levels. This increases the chance of becoming injured. An effective way of protecting oneself from muscular-skeletal injuries is by performing warm-up and stretching exercises. Proper physical preparation strengthens and balances one's musculature, reducing the risk of injuries.

Tips:


- A good exercise program should include warm-up exercises before starting work, and stretching exercises before, during and after work.
- It need not take much time: from 5 to 10 minutes per day usually suffices.
- These exercises are not a competition or a race. Movements must be slow and controlled. avoiding quick, sudden movements.
- Apart from these exercises, frequent breaks should be taken and muscles stretched in the opposite direction (for example, if you work with your neck stretched backwards, stretch it forwards briefly).
- These exercises should not be seen as a chore. The idea is not to tire yourself out, but rather to prepare and protect your body. Some people can spend more time on these exercises and others less. This is completely normal. You are recommended to start off these exercises slowly and gradually build up.
- If you feel any pain or unwell while doing them, stop.
- People who have suffered an injury or have had problems before may not be advised to do certain exercises. If in doubt, check with the doctor.
- The exercises described below are a just guide. You are advised to check with the doctor before starting different exercise programs.




Warm-up Exercises:





- Warm-up exercises should be done before starting work. Their purpose is to prepare the body for the physical task ahead. They should take around 5 minutes.
- The exercises should be light, placing minimum pressure on joints. Quick, sudden movements should be avoided. Each exercise should be repeated 5 to 10 times.


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Arms and legs	
<p>Move your arms and legs in opposite directions (like walking, but with more exaggerated movements and on the spot). Make sure your heel touches the floor. Do this exercise for 2-3 minutes.</p>	

Head	
<p>Move your head slowly:</p> <p>1. Up and down.</p>	
<p>2. Right and left.</p>	
<p>3. To the sides.</p>	

Arms and hands	
<p>1. Move your arms in circles, in a swimming motion.</p>	
<p>2. Open out your arms to the side and then close them in a hugging motion.</p>	
<p>3. Stretch your arms forwards and then bend them, touching your shoulders with your hands.</p>	
<p>4. With your arms stretched out, move your palms upwards and downwards.</p> <p>5. Open and close your hands.</p>	


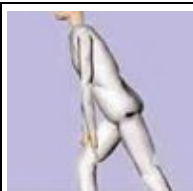

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Back	
<p>Slightly open your legs, put your hands on your waist and move your back as follows:</p> <ol style="list-style-type: none"> 1. Twist to the right and left. 2. Lean your back to the right and left. 	
<ol style="list-style-type: none"> 3. Move your back forwards and backwards. 	



Stretching Exercises:

- You are advised to do stretching exercises before commencing work, although you can also do them at other times (for example, when you switch tasks) and at the end of the work day. Their purpose is to prevent strain and fatigue on specific parts of the body. They should take around 5 to 10 minutes.
- The stretching should be gentle and gradual. The stretching movement should be held for 10 to 15 seconds. Quick, sudden movements should be avoided. Each exercise should be repeated 2 to 3 times.

Knee to chest	
<p>Rest one hand against a wall to keep your balance. Bring your knee up to your chest and hold it with your free hand. Hold for 15 seconds and switch legs. Repeat 3 times with each leg.</p>	
Hips	
<p>Place one foot in front of the other. Bend one knee gently forwards, keeping your back foot firmly on the floor. Hold for 20 seconds and switch legs. Repeat 3 times with each leg.</p>	
Thighs	
<p>Rest one hand against a wall to keep your balance. Bend your leg backwards and take your ankle with your free hand, keeping your back straight. Hold for 20 seconds and switch legs. Repeat 3 times with each leg.</p>	


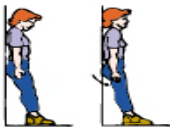


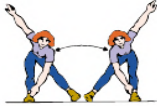
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Back – lower back	
Stand straight and push your back slightly backwards. Hold for 15 seconds and repeat 3 times.	
Arms and shoulders	
Cross your arms behind your head. Lean your back sideways to the right. Hold for 15 seconds. Then lean to the left. Repeat 3 times on each side.	

Muscle Strengthening Exercises:

- Muscle strengthening exercises are designed to strengthen and tone your muscles.

Jump up and down with your legs open	
Lean against a wall and tighten your abdominal and gluteus muscles, and try to slide your back slowly downwards	
Lean on your hands, straighten your arms and with your back straight raise and lower your body	
Stand on tiptoe with your hand on the wall and try to bend your knee, alternating both legs	
Stand with your feet apart, look ahead and bend your right knee until you can touch your right foot with your left hand. Then do this inversely	

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22. PREGNANT WORKERS


- Pregnant workers may only access the wind turbine Ground platform, and access to any other areas of the wind turbine is prohibited.
- Pregnant workers may only carry out operations on ground level and must not work from a height, for example, on elevating platforms, ladders, etc.
- Pregnant workers must not be assigned to load lifting or transporting duties or other heavy manual work. This measure must be respected including up to 3 months after giving birth. Do not exert yourself when dragging or pushing loads (+10 kg.). When seated, do not handle loads weighing more than 3 kg or exert yourself.
- Pregnant workers may not perform night work.
- Pregnant workers may not perform work involving risk of electric shock.
- Ensure that access and space in the workplace is optimum to allow pregnant workers to move around easily and comfortably.
- Provide facilities so that pregnant workers can carry out their work while seated.
- Tasks assigned to pregnant workers, especially during the last stages of pregnancy, must be flexible to allow them to stop for breaks. If necessary, plan the work rota so that pregnant workers can adjust their own work pace.
- Give pregnant workers enough break periods throughout the working day.
- Provide services and rest areas so that pregnant workers can use them at their convenience.
- Pregnant workers may not handle chemical products that are identified on the Safety Datasheet as being potentially harmful for the health of pregnant women and/or the unborn child.

Dynamic, ergonomic posture recommendations: Do not stand in one, fixed position for more than 1 hour without moving, or for more than 4 hours in any fixed position or combined with movements. Do not remain in a kneeling or tiptoe position. Do not bend to the side or twist your torso for long periods (+ than 1 minute) or repeatedly (+ 2 times/minute). Do not bend your torso.

Static, ergonomic posture recommendations: Do not remain seated for more than 2 hours non-stop. When seated, make sure your legs do not hang off the chair and that your feet are supported, you are leaning back against the backrest and you can move your legs comfortably under the desk.

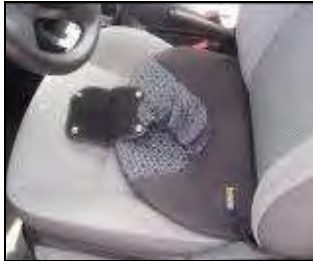
Driving:

- Avoid driving for many hours without stopping. Stop every two hours or every 200 km. When you take the vehicle off the road, stretch your legs and breath in fresh air. As soon as you feel the slightest bit tired, stop the vehicle by the side of the road and have a nap or take a rest.
- The safety belt should be placed such that, when it locks suddenly, it does not press on the central area of a pregnant woman's abdomen, to avoid damaging the unborn child. The following device is available on the market and can be used for this purpose, detailed here for informational purposes only:

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- The steps for putting the belt on are as follows:




1. Place the device on the car seat.



2. Sit on the device and put the safety belt on with the horizontal band over the restraint system. Then, fasten the belt to the device.

23. PSYCHOSOCIAL RISKS


- Stress and mental and physical fatigue:
 - Set mini-breaks during work processes, alternating tasks.
 - Keep working procedures and supports (documentation, codes, accesses, etc.) updated and available.
 - Know the organisational support and systems available for each type of demand or special situation which exceed your own scope of decision making.
 - Generally in the psychosocial field, you must earn the participation and involvement of workers in the future of the company, provide oral and written paths for sharing information about preventive and organisational business issues, proper management of work time with some autonomy for the worker in the organisation to introduce pauses, breaks and alternation of work and tasks, as well as promoting a good social work climate and if possible friendly personal relations between peers.

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Title: ROAD SAFETY, TRANSPORT AND MOVEMENT OF MATERIALS			Prepared by: J.E.R. (Signature and Date)
Safe Practice Code: PS-MM.2	Revision: 07	Date: 01/04/2015	
RA Code: ART.MM.2	Revision: 07	Date: 01/04/2015	
PS code it replaces: PS-MM.2 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.2 Revision 01 of Multitechnology and Made			Checked: D.P.C (Signature and Date)
Manufacturer:	ALL		
Model:	ALL		
This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.			Approved by: L. P. (Signature and Date)

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Title: ROAD SAFETY AND MATERIAL TRANSPORTATION	Safe Practice Code: PS-MM.2	Revision: 07
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0. GENERAL INSTRUCTIONS:

- On arrival at the wind farm, and before carrying out any work, report to the substation and notify the work to be carried out, complying with all operating requirements (remote control notifications, work order requests, etc.) established by the customer and GCT for said wind farm.

1. ROAD SAFETY: MEASURES TO PREVENT ACCIDENTS

- Related to the road: animals.
- Related to the weather and environment.
- Related to other drivers.
- Related to the driver.
- Related to the vehicle.
- Conduct when facing risk situations

1.1. Related to the road: animals

There have been many injuries and even fatalities due to swerving or braking to avoid a dog or other animals crossing the road.

To prevent this type of accident, drivers must be aware of the animals in the area they are passing through, especially in hunting grounds, and adjust their speed and take special care to be able to react if an animal suddenly crosses the vehicle's path.

Preventive measures to avoid accidents due to colliding with animals: Ultrasonic horns.

These are low-cost, simple devices that are fitted strategically to the vehicle (usually the front radiator air intake grille). Once the vehicle starts running and reaches 40 km/h, these horns emit an ultrasound due to turbulence from the air flow, similar to a straightforward whistle. This warns animals near the vehicle and frightens them off. Some manufacturers have published statistics on their websites that show the effectiveness of these devices in substantially reducing the accident rate.




Available from the Norauto chain



<http://www.deerwhistle.co.uk/>
<http://www.deerwhistle.com/index.html>

Available on the Internet

If a collision is imminent: it is not always possible to avoid a collision. In such a case, firmly hold the wheel and lift your foot off the accelerator pedal, continue straight without braking hard and prepare yourself for the impact. Swerving to avoid collision is risky and endangers the passengers in our vehicle and any oncoming cars.

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1.2. Related to the weather and environment.

Prior to performing any driving manoeuvres in adverse weather conditions, follow the following Safety Rule: **See – Analyse – Act**.

Use caution in rain, snow or fog. We hear this advice every day when we need to go out on the road in poor weather conditions. To avoid mishaps due to inclement weather conditions there is one golden rule: anticipate danger. Here are some tips to adapt your driving to weather and/or environmental conditions that could affect driving:




WINTER DRIVING: SNOW AND/OR ICE

- You are advised to inspect the vehicle to ensure it is prepared for the winter before it arrives.
- Before setting off, check the weather forecast and the situation on the chosen route. Assess the necessity of travelling on roads affected by snow and, when possible, avoid doing so.
- Drive on A roads and during the day time. Avoid travelling on B roads at night.
- Use chains and gloves put them on, a torch, suitable footwear, warm clothes and equipment to protect against the cold. When driving, it is better to put the heating on, although not very high, and take off warm clothes as their looseness renders the seat belt less efficient. You are also advised to carry a brush and scraper to remove ice and snow, towing equipment and battery clips.
- Follow the instructions from road surveillance agents, road signs and information on message boards at all times. If road officers instruct you to stop the vehicle, do not restart it until they tell you to.
- On two-lane roads, drive in the right-hand lane and if you need to stop the vehicle, always do so off the road or on the hard shoulder.
- Make sure you have a mobile telephone (with a charged battery or in-vehicle charger) and fill the fuel tank approximately every 100 kilometres. The extra weight of this fuel on the rear provides more stability, and if you get stranded you can switch the heating on.
- Stay a safe distance from the vehicle in front. The worse the conditions, the further the distance should be.
- Do not overtake, except extremely slow vehicles and as long as there is enough free space in front.
- If you cannot avoid driving in adverse conditions, inform your superior or the remote control person of your destination and ETA.
- Do not veer from the tracks so as to avoid colliding with obstacles hidden by the snow.



For better adherence

- Drive gently, without making abrupt steering movements or gear changes. Use all the vehicle controls, brake, accelerator, clutch, etc. with great care.
- Make sure the tyres are in good condition and have the right pressure, and test them frequently.
- Adjust your speed to the specific circumstances.
- Climb ramps slowly, at a steady speed and in the highest gear possible.
- Drive down slopes slowly and in a low gear to use engine braking, using the brake when absolutely necessary.
- Try to drive over the tracks made by other vehicles because trodden snow gives better grip.
- Do not accelerate or brake sharply to avoid losing grip unnecessarily.

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- There is almost zero traction on ice. In this case, chains must be used. If you have four chains, use one on each wheel, but if you only have two use them on the driving wheels (usually the front wheels) to ensure traction and steering at the same time.
- Drive over tyre tracks providing the snow does not come into contact with the underside of the vehicle, and in this case drive close to them using chains.
- Avoid sudden manoeuvres. If you lose control, avoid braking and try to keep the vehicle under control by using countersteering.
- When you need to bring the vehicle to a stop, look for a flat area. If you need to leave your car, apply the hand brake and leave it in gear.

For better visibility:

- Snow can freeze over and the windscreen wipers may not work if you do not add antifreeze to the water tank so that this dissolves the snow or ice when the water is sprayed over the windscreen. If there is so much snow that the windscreen wiper does not clear the surface entirely, stop the car to remove it.
- Use the front fog light during a snow fall and the rear fog light during a heavy snowfall.
- If the windows mist up, use the demister heater, and if necessary, stop the car and clean the windows.

To locate ice patches:

ACCESS TO WIND FARM:


- **Snow** on the wind farm access roads: the wind farm must only be accessed with a four-wheel drive vehicle, **without using tyre chains**. They must however be carried aboard the vehicle and only used for evacuation of the wind farm if it is necessary to leave it due to worsening weather conditions (snow, fog, etc.). If weather conditions worsen while carrying out a maintenance operation, the operation must be suspended immediately and the wind farm evacuated.
- **Ice** on the wind farm access roads:
 - Possible existence of patches of ice: the wind farm can be accessed, after having checked conditions, provided that the four-wheel drive vehicle has **special winter tyres** that ensure optimal road adherence and manoeuvrability of the vehicle.
 - Evidence of large patches of ice (which can be seen or assumed due to extremely adverse climate conditions): access is not allowed unless previously validated special equipment is available.



IF IT IS FOGGY

- Avoid driving through foggy areas. These days, weather forecasts can tell us in advance if there is fog forecast along the planned route.
- Before you leave, clean the windows, rear window and windscreen, and make sure all of the lights are working properly. Adjust the height setting for the lights and clean them.
- If the fog is heavy, notify the people at the destination.
- Drive with dipped headlights. Only use the front and rear fog lights when visibility is less than 100 metres. Switch off the fog lights as soon as visibility is resumed.
- Do not switch the main beam on; thick fog causes a mirror effect, and could blind you.
- Use the windscreen wiper every now and again to remove moisture caused by fog on the glass.
- If the inside of the vehicle mists up, clear it by directing the fan heaters towards the windows. If this does not work, open the windows slightly.



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- Drive at a moderate speed and keep a safe distance from the vehicle in front. Remember that if you need to brake or make an emergency manoeuvre you must do so within the distance at which you can see clearly. For instance, if visibility is 50 metres, drive at 50 km/h and keep 50 metres back from the vehicle in front.
- On motorways or dual carriageways, always drive on the right and avoid overtaking.
- If the fog is very thick, use the continuous white line on the right-hand side of the lane as reference.
- Do not follow the path taken by the vehicle in front, because if they go wrong or become distracted you could collide with them.
- Apply the brake gently to avoid locking the wheels. Braking earlier than usual and regularly is a way of warning the vehicle behind of your presence.
- Try to drive in silence, without the radio equipment switched on. This way you can listen out for other vehicles. At crossroads, for example, lower the windows and try to tune your ears.
- In zero visibility situations, look for a safe place to stop until the fog lifts.
- If you are involved in an accident and cannot find a safe place to stop, stop as close to the right hand shoulder as possible and switch your hazard warning lights on.
- If you need to leave your vehicle, keep the hazard warning lights on, report your situation by telephone and wear warm and reflective clothes.



IF IT IS WINDY



- Grip the steering wheel firmly to stay on a steady course and move it gently. If the wind dies down, do not become confident as it could return even stronger.
- Watch out for everything around you. If you veer off course, you could hit another vehicle or obstacle. Even if you do not veer off course, you could be hit by a loose object or branch.
- Try to find out which direction the wind is blowing by watching tree branches or switching off or lowering the radio equipment to listen to it.
- Be careful in awkward areas and anticipate. For example, on coming out of a tunnel or sheltered areas, when going under a bridge or when overtaking a lorry you may be blown dangerously off course due to the shielding factor.
- Lower your speed and increase the safety distance. If you do not, the danger will be worse because you will have less time to react.
- Keep a steady speed. Do not allow the car to accelerate in tailwinds or brake in headwinds.
- Drive in a low gear so that the engine helps to counteract the force of the wind.
- Avoid overtaking. If you have no choice but to overtake, stay as far away from the vehicle as possible, make gentle movements and hold the steering wheel tightly.
- Take care when driving wind-sensitive, high-sided or broad-sided vehicles such as lorries, minivans or vans. Motorbikes are particularly sensitive due to their lightness.
- Keep the tyres in good condition and the pressure correct, a basic aspect of road safety. Remember that they are a point of contact between the car and the road surface.
- Stop in a safe place if you cannot drive on. If apart from windy conditions it is also night time, raining or another adverse weather condition, you will have no choice but to stop.

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IN THE RAIN

- Pay special attention to the safety distance, because in these conditions braking time is doubled.
- Do not drive too closely to the vehicle in front to avoid spray and allow enough space in case you have to brake sharply.
- A change of inside/outside temperature causes the windows the fog up. Use the heating/air conditioning system, avoiding excessively cold air.
- Sudden movements should be avoided. Rain and fog reduce adherence between the tyre and the road surface, which increases the risk of losing control of the vehicle in the event of an unforeseen situation, hence the importance of checking the tyres everyday before using the vehicle.
- Brake gently and with short foot movements (except in vehicles with ABS) to avoid locking the steering and drying out the brake pads. Increase the safety distance and reduce your speed. Brake earlier because the braking and therefore safety distance is longer, almost double, than on dry roads.
- Switch the dipped headlights on. If you are driving very slowly, switch the hazard lights on to warn other drivers that you are driving at an abnormally slow speed.
- Aquaplaning: This is one of the most dangerous effects caused by rain. It refers to sliding and loss of vehicle control when water builds between the tyres and the road surface:
 - Check the tyres. This effect becomes more likely when they are worn or too wide.
 - Driving through a puddle at an excessive speed could also be dangerous.
 - Do not brake, lift your foot gently off the accelerator and hold the wheel firmly. Only brake once the vehicle has recovered contact with the road.

For better visibility:


- If the rain is heavy, switch on the front and rear fog lights, if available, or at least the dipped headlights. The rear fog light can only be used when the other lights are switched on.
- Always keep lights, lens, windscreen, windows and rear view mirrors clean. If you are already travelling, stop to clean them if necessary.
- Switch the windscreen wipers on, and the headlight and rear screen wipers, if available.
- Use the heating and ventilation system to demist the windows and switch on the rear window heating, if available. Reduce your speed as far as possible depending on the amount of rainfall so that the tyre treads evacuate the water and do not lose road adherence.



IN HOT AND SUNNY WEATHER

- Avoid the effects of heat by drinking water, eating a light meal, wearing loose clothing and sun glasses, and making frequent stops along the journey.
- Keep the temperature in the car between 18° and 23° using the air conditioning or climate control system.
- Use sunshields and wear sunglasses to reduce the sun's glare in your eyes.
- If you can, adapt your departure time to the solar angle of incidence depending on the route you are going to take.



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AT NIGHT

- Always try to drive in the daytime, avoiding driving at night as far as possible.
- Reduce your speed: you must be able to bring the vehicle to a complete stop inside the illuminated area. On the road, the recommended maximum speed is 90 kilometres per hour.
- Keep a safe distance: This should not be less than three seconds away from the vehicle in front.
- Look in the rear view mirrors more frequently: at least every ten seconds.
- Stop more frequently: you should stop to rest your legs and clean the windows to ensure you can see clearly. Do not eat heavy meals.
- At dusk, switch the dipped headlights on: At the first sign of poor visibility, switch the headlights on.
- Stop if you feel tired: have an energy drink or food.
- Stop if you feel sleepy: rest for 20 minutes and have a hydrating and energy drink. Sleep if you are very tired.
- On roads where there is no risk of dazzling other drivers, use the full beam instead of the dipped headlights to improve night vision.
- Switch the full beam off when overtaking. To avoid dazzling drivers, when you meet another vehicle switch from full beam to dipped headlights.
- Lower the light intensity on the instrument panel: The more light inside, the worse you can see outside.



DRIVING OVER SAND

- Drive carefully but in the highest gear possible and perform gear changes at high revs because you also need a certain amount of speed so that the vehicle does not stop. This will depend on the vehicle's horsepower and features.
- Above all, you should not accelerate and brake sharply.
- Drive over the tracks left by other vehicles because the sand will usually be more compact in those areas. These tracks will also show whether there are any "traps" on the path.
- Try to keep the vehicle moving at an even speed because if it stops on this type of surface it will be difficult to get going again.
- If the surface is excessively soft, the tyre pressure can be reduced up to 1 kg/cm², but once out of the sand this pressure must be returned to its normal value.
- If you get stuck, do not keep pressing on the accelerator because you will only sink further. Place an object, such as boards, planks or stones, to improve traction and clear the exit path. The movement should be gentle and gradual.

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DRIVING OVER MUD

- It will be important to know how thick the layer of mud under the wheels is. If it is thin, drive carefully because there will be poor grip, similar to on ice, and the vehicle will lose steering control.
- If there are shallow tracks, try to drive over them with a firm hand on the steering wheel and taking care not to veer from them. In the case of deep tracks, drive outside them to avoid the built up mud coming into contact with the underside of the vehicle and getting stuck.
- Take care when braking because the braking distance is usually longer. You should therefore leave more distance between your vehicle and the one in front. Avoid driving in convoy and avoid making sudden movements.
- If the path is very muddy, try to drive over it without stopping, turning the steering wheel quickly in both directions.
- If you get stuck, you could reverse a little to try to gain momentum. In this case, you could also deflate the tyres a little to improve adherence and remove the mud from underneath the vehicle and from the tyres.
- Once you have made it across, you should clean all of the vehicle parts with pressurised water because mud gets stuck to the mechanical parts and reduces the engine's cooling.




MOTORWAYS AND DUAL CARRIAGEWAYS

- Always drive in the right-hand lane. Switch lanes only when necessary, for example, to overtake. Once you have overtaken, gradually move back over to the right-hand lane.
- When you need to switch lanes, follow the safety rule: Mirror - Signal - Manoeuvre, always bearing in mind that faster-moving vehicles may come up in the rear.
- Start the lane switching procedure much earlier than on ordinary roads to make sure your indicators are seen clearly, and keep them on throughout the entire procedure.
- Any driver who due to emergency circumstances must drive slower than 60 km/h on motorways or dual carriageways must leave the road at the first exit, with the hazard warning lights on until the exit is reached.
- If you need to stop, take the vehicle off the road and hard shoulder as soon as possible and use warning signals and signs.



DRIVING ON TOURS AND LONG DISTANCES

- On the night before the journey, get enough rest and sleep.
- Avoid eating large meals during the journey as they could impair your driving skills.
- Avoid driving for many hours without stopping. Stop every two hours or every 200 km travelled, taking the vehicle off the road to stretch your legs and breathe fresh air. As soon as you feel the slightest bit tired, stop the vehicle by the side of the road and have a nap or take a rest.
- Do not set yourself time or distance goals.
- Adjust your speed to the road conditions. Wear comfortable clothes and suitable footwear for driving.
- Keep personal belongings and any items you may need during the journey within reach and in a suitable place.
- The maximum number of people who can be carried must not exceed the number of seats for which the vehicle is authorised, all of which must have their own individual place.

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TRAFFIC JAMS

- Radio traffic updates can be useful to avoid traffic jams or look for alternative routes if you get caught in one.
- Do not switch lanes for no reason.
- If you join traffic from another road, respect the "zip" merge: each vehicle gives way to the first vehicle in the joining queue. This ensures flow.
- In the joining queue, do not join onto the main road before the vehicles in front. This causes several vehicles to brake and complicates the situation further.
- Try to ensure the traffic flows as much as possible in these "zip" merges. Fighting to "butt in" and gain four metres causes vehicles to brake and holds up the end of the jam.
- If a long hold-up is foreseen, check you have enough fuel.
- If you are stopped for a long time, it is good idea to switch the engine off. Calculations show that disconnecting a modern fuel-injection engine saves money if you are going to be stopped for more than two minutes.
- After you have left the hold-up, never try to make up for lost time. It is better to use your mobile phone to say you will be late.
- In traffic jams inside a tunnel, switch your hazard lights on, do not stop too close to the vehicle in front, switch the engine off and never leave the vehicle unless the control centre instructs you to do so.
- Never beep the horn for no reason because this will not improve the situation, it will only make the tension worse.
- Always keep the safety distance between vehicles.
- Try to distract yourself: switch the radio on, watch people, look at the scenery... as long as this does not affect safety.
- Try to avoid the traffic jam before you set off on your journey.



1.3. Related to other drivers

Driving can be a merely mechanical action, the physical handling of a vehicle, whereas circulating (driving on a road in traffic) means driving in a given setting surrounded by other road users. So road driving becomes a social activity. Therefore, the education that the driver receives and applies is crucial when it comes to road driving.

Defensive driving involves permanently being on guard to avoid minor incidents and major accidents. Because accidents do not only depend on yourself due to sharing the road with many other drivers, anyone practicing defensive driving must bear in mind that any situation could turn into a problem over time. One of the key aspects of defensive driving involves anticipation, and the following rules apply:


1.3.1 The driver of the vehicle in front

Basic procedures:

- Remain alert and keep a safe distance from the vehicle in front.
- Anticipate events, looking beyond the driver in front to foresee situations that could make them stop suddenly. Apply the two second rule, which is described below.
- In adverse traffic conditions, increase your distance from the vehicle in front.
- When you see the brake lights of the vehicle in front, rest your foot on the brake.



Remember that the other driver has already braked while your foot is still on the accelerator.

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1.3.2 Two second rule

It works like this:

- 1 When the vehicle in front passes an anchor point, like a shadow, lamp post or line on the road, start counting from when the rear end of the vehicle in front passes the object until the front of your vehicle reaches it:

“one one thousand, two one thousand”

- 2 If you reach the object before you finish counting, you are closer to the vehicle in front than is safe.

Reduce your speed and start counting again

If you use the two second rule, your vehicle will wear the brakes less. The brakes will last longer and you will consume less fuel, which saves you time and money. Most importantly, if you use the two second rule you will have a greater safety distance to stop your vehicle should the driver in front stop suddenly.

1.3.3 The driver in the vehicle behind

The main rule of defensive driving with regard to drivers behind you involves positioning the headrest properly. This should support the back of the skull (at eye level) and neck. If it is kept in the low position, it will increase the seriousness of the injury by causing the so-called "whiplash effect" when the impact of a rear-end collision forces the neck and head to whip back and forth suddenly.

Basic procedures:

- Show your intentions. Use the indicator lights and brake lights to signal your manoeuvre.
- Reduce your speed and come to a stop slowly, keeping a safe distance from the vehicle in front.
- When there is a vehicle alongside you, reduce your speed to allow it to overtake. Increase your distance from the vehicle in front and reduce your speed slowly and courteously to allow the other driver to reach their destination.
- When you stop, keep a safe distance that allows you to see the wheels of the vehicle in front. This will give you enough space to move forward if the vehicle behind moves forward.

1.3.4 Overtaking or being overtaken


When you are overtaken on a road, cooperate with the other driver. Watch the traffic ahead and reduce your speed if necessary. This will ensure safety for both of you. Importantly, before overtaking make sure it is absolutely necessary.



Basic rules:

1. Stay back

- Watch the road ahead: can you see the driver in the vehicle coming towards you? If you can: do not overtake.
- Check behind your vehicle by looking over your shoulder if there are blind spots, or in the mirror.
- Indicate left.
- Pay attention to blind spots.

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2. Move over to the left

- Accelerate.
- Indicate right.
- Pay attention to blind spots.

3. Move over to the right.

- Switch the indicator off.
- Resume your initial speed.

Make any overtaking manoeuvre a safe one and remember: Do you really need to overtake?

1.3.5 With a driver coming in the opposite direction

A driver coming in the opposite direction could present an emergency situation that requires quick action.

Proceed as follows:

- "Read the road signs".
- Reduce your speed to allow the oncoming vehicle to get back into its original lane if possible.
- Drive on the right, leaving enough space for the overtaking vehicle to pass (if possible).

If you are forced to leave the road:


- Look for a soft spot, with small bushes, trees or fences.
- If you cannot avoid colliding with fixed objects or an oncoming vehicle, it is best to hit them at an oblique angle.



1.3.6 At crossroads

Of all the traffic situations you can come across, crossroads are the most tricky because they put your driving skills to the test by including every circumstance simultaneously.

When you approach crossroads, be ready to give way by reducing your speed and stopping if necessary. Whenever you approach crossroads, take your foot off the accelerator and place it on the brake if traffic conditions are poor.

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1.4. Related to the driver

There are many factors that could affect the driver and cause an accident. The effect that each of these factors (fatigue, distractions, sleepiness, alcohol, etc.) has on a driver behind the wheel is explained below. Between 70% and 90% of accidents, whether work-related or not, are due to unsafe actions by people caused by temporary states of mind or changes in conduct that affect the driver's skills.

- Fatigue, loss of attention, distractions and tiredness
- Alcohol and drugs
- Illnesses and medicines
- State of mind: stress, depression, anxiety
- Awareness and training: knowledge and skills

Three of these factors, that is, alcohol, speed and distractions, are estimated to account for 60% of accidents.

Health personnel from the Prevention Services play an important role in preventing accidents due to worker-related factors. Changes in mental states that could affect the ability to drive due to an illness or medical treatment can be observed or detected during medical examinations at Occupational Health consultations. Company Doctors are in the best position to take preventive measures regarding the human factor in road safety, by giving selective and personalised health education to workers with detected pathologies or factors that could entail a risk for road safety, hence the importance of including the "driving protocol" in medical check-ups.


1.4.1. Fatigue, loss of attention, distractions and sleepiness

Fatigue: this is a gradual loss of the ability to respond due to carrying out a task for a long time. Driving requires physical and mental effort, and so over long periods it could lead to tiredness. Consequences include difficulty concentrating, longer reaction time and sleepiness. Fatigue depends on two main factors: physical overexertion (muscular fatigue due to staying in one position for a long time) and mental overexertion (constant state of alertness or attention).

General preventive measures to combat fatigue

- Before commencing a long journey, make sure you have had enough sleep. Do not get behind the steering wheel at the end of a working day without having rested sufficiently.
- Try to pack your luggage, tools, materials, etc. and load them the night before if possible, to avoid extra stress on the day of the journey.
- Wear loose, comfortable clothing.
- Try not to travel at times of the day when alertness levels are lower: between 2:00 and 6:00 and between 14:00 and 16:00.
- Ensure the seat, headrest and steering wheel are in the correct position:
 - The back should be at an angle of between 10°-20° leaning towards the rear of the vehicle.
 - The headrest must be touching the driver's head, never the neck, to prevent cervical injuries.
 - The driver's hands must be positioned between 9:15 and 10 o'clock (left hand) and 2 o'clock and 2:45 (right hand) when driving. The driver's hands must hold onto the outside of the steering wheel and never cross over inside it.



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- Drive at the recommended speed (the faster the speed the more attention is required and the onset of fatigue quicker).
- Rest for 10 to 15 minutes every 150-200 km. For the rest to be efficient, when you get out of the car move around and do some exercises.
- Drink plenty of water to avoid dehydration causing muscular fatigue and sleepiness.
- Always wear sunglasses. Wear them during the midday hours to reduce eye strain.
- If you wear prescription glasses, always wear them while driving and do not forget to carry a spare pair.

Loss of attention and distractions: This is when an object, event or person inside or outside the vehicle turns the driver's attention away from driving. This factor has increased in recent years and is one of the main causes of accidents next to tiredness, fatigue and alcohol. There are two types of distraction:

- **Internal:** they happen inside the vehicle: talking or arguing, looking at a map, tuning the radio, using a mobile phone, smoking, eating, and so on. These are the most common causes.
- **External:** they happen outside the vehicle: incorrect signposting, looking for no-driving related information (hotels, restaurant, etc), advertising billboards, roadworks, and so on.

You must avoid distractions while you are driving and be aware that while you are behind the wheel any secondary task that takes your attention away from the road could become a risk for safe driving.


Preventive measures to avoid distractions:

- Get all of the information you require for your journey so that you do not need to look at maps while driving. You can use electronic devices such as GPS devices to avoid the distraction of looking at signs, etc., although these devices must be set before commencing any journey and always with the car stopped.
- Rest every 150-200 km or 2 hours of driving.
- Do not turn around to speak to rear seat passengers.
- Do not eat or drink while you are driving. That is what breaks are for.
- Avoid fiddling with the controls as far as possible.
- Do not try to kill or get rid of insects while you are driving.
- It is prohibited to drive while wearing headphones connected to music devices or radios.

Mobile phones: The following are some facts regarding the use of mobile phones while driving:

- They can increase the possibility of having an accident by between 5-10 times.
- After 90 seconds talking on a mobile phone, drivers do not notice 40% of signs, their average speed drops by 12%, their heart rate speeds up during the call and they take longer to react.
- They put the risk of accident on the same level as driving with blood alcohol content of 1.0 g/l.
- They interfere with vehicle handling manoeuvres (steering wheel, indicators, gear changes, etc).
- They cause drivers to alter their safety distance, get lost and commit more minor offences than usual.
- They cause drivers to change their speed abruptly and they tend to drive more slowly than usual.
- They increase the driver's reaction time by 0.71 seconds.
- If drivers normally do not notice 5-15% of traffic signs, when they talk on mobile phones they miss 50% of signs.
- The most common times that mobile phones cause an accident: when the driver receives an unexpected call which raises their pulse. Also, when dialling the telephone, this action requires 5-10 seconds meaning that if you are driving at 120 km/h you could travel between 180 and 350 metres without having proper control over your vehicle.

Therefore, the use of mobile phones while driving is therefore strictly prohibited, unless you have a hands free device, in which case you can make and receive brief calls.

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Sleepiness: This is among the top 5 factors that cause traffic accidents with victims. The main causes of sleepiness behind the wheel are:

- Fatigue, and severe and accumulated physical and mental stress.
- Heat, lack of oxygen inside the vehicle.
- The consumption of medicine or drugs.
- Monotonous roads (hypnotic effect of motorway driving).
- Physical condition and age.
- Sleep apnea, which is caused by respiratory problems, affects 3% of the adult population and involves waking up frequently at night causing interrupted sleep and consequent sleepiness during the day.

Sleepiness totally cancels driving ability and is one of the most dangerous risks for driving as it causes complete loss of control of the vehicle. It has caused 15-30% of accidents in Spain in the last few years.

Preventive measures to avoid sleepiness behind the wheel:

- Plan work days ahead, observing break times.
- Do not eat a heavy meal before setting off.
- Sleep enough hours to rest properly.
- Stop frequently.
- Ensure the vehicle is properly ventilated.
- Avoid smoking while you drive as it increases sleepiness.
- Try to stay alert by switching on the radio, talking to your co-driver, etc., but always keeping your attention on the road and traffic.

The following driving and rest times are generally recommended to prevent fatigue, distractions and sleepiness:

- A maximum of 10 hours of driving (observing the breaks established in the above sections), after which you should rest for 8 consecutive hours.
- After 15 hours of work, that is, tasks that are part of your job including hours spent driving, you must not drive until you have rested for 8 consecutive hours.

Driving should also be avoided following long-haul flights because this type of journey is very tiring. It is better to take a taxi or be collected by someone.

1.4.2. Alcohol and drugs


Alcohol: alcohol affects driving skills and increases the risk of accident. There is no set limit, driving skills can be affected by as little as 0.2 g/l. The higher the level of alcohol, the higher the risk.

Alcohol causes:

- A false sense of euphoria, security, optimism and self-confidence.
- Nonchalance, recklessness and aggressiveness.
- Disregard for danger and the tendency to break rules and drive faster.
- Distortion of distances and speeds.
- Driving errors.
- Incorrect signalling and erratic driving.
- Slower reflexes and reaction time.
- More sleepiness and fatigue.
- Narrower field of vision (tunnel effect).

The blood alcohol level reaches its peak 1 hour after the last drink.



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Drugs: the different types of drugs and their effects are:

- **Stimulants** (amphetamines and cocaine, methylxantines, nicotine) cause a stimulating or euphoric effect. By causing a reduced feeling of tiredness, loss of inhibitions and hyperactivity, they are potentially dangerous because they could lead to overspeeding and no respect for traffic signs.
- **Hallucinogens** (cannabis, LSD and others) give the user a feeling of well-being, relaxation and euphoria, and alter perceptions and cause hallucinations, difficulty concentrating, slower reflexes and poor coordination.
- **Depressants** (opiates, soporific drugs, sedatives, solvent and glue sniffing) cause a feeling of relaxation, sedation and well-being. The skills affected the most are visual perception and the ability to identify and concentrate.

Medical staff play a fundamental role in preventing these problems and intervening early.

The consumption of alcohol and drugs and driving under the influence of these is strictly prohibited at any time the Labour Authorities and Tribunals consider that the worker is at the company's disposal, and during any journeys that could cause a commuting accident (on the way from home to work and vice versa).


1.4.3. Illnesses and medicines

Illnesses: 1.7% of work-related accidents are related to illnesses. Health personnel should warn drivers with chronic illnesses of some precautions to take while driving vehicles: avoid driving at night, rest sufficiently before commencing a journey, avoid driving for long periods, keep proper sleep and meal routines and be aware of how medical treatments can affect driving skills (avoid driving for the first week after starting a new treatment or changing doses and do not suddenly stop a course of treatment). People with illnesses must also go for checkups and their work conditions should be monitored regularly. The most effective preventive measure is encouraging cooperation and communication between the company doctor and the worker.

Medication: Drugs can alter the driver's psychophysical performance. They therefore have an influence on the human factor and could affect safety when driving vehicles. Drugs do not necessarily have a negative effect on driving ability. Sometimes, by stabilising or controlling the pathology (mental illness) they can even improve the person's ability to drive. At medical examinations, the doctor should ask about the person's driving habits and any medical treatments, give information about the repercussions of the illness and evaluate the risk or benefits of the treatment for driving.

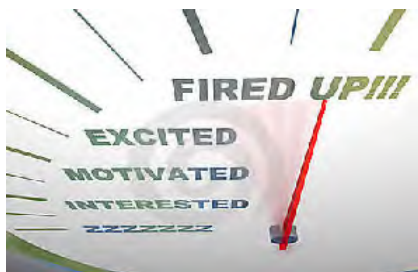


Drivers who need to drive as part of their job must report any illness and/or medical treatment to the company doctor (or the external prevention service hired to supervise health matters) during medical examinations or, should this arise between medical appointments, by arranging a visit to the doctor. Any exchange between workers and the company doctor is confidential, but it allows the doctor to give the worker and the company instructions to avoid accidents, both road incidents and any other types of accident caused by illnesses and/or medical treatment.

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1.4.4. State of mind: stress, depression and anxiety

Driving is a challenging and changeable, and therefore stressful, activity. It is a complicated task that requires more from us than meets the eye. The driver is involved psychologically and physically and must ensure permanent concentration and alertness.



Driving safely therefore also depends on experience, awareness of the risks on the road and emotional maturity and stability. Stressed drivers are not fit to drive safely because they will not be able to cope with traffic situations, increasing tension and distress.

Every problem that the driver encounters on the road (traffic jam, slow driver in front, blinding headlights, red light, changes in road conditions, and so on) will cause excessive tension and anxiety which can lead to erratic and/or aggressive reactions (driving too fast, overtaking and changing lanes constantly, not keeping the safety distance, sudden and abrupt manoeuvres, making mistakes due to being distracted, indecision when faced with an unexpected event, etc.). All of these situations could potentially cause an incident which in many cases will result in an accident.

Here are some tips to reduce stress and aggressiveness behind the wheel:


- Firstly, be aware of your state of mind. If you know you are going through an emotionally difficult time, or if you are suffering from any of the symptoms described above, adopt safety measures while driving or, in extreme circumstances, avoid driving.
- Plan each journey by giving yourself more time than you think you need in order to prevent anxiety if you encounter delays or obstacles along the way.
- Adapt your speed to road and traffic conditions and your state of mind. It is a fact that the faster you drive, the more tension you create. It is therefore important to find a speed at which you find you drive more relaxed.
- Accept traffic situations. This means that when faced with a traffic jam, obstruction, poorly coordinated traffic lights, slow traffic, etc. try to stay calm and do not try to force your speed and hurry others along, breaking rules or zigzagging. Remember you are putting health and safety at risk.
- If necessary, do breathing exercises by breathing in deeply and exhaling slowly. You can help yourself by listening to pleasant, relaxing music.
- When faced with a clumsy, slow and/or aggressive driver, do not get worked up. Try to avoid them by giving way or overtaking prudently to put distance between you both.
- Avoid arguing with passengers and try to avoid talking on a mobile phone while driving as these activities could cause tension.

1.4.5. Awareness and training: knowledge and skills

Employee road safety training and awareness significantly contribute to reducing the accident rate.

Possession of driving licence gives workers the legal right to drive. The company must check that the worker has a valid driving licence (with possible restrictions and limits) that is suitable for the vehicle in question. The worker must undergo regular medical checkups required to renew the licence. This licence is used to assess the worker's ability to drive vehicles (along with a medical examination in accordance with the vehicle driving protocol) so that the worker's superior can authorise him/her to drive, if necessary, according to the management system. Extra skills and knowledge also need to be updated through theory and practical training.



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Theory-based training:

- Attitude or conduct lessons: aimed at building knowledge and respect for safe road coexistence regulations.
- Cognitive learning: driving regulations, safety aspects and risk factors.

This control measures on a risk assessment deals with the first of these aspects, which workers must read slowly and reflect upon the various points. Cognitive learning will be included in the training they receive to get their driving licence and/or renewals.

Practical training: Training in an enclosed track simulating different scenarios and/or on the road in urban and interurban traffic conditions (defensive driving techniques have proven effective).

A useful tool for the theory sessions are online courses which allow drivers to take short courses to boost their knowledge of the measures to control accident risks and their awareness. (E.g. Gamesa's offer of training activities includes this type of course: BEUHS01010 ROAD SAFETY)

1.5. Related to the vehicle


1.5.1. Vehicle maintenance

As regards inspection of the vehicle's technical aspects in relation to safety, the company must ensure that its vehicles comply with the requirements, over and above those established by law.



- First of all, check that you have the manufacturer's vehicle manual and read it before getting behind the wheel so that you become familiar with the vehicle's relevant features.
- Carry out all the inspections necessary to maintain the vehicle in optimal conditions according to the manufacturer's manual.
- Vehicle maintenance: tyres, brakes, lights, steering, energy absorbers, horn, etc.
- Keep all documentation up to date (valid driver's licence, valid driving permit for the vehicle, MOT certificate, latest insurance receipt and latest road tax receipt).
- An out-of-date MOT could mean that the risks included in the insurance policy are not covered in the event of an accident.
- Drivers must adopt a correct seat position and posture while driving.
- Safety while transporting animals and the more regular: loads.
- Use the vehicle's Passive Safety system properly: rear view mirrors, seat belt (without using clips), headrest at eye level and airbag.

Safety sheets and check lists can be used to detect the safety problems involved in the use of specific types of vehicles and for the inspection of the vehicle's technical aspects in relation to safety. It is highly advisable that vehicles be subject to management system procedures so that the check lists and manufacturer's, official or other inspections, and the people responsible for performing them and following them up, are established properly and planned.

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1.5.2. List of vehicle equipment:

- Compulsory:
 - Spare wheel inflated to the right pressure, a jack, a set of tyre replacement tools and mechanical protection gloves.
 - Set of lights in working order and tools required to change them.
 - 2 warning triangles.
 - Snow and ice removal equipment (scraper, etc).
 - High-visibility vest.
 - Set of snow chains (in the event of possibility of snow).
 - Flashlight.
 - First aid kit.
 - Fire extinguisher.
 - Rescue sheets.
 - Special winter tyres (if necessary due to climate, as specified in previous sections).
 - Ultrasonic horns to frighten off animals.
- Recommended:
 - Towing equipment.
 - Battery clips.
 - Mobile phone with charged spare battery.
 - GPS road assistance device.
 - GPS geolocation and speed control device.
 - Special hammer to cut safety belts and windshield if the vehicle needs to be evacuated (carry it in your car in an easily accessible place, but from where it will not fly out in the event of an accident).



1.5.3. Technical breakthroughs in active and passive safety

If possible, when choosing which vehicle to use you are advised to check whether it comes with the latest active and passive safety components. Examples: cruise speed control system, electronic drive control system, antilock braking system, front and side air bags, blind spot vehicle detection system, pedestrian detection system, traffic sign recognition system, front and rear parking assistance cameras, sleeping driver detector and alarm system, alcohol level control system, rain-sensing windscreen wipers, fog lights, seat belt warning system, etc.

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1.5.4. Global Positioning Systems


Satellite positioning system (GPS) devices should be mentioned in a separate section. These provide the following functions:

- **Speed control:** allows the vehicle speed to be monitored in real time and compared to the maximum speed allowed on the specific road in question. If this speed is exceeded an alarm is activated. They are highly effective in preventing speeding accidents.
- **Route planning and information:** used properly, they can assist the driver by providing information on the route to follow to arrive at the destination, about the road, ETA, etc. All of this information can also help to reduce stress, which is an important risk factor when we are not sure about which route to follow or we get lost. These devices must not be set while driving. They must always be set before setting off or by stopping the vehicle if necessary.
- **Geolocation:** this function is very useful in an emergency. If an accident happens and the driver is rendered unconscious or cannot ask for help, or is isolated in a remote place, this function locates the vehicle and sends help. Whenever this type of situation could arise, this type of device must be used to make sure assistance is provided in an emergency.

There are many makes available on the market. When choosing a system, it is important to consider which functions you require and whether the device can be used internationally. One important feature to consider is the use of hire vehicles, which are often used to travel to wind farms by personnel who do not usually work there. In this case, portable devices will be necessary that the worker can carry around and use in any vehicle.

There is the option of controlling aspects such as the vehicle speed and geolocation by remote control.



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1.5.5. Special tyres

Winter tyres must offer maximum performance when the road surface does not provide adherence, whether due to the temperature or climate conditions. Winter tyres have the following features:

- A deeper and more open tread design to evacuate water and allow better handling in difficult conditions.
- A large number of sipes in the tread blocks -up to 5 times more than a standard tyre- providing better adherence on icy or wet surfaces, snow, etc.
- A softer and more flexible rubber composition, with silica, which does not harden below 7 °C.



Specific compositions used to make winter tyres mean that when the temperature drops they remain flexible enough to provide maximum adherence in any circumstances. The harder a tyre becomes, the less it grips and the less manoeuvrability it provides.

To recognise a winter tyre, look for “M+S” (Mud + Snow) on the side and a drawing of a mountain with a snowflake inside it. This drawing is important because it differentiates winter tyres for roads from those designed to drive over muddy paths, which are not recommended on tarmac.




Braking distance in snow driving at 50 km/h

- Winter tyres: 32 metres
- Summer tyres: 63 metres

Difference: 31 metres less with winter tyres

Some recommendations as regards maintenance: pressure, wear and storage:

1. It is important to check the tyre pressure in winter because low temperatures can alter measurements. The lower the temperature, the greater the difference between measured pressure and actual pressure. To offset the temperature effect, add 0.2 bar (cold) to the reference pressure that the vehicle manufacturer recommends.
2. The tread and composition are key factors in the performance of this type of tyre on snow or icy roads. Therefore winter tyres should be replaced when the tread pattern depth reaches 4 mm (the legal limit is 1.6 mm). This does not mean that the tyre can no longer be used, it only means that it no longer performs as a winter tyre. To use up the remaining rubber, it can be worn down by using it as a summer tyre.
3. Because it is a seasonal product, which is only used a few months of the year, these tyres can be used in different winter seasons. To ensure that the tyres do not become damaged and remain intact from one year to the next, they must be stored properly. In areas where these tyres are used more frequently, specialist garages offer customers a tyre storage service. If the drivers store them themselves, they must take the following into consideration:
 - Make a note of the position in the vehicle to swap them over next winter.
 - Clean and dry them properly to prevent rusting.
 - Store them standing up or lying down in a cool, dry place away from sunlight.


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Studded tyres are an alternative to winter tyres, although legislation establishes limits on this type of tyre. Because they are very aggressive, especially on tarmac, they are limited to completely iced over terrain. Not every country allows them, and those that do usually limit their use to certain times of the year. In Europe, countries in the Alps, such as Switzerland, Austria and Liechtenstein, and Nordic countries such as Sweden, Finland and Norway, do allow them. The studs used must be rounded, and not protrude more than two millimetres from the tyre surface. If used, these tyres must have the M+SE code on them. Their use is residual, mainly due to the assembly problems involved and limits on their use, that mean that they can hardly be used continuously.

1.6. Conduct when facing risk situations

- If the brakes fail descending a hill:
 - Shift to a lower gear (engine braking action)
 - Pump the brake pedal rapidly while gradually engaging the hand brake
- If a tyre blows out while driving at a high speed:
 - Do not step on the brake
 - Hold the steering wheel firmly with both hands and turn as required to maintain the direction of the vehicle, while gradually raising your foot off the accelerator.
 - Allow the engine to restrain the vehicle and, when the speed has reduced sufficiently, apply the brake gradually.
- If the lights of another vehicle blind you:
 - Reduce your speed.
 - Do not look directly into the bright headlights, and turn your head slightly, looking towards the right edge of the road.
 - When the vehicle has passed, turn on the bright lights.
- If you have entered a curve too fast:
 - Step on the brake various times.
 - While inside the curve, accelerate slightly if you begin to skid. At the same time, keep the right foot on the accelerator while stepping slightly on the brake.
- If an oncoming vehicle is heading directly towards you:
 - Press the horn forcefully and turn on your headlights. If the vehicle continues heading towards you, turn rapidly to the right, even if this means leaving the roadway.
 - If a head-on collision is inevitable, whether against another car, tree or wall, step on the brake completely and switch off the ignition key to prevent a possible fire.
 - Duck to one side to keep from striking the steering wheel, though continue holding it.
 - The front-seat passenger should bend over with his/her arms on the dashboard and the rear passengers should protect their heads with their arms.
- If there is a fire in the vehicle:
 - Turn off the engine, pull over to the side of the road, and then have all passengers exit the vehicle.
 - Suffocate the flames with an extinguisher. Never with water.
 - If the fire approaches the petrol tank, get as far away as possible to avoid the dangers of the explosion.
- If the vehicle falls into the water:
 - Try to leave the vehicle by a door or window while the vehicle is still afloat.
 - If the vehicle dives nose first, exit from the rear windscreen, breaking it.
 - The car door may not be opened until the water inside reaches the same pressure as the water on the outside. In other words, when the vehicle is completely flooded.


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- If the engine stops when shifting gears:
 - Immediately shift to second gear, release the clutch and try to continuously start the engine so that the impulses disengage the shift.
 - If the previous steps cannot remove the vehicle, exit and keep a safe distance away from it. Alert emergency services.
- If a person falls onto the ground in front of the wheels:
 - Do not brake suddenly. Braked wheels passing over a person would be worse than rolling wheels doing so.
 - pass rolling.
- If a wasp enters the vehicle:
 - Do not take your eyes off the road nor hands off the steering wheel.
 - Calmly stop the vehicle, bringing it away from the road and then attempt to get rid of the insect.
 - A wasp sting is always less dangerous than a collision from losing control of the vehicle!
- If an animal crosses the road:
 - Do not manoeuvre or brake suddenly.
 - Prevent running it over by looking in the distance to locate the animal as soon as possible and engage the horn.

REMEMBER! THERE ARE 3 OCCASIONS IN WHICH THE BRAKE SHOULD NOT BE ENGAGED FULLY:

- In case of a blow out
- When the vehicle is skidding
- When a person has fallen in front of the wheels

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2. TRAVELLING TO AND WITHIN A WIND FARM

2.1. General preventive measures for all types of vehicles

- It is forbidden to work or drive under the influence of alcohol, other drugs or medicines which so advise. The driver of the vehicle should have the necessary driving licence, and the vehicle must have all the valid documentation (transport cards, MOT, insurance, etc.).
- When travelling by public roads, the rules established by the Traffic Department must be observed at all times.

ROADS ► VEHICLES ▼	Dual Carriageways and Motorways	Conventional roads marked as suitable for motor vehicles	Other out-of-town roads
Cars and motorbikes	120 km/h	100 km/h	90 km/h
Light commercial vehicles, multipurpose vehicles	100 km/h	90 km/h	80 km/h
Lorries, trucks, vans, articulated vehicles, motor vehicles with trailer weighing up to 750 kg.	90 km/h	80 km/h	70 km/h
Motor vehicles with trailer weighing more than 750 kg.	80 km/h	80 km/h	70 km/h

- While driving, the use of mobile phones and any other means or system of communication is forbidden, except if communication can be established without using the hands, headphones or similar devices.
- When travel takes place within the farm, the traffic rules and signs established by the Owner must be respected. If there are no such rules or they are less restrictive than those established, the last ones must be observed, which are:
 - Maximum speed for heavy vehicles: 20 km/h
 - Maximum speed for light vehicles: 40 km/h
 - In adverse weather conditions or if the road surface is in poor condition, the speed is limited to 20 km/h.
- The vehicle must be equipped with a first-aid kit, fire extinguisher and snow chains (when there is a likelihood of ice and snow).
- Ascent and descent to and from the vehicle must be upon firm ground without obstacles. The loading and unloading area must be free of obstacles and materials.
- Equipment and vehicles must stay far enough from the edges of slopes to prevent their weight from causing landslides. This distance will generally not be less than 2 m, increasing in low stability terrain. When a vehicle needs to approach a slope or the border of an excavation, security stops must be placed, firstly checking the terrain's resistance to the vehicle's weight.
- Whenever a stopped vehicle or machine initiates a sudden movement, it must be alerted by an acoustic signal. When the movement involves circulating in reverse or when the driver lacks visibility, another operator must direct the manoeuvre from outside the vehicle.

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- When driving to other countries, it is necessary to know the specific rules, customs, etc., of the country concerned and adapt your driving to them.
- Travel abroad:
 - The trips must be planned in such a way that non-local staff who are not familiar with the characteristics of local traffic have a person available who is accustomed to driving in these circumstances. Based on this:
 - 1) In foreign countries with a particularly high risk of accidents due to difficult driving conditions, you should hire a local driver.


2.2. Preventive measures for transport

2.2.1. General preventive measures

- PPE Required: Upon leaving their vehicle, all transport vehicle or safety car drivers must wear working clothes, safety helmet with chinstrap, safety boots, reflective vest and protective goggles against mechanical injuries.
- Recommended PPE: Lumbar protection, protective gloves against mechanical injuries
- Immediately switch off the engine when entering enclosed, poorly-ventilated areas.
- Before moving the transport vehicle and periodically during transport (depending on the load), check that the load is properly anchored.
- Use suitable containers for carrying small or loose objects.
- If there is a risk of particles or transported objects flying off, cover them with a canvas to avoid accidents to third parties.
- Keep the work area clean and tidy. In the event of an oil or petrol leak, clean the affected surfaces before carrying on with the work. Wear safety boots with anti-slip soles.
- Make sure there are no remains of oil or substances on the steps which lead to the transport vehicle cabin.
- When entering and exiting the cabin, always do so facing forward and using all safety measures available, such as grips, steps, etc.
- Descend from the cabin onto firm ground without obstacles. Do not move too quickly nor jump from the cabin.
- Adapt transport vehicle seats ergonomically to avoid lumbar spine pain, back pain, etc. The seat back should be reclining and have lumbar adjustment. The instrument panel should be adjustable so that the controls are at the right distance.
- Provide transport vehicle drivers with comfortable clothes that are not too tight, do not hinder movements and are not oppressive, and with flexible, light footwear that allows proper pedal operation.
- During transport vehicle and machinery refuelling operations at wind farms: switch the engine off if it is running, switch the lights off, refrain from smoking, close the tank lid properly and clean any fuel that has spilled outside the tank, touch the outside of the tank hole with the petrol pump before filling the fuel to avoid sparks due to static electricity, keep the pump touching the tank to establish an electrical connection until the operation is complete, and do not start up the engine for more than 30 seconds, and leave it to cool for at least two minutes to prevent fire.
- Transport vehicles must have a portable first-aid kit and extinguisher for emergency situations.
- Drivers must take specific medical tests to check their health and ability to carry out the operations in question.
- Under no circumstances are the maximum admissible loads for each type of transport vehicle to be exceeded.
- The transport vehicle load must be properly positioned, stable and well distributed to ensure proper balance.
- Open the windows as little as possible during the journey to prevent deafness in people travelling in the transport vehicle.

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- Wear suitable clothes for the weather conditions.
- If there are any defects in the vehicle, do not use it and place 'out of use' signs.
- Make sure the transport vehicle control systems (brakes, steering, etc.) are working properly before setting off.
- To ensure visibility, clean the windshield, windows and rear view mirrors, and at night the lights, and adjust them accordingly.
- Transport vehicles must have passed regular checks (MOT) and the log number must be kept inside the vehicle.
- As a general rule, the load must not protrude over the sides and the front or rear.
- Size and weight limits for transport vehicles in the country in which the vehicle is driven must be observed (except special vehicles).
- All transport vehicle or safety car drivers upon leaving their vehicle must wear work clothes, safety helmet with chinstrap, safety boots and a Hi-viz jacket.
- Only use Gamesa approved transport equipment.
- Gradients, radii of curvature and width of roads, as well as the compaction of these and the yards, must meet Gamesa specifications. In the case of special transport vehicles, the transport company must first inspect the condition of the access roads, and if necessary repair them to guarantee safety.
- When transport vehicle drivers need help operating the rear control systems (dollies, etc.) and in order to increase the turning radius, wireless control button stations or a sufficiently long cable should be used so that the worker remains outside the operation area. The worker operating the button panel must be trained. Untrained workers are prohibited from using it.
- The transport vehicle must be suitable for the load and the conditions of the roads and platforms.
- When the driver lacks visibility, another operator must direct the manoeuvre from outside the vehicle. A single operation coordinator should be appointed, who must be in constant communication with all the operators involved in the manoeuvres via walkie-talkies.
- It is prohibited to drive around uneven and irregular ground unless the transport vehicle specifications allow this.
- Moving material using manitou or fenwick forklift trucks:
 - Whenever a sudden movement is going to be initiated, it must be alerted by an acoustic signal.
 - When material is moved in reverse, or when the driver lacks visibility, another operator, or more than one, must direct the movement from outside the vehicle. A single coordinator of the operation should be designated who must be in continuous communication with all the operators involved in the work through walkie-talkies.
 - During reversing manoeuvres, use acoustic or light signals (preferably both). If necessary, use the horn as an acoustic signal.
 - Before starting to move the transport vehicle and periodically during transport (depending on the load), check that the load is properly secured.
 - Check there is no one near the vehicle. If there are any workers nearby, warn them of the operation so that they stand outside the area of influence.
 - During material moving operations, workers must not move around the vehicle.
 - Whenever possible, plan material moving operations for periods during the work day with the fewest people working in the area.
 - During material moving operations, always look ahead and keep your eyes on the path you are travelling.

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2.2.2. Transporting power generator sets


- When transporting power generator sets by vehicle, the following safety measures must be observed:
- Transport operations shall be carried in strict adherence to the manufacturer's operation and maintenance manuals, according to the following sequence steps:

1. Preliminary checks / Visual Inspection

- Vehicle with trailer or independent loading compartment.
 - Vehicle equipped with extinguisher, preferably CO2, to prevent damages to the generator set if a fire needs to be extinguished.
 - All loads, without exception, are fastened to the vehicle's trailer or loading compartment.
 - Power generator set switch set to OFF.
 - Protection on battery terminals. Plugs correctly fitted and absence of leaks on the power generator set's fuel tank
 - Plugs properly sealed, absence of leaks and proper conditions of the additional fuel recipient, which must be certified.
 - Earth connection stake cable insulation in good condition, without nicks or cuts.
 - Fuel and oil collection tray in good condition.
- Load the fuel and oil collection tray.
 - Load the power generator set onto the fuel and oil collection tray.
 - Secure the power generator set with slings or other system.
 - Fit the earth spike and secure it using a sling or other system.
 - Load the approved extra fuel tank and secure it using a sling or other system.
 - Earthing the vehicle is recommended, including connect to the earth connection on the vehicle.

Measures to adopt:


- If the fuel and oil collection tray is separate from the power generator set, load it first in the spot designated for the power generator set.
- The power generator set should be loaded in the trailer or separate cargo compartment using auxiliary equipment or at least two workers and in accordance with safety measures for manual load handling. Once loaded, secure them using slings or another system to prevent them moving during transport.
- The certified additional fuel recipient, based on its volume capacity, shall be loaded by either one or two workers and likewise fastened with slings or another system to prevent it from shifting or moving during transport.
- The earth connection stake shall be placed on the floor of the trailer box or vehicle load compartment, never on the top, nor resting on the power generator set. Due care must be taken to prevent accidental contact between the stake or the ground cable and the battery terminals. It must be secured using slings or another system to prevent them moving during transport.
- Do not place any metal components, tools, etc. above the power generator set or resting on it which could come into contact with the battery terminals and short-circuit the battery.
- Stow the certified additional fuel deposit as far away as possible from the power generator set whenever these share the same loading space.
- Verify that the power generator set and the additional fuel recipient are properly secured prior to ignition.
- Never transport power generator sets in private vehicles.
- Smoking is prohibited.

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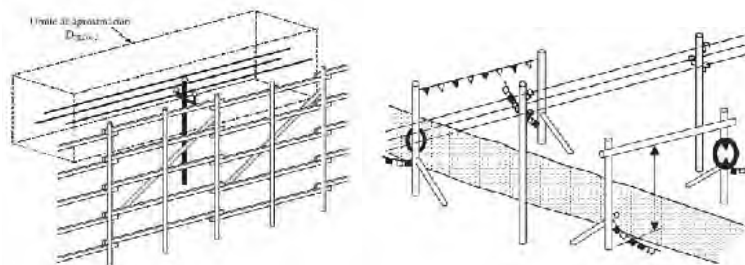
2.2.3. Transport with special vehicles

- Keep a minimum distance of 50 m from the vehicle in front.
- Special vehicles must always be driven as close to the right edge of the road as possible.
- Stops and parking should always be done off the road and the hard shoulder.
- Transportation of heavy goods using special vehicles must always comply with all the safety regulations related to load, height, length, width, etc., as established by the Traffic Department as well as international and regional regulations.
- Once the route to be followed is submitted to the corresponding official body (the Ministry of Public Works in Spain), all the instructions received regarding measures to be taken and special vehicle traffic must be followed.
- Both transport vehicle drivers and safety car drivers must wear clothes with high visibility reflective elements (specially designed jacket or clothing).
- During long stops (weekend, holidays), transport vehicle drivers will be responsible for applying the brake and disconnecting the battery.
- During reversing manoeuvres, use acoustic or light signals (preferably both). If necessary, use the horn as an acoustic signal.
- If for any reason the engine stops running, immediately stop the vehicle since there is a risk of losing brake or steering control.
- Coordinate activities with clients at the place where the goods are to be transported. Give instructions to transport vehicle drivers regarding the measures to be taken at external companies.
- Mark off and place signs in the transport vehicle manoeuvring area.
- A rotating, flashing amber-coloured light must be mounted on special transportation vehicles whenever they are loaded to alert of their presence on the road.
- Make sure that no one is in the immediate vicinity of the vehicle and, in the event there is, warn of the manoeuvre so that the person may move out of the area of influence.
- Emergency lighting must be used during the day and night when driving a broken down vehicle or at a reduced speed.
- In the event of an emergency, place signs to show that the vehicle has stopped on the road or that the load has fallen. If this happens at night, keep the indicators on and place the necessary signs (warning signs, triangles).
- At trouble spots, during reversing manoeuvres, etc. reduce your speed, look towards the rear and keep your eyes on the path you are travelling.
- Avoid loading and unloading in areas of vehicle transit.
- Provide transport personnel with advance warning signs or devices. Place one in front and one behind the vehicle or load, at a minimum distance of 50m and visible from at least 100m for approaching drivers.
- Whenever a transport vehicle or machine starts a sudden movement, it must be alerted by an acoustic signal.
- Whenever required by a driver or during reversing manoeuvres, as many operators as necessary must give directions.
- Safety car drivers will assist when necessary. A single operation coordinator should be appointed, who must be in constant communication with all the operators involved in the manoeuvres via walkie-talkies.
- It is prohibited to access the transport vehicle platform or any device installed on it while this is moving.
- It is prohibited to walk on the transport vehicle platform or on any element installed on it.


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2.2.4. Presence of High Voltage Overhead Lines

- Mark out any overhead power lines and position height limit signs to prevent the passage of vehicles that do not meet the safety distance.
- The safety distance from a nearby overhead power line must be respected. The minimum distance to HV power lines based on their voltage will be: 3 m up to 66 kV, 5 m from 66 kV up to 220 kV, and 7 m from 220 kV up to 380 kV.



- If safety distances cannot be observed or the power supply cannot be cut off, specialised personnel must place insulating elements between the vehicles and the lines.
- During manoeuvres underneath power lines, a Preventive Resource appointed by the transport company involved in the operations must be present, who will supervise and check that the transport vehicle size meets the minimum safety distance.
- If the trailer or transported goods come into contact with overhead power lines, the people present shall:
 - Request medical assistance and ambulances if there are injured people.
 - Move away from the area, and not try to help any injured people unless it has been ascertained that the area is safe.
 - Cordon off a safety area that is 5 metres away from any point on the vehicle or load.
 - If contact with the line persists or a cable has broken, notify the electricity company so that it can disconnect the power line.
- If the trailer or transported goods come into contact with overhead power lines, the driver shall:
 - Remain in the cab and manoeuvre until contact is broken with the power line.
 - Move the vehicle away from the area, ensuring that no one approaches the tyres if they are still inflated, if the power line is high-voltage.
 - If contact cannot be broken or the vehicle moved, the driver shall remain in the cab and tell everyone to move away from the area until it is confirmed that the line has been disconnected.
 - If due to force majeure it is necessary to leave the vehicle before the line has been disconnected, the driver must make sure there are no fallen cables on the ground or on the vehicle, and if there are he/she must exit through the other side. The descent should be made in one jump to avoid touching the vehicle and the ground at the same time. Land with your feet together and take small steps to move away without touching any objects in the area.
- Presence of rail tracks:
 - If rail tracks need to be crossed, a specific protocol is established based on the characteristics of the railway and the railway operator's requirements.
 - If the vehicles crossing the tracks cause any damage, the problem is reported immediately.
- Only transport personnel involved in the operation must remain in the work area.

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- Due to the risk of flying objects during transport operations, personnel in the area must wear a safety helmet with chinstrap and goggles to protect against the impact of particles.

2.2.5. Towing special transport vehicles

- When carrying out towing operations, a specific procedure is followed for the operation in question, analysing the following:
 - Ground conditions: material, condition, gradient, etc.
 - Anchor point on the towing vehicle.
 - Anchor point on the towed vehicle.
 - The connecting element between the towing vehicle and the towed vehicle.
- It is prohibited to stand in the area between both vehicles while they are moving.
- Avoid sudden pulling movements.
- The maximum speed must not be exceeded.
- A single coordinator for the operation will be appointed, who will ensure constant communication between the vehicle drivers and auxiliary staff (walkie-talkies or other systems allowing uninterrupted verbal contact).
- Keep the safety distance from slopes. Do not move over to the edge of slopes to allow other vehicles to pass.
- Inspect the condition of roads before commencing operations. Do not perform the manoeuvre when the roads are impassable (snow or ice).
- Only the personnel strictly required for the manoeuvre must be present.
- Do not stand behind vehicles.
- When personnel need to walk behind moving vehicles, they must do so at a safe distance.
- Do not perform manoeuvres in severe weather conditions (heavy rain, fog, poor visibility, etc.).

2.2.6. Transport of hazardous goods by road (ADR - EU-RoW)


- In accordance with section 1.1.3.1 c) of the ADR, loading and carriage of hazardous goods by assembly or maintenance personnel using Gamesa vehicles is exempt from complying with regulations on transporting hazardous goods by road:

"The provisions laid down in ADR do not apply to: (...) c) the transport undertaken by enterprises which is of a secondary nature to their main activity, such as deliveries to or returns from building or civil engineering sites, or in relation to surveying, repairs and maintenance, in quantities of not more than 450 litres per packaging and within the maximum quantities specified in 1.1.3.6. Measures must be taken to prevent any leaks under normal transport conditions. This exception does not apply to class 7 (Radioactive substances). However, carriage by those companies for supply or internal or external distribution will not be included in this exemption."

- Gamesa owned vehicles that carry out this type of transport activity must always carry a document with the following text:

It is hereby certified that the hazardous goods in the vehicle are transported for assembly, repair and maintenance work, in accordance with the exemption contained in section 1.1.3.1. c) of the ADR:

- *"The provisions laid down in ADR do not apply to: (...) c) the transport undertaken by enterprises which is of a secondary nature to their main activity, such as deliveries to or returns from building or civil engineering sites, or in relation to surveying, repairs and maintenance, in quantities of not more than 450 litres per packaging and within the maximum quantities specified in 1.1.3.6. Measures must be taken to prevent any leaks under normal transport conditions. This exception does not apply to class 7 (Radioactive substances). However, carriage by those companies for supply or internal or external distribution will not be included in this exemption."*

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3. ROAD EMERGENCIES AND SITUATIONS POSING HEALTH RISKS

When providing assistance in an accident, the main rule is not to put your own safety at risk. Mark the accident site with beacons, foliage, torches or anything that warns an approaching vehicle sufficiently in advance.

Mortalities in traffic accidents happen in three phases:

Phase one: the first few seconds or minutes following the accident. This represents 10% of all deaths. Due to severe injuries to the central nervous system or broken blood vessels. These deaths are very difficult or almost impossible to prevent.

Phase two: The so-called "golden hour" because it usually happens in the first or second hour following the accident. This accounts for most fatalities (75%). Deaths in this phase are usually caused by blocked airways or loss of blood. This is the phase in which most deaths can be prevented with prompt assistance by trained medical staff.

Phase three: This happens days or weeks after the accident. It usually accounts for 15% of total deaths and is usually due to complications following initial medical treatment.



Measures that should be adopted must be aimed at reducing the time taken to assist the injured person and provide final care quickly and efficiently depending on their injuries. Reducing the assistance time depends on:

- Accident reported quickly to the emergency medical services. Accessibility to a comprehensive emergency system.
- Start of on-the-spot treatment immediately: early and proper out-of-hospital care by medical staff.
- Urgent transport to the nearest hospital with trained staff for providing final treatment.

The care received by injured people involved in vehicle accidents must be in keeping with their injuries, which are usually polytraumatic, and the procedures used for this type of patient must be known. Most people, although they have first aid training, do not have enough knowledge to deal with this type of injuries. Therefore, the following emergency procedure should be followed at the accident site until the emergency team arrives:

1 Protect: the victim and their helper from dangers surrounding the accident: being run over, falls, explosions, etc. by making the area safe.

2 Warn: the emergency medical teams, fire fighters and police.


3 Assist the victim, if you know how to and are able to.

Measures to reduce the consequences in the event of an accident:

- The driver and front and rear seat passengers must always wear a seat belt (fastened properly).
- Ensure the seat, headrest and steering wheel are in the correct position:
 - The back should be at an angle of between 10°-20° leaning towards the rear of the vehicle.
 - The headrest must be touching the driver's head, never the neck, to prevent cervical injuries.

How to proceed in the event of an accident with material damages only:

- Remember there are other vehicles on the road. Look for a safe place to swap details.
- Switch the engine off and switch the emergency lights on to warn other drivers. Apply the handbrake, step out of the vehicle wearing the Hi-viz jacket and put the warning triangles in position if necessary.
- Swap details as quickly as possible and clear the road to avoid causing tailbacks.

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- Give your name, address, registration number, vehicle make, model and colour and insurance company to the other drivers involved and make sure you get this same information from them.
- Take photographs if possible.
- You do not need to call the police unless the situation is dangerous or there are injured parties or accused reckless driving involved.
- Report the accident to your insurance company and work superior as soon as possible to initiate the accident investigation protocols.

Pregnant women:

- Avoid driving for many hours without stopping. Stop every two hours or every 200 km. When you take the vehicle off the road, stretch your legs and breath in fresh air. As soon as you feel the slightest bit tired, stop the vehicle by the side of the road and have a nap or take a rest.
- The safety belt should be placed such that, when it locks suddenly, it does not press on the central area of a pregnant woman's abdomen, to avoid damaging the unborn child. The following device is available on the market and can be used for this purpose, detailed here for informational purposes only:




- The steps for putting the belt on are as follows:
 1. Place the device on the seat of the car.
 2. Sit on the device and put the safety belt on with the horizontal band over the restraint system. Then, fasten the belt to the device.



3.1. Vehicle rescue sheets

In the event of a serious traffic accident, the maximum time between when this occurs and the injured person arrives at the hospital must be less than one hour to ensure a high survival rate. If it takes a long time to free a trapped person, the risk of their injuries getting worse increases. Rescue teams need clear and precise information about the vehicle in question: where the high voltage components are, where the airbags are, what fuel the vehicle uses, the best places to cut the bodywork, and so on.

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What is a rescue sheet?

A rescue sheet contains all of the necessary technical information to open a vehicle quickly and safely. It has a standard format which is valid throughout Europe.

Why is it useful?

Because if it is accessible inside the vehicle, any rescue team can have it immediately on arriving at the accident site, understand it and use it to ensure that the injured person is freed as quickly and safely as possible.

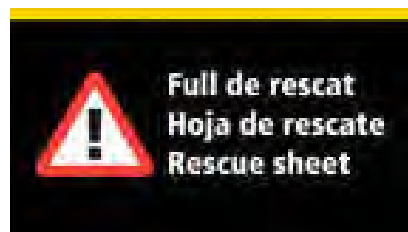
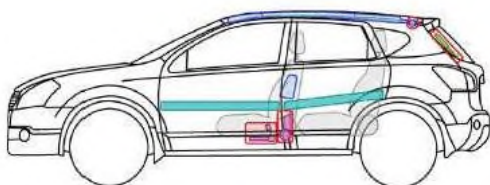
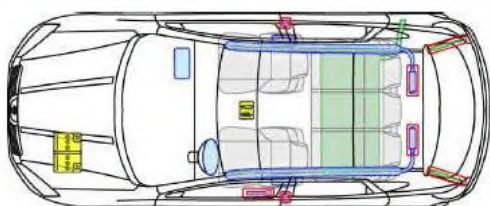
How is it kept in the vehicle?


1. Print the form for your vehicle on a sheet of A4 paper.
2. Fold the rescue sheet and put it in the sun visor of the driver's seat.
3. Place a sticker on the visor to let the rescue teams know that the car has this information (these stickers are available at RACE offices).

You can find more information and rescue sheets at:

<http://www.hojaderescate.es/racc/rescate/home>

<http://www.rescuesheet.info/index.html>




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Title: WORK USING A BASKET			Prepared by: J.E.R. (Signature and Date)
Safe Practice Code: PS-MM.3	Revision: 07	Date: 01/04/2015	
RA Code: ART.MM.3	Revision: 07	Date: 01/04/2015	
PS code it replaces: PS-MM.3 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.3 Revision 01 of Multitechnology and Made			Checked: D.P.C (Signature and Date)
Manufacturer:	ALL		
Model:	ALL		
This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.			Approved by: L. P. (Signature and Date)

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0. GENERAL INSTRUCTIONS:

- Upon arriving at the farm and prior to starting any operation:
 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and by GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- Before starting any manoeuvre, the area must be properly cordoned off to indicate that access of unauthorised personnel is forbidden and the risk of falling objects or tools. Furthermore, check the condition of the tools (suspension tools, bags for hoisting materials and tools, etc.) and their correct placement.
- Comply with the provisions of PS-MM.1, "General Activities", Safe Practice to the specific WTG model and the Wind Turbine Instruction Manual, as well as all other applicable safe practices according to the operation to be performed and which are referenced in each section.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lifeline, including the length of the energy absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against the objects located in a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above the shoulder level, reaching behind the body, pronounced inclination or twisting of the back and neck, etc. Use lifting elements designed for this purpose and mechanical tools whenever possible. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.


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1. WORK WITH BASKETS PROCEDURES:

- PPE Required: Working clothes, safety helmet with chinstrap, safety boots, protective gloves against mechanical injuries, harness, protective goggles against mechanical injuries, two ropes with a energy absorber device and a wide mouth hook, and those specifically required due to the use of elevating platforms or baskets attached to cranes, as described throughout this Safe Practice, Emergency Descent Device.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - PS-MM.9 Material Unloading, Storage and Hoisting.
 - Safe Practice for the specific WTG model.
- Carrying out these operations requires the presence of a Preventive Resource to guarantee that it is done at all times in compliance with the procedures and safety measures established by GCT.
- It is absolutely mandatory for any persons working at heights from an elevation platform or basket coupled to a crane to be fastened to an anchor device which complies with regulations and guarantees the operator's safety.
- Equipment may only be used in a manner or for operations or under conditions not specified by the manufacturer if a risk analysis has been carried out in advance and pertinent measures have been taken to eliminate or control these risks.
 - Before the use of any basket attached to a crane or elevating platform by personnel employed or subcontracted by GCT, experienced wind turbine maintenance personnel, whether employed or subcontracted by GCT, must **stop the wind turbine, lockout and tagout the rotor, lock the yaw system of the nacelle and lock the rotation of the blades. They must place signs indicating that personnel are working in the wind turbine and cordon off the area** where material could fall as indicated in PS-MM.1, "General Activities", Safe Practice for the specific WTG model, and the Wind Turbine Instruction Manual.
- The locking of the rotor for these tasks may be performed as indicated in PS-MM.1, "General Activities", Safe Practice for the specific WTG model and the Wind Turbine Instruction Manual. Place the blades in work position, and lock the rotor, with it completely stopped. NEVER LOCK IT WITHOUT COMPLETELY BRAKING THE WIND TURBINE.
- The elevation platform or basket coupled to a crane is only to be used by AUTHORISED personnel. The use of the elevation platform or basket coupled to a crane is absolutely prohibited for any personnel not familiarised with the user's manual or instructions, or who do not have medical certification as to their health condition being apt for working at heights.
- The elevating platform or basket coupled to the crane must be equipped with an emergency descent device that enables evacuation from these, if necessary.
- The maximum wind speed at which the elevating platform or the basket attached to the crane may be used is that indicated in Safe Practice for the specific WTG model and/or in the Wind Turbine Instruction Manual (unless the user manual is more restrictive). Personnel must carry manual anemometers while using the platform to know the wind speed at which they are working at all times. If the elevating platform or crane to which the basket is fixed has anemometers, in case of difference between the wind speed limits in the anemometer manuals and those of the hoisting equipment, the manuals shall be taken as the correct limit. If the basket cannot be controlled, even when the indicated maximum wind speed has not been attained but due to strong oscillations caused by the wind, the work must be suspended.
- The machinery is to be placed avoiding any unevenness of the terrain, levelling the ground where necessary so that the crane or elevating platform is perfectly level. This levelling must be checked prior to starting the works, and these must be immediately suspended if any support shows signs of sinking while works are being carried out.

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- When the machine works on outriggers, the pneumatic support arms must be extended to their maximum length and, maintaining a proper horizontality, the jacks must be raised to the necessary height so that the tyres are completely off the ground.
- The lifting of workers is only permitted using work equipment and accessories designed for that purpose. Nevertheless, if in exceptional cases it is necessary to use work equipment for a purpose other than that for which it was designed, take appropriate measures to ensure the safety of the workers and have adequate supervision. While the workers are positioned upon equipment used for hoisting loads, the control post must be under constant supervision. Elevated workers must have a suitable means of communication and their evacuation must be allowed for.
- The work is always carried out with **the elevating platform** for persons, with its corresponding CE marking (or the one that applies based on the legislation in the country where the work will be done), instruction manual for use and maintenance, and proper maintenance of the platform. In **exceptional** cases, if the market cannot supply the necessary platforms, it justifies the timely use of a crane with basket as long there is the guarantee of the safety of personnel and compliance with the requirements defined by the competent authorities of the country in which the equipment will be used. To this end, you must comply to the maximum extent possible with applicable regulations. As a minimum the baskets used must have a **certificate** issued by a **competent technician (Engineering, OCA, etc.)** which shows that the basket complies with the applicable regulations (according to the legislation in the country where the work will be done). The **basket-crane attachment** must guarantee the safety of the users, and the **crane must have its CE marking** (or that which applies according to the legislation in the country where the work will be done). When using the crane-basket unit there must be **direct communication** between the crane operator and the worker in the basket, as well as the means for evacuation (descent device). Proof that all necessary maintenance specified in the **use and maintenance manual has been carried out** must be available.
- When using a crane with the basket attached, keep in mind the recommendations of good practices published by organisms of prestigious reputation of the country in which you are going to use the equipment (e.g., National Institute and Safety Hygiene in Work INSHT) in Spain, INRS (National Institute of Recherche et Sécurité), CNAM (Caisse National Assurance Maladie) in France, H&S Executive in the United Kingdom etc.).
- These baskets must be permanent (fixed to the crane arm) and have handrails with a minimum height of 1 m for the top rail, another intermediate one, and a closed skirting of a minimum height of 15 cm. On the elevating platforms and baskets attached to cranes, the nominal load, in kilograms, must be permanently and clearly displayed; the nominal load expressed in terms of the authorised number of persons and weight of equipment in kilograms; and the maximum admissible wind speed in metres per second. If the basket has an access door (tilting or sliding) it must have an automatic lock (gravity or springs) which locks in the closed position to prevents its opening involuntarily. Furthermore, if the door is tilted, it must open towards the inside of the basket.
- The load to be hoisted in the compartment or basket, including the persons, the materials and the weight of the compartment, should be, at most, 40% of the nominal load of the crane in its most unfavourable configuration of use.
- The work speed of the crane will be limited to 0.5 m/s.
- In exceptional cases and providing it is absolutely impossible to perform the operation using an elevation platform or basket attached to a crane, a suspended basket can be used, taking into account that the operation to be performed using the suspended platform must be limited to a wind speed equal to or less than 5 m/s and retention and guide lines must be fitted to four symmetrical points on the platform to control its movement at all times This basket must comply with the requirements applicable to baskets coupled to cranes, as defined in the two preceding points.

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- Whenever a self-propelled crane for loads is used for elevating persons, the following requirements must be complied with:
 - Use is justified as exceptional.**
 - Description of devices:**

Self-driven cranes: you must specify the particular model or models on which installation can be performed.

Basket for carrying persons: The model which attaches to the self-propelled crane and its particular characteristics (material with which it is manufactured, maximum number of persons, maximum load, auto-stabilising system, etc.) are specified.

Coupling between the basket and the self-propelled crane: The characteristics and materials with which the coupling is manufactured are specified.
 - Specific instructions.**

Installation: Aspects to be taken into account before the installation, prior revision of the elements.


Use: Safety procedures during use, electrical risk, maximum admissible wind speed, evacuation, marking of areas at risk of falling objects.

Revision: Periodical safety inspection of all components.
 - Necessary safety equipment.**

See Section 1.1. "Procedures for use".
 - Calculations of the coupling and basket.**

Take into account the safety coefficient for reducing the elasticity limit in accordance with Regulations EA 95 Steel structures in construction and the safety coefficient for reducing the elasticity limit for work with fatigue loads.
 - Risk analysis.**

Analysis of all of the phases of the work process, analysing the probability and consequences of accidents, for the purpose of knowing the magnitude of the risks unto which the workers are exposed and being able to decide as to the appropriateness of carrying out the work.
- Preferably an intercom system will be used for issuing orders, but when this is not feasible, instructions shall be given by the use of coded gestures which both the person in charge of the manoeuvre and his assistants as well as the crane operator (when using a basket attached to a crane) must be thoroughly familiar with, and the crane operator will respond by using acoustic or luminous signals.
- For the operator to access and leave the platform, it must be resting on the ground. Once inside, the operator must be tied to the anchor devices present or to the portable lifeline previously fastened onto the points defined in the following section. The ascending operation must be done parallel and as close to the tower as possible.
- For operations where the use of portable lifelines forms an angle with the vertical greater than 11° (placement of bags on blades, etc.), these operations may not be carried out using the lifelines as anchor devices. Instead, the operations must be done while the workers are tied to anchor devices present on the elevating platform or basket attached to a crane.

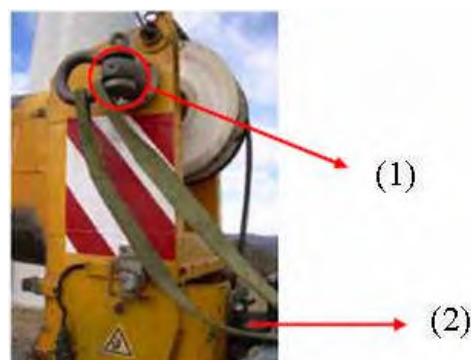
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1.1. Procedures for use:

- On the market there are platforms equipped with anchor devices, defined in their operating manuals and labelled on the basket, for fastening personal protective equipment. There are others which do not have such anchor points or, if they do, they are not guaranteed by the manufacturer for that purpose.
- Elevating platforms or baskets attached to cranes that have anchor devices defined as such in their operating and maintenance manuals, or those certified by a competent technician (manufacturer, engineering or OCA) and endorsed by an official association as having anchor devices which conform to regulations (in the case of Europe, EN-795), it is possible for users of the platform or basket to work while secured by means of a line attached to the anchor device without the need to install lifelines. If, following the inspection prior to the start of the work, there is any doubt as to the condition of the terrain, elevating platform or basket-crane unit, etc., it is obligatory for personnel to anchor themselves to lifelines.
- IT IS STRICTLY FORBIDDEN TO ANCHOR YOURSELF TO THE LIFELINE AND, AT THE SAME TIME, TO A POINT ON THE BASKET/PLATFORM
- The other options involve the worker being secured to a portable lifeline, as described below:



E.g. Anchor device on the platform



E.g. Anchor device on the crane arm
(1) Fastening point (2) basket fastening

1.1.1. Pre-work conditions:


A) Equipment required in the basket

For any of the work options, it is obligatory to have an emergency decent device in the basket as well as a means of direct communication with the platform/crane operator.

As well as the personal protection equipment required for this type of work, other equipment specific to the activity in question may be required (for example: safety boiler suit, mask to protect against organic vapours...for repairing blades).

B) Worker training

All workers must be trained in the health and safety plan for the wind farm where the work is to be carried out or, if this plan does not exist, they must be trained in the assessment of risks involved in the activity as well as those pertaining to the work centre and the established emergency procedures.

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Personnel working from the basket must be trained in:

1. Use and maintenance of personal protective equipment pertinent to the activity,
2. Evacuation by means of an emergency descent device
3. A basic course in risk prevention for the person(s) acting as Preventive Resource
4. First-aid (a basic risk prevention course is also valid)

If use of a lifeline is required, it may only be fitted by personnel authorised by their company and who have been trained by a company specialising in:

5. The installation of lifelines on a wind turbine (point 1.1.2)
6. The use and maintenance of personal protective equipment specific to such work (manual descent device, rope fall arrest device, cuff....) (point 1.1.3)
7. How to self-evacuate via the lifeline (point 1.1.4)
8. Basic rescue of a colleague, (point 1.1.5)

The person operating the elevation platform/crane must have, depending on the means employed, theoretical and practical training based on the safety and handling of:

9. The elevation platform,
10. The self-propelled moving crane
11. Depending on the applicable legislation in each country where work is carried out, it may be obligatory to present an official licence.

The previous training but be added if the platform operator is to operate it from the basket (points 1 to 8).

C) Minimum number of persons in the basket

Due to the need to act promptly in the event of an incident, there must always be at least 2 people in the basket, each suitably trained as described above.

1.1.2. Installing the safety system:



Before any installation work, remember that the area must be properly cordoned off to indicate that access of unauthorised personnel is forbidden and to highlight the risk of falling suspended loads.




This work must be done with the wind turbine switched off. The first operation for preparing to work on the nacelle must be to bring up the emergency descent device.



The rotor must be locked mechanically. If this lock cannot be set, it is necessary to also lock the corresponding electrical equipment, by using a personal padlock (as detailed in Safe Practice PS-MM.1, "General Activities"). Also in cases where there is a possibility rotation of the nacelle or the blades, this rotation must be locked.

Bring the material necessary to install the safety system up to the nacelle, either using the hoist or the load hoist system described in Safe Practice PS-MM.1, "General Activities" if the wind turbine is not powered up and there is no power generator set.

Once in the nacelle, locate the access points and exact position for the work.

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Leave **two ropes (semistatic, a long as the tower height + 5m and 10.5-11mm in diameter)** for each worker in the basket, ensuring they reach the ground properly. The two ropes carried by each worker must be of different colours so the safety rope can be quickly identified.

The reason for fitting two ropes is to provide backup should it be necessary to free the worker from the safety system. When working at height, all tasks above 2 metres must have a safety system to arrest a worker's fall as and when required (fall from a basket, fall of the basket itself or malfunction of the crane). The second rope is required so that, if a worker becomes suspended, he or she may use it to climb down.

The anchor devices defined for installing the lifeline shall be those defined in the Instruction Manual for the WTG and/or Safe Practice for the specific wind turbine model.

At least 2 anchors per rope must be used at all times so that one anchor only works if the main one fails to do so.

Installation is summarised thus:

1. Check that the work equipment is in good condition (ropes, carabiners, flat tapes, etc.).
2. If there are no permanent anchor devices, install temporary anchor devices by fitting the anchorage straps onto the structural points identified in Safe Practice for the specific wind turbine model.
3. Reinforce the installation.
4. In each anchor device (permanent or temporary) prepared for each worker, insert both ropes with a double carabiner (one inverted in relation to the other).


If the ropes do not come with the knot already formed, make a figure-eight knot (only properly trained personnel). How to make a figure-eight knot:

- Form a loop with the rope.
- Bring the end of the rope over then under the standing part
- Finally pass the end over and through the initial loop.



5. Pass the ropes out through the upper window of the nacelle.
6. Once both safety installations and the four ropes are in place, access the outside the nacelle following the indications in PS-MM.1, "General Activities", Safe Practice for the specific WTG model and the Wind Turbine Instruction Manual. Place the ropes where they are to be used and make sure they reach the ground.
7. Before descending the rope, finish the installation by fitting the anti-scraping guards for those sections of rope that need them. This will vary in accordance with the model of wind turbine, though it usually corresponds to such elements as the blades, handrail, nacelle hatchway, etc.



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A colleague must check the installation before it is used.

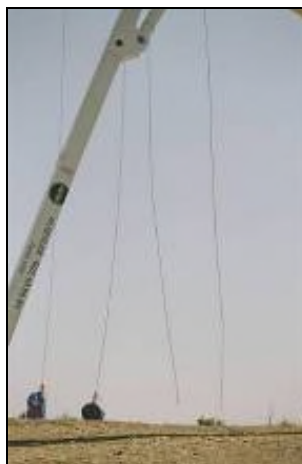
- The flat tapes must be correctly fitted to the anchor device.
- The guards must perform their function.
- The karabiners must be closed and their pins facing each other.




The ropes must be fitted and ready to use from the basket on the lower section of the crane.

If it is necessary to rotate the rotor, we must gather up the system of lines, rotate the rotor and then run out the lines once more.

8. Finally, anchor or weigh down the ropes to be used for ascending or descending, as shown in the image.



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1.1.3. Use of the safety system on elevation platforms and crane-coupled baskets:

Before climbing into the basket, the worker must check that he or she is carrying all these elements and that they are in good condition:

1. Integrated fall arrest harness
2. Anchor line
3. Helmet with chinstrap
4. Connectors



5. Fall-arrest device of ASAP rope



6. Manual descent device ID-20 S



7. Energy absorber ASAP' ABSORBER



8. B17 handled ascender



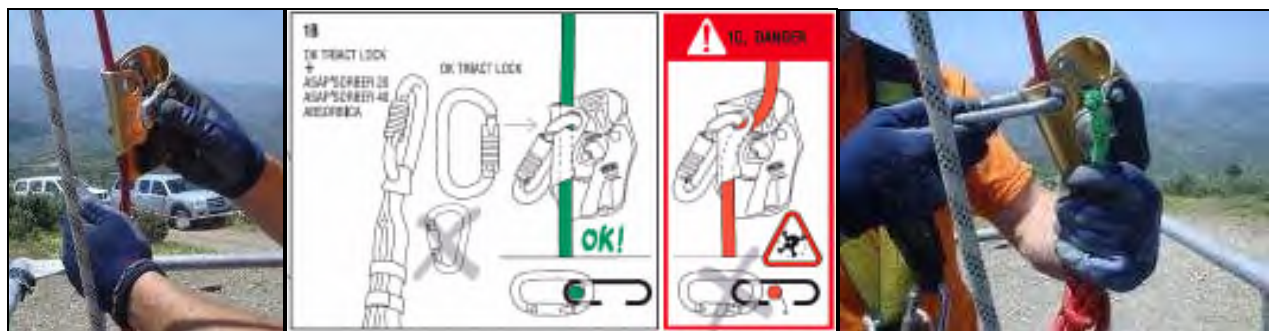
9. Foot loop




10. Hook cutter

And: emergency descent device for basket evacuation and system for communicating with the platform/crane operator.

We must first anchor ourselves to the safety line by means of the fall arrest device, as per the following images:



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Fit the safety rope fall arrest device secured by the energy absorption system to the pectoral point on the worker's harness.

Note: pass the karabiner through both holes of the fall arrest device. The rope must end up inside the karabiner.

Take extreme precautions during ascent and descent, remaining anchored to portable lifelines. Ensure that the line can slide through the sliding fall arrest device at all times to prevent loops from forming during ascent or to prevent the person from becoming suspended from the line during descent.

Important: it is useful to have the ladder or footloop attached to the harness and the descent device fitted to the descent anchor point on the fall arrest harness since, if used, it may fall from the hands of the operator preparing to use it at height.



Position of fall arrest device during ascent using the crane platform.

Stand in the work area secured to the safety rope alone, never to the platform.

Once in the work area, we can move the fall arrest device to a higher position to reduce swing in the event of a fall.

Important: IT IS STRICTLY FORBIDDEN TO ANCHOR YOURSELF TO THE LIFELINE AND, AT THE SAME TIME, TO A POINT ON THE BASKET/PLATFORM.




1.1.4. Unlocking and descent manoeuvre:

If the work platform falls or a worker falls from it, the fall arrest device will halt the free descent. A procedure must be followed to release the pressure from this fall arrest device on the rope after having positioned the rope correctly in the manual descent device, in order to make the descent. I.e. return safely to the ground.

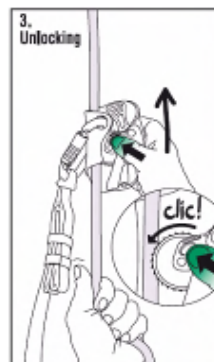
The steps are as follows:

- Place the foot loop over the handled ascender.
- Position the handled ascender above the fall arrest device.
- Place the manual descent device over the working line.
- Support yourself on the foot loop and, at the same time, tense the rope fitted to the manual descent device to release the tension from the fall arrest device.

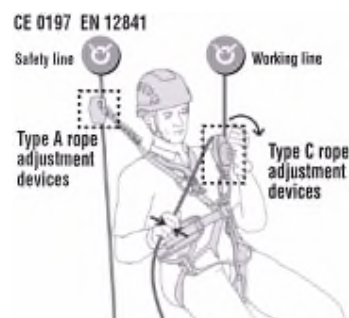
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- Unlock the fall arrest device from the safety line.



- Descend with both fitted elements acting upon the manual descent device.



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1.1.5. Basic rescue:


All workers performing work at a height or vertical work, whether they are new or experienced, must be familiar with the procedure to rescue a colleague in difficulties from a height.

The basic rescue procedure is:

1. Approach the worker in trouble and position yourself above them or, if this is not possible, as close to them as you can get.
2. Secure one end of their anchor line or fastening element of their chest anchor point to yours.
3. Sever their line above their fall arrest device using the hook cutter.




4. Remove their fall arrest device from the severed line and fit it onto the unused and unsevered line.
5. Descend with him/her secured to your anchor line. Bear in mind that the injured worker will reach the ground before you, so their touch down must be conducted with extreme caution.
6. The injured worker must receive medical treatment as soon as possible. If they have spent several minutes suspended inert from the harness, do not allow them to lay on the ground so as to avoid harm caused by harness hang syndrome or suspension trauma.

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Safe Practice Code: PS-MM.4	Revision: 07	Date: 01/04/2015	
RA Code: ART.MM.4	Revision: 07	Date: 01/04/2015	
PS code it replaces: PS-MM.4 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.4 Revision 01 of Multitechnology and Made			Checked: D.P.C (Signature and Date)
Manufacturer:	ALL		
Model:	ALL		
This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.			Approved by: L. P. (Signature and Date)


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0. GENERAL INSTRUCTIONS:

- Upon arriving at the farm and prior to starting any operation:
 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and by GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to use the hoist to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- **Definitions:**
 - Manoeuvring; actions that allow energising or de-energising or separating a circuit or electricity grid. This equipment should therefore be made of elements such as circuit breakers and/or disconnector switches, which make it possible to perform these actions or manoeuvres.
 - Discharge: a set of coordinated actions to secure an installation in safety conditions order to establish the Protected Area or the Work Area to work on it, or near it, **WITHOUT VOLTAGE**.
It comprises:
 - Opening all the voltage sources, indicated in the Request as required points of isolation, using visible and/or effective cut-off.
 - Lockout and tagout signalling that use is prohibited.
 - Check the absence of voltage in the element.
 - Earth and short-circuit all possible voltage sources.
 - Cordon off the work area using signalling or insulating screens.
 - De-energising: action/process in which voltage is removed from an installation or an element of that installation.
 - Energising: action/process in which voltage is re-established to an installation or an element of that installation.
- If the client has no on-site operators and gives authorisation to handle the switchgear, do so in accordance with the client's discharge procedure. If such a procedure does not exist, proceed as described herein.
- Only handle the switchgear when the **wind turbine is shutdown** (follow the procedure set out in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual). It is essential to be sure no one is inside the nacelle or tower of the affected wind turbine.
- The use of PPE for High Voltage is mandatory, i.e. Insulating gloves against electrical injuries, Face Shield, Insulating Stool or Mat, all defined according to the voltage at the Transformer Station to be handled.
- Comply with the provisions of PS-MM.1, "General Activities", Safe Practice specific to the WTG model and the Wind Turbine Instruction Manual, as well as all other applicable safe practices according to the operation to be performed and which are referenced in each section.

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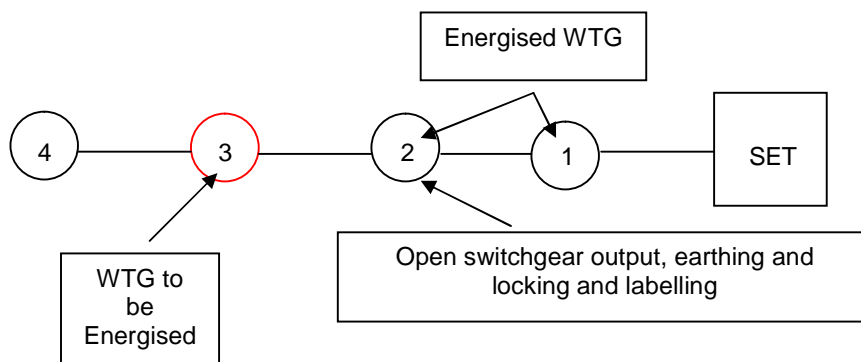
- To lock and label the High Voltage switchgear, as well as operations requiring the voltage to be disconnected in the wind turbine, follow the directions given in the PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lifeline, including the length of the energy-absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against the objects located in a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above the shoulder level, reaching behind the body, pronounced inclination or twisting of the back and neck, etc. Use lifting elements designed for this purpose and mechanical tools whenever possible. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.

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1. INITIAL ENERGISATION

1.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective goggles against mechanical injuries, Insulating gloves against electrical injuries, Face shield for working with electrical hazards, Insulating Stool or Mat and Pole with voltage presence indicator, appropriate for the voltage of the Transformer Substation to be handled
- Recommended PPE: Lumbar protection.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- Carrying out this operation requires the presence of a Preventive Resource which guarantee that it is done in compliance, at all times, with the procedures and safety measures established by GCT.
- To handle the Transformer Station installed in wind turbines, follow the instructions in point 2. **Discharging/Reconnecting Voltage in the WTG Transformer Station.**
- Whenever operations are to be conducted on a wind turbine that has yet to be energised for the first time but which may be powered from the preceding wind turbine (already energised) or from the substation (if it is the first in line), check that the energised wind turbine's or substation's switchgear is open, earthed and locked out and tagged out as per the PS-MM.1 "General Activities", Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.




- The isolator switch of the transformer stations may only be handled by personnel authorised by their company in accordance with current regulations protecting workers from electrical hazards in the country in which the wind turbine is installed.
- The equipment performing the energisation shall have at least two fire extinguishers guaranteeing a level of 89B efficiency suited for fires of electrical origin (CO₂). In the event that the extinguishers are required, never enter the tower due to the risk of asphyxia; operate the extinguisher from the door of the tower while remaining outside.
- Make sure there are no personnel in or near the wind turbine to be energised and block off the access route.
- During energisation, keep the door open to detect any anomalies.
- In mechanical interventions on the isolator, use an insulating stool or mat, insulating gloves against electrical injuries and face shield for work with electrical hazards, appropriate for the voltage of the Transformer Station to be handled.

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- If any anomaly is detected on the wind turbine, it must be immediately disconnected from the main grid.
- Once energising has been completed, the operators must wait for 15 minutes before entering the wind turbine.
- Prior to starting the energisation operations, it must be confirmed that the client has verified the correct condition and functioning of the underground power supply lines which feed the wind turbines.

INITIAL ENERGISATION PROTOCOL

- Before energising the WTG, follow these steps:
 - For the first energising, the work specification for each model of wind turbine must be followed, with regard to the checks to be performed before proceeding with energisation, indicating the operations carried out and the data obtained in the corresponding Checklists.
 - Demand the presence of the person responsible for Start-Up assigned by GCT for this wind farm, to condition Start-Up to said person's approval having verified that all deficiencies detected by Quality have been corrected, that the GCT specification referring to "Checks Prior to Energisation" has been met and that the "Energisation Protocol" followed by the client complies with the minimum requirements defined by GCT.
 - Until the GCT Start-up Supervisor gives the go-ahead to energise the wind turbine, the circuit breaker or switch must be locked with a padlock in the open position to prevent current from entering the turbine.
 - Before starting the energisation operations, a meeting must be held attended by the wind farm manager, the owner, the person responsible for energisation and representatives from participating companies to define the energisation sequence to be followed, actions to be taken, etc.
 - Prior to energisation, we must check that all wind turbines to be energised have their outlet to the next wind turbine open and not earthed.
- Once owner authorisation and qualified worker conditions have been met, the following sequence of steps must be followed to reconnect the power supply:
 - a. Check in the previous tower, or in the substation if it is the start of the line, that the output of the switchgear to the wind turbine to be energised is open.
 - b. Open without earthing, locking out and tagging out the circuit output to the next wind turbine.
 - c. Make sure the general power and auxiliary switches etc. (i.e. those directly connected to the transformer) are closed.
 - d. Evacuate the machine to be energised and the connection boxes involved, ensuring that there is no one inside the tube or in the nacelle.
 - e. Remain several meters from the tower to be energised, avoiding any intrusion into it.
 - f. Confirmation from the personnel at the foot of the tower to be energised as to the total absence of risk is to be given to the personnel at the previous tower or substation if it is the start of the line.
 - g. Connect the switchgear or substation output as soon as the absence of risks has been confirmed. If the turbine is not energised immediately, new confirmation will be required, and so on so forth.
 - h. If any anomaly is detected during the execution of this procedure, inform the person responsible for the installation, leaving all elements in their initial conditions.
 - i. Next, check that the input to the switchgear from the previous wind turbine or from the substation is powered. Check this using the voltage detectors in the switchgear.
 - j. Lock the circuit output to the next wind turbine, set it to earth, lock it and tag out.

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- It is absolutely forbidden for workers to remain in the tower while the first voltage energisation test is being carried out (send voltage from the substation and check that the switchgear does not trip). Likewise, if it is not the first time the turbine is connected to the power supply, but a power part element has been handled, three (3) days have elapsed since the wind turbine has been running due to prolonged stoppage, or if after a shorter stoppage period there are suspicions that the electrical cabinets are damp or have water inside them, follow the instructions in the specification regarding "Electrical Checks prior to energising" specific to the model of wind turbine".
- Each time a wind turbine is energised, the switchgear trip test must be run by pressing the emergency trip button. Having checked the switchgear trip function, the wind turbine will be re-energised from the protection switchgear.

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2. DISCHARGING / ENERGISING WTG TRANSFORMER SUBSTATION:

- Carrying out this operation requires the presence of a Preventive Resource which guarantee that it is done in compliance, at all times, with the procedures and safety measures established by GCT.
- PPE Required: Working clothes, Helmet with chinstrap, Safety boots, Protective goggles against mechanical injuries, Insulating gloves against electrical injuries, Face shield for work entailing electrical risk and Insulating mat or stool, appropriate for the voltage of the Transformer Substation to be handled.
- Recommended PPE: Lumbar protection.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- Carrying out this operation requires the presence of a Preventive Resource which guarantee that it is done in compliance, at all times, with the procedures and safety measures established by GCT.
- All personnel who handle a Switchgear must be authorised in writing by their company. This authorisation should be made on the basis of current legislation protecting workers from electrical hazards for the country in which the wind turbine is installed. If there is no legislation regarding this matter, or if the existing legislation is less stringent than the provisions in the Regulations of Coordination of Activities (RCA) of GCT, comply with the requirements laid down in these standards.
- In mechanical interventions on the isolator, use an insulating stool or mat, insulating gloves against electrical injuries and face shield for work with electrical hazards, appropriate for the voltage of the Transformer Station to be handled.

2.1. VOLTAGE DISCHARGE IN THE WTG TRANSFORMER STATION:

2.1.1 General Preventive Measures for all types of wind turbines:

- Discharge is the procedure to prepare a facility or part of a facility so that it can work without any voltage. To perform a discharge operation, we must always follow the Five Golden Rules. Normal operations that do not involve the five golden rules are not discharge operations and are not subject to this procedure.
- A discharge involves:
 - Processing written documents.
 - Identification of involved parties.
 - Clear identification of the installation in question.
 - Signatures and written authorisations.
 - Observe the 5 Golden Rules for working with electrical hazards.

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VOLTAGE DISCHARGE PROTOCOL:

1. Once the above conditions have been met, having permission from the owner and being a worker authorised by the company, we can then carry out the following steps to de-energise the installation:
 - 1.1. Disconnect the voltage via the switchgear using the switch or switchgear trip, depending on the model.
 - 1.2. Prevent any possible power re-connection by personally locking the equipment (fit personal lockout padlocks in accordance with the instructions given in the PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
 - 1.3. Check the absence of voltage. In order to verify the absence of voltage, action must be taken as if the installation has voltage. It is essential to check that the voltage tester is working properly immediately before and after each use
 - 1.4. Earth and short-circuit the switchgear.
 - 1.5. Mark off the work area using the labels designed for that purpose.
2. The installation will be deemed to be Discharged and, therefore, apt for working thereon with no risk of electrical hazards, once all these steps have been followed and the substation and/or control centre overseeing the on-site operation has been notified, depending on the case at hand, providing them with confirmation by means of a no. ___ which must be recorded in both the discharge authorisation and the deployed signalling.
3. To lock and label the High Voltage switchgear, as well as operations requiring the voltage to be disconnected in the wind turbine, follow the directions given in the PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.


2.2. ENERGISING WTG TRANSFORMER SUBSTATION:

2.2.1. General Preventive Measures for all types of wind turbines:

- The equipment performing the energisation shall have at least two fire extinguishers guaranteeing a level of 89B efficiency suited for fires of electrical origin (CO₂). In the event that the extinguishers are required, never enter the tower due to the risk of asphyxia; operate the extinguisher from the door of the tower while remaining outside.

VOLTAGE RECONNECTION PROTOCOL:

- Once the initial conditions have been met, having permission from the owner and being a worker authorised by the company, we can then carry out the following steps to re-energise the installation:
 - a) Reconnecting the voltage after a voluntary triggering of the switchgear during wind turbine safety system checks carried out during preventive maintenance operations.
 - Make sure the general power and auxiliary switches etc. (i.e. those directly connected to the transformer) are closed.
 - Before voltage is re-instated, all workers must:
 - If the transformer and power cabinets are in the nacelle, before restoring voltage, all personnel must leave the nacelle and can position themselves on the platform immediately underneath it while voltage is being restored from the switchgear, as long as when conducting this operation there is continuous communication between nacelle personnel and those who are going to operate the switchgear and the restoration of voltage is done subject to the express order of the person directing the work on the nacelle, who must make sure that nobody remains inside.
 - If the transformer and/or power cabinets are located on sections of the tower: before voltage is re-instated, all workers must leave the wind turbine.
 - Close circuit breaker.


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b) Restoring voltage after carrying out operations affecting the power supply area: change of transformer (both of the entire wind turbine, as well of the components that go make it up), change of generator, change of power cabinet or change of power wiring:


- Check that the installation has the fuses of the secondaries of the transformer or other power cut-off element validated by GCT.
- In the event the installation has the fuses of the secondaries of the transformer or other power cut-off element validated by GCT, the following sequence of steps will be followed:
 - a. Make sure the general power and auxiliary switches etc. (i.e. those directly connected to the transformer) are closed.
 - b. Evacuate the machine to be energised and the connection boxes involved, ensuring that there is no one inside the tube or in the nacelle.
 - c. Any personnel, except the worker to carry out the reconnection of the voltage, must remain several meters from the tower to be energised, avoiding any intrusion into it.
 - d. Open the switchgear earthing and close switch.
- If the installation does not have the fuses of the secondaries of the transformer or other power cut-off element validated by GCT, the following sequence of steps will be followed:
 - a. Check in the previous tower, or in the substation if it is the start of the line, that the output of the switchgear to the wind turbine to be energised is open.
 - b. Open the earth connection and turn off the switch of the turbine to be energised.
 - c. Make sure the general power and auxiliary switches etc. (i.e. those directly connected to the transformer) are closed.
 - d. Evacuate the machine to be energised and the connection boxes involved, ensuring that there is no one inside the tube or in the nacelle.
 - e. Remain several meters from the tower to be energised, avoiding any intrusion into it.
 - f. Confirmation from the personnel at the foot of the tower to be energised as to the total absence of risk is to be given to the personnel at the previous tower or substation if it is the start of the line.
 - g. Connect the switchgear outlet or substation immediately after confirmation of the absence of risk. In the event the restoration of voltage is not done immediately, a new confirmation will be required, and likewise successively.
 - h. If any anomaly is detected during the execution of this procedure, inform the person responsible for the installation, leaving all elements in their initial conditions.
- If any power part element has been handled, three (3) days have elapsed since the wind turbine has been running due to prolonged stoppage, or if after a shorter stoppage period there are suspicions that the electrical cabinets are damp or have water inside them, follow the instructions in the instructions regarding "Electrical Checks prior to Energising" specific to the model of wind turbine.

• **NOTE: In the event of an automatic (involuntary) trip of the switchgear, that is to say, that the operators are find the switchgear has tripped for no apparent reason, the following steps must be taken to restore voltage:**

1. **Earth the switchgear and then lock and label it.**
2. **Enter the transformer compartment complying with all the appropriate access safety measures (see PS-MM.1 "General Activities", Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual) and check that it is in good condition and for any possible blown LV fuses. Also check the neutral detector, the detectors and that the transformer's compartment doors are properly closed.**

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3. Check the correct status of the power part: the electrical cabinets through which the highest electrical currents pass (power cabinets, condensers, etc) both at the base of the wind turbine and in the nacelle and/or tower sections.
 4. Make sure the main switch(es) are working properly by conducting a visual inspection and checking the absence / existence of continuity in each phase using a voltage detector. Furthermore, if there are voltage converters, check on their condition.
 5. Reset the switchgear after all personnel have left the wind turbine.
- Reconnecting voltage in the wind farm turbine power line after this has been removed and when there are workers present in the wind turbines:
 - a. If the switchgear of the wind turbine being worked on is open, earthed, locked and labelled: workers may continue to work anywhere in the wind turbine.
 - b. If the wind turbine switchgear in which the work is being performed is closed:
 - i. If the transformer and power cabinets are in the nacelle, before restoring voltage, all personnel must leave the nacelle and can position themselves on the platform immediately underneath it while voltage is being restored from the switchgear, as long as when conducting this operation there is continuous communication between nacelle personnel and those who are going to operate the switchgear of the substation and the restoration of voltage is done subject to the express order of the person directing the work on the nacelle, who must make sure that nobody remains inside.
 - ii. If the transformer and/or power cabinets are located on sections of the tower: before voltage is re-instated, all workers must leave the wind turbine.

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Title: ROPE ACCESS WORK			Prepared by: J.E.R. (Signature and Date)
Safe Practice Code: PS-MM.5	Revision: 07	Date: 01/04/2015	
RA Code: ART.MM.5	Revision: 07	Date: 01/04/2015	
PS code it replaces: PS-MM.5 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.5 Revision 01 of Multitechnology and Made			Checked: D.P.C (Signature and Date)
Manufacturer:	ALL		
Model:	ALL		
This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.			Approved by: L. P. (Signature and Date)

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Title: ROPE ACCESS WORK	Safe Practice Code: PS-MM.5	Revision: 07
Manufacturer: ALL	Model: ALL	Date: 01/04/2015

0. GENERAL INSTRUCTIONS

- Upon arriving at the farm and prior to starting any operation:
 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to use the hoist to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- If the client has no on-site operators and gives authorisation to handle the switchgear, do so in accordance with the client's discharge procedure. If such a procedure does not exist, proceed as described herein.
- Only handle the switchgear when the **wind turbine is shutdown** (follow the procedure set out in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual). It is essential to be sure no one is inside the nacelle or tower of the affected wind turbine.
- Comply with the provisions of PS-MM.1, "General Activities", Safe Practice specific to the WTG model and the Wind Turbine Instruction Manual, as well as all other applicable safe practices according to the operation to be performed and which are referenced in each section.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lifeline, including the length of the energy-absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against the objects located in a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above the shoulder level, reaching behind the body, pronounced inclination or twisting of the back and neck, etc. Use lifting elements designed for this purpose and mechanical tools whenever possible. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.


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1. VERTICAL WORK


1.1. General Preventive Measures for all types of wind turbines:

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness, sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook. Self-braking descending device, rope fall arrest device, absorber for rope arrest device, handled ascender, foot loop / pedal.
- Equipment: Semi-static ropes certified by the manufacturer of the rope fall arrest device and/or manual descent device, Sewn tape ring and lanyard protectors.
- Retractable fall arrest device to exit the nacelle in order to install the lifelines. This belt can be replaced by fastening to the working line with self-braking descent device and with the rope fall arrest device fastened to the safety rope previously installed and reinsured inside the nacelle.
- Climbing Tools: Carabiners, Locking handle, Rope clamp, Knife, Ladder, Foot Loop, Semi-static certified climbing ropes.
- Recommended PPE: Lumbar protection.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - PS-MM.9 Material Unloading, Storage and Hoisting.
 - Safe Practice for the specific WTG model.
- Carrying out these operations requires the presence of a Preventive Resource to guarantee that it is done at all times in compliance with the procedures and safety measures established by GCT.
- Wind speed to perform Rope Access Work **Outside** the wind turbine: see Safe Practice specific to the WTG model and/or the Instruction Manual for the WTG.
- Wind speed to perform Rope Access Work **Inside** the wind turbine: see Safe Practice specific to the WTG model and/or the Instruction Manual for the WTG.
- Rope access work is a technique for working at height based on the use of ropes, anchors and extension equipment to access natural objects, subsoil, structures, and in-built accessories in order to carry out a specific task.
- Before performing any operation by personnel employed or subcontracted by GCT, experienced wind turbine maintenance personnel, whether employed or subcontracted by GCT, must **stop the wind turbine and lockout and tagout the rotor, lock the yaw system of the nacelle and lock the rotation of the blades. They must place signs indicating that personnel are working in the wind turbine and cordon off the area** where material could fall, as indicated in PS-MM.1 "General Activities", Safe Practice specific to the WTG model and the Instruction Manual for the wind turbine.
- The locking of the rotor for these tasks may be performed as indicated in PS-MM.1 "General Activities", Safe Practice specific to the WTG model and the Wind Turbine Instruction Manual. Place the blades in work position, and lock the rotor, with it completely stopped. **NEVER LOCK IT WITHOUT COMPLETELY BRAKING THE WIND TURBINE.**
- Workers must be trained to at least the intermediate level of specialisation, in accordance with requirements or recommendations from leading associations belonging to the vertical work sector, such as experienced technician or work supervisor, and they must be trained to perform any type of vertical work and overhead work systems and be familiar with rescue procedures and special access techniques. They must work under the supervision of a superior and carry out that person's instructions.

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- All companies must have at least one higher-level worker, in accordance with requirements or recommendations from the prestigious associations in the sector of rope access work, such as an experienced technician with full responsibility for every aspect of a work project and who is familiar with legislation and advanced rescue procedures.
- The Contractor's Representative for the work must, under his/her responsibility, check whether the Health and Safety Requirements are met, ensuring that working conditions are safe, the necessary safeguards and appropriate safety resources are employed and that the tools, materials and auxiliary resources (those relating to work as well as to safety and first-aid) are in proper condition.
- The Contractor's Representative for the work must ensure that all operators have a full understanding of the task assigned to them and, if necessary, make them repeat the instructions which they have been given for the task, allowing all questions and suggestions that may arise, especially in regard to possible risks and how to avoid them.
- All operators must inform the Contractor's Representative for the work of any unsafe conditions observed at the worksite and inform of materials or tools which are in poor condition.
- The erroneously named "acts of bravery", which always involve an obvious risk, are strictly forbidden.
- It is forbidden to consume alcohol or drugs at work.
- Use of a particular rope must be limited to a specific length of time, bearing in mind that the rope's strength gradually diminishes in correlation to how we use it.
- We must avoid rope coming into contact with water as this reduces its strength by up to 10%. We must also prevent rope from being exposed to sunlight as far as possible.
- Keep rope clean and, if detergent must be used, always use a neutral type.
- It is forbidden for two operators to be suspended in the same vertical plane at the same time.
- Report any equipment anomaly detected and all equipment which has withstood a fall must be disposed of in all cases.
- Avoid equipment wear and tear, especially in regard to contact and rubbing against rough, hot or corrosive edges and surfaces or which may make mechanisms oily.
- Connectors must have no sharp or rough edges which may cause cuts, wear away due to friction, damage rope or injure the operator.
- Safety harnesses must be designed so that they do not cut off blood supply, support the lumbar region and do not press on the hip bone. Before each use, a visual inspection should be carried out to ensure the harness is in optimal condition.
- Depending on the duration of the work and ergonomic requirements, a seat fitted with the necessary accessories must be provided. This seat should have a backrest or lumbar support and foot loop. A work seat or chair must always be used during rope access work whenever the worker is to be suspended for more than 30 minutes at a time.
- The worker's main means of connection to the ropes will be via a harness, not the seat.
- The operator must wear a safety helmet with chinstrap, working clothes, gloves against mechanical injuries and safety boots appropriate for the work to be carried out and these must be used at all times and throughout the entire task. After use, the equipment must be dried if it has become wet, and stored away from the elements, sunlight or other aggressive agents.
- Fall protection equipment must have all documentation required based on the legislation of the country in which the tasks will be carried out or, if no specific legislation exists, equipment that complies with European legislation shall be employed.


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- The equipment must be appropriate to the prevailing environmental conditions, such as humidity, cold, mud, UV rays, etc...
- If weather conditions are adverse: snow, patches of ice on the nacelle, heavy rain, etc., postpone work until conditions improve.
- All elements of the fall arrest PPE must be checked and verified daily by each operator before work commences and any equipment or element showing signs of damage must be rejected.
- The outcome of the latest inspection of equipment to be used for the work in hand out must be made available to GCT.
- Wear suitable clothes for low/high temperatures in accordance with applicable regulations. Follow the indications described in Safe Practice PS-MM.1 "General Activities", Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.

Specific regulations:

- Two duly certified lines must be installed, a descent line and a safety line, each fastened to a different anchor point.
- The line installation must be checked by another person before use.
- To access the exterior of the nacelle, follow the indications in PS-MM.1 "General Activities", Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.
- In line ascent-descent operations, the suspension points must be formed by two or more anchors.
- Workers performing this type of work must be trained in vertical work and rescue procedures. Only **authorised** people who are trained in vertical work can perform these operations. Operators who perform such tasks must have specific knowledge in the use of rope access work equipment involving two lines, a suspension line and a safety line, for each operator. They must also be trained in installation techniques, including both natural and installed fastening elements as well as climbing techniques once the equipment has been installed.
- All workers must pass a medical examination ruling out any physical or psychological problems and must undergo yearly check-ups.
- Vertical work will be performed using two safety systems at all times (two-rope system). Each specialist must have a semi-static working line, of an acceptable diameter as specified by the descent device and fall arrest device manufacturers, as well as a safety line, which he/she will control him/herself. Line descent must be carried out using self-locking devices, all of which must be certified. The specialist must use self-locking handled ascenders allowing him/her to ascend using the line. Once at the height of work, the descent devices lock and the specialist can carry out his/her job.
- The team must be formed by the right number of people (minimum two), although not all of them can be suspended at the same time, one of them must supervise the work at the top or ground operations base throughout. This supporting worker must always be in a position to rescue him/herself, be rescued, or quickly and efficiently rescue the personnel specific to the location. The workers will communicate using hands-free closed circuit receivers. The work must be carried out by at least two workers so that one is able to help the other in the event of an emergency.
- Tools that are uncomfortable to use when suspended from the harness (and, compulsorily, any which weigh more than 10 Kg) must be secured and anchored directly to an auxiliary rope installed specifically for this purpose.
- Liquids, such as water, must be carried in sealed containers. In the case of paint, tall-sided paint containers must be used, filled to no more than one third. In the case of potentially aggressive chemical products, extra protection measures must be taken for the worker and the ropes (use of protective covers 1.5 metros above the worker).
- Tools, chemical products, etc., must be hoisted in sufficiently sturdy and closed containers.
- When using heated/cutting tools, the worker will be suspended from steel cables ((5 mm in diameter) or metal chains along the last 2 metres above the worker. A locking device will be fitted to the working rope from which the cable or chain is suspended, and the worker will be secured to the end of this element.


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- Under no circumstances shall tools be suspended directly from the power cable. Instead, a safety system secured to the wind turbine to prevent them falling must be used. Likewise, the wind turbine power cable and the extension cable must be connected in such a way as to prevent it from being disconnected accidentally.
- All equipment used shall be subject to those European standards specific and applicable to each element.
- Discard any metal elements (rings, hooks, locking devices, etc.) that have burrs.
- Suspension ropes must be inspected regularly to ensure they are in perfect condition. This operation must be carried out before each use thereof.
- All harnesses that have been involved in a fall, strain or a visual inspection raising doubts as to its condition must be replaced.
- All material is regarded as personal to each worker, who must keep it in good condition as request its renewal in accordance with expiry dates.
- It is forbidden to make modifications to harness seams, webbing or straps.
- Check wind speed before work commences to make sure we are within the established limits for carrying out the operations.
- Before using any Chemical Product, all personnel who handle it must be familiar with and apply the required safety measures described on the product's Safety Datasheet and use the appropriate protective equipment.
- The ladder access hatchway must be closed each time the upper platform on the last section is accessed.
- To open/close the rear nacelle door, wear a safety harness attached to an anchor device and fit the safety bar or chain while the door remains open.
- The work area must be kept clean of remains of materials and products used.
- When unlocking the rotor to allow the blades to move, all personnel involved must be notified.
- Control periodic breaks and the ergonomic conditions of the work.
- When working with a Power Washer, use the following equipment: Protective goggles against mechanical injuries and against liquid splashes or face shields, waterproof boots, waterproof clothing and hearing protection.

Interaction with the wind turbine:

- Once in the upper section of the wind turbine, in nacelle, we must locate the anchor devices best suited to the position where we wish to place the ropes for accessing and positioning to the precise point of work.
- Remember that we must always use at least two anchors.
- The anchors must be fitted using flat tape or portable structural anchors, as described below:
 - 1.-If there are no permanent anchor devices, install temporary anchor devices by fitting the anchorage straps onto the structural points identified in Safe Practice for the specific wind turbine model.
 - 2.- Join the two anchor devices (permanent or temporary) with each of the two ropes using a figure-eight knot and carabiner.
 - The figure-eight knot is the most common working knot and can be done in two ways: one starting from the end of the rope (a double figure-of-eight loop or double bowline knot) and another from the middle of the rope while doing so from the end is not usual, solely for "thread-throughs/pinches" or structural anchors where we need to spare a karabiner; starting from the middle of the rope is the most common method (figure-of-eight) and is used for joining ropes to the anchors, installing a fixed rope, passing materials to a colleague, fitting a pulley, isolating material or any situation where we need a knot in the middle of the rope able to withstand great strain. And you can undone it easily after being suspended from the rope.

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- To make one, form a loop with the rope and bring one end over then under the standing part, finally passing the end through the loop.

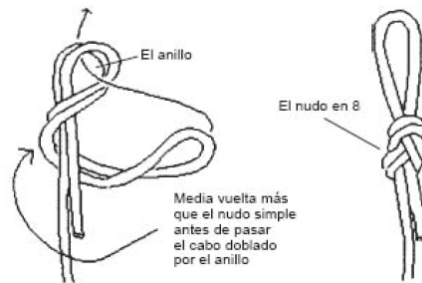



Figure
Figure-eight knot

3.- Reinsure the installation

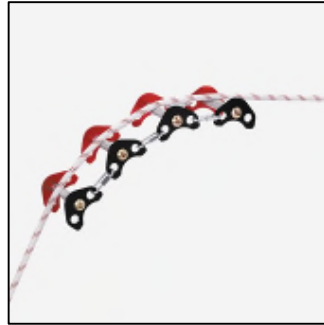
- With the rope left over when making these knots, approximately 1.5 metres, we make another figure-eight knot that we will use to join it to one of the two main anchors.
- Take care that the ropes do not rub against sharp edges. When this situation occurs, the ropes must be fitted with an edge guard.
- It must be fitted at the point on the rope where it may be damaged by rubbing against a particular element.
- Depending on the type of guard, the ropes must be encased in the guard or over it.
- Whenever possible, according to the work procedures, the ropes must be run through areas of the nacelle where these ropes would not rest on elements that may cause damage.



- In order to carry out the cleaning of the tower and nacelle or for any other operation that requires vertical work and when ropes must be positioned on the sides of the nacelle, on or near elements that could cause damage to the ropes, are used must stand on the nacelle sides on or near elements that may cause damage to the ropes, metal or flexible steel guards must be placed in all areas where the ropes could come into contact with or do come into contact with these elements.

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Metal edge guard



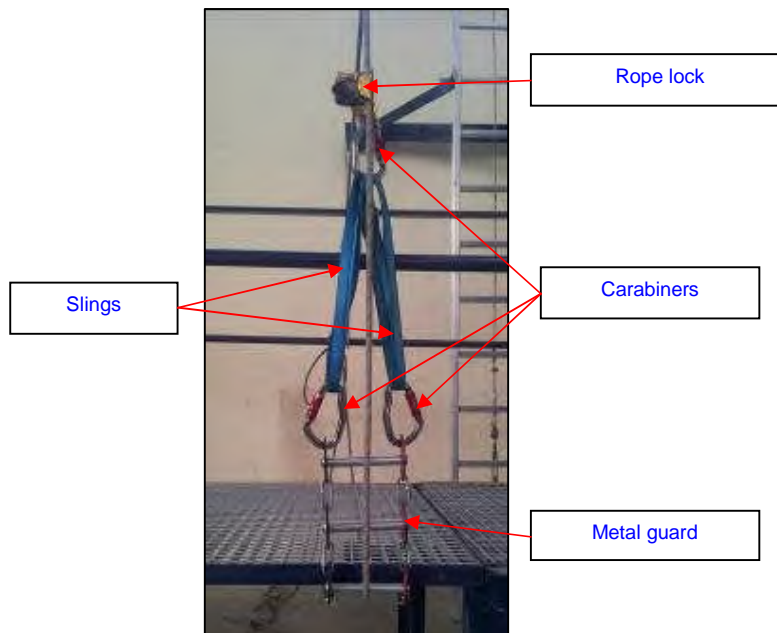
Flexible steel guard


- *Flexible steel guard: place the guards over the ends of the ropes to be anchored to the anchor devices of the nacelle, before securing them. Slide the guards along the ropes as the worker slides down until reaching the area of the ropes to be protected. Place the protectors in these areas and secure them with clamps to the ropes to avoid sliding.*

- *Metal edge guard:*

Preassembly: place two carabiners on both sides of the guard, then insert two slings (one on each carabiner) and fasten the opposite end of the slings to a carabiner. Finally, attach the carabiner to a rope lock.


Placing the system on the area to be protected: slide down the ropes until reaching the area to be protected. Place the locks on the ropes and adjust their position until the guards are located in this area.



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- Note: if you wish to use another type of guard than those mentioned in this document, the information must be sent to the contact person at Gamesa, and this guard may not be used until its validation process has been completed.
- Once the ropes have been duly tied and safeguarded, they must be lowered into the area chosen for descent, making sure they reach the ground.
- The ropes must be long enough so that once fitted to the anchor points they reach the ground. Before lowering the lines to the ground, a knot must be made on the end of each.
- Having installed the ropes, anchors and guard (i.e. the suspension system which makes it possible to descend inside and outside of the wind turbine with appropriate use), the worker can secure him/herself to the safety system and start the rope-controlled descent.
- Before leaving the nacelle, we must join our personal anchor line to the main anchor that has just been installed.
- Once this operation has been performed, we can connect up to the ropes with self-locking devices, fall arrest device and descent device.
- Fit the descent device to one rope and the fall arrest device to the other.
- The descent device is fitted to the ventral ring and the fall arrest device to the chest ring of the safety harness
- Having performed these operations, we can use the equipment to commence descent and carry out the work..
- Vertical work specialists must descend vertically with as little swing as possible to reduce rope abrasion.
- It is essential to remember that before starting any operations outside the nacelle, we must activate all blade safety devices to prevent any movement thereof.

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0. GENERAL INSTRUCTIONS

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 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and by GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to use the hoist to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- Before using any lift or ascent aiding device (Helper) installed on a GCT wind turbine, the wind turbine must be stopped (only by experienced wind turbine maintenance personnel) as indicated in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- It is absolutely forbidden to use an lift or Helper that has not been certified by the supplier (due to lack of the certification issued following the final inspection prior to start-up), or is blocked by maintenance personnel, or that, following the users inspection prior to its operation, fails to guarantee that it is in correct condition.
- An lift which is out of service due to any of the points included in the previous section must be disconnected from the power supply to prevent its accidental use, the Emergency Stop switch permanently set (all controls remain blocked in this way), taped off and signs placed on to indicate "OUT OF SERVICE". Likewise, a Helper which is out of service due to any of the points described in the above section must be disconnected from the power supply to prevent its accidental use and signs placed on it indicating "OUT OF SERVICE".
- Only personnel trained in the use of lifts are authorised to operate the lift as a usable transportation element. It is absolutely forbidden for any lift to be used by personnel not trained in its operation, are not completely familiar with the user manual, and that cannot certify these conditions by means of a related record.
- Only personnel previously trained in Helpers are authorised to operate them.
- Before any use of the lift or Helper, a prior inspection must be performed to guarantee that it is in proper condition in accordance with the supplier's user and maintenance manual. If any damage or faults are detected during the inspection or while operating, or if circumstances arise which may compromise safety, all work must be suspended immediately and the GCT supervisor must be notified so that he or she may arrange for the equipment to be locked and labelled until repaired and returned to service. Under no circumstances must the equipment be used until the fault has been rectified.
- All doors of the enclosures must remain closed while the lifts are being used.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.

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- All tests, repairs and replacements of components and annual reviews of the lifts or Helpers must be carried out by **qualified personnel authorised** by GCT. Take into account at all times that a person trained in the use of lifts or Helpers is not necessarily qualified to carry out any repairs on them and, in the event of a failure, they are restricted to reporting to the GCT supervisor, as mentioned earlier, so that they may order the equipment to be locked out and tagged out until it has been repaired and put into service again. All new or repaired parts fitted to the lifts or Helpers must be certified by the manufacturer.
- It is **STRICTLY** prohibited to bridge any of the safety systems installed on the lifts and Helpers.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lifeline, including the length of the energy absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against the objects located in a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.
- **Sealing the lift:**
 - Before any use of the lift, a prior inspection must be performed to guarantee that it is in proper condition in accordance with the supplier's user and maintenance manual. If any damage or faults are detected during the inspection or while operating, or if circumstances arise which may compromise safety, all work must be suspended immediately and the Gamesa Corporación Tecnológica (GCT) supervisor must be notified so that he or she may arrange for the lift to be locked and labelled until repaired and returned to service. Under no circumstances must the lift be used until the fault has been rectified.
 - In addition to the situations described in the previous paragraph, taping off an lift is justified in the following cases: lifts not certified by the supplier (due to lack of certification issued after the final inspection prior to start-up), lifts which have not been serviced by the supplier or authorised maintenance company for more than 1 year, lifts deemed unsafe to use after being serviced by the supplier or authorised maintenance company, lifts with electrical faults (severed cables, damaged plugs, etc.), mechanical faults (damaged guides, beam bolts with no torque applied (Photo 1), fraying traction towrope (Photo 2), obstacles in the lift's path (Photo 3), etc.).



Photo 1

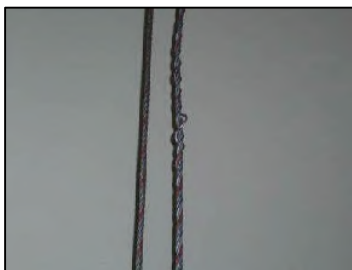



Photo 2



Photo 3

- Once the GCT supervisor has been notified of an lift anomaly, he or she must access the wind turbine in question to personally verify the information received.
- If once the situation has been analysed, the supervisor detects that the lift cannot be used because it compromises the safety of the workers, the supervisor must lock it and place signs on it, then report the situation to the lift section personnel.

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1. FIXED GUIDE LIFT

1.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- The use of lifts with fixed guides is limited by the wind speed defined in PS-MM.1 General Activities, Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.
- Respect the maximum load limit established by the manufacturer.
- Use of the lifts installed in this type of turbine is restricted to two persons.
- The use of the lift evacuation ladder is prohibited, but not the service one, whenever the lift is being used, given that the evacuation ladder is located in the same shaft along which the lift travels. If it proves necessary to use this ladder, you must block the lift by disconnecting its power supply and removing the key from the electrical panel.
- The transportation of persons in AUTOMATIC mode (controlling the lift by way of the control panel located on the lower platform of the wind turbine) is prohibited.
- It is strictly forbidden to pass or remain below the lift while in use.
- Carrying of loads in this type of lift is permitted providing the maximum admissible load for the equipment is not exceeded, the wind speed limit established for its use is respected and its movement is conducted in AUTOMATIC mode, with no personnel present inside, controlled by way of the control panel located on the lower platform of the wind turbine. This is because, if a worker uses the lift manually and there is a load inside, in the event that an evacuation is required the load being carried would block our exit from its lower section.
- How to work with the lift. The lift functions using three-phase 690 V electric current from the wind turbine. The operation panel remains inoperative until the panel key is activated.

Recommended RULES OF USE:

1. Connect the operation panel key.
2. Elevator in use available, the cabin light automatically comes on.
3. Ensure that nobody is climbing up or down its evacuation ladder before using it.
4. It is mandatory to wear a harness with sliding fall arrest device and two lanyards when using the lift.
5. Enter the cabin through the front door, closing the outside door as well as the cabin door.
6. Press the start button located at the top and keep it pressed.
7. Press the button of the desired floor and the cabin will arrive at the floor automatically. In order for it to function, both the doors and the hatchways must always be closed and the stop push-buttons disconnected.
8. Exit through the door onto the platform.
9. Keep the doors open so that the elevator remains available.
10. Always travel with the exterior and cabin doors closed.
11. After use, the cabin will always remain stationed on the lower floor.
12. Remove the key from the panel once it has been used.

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- In any **emergency situation**, the lift must stopped by releasing the start button. It also has a Stop push-button that cuts off the power supply, thus causing the lift to stop immediately, as well as an automatic speed limiter that locks the lift into a wedged position should it accelerate above its normal working speed. If all these safety elements fail, the red ball next to the roof of the cabin must be activated immediately. This is a manual wedging control, which may be employed by the lift user in the event of an emergency during descent.
- It is prohibited to use any elements to lock the start button while in functioning status, so as to avoid having to keep it pressed the whole time while the lift is being moved.

- **Safety systems.** There are various operating safety systems:

1. Electrical safety: The lift will only function if the entire chain of safety contacts is closed. It is absolutely prohibited to bridge any of the lift's safety mechanisms, even if not doing so would render the lift inoperable.


In the event that someone is climbing up or down the ladder and a situation arises in which that person could get run over, activate the grilles located on the floor and ceiling of the cabin, as these have an electrical contact and the lift can be stopped simply by pushing them.

The machine has a cable-lengthening contact that stops the lift should the lengthening of the towropes be excessive, until the situation is rectified by re-tensing the cables. It also has a stop push-button for any emergencies that arise in the pit of the tower. There is an end-limit electrical system that cuts off the main operating sequence if the elevator enters the end limit.

2. Mechanical safety systems: If the suspension breaks or the cables become loosened, a safety catch systems activates automatically, wedging the cabin onto the guides. If the lift is operating with a user inside and they detect any anomalous overspeed, they can wedge the cabin by pulling the red ball located inside (these elements are a backup to the speed limiter that acts whenever a descending lift accelerates above its normal working speed).
3. Overspeed system: This detects any increase in speed of the lift, locking the system to the fixed guides in order to stop the cabin as soon as its normal working speed is exceeded.

- **Evacuation from the lift:**

1. Opening the front access door gives direct access to the safety lifeline, to which the user must attach their safety harness, enabling them to escape through either the upper or lower hatchway.
2. Exiting to above through the upper hatchway: This exit must be used whenever the lift ceases to function and we need to evacuate upwards. To do so, open the three-panel front door, opposite which is the ladder for our evacuation. In this situation, we must attach our safety harness to the lifeline using the sliding fall arrest device, and then climb the ladder manually. We must then open the upper hatchway and go through the roof of the cabin towards the top, returning the hatchway to its original position.
3. Exiting to above through the lower hatchway: This exit must be used whenever the lift ceases to function and we need to evacuate downwards. To do so, open the three-panel front door, opposite which is the ladder for our evacuation. In this situation, we must attach our safety harness to the lifeline using the sliding fall arrest device. Once we are on the ladder, we must then lift up the floor of the lift using the rod located on the right side of the cabin. Once lifted, it must be stopped from turning by positioning the latch installed on the underside of the floor. Finally, we must climb down the ladder.

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Photo.4

NOTE: In G8X/90 wind turbines, the lift's upper hatchway must be used to evacuate the lift and later descend to Ground platform, going up by the evacuation ladder to the first tower platform you come across and then climbing down the service ladder to the bottom part of the wind turbine.

- **Sealing the lift:**

- The lift start-up key must be removed from the wind turbine and the opening lock on the door of the operation panel, located on the upper platform of the tower, must be sealed (see Photo 5) so as to prevent the panel from being opened or being manipulated inside (see Photo 6).



Photo.6

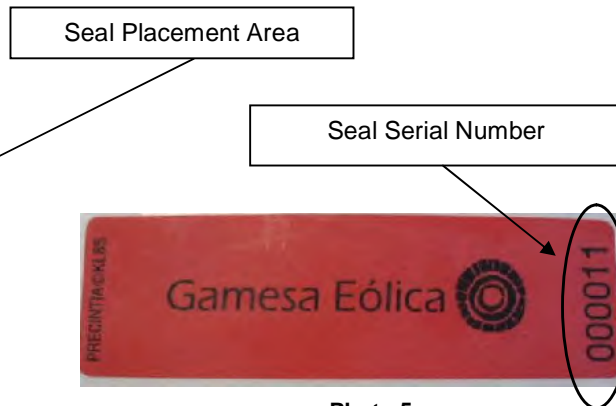


Photo.5

- Having placed the seal, the lift must be labelled prohibiting its use by way of an adhesive label placed onto the enclosure door (see Photo.7).


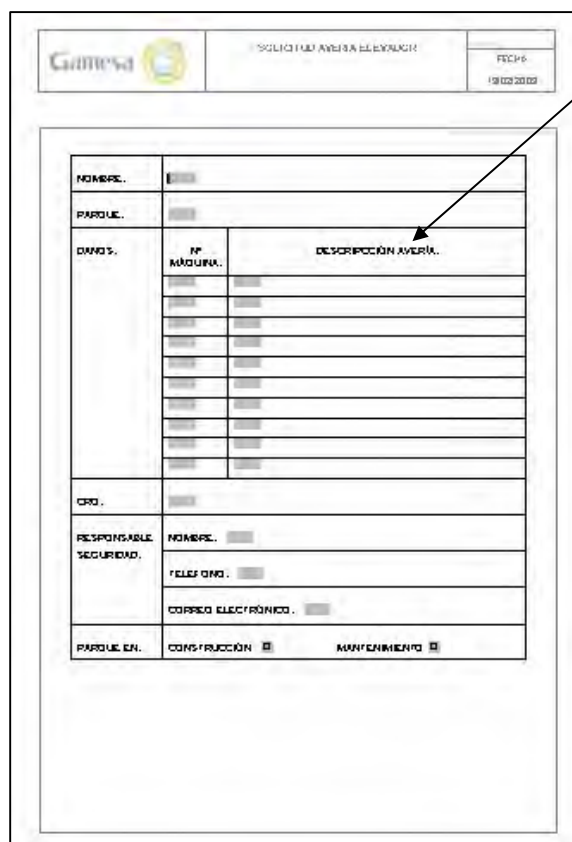
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Photo.7


- Having sealed the lift, the "Lift Breakdown Request" document must be completed and sent to the lift section (Photo.8).



Include the Seal Serial Number

Photo.8

- In this document, when describing the breakdown that caused the lift to be sealed, we must include the number of the seal (Photo.5) that was used to lock the equipment.



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2. TOWROPE-GUIDED LIFT

2.1. General Preventive Measures for all types of wind turbines


- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- The use of lifts with towrope guides is limited by the wind speed defined in PS-MM.1 General Activities, Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.
- Respect the maximum load limit established by the manufacturer.
- Use of the lifts installed in this type of turbine is restricted to two persons.
- When not required, elements such as: anchorage straps, retractable fall arrest devices, foot loops, etc. that could be snagged by moving elements must be carried in a tool bag.
- When using the lift: **DO NOT CARRY ANYTHING HANGING FROM THE HARNESS EXCEPT THE ROPES WITH WIDE MOUTH HOOKS AND THE SLIDING FALL ARREST DEVICE.**
- To operate the lift, or if you are near an lift in operation: **DO NOT CARRY ANYTHING HANGING FROM THE HARNESS EXCEPT THE ROPES WITH WIDE MOUTH HOOKS AND THE SLIDING FALL ARREST DEVICE.**
- • Except for lifts fitted with a differential switch protecting workers in the event of lift power cable leakage, whether due to breakage or damage to the cable's insulation, no workers may remain inside the tower or on its lower platform while the lift is in use.
- It is prohibited to carry persons while in AUTOMATIC mode.
- It is strictly forbidden to pass or remain below the lift while in use.
- To ensure a safe entrance / exit, lower the cabin to the ground, until the limit switch stops its decent, or move it to the correct height of the desired platform.
- The carrying of loads on such lifts is permitted providing their maximum load is not exceeded and the wind speed limit established for their use is observed.
- It is prohibited to use any elements to lock the start button while in functioning status, so as to avoid having to keep it pressed the whole time while the lift is being moved.
- It is prohibited to gain access from the auxiliary ladder when the lift is in use. As the lift shaft and its evacuation ladder are very close to each other, it is forbidden to use the lift and ladder at the same time. Should it be necessary to use the ladder, the lift must be locked by removing the key from the electrical panel.
- **Operation:** The service lift is fitted with a TIRAK traction system enabling it to move vertically along a cable attached to the wind turbine. The BLOCSTOP safety retention device secures the lift onto an independent safety cable. The lift is manually moved vertically from inside, or from outside when in automatic mode. An elevation force limiter stops the lift from ascending if the Tirak cable causes an overload on the traction lift. Two guide cables located each side of the service lift stop it from pivoting and leaning.

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- It is mandatory to wear a safety harness fastened to a yellow anchor device located inside the cabin, and to be equipped with a sliding fall arrest device and ropes with energy absorber device and wide mouth hook, in the event that the lift has to be evacuated via the ladder. The lanyard with energy absorber device and wide mouth hook fastened to the lift's anchor device must be fastened to the tie-off point on the chest of the harness worn by the operator, in order to facilitate evacuation in case it is necessary.
- Ensure that the safety cable on the BLOCSTOP device is fully tensed to guarantee efficient functioning.
- The lift must only be used with the doors closed: The service lift's sliding doors are closed by pushing the steel door key into the red lock. To open it, press the black button on the red doorlock. From the outside, this button can be reached through a gap.
- It is prohibited to use an overloaded lift and the load limitations indicated on its specification plate must be observed. If the hoisting strength limiter activates (an acoustic signal goes off), reduce the load to below an acceptable limit in the case of overloading, and if it activates due to there being an obstacle in its path during use, make the lift descend until the obstacle has been freed before using it again.
- All repairs to TIRAK and BLOCSTOP must be performed by **qualified operators**.
- If the lift does not work due to an electrical fault (no power is reaching the TIRAK traction motor), the lift can be lowered using the brake lever.
- If BLOCSTOP locks the lift onto the safety cable, move the lift upwards (using the Tirak wheel, turning anticlockwise).
- XCS locking and interlocking switch: Hazardous functions of the work equipment covered by the guard cannot be performed until the guard is in its safety position (closed) and locked.
 - The guard cannot be opened until the risk no longer exists.
 - The mobile guard can only be opened once it has been detected that the motor driving the lift has stopped operating
- Keep all enclosure doors closed, and do not enter the enclosure shaft while the lift is in use (flashing clearance lights).

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- **Manual Operation:**

- Manual emergency descent

1. Open the hatchway by pushing the roof cover and operate the lift from above.
2. Insert the lever (1) for the Tirak brake.
3. Pull the lever upwards. The service lift will descend. The embedded centrifugal force brake limits the descent speed.
4. To stop, release the lever.
5. After use, replace the lever into the hole on the top.



- Manual ascent (with the brake open, it is possible to move the service lift upwards using the crank)

1. Remove the cover.
2. Fit the crank (2) into the slot in the motor and turn it anticlockwise, with the brake open.
3. After use, remove the crank and lever from the Tirak and replace the covers in the holes.



- **Connecting the retaining device (Blockstop):** if this has been connected, unlock it by lowering the lever (A) until it clicks. If the lift is hanging from this device, then this operation will not be possible and the lift must be evacuated.


1. Remove the load applied to the cable.
2. Manually open Blockstop by pressing the lever downwards and, once resting on the ground, check that the brake is working properly.



- **Procedure for evacuation from the lift:**

- If fault, failure or damage occurs to the equipment which impedes its correct functioning while the lift is in use, the following is to be done:

- 1- First, the TIRAK brake must be used to descend the lift to the first platform encountered along the descent, or to the wind turbines lower platform. In order to carry out this task, two situations are possible:
 - A) If the safety retention device (BLOCSTOP) has not been activated, the steps below are to be followed:
 - i. Open the hatchway by pressing the cover of the cabin roof and ascend along the lift's steps until accessing the area where the TIRAK is located.

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- ii. Insert the lever in the hole (1) of the TIRAK brake.
 - iii. Pull the lever upwards. The service lift will descend. The embedded centrifugal force brake limits the descent speed.
 - iv. To stop, let go of the lever.
 - v. After its use, replace the lever into the hole on top of the device, designed for this purpose.
- B) If the safety retention device (BLOCSTOP) has been activated, the steps below are to be followed:
- i. Unblock it by lowering the lever until it clicks and then proceed as specified in section A.



- ii. If the lift is hanging from this mechanism, then the operation described in the preceding point (B.i.) will not be possible and the following must be done:
 - a. Open the hatchway by pressing the cover of the cabin roof and ascend along the lift's steps until accessing the area where the TIRAK is located.
 - b. Remove the cover located on the upper part of the motor, assemble the crank (2) into the hole and insert the lever (1) into the TIRAK brake hole.



- c. Turn the crank counterclockwise while at the same time activating the lever, in such a way that the lift moves upwards.
- d. Then, proceed to unlock the BLOCSTOP by activating the lever positioned in (A) downwards.

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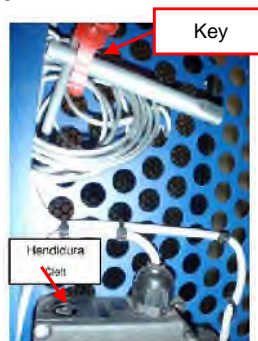


e. Proceed in the manner specified in Section A.

- 2- In the event it is impossible to lower the lift in the manner specified in section 1, due to the fact that the safety wire is hanging and it is impossible to unlock the BLOCSTOP, then the lift must be evacuated. In order to perform this evacuation, the steps described below must be followed.


1. This evacuation must only be done one person at a time.
2. Open the cabin door and move toward the tower ladder.

Note: For Avanti lifts adapted to Machinery Directive 2006/42/EC, if the lift is not positioned level with a platform, the door cannot be opened. To unlock the door, use the key located inside the cabin, inserting it into the slot and turning it clockwise.



3. When it is possible to be fastened to a secure and resistant point (rung with threaded bar), one must proceed in this way while remaining inside the lift cabin, and if it is not possible, one must move out onto the ladder and when unable to reach a rung with threaded bar from this position, must descend along it until having tied the lanyard with the energy absorber and wide mouth hook to the nearest rung with threaded bar.
4. Once fastened to the rung with threaded bar, two courses of action are possible: if having reached the rung with threaded bar from the lift, the rope will be released from the lift anchor device and one will access the tower ladder. Otherwise, if it was necessary to access the ladder in order to be fastened to a rung with threaded bar, the connection between the lanyard and the tie-off point on the chest of the harness must be released, leaving it hanging from the lift.
5. Place yourself inside the ladder.
6. Fit the sliding fall arrest device onto the lifeline and check that it works correctly.
7. Release the lanyard with the energy absorber device and wide mouth hook from the ladder and start the descent.

- **Sealing the lift:**

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- Place a seal onto the enclosure door on the lower tower platform to keep it from opening and, therefore, preventing access to the lift (see Photo.9, 10 and 11).



Photo.9



Photo.10




Photo.11



- Once the seal has been placed, we must place an adhesive label on the safety barrier door indicating that the lift must not be used (see Photo 12).



Photo.12

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- Once the lift has been sealed, the “Lift Breakdown Request” document (Photo 13) must be completed and sent to the lift section
- In this document, when describing the fault which made it necessary to seal the lift, we must add the number of the seal (Photo 14) used to lock the lift.

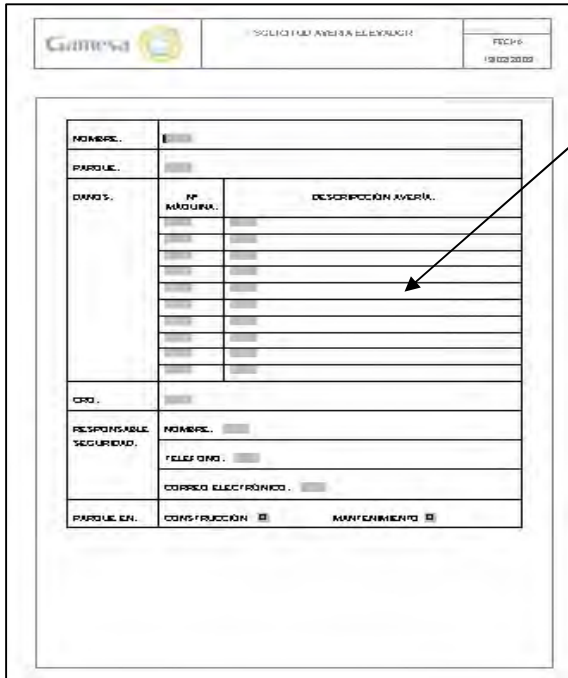


Photo.13

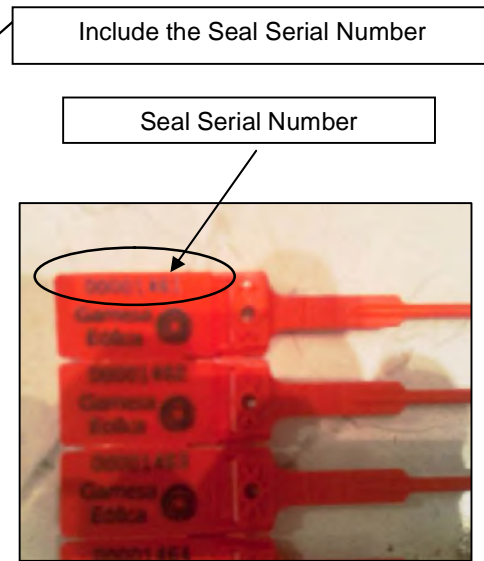



Photo.14

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3. RACK-PINION LIFT

3.1 General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- The use of rack-pinion lifts is limited by the wind speed defined in PS-MM.1 General Activities, Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.
- It is strictly forbidden to use the ladder except in the following situations:
 1. The lift breaks down during use, requiring it to be evacuated.
 2. Parts of the tower and/or nacelle need to be accessed while the lift is out of service and maintenance tasks have to be carried out that require use of the ladder. In such cases, to climb up and down the ladder safely, it is mandatory to complete both steps:
 - a. Remove the lift key from those models that allow this option.
 - b. Disconnect, lock and label the lift's main power switch. To do so, there are two possible scenarios:
 - i. The lift has its own cabinet on the door, housing the controls and main switch, which allows interlocking (e.g. Ecotecnia and General Electric wind turbines that have lifts manufactured by Equipamientos Eólicos).
 - ii. The controls are housed in other cabinets of the wind turbine and the main switch is located inside one of these cabinets. In such cases, in order to interlock the main switch, follow the instructions in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual (e.g. Made wind turbines that have lifts manufactured by Equipamientos Eólicos).




Key-activated switch inside the lift
(e.g. Equipamientos Eólicos)



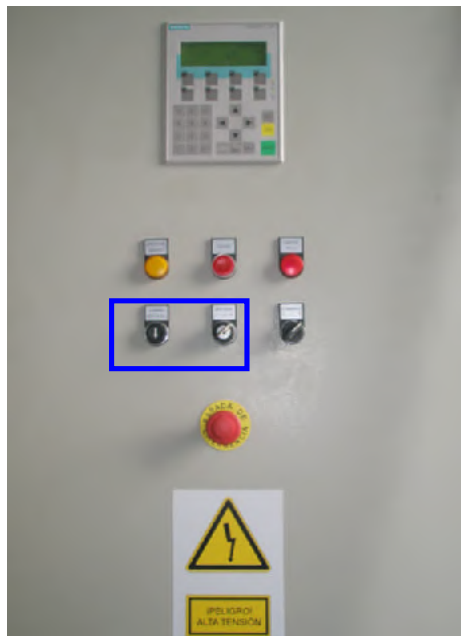
Control cabinet with main switch
on the door (e.g. Goian)



Control cabinet with interlockable
main switch on the door (e.g.
Equipamientos Eólicos)

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Lift controls in the ground control cabinet (e.g. Equipamientos Eólicos lifts in Made wind turbines)



Lift controls in the nacelle's control cabinet (e.g. Equipamientos Eólicos lifts in Made wind turbines)

- Carrying of loads in this type of lift is permitted providing the maximum admissible load for the equipment is not exceeded, the wind speed limit established for its use is respected and its movement is conducted in AUTOMATIC mode, with no personnel present inside, controlled by way of the control panels located on the platforms of the wind turbine. This is because, if a worker uses the lift manually and there is a load inside, in the event that an evacuation is required the load being carried would block our exit from its lower section.
- When not required, elements such as: anchorage straps, retractable fall arrest devices, foot loops, etc. that could be snagged by moving elements must be carried in a tool bag.
- When using the lift: **DO NOT CARRY ANYTHING HANGING FROM THE HARNESS EXCEPT THE ROPES WITH WIDE MOUTH HOOKS AND THE SLIDING FALL ARREST DEVICE.**
- To operate the lift, or if you are near an lift in operation: **DO NOT CARRY ANYTHING HANGING FROM THE HARNESS EXCEPT THE ROPES WITH WIDE MOUTH HOOKS AND THE SLIDING FALL ARREST DEVICE.**
- GENERAL RULES FOR USING ALL TYPES OF ELEVATORS:**
 - Ensure that nobody is climbing up or down its evacuation ladder before using it.
 - When using the lift, it is compulsory to wear the safety harness with fall arrest device and 2 lanyards with energy absorber device in case the lift has to be evacuated.
 - Press the button to go up or down and release it when you reach the correct floor. In order for it to function, both the doors and the hatchways must always be closed and the stop push-buttons disconnected.
 - In the case of intermediate floors, remove the key, open the door and exit onto the platform. If you go up to the nacelle, exit via the upper hatchway, anchoring yourself to the specific anchor device and using the handholds next to the hatchway leading to the platform.
 - To reach the nacelle, keep the UP button pressed until the end-limit sensor stops the elevator automatically. On intermediate platforms, stop the elevator when the doors are as close as possible to the upper railing.

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6. Keep the door or upper hatchway open so that the lift remains available for use. If more than one journey to the nacelle is required (to carry several people), the workers at the top must make sure the platform is closed and notify the workers below that they can call the lift, once they themselves are inside the nacelle and have closed the access platform.
 7. When using the elevator, always keep the exterior and cabin doors closed. It is strictly prohibited to bridge any safety guards on these hatchways and doors: doing so is a serious offence.
 8. After use, the cabin will always remain stationed on the lower floor.
 9. Remove the key from the panel once you have finished using the lift and disconnect the general switch inside the lift's cabinet.
- In any emergency situation, the lift must stopped by releasing the start button. There are also emergency push-buttons (inside the cabin, on the bottom floor and in the nacelle) that cut off the power supply, thus causing the lift to stop immediately. The lifts is equipped with 2 gear motors which, in the event of a shutdown or power interruption, act upon the motor brakes, thus locking out the lift. In the event of a cabin malfunction or lock out, the motors are fitted with a lever to unlock them, lowering the lift to the bottom floor at a constant speed. If the hose gets trapped in the gears or rack mechanism causing a total lock-out, exit the lift via the upper or lower hatchway (if applicable, depending on the model) and climb down the ladder with the fall arrest device fitted to your lifeline or anchor ropes.
 - It is prohibited to use any elements to lock the start button while in functioning status, so as to avoid having to keep it pressed the whole time while the lift is being moved.
 - **Safety systems.**
There are various operating safety systems:
 1. Electrical safety: The lift will only function if the entire chain of safety contacts is closed. It is absolutely prohibited to bridge any of the lift's safety mechanisms, even if not doing so would render the lift inoperable.

In the event that someone is climbing up or down the ladder and a situation arises in which that person could get hit by the elevator, release the Up or Down push-button immediately.

There is an end-limit electrical system that cuts off the main operating sequence when the elevator reaches this point.
 2. Mechanical safety systems: In the event of an lift malfunction, power to the motor brakes will be cut off, thereby locking out the lift.
 - **Evacuation from the lift:**
 1. Exit via the lower hatchway (not available on some older models): While wearing your safety harness attached to the lifeline, open the lower hatchway (if there is one) and exit the elevator. Before climbing down and anchoring yourself by means of the lifeline, and before opening the hatchway, secure your anchor ropes to the rungs inside the lift so that you can then exit and secure yourself to the lifeline.
 2. Exiting to above through the upper hatchway: While wearing your safety harness attached to the lifeline, open the upper hatchway and exit the elevator. Before climbing up and anchoring yourself by means of the lifeline, and before opening the hatchway, secure your anchor ropes to the rungs so that you can then exit the lift and secure yourself to the lifeline.




Before exiting the cabin onto intermediate platforms, disconnect the main switch, remove the key and take it with you. This prevents anyone from operating the lift from the Ground or the Nacelle

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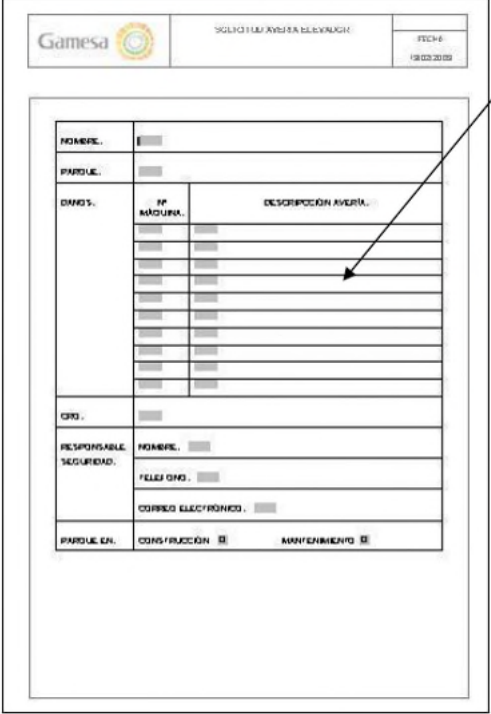
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Evacuating and accessing the lift



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- **Sealing the lift:**
- Remove the lift start-up key from the wind turbine, disconnect the main breaker and seal the opening lock on the door of the operating panel, located on the upper platform of the tower on those models that have their own cabinet in the Ground, thus preventing the panel from being opened or being manipulated inside.



Incluir el Número de Serie del Precinto

Número de Serie del Precinto


- Once the seal has been placed, we must place an adhesive label on the safety barrier door indicating that the lift must not be used.



**ELEVADOR FUERA DE
SERVICIO**

**PROHIBIDO SU USO Y
MANIPULACION**

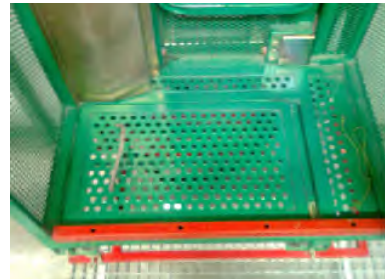
- Having sealed the lift, the "Lift Breakdown Request" document must be completed and sent to the lift section.
- In this document, when describing the breakdown that caused the lift to be sealed, we must include the number of the seal that was used to lock the equipment.

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Photographs of a Rack-Pinion Lift manufactured by Equipamientos Eólicos



Photographs of a Rack-Pinion Lift manufactured by GOIAN

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4. WIND EQUIPMENT LIFT

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.



The type of lifts installed in wind turbines can vary from wind farm to wind farm. The following details are specific to lifts manufactured by Equipamientos Eólicos. Equipamientos Eólicos rack-pinion lifts run along the wind turbine's fixed ladder, offering different evacuation routes depending on the model and date of manufacture (roof or roof-floor).



The use of lifts is limited by the wind speed defined in PS-MM.1 General Activities, Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.



The lift must not be used by personnel who are not trained in its use and evacuation.



Before operating the lift, make sure that nobody is climbing up or down the ladder. It is strictly forbidden to jump onto a moving lift.


4.1. LIFT SAFETY REGULATIONS

- Signs must be posted informing of personnel working on the wind turbine, any risks present and prohibiting access to the wind turbine to all unauthorised personnel.
- Lifts must NEVER be used by personnel who are not trained in their use and evacuation.
- It is forbidden to use an lift that has not been certified by the manufacturer, is locked out by maintenance personnel, or that, following the users inspection prior to its operation, fails to guarantee that it is in correct condition.



All tests, repairs and replacement of components relating to lifts or hoist aid devices must be performed by qualified operators.

- It is permitted to carry loads in lifts installed in wind turbines when personnel are present in the cabin providing the size and/or weight of the loads does not hinder an emergency evacuation of the lift and does not exceed the maximum admissible load for the equipment.

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It is prohibited to use an overloaded lift and the load limitations indicated on its specification plate must be observed.

- Before using the lift, visually check that the pinions and guide rollers are in place and in good condition.
- The wind turbine must be shutdown before any lift is used.

NOTE: Use a safety harness anchored to a rung inside the cabin and wear the fall arrest device in case you have to evacuate the lift via the ladder.

- Before using the lift, conduct an inspection to make sure it is in good condition.



If any damage or faults are detected on the lift, stop using it immediately and notify the GCT supervisor so that he or she may arrange for the equipment to be locked and labelled and have it repaired and returned to service. Do not use the lift until the problem has been rectified.

- While the lift is in use, keep all doors closed and DO NOT enter the enclosure shaft.
- It is prohibited to gain access from the auxiliary ladder when the lift is in use. If it is necessary to use the auxiliary ladder, you must lock the elevator by removing the key from the electrical panel.
- If the lift is out of service, disconnect the power supply to prevent its use and activate the permanent emergency stop switch.

ELECTRICAL SAFETY

- The lift will only function if the chain of safety contacts is closed.



It is absolutely prohibited to bridge any of the lift's safety elements, even if not doing so would render the lift inoperable and unusable.


- The lift has three emergency buttons located in the electrical cabinet at the base of the tower, inside the cabin and on the panel on the tower's upper platform.
- There is an end-limit electrical system that cuts off the main operating sequence if the elevator enters the end limit.
- There are magnetic detectors that render the lift inoperable when the door or hatchways are open.
- There is an inductive sensor that stops the lift whenever a section of ladder is no longer detected.
- There is an obstacle avoidance system that activates an end-limit to stop the lift if an obstacle is encountered while the lift is running.
- The gear motors are equipped with an electromagnetic brake that locks the cabin at a given position when the lift is not in use.

MECHANICAL SAFETY

- Elevation system based on a rack-and-dual-pinion coupled to a gear motor.
- Manual unlocking levers allowing the elevator to descend in the event of an electrical malfunction.

OVERSPEED SYSTEM

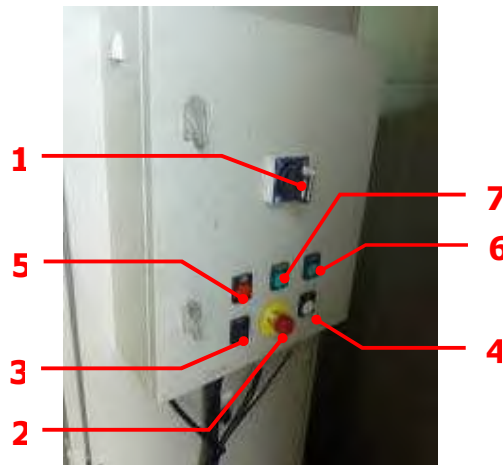
- The gear motors are equipped with a centrifugal brake that prevents the lift from accelerating during manual operation.

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4.2. LIFT OPERATION

NOTE: The lift functions using three-phase 690 V electric current.

- The lift can be operated via the panel inside the cabin, via the cabinet at the base of the tower and via the panel on the tower's upper platform.




Lift cabinet.

1	Front control of the lift's general switch
2	Emergency push-button
3	Reset button
4	Down push-button
5	"Out of Service" light
6	"Up" light
7	"Down" light

Elements in the lift cabinet.



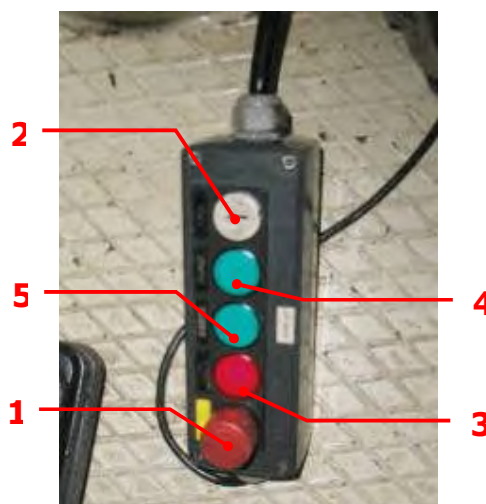
Panel inside the cabin.

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1	Emergency push-button
2	Key-operated selector: <ul style="list-style-type: none"> Position 0: Out of service. Position I: Operation Position II: Lower obstacle-avoidance system.
3	Up button
4	Down push-button

Elements on the cabin button panel.




Top panel

1	Emergency push-button
2	Up button
3	“Out of Service” light
4	“Up” light
5	“Down” light

Elements on the top panel

NOTE: The operating panel at the base of the tower will not function until the main switch control is activated, on the panel door.

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4.2.1. OPERATING THE LIFT FROM INSIDE THE CABIN

- To operate the lift from inside the cabin, proceed as follows:

- 1 Activate the operating panel via the front control of the lift's general switch.



If the elevator is unavailable, the orange light on the front of the cabinet will automatically come on. Make sure that nobody is climbing up or down its evacuation ladder before using it. It is mandatory to wear a safety helmet as well as the safety harness with fall arrest device and 2 lanyards with energy absorber device and wide mouth hook.

- 2 Enter the cabin through the front door.
- 3 Use a wide mouth hook to remain attached to one of the rungs inside the cabin.



Anchor device inside the cabin.

- 4 Set the selector on the cabin control panel to the I position.

NOTE: The lift will not work unless the key is inserted in the mechanism and the selector is in the I position.

- 5 Press the UP (or DOWN) button and release it when you reach the correct position.

NOTE: Doors and hatchways must remain closed and emergency buttons disconnected.


- 6 Exit the cabin as instructed in the "Exiting the Lift Cabin" section.

- 7 Disconnect the operating panel once it has been used.

NOTE: The lift stops when the start button is released.

4.2.2. EXITING THE LIFT CABIN

NOTE: Before exiting the lift cabin, you must ensure compliance with all safety warnings therein.

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4.2.2.1. EXITING TO THE LOWER FLOOR

- Exit the cabin as follows:
 - Pull the latch up and open the front door of the lift.



Front access door to the cabin

- Release the wide mouth hook from the cabin rung and exit the lift.
- Close the front door.



4.2.2.2. EXITING TO INTERMEDIATE PLATFORMS

- To exit onto an intermediate platform:
 - Bring the cabin level to the platform so that the bottom of the front door is a few centimetres above the platform railing.



Stop position on intermediate platforms

- Press the emergency push-button, move the selector to the "0" position and remove the key to prevent the lift from being operated before exiting.
- Pull the latch up and open the front door of the lift.
- Release the wide mouth hook from the cabin rung and carefully exit the lift.

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4.2.2.3. EXITING DIRECTLY ONTO THE UPPER PLATFORM

- Once the cabin has reached the top platform:
 - 1 Pull the latch up and open the front door of the lift.
 - 2 Open the door of the upper safety casing.
 - 3 Release the wide mouth hook from the cabin rung and exit the lift.



Upper casing.


- 4 Close the front door.
- 5 Close the door of the upper safety casing.

NOTE: If the lift is unable to reach the nacelle access platform, exit the cabin via the upper hatchway as described in the following section.

4.2.2.4. EXITING TO THE UPPER PLATFORM OF THE TOWER VIA THE LIFT ROOF

To access the upper platform of the tower, proceed as follows:

- 1 Before exiting the cabin, it is compulsory to remove the ignition key.
- 2 Inspect the safety harness.
- 3 Secure the line to the fixed point on the cabin roof.
- 4 Open the lift's upper hatchway.
- 5 Use the ladder inside the cabin to climb up and open the platform hatchway.

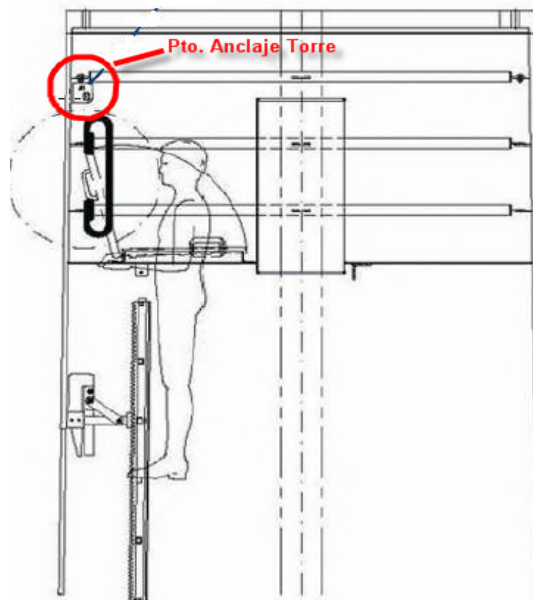
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Example of hatchway leading to the upper platform on ECO74

- 6 Tie another line to a secure point on the tower.




Example of secure anchor point on the tower on ECO74

- 7 Release the line from the cabin.
- 8 Once on the platform, close the lift and platform hatchway.

4.2.2.5. EXITING TO THE REMAINING POINTS ON THE LIFT'S RUN

- If you need to exit the cabin to carry out a maintenance task at any intermediate point along the lift's run, always do so via the upper hatchway and proceed as follows:
 - 1 Place the lift in the 0 position and press the emergency push-button inside the cabin.
 - 2 Remove the ignition key and keep it safe until you return to the cabin.
 - 3 Open the upper hatchway.

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While exiting the lift via the upper hatchway, there is a risk of falling onto another level.

- 4 Release the wide mouth hook from the cabin rung and anchor it to a rung on the tower ladder.




Anchor on a ladder rung

- 5 Climb up the rungs until half of your body is protruding from the cabin.
- 6 Attach the sliding fall arrest device to the lifeline.
- 7 Release the lanyard with energy absorber device and wide mouth hook from the ladder rung.



Anchor to lifeline

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- 8 Exit the cabin fully and start the ascent.



Exit through the upper hatchway

4.2.3. OPERATING THE LIFT FROM OUTSIDE THE CABIN

- It is permitted to operate the lift from outside the cabin providing no personnel are inside.
- The lift must only be moved from outside the cabin in the following cases:
 - Lift descent via the operating panel at the base of tower.
 - Lift ascent via the panel on the upper platform of the tower.
 - Emergency stop.
- To operate the lift from outside the cabin, proceed as follows:
 - 1 Verify that there are no personnel inside the cabin.
 - 2 Verify that the Out of Service light is not on.
 - 3 Activate the Down push-button (if activated via the panel at the base of the tower) or the UP button (if activated via the tower's upper platform) until the lift reaches the end-limit of its run.
 - 4 Disconnect the operating panel once it has been used.

4.3. EMERGENCY MANUAL DESECENT


- The lift cabin has an unlocking lever on each gear motor. In the event of a breakdown or electrical malfunction, it allows the lift to be lowered at a controlled speed.

NOTE: The speed of an emergency manual descent is slightly higher than the rated speed under normal conditions.

- To lower the lift cabin manually:
 - 1 Pull both gear motor levers -1- upwards at the same time.



The elevator must be stopped for a few minutes halfway along the run to prevent the brakes from overheating.

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Emergency descent levers.

- 2 To stop the elevator, stop operating the levers.
- 3 Stop the lift a few centimetres before it reaches the lower end-limit of its run.
- 4 Exit the lift through the front door.

4.4. EVACUATING THE LIFT

- If the lift cabin has to be evacuated due to an emergency, do so via the upper or lower hatchways (if the lift has a lower hatchway):

4.4.1. EVACUATION VIA THE UPPER HATCHWAY

- Proceed as instructed in the section on “Exiting to the remaining points on the lift’s run”.

4.4.2. EVACUATION VIA THE LOWER HATCHWAY

- If the lift has a lower hatchway, this can also be used to evacuate the cabin as follows:
 - 1 Place the lift in the "0" position and press the emergency push-button inside the cabin.
 - 2 Attach the wide mouth hook to the bottom rung -1- of the cabin.
 - 3 Open the lower hatchway -2-.




Closed lower hatchway.




Open lower hatchway.

- 4 Exit through the lower hatchway until you can reach the lifeline with your hands.

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- 5 Attach the fall arrest device to the lifeline.
- 6 Release the lanyard with energy absorber device and wide mouth hook from the cabin rung.
- 7 Start climbing down the ladder.


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5. HELPCLIMBER LW-50

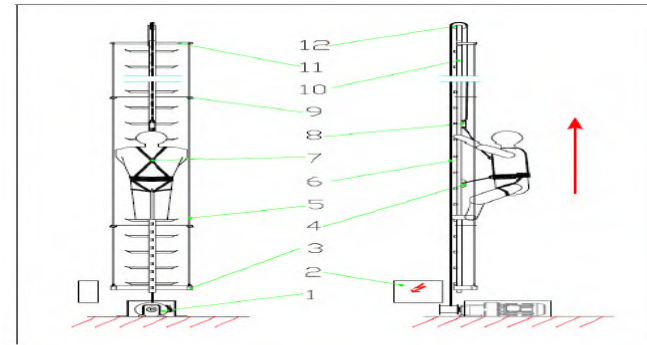
5.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- It is forbidden to use the climbing aid system with wind speeds exceeding the indications in PS-MM.1 General Activities, Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.
- The climbing aid must only be used by persons who are familiar with the installation and have a minimum body weight of **65 Kg**.
- Before ascending, check the climbing aid to make sure it works properly.
- It is absolutely PROHIBITED to use the Helper to carry materials.
- The Helper offers no protection against falls, so when climbing up the ladder using this system you must remain attached to the lifeline via the sliding fall arrest device.
- The traction cable must be directly connected to the harness and NEVER to the sliding fall arrest device.
- If the lifeline installed at the tower ladder is not approved or, when approved has not been certified for use, it is prohibited to use of the ascent aid system.
- If during ascent via the ladder there are hatchways on the tower platforms, stop the helper so that the worker is below it, open it, proceed with the ascent and once over the hatchway close it again.
- The helper must not be used by more than one person at a time.
- The equipment must only be used for personnel ascent purposes and must never be used during its descent.
- When climbing up the ladder, pay attention to the sliding fall arrest device as it could get caught in the lifeline supports/guides, thus impeding ascent and straining the equipment unless its movement is detained.
- When using the climbing aid, keep your fingers, all other parts of your body, clothes, etc. away from the traction cables, pulleys, etc.

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• **Instructions for use:**



- | | |
|---|--|
| 1.- Cabrestante-motor de tensión constante | 7.- Arnés de seguridad |
| 2.- Cuadro eléctrico de alimentación y parada de emergencia | 8.- Sistema de guiado con conexión a arnés o con montacargas |
| 3.- Interruptores de funcionamiento | 9.- Guía hilos de control |
| 4.- Línea de vida | 10.- Escalera |
| 5.- Hilo de control de subida (poliamida) | 11.- Polea superior |
| 6.- Cable de tracción (acero inoxidable) | |

Ascent operation:


- Place yourself on the inner side of the ladder.
- Connect the equipment's hook to the tie-off point on the chest of the harness.
- Right rope: tugging once signals start of ascent.
- Right rope: tugging a second time indicates a pause in ascent.

To send the guide downwards:

- Left rope: tugging once signals start of descent.
- Left rope: tugging a second time indicates a pause in descent.

Descent of the guide is stopped automatically when the limit switch reaches the bottom of the tower.

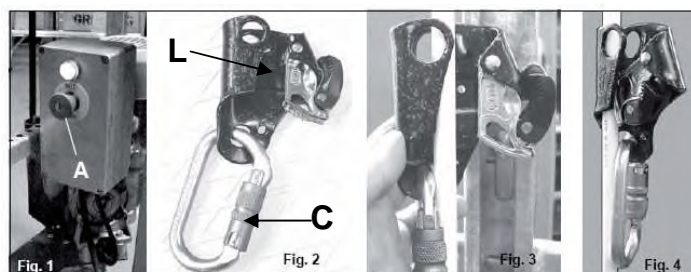
- During ascent the worker can stop at any level without needing to stop the device. The equipment will continue to operate though engaged. The timer will disconnect the equipment after 20 minutes.
- Once the equipment reaches the top, stop the ascent by using the control line, otherwise the equipment will reach the end-of-run and continue driving against the rubber stops, leading to unnecessary strain on the equipment and preventing descent.
- Once the equipment has been stopped, we advise climbing up one rung on foot to release tension from the system.
- We recommend sending the free guide down before descending.
- Upon completion of the work, activate the Emergency Stop button and cut off the power supply.


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6. TRACTELIFT

6.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- It is forbidden to use the climbing aid system with wind speeds exceeding the indications in PS-MM.1 General Activities, Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.
- The climbing aid must only be used by persons who are familiar with the installation and have a minimum body weight of **60 Kg**.
- Before ascending, check the climbing aid to make sure it works properly.
- It is absolutely PROHIBITED to use the Helper to carry materials.
- The Helper offers no protection against falls, so when climbing up the ladder using this system you must remain attached to the lifeline via the sliding fall arrest device.
- The traction cable must be directly connected to the harness and NEVER to the sliding fall arrest device.
- If the lifeline installed at the tower ladder is not approved or, when approved has not been certified for use, it is prohibited to use of the ascent aid system.
- If during ascent via the ladder there are hatchways on the tower platforms, stop the helper so that the worker is below it, open it, proceed with the ascent and once over the hatchway close it again.
- The helper must not be used by more than one person at a time.
- The equipment must only be used for personnel ascent purposes and must never be used during its descent.
- When using the climbing aid, keep your fingers, all other parts of your body, clothes, etc. away from the traction cable, pulleys, etc.
- **Instructions for use:**
 - 1. Connect:** Turn the **operating switch (A)** (Fig.1) to the right. The **Emergency Stop** button pops out and the control light switches on.
As a test, connect and disconnect the climbing aid (see 3 and 4).
Upon completion of the work, activate the **Emergency Stop** – the control light goes off.
 - 2. Connecting the safety harness:** Connect the locking ascent device **B** (EN 567) using a hook **C** (EN 362) with the harness (EN 361). Preferably, the ascent locking handle is fastened to the chest tie-off ring. This order affords the most effective aid for a comfortable ascent. If the harness only has one tie-off ring at hip height, the locking handle can also be secured there.



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a) **Open the locking device** (Fig.2): Pull down the black lever on the locking handle, keep it pressed and push out to the right until it can go no further. Release the black lever and the jaw of the locking handle remains locked in the open position.

b) **Position the locking device on the cable** (Fig. 3) and push the black lever downwards.


c) **Secure the locking device**: Give the locking handle a sharp tug downwards so that the teeth of the locking handle's jaw bite firmly into the synthetic cable.

3. Start-up: Climb one or two rungs and pull the locking ascent device with the synthetic cable upwards - the motor will start automatically.

4. Disconnecting: Stop the synthetic cable - the motor will disconnect automatically after a preset interval.

5. Leave the ladder: Always remove the locking handle from the synthetic cable! Otherwise the following might happen: If the climbing aid were connected (e.g. by someone at the foot of the tower), the synthetic cable would carry the locking handle upwards, until reaching the deviating station; there, the synthetic cable would be locked, thereby disconnecting the drive. **The helper can then not be used** until someone **without assistance** climbed up to remove the ascent locking device from the synthetic cable.

6. Upon completion of the work, activate the Emergency Stop button and check that the control light is off. Then remove the key and store it in its proper place.


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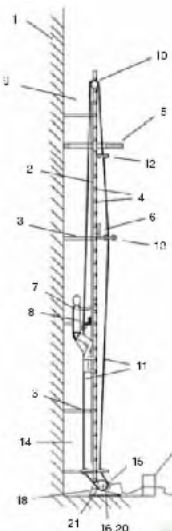
7. CLIMB ASSIST AVANTI

7.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- It is forbidden to use the climbing aid system with wind speeds exceeding the indications in PS-MM.1 General Activities, Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.
- The climbing aid must only be used by persons who are familiar with the installation and have a minimum body weight of **55 Kg**.
- Before ascending, check the climbing aid to make sure it works properly.
- It is absolutely PROHIBITED to use the Helper to carry materials.
- The Helper offers no protection against falls, so when climbing up the ladder using this system you must remain attached to the lifeline via the sliding fall arrest device.
- The traction cable must be directly connected to the harness and NEVER to the sliding fall arrest device.
- If the lifeline installed at the tower ladder is not approved or, when approved has not been certified for use, it is prohibited to use of the ascent aid system.
- If during ascent via the ladder there are hatchways on the tower platforms, stop the helper so that the worker is below it, open it, proceed with the ascent and once over the hatchway close it again.
- The helper must not be used by more than one person at a time.
- The equipment must only be used for personnel ascent purposes and must never be used during its descent.
- When using the climbing aid, keep your fingers, all other parts of your body, clothes, etc.. away from the traction cable, pulleys, etc..

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• Instructions for use:




1. Check wh and/or activa

on t re ele

ty supply

Lista de componentes::

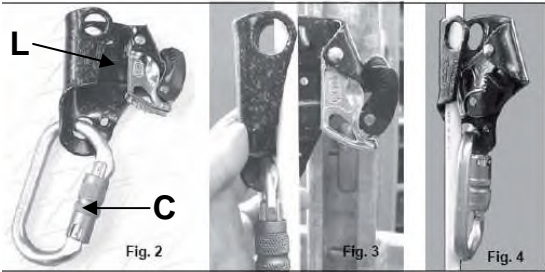
1. Pared	12. Rodillo de guía
2. Escalera	13. Rodillo de guía
3. Soportes de escalera	14. Extremo inferior
4. Escalones	15. Motor
5. Plataforma	16. Rueda de arrastre
6. Plataforma de descanso	17. Alimentación eléctrica
7. Persona en ascenso	18. Base accionada por resorte
8. Arnés	19. Cuadro de control eléctrico
9. Extremo superior	20. Protección de rueda
10. Accesorio superior con rueda	21. Cable con sensor
11. Cable de tracción	




Ajuste de la fuerza de tracción

Conexión / Desconexión


2. Adjust the traction power (1 to 10) on the control panel. Depending on the length of cable, it will be equal to 35-45 kg approximately.
3. Connect the ascent locking **B** device using a **C** carabiner with the harness. Preferably, the ascent locking handle is fastened to the chest tie-off ring. This order affords the most effective aid for a comfortable ascent. If the harness only has one tie-off ring at hip height, the locking handle can also be secured there.



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- a) **Open the locking device** (Fig.2): Pull down the black lever on the locking handle, keep it pressed and push out to the right until it can go no further. Release the black lever and the jaw of the locking handle remains locked in the open position.
 - b) **Position the locking device on the cable** (Fig. 3) and push the black lever downwards.
 - c) **Secure the locking device:** Give the locking handle a sharp tug downwards so that the teeth of the locking handle's jaw bite firmly into the synthetic cable.
4. Pull on the climbing aid's cable to activate the motor.
 5. To deactivate the motor, stop the ascent and stay still for 5 seconds.
 6. After use, cut off the power supply and unplug the power cable.


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8. IBEX POWER CLIMBER

8.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- It is forbidden to use the climbing aid system with wind speeds exceeding the indications in PS-MM.1 General Activities, Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.
- The climbing aid must only be used by persons who are familiar with the installation.
- Depending on the weight of the worker who is going to use the system, the desired climbing aid level must be set to one of 4 possible positions (25, 35, 45 and 55 kg). **NEVER** set a higher assistance level than the worker's weight.
- Before ascending, check the climbing aid to make sure it works properly.
- It is absolutely PROHIBITED to use the Helper to carry materials.
- The Helper offers no protection against falls, so when climbing up the ladder using this system you must remain attached to the lifeline via the sliding fall arrest device.
- The traction cable must be directly connected to the harness and NEVER to the sliding fall arrest device.
- If the lifeline installed at the tower ladder is not approved or, when approved has not been certified for use, it is prohibited to use of the ascent aid system.
- If during ascent via the ladder there are hatchways on the tower platforms, stop the helper so that the worker is below it, open it, proceed with the ascent and once over the hatchway close it again.
- The helper must not be used by more than one person at a time.
- The equipment must only be used for personnel ascent purposes and must never be used during its descent.
- When climbing up the ladder, pay attention to the sliding fall arrest device as it could get caught in the lifeline supports/guides, thus impeding ascent and straining the equipment unless its movement is detained.
- When using the climbing aid, keep your fingers, all other parts of your body, clothes, etc. away from the traction cables, pulleys, etc.

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- **Instructions for use:**

- **Set the assistance level:**

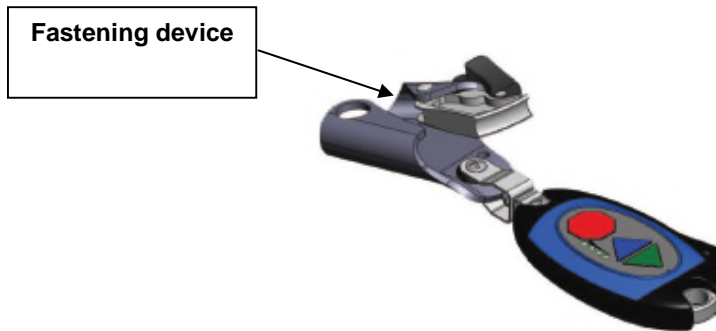
- Keeping the STOP button pressed, push the UP button to set the desired assistance level for the ascent. Once you have set the desired levels, release the STOP button.



- The levels cannot be adjusted while the motor is running. Press the STOP button before trying to change the climbing aid level settings.

- **Ascent:**

1. Join the EasyClimb regulator to the harness by means of a karabiner and to the round, reinforced polymer belt by means of the system's fastening device.



2. Press and release the UP button. The display will flash to indicate the established climbing aid level.
3. Load your body weight onto the fastening device so that the belt starts up gradually.
4. When you start to notice the climbing aid level, begin your ascent.
5. To stop the ascent, press the STOP button.


NOTE:

If the assistance level does not reach 9kg in 15 seconds, the motor will stop. Re-start it by pressing the UP button.

When you are about to reach the top of the ladder, make sure you press the STOP button about 30cm before the belt securing point reaches the end plate of the top pulley.

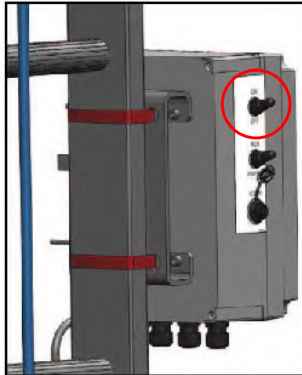
- **Stop:**


- To stop immediately, press the STOP button.

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- **System shut-down:**

To shut down the system, turn OFF the switch located on the electrical control box.




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9. GHS

9.1. General Preventive Measures for all types of wind turbines

- PPE Required: Working clothes, Safety helmet with chinstrap, Safety boots, Protective gloves against mechanical injuries, Protective goggles against mechanical injuries, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- It is forbidden to use the climbing aid system with wind speeds exceeding the indications in PS-MM.1 General Activities, Safe Practice for the specific WTG model and the Instruction Manual for the wind turbine.
- The climbing aid must only be used by persons who are familiar with the installation.
- Use the climbing aid system is prohibited for persons who weight less than 55Kg (including PPE).
- Depending on the weight of the worker who is going to use the system, the desired climbing aid level must be set to one of 2 possible positions: position the selector on (-) for users who do not exceed 75 Kg, position the selector on (+) for uses with weight greater than 75Kg.
- Before ascending, check the climbing aid to make sure it works properly.
- It is absolutely PROHIBITED to use the Helper to carry materials.
- The Helper offers no protection against falls, so when climbing up the ladder using this system you must remain attached to the lifeline via the sliding fall arrest device.
- The traction cable must be directly connected to the harness and NEVER to the sliding fall arrest device.
- If the lifeline installed at the tower ladder is not approved or, when approved has not been certified for use, it is prohibited to use of the ascent aid system.
- If during ascent via the ladder there are hatchways on the tower platforms, stop the helper so that the worker is below it, open it, proceed with the ascent and once over the hatchway close it again.
- The helper must not be used by more than one person at a time.
- The equipment will be used to facilitate the ascent and descent of individuals.
- When climbing up and down the ladder, pay attention to the sliding fall arrest device as it could get caught in the lifeline supports/guides, thus impeding ascent or descent and straining the equipment unless its movement is detained.
- When using the climbing aid, keep your fingers, all other parts of your body, clothes, etc. away from the traction cables, pulleys, etc.

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- **Instructions for use:**

- Connect the equipment with the general switch in the "ON" position.
- Aid with ascent:
 - Select the type of desired force:
 - Position of the selector to (-) is recommended for users who weigh less than 75Kg.
 - Position of the selector to (+) is recommended for users who weigh more than 75Kg.
 - Secure yourself to the lifeline with the appropriate fall arrest device.
 - Fasten yourself to the polymer/rope with energy-absorbing traction croll.
 - "0" Level.
 - Move the polymer continuously in the direction of ascent or activate the run push-button.
 - Outside of "0" level
 - Manually move the polymer continuously in the direction of ascent.
 - To stop the equipment, it will suffice to stop the ascent for 5 seconds and the equipment will stop.
- Aid with descent:

NOTE: If the equipment is disconnected or damaged, it will not aid in the descent.


 - Secure yourself to the lifeline with the appropriate fall arrest device.
 - Fasten yourself to the polymer/rope with energy-absorbing traction croll
 - Begin descent along the ladder, when the polymer moves downward, the equipment will begin to operate automatically.
 - To stop the equipment, it will suffice to stop the descent for 5 seconds and the equipment will stop.
- DISCONNECT THE EQUIPMENT AFTER USE, SWITCHING THE GENERAL SWITCH TO THE "OFF" POSITION

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Title: SUSPENDED ELEVATING PLATFORMS			Prepared by: J.E.R. (Signature and Date)
Safe Practice Code: PS.MM.7	Revision: 07	Date: 01/04/2015	
RA Code: ART.MM.7	Revision: 07	Date: 01/04/2015	
PS code it replaces: PS.MM.7 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.7 Revision 01 of Multitechnology and Made			Checked: D.P.C (Signature and Date)
Manufacturer:	ALL		
Model:	ALL		
This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.			Approved by: L. P. (Signature and Date)

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0. GENERAL INSTRUCTIONS


- Upon arriving at the farm and prior to starting any operation:
 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to use the hoist to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- To perform any operation that requires electrical equipment lockout, proceed in accordance with the provisions of the document PS.MM.1 "General Activities", the Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual to ensure that electrical power does not return to the equipment while work is being carried out.
- Before suspending any loads with the hoist, the area must be properly marked off to indicate that access of unauthorised personnel is forbidden and to highlight the risk of falling suspended loads. Furthermore, check the condition of the equipment (suspension tools, bags for hoisting materials and tools, etc..) and their correct placement.
- Comply with the provisions of PS.MM.1, "General Activities," Safe Practice for the specific WTG model and the Wind Turbine Instruction Manual, as well as all other applicable safe practices according to the operation to be performed and which are referenced in each section.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lifeline, including the length of the energy-absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against the objects located in a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above the shoulder level, reaching behind the body, pronounced inclination or twisting of the back and neck, etc. Use lifting elements designed for this purpose and mechanical tools whenever possible. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.

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1. OPERATIONS USING SUSPENDED ELEVATION PLATFORMS

1.1. General Preventive Measures for all types of wind turbines


- PPE Required: Working clothes, safety helmet with chinstrap, safety boots, protective gloves against mechanical injuries, protective goggles against mechanical injuries, harness, two lanyards with energy absorber device and wide mouth hook, the equipment specified for the use of suspended elevation platforms, emergency descent device.
- Recommended PPE: Lumbar protection.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - PS-MM.3 Working with Baskets.
 - PS-MM.6 Use of Lifts and Helpers.
 - PS-MM.9 Material Unloading, Storage and Hoisting.
 - Safe Practice for the specific WTG model.
- Carrying out these operations requires the presence of a Preventive Resource to guarantee that it is done at all times in compliance with the procedures and safety measures established by GCT.
- Before the use of any suspended elevating platform in a wind turbine by personnel, whether employed by or subcontracted by GCT, experienced wind turbine maintenance personnel, whether employed by or subcontracted by GCT, must **stop the wind turbine, lockout and tagout the rotor, lock the yaw system of the nacelle and lock the rotation of the blades. They must place signs indicating that personnel** are working in the wind turbine and **cordon off the area** where material could fall, as indicated in PS.MM.1 "General Activities", Safe Practice for the specific WTG model, and the Instruction Manual for the wind turbine.
- The Elevation Platform is only to be used by AUTHORISED personnel. It is absolutely prohibited for personnel to use any elevation platform if they are not trained in its use, not familiarised with the user's manual or are not medically fit to work at heights.
- For each worker who works on the hanging elevation platform, two ropes must be installed by fastening them to higher points, different from those used for suspending the platform. The worker must remain attached to one of the ropes at all times to avoid falls from heights. The second rope will be necessary for descent in the event that the worker remains suspended from the first rope. Furthermore, the platform must be equipped with an emergency descent device to allow for its evacuation, if necessary. Always follow the indications in **PS.MM.3 "Work with Baskets"**.
- If the suspended elevation platform is fitted with anchor devices to which workers can attach themselves and has a safety system preventing it from falling should the traction cable break, it is possible for workers to remain attached to these points without having to use portable lifelines providing a validation process has been passed within GCT.
- The **maximum wind speed** at which the Hanging Elevating Platform can be used is defined in the Safe Practice specific to the WTG model and/or in the Instruction Manual for the WTG. Personnel must carry manual anemometers while using the platform to know the wind speed at which they are working at all times.
- A platform which is out of service must be disconnected from the power supply to prevent its accidental use, the switch for Emergency Stops permanently set (all controls remain blocked in this way) and signs placed on it indicating "OUT OF SERVICE".

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- Platform Assembly:** This may only be done by qualified personnel who must scrupulously follow the assembly manual provided by the manufacturer. Prior to the first ascent upon completing the assembly of the hanging elevating platform, it is mandatory to carry out an inspection to guarantee the installation is correct as well as its perfect condition according to the use and maintenance manual provided by the supplier. In the event any damage or faults are detected during this inspection, the work in progress must be immediately detained and under no condition may the elevation platform be used until the error has been remedied.
 - In order to elevate it, anchor points validated by GCT will be used. The system used for fastening shall be redundant and thimbles will be used on all surfaces that may damage the cables or slings used by the fastening system.
 - Wear gloves to protect against mechanical abrasions whenever working with hoisting cables.
 - One must remain attached to the lifeline at all times during the ascent along the ladder of the tower to the nacelle to install the platform's system used for fastening.
 - The work area will be cordoned off to prohibit access to the area upon which any materials or tools used by the personnel working at heights may fall.
 - Before using the hoist to lift up the cables from which the platform will be suspended, make sure they are perfectly fastened to the chain of the same.
 - Tasks related to the electrical connection of the platform may only be done by personnel authorised in accordance with current legislation protecting workers from electrical hazards in the country in which the wind turbine is installed.
- Operation and use:** The platform is fitted with a TIRAK traction system enabling it to move vertically along a cable attached to the wind turbine. The BLOCSTOP safety retention device secures the platform onto an independent safety cable. The platform is manually moved vertically from inside. An elevation force limiter stops the elevator from ascending if there is an overload on the platform.
 - If any damage or faults are detected during an inspection or while operating, or if circumstances arise which may compromise safety, all work must be suspended immediately and the elevation platform must not be used under any circumstances until the fault has been rectified.



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Title: SUSPENDED ELEVATING PLATFORMS	Safe Practice Code: PS.MM.7	Revision: 07
Manufacturer: ALL	Model: ALL	Date: 01/04/2015

- Ensure that the safety cable on the Blocstop device is fully tensed to guarantee efficient functioning.
- It is forbidden to climb onto an overloaded platform. Respect the load limits specified on the platform's plate. If the hoisting strength limiter activates, reduce the load to below an acceptable limit in the case of overloading, and if it activates due to there being an obstacle in its path during use, make the platform descend until the obstacle has been freed before using it again.
- All replacements/repairs of Tirak, Blockstop or electronic components must only be performed by the manufacturer or an approved technical service.
- If the platform does not work due to an electrical fault (no power is reaching the Tirak traction motor), the platform can be lowered using the brake lever.
- If BLOCKSTOP locks the platform onto the safety cable, move the platform upwards (using the Tirak wheel, turning anticlockwise).

• Manual Operation:

- Manual emergency descent
 1. Insert the lever in the hole (1) for the Tirak brake.
 2. Pull the lever upwards. The platform will lower. The embedded centrifugal force brake limits the descent speed.
 3. To stop, release the lever.
 4. After use, replace the lever into the hole on the top.



- Ascent manual (with the brake open, it is possible to move the platform upwards using the crank)
 1. Remove the cover.
 2. Fit the crank (2) into the slot in the motor and turn it anticlockwise, with the brake open.
 3. After use, remove the crank and lever from the Tirak and replace the covers in the holes.




- **Connecting the retaining device (Blockstop):** if this has been connected, unlock it by lowering the lever (A) until it clicks. If the platform becomes suspended from this device, the operation will not be possible and the platform must be evacuated.

1. Remove the load applied to the cable.
2. Manually open Blockstop by pressing the lever downwards and, once resting on the ground, check that the brake is working properly.




- **Evacuating the elevation platform:** In the event that, due to any reason, the platform remains suspended from the safety cable, it must be evacuated using the emergency descent device.

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Title: START UP			Prepared by: J.E.R. (Signature and Date)
Safe Practice Code: PS-MM.8	Revision: 07	Date: 01/04/2015	
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PS code it replaces: PS-MM.8 Revision 06 of G8X, G5X and G4X. PS.MTO.8 Revision 01 of Multitechnology and Made			Checked: D.P.C (Signature and Date)
Manufacturer:	ALL		
Model:	ALL		
This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.			Approved by: L. P. (Signature and Date)

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Title: START UP	Safe Practice Code: PS-MM.8	Revision: 07
Manufacturer: ALL	Model: ALL	Date: 01/04/2015


0. GENERAL INSTRUCTIONS

- Upon arriving at the farm and prior to starting any operation:
 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and by GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to use the hoist to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- Unauthorised personnel are strictly prohibited in the work area.
- If the weather conditions or the duration of the work shift implies a decrease in visibility when moving along roads or platforms, clothes with highly visible, reflective elements must be worn (specially designed vest or clothes). Wear a vest if one must stop and exit the vehicle on the road due to breakdown or similar reason.
- Before starting any load hoisting operation, the area must be properly cordoned off to indicate that access of unauthorised personnel is forbidden and to highlight the risk of falling suspended loads. Furthermore, check the condition of the tools (suspension tools, bags for hoisting materials and tools, etc.) and their correct placement. In the event that cranes are used, it must be checked that these have successfully passed required regulatory inspections.
- It is prohibited to stand under suspended loads, within their path or in the area cordoned off for the operation and radius of action, including underneath the crane arm, given the risk of loads falling should the slings, chains, crane, etc., break. If unavoidable due to the nature of the task to be carried out, special precaution must be taken when the suspended loads are in motion to minimise risks and the presence of personnel.
- If while carrying out any operation portable ladders must be used, these must be inspected to check that they are in perfect condition; otherwise, they must be replaced with others apt for carrying out the task at hand. The gradient must be approximately 75° with respect to the horizontal plane.
- Comply with the provisions of PS-MM.1, "General Activities", Safe Practice specific to the WTG model and the Wind Turbine Instruction Manual, as well as all other applicable safe practices according to the operation to be performed and which are referenced in each section.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above the shoulder level, reaching behind the body, pronounced inclination or twisting of the back and neck, etc. Use lifting elements designed for this purpose and mechanical tools whenever possible. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.

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- Whenever preparing to carry out handling operations on elements under pressure, pressure must be removed and the absence of pressure must be verified before performing these tasks.
- Check that there is sufficient lighting, whether natural or artificial, for performing the operation, and that the level complies with those established in PS-MM.1 General Activities – Night Shifts.
- To perform any operation that requires electrical equipment lockout, proceed in accordance with the provisions of PS-MM.1 “General Activities”, the Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual to ensure that electrical power does not return to the equipment while work is being carried out.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lanyard, including the length of the energy absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against objects located on a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.


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1. START UP OPERATIONS


1.1. General Preventive Measures for all types of wind turbines

- **PPE Required:** Working clothes, Safety Helmet with chinstrap, Safety Boots, Goggles against mechanical injuries, Highly visible clothing, Harness with sliding fall arrest device, two lanyards with energy absorber device and wide mouth hook, Retractable fall arrest device for operations on the exterior of the nacelle, underneath the frame and inside the rotor, nitrile-covered protective gloves against mechanical injuries for chemical products and protective goggles against liquid splashes and Mask with a combined A2P2/P3 filter for organic vapours and particles.
- When handling the Switchgear: Use insulating stools or mats, Insulating gloves against electrical injuries, Face shield for work involving electrical risk, according to the voltage of the Transformer Station to be handled.
- **Recommended PPE:** Lumbar protection, Head lamp.
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - PS-MM.4 Wind Turbine Energisation /Discharge.
 - PS-MM.6 Use of Lifts and Helpers.
 - PS-MM.9 Material Unloading, Storage and Hoisting.
 - Safe Practice for the specific WTG model.
- The performance of these operations requires the presence of the Preventive Resource to guarantee that it is done at all times in accordance with the procedures and safety measures established by GCT.
- Speed limit for operations in which the rotor must be locked: according to procedure of the Wind Turbine Instruction Manual and Safe Practice specific to the model of WTG.
- Speed limit for operations in which it is not necessary to lock the rotor: see Wind Turbine Instruction Manual and Safe Practice specific to the model of WTG.
- The wind turbine must be energised for a minimum of 15 min before beginning the start-up. During these 15 min it is forbidden to enter the wind turbine.
- In order to carry out the start-up, the blades must be in the feathered position and the bearings locked using the lock bolts in the case of variable pitch system and hydraulic activation.
- The rotor must be unlocked during start-up but then locked if the rotor is to be accessed.
- For Pitch tests, lock the rotor with the blade (on which the test is being performed) parallel to the tube and with this blade unlocked if the pitch is hydraulic.
- When using a power generator set for start-up, and prior to starting up the power unit, all workers must exit the wind turbine except for one, who will remain on the nacelle access platform. Once the unit has been started up, the worker on the platform must check that everything is in working order, always doing this from the platform. If any abnormality is detected, it must be immediately reported to the person in the yard so that they can disconnect the power generator unit. Wait at least 15 minutes to check the equipment is working. During these 15 min no worker may enter the wind turbine, except the one on the nacelle access platform.
- The team performing the start-up shall have at least two fire extinguishers guaranteeing a level of 89B efficiency suited for fires of electrical origin (CO₂).
- To carry out the start-up procedure, it is obligatory to follow the work specifications according to the model of wind turbine.
- Check that all the Tests Prior to Energising have been conducted (see PS-MM.4).

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- Check that the fuses or any other cut-off devices approved by GCT are installed in the transformer secondary that is part of the transformation station installed for raising the voltage generated by the wind turbines. If there are no fuses or other cut-off elements, works are stopped until the situation is analysed and the necessary measures are taken.
- If during the start-up operations it is necessary to work on the transformer, follow the safety instructions given in **PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual**
- The performance of this operation requires the presence of Preventive Measures which guarantee that it is done in compliance, at all times, with the procedures and safety measures imposed by GCT.
- Gloves against mechanical injuries must be worn to avoid cuts and a safety helmet with chinstrap to avoid blows and impacts.
- All operations involving electrical hazards must be performed by personnel authorised by their company to do so. This authorisation must be based on the legislation in force for protecting workers faced with electrical hazards in the country where the wind turbine is installed, and following the "Five Golden Rules" at all times.
- When a power generator set is used to perform the operations, there must be a CO₂ extinguisher nearby in the case of fire. The generator set must have a differential element and be earthed by means of a cable and copper stake, its covers must be kept closed, it must have a tray to prevent spills from reaching the soil, and the fuel needed for its operation must be stored properly.
- Whenever operations are to be carried out on electrical cabinets, follow the indications set out in the documents contained in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Instruction Manual for the Wind Turbine regarding the safety measures to be taken when carrying out operations on the various compartments of the electrical cabinets.
- If operations require disconnection of voltage, locking and labelling systems must be used to avoid the voltage being reconnected while the work is underway.
- Generally speaking and unless otherwise instructed in the Safe Access Manuals specific to the model of wind turbine, for work under the tramex walkway it will be necessary to disconnect the voltage at the preceding wind turbine, the first one of the line or from the substation itself, depending on the High Voltage circuit of the wind farm.
- For safety reasons, at least two people must be present at all times for the duration of the start-up process.
- If oil or coolant leaks occur in any of the components checked during the initial test, clean these spills and the affected surfaces immediately before continuing with the tasks, in order to reduce the possibility of slipping or falls. Use nitrile-covered protective gloves against mechanical injuries for chemical products and protective goggles against liquid splashes.
- Keep hands and other extremities away from the areas that can be reached by the tool due to sliding, deviations, faults in the working materials, etc.
- To lubricate components, wear nitrile-covered gloves against mechanical injuries and protective goggles against liquid splashes.
- Installation and wiring of the accelerometer or other components on elevated parts of the wind turbine must be done from an appropriate work platform or portable ladder which allows access to these areas.
- **Checking the voltages and the phase sequence:**
 - Voltages and phases are checked at points on the machine that are protected against short-circuits.
 - In mechanical interventions on the isolator, use insulating stools or mats, insulating gloves against electrical injuries and a face shield for working with electrical hazards, according to the voltage of the Transformer Station to be handled.

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• **Hydraulic pressure tests on accumulators and safety valves:**


- Nitrogen bottles required for work in the accumulators must be hoisted in suitable containers to prevent them falling. They must be stored in safe places inside the nacelle where they cannot get hit, roll, or fall to different heights through the openings in the nacelle.
- Before use, check that the hoses, measuring devices and nitrogen cylinders are in good condition.
- To access and work inside the rotor, follow the instructions given in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- To access and work inside the hub, lock the Pitch system as instructed in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- When running tests on pressurised elements, wear protective goggles against mechanical injuries and liquid splashes and nitrile-covered protective gloves against mechanical injuries.
- If during the start-up work you need to handle hydraulic unit oil, wear nitrile-covered gloves against mechanical injuries for use with chemical products, protective goggles against liquid splashes and a face mask with a filter for particles.

• **Yaw system, Greasing the ring:**

- While carrying out the work, do not wear necklaces, long hair not tied back, loose clothing... that could get caught.
- The yaw ring teeth must be greased using spatulas or similar tools and must NEVER be applied with bare hands.
- Applying of grease to the ring must be done at a location as far away as possible from the contact with the yaw gears.
- In order to check the ring bolts make sure mechanical tools are used whenever possible in order to reduce overexertion.
- To lubricate the ring, wear nitrile-covered gloves against mechanical injuries and protective goggles against liquid splashes.

• **Generator (lubrication of bearings, tightening of terminals in terminal box):**

- The worker who conducts megging tests must wear insulating gloves against electrical injuries in the megging procedure. After carrying out Meggering tests, unload the elements involved in the test in order to avoid the risk of an electrical discharge.
- Because the bearings are greased with the wind turbine rotating (200 rpm), check that the protective cover of the moving part is in place before commencing the operation. Do not wear a harness and stand away from the moving part.
- To lubricate the bearings, wear nitrile-covered gloves against mechanical injuries and protective goggles against liquid splashes.
- When checking generator brushes, the rotor must remain locked and the brake applied by activating an emergency push-button.
- When verifying rubber elements or tightening terminals of the generator terminal box, make sure that the machine is locked and that the power supply to the rotor is disconnected. Nevertheless, before intervention in the generator terminal box, use a voltage detector to verify that there is no voltage, wear insulating gloves against electrical injuries appropriate to the voltage of the element subject to handling and a face shield for working with electrical hazards.

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- **Check, lubricate pitch system:**

- This operation is carried out with the machine stopped and locked. All other operators should stay away from the emergency push buttons.
- To access and work inside the rotor, follow the instructions given in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- To access and work inside the hub, lock the blades individually as instructed in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- To lubricate the Pitch system, wear nitrile-covered gloves against mechanical injuries and protective goggles against liquid splashes.

- **Lubricating cardan shaft joints:**

- Before removing the protective cover from the cardan shaft, lock the rotor and apply the brakes.
- Wear gloves that protect against mechanical injuries while handling mechanical protections to prevent cuts.
- To lubricate the cardan, wear nitrile-covered gloves against mechanical injuries and protective goggles against liquid splashes.

- **Brake inspections:**

- Before removing the brake guards and inspecting the brake, the rotor must be locked and the brakes applied.
- Wear gloves that protect against mechanical injuries while handling the brake guards to prevent cuts.

- **Wind vane and anemometer check:**

- To access the exterior of the nacelle, follow the indications in PS-MM.1 "General Activities", Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.
- When the air temperature sensor heating system is going to be checked, special care must be taken due to the risk of burns. Do not hold on to elements tightly. Your hand must remain in contact with the element for the shortest time possible, in order to avoid burns.

- **Verification of the Fiberglass protection:**

- When accessing the nacelle cover (underneath the frame), remain attached to an anchor device by means of a harness and retractable fall arrest device.
- To access the rotor and while working inside, follow the instructions given in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.
- To access the exterior of the nacelle, follow the indications in PS-MM.1 "General Activities", Safe Practice specific to the model of WTG and the Wind Turbine Instruction Manual.

- **General nacelle cleaning:**


- When using chemical products to clean the nacelle, follow the instructions in the Safety Datasheets.
- When accessing the nacelle cover (underneath the frame), remain attached to an anchor device by means of a harness and retractable fall arrest device.
- To access the rotor and while working inside, follow the instructions given in PS-MM.1 "General Activities", Safe Practices specific to the model of WTG and the Wind Turbine Instruction Manual.

- **Overspeed Tests:**

- Run this test from the tower base. It is **PROHIBITED** to perform this test from inside the nacelle.


- **Machine start-up:**

- When carrying out tests on the converters or condensers, the cabinet door must be kept closed.
- Before inspecting the converters or condensers, check they are de-energised and allow a minimum of ten minutes to pass after this de-energising process in order to reduce the risks from direct contact with the accumulated charge.

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- Before the wind turbine is started up, check that the converter or condenser cabinet doors are closed to reduce the risks caused by a possible blowout.
- During the tests to be conducted on converters in the nacelle, it is PROHIBITED for personnel to remain in the nacelle. The tests must be conducted from the nacelle access platform.
- Before leaving the wind turbine, check that all the guards, particularly those on the gearbox brake, are correctly fitted. The gearbox brake guards not only protect operators but also prevent sparks from being released from the brake, consequently lowering fire hazards. Due to the risk of fire, the area next to the gearbox in particular must be clear of flammable items. It must also be checked that the rotor is not locked, there is no emergency button applied and that the nacelle is clean and tidy.
- Except when working on G8X/90 DTC wind turbines, in order to carry out the connection to the grid, no one must remain inside the wind turbine, and the start-up must be done from the ground, immediately leaving the tower before the connection is activated.
- Workers should remain a safe distance from the wind turbine and the door kept open to detect any abnormalities. When the grid connection is completed, wait a few minutes before accessing the interior, after checking that the start-up noise is normal.
- If any anomaly is detected on the wind turbine, it must be immediately disconnected from the main grid.

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Title: MATERIAL UNLOADING, STORAGE AND HOISTING				Prepared by: J.E.R. (Signature and Date)
Safe Practice Code: PS-MM.9	Revision: 07	Date: 01/04/2015		
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PS code it replaces: PS-MM.9 Revision 00 of G10X, Revision 06 of G8X, G5X and G4X. PS.MTO.9 Revision 01 of Multitechnology and Made				
Manufacturer:	ALL			
Model:	ALL			Approved by: L. P. (Signature and Date)
<p>This document is a development of the preventive measures associated with the risks identified in the Risk Assessment of the Wind Turbine Access Tasks, and all personnel must be familiar with them. All workers, whether employed or subcontracted by Gamesa Corporación Tecnológica (GCT), involved in the activities described herein must comply with these instructions. GCT reserves the right to adopt any measures as it sees fit upon detecting any non-compliance. This revision of prevails over the previous revision and all Circulars issued as supplements to the previous revision.</p>				

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Title: MATERIAL UNLOADING, STORAGE AND HOISTING	Safe Practice Code: PS-MM.9	Revision: 07
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0. GENERAL INSTRUCTIONS

- Upon arriving at the farm and prior to starting any operation:
 - WF under Construction: workers should report to the Project Director, or Preventive Resource designated by Gamesa Corporación Tecnológica (GCT) if the former is not available, in order to indicate they have arrived and to state the operation they are to conduct, in line with the work access control requirements established by the owner and GCT for the assembly of said park.
 - Operating WF: report to the sub-station to register your attendance and the work to be done, in line with the operating requirements (notification to remote control, request for work orders, etc.) established by the client and by GCT for the wind farm in question.
- Any installation or maintenance procedure shall ALWAYS be done by **a minimum of two** duly trained and instructed persons for the task to perform. The first task when working on the nacelle is to use the hoist to raise the **RESCUE KIT** (provided it is not already installed in the wind turbine). If all workers are not in the same work area, they must still be able to communicate with each other at all times via walkie-talkies or a similar communication system. Also, an operations coordinator must be appointed and shall communicate every 10 minutes with all the workers involved in the operation to check on their condition, and must receive a reply from each worker when working from other areas (the reply from a single worker will be enough if several are together in the same place).
- All material lifting operations done with a crane to a wind turbine with the rotor mounted shall be carried out with the **machine stopped** and with the **rotor locked**.
- Before suspending any loads with a crane or hoist, the area must be properly marked off as described in PS-MM-1 "General Activities", indicating that access of unauthorised personnel is forbidden and highlighting the risk of falling suspended loads.
- Before commencing any load suspension operation, check that the cranes have gone through regulatory inspections and, before each load hoisting operation, check the condition of the equipment (lifting and suspension tools, bags for hoisting materials and tools, etc..) and its correct placement.
- Comply with the provisions of PS-MM.1, "General Activities", Safe Practice specific to the WTG model and the Wind Turbine Instruction Manual, as well as all other applicable safe practices according to the operation to be performed and which are referenced in each section.
- Signs must be posted informing of the presence of personnel working on the wind turbine, any risks present, and the prohibition of access to it by all unauthorised personnel not involved in the operation.
- To avoid ergonomic risks, carry out stretching/warming up exercises in order to acquire the appropriate muscle tone before performing the task. While working, avoid awkward postures that involve extreme positions or movements of the joints: arms above the shoulder level, reaching behind the body, pronounced inclination or twisting of the back and neck, etc. Use lifting elements designed for this purpose and mechanical tools whenever possible. Avoid repetitive movements and, if it is impossible to do so, rotate workers performing different tasks so as to avoid minor overexertion that may cause muscular-skeletal lesions. Establish occasional rests during tasks requiring greater physical exertion, establishing a rotation of positions amongst workers.
- Whenever there is a risk of falling from higher than 1.8 m workers must remain attached to an anchor device by a harness and lanyard with energy absorber device and wide mouth hook. The full length of the lanyard, including the length of the energy absorber, should be appropriate for the distance of the fall to which the worker is exposed in order to prevent him from hitting against the floor or against objects located on a lower level.
- Use only approved work platforms that are in good condition and appropriate for the work to be done. If, due to the space of the work area, it is impossible to use platforms, portable ladders may be used.
- For all operations requiring the use of chemical agents, the Safety Datasheets issued by the manufacturer for these products must be observed.

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Title: MATERIAL UNLOADING, STORAGE AND HOISTING	Safe Practice Code: PS-MM.9	Revision: 07
Manufacturer: ALL	Model: ALL	Date: 01/04/2015

1. UNLOADING, STORING AND HOISTING OF MATERIAL

1.1. General Preventive Measures for all types of wind turbines

- PPE Required: All crane operators or operation signallers leaving their vehicle must wear Working clothes, Safety helmet with chin strap, Reflective Jacket, Safety boots and Gloves to protect against mechanical injury, Protective goggles against mechanical injuries.
- Recommended PPE: Lumbar protection
- See safe practices:
 - PS-MM.1 General Activities.
 - PS-MM.2 Road Safety, Material Transportation and Movement.
 - Safe Practice for the specific WTG model.
- The performance of these operations requires the presence of the Preventive Resource to guarantee that it is done at all times in accordance with the procedures and safety measures established by GCT.
- No equipment shall be installed without first running the necessary tests, and never if the seal or packaging has been damaged in such a way that doubt arises as to whether the conservation of all the properties of the equipment may be compromised.
- It is mandatory that all steps specified on the Roadmap be followed, and conformity thereto must be recorded upon completion of each operation and before commencing the next.
- For generic operations of assembly and major corrective actions, which imply **suspended loads**, the wind speed limit will be defined in the Safe Practice for that WTG model and/or in the WTG Instruction Manual. This limit could vary based on the type of load to be hoisted, or if the task is done with one or two cranes.
- Verify the ground compaction as per the documentation on compaction (for example, the conditions contained in Mounting Specification "OP085371 "OP ASS ACCESS ROADS SG8X" must be met) before carrying out operations upon it. If there is any evidence of the terrain yielding during the operations, they must be interrupted until the situation can be analysed and a corresponding solution implemented.
- Storage of materials closer than 2 m to slopes, borders of excavations or, in general, on grounds that show signs of instability is not permitted. The storage area should be free from unnecessary materials, removing obstructing materials.
- If there are stored elements in the wind farm that could be swept away by the wind, use restraining elements (nets, etc..) to prevent this.
- Whenever materials are stockpiled on top of each other, check that the whole pile is stable and there is no risk if it overturning.
- Storage of different elements must be done with the tools defined by GCT, and the use of unauthorised storage systems is prohibited.




		Record		Code: IHS-SER-007-R05
		SAFE PRACTICE		Previous code: N/A
Edition: 1	Language: EN	Security Classification:	PUBLIC	Page: 4 of: 6
Date: 01/02/2015				


Title: MATERIAL UNLOADING, STORAGE AND HOISTING	Safe Practice Code: PS-MM.9	Revision: 07
Manufacturer: ALL	Model: ALL	Date: 01/04/2015

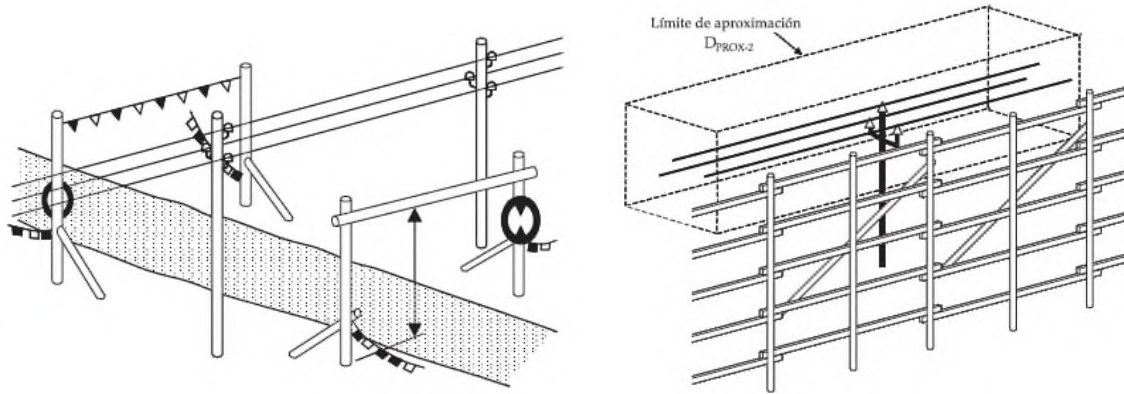


- The following precautions should be adopted when using machinery:
 - Before starting up any machine, the operator must carry out the control measures set out in the manufacturer's manual.
 - Upon completion of the work, the machine operator must remove the ignition key and accept liability for its safekeeping and control.
 - The machine must be stopped on level terrain, applying the brakes and blocking the wheels if necessary.
 - The terrain upon which the machine is parked must be firm and stable. During winter, as a precaution against frost, the machine must not be parked upon muddy surfaces or puddles.
 - If for any reason the motor stops running, immediately stop the machine since there is a risk of remaining without brakes or steering control.
 - Control dust by watering regularly.
 - When moving materials, follow the instructions in PS-MM.2 "Road Safety, Transport and Movement of Material".
- For complex manoeuvres, a person responsible for these must maintain continuous communication with the crane operator and workers participating in the task via walkie-talkies, supervising the operation and giving any necessary instructions.
- Before commencing lifting operations, **mark off the area** into which the load could fall, prohibiting access thereto to any persons not involved in the work (follow the instructions in PS-MM.1 "General Activities").
- The hoisting tool and work equipment must have all documentation required based on the legislation of the country in which the tasks will be carried out or, if no specific legislation exists, equipment that complies with European legislation shall be employed. This documentation will be: Instructions regarding mounting and operation, Certificates of compliance with legislation and/or regulations within the geographical area, Marking: according to the regulatory and/or legislative requirements in the applicable geographical area, WLL identification plate, model and serial number, Preventive Maintenance Manual in case this needs to be performed, inspections to be conducted prior to use if it is necessary to conduct them and Corrective Maintenance Manual, instructions on what to do in case of breakdown.
- Before lifting any loads check that all the tools for suspending loads are present and that they are in good condition, as well as being correctly mounted, and that they have all documentation required by the legislation of the country in which they are to be used. If there are no regulations in the country, European regulations shall be applied.
- The crane operator must hold the official self-propelled mobile crane operator's license entitling him/her to handle at least the nominal load of the crane.

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- It is Forbidden for unauthorised personnel to be near the machines while they are being worked on. Use of a reflective vest is mandatory.
- During hoisting operations, a designated OPERATION SUPERVISOR will be in charge of supervising and directing the operation. This Supervisor must be intimately familiar with the operation. Furthermore:
 - He will inspect the state of the load, lifting and slinging accessories, as well as proper hoisting of the load, and in general all of the circumstances of the operation.
 - He will inspect, along with the crane operator, the condition of the terrain.
 - He will make sure that the crane operator checks the proper condition and operation of the crane and fulfils the responsibilities and obligations set forth in ITC MIE AEM 4 for crane operators.
 - Prior to the operation, he will meet with the personnel participating in the operation, crane operators, riggers, etc.. for the purpose of ensuring that they are familiar with all of the circumstances of the operation and of their own responsibilities.
 - Before the operation, he will ensure that communication devices are operating (intercoms, signals, speakers, horns, etc..).
- During assembly, the crane operator will be responsible for:
 - Driving the mobile crane,
 - Installing and checking the operation of the capacity indicator/limiter and all of the crane's safety devices
 - Positioning the crane based on the data regarding ground-bearing capacity, weights, load balancing and distances, heights and depths to be worked on during the operations, duly provided by the tenant,
 - Placing and checking the support plates and the support jacks.
 - Checking proper assembly and the general condition of the crane (cables, hooks, jib, pulley wheels, bolts, safety clips, etc..), guaranteeing proper operation of the crane during the execution of the work.
- During the operation, the crane operator will be responsible for:
 - The operation of the mobile crane.
- All machines used for loading and unloading parts must operate with a single load each time and it must be ensured that no slings and tools employed are faulty or damaged.
- Outriggers must be installed whenever a manoeuvre is to be performed and loads must not be suspended laterally when the lorry's support surface is sloped towards the side with the load.
- Do not release the crane tie until having verified the correct position and stability of the load.
- Heavy machine operators must keep them away from unstable ground and ground prone to sinking.
- The crane operator must keep the suspended load in sight at all times. In operations where this is not possible, a second operator must guide the crane operator's manoeuvre by radio or walkie-talkie.
- It is prohibited **to work** with machines or vehicles in proximity to electric lines when their height does not comply with the safety distance.
 - 3 metres for lines with voltage up to 66kV.
 - 5 metres for lines with voltage from 66 to 220kV.
 - 7 metres for lines with voltage from 220 up to 380kV.
- When it is not possible to guarantee that these distances are going to be respected and the power supply cannot be cut, specialised personnel must place insulating elements between the machines and the lines, and must take any additional measures that will guarantee safety.

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- Before performing any action, inspect the tyres in order to detect possible electric bridges with the ground, besides placing a by-pass to earth on the machine, from its metallic structure to a copper stake stuck into the ground.
- If machinery with rubber-tyred running gear comes into contact with power lines, the machine operator must remain immobile in the driving seat and sound the horns for help.
- Loads will be controlled by guide and retaining ropes. When holding loads using ropes, workers must never secure them behind their bodies to avoid being pulled along or lifted off the ground in the event of a sudden movement of the load following incorrect crane operations or a sudden gust of wind.
- No one may remain in the crane truck area, underneath the suspended loads or in their path unless strictly necessary. When this is required, only a minimum number of operators must do so for a minimum amount of exposure time and always using, whenever possible, double safety systems such as double slings.
- All operators must avoid contact with the machines' telescopic arms when in service.
- Make sure the crane arm is immobile before commencing any movement.
- It is forbidden to hold onto the hoist chain with your hands, hang from the load or hook or climb onto them.
- Before suspending any loads (with a crane or hoist), the area must always be properly marked off warning that access of unauthorised personnel is forbidden and highlighting the risk of falling materials (follow the instructions in PS-MM.1 "General Activities").
- Operators must climb on and off the machines using the areas designated for this purpose, while they are not in motion, and never by directly jumping from the machine to the ground.
- Workers must wear safety boots with nonslip soles, and the walkways and access ladders for driving or maintenance must be free of gravel, mud and oil to reduce the risk of falls.
 - All personnel on site must use the PPE indicated thereon.
- The dimension and compaction requirements **for material storage and hoisting** established in GCT specifications must be met.

1.2. Specific Preventive Measures per type of wind turbine:

- Respect the **wind speed limits** established for each operation and type of machine, as specified in PS-MM.1 "General Activities", the Safe Practices specific to the model of WTG and/or the Wind Turbine Instructions Manual.

EXHIBIT A TURBINE INFORMATION

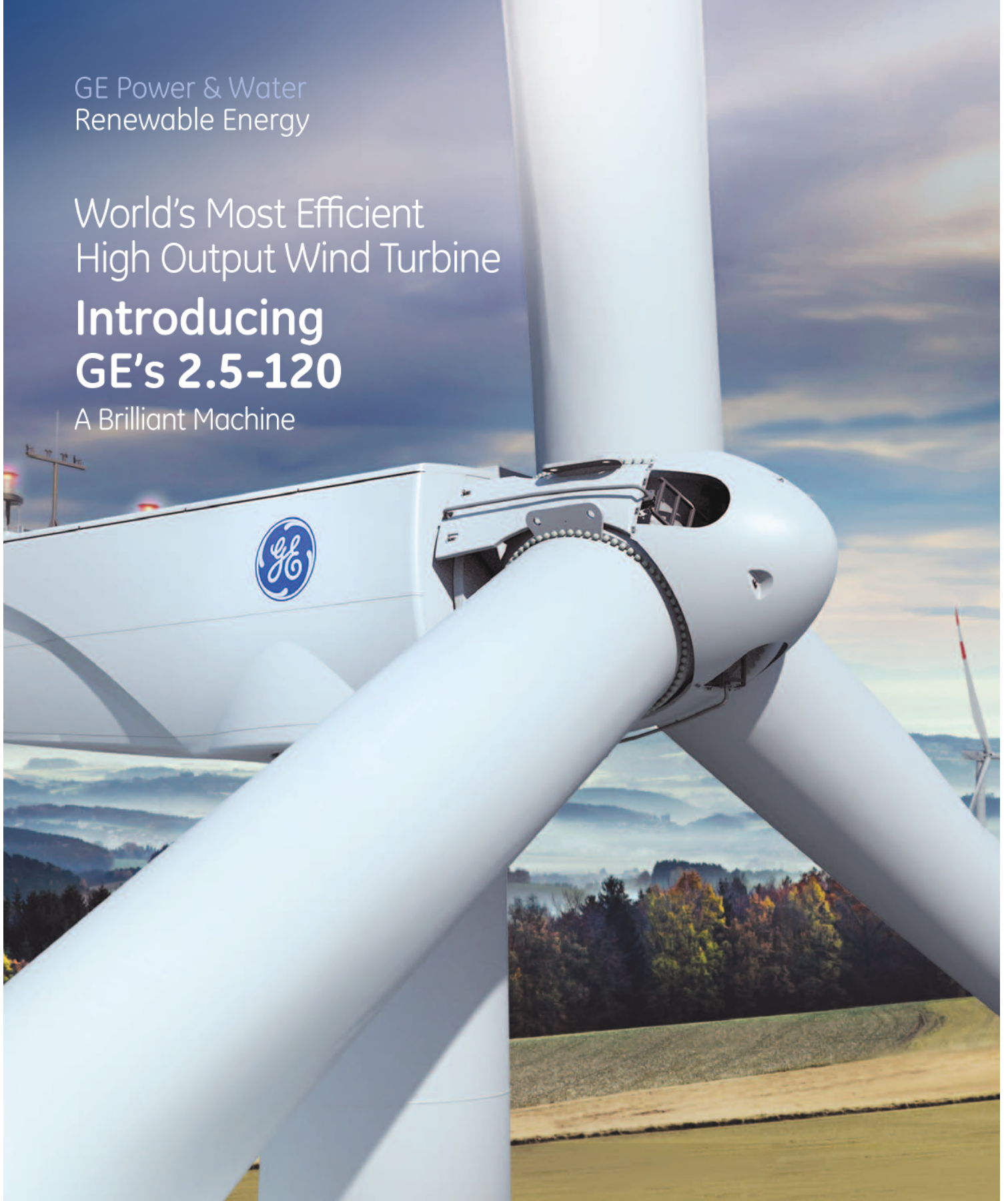
Exhibit A-3a GE 2.5-120 Product Brochure

GE Power & Water
Renewable Energy

World's Most Efficient
High Output Wind Turbine

Introducing GE's 2.5-120

A Brilliant Machine



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a product of
ecomagination

Harnessing the Power of Wind

Product evolution. It's one of the things GE does best—especially when it comes to the next generation of wind turbines. As wind becomes a more significant portion of the energy mix, GE continues to deliver products and services designed to create more value for our customers.

More power, lower cost of electricity and higher reliability are the prime goals of GE's wind product portfolio. Our customers have come to rely on GE to work towards a better future while helping them become more profitable. We inspire them to succeed, while they inspire us to continue doing what we do best—delivering on proven performance, availability and reliability—to create more value for our customers.

GE's 2.5-120 Wind Turbine

Increased customer value

GE's 2.5 MW product platform is evolving towards a wider range of site applications by introducing the 2.5-120 wind turbine designed for IEC Wind Class III environments. This new turbine features a 120-meter rotor in combination with the proven single-blade pitch control that offers the latest enhancements in load management controls, low acoustic emissions, efficient electrical power conversion and robust performance.

Designed specifically for forested areas and low to medium wind sites, GE's 2.5-120 wind turbine offers a 25% increase in capacity factor (CF) and a 15% increase in Annual Energy Production (AEP)—resulting in more full load operating hours and improved project economics for wind developers. Focusing on performance, and efficiency, GE's 2.5-120 wind turbine will provide higher customer value through evolutionary design.

GE's 2.5-120 wind turbine, with a 139-meter hub height and 120-meter rotor diameter, allows customers to build profitable wind farms at low wind and forested sites.

Building Upon Proven Performance

With an installed global fleet of 21,000+ units, GE's proven platform runs at 98%+ availability, making it the world's best producing fleet. Together with GE's tailored customer service options, GE can enhance the value of your assets over their lifetime—generating high yields at low to medium wind speeds—and reduce the cost of electricity for our customers.

With over 1,100 units in operation, GE's 2.5 MW platform is the turbine of choice for two of the world's largest onshore wind farms in operation today:

- 845 MW Shepherds Flat wind farm, USA
- 600 MW Fantanele wind farm in Romania

As one of the world's leading wind turbine suppliers, GE provides evolutionary wind turbine designs and support services extending from development assistance to operation and maintenance for the successful implementation of projects. This creditable track record supports customers with the finance-ability of their wind projects.

Technical Description

Sharing the experience from over 1,100 operating 2.5 MW turbines, GE's 2.5-120 is based on this proven platform design. With the new 120-meter rotor, the 2.5-120 wind turbine is designed to meet certification requirements for IEC Wind Class III and German DiBT WZ2 environments. GE's patented loads control system proactively measures stress during operation. The individually adjustable blade pitch system from GE is used to operate the unit for high energy generation. The GE partial power converter system efficiently converts the produced energy into the 50/60 Hz power network, maximizing the annual energy production. With over 21,000 wind turbines in operation, GE has the worldwide reputation to meet the strictest grid requirements and deliver reliable energy into the grid.

Focusing on performance, reliability and efficiency, GE's 2.5-120 wind turbine will provide high customer value through evolutionary design.

Features and Benefits

GE's 2.5-120 offers the following technical features:

- 120-meter rotor diameter
- 50/60 Hz
- 110-meter or 139-meter tower
- 106 dB(A) standard sound power level
- Sound reduced operations and sound mitigation technology available
- Standard and cold weather extreme package



GE's 2.5-120...a Brilliant Machine

How do you define brilliance? GE is redefining the future of wind power by integrating the Industrial Internet with GE's industry leading power conversion technology, enabling "grid friendly integration of wind farms around the globe. By helping to manage the variability of wind, GE is working to provide smooth, predictable wind power to the world regardless of what Mother Nature throws its way.

- **Increased output** – less downtime through turbine to turbine communication
- **Productivity** – enhanced diagnostics with Mark*Vle controller from GE
- **Smooth grid integration** – with wind farm to grid communication
- **Improved grid voltage support in the area** – with windfarm to windfarm coordination
- **Technical support around the world** – turbine to remote monitoring communication
- **New revenue streams** – advanced forecasting algorithms and storage ready

Tailor-Made Service Solutions

A full service agreement (FSA) is offered on GE's 2.5-120. Maximize turbine operating performance and life by adding predictive condition monitoring services, unplanned maintenance with advanced services and up tower repairs, as well as options for turbine performance and life extension enhancement. Under this comprehensive package GE provides the customer with the highest level of performance.

For customers that prefer to manage the O&M of their assets in another type of structure, flexible options to support our customers are available:

- Service support
- 24/7 Remote control center
- Upgrades packages
- Performance improvements
- Spare part centers
- Lifetime extension

We have 1,000+ service professionals—available to you 24/7.

GE's 2.5-120



World's most efficient, high output wind turbine

World's Most Efficient High Output Wind Turbine

- **Value.** Enabling competitive power at low wind speed sites.
- **Reliability.** GE global fleet at 98%+ availability.
- **Experience.** 21,000+ wind turbines installed globally.
- **Finance-ability.** Evolutionary design using "proven technology" from GE's 1.5 MW and 2.5 MW platforms.



1.6 MW wind turbine, Tehachapi, California, U.S.A.

Powering the world...responsibly.

For more information please visit www.ge-energy.com/wind.



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GEA30534 (02/2013)

EXHIBIT A TURBINE INFORMATION

Exhibit A-3b GE Safety Manual

Technical Documentation

Wind Turbine Generator Systems

1.x Series



Safety Manual

-Please read first-

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www.gewindenergy.com



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All technical data is subject to change in line with ongoing technical development!

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1 Basic Information on the Technical Documentation for GE Energy Wind Turbine Generator Systems

This "Safety Manual" is a constituent part of the technical documentation for GE Energy wind turbine generator systems. In the case of offshore plants, the supplementary safety information for offshore plants is also to be considered.

The safety manual must be read and understood by the operating and maintenance personnel and the owner, in order to guarantee safety in and on the wind turbine generator system and to prevent accidents and personal injuries.

In addition to the safety manual, the respective specific safety information in the technical documentation, in which e.g. installation or maintenance is described, must always be read.

The basic rules of conduct for safe working in and on the WTG are described in this safety manual.

Any unclear points in the technical documentation, which may jeopardize the correct performance of work in or on the WTGS, must first of all be clarified. Contact GE Energy for advice if necessary.

In addition to the safety manual, the local safety and accident prevention regulations must be complied with to ensure the safety of personnel.

Explanation of Abbreviations

WTGS	Wind Turbine Generator System
PPE	Personal Protective Equipment
EHS	Environment, Health & Safety

2 General Safety Principles

The GE Wind Energy 1.x Series Wind Turbine Generator System (WTGS) has been built according to recognized safety rules.

Hazards for the user or third parties and impairment of the wind turbine generator system and other property may nevertheless arise during the use of this facility if it is

- operated by untrained or uninstructed staff
- not used properly
- improperly maintained or serviced

The owner / operator responsible for the WTG must ensure that

- The safety manual and the operating manual are available and are complied with
- The service conditions and technical data are complied with
- The protective devices are used
- The prescribed maintenance work is carried out
- The maintenance personnel are immediately informed or the plant immediately shut down if higher temperatures, noise, vibration, etc. compared to operation at normal rating should occur.

The operating manual contains the information required for operation of the WTG by qualified personnel.

The warranty of the manufacturer is only provided if the currently valid operating manual is observed and complied with.



Take precautions against malfunctions and thereby prevent personal injury or death and material damage!

2.1 Personnel Groups

Different personnel groups are specified for carrying out the various tasks in and on the WTG. Before work is started, it must be ensured that the personnel in question have the requisite qualifications to carry out the respective tasks. If necessary, suitable training or qualification measures are required, or the work is carried out by other personnel with a suitable qualification.

2.1.1 Qualified Persons

Work on electrical equipment and machinery may only be carried out by qualified persons who are familiar with the currently applicable safety and installation regulations. The qualified persons must be authorized to carry out the requisite tasks by the person responsible for safety in the WTG under the health and safety regulations. A qualified person is a person who

- has appropriate training and experience
- is familiar with the currently applicable standards, regulations and accident prevention regulations and generally recognized code of practice
- has been instructed in the operating principle and service conditions of electrical and mechanical drive systems and
- can recognize and avoid dangers

Unqualified persons may not be deployed.

2.1.2 Technically Competent Persons

Technically competent persons are persons who have the requisite technical knowledge for the inspection of work equipment as a result of their professional training, their professional experience and their current professional activity.

2.1.3 Experienced Persons

An experienced person is someone who, on the basis of his technical training and experience, has gained adequate knowledge in the particular field of the equipment/device to be tested and who is acquainted with the pertinent national industrial safety legislation, the regulations for the prevention of accidents, directives and generally accepted engineering standards (DIN standards, VDE regulations, technical rules of other member states of the European Union or other contracting states of the agreement concerning the European Economic Area as well as OSHA/ANSI/NFPA/CSA and other standards and regulations for the Americas) to the extent that he is able to assess the safe working order of the equipment/device concerned.

2.1.4 Experts

Experts are persons who are familiar with the relevant industrial safety regulations, directives and generally recognized code of practice and can verify and authoritatively assess the presence of threats and dangers.

2.2 Proper Use

The GE Energy 1.x Series Wind Turbine Generator Systems are intended solely for the generation of electrical power by means of wind energy.

Any other use or use extending beyond this is deemed to be improper. The operator / owner of the WTG bears the sole responsibility for any damage resulting there from.

The same also applies to any unauthorized modifications made to the WTG. As a general principle, modifications to the WTG may be carried out only after consultation with GE Energy, in order to guarantee the safety and the correct functioning of the WTGS.

Proper use also includes compliance with the information on

- Safety
- Operation
- Service and maintenance

provided in the technical documentation of the WTGS.

2.3 General Information

The wind turbine generator system may only be used in a technically perfect condition in line with the technical documentation. In addition, it must be used as intended, as well as with safety in mind and with an awareness of the dangers. Any malfunctions, particularly those which could impair safety, must be reported and remedied immediately.

Anybody who has been authorized to carry out erection, commissioning, operation or maintenance work must have read and understood the complete operating manual, in particular the safety manual.

It is too late to read the manual while carrying out the work. This applies especially to personnel who are only occasionally deployed on the wind turbine generator system.

The operating manual must be readily available at the site of operation of the wind turbine generator system at all times. It is kept in the main cabinet of the WTG.

The relevant regulations for the prevention of accidents (see "Information for the Operator" in "Basic information regarding the operating instructions manual") and any other generally recognized safety and industrial health regulations must also be complied with.

We cannot be held liable for any damage or accidents as a result of non-compliance with the operating instructions, the relevant regulations for the prevention of accidents and any other generally recognized safety and industrial health regulations.

Responsibilities for the different activities within the framework of operation, service and maintenance of the WTG must be clearly defined and complied with. This is the only way to prevent mistakes, particularly in dangerous situations.

The instructions for

- Shutting down the WTG
- Maintenance work
- Handling the rotor lock
- Entering the rotor hub

must be followed during the inspection, maintenance and repair of the wind turbine generator system and the safety devices.

3 Marks, Signs and Symbols

3.1 Danger Classifications and Symbols

The following danger classifications and symbols are used in the technical documentation for the GE Energy 1.x Series wind turbine generator systems:



Danger!

Exact description of the danger!

Indicates an imminent threatening danger resulting in death or serious injury.



Warning!

Exact description of the danger!

Indicates a potentially hazardous situation that may result in death or serious injury if the dangerous situation is not avoided.



Caution!

Exact description of the danger!

Indicates a potentially hazardous situation that may result in slight or minor injury if the dangerous situation is not avoided.



Attention!

Exact description of the danger!

Indicates a potentially hazardous situation that may result in damage to the WTG or surrounding area if the dangerous situation is not avoided.



Danger!

Danger! Electricity!

This symbol is used in safety information for electrical energy.



Notes include user tips and useful information.

The notes should be read in the interests of proper use as well as with regard to proper operation and maintenance of the WTG.

All notices and symbols directly attached to the WTG, such as safety signs, operating notices, rotation arrows, component identification markings, etc., must be observed without fail. They may not be removed and must be maintained in a fully legible condition.

3.2 Marks and Signs attached by GE Energy

The personnel in the WTG must be able to check certain data at all times, in order to ensure safe operation of the WTG. The following information must therefore be clearly visible and permanently attached:

1. Marks for identification of the device
2. Characteristic values by means of which the permissible limits for safe use are specified, e.g. permissible load, rotational speed, pressure.

In addition, information about the prescribed use and about possible dangers which could arise when handling a device must be provided.

Safety marks could be texts, signs, signals, pictographs and colors. All texts are to be in two languages, i.e. English and the respective national language. Pictographs must be easy to understand and self-explanatory.

The signs are made of durable materials with stable colors.



The instructions on the safety signs and marks must be followed.






The presence and legibility of the safety signs must be checked as part of the regular maintenance work. Any missing or illegible safety signs must be replaced immediately.

The signs in the wind turbine generator systems may differ as a result of country-specific differences in the environmental and safety regulations.

All possible signs attached by GE Energy are listed in the following:

3.2.1 Tower

<p>Keep escape and rescue routes clear!</p> <p>This sign is attached in the entrance area of the turbine.</p> <p>Not for USA/Canada!</p>	 <p>Escape and rescue routes must be kept clear at all times!</p> <p>Die Flucht- und Rettungswege müssen frei von Hindernissen sein!</p> <p>10/W2006P002</p>
<p>It is strictly forbidden to leave the WTGS with rotor lock applied!</p> <p>This sign is attached in the tower at the bottom of the ladder.</p>	 <p>It is strictly forbidden to leave the Wind Turbine Generator System with the rotor lock applied!</p> <p>Das Verlassen der Windenergieanlage bei eingelegter Rotorarretierung ist streng verboten!</p>

<p>Falling hazard warning on trap doors and floor openings!</p> <p>This sign is attached to each platform.</p>	
<p>Falling objects hazard warning!</p> <p>This sign is attached to each hatch.</p>	
<p>Admissible maximum loading of the platform!</p> <p>This sign is attached to each platform.</p>	<div> <p>Admissible max. loading of the platform 200 kg/m²</p> <hr/> <p>Zulässige Höchstbelastung der Plattform 200 kg/m²</p> </div>
<p>Always close hatch after climbing through!</p> <p>This sign is attached to each platform.</p>	<div>   <p>Attention!</p> <p>Hatch always to be closed after climbing through!</p> <p>Achtung!</p> <p>Luke immer nach dem Durchstieg schließen!</p> </div>
<p>Climbing the WTG - Things to do!</p> <p>This sign is attached in the tower near the ladder.</p>	<div>  <p>Before climbing the Wind Turbine Generator System:</p> <ul style="list-style-type: none"> • make sure that you are familiar with the safety information in the technical documentation, • put on personal protective equipment! <p>Carry a mobile phone!</p> <hr/> <p>Vor dem Bestelgen der Windenergieanlage:</p> <ul style="list-style-type: none"> • mit den Sicherheitshinweisen der technischen Dokumentation vertraut machen, • persönliche Schutzausrüstung anlegen! <p>Mobiltelefon mitführen!</p> </div>

<p>Danger: Electricity!</p> <p>This sign is attached to the outside of the door..</p>	
<p>Dangerous batteries!</p> <p>This sign is attached to the emergency power supply unit and to the main cabinet.</p>	
<p>Attention, confined space!</p> <p>This sign is attached to the underside of the access hatch leading to the transformer section.</p>	
<p>No access for persons with pacemakers!</p>	
<p>Fire extinguisher!</p> <p>This sign is attached in the tower near the fire extinguisher.</p> <p>Not for USA/Canada!</p>	

ONLY WITH TRANSFORMER IN TOWER:**Attention! High voltage!**

This sign is attached to the outside of the door, the switch gear, the transformer cage and the hatch to the tower base.

**Access forbidden!**

This sign is attached to the outside of the door.

**First Aid!**

This sign is attached at the bottom of the tower.

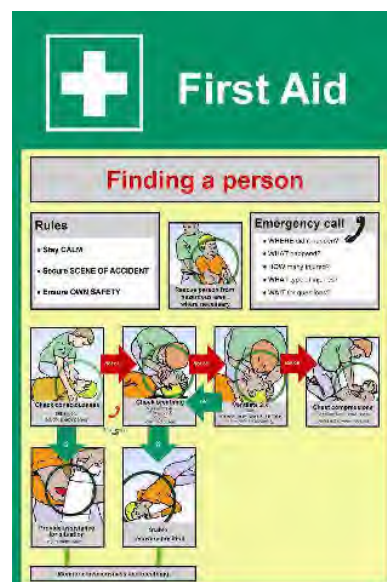
Not for USA/Canada!



First Aid!

This sign is attached at the bottom of the tower.

Not for USA/Canada!



Climbing the WTG - Things not to do!

This sign is attached in the tower at the bottom of the ladder.













Tie off point

Only for USA/Canada!




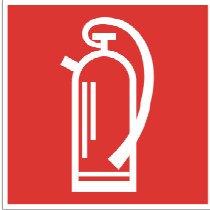





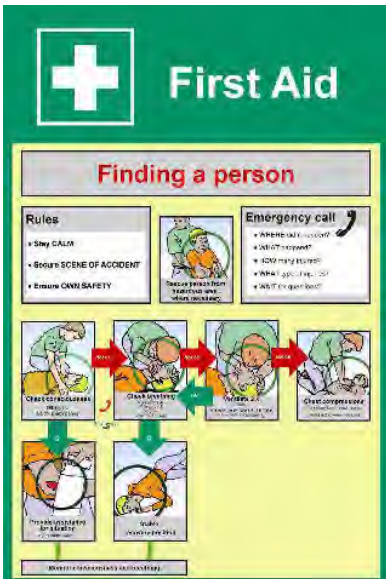

3.2.2 Nacelle







Description	Sign
<p>Pinch Point (ANSI)</p> <p>This sign is attached in the nacelle during the assembly.</p> <p>Only for USA/Canada!</p>	
<p>Pinch Point (ISO)</p> <p>This sign is attached in the nacelle during the assembly.</p> <p>Only for USA/Canada!</p>	
<p>Instructions for working in the nacelle!</p> <p>This sign is attached in the nacelle.</p>	
<p>Instruction for the rotor lock on the high-speed shaft!</p> <p>This sign is attached to the cover beside the rotor lock on the high-speed shaft.</p>	



Description	Sign
<p>Allowable Loading rotor lock - low-speed shaft!</p> <p>This sign is attached to the rotor lock of the low-speed shaft.</p> <p>This sign shown here is a representative example; versions with the updated wind speeds for newer models may be applied.</p>	
<p>It is forbidden to leave the WTGS with rotor lock applied!</p> <p>This sign is attached in the nacelle above the passage to the tower.</p>	
<p>Standing on the starter terminal box prohibited – NOT A STEP!</p> <p>This sign is attached to all surfaces which may not be used as a step.</p>	
<p>Warning: strong wind currents!</p> <p>This sign is attached to the hatch leading to the roof of the nacelle (exit to the hub).</p>	
<p>Falling Hazard Warning!</p> <p>This sign is attached to the hatch leading to the roof of the nacelle (exit to the hub).</p>	
<p>Caution! Hot surface.</p> <p>This sign is attached to the generator.</p>	

Description	Sign
<p>ONLY FOR PLANTS WITH COLD WEATHER EQUIPMENT!</p> <p>Caution! Hot surface.</p> <p>This sign is attached to the anemometer on the roof of the nacelle.</p>	
<p>Instructions for entering the rotor hub!</p> <p>This sign is attached to the hatch leading to the roof of the nacelle (exit to the hub).</p>	
<p>Instructions for yaw stop!</p> <p>This sign is attached beside the yaw stop switch on the uppermost tower platform.</p>	
<p>ONLY FOR PLANTS WITH AN "EMERGENCY DESCENT HATCH":</p> <p>Falling hazard at hatches!</p> <p>This sign is attached to the optional emergency descent hatch.</p>	





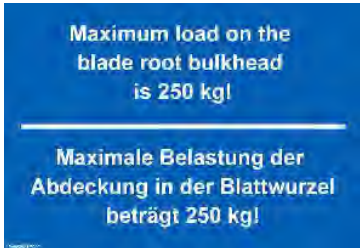
Description	Sign
<p>Maximum load on the bottom surface in the nacelle enclosure!</p> <p>This sign is attached in the nacelle enclosure near the generator.</p>	
<p>Warning! Must be tied off at all times!</p> <p>This sign is attached to the hatch leading to the roof of the nacelle (exit to the hub).</p> <p>Only for USA/Canada!</p>	
<p>Attention! Danger from rotating parts!</p> <p>This sign is attached to the yaw and the low-speed and the high-speed shaft.</p>	
<p>Fire extinguisher!</p> <p>This sign is attached in the nacelle near the fire extinguisher.</p> <p>Not for USA/Canada!</p>	
<p>ONLY FOR PLANTS WITH AN "EMERGENCY DESCENT HATCH":</p> <p>Emergency exit!</p> <p>This sign is attached above the emergency descent hatch!</p>	
<p>First Aid!</p> <p>This sign is attached near the First Aid box.</p> <p>Not for USA/Canada!</p>	

Description	Sign
<p>First Aid!</p> <p>This sign is attached near the First Aid box.</p> <p>Not for USA/Canada!</p>	
<p>First Aid!</p> <p>This sign is attached near the First Aid box.</p> <p>Not for USA/Canada!</p>	
<p>Use the railing for hooking!</p> <p>This sign is attached beside the roof hatch in the nacelle enclosure.</p> <p>Not for USA/Canada!</p>	

Description	Sign
<p>Attention! Use the railing for hooking!</p> <p>This sign is attached beside the roof hatch in the nacelle enclosure.</p> <p>Only for USA/Canada</p>	
<p>Hook onto Spinner!</p> <p>This sign is attached to the hatch leading to the nose cone.</p> <p>Not for USA/Canada!</p>	
<p>Hook onto Spinner!</p> <p>This sign is attached to the hatch leading to the nose cone.</p> <p>Only for USA/Canada</p>	
<p>Lift point (ANSI)</p> <p>This sign is attached to the lifting lugs of the main frame.</p> <p>Only for USA/Canada</p>	
<p>Lift point (ISO)</p> <p>This sign is attached to the lifting lugs of the main frame.</p> <p>Only for USA/Canada</p>	
<p>Lift point for top cover only (ANSI)</p> <p>This sign is attached to the tie-off points of the top cover.</p> <p>Only for USA/Canada</p>	

Description	Sign
Lift point for top cover only (ISO) This sign is attached to the tie-off points of the top cover. Only for USA/Canada	 

3.2.3 Hub

Description	Sign
Dangerous batteries! This sign is attached to the battery cabinet in the hub.	
Attention! Danger from rotating parts! This sign is attached to the pitch drive mechanisms.	
Danger: Electricity! This sign is attached to the axis cabinets in the rotor hub.	
Falling Hazard Warning! This sign is attached to the hatches of the hub.	
Maximum load on the blade root bulkhead This sign is attached above and below each rotor blade connection, so that the signs are exposed to view on entering the rotor blade.	

Description	Sign
<p>Attention! Confined space</p> <p>This sign is attached to the access hatch leading the hub.</p>	 <p>The sign features a yellow background with a red border. At the top, there is a yellow triangle with a black exclamation mark and a red circle with a black hand icon. Below this, the text reads: "Attention! Confined space" in black, "No unauthorized entry!" in white on a red background, "Achtung! Enger Raum" in black, and "Zutritt für Unbefugte verboten!" in white on a red background.</p>
<p>Caution! May energize without warning (ANSI)</p> <p>This sign is attached to the pitch drive mechanisms.</p> <p>Only for USA/Canada</p>	 <p>The sign has a yellow background with a black border. It contains the text: "Caution!" in large black letters, followed by "May energize without warning" in smaller black letters.</p>
<p>Caution! May energize without warning (ISO)</p> <p>This sign is attached to the pitch drive mechanisms.</p> <p>Only for USA/Canada</p>	 <p>The sign consists of two parts. On the left is a yellow triangle with a black lightning bolt. On the right is a white rectangle with a yellow border containing the text: "CAUTION" in black, "May energize without warning" in black, and a small code "104W2755P001" at the bottom.</p>
<p>Secure hatch (ANSI)</p> <p>This sign is attached to the access hatch to the hub</p> <p>Only for USA/Canada</p>	 <p>The sign has a yellow background with a black border. It contains the text: "Secure hatch" in large black letters.</p>
<p>Secure hatch (ISO)</p> <p>This sign is attached to the access hatch to the hub</p> <p>Only for USA/Canada</p>	 <p>The sign consists of two parts. On the left is a yellow triangle with a black exclamation mark. On the right is a yellow rectangle with a black border containing the text: "Secure hatch" in black.</p>
<p>Caution! Handle or Step only (ANSI)</p> <p>This sign is attached to the handles in the entrance to the hub.</p> <p>Only for USA/Canada</p>	 <p>The sign has a yellow background with a black border. It contains the text: "Caution!" in large black letters, followed by "Handle or step only" and "not for anchor" in smaller black letters.</p>
<p>Caution! Handle or Step only (ISO)</p> <p>This sign is attached to the handles in the entrance to the hub.</p> <p>Only for USA/Canada</p>	 <p>The sign consists of two parts. On the left is a red circle with a black diagonal line. On the right is a white rectangle with a yellow border containing the text: "CAUTION" in black, "Handle or step only!" and "Not for anchor!" in black, and a small code "104W2755P001" at the bottom.</p>

4 Information for the Operator / Owner of the Wind Turbine Generator System

The operator of the WTG is responsible for ensuring that no unauthorized persons remain inside or on the WTG. The WTG must be kept locked to prevent this.

The wind turbine generator system may only be started up if it has been completely assembled and is in working order.

The wind turbine generator system may only be operated if all safety equipment and safety-relevant devices, e.g. detachable protective equipment, are in place and operational.

If any malfunctions occur or if ice builds up on the rotor blades, the wind turbine generator system must be shut down immediately and secured. Malfunctions are to be remedied without delay by trained technical personnel.

In the case of malfunctions which are not automatically reset by the control system of the WTG, GE Energy must be contacted before a restart is carried out, in order to confirm that the WTG may be placed in the automatic operating mode (i.e. whether the WTG may be restarted).

Follow the switch-on and shut-down procedures and take note of the visual and monitoring displays in accordance with the operating manual!

In addition to this, the operator/owner of the WTG must comply with the following additional safety instructions (if maintenance is not carried out by GE Energy employees):

- If the WTG is not directly connected to the public telephone system, the maintenance personnel must have a cell phone or radio with them when ascending the tower.
- The personnel must be informed about who to contact in an emergency. (Telephone numbers of a rescue center, police, fire department...)
- For safety reasons, the personnel must be instructed that the WTG may only be entered by a minimum of two persons.
- Special authorization from GE Energy is required to carry out inspection and maintenance work inside a WTG while it is in operation.
- The personnel must be instructed to keep the WTG escape routes clear at all times when carrying out work as a part of maintenance or operation.
- In the case of work involving a fire hazard, the personnel must have a fire extinguisher ready at hand, in order to be able to immediately extinguish any fire that may start.
- Personnel are not permitted to remain at a higher level in the WTG while work involving a fire hazard is being carried out.
- Personnel instructed to carry out work in or on the WTG must be provided with instructions and the appropriate personal protective equipment (PPE).
- The WTGS must only be entered when a second person is available to provide assistance or call for help in case of accident.

- If the WTG is part of a wind farm and connected to a wind power plant, this safety manual must be supplemented in cooperation with the local power supply company, so that it also:
 - describes the safety aspects relevant to the wind farm
 - describes the exchange of information and names the persons who are to be contacted
 - describes access to basic first aid facilities

5 Signs to be attached by the Operator/Owner

The operator/owner of the WTG is obliged to attach additional warning signs to the WTG. These are intended to cover safety aspects which are not related to the scope of supply of the manufacturer of the WTG.

The warning signs must state that

- It is dangerous and prohibited for unauthorized persons to enter or climb the WTG
- It is prohibited to remain in the vicinity of the WTG while work is being carried out outside the nacelle
- Deposits of ice which have formed on the rotor blades (depending on the location of the WTG) could drop off

The operator/owner is responsible for seeing that any components or plant components which he has supplied are properly equipped with signs.

6 Safety Equipment

The safety equipment serves to reduce risks and dangers. You will find further information on equipment and items which are subject to inspection in the annex of this safety manual.

6.1 Personal Protective Equipment

Everybody must wear Personal Protective Equipment (PPE) when working on or in the WTG to protect themselves from injury.



Danger!

Danger of accident!

Never enter or climb the WTG without the personal protective equipment. Otherwise there is danger of injury and falling.

The PPE is especially required for climbing the tower. It comprises:

- Safety harness
- Cable of rail grab device/fall arrestor
- Double lanyard with shock absorber
- Hard hat
- Safety boots
- Gloves
- Safety glasses
- Hearing protection (if required)
- Respirator (if required)
- Thermal clothing (if required)
- Suspension travel straps

The PPE must be of an approved type; must be compliant with the applicable local regulators; and must bear marks of conformity stating that it is suitable for the work and protection involved and that it is also suitable for the climatic conditions at the site of the WTGS.



Note!

The extent and the equipment of the personal protective equipment may vary in some countries. Please comply with the local regulations!

Optionally, safety harness and travelling safety hooks may be supplied by GE Energy. The remaining constituents of the PPE are not part of the scope of supply of the wind turbine generator system. If supplied the safety harnesses and travelling safety hooks must be properly stored in the WTG and must be accessible.

If several persons ascend the tower simultaneously, personal protective equipment must be available for the respective number of persons.

**Note!**

Check the completeness, the condition and the function of your personal protective equipment in good time before entering the WTG. If a piece of the equipment is missing, it must be replaced before starting work.

The safety harness and the entire safety equipment must be checked before use. Damaged equipment must never be used.

The PPE must be inspected and tested by a technically competent person after any fall, or at the intervals recommended by the manufacturer at least.



Follow the manufacturer's directions for use for all component parts of the personal protective equipment!

6.2 Safety Harness

**Attention!**

A Safety harness and all safety equipment should never be exposed to acids/caustic chemicals. If this is unavoidable, follow manufacturer instructions for treatment.

Protect from sharp edges and sharp-edged objects.

Wash and dry according to manufacturer's instructions.

Store in a well-aired place out of direct sunlight.

The safety harness is used to protect personnel during the ascent to the nacelle of the WTG, during the descent from the nacelle of the WTGS and, in combination with a lanyard and a shock absorber, when carrying out work in areas where there is a danger of falling.

Optionally, safety harness and travelling safety hooks may be supplied by GE Energy.

The safety harnesses and the entire safety equipment must be cleaned, cared for, maintained and stored in accordance with the manufacturer's instructions.

Follow the manufacturer's instructions when putting on the safety harness.

6.2.1 Example of Putting on a Standard Safety Harness

As previously mentioned, the manufacturer's instructions should always be followed when putting on a safety harness. An example of how to wear a safety harness is included below.

1. **Hold the safety harness in such a way that you can see in which way it is going to be put on at a later stage.**

(Fig. 1)

Ensure that the loops are not twisted.



Fig. 1: Preparing the safety harness

2. **Insert your arms through the yellow shoulder straps and place the safety harness on your shoulders like a rucksack.**

(Fig. 2 and Fig. 3)



Fig. 2: Insert your arms through the shoulder straps



Fig. 3: Safety harness on the shoulders

3. Closing the stomach strap

Take the two loops positioned at stomach height. Pull the right-hand loop (1) through the eyelet (2) and guide the end of the loop through the rectangular frame (3). (Fig. 4)
Adjust the strap to ensure a close fit.

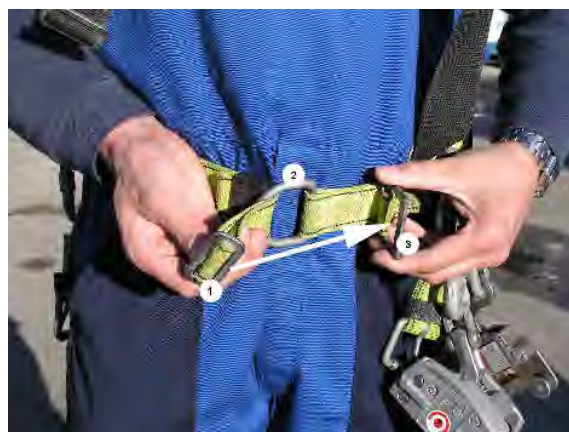


Fig. 4: Closing the stomach strap

4. Closing the chest strap

Take the two straps positioned at chest height. (Fig. 5)
Pull right-hand strap (1) through the eyelet (2) and insert its end through the rectangular frame (3) also located on the right-hand strap.
Adjust the strap to ensure a close fit. (Fig. 6)

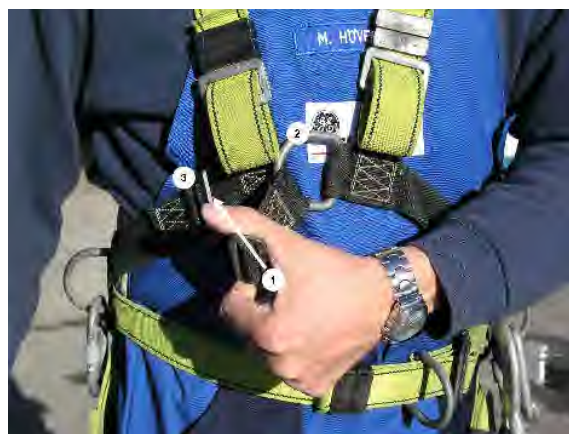


Fig. 5: Closing the chest strap



Fig. 6: Closed chest strap

5. Closing the leg loops

Push both loose leg loops from behind through the legs and to the front.

Pull the leg loops through the strap closure and pull the leg loops tight. (Fig. 7)



Fig. 7: Closing the leg loops

6. Check that all straps are straight and close fitting and that the buckles are closed correctly.

(Fig. 8)



Fig. 8: Safety harness correctly fitted

6.2.2 Cable or Rail Grab Device/Fall Arrestor

The manufacturer's instructions for use of cable or rail grab device are to be followed.

In combination with the safety harness, the cable or rail grab device is a safety device for ascending/descending the tower via the ladder. Should somebody slip off the ladder, the cable or rail grab device clamps on tightly to the safety rail and prevents a fall. The system consists of a fixed guide, fastening elements, and a travelling arrestor device. A steady straight-line ascent and descent of the ladder without the user leaning back in the harness is best way to ensure that the travelling safety hook runs freely.



Warning!

Beware of hand injuries!

A free running travelling safety hook can crush your hands if you grasp the device or the safety rail or cable.

Keep your hands on the sides of the ladder during the ascent/descent.

Using the Cable or Rail Grab Device

Rail Grab Device

1. Insert the travelling safety hook into the retaining eyes of the safety harness.
2. Push the travelling safety hook into the guide rail mounted on the ladder.
3. Ascend and descend the ladder slowly and carefully.



Fig. 9

Cable Grab Device

1. Insert the cable grab fall arrestor and the shock pack assembly into the D-ring (or retaining eyes) of the safety harness.
2. Push the cable grab fall arrestor into the wire rope attached to the ladder.
3. Ascend and descend the ladder slowly and carefully.
4. Ensure to be in contact with the ladder on at least 3 points at all times.



Fig. 10

6.3 Protective Equipment for Measurements on Live Components



Danger!

Danger! Electricity!

Contact can cause extremely serious injuries and even death.

Life-threatening hazard!

Special PPE is required for measurements on live components. This provides protection against electricity flowing through the body, e.g. as a result of touching live components in operation. Furthermore, it provides protection against accidental arcs caused by insulation breakdowns e.g. as a result of switching operations under load.

Refer to NFPA 70E document (GE Standard) for further guidance on PPE requirements for electrical work.

6.4 Hooking Points

As a rule, the hooking points are marked in yellow and are designated with a statement of the permissible safe work load. These hooking points are to be used with a safety harness and lanyard with a shock absorber to provide protection in areas where there is a danger of falling.



Attention!

Exchange of the rail

The nose cone rail and nacelle rail must be exchanged after any fall!

6.5 Abseiling Device

Not all wind turbine generator systems are supplied with an abseiling device. There is sometimes only a certain number of devices, especially in larger wind farms.

The abseiling device (e.g. abseiling device AG 10 K – RK Sicherheitstechnik) has a rope which is long enough for the respective height of the tower of the WTG.

The abseiling device is stored in a lead-sealed equipment bag, which is located in a net beside the hatchway to the roof of the nacelle.



Fig. 11: Equipment bag in the net

The abseiling device is used by the personnel to abseil from high workplaces. It is not a fall arresting device, instead it is used primarily for the evacuation of personnel in the event of an accident or fire. In case of fire, it can be used to abseil from the roof of the nacelle of the WTG as a 2nd escape route.

As a rule, the hooking points for the abseiling device are marked in yellow and are designated with a statement of the permissible safe work load. The abseiling device is attached to the hooking point by means of a snap hook or to the roof rail by means of a sling rope and a snap hook.



Attention!

Danger of accident with a defective abseiling device!

In an emergency, your life could depend on the abseiling device working properly!

As a result, check the integrity of the seal of the equipment bag on each visit to the nacelle. The abseiling device is pre-assembled and is ready for use immediately after it has been removed from the equipment bag.

Carry out an additional visual inspection of the abseiling device immediately before use.



It is easy to operate the abseiling device incorrectly in emergency situations. As a result, ensure that you know how to operate the device and are familiar with the abseiling operation. Please also read the operating manual.

This is the only way to ensure that the correct maneuvers are carried out in an emergency.

6.5.1 Abseiling from the Roof of the Nacelle

Abseiling can take place individually or in pairs. The abseiling device may be loaded with a maximum of 225 kg up to a rope pitch of 100 m. Abseiling takes place at a speed of 0.7 m/s. The abseiling speed is regulated by means of a centrifugal brake.

A typical abseiling operation is described in the following. The procedure described may vary depending on the abseiling device. As a general principle, always follow the instructions of the manufacturer of the respective abseiling device!

1. **Make sure that your safety harness is put on correctly.**
2. **Secure yourself against falling by means of the lanyard. Attach the lanyard to tie-off points or nacelle rail. Step out on the roof of the nacelle.**
3. **Close the roof hatch.**
4. **Break the lead seal on the equipment bag.**
5. **Remove the abseiling device from the equipment bag.**

Leave the rope in the equipment bag.

6. Attach the abseiling device to the roof rail of the nacelle by means of the sling rope and the snap hook.
7. Secure the snap hook with the clamping nut.
8. Throw down the equipment bag with the rope.



Fig. 12: Abseiling device

9. Check the condition and the correct functioning of the device.
10. Check the rope for loops and knots.



Danger!

Interruption of abseiling through loops or knots!

Loops or knots in the rope prevent abseiling, since the rope cannot run through the abseiling device if it has a knot. As a result, always check the rope carefully!

REMOVE ALL LOOPS AND KNOTS FROM THE ROPE BEFORE YOU START ABSEILING!

11. Hook the snap hook on the short end of the rope into the two chest rings of your safety harness.
12. Sit in front of the roof rail on the edge of the nacelle.
13. Ensure that the length of rope between the chest rings of your safety harness and the abseiling device is pulled taut.
14. Release the lanyard attached for your safety.
15. Slowly put your weight on the rope of the abseiling equipment.

After you have let go of the nacelle and the roof rail, you will abseil at a speed of 0.7 m/s.

16. After you have reached the ground, immediately release the snap hook from the chest rings of your safety harness.
17. A second person waiting on the roof can then hook in the snap hook of the end of the rope which is now at the top and abseil as described.
The rope may have to be pulled through until the snap hook arrives at the top.
18. The device must be inspected by a technically competent person after a rescue or an abseiling exercise.

6.5.2 Care and Maintenance of the Abseiling Device

The textile components of the abseiling equipment may only be cleaned by the manufacturer.

If damage to the rope, snap hook or abseiling device is discovered, the escape equipment must be withdrawn from use and inspected by the manufacturer.

Under normal service conditions, a service period of 4-6 years can be assumed for the textile ropes.

The abseiling device must be inspected by a technically competent person or by the manufacturer after a rescue or an abseiling exercise or at the intervals recommended by the manufacturer at the latest.

6.6 Fire Extinguishers (optional feature)

Fire extinguishers are optional in the wind turbine generator systems (WTG). If fire extinguishers are supplied, the WTG is normally provided with a fire extinguisher in the tower and in the nacelle.



The locations of the fire extinguishers are identified by this sign.



Danger!

Danger: Electricity!

De-energize the installation before using the fire extinguisher.

After actuation of the medium-voltage circuit-breaker, keep a safe distance of at least one meter from the fire when extinguishing!

The fire extinguisher may only be used on electrical installations up to 1000V!



Ensure that you are familiar with the function and the operation of the fire extinguisher. Only thus can you act quickly and purposefully in emergency situations.

The use of fire extinguishers must be practiced. The personnel deployed in the WTG must therefore be trained in fire-fighting at regular intervals.

The fire extinguishers must be regularly inspected by a technically competent person in accordance with the national regulations. A record of the check with the date must be permanently affixed to the appliance in an easily visible location. The directions for use (on the fire extinguisher) must be followed before fire-fighting.

6.6.1 Operating principle of the optional fire extinguisher – An example

As a general principle, always follow the instructions of the manufacturer of the respective fire extinguisher.

1. Remove the safety tab (1).
2. Press down the fire-extinguishing button (2).
3. The perforating disk of the CO₂ cylinder (3) is opened and the CO₂ released for charging the tank. The appliance is ready for use.
4. The extinguishing agent, which is under pressure, flows through the riser pipe (4) to the valve armature.
5. After the fire-extinguishing button has been pressed, the extinguishing agent flows through the hose line to the spray fog nozzle (5).
6. The jet of extinguishing agent can be interrupted at any time by releasing the fire-extinguishing button.

(Contents of the fire extinguisher: 5 kg)



Fig. 13: Fire extinguisher - An example

6.6.2 Types of Fire Extinguisher

		Substances to be extinguished			
		Solid, glowing substances	Liquid substances or substances becoming liquid	Gaseous substances, also under pressure	Flammable metals (use only with a powder nozzle)
Types of Fire Extinguisher	Dry powder extinguisher with ABC dry powder	+	+	+	-
	Dry powder extinguisher with BC dry powder	-	+	+	-
	Dry powder extinguisher with metal fire powder	-	-	-	+
	Carbon dioxide fire extinguisher	-	+	-	-
	Water extinguishers (also with additives, e. g. wetting agent, antifreeze or corrosion inhibitor)	+	-	-	-
	Water extinguishers with additives which also extinguish liquid substances or substances becoming liquid in combination with water	+	+	-	-
	Foam extinguisher	+	+	-	-

6.7 First Aid

First aid is used for the initial treatment of an accident victim until the arrival of a doctor or until transport to a hospital, in order to avert a life-threatening situation or to prevent secondary injury.



There is a legal obligation to carry out rescue measures provided that this is possible without considerable self-endangerment.

The plant may never be entered alone, so that a second person can send an emergency call. If the interphone has a landline connection, the emergency call can be made via the interphone. An operational cellphone is to be carried at all times, in order to be able to ensure rapid assistance in an emergency.

Proceed as follows in the case of an accident:

1. **Keep CALM!**
2. **In the case of serious accidents and injuries, notify a rescue center by interphone, cell phone or radio.**
3. **Render first aid immediately.**
4. **Secure the scene of the accident.**
5. **Report all accidents (near-accidents, minor accidents, serious accidents) to your immediate supervisor. Also notify the EHS department of GE Energy.**



ATTENTION!

Keep access to the WTG clear!

The access roads to the plant must be kept clear at all times and be negotiable by car, in order to guarantee rapid and problem-free first aid in an emergency.

First Aid Box (Optional)

The provision of wind turbine generator systems (WTGS) with first aid boxes is optional.

If provided a first aid box is located in the nacelle of the wind turbine generator system for the treatment of minor injuries. Any material removed is to be replaced immediately after use.



This sign identifies the location of the first aid box in the nacelle.

7 Safety Devices

The safety devices of the WTG comply with the requirements of the following standards:

- DIN EN ISO 13857: 2008 - 06 – Safety distances to prevent danger zones from being reached by the upper limbs and lower limbs.

The unauthorized removal or the overriding (by-passing) of safety devices is a punishable offence. Any liability claim is invalid in the case of damage.

Any point at which danger can arise and all drive units are provided with protective covers, which can only be undone and removed by means of tools. These protective covers may only be removed by qualified staff and only for the performance of service and maintenance or repair work. The protective covers are to be refitted immediately after completion of the work.

The owner / user of the WTG and the personnel deployed by him for operation, maintenance and repairs bear the responsibility for an accident-free work process.

7.1 Emergency Stop Pushbuttons

Any power-operated work equipment with dangerous movements must have one or - if necessary - several emergency control units for the prevention or reduction of an imminent or arisen danger, by means of which the dangerous movements can be stopped or rendered ineffective in another manner.

The emergency stop pushbuttons are not dependent on electronic logic.

Emergency stop pushbuttons (red mushroom pushbutton on a yellow base) are located on the control cabinet, the top box in the nacelle and the control cabinet in the hub.



Fig. 14: Emergency stop pushbutton



The EMERGENCY STOP pushbutton may only be pressed in situations, in which the safety of personnel or the WTGS and its components is threatened.

Pressing the emergency stop pushbutton causes the safety chain to open, and the rotor of the WTG is brought to a standstill via emergency braking. Initiation of the safety chain causes the rotor blades to travel to the feathering position in the [emergency] battery mode! In addition to this, the WTG is de-energized except for the control voltage.

7.2 Rotor Lock

The GE 1.x series plants are equipped with two rotor locks.

7.2.1 Rotor Lock on the High-speed Shaft

The rotor lock on the high-speed shaft is located on the brake disk of the outgoing shaft of the gearbox. It must be engaged during all regular maintenance work on the drive train and for the physical inspection of the rotor hub.

Maintenance work on the drive train which requires the rotor shaft to be locked may only be carried out at wind speeds up to 15 m/s.

Maintenance work in the rotor hub may only be carried out at average wind speeds of less than 15 m/s. In this connection, the rotor lock on the high-speed shaft must be engaged. The rotor lock on the low-speed shaft **must not** be engaged.

If the turbine is unable to idle after a malfunction, the lock on the high-speed shaft must be engaged. It must be ensured that all three rotor blades are in the feathering position.

Engaging the Rotor Lock on the High-speed Shaft

1. Manual stop
2. Remove the locking pin of the rotor lock and advance the rotor lock as far as possible by means of the crank
3. If necessary, briefly actuate the "rotor brake" switch on the top box, in order to disengage the brake for a short time, thereby placing the brake disk in a better position.
4. Fully engage the rotor lock until the locking pin locks home again at the lower position.

7.2.2 Rotor Lock on the Low-speed Shaft

A lock is located on the rotor shaft flange of the low-speed shaft. This is only used for carrying out special work on the drive train. A sliding block or a sliding bolt which is guided in a fixture on the base frame is pushed onto the shaft flange in grooves or holes. The limit switch in the safety loop is opened as a result.

The rotor lock on the low-speed shaft may only be engaged up to the following average wind speeds:

- 8 m/s in the welded frame version up to 2004 (individual gusts up to a max. of 14 m/s)
- 12 m/s in the 1.5-82.5 (individual gusts up to a max. of 19 m/s).
- 15 m/s in the cast frame version and in the welded frame version from 2005 (individual gusts up to a max. of 24 m/s)

The current wind speed can be read on the SCADA display!

Engaging the Rotor Lock on the Low-speed Shaft

1. Manual stop
2. Manually turn the blades to the 0 degree position
3. Position the rotor to engage the lock
4. Engage the rotor lock on the high-speed shaft
5. Actuate the service switch to disconnect the battery in the rotor hub
6. Engage the rotor lock on the low-speed shaft
7. If necessary, release the lock on the high-speed shaft after leaving the hub.

If the wind speed unexpectedly increases, any installation work must be ended immediately, and the rotor lock must be disengaged in the reverse sequence.



Leaving the WTG with the rotor lock applied is strictly prohibited!

8 Residual Risks

Even if all the safety requirements are complied with, a residual risk remains during operation of the GE Energy 1.x Series wind turbine generator systems.

Anyone who works on and with the WTG must be aware of these residual risks and follow the instructions which prevent these residual risks from resulting in accidents or damage.



Danger!

Danger of injury during ascent!

The full-body safety harness must be put on and attached to the safety rail by means of the travelling safety hook during the ascent to the nacelle, in order to prevent the person ascending from falling. Any oil or grease deposits on the ladder must be removed immediately to prevent anyone from slipping while using the ladder.

Ensure that your footwear is clean!



Warning!

Falling objects hazard warning!

An object may be unknowingly and unintentionally dropped and hit and cause injury to somebody.

For this reason, only one person at a time may climb a section of the ladder between two platforms. The hatch covers must be closed again immediately after they have been passed through.

Tools and equipments must be secured while climbing and transitioning to the nacelle roof or the hub.



Danger!

Life-threatening hazard - working under suspended loads!

Never stand under suspended loads.



Danger!

Danger of falling from the nacelle!

The nacelle has a roof hatch for accessing the hub. You are exposed to strong winds when climbing out through the hatch. Attach your lanyard to the outside rail from inside the nacelle. Climbing out is only allowed at wind speeds up to 15 m/s.

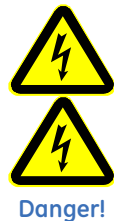
As a general principle, there is a falling hazard at all higher locations / workplaces.

8.1 Special Dangers – Electric Power

Note the following rules when carrying out any work on the electrical components of the plant, e.g. assembly, connection, opening of a device, maintenance:

1. DISCONNECTION
2. SECURE against re-connection, following proper Lock Out/Tag Out (LOTO) procedures
3. Ascertain safe isolation from supply
4. Ground and short-circuit
5. Cover up adjacent live components or provide them with barriers

In addition, ensure that all drives are at standstill.



Caution! Danger from electrical voltage!

When switched on, electrical installations and machinery have live exposed conductors or rotating parts. They could therefore cause personal injury or death and material damage if the cover and the prescribed safety devices are removed, or in the event of incorrect handling and maintenance and in the case of improper use. The above stated safety regulations must therefore be complied with, particularly when removing a cover.

In addition to this, electrical energy is still present in devices with power electronics even after the supply voltage to the device has been switched off. These devices are secured against unauthorized access. After waiting an appropriate time for the device to discharge (e.g. capacitors), always check for residual voltage before starting work.

FOLLOW THE RESPECTIVE LOCKOUT/TAGOUT INSTRUCTIONS! (cf. Chapter 13)

In the case of malfunctions of the energy supply of the wind turbine generator system, actuate the EMERGENCY STOP button immediately if the plant has not already been switched off by the automatic control system.

Only use original fuses with the prescribed amperage!

In the case of repairs, care should be taken that design features are not modified, so that safety is compromised (e.g. leakage distances and sparking distances in air) and that distances are not reduced by insulation materials.

As a general principle, maintenance work may only be carried out by two persons, so that the second person can actuate the EMERGENCY STOP button in an emergency.

Only use insulated and approved tools.

The control system and interlocking as well as the monitoring and protective functions (thermal motor protection, speed monitoring, over current, fault to ground, etc.) may not be set out of function, even during a test run.

8.2 Special Dangers – Hydraulic System

For maintenance work on the hydraulic system, maintenance staff must be completely acquainted with the hydraulic circuit diagram and must have been instructed about its function and the possible consequences of an operating error.

Prior to any work on the hydraulic accumulators, it must be ensured that the accumulator circuits have been depressurized. The shut-down device is clearly marked and independent of the system management.



Danger!

Danger through stored residual hydraulic energy!

FOLLOW THE RESPECTIVE LOCKOUT/TAGOUT INSTRUCTIONS! (cf. Chapter 13)

8.3 Special Dangers - Noise

The A-weighted equivalent continuous sound intensity level in the tower and the nacelle exceeds the permissible 70 dB(A) (per European Standard EN 50308) or the permissible 85 dBA TWA (per OSHA 29 CFR 1910.95) during operation. For some work, it may be necessary to place the WTG in operation or carry out a test run while personnel are in the nacelle.



Anybody carrying out work in the tower or the nacelle when the WTG is in operation must wear hearing protection with an appropriate level of noise protection as part of their personal protective equipment.

8.4 Special Dangers - Icing

8.4.1 Ice Build-up on the Rotor Blades

Ice build-up on wind turbine generator systems (WTG) and, in particular, the shedding of ice from rotor blades can lead to problems if wind turbine generator systems are planned in the vicinity of roads, car parks or buildings at locations with an increased risk of freezing conditions, unless suitable safety measures are taken.

If people or objects near the wind turbine generator system (within the distance **R***) could be endangered by pieces of ice thrown off during operation, GE Energy always recommends the use of an ice detector.

The ice detector is installed on the nacelle. It is possible to detect the build-up of a small amount of ice by means of the ice detector. If this is the case, the ice detector sends a signal to the turbine controller. The turbine controller disconnects the wind turbine generator system from the grid and the rotor is brought to a standstill or rotates at a very low speed. A message about the icy condition is displayed on the monitor in the

turbine, In addition, a message is sent to the service station and the operator via modem. The turbine does not restart until the detector is free of ice or the operator has satisfied himself of the ice-free condition of the rotor blades, has acknowledged the ice alarm message and restarts the plant.

However, ice may form on the rotor blades considerably more quickly than on the ice sensor on the nacelle. As a result, there is a residual risk for the reliable detection of ice build-up on the rotor blades.

The detector on the nacelle must be set relatively sensitively, in order to ensure that the time from when ice starts to build up on the rotor blades until the detector sends a message about the build-up of ice is as short as possible. As a consequence, a certain number of spurious trippings cannot be excluded. Loss of energy yield may occur as a result of the spurious trippings.

If an ice detector is not used, it is advisable to cordon off an area around the wind turbine generator system with the radius **R*** during freezing weather conditions, in order to ensure that individuals are not endangered by pieces of ice thrown off during operation (cf. also Section 11.1).

***R** = 1.5 x (hub height [m] + rotor diameter [m])
(Recommendation of the German Wind Energy Institute DEWI 11/1999)

8.4.2 Icy Condition of the Access Route

During the winter months, access to the plants may be very slippery due to ice or hard-packed snow. There is an increased danger of slipping.

cf. Section 11.1 on approaching and entering WTGs which may be frosted.

8.4.3 Icy Condition of the Tread of the Steps outside the Nacelle

In the winter months, the tread of the steps outside the nacelle can be icy as a result of ice and hard-packed snow.

8.5 Exceptional Dangers – Earthquakes

In the case of an earthquake, the operator must inspect the WTG for damage. The following procedure is recommended:

- Determination of the acceleration values in the tower top which arose during the earthquake (PCH BOX).
- Contact GE Energy, in order to agree on the further procedure and possible inspection schedules.

9 Safety Information for Individual Plant Components

9.1 Down Tower Assembly

The down tower assembly is the electrical cabinet lineup consisting of:

- Power distribution cabinet (PDC)
- Converter filter cabinet (CFC)
- Converter bridge cabinet (CBC)
- Main control cabinet (MCC)



Danger!

Caution! Danger from electrical current!

All personnel remaining in the WTG must be located between the person carrying out the measurements and the tower entrance during voltage measurements on the low voltage main distribution or on the low voltage main control panel.



Danger!

Attention! Check the work area / control cabinet before completion of the work!

Remove all loose parts, tools and materials from the control cabinets. Tools and materials left in the control cabinets lead to unsafe working conditions for the service technicians when the plant is put into operation again.

Close and lock the control cabinets before returning to service.



Attention!

Please follow respective Lock Out/Tag Out (LOTO) instructions.

9.2 Anemometer and Wind Vane

The anemometer and the wind vane are intensely heated in WTGs with cold weather equipment!



Attention!

Hot surface!

Disconnect the anemometer and the wind vane from the supply and allow both to cool down prior to maintenance.

Physical contact may cause burns.

9.3 Top Box

The top box is the electrical cabinet that resides in the nacelle. The main purpose of the top box is to distribute power to the up-tower wind turbine components.



Danger!

Caution! Danger from electrical current!

All personnel remaining in the WTG must be located between the person carrying out the troubleshooting and the nacelle exit during voltage measurements.



Danger!

Attention! Check the work area / control cabinet before completion of the work!

Remove all loose parts, tools and materials from the cabinet. Tools and materials left in the control cabinets lead to unsafe working conditions for the service technicians when the plant is put into operation again.

Close and lock the control cabinets before returning to service.



Attention!

Please follow respective Lock Out/Tag Out (LOTO) instructions.

9.4 Pitch Electrical Control Cabinets Inside the Hub - Axis and Battery



Danger!

Danger from electrical current!

Before beginning any maintenance work, ensure that the control cabinets have been disconnected from all the energy sources in accordance with the currently applicable Lock out/Tag out instructions.

In addition to the main circuits, take any supplementary or auxiliary circuits into account. Wear appropriate electrical PPE for entrance into energized cabinets.



Danger!

Check the work area/control cabinet before completion of the work!

Remove all loose parts, tools and materials from the cabinet.

Tools and materials left in the control cabinets lead to unsafe working conditions for the service technicians when the plant is put to operation again.



Danger!

Danger from electrical current!

All axis and battery cabinet doors must be securely latched in place before the system is reenergized to avoid exposure to the potentially hazardous transient voltages that are present during start-up.

10 Conduct in Emergency Situations

10.1 Conduct in Case of Fire

In principle the WTGS consists of fire-resistant materials. However



Fire, open flames and smoking are prohibited!

If a fire does occur, however, **call the fire department immediately!**

State the following information:

- Name of the person calling
- What is on fire
- Where the fire is located (seat of the fire / location of the plant)
(You will find the site coordinates on the nameplate)
- Wind direction and wind strength

Note the following information in the case of fire:

- Saving lives has priority over fire-fighting
- Alarm all personnel who are in the WTG
- Use the escape routes described in Chapter 10.2 – ensure that you are familiar with the various escape routes.
- Do not use the service lift.
- Burning debris can be expected to fall down if there is a fire in the nacelle or the upper part of the tower.
- If the wind turbine generator system is still in operation, it must be stopped and a large area around the plant cordoned off.
- Close the door of the plant.

10.1.1 Fire-Fighting

Fire-fighting may only be carried out by immediately fighting an initial fire using the fire extinguishers that may be available in the plant. The locations of the firefighting equipment (if available) in the tower and the nacelle are marked.

If the initial fire cannot be extinguished within a short time, abandon any further attempts to extinguish the fire and call the fire department immediately.

In addition to the direct danger from the fire, a combustion toxicity hazard and the danger of asphyxia could also arise. As a result, move in a crouched position if smoke develops and also crouch down when attempting to extinguish the fire.



Danger!

Attempts to extinguish a fire may lead to very serious burns!

Do not make any attempts to extinguish the fire beyond the initial attempt. Due to confined space limitations, since the required minimum distance cannot be maintained while attempting to extinguish the fire.

10.1.2 Fire in the Tower - Person in the Nacelle

- Leave the WTG immediately via the second escape route (cf. Chapter 10.2).
- Abseiling device in the nacelle - emergency exit using the abseiling device

10.1.3 Fire in the Nacelle - Person in the Nacelle

- Attempt to extinguish the fire.

If unsuccessful:

- Leave the danger area immediately via the first escape route (cf. Chapter 10.2).
- Do **not** use the service lift.
- Do **not** use the abseiling device.

10.1.4 Fire in the Transformer



Danger!

Do not make any attempts to extinguish the fire – High voltage!
Conventional fire extinguishers are not suitable.

- Leave the WTG immediately.

In the case of transformers in the tower:

- Leave the WTG via the second escape route

In the case of transformers in the transformer station:

- Leave the WTG via the first escape route

Fire-fighting may only be carried out by trained personnel.

10.2 Escape Routes



Attention!

Keep escape routes clear!

The escape and rescue routes must be free of obstructions (tools, equipment, rubbish, etc.), in order to ensure that the turbine can be evacuated as quickly as possible in an emergency.

10.2.1 First Escape Route

In case of fire, leave the plant immediately. The first escape route from the nacelle is down the ladder in the tower. The descent is facilitated and made safer by resting platforms every 6 m. Do not use the hoisting passenger suspension device.

10.2.2 Second Escape Route

If the descent through the tower is no longer possible, use the second escape route. (Abseiling with the abseiling device). This either leads over the roof of the nacelle (hooking point on roof rail) or through the emergency descent hatch which may be present (hooking point directly beside the winch in the nacelle, which is also present in this case).

Correct use of the abseiling device:

- Make sure your safety harness is on correctly.
- Attach lanyard to approved tie-off point or nacelle rail.



Danger!

Use of the abseiling device!

Your life could depend on the correct use of the abseiling device.

The abseiling device can also be used by two people to abseil.

Read the instructions before beginning the abseiling operation!

10.3 Information for Rescue and Emergency Personnel

The rescue services and the emergency personnel must be equipped with their own personal protective equipment (safety harness, etc.). The rescue/emergency personnel must bring with them all the equipment required for rescuing personnel from the hub, nacelle or tower.

The information stated in this safety manual must also be read by the rescue / emergency personnel.

10.4 Oil Spill – Immediate Measures

The objective of the immediate measures is to prevent or at least to contain a further uncontrolled escape of water-endangering substances and keep the areas of threatened or contaminated soil as small as possible, under consideration of safety engineering requirements.



Inform yourself about the oils used beforehand. The safety data sheets provide details of Water Hazard Classes and suitable measures for combating oil pollution.

Measures

1. Decide and act quickly, so that the amount of oil reaching the environment is kept as small as possible.
2. Prevent further discharge (closure of valves, temporary sealing of cracks and holes, e.g. by means of sealing rags, sealing bags, sealing wedges, collection in containers, pumping out, transfer, etc.)
3. Bind the discharged oil – use approved oil binding agents and oil binder mats if the oil could not be pumped out or skimmed off in time. The damage can be limited by means of collecting containers, rolled foils and a shovel.
4. Prevent the oil from getting into the soil or bodies of water.
5. Remove contaminated soil.
6. Take the contaminated oil-absorbing materials to a local specialist waste disposal company for material recovery/conversion to energy or disposal. The national regulations are to be complied with.

11 Remaining in and on the Wind Turbine Generator System



Attention!

Fire Hazard!

The storage of combustible or highly inflammable materials in the wind turbine generator system **is not allowed**.

Personnel may not remain inside the WTG, and maintenance or repair work may not be carried out in or on the WTG under power supply. There is a danger of accident and a danger to life and limb. In order to prevent accidents, the following actions are to be carried out in the following order before and on entering the wind turbine generator system:

1. Shut down the WTG and secure against an unauthorized return to service
2. Put on the personal protective equipment
3. Disable the power supply for the work to be carried out – carry out corresponding Lockout/Tagout instructions (cf. Chapter 13)

Staying in the WTGS while it is in operation is unavoidable in the case of certain maintenance and repair work. In such cases a risk assessment should be developed for the task. Particular care is called for and hearing protection must be worn.

In addition, the following safety regulations are to be complied with without fail:

- As a general principle, no person may stay in the WTG during a gale or a thunderstorm! If a thunderstorm comes up, the WTG must be left immediately.
- The WTG may only be entered in the company of a second person who can provide assistance or call for help in the case of an accident.
- The entrance door to the tower must be kept closed or if it is kept open, it must be properly secured to prevent it from flying open and getting warped.
- Long open hair, loose clothing (e.g. flapping coats, tops with wide sleeves or trousers with wide legs) and scarves, ribbons, headscarves or jewelry may not be worn in the WTG! There is a fundamental danger of injury as a result of getting caught, trapped or drawn in by rotating elements! Clothing must always be tailored to suit the respective work and the weather conditions.
- Switch-on and shut-down procedures in accordance with the operating manual are to be complied with for all work which concerns the operation and adjustment of the WTG and its safety equipment.
- If any changes in the operating characteristics which are relevant to safety or any faults arise in the WTG, it must be shut down immediately and the event reported to GE Energy or the customer (if a maintenance contract has not been concluded with GE Energy).

11.1 Approaching and Entering Frosted Wind Turbine Generator Systems

Before parking near the turbine, stop approx. 350 m from the turbine and check the rotor blades for ice by means of binoculars and the sound of the rotation of the blades. If the turbine is running and ice is present on the rotor blades, call for a remote stop.

Once the blades have come to a complete standstill, verify that none of the blades is located over the entrance door of the turbine. If this is the case, call for a remote traverse of the yaw drive in any direction, so that the rotor is positioned on the side of the turbine opposing the door. As soon as the rotor is correctly positioned, call for a remote stop of the yaw drive and ask for confirmation of this operation.

Once the above conditions have been complied with, park your vehicle at a safe distance from the WTGS (at least 100 m). Watch out for falling ice as you approach the tower. If the wind is blowing against the opposite side of the door (or into the rotor at this point), you must proceed with extreme caution, since falling ice could be blown in your direction.



Warning!

Danger of slipping as a result of icy conditions!

There is danger of slipping as a result of the frozen ground and ice on the foundation and the stairs.

Sprinkle de-icing salt or sand over the foundation.

Use the handrail when going up the stairs.

Leave the immediate vicinity of the WTG after completing your work. Watch out for falling ice. Get into your vehicle. Do not call for a remote re-activation of the yaw drive and restart of the turbine until you are approximately 350 m away from the WTG.

11.2 Shut-down of the Wind Turbine Generator System

Before starting any service work, the wind turbine generator system must be deactivated. Proceed as follows:

1. Contact any remote monitoring groups that are supervising the site (before entering the wind turbine)
2. Contact any site operators or maintenance people (before entering the wind turbine)
3. Temporarily disconnect the Mark VIe controller from the site SCADA network:
 - Locate the SCADA network switch in the down tower assembly that houses the SCADA network switch
 - Disconnect the two fiber pairs (RX-TX and RX-TX) from the switch, taking the turbine off the site network
4. Press the "Stop-Reset" button to shut-down the plant manually.
5. Set the key-operated switch to "Repair".



Follow lock-out-tag-out procedures to de-energize, lock-out and tag-out equipment to ensure that unit equipment is always put in a safe condition. Wind conditions must be continuously monitored manually if LOTO procedures used mean that the unit is not capable of moving to minimum load condition.

**Danger of accident!**

The WTG must remain shut down as long as personnel are in the plant. Before it is returned to service by authorized personnel, check without fail that nobody is in the plant. Otherwise there is the danger of an accident!

11.3 Climbing the Tower

- Only persons who are physically fit, are wearing appropriate PPE and are capable of coping with the ascent may climb the WTGS.
- The WTGS must be shut down and secured against unauthorized start-up before the tower is ascended. The WTGS must remain shut down as long as anybody is climbing the tower or is on the tower platform.
- The entrance door to the tower must be kept locked, in order to inhibit access to unauthorized persons.
- In order to avoid accidents caused by falling objects, nobody may stand under the ladder while somebody is ascending the tower. Even a small screwdriver can cause very serious injuries if it drops from a great height.

**Danger!****Danger through falling objects!**

Falling objects can cause very serious injuries irrespective of their size and weight!

Never stay in the vicinity of the ladder while somebody is ascending or descending. The ladder may only be used by one person at a time. Only after this person has reached an intermediate platform and has closed the tower hatch or has reached the ground in the tower base and stepped back from the ladder may the next person approach the ladder. Tools and equipment must be secured while climbing.

- Fall protection PPE must always be put on correctly before ascending the tower.
- Always check the safety harness and the entire safety equipment prior to use. Damaged PPE may never be used.
- Safety boots and a hardhat must be worn when ascending the tower. Gloves must be worn while climbing.
- The maximum possible fall path must be kept to a minimum by means of rope-shortening devices or similar.
- Only use marked hooking points with an adequate load-bearing capacity.
- The tower may only be ascended by means of the ladder installed inside the tower or (if the person is properly trained) the hoisting passenger suspension devices/service platform which may be installed. (Follow the operating instructions of the manufacturer).

- The rail or cable grab must run freely in the rail while ascending and descending the tower. Never touch the travelling safety hook, otherwise there is a danger of injury!
- Both hands must be kept free during the ascent or descent. Tools, lubricants and other material may only be transported in a suitable bag. Permanent "3-point contact" with the ladder is only guaranteed by this means.
- Greater care needs to be exercised when climbing the ladder experiencing wet conditions or if the tower is covered in ice.
- Only unhook the lanyard after you have reached the tower platform and the access hatch has been closed.
- Ensure that you are always protected by at least one lanyard with a fall arrest block.
- The rest platforms in the tower are fitted with hatches that must be kept closed at all times. The platform hatches must therefore be opened on reaching a platform and closed again immediately after crossing to the next section of the tower. Tie off to anchor points while on platforms when hatches are open.

11.4 Deactivation of the Yaw Drive

Yaw stop switches are located in the tower base, below the nacelle and on the top box in the nacelle. The yaw drive and the automatic nacelle adjustment are disabled in the "Off" switch position, so that the nacelle is technically prevented from moving if there is a change in wind direction.

11.5 Entering the Nacelle

The yaw stop switch on the uppermost tower platform must be placed in the "Off" position before crossing from the tower to the nacelle. The yaw drive and the automatic nacelle adjustment are thereby disabled.

Depending on the position of the nacelle, the available simple ladder is hooked into one of the holders to prevent the ladder from slipping. Some of the WTGs are provided with a permanently installed extension ladder.

Hooking points are available in the vicinity of every platform.

11.6 Walking on the Roof of the Nacelle/Entering the Rotor Hub

The roof of the nacelle may only be accessed for entering the rotor hub and for carrying out work on the wind vane, the anemometer and the obstruction light.

Only trained or instructed staff are permitted to enter the hub or walk on the roof of the nacelle. The rotor hub may only be entered at maximum wind speeds up to 15 m/s. The rotor lock on the high-speed shaft (brake disk on the coupling) must be engaged before the rotor hub is entered.

1. Place the yaw stop switch on the top box in the "Off" position.
2. Turn the rotor to the "Y" position, so that the rotor hub can be entered.
3. Engage the rotor lock on the high-speed shaft.
4. Turn the rotor blades to the 85° feathering position.



Fig. 15: Rotor in the "Y" position



Danger!

Life-threatening hazard through sudden start-up of the rotor if the rotor lock (brake disk on the coupling) on the high-speed shaft has not been engaged!

Always engage the rotor lock on the high-speed shaft before entering the rotor hub.

FOLLOW THE RESPECTIVE LOCKOUT/TAGOUT INSTRUCTIONS! (cf. Chapter 13)



Warning!

Maintenance work inside the hub may only be carried out at maximum wind speeds up to 15 m/s!

Always engage the rotor lock on the high-speed shaft. Use of the rotor lock on the low-speed shaft or only the brake on the high-speed shaft for this purpose is prohibited.



Falling Hazard! Warning: strong wind currents!

Before climbing out of the nacelle enclosure through the roof hatch above the gearbox, the lanyard must be hooked on to the rail on the nacelle, then transfer to the spinner if transitioning to the hub.



Danger!

The roof rail is to be selected as a hooking point for all other work on the roof of the nacelle. Follow the hub access and rotor Lock Out/Tag Out (LOTO) procedures, in addition to proper JSA/EHS procedures.

5. In the hub, place the battery maintenance switch and the pitch maintenance switch on all three axis cabinets in the "Off" position.



Fig. 16: Battery maintenance switch

6. Switch the pitch controller on the control cabinet to "Manual".

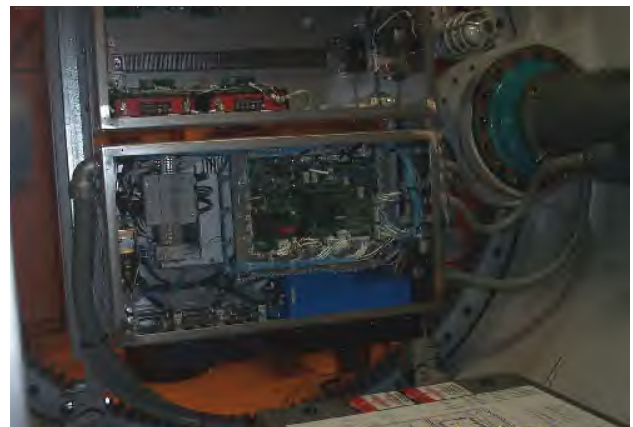


Fig. 17: Pitch controller

Walking on the Roof with Ice and Snow

If you have to walk on the roof of the nacelle or climb into the hub, first of all ensure that the rotor blades are in the Y position before you open the hatch. Otherwise there is danger of injury from falling pieces of ice.



Danger!

Danger of Slipping and Falling Hazard as a result of icy conditions!

There is a high risk of slipping and falling if the roof of the nacelle and the spinner are covered by snow and ice.

Completely remove any snow and ice from the roof before walking on it. Sprinkle sand on the cleared areas

Do not walk on the roof/spinner if the snow and ice cannot be removed completely and the danger of slipping cannot be excluded. Proper JSA/EHS procedures should be followed at all times.

11.7 Activation of the Wind Turbine Generator System



Danger of accident!

The WTG must remain shut down as long as personnel are in the turbine. Before it is returned to service by authorized personnel, check without fail that nobody is in the turbine. Otherwise the danger of an accident arises!

Proceed as follows to return the WTG to service:

1. Make an entry in the service life card of the WTG
2. Connect the Mark VIe controller to the site SCADA network:
 - Locate the SCADA network switch in the down tower assembly that houses the SCADA network switch
 - Reconnect the two fiber pairs (RX-TX and RX-TX) from the switch, putting the turbine on the site network
3. Set the key-operated switch to "Operation".
4. Check the alarm message panel in home web page for error messages
5. Press the "Stop-Reset" button and then the "Start" button.
6. Inform the remote monitoring division that wind turbine is back in operation
7. Inform the operator / customer that wind turbine is back in operation

12 Information on Maintenance and Troubleshooting

Only trained or instructed staff may be deployed!

Trainee personnel or personnel undergoing orientation or general training may only carry out work on the wind turbine generator system under the constant supervision of an experienced person.

Personnel must familiarize themselves with the work environment around the wind turbine generator system before starting work!

As it is possible to start the plant by means of the remote monitoring system, the WTG must be shut down for maintenance work as described in Chapter 11.2. In addition, the service switch on the control cabinet must be placed in the "Maintenance" or "Repair" position. Once the maintenance or repair work has been completed, the service switch must be returned to the "Automatic" position.

Maintenance/inspection of the cable winch in the tower is the responsibility of the operator and must be carried out in accordance with the operating and maintenance instructions of the supplier of the cable winch.

Time limits for recurring tests/inspections prescribed or stated in the operating manual must be adhered to.

Suitable workshop equipment is essential for carrying out maintenance measures.

Work on electric equipment of the WTGS may only be carried out by a skilled electrician, equipment specific trained technician or by instructed persons under the guidance and supervision of a skilled electrician in accordance with the electrical engineering regulations.

Any safety equipment which has to be dismantled to carry out maintenance and repair work must be re-installed and checked immediately after the maintenance and repair work has been completed!

The wind turbine generator system, in particular the connections and bolted connections, must be cleaned of any oil, consumables and process materials, dirt or old preservative agents at the beginning of any maintenance/ repair / conservation work.

Only entrust experienced persons with the fastening of loads.

Individual components and larger modules which need to be exchanged must be carefully attached and secured to lifting gear, in order to minimize the danger that emanates from them. Only use suitable lifting gear and load suspension devices which are in a technically perfect condition and have an adequate load bearing capacity!

Follow the operating instructions of the winch manufacturer.

Never stand or work below suspended loads.

Use the specified or other safe ascent equipment and working platforms to carry out installation work above head height. Wear fall protection equipment when carrying out maintenance work at great heights. Keep all handles, steps, safety rails, platforms, stages and ladders free of dirt.

Ensure that consumables and process materials and replacement parts are disposed of safely and in an environmentally-friendly manner!

13 Power Disconnection and Isolation Procedures (Lock-out/Tag-out Instructions)

Pursuant to EN 50308 and OSHA standard 29 CFR 1910.147, wind turbine generator systems must be equipped with devices to disconnect and isolate them from all their energy sources during inspection and maintenance work.

These disconnecting/energy-isolating devices are prescribed for all mechanical, electrical and hydraulic energy sources.

GE Energy advises the plant operator/owner to develop specific procedures for the power disconnection and isolation of every individual subsystem.

Local and national regulations must be taken into account when developing workplace-specific Lockout/Tagout instructions.

The disconnection/isolation points are marked in the plant-specific circuit diagrams and hydraulic schematics supplied with the respective WTG.

Procedures for the Lock-out/Tag-out of power disconnection and isolation devices must consider the following aspects:

13.1 Identification of Installations, Processes, Circuits

(Individual mechanical, electrical or hydraulic subsystems)

13.2 Preparation for Shutdown / Notification of Affected Employees

- All personnel who may be affected must be notified before Lock-out/Tag-out devices are installed and after they have been removed. In addition to this procedure, authorized employees must be aware of any additional safety requirements prescribed for working on this type of equipment.
- Affected employees who work on or near an installation which is about to be disconnected and on which Lock-out/Tag-out devices are to be mounted must be notified thereof.

13.3 Identification of Energy Sources and Strengths

13.4 Deactivation of Energy Sources and the Mounting of Energy Control Devices

- The power disconnection and isolation devices (e.g. disconnecting switches or load interrupter switches, valves etc.) must be positioned in such a way that they interrupt the energy flow to installations, processes or circuits. The authorized employees are obliged to mount and secure Lock-out/Tag-out devices to these. They must hereby ensure that the power disconnection and isolation devices are "locked out" until further notice and remain in their safety or "Off" position.

13.5 Control of Stored Energy



Attention!

Residual risks from stored energy!

PLEASE OBSERVE THE RESPECTIVE LOCKOUT / TAGOUT INSTRUCTIONS!

- The authorized employee must ensure that all potentially hazardous energy in any form (stored, residual, chemical or potential energy) is relieved, dissipated, contained, discharged or otherwise controlled. Additional measures may be necessary to prevent the re-accumulation or re-storage of energy, in order to protect personnel. Stored energy can form e.g. in batteries, capacitors, through gravity or in chemical lines.

13.6 Verification of Isolation

- The authorized employee must verify that the isolation and de-energization of the respective installation, process or circuit has actually been carried out before maintenance work may be started. The check must confirm that the installation, process or circuit has achieved a "zero" energy state. (Test equipment, circuit activation attempts, measuring devices, visual inspections, etc. can be used to verify the zero energy state.)

13.7 Reconnection of the Installation to the Supply

The authorized employee must carry out the following measures before returning the installation to service:

- Inspection of the work area to ensure that all items which are not required for the operation of the installation have been removed and that all the guards have been replaced, that the machine/installation, process or circuit is operational and that all personnel are in a safe location.
- Removal of all locks, tags and other Lock-out/Tag-out devices from all power disconnection and isolation devices by the authorized employee who previously attached these LOTO devices.
- Notification of affected personnel that the energy supply is about to be restored to the machine/installation, process or circuit.
- Visual inspection and/or cycle test to verify that the service or maintenance work has been successfully completed. Provided that the work has been completed, the machine/installation, process or circuit may be returned to service. Otherwise, the requisite procedural steps must be repeated.
- Correct sequential run-up of the installation, process or circuit.

WTG operators must ensure that suitable disconnection regulations are available for their plants and construction sites and those they are implemented. GE Energy has developed installation-specific Lock-out/Tag-out procedures for the activities listed below. This list does not claim to be complete, however. It may be advisable to develop additional procedures as a result of changes to installations or to comply with construction site-specific disconnection regulations.

Service Jobs / Subsystems	Installations, Processes, Circuits
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Gear box / gearing lubricant	Nacelle – protection of the gear lubricant flow
Work in the converter cabinet / on the generator	Isolation of converter cabinet from dangerous energy / isolation of generator from dangerous energy
Surge protector / medium voltage	De-energize power distribution cabinet (PDC) at MV transformer.
Surge protector / high voltage	De-energize power distribution cabinet (PDC) at MV transformer.
Work on the synchronization switch	Isolation of the synchronization switch. De-energize power distribution cabinet (PDC) at MV transformer.
Work on the safety isolated WTG	Disconnection of the power distribution cabinet.
Disconnection of the 400 V power supply	Disconnection of the 400 V power supply to the power distribution cabinet in the tower base and to the top control cabinet in the nacelle and to the hub.
Disconnection of the 690 V power supply	Disconnection of the 690 V power supply to the power distribution cabinet in the tower base and to the top control cabinet in the nacelle.
Work on the transformer in the DTA converter filter cabinet	Disconnection of the transformer in the DTA converter filter cabinet
Work on the UPS voltage output	Disconnection of the 230 V UPS voltage output in the main cabinet and the control cabinet, the nacelle and the hub
Disconnection of the 24 V power supply unit in the main cabinet	Disconnection of the 24 V power supply unit in the main cabinet
Isolation of the 400 V power supply from the nacelle to the hub	Isolation of the 400 V power supply from the nacelle (top control cabinet) to the hub
Nacelle hydraulics	24 V transformer / interruption of the hydraulic supply
24 V transformer in the nacelle	24 V transformer in the top control cabinet (e.g. for exchanging the transformer)
Battery charging voltage nacelle / hub	Disconnection of the battery charging voltage to the hub
230 V power supply to the nacelle	Disconnection of the battery charger, interruption of the 230 V power supply
Nacelle / motors	Disconnection of the motor
400 V motor circuit breaker in the nacelle	Disconnection of the 400 V motor circuit breaker
Work in the hub	Disconnection of the motor (hub)
Work in the hub	Back-up battery pack in the hub
Locking the high-speed shaft	Nacelle / high-speed shaft (gear box)
Locking the low-speed shaft	Nacelle / low-speed shaft (gear box)
Work on the transformer	Isolation of the transformer in WTGS with a transformer in the tower

ANNEX: Items and Installations which are subject to Inspection pursuant to the Accident Prevention Regulations

Article to be tested	Test before the initial operation	Exceptional tests	Regular tests	Proof of test	Regulations
Winches	To be checked by a technically competent person		Regular check by a technically competent person in accordance with the manufacturer's instructions and operational conditions.	Inspect and test log book and inspection sticker	Manufacturer's instructions
Doors Emergency exits	To be checked by a technically competent person. Doors must be executed so that they are self-closing, open in the direction of escape and can be easily opened from the inside at all times without auxiliary means.		Regular check by the operator. Once a year by a technically competent person.	Documentary evidence	Manufacturer's instructions
Escape routes			In case of danger, the work areas must be able to be evacuated via escape routes or escape equipment. It must be ensured that at least one escape route can also be used in the case of a power failure. Escape routes or escape equipment are: routes via ladders and abseiling devices.		
Service lift	To be checked by an expert. In addition to the experts of the Technical Inspection Association (TÜV), only experts for the inspection of hoisting passenger suspension devices who are authorized by the trade association are considered to be experts for the purposes of this safety regulation. The operator must ensure that a test run is carried out at the installation location in all directions of movement with the working load of the passenger suspension device in the presence of the supervisor before the initial operation.	The operator must ensure that hoisting passenger suspension devices are subjected to an exceptional test by a qualified person after cases of damage or particular events which could affect the carrying capacity, as well as after any repair work.	All components of the hoisting passenger suspension device must be inspected for operational safety by a technically competent person at least once a year. Shorter test intervals may arise as a result of the service conditions. The manufacturer's instructions are to be followed.	Documentary evidence	Manufacturer's instructions
Fire extinguishers (optional feature)			Regular check by a technically competent person or expert in accordance with the national regulations.	Inspection sticker or test report	

Article to be tested	Test before the initial operation	Exceptional tests	Regular tests	Proof of test	Regulations
Personal protective equipment against falling (safety harness)	Check of the fall protection rail by an experienced person.		Users must check the PPE for its orderly condition and correct function before it is used. An experienced person must check the PPE for perfect condition at regular intervals. The manufacturer's instructions are to be followed.	Inspect and test log book, inspection sticker	Manufacturer's instructions
Abseiling device	To be checked by an experienced person.	To be checked by an experienced person after use.	Users must check the abseiling device for its orderly condition and correct function before it is used. An experienced person must check the abseiling device for perfect condition at regular intervals. The manufacturer's instructions are to be followed.	Inspect and test log book, inspection sticker	Manufacturer's instructions
Ladder		A technically competent person checks the orderly condition of mechanical ladders after any alterations or repairs.	A technically competent person checks the orderly condition of the ladders and steps once a year. Irrespective of this, the user must check the suitability and condition of the ladders before use. The manufacturer's instructions are to be followed.	Inspect and test log book, inspection sticker	Manufacturer's instructions
Electrical equipment	Check by a qualified electrician or under the supervision of a qualified electrician. (Also after alteration or repair) The test before the initial operation in accordance with Section 1 is not necessary if the manufacturer or installer confirms that the electrical installations and equipment are designed to comply with the provisions of this accident prevention regulation.		At specified intervals: The intervals are to be calculated in such a way that any defects which can be expected to arise are found in due time. The relevant electro-technical regulations are to be complied with for the check. At the request of the trade association, an inspection and test log book with specified entries is to be kept. The manufacturer's instructions are to be followed.	Inspect and test log book	Manufacturer's instructions
First aid box (optional feature)	Pursuant to the Law on Medical Devices, which has been in force since 1st January 1995*, bandaging materials must have a CE-marking but do not have to have a use-by date. If a use-by date is stated, however, the Law on Medical Devices prohibits further use after expiry of the use-by date under penalty of a fine. First aid material without a use-by date must only be replaced in the event of soiling or damage. With the exception of plaster material, it remains usable over a long period, provided that it is stored in a clean and dry place.				

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Case No(s). 15-1921-EL-BGA

Summary: Application of 6011 Greenwich Windpark, LLC to Amend its Certificate of Environmental Compatibility - Part 2 of Exhibit A electronically filed by Teresa Orahod on behalf of Sally Bloomfield