

Title:

Complete Machine
General wind turbine safety regulations
G8X-G9X-31-00-00-00-0-310-0-F

APPLICABILITY

- Product attributes

Model	G8X G9X
Operating voltage	ALL
Frequency	ALL
Temperature	ALL
Dust	ALL
Corrosion	ALL
Action before test	ALL
Yaw system	ALL

- Component attributes

PLC operation	ALL
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CHANGES

Rev.	Author	Date	Description
00	MDANDRES	27/11/09	Initial version
01	MDANDRES	22/11/10	Illustrations format is modified
02	MDANDRES	15/03/11	Document contents updated



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1 RESPONSIBILITIES AND OBLIGATIONS

Gamesa Corporación Tecnológica (hereinafter GCT) considers Health and Safety to be a permanent objective of priority, and incorporates Prevention in the design of the wind turbines it manufactures.

The design incorporates the obligatory requirement not to jeopardize the Health and Safety of individuals, animals or property, provided that the wind turbines are correctly installed, maintained and used for the purpose designed by GCT.

Authorized personnel entering or using the wind turbines are entitled to adequate protection with respect to Occupational Health and Safety.

Likewise, authorized workers carrying out tasks in wind turbines must comply with the legal and legislative measures concerning Occupational Health and Safety as well as environmental provisions for occupational risk prevention.

Authorized workers entering the installations shall have received sufficient and adequate theoretic and practical training for the correct performance of their tasks.

This document defines the precautionary measures, obligations and general procedures with respect to safety to be observed when entering a G8X-G9X wind turbine platform; specific safety measures for different maintenance operations are given in documentation corresponding to these operations.

An operator is not allowed to try to repair a wind turbine on his/her own.

2 EQUIPMENT AND PROTECTION AND SAFETY DEVICES

Personal protective equipment (hereinafter PPE) used should be adequate for the task to be performed, comply with current standards and legislation, bear the EC Mark, and include a declaration of conformity and instructions for use.

IMPORTANT:

- **The operator should make correct use of the the safety equipment and check it before and after use.**
- **Servicing of the equipment shall only be performed by authorized maintenance firms and shall be recorded in the equipment documentation.**
- **Equipment showing signs of wear or which has exceeded the manufacturer's recommended useful life should not be used.**
- **When ascending the tower, the fall arrest system must be directly fastened to the hook of the safety harness and be connected to the lifeline (cable).**

2.1 MANDATORY PROTECTIVE EQUIPMENT

While entering and remaining in a G8X-G9X wind turbine, it is necessary to at least have the following equipment, officially approved in accordance with the applicable legislation in force at the place where the wind turbine is installed:

- Clothes appropriate to both the tasks to be carried out and weather conditions.
- Safety helmet with chin-strap, -1-.
- Harness, -2-.
- Two elastic anchoring ropes, -3-, having a maximum length of 2 m; each one with a shock absorption system, wide-opening safety hook on one end and safety snap hook on the other
- Fall arrest device, -4-
- Safety boots with non-slip sole
- Gloves against mechanical aggressions.



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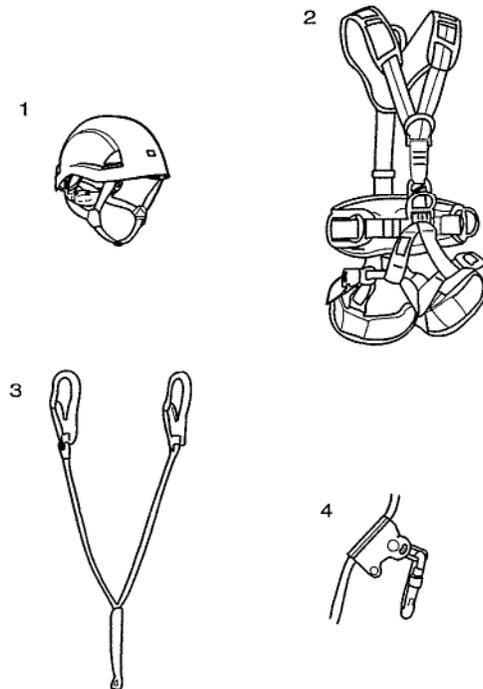
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Figure 1: Mandatory equipment

IMPORTANT:

In addition to the aforementioned required equipment, any special equipment which may be necessary due to the working conditions will also be used.

Include the following elements for each pair of inspection or maintenance operators:

- 1) Signs delimiting the danger zone due to risk of falling objects.
- 2) Sign prohibiting entrance to the tower.
- 3) Lock and labeling system.
- 4) Fire extinguisher (available in vehicles).
- 5) Cellphone and intercoms.

IMPORTANT:

The safety helmet must be worn at all times, both inside and outside the wind turbine.

It is recommendable to include a torch and safety goggles with the climbing equipment and, depending on the work to be carried out (inspection or maintenance with the wind turbine in operation), hearing protection as well.

2.1.1 USE OF PERSONAL PROTECTIVE EQUIPMENT

PPE is only for individual use; each operator is responsible for the equipment's adequate care, cleaning, service and storage.



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It is forbidden to modify the protection equipment (seams, ribbons or bands on the harness or the safety ropes, in the absorber protectors, etc.).

Equipment showing signs of wear or which has exceeded the useful life indicated by the manufacturer should not be used

The PPE should be used as long as the risks for which they are designed to offer protection against exist.

NOTE:

Before choosing a PPE to protect against chemical products, the Product Safety Data Sheet must be consulted to confirm its adequacy.

Respiratory protection equipment shall only be worn at the places where their use is necessary.

The filters should not be stored in areas of exposure since they will be saturated by environmental exposure which reduces their efficiency.

When it is suspected that their protection is no longer effective, filters should be replaced.

During the use of the PPE, strict conditions of hygiene and cleanliness of the same must be followed as otherwise problems resulting of permanent contact may arise.

If the equipment is wet after using it, refer to the instructions in the manufacturer's manual in order to withdraw it in case doing so is specified, or to dry it following the measures indicated in that document.

Each time a PPE is used to avoid an accident, it must be inspected to guarantee that it maintains its original characteristics and has not lost the degree of protection for which it is guaranteed.

2.1.1.1 USE OF THE HARNESS INSIDE THE NACELLE

NOTE:

The use of a harness in the nacelle is not allowed when workers carry out tasks in proximity to moving elements (locking the rotor, turning the rotor from the cardan, greasing bearings of the trestle) and tasks which imply checking alignment, in which it is necessary to take action on the coupling and which imply turns of the same.

The use of the harness in the nacelle is mandatory while performing the following operations, for which it is necessary to remain anchored to a fixed, resistant point to avoid falls to different levels.

- Access to the interior of the rotor.
- Use of the Hoist: Before opening the nacelle hatchway, the operator who manipulates the hoist must use a harness.
- Access to the exterior of the nacelle.
- Corrective maintenance operations: During corrective maintenance operations during which it is necessary to remove the nacelle roof, or which when removing components, result in openings through which workers may fall to another level.

NOTE:

Operators must remain fastened by the harness until the component and nacelle roof are in place.

2.2 PROTECTIVE EQUIPMENT FOR SPECIAL OPERATIONS

Any special or unexpected operation to be performed in the wind turbine must be authorized by the Owner, who is advised to seek previous advice from Gamesa Corporación Tecnológica (GCT), which will determine whether the use of special equipment is necessary and the conditions for their use.



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2.2.1 EMERGENCY DESCENT EQUIPMENT

When performing tasks on the wind turbine, operators should be equipped with the emergency descent equipment for emergency evacuation in safe conditions.

Operators should be familiar with the equipment and the operating instructions and prepared in the event of an emergency requiring evacuation.

The instructions for the use of the emergency descent equipment are provided with the equipment and shall be available for consultation without requiring that the equipment be opened.

The nacelle has a safety eyebolt located on the nacelle hatchway from which to suspend the emergency descent equipment.

2.3 SAFETY DEVICES

2.3.1 EMERGENCY STOP DEVICE

The wind turbine is equipped with 4 emergency stop devices, located at:

- The control cabinet *GROUND*.
- The control cabinet of the nacelle (*TOP*).
- The main shaft of the main bearing housing.
- The ring.

The emergency stop devices are red against a yellow cover. When pressed, the EMERGENCY STOP is activated and, with it, the blades are feathered and the brake is applied, forcing the turbine to stop. When the stop device is pressed, only the brake is applied. The rest of the motors are stopped, therefore any movement of the wind turbine ceases. Electricity is still supplied to the lighting and control cabinets.

WARNING



Pressure is maintained in the hydraulic system. The accumulators contain 6 liters of hot oil which may escape if repairs are made to the hydraulic system.

When the emergency stop device is activated, and as long as there is pressure in the unit and tension in the wind turbine, the brake is set.

When the wind turbine has no voltage and a stop device has been pushed, the brake will be released after approximately 15 minutes.

If the brake must be applied for a longer period of time, the lever of the hydraulic unit's solenoid valve must be activated.



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2.3.2 EMERGENCY ACOUSTIC SIGNALS

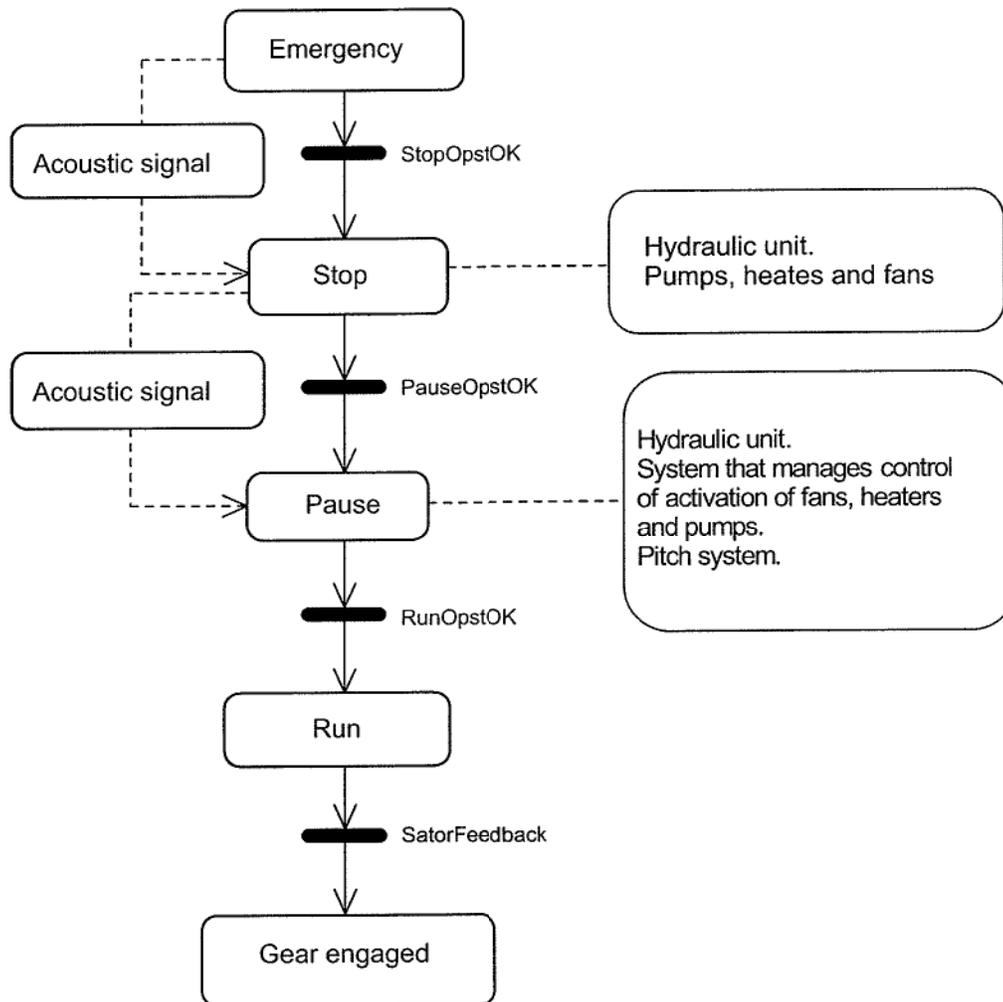
Acoustic signals serve as a warning to persons that the machine is going to be put into operation.

The warning remains activated for a specific period of time per its programmed parameters, the default value being 30 seconds, enough time so that a person may deactivate the start-up or move to a safe position.



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Figure 7: Relation between the acoustic alarm and the status of the machine

2.3.3 GRID CONNECTION DEVICE

WARNING



The mid-voltage switchgear is de-energized when pressing the button. In order to isolate it, a de-energization procedure must be carried out from the switchgear itself.

The button for disconnection from the grid or switchgear trip is located next to the *TOP* electrical cabinet's push-button. When this button is pressed, the pitch control system, yaw system, hydraulic pump and nacelle fan stop so that all wind turbine movements cease.



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NOTE:

There is no supply for lighting, cabinets, or control unit.

2.3.4 WRAPPING OF THE NACELLE'S MOVING ELEMENTS

All of the mechanisms in the area of the drive train which present a possible danger due to risk of mechanical entrapment are protected. The wrapping of the nacelle's moving elements, as follows:

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- Gearbox-generator connection (mechanical brake cover and coupling between gearbox and generator).

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2.3.5 NACELLE ROOF HANDRAIL



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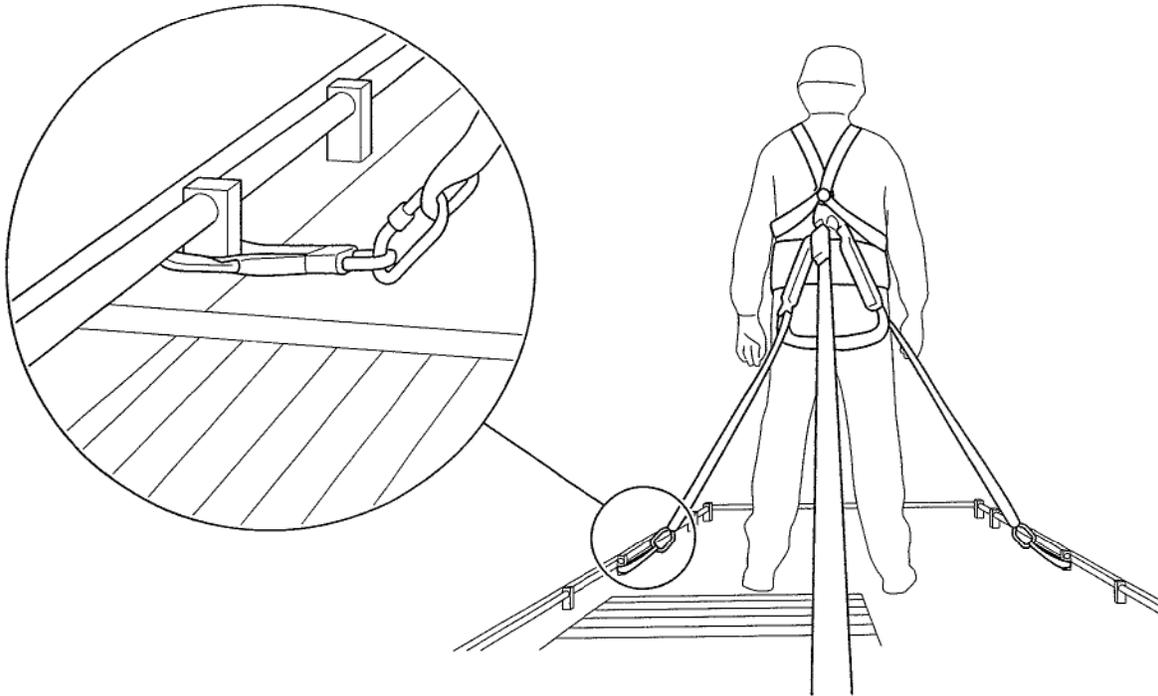
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It allows for operators to safely anchor themselves while carrying out maintenance tasks which require accessing the exterior of the nacelle.

The handrail is located on the nacelle roof and is composed of a perimetral bar along the entire roof and a series of blocks which act as anchor points.



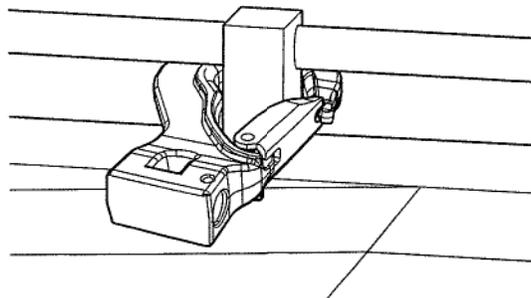
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Figure 10: Nacelle roof handrail and anchor blocks

WARNING



Always tie yourself to the handrail blocks (Figure 11) unless the handrail presents discontinuities. In this case, it is forbidden to use the end stanchions (where the handrail ends) for anchoring, as the hook could turn over and hook over the top of the rail, causing the bar to withstand all the stress in the event of a fall (Figure 12 and Figure 13), in breach of that indicated above.



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Figure 11: Tying to the handrail stanchion



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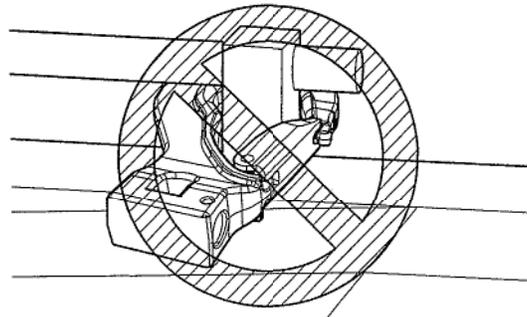
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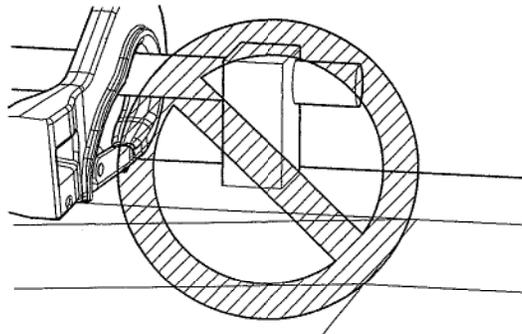
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Figure 12: Do not tie yourself to the end of the handrail

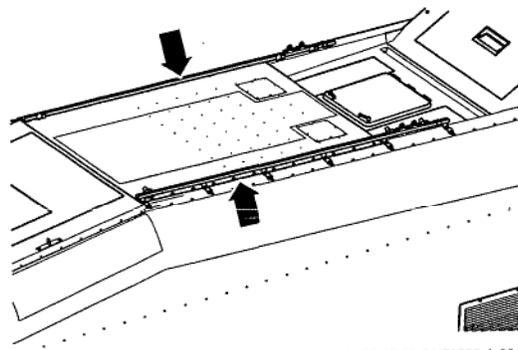


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Figure 13: Do not tie to the handrail

2.3.6 NACELLE ROOF BARS

Located on the nacelle roof, these are composed of fixed elements, or rails, onto which sliding elements (trolleys) are positioned to aid one's movement.



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Figure 14: Location of the guides on the nacelle roof



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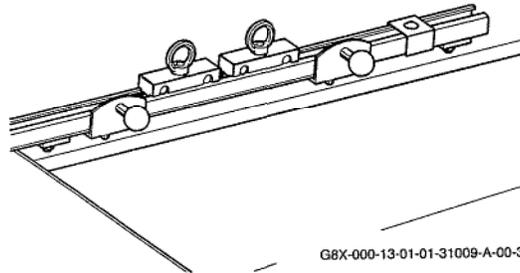


Figure 15: Guide trolleys

3 TRAVEL TO AND WITHIN THE FARM

Before beginning to move, inspect the vehicle to check for oil leaks or parts in poor condition.

Check the condition of the tires.

Check the correct functioning of the transportation vehicle's control systems.

NOTE:

If any defects are found in the vehicle, leave it out of service, alerting of the same by signs.

To assure good visibility, keep the windshield, windows and mirrors clean, and for night vision, the lights, as well as regularly maintaining all of these.

When driving, keep in mind the following recommendations:

- Medications: Consult the leaflet, doctor or pharmacist to know the side effects.
- Avoid abundant meals.
- It is advisable not to smoke while driving. Smoking may cause distractions, drowsiness and reduce one's reflexes.
- Do not handle any types of objects while driving.
- Do not use a mobile phone while driving a vehicle (unless using a hands-free device).
- The consumption of alcohol and drugs is prohibited.
- Condition the cabins so that temperature and humidity of their interior remain within a comfortable range, as excess heat may cause drowsiness and fatigue.
- Periodically ventilate the cabin and obey established safety limits.

When refueling, keep in mind the following recommendations:

- Stop the motor and turn off the lights.
- Smoking is not allowed.
- Touch the tip of the gas pump pistol against the hole of the deposit before pumping fuel to avoid sparks due to static electricity.
- Maintain contact between the gas pump and the deposit to establish electrical contact until the operation has concluded.
- Close the tank cover well and clean any spilled fuel.
- The starter motor must not be activated more than 30 seconds to start the vehicle. Let it cool for at least two minutes to prevent possible fires.



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The driver of the vehicle must possess the obligatory permit, and the vehicle must have all its documentation in order (circulation permits, technical inspection approvals, insurance).

During travel on public routes, the legal regulations in effect in the corresponding country must be complied with at all times.

Traffic patterns, both pedestrian and for vehicles, should always be observed.

When travel takes place within the wind farm, the traffic rules and signs established by the Owner must be respected. If these are nonexistent or are less restrictive than those established by GCT, the following general rules must be adhered to:

- Maximum speed limit for heavy vehicles within the park is limited to 20 km/h.
- Maximum circulating speed limit for light vehicles within the park is limited to 40 km/h.

NOTE:

In adverse weather conditions (fog, snow, rainstorm, ice...) or if the road surface is in poor condition, the speed is limited to 20 km/h.

For lengthy trips, the driver must be sufficiently rested before starting off, and must stop for rests approximately every 200 km or two hours of driving.

Adjust the seats of the transport vehicles in an ergonomic position to avoid back and lumbar pain and problems related with incorrect posture.

NOTE:

- The seat back should allow vertical inclination and have lumbar adjustment.
- The instrument panel should be adjustable to optimize access to the controls.
- Sit with one's back straight, allowing the back muscles and vertebrae to relax.

The vehicle must be equipped with a first aid kit, fire extinguisher and snow chains when there is a chance of facing adverse conditions of ice and snow.

Getting in and out the vehicle should be carried out in firm ground without obstacles. At the time of leaving the transport vehicle, it is necessary to wear work clothes, safety helmet with chin strap, safety boots and reflectant vest.

NOTE:

The dock area must be free from obstacles and materials.

When equipment and vehicles must circulate through the construction site, these must maintain a sufficient distance from the edges of the slopes so that their weight does not provoke landslides.

NOTE:

In general, this distance must not be less than 2 m, and in the case of unstable terrain, should be even greater.

When a vehicle needs to approach a slope or the border of an excavation, security stops will be placed, previously checking the land resistance to the weight of the vehicle.

Whenever a stopped vehicle or machine initiates a sudden movement, it must be alerted by an acoustic signal. When the maneuver involves driving in reverse or when there is insufficient visibility, another operator must direct the maneuvers from outside the vehicle.

Given the fact that wind farms are usually located at mountain summits or plains, it is almost certain that there will be contact with the fauna characteristic of the area.



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It is necessary to be familiar with the fauna surrounding the wind farm before performing any operations in order to evaluate inherent danger.

NOTE:

Take any necessary, precautionary measures (placement of barriers to avoid their access to the work areas, vaccinations against stings or bites) to avoid situations of risk.

3.1 TRANSPORT AND HANDLING OF MATERIAL

The PPE required are as follows:

- Work clothes
- Safety helmet with chin strap.
- Safety boots.
- Reflectant Vest.

In addition, lumbar protection, gloves to protect against mechanical abrasions and safety goggles against dust are also recommended.

However, only those means of transportation certified by GCT are permitted.

When using a vehicle to access indoor places which are closed and lack ventilation, the motor must be turned off immediately.

Before moving the transport vehicle and periodically during transport, check that the load is properly anchored onto the vehicle.

NOTE:

In the event of the risk of the spread of particles or the fall of transported objects, the load must be covered with a canvas to avoid accidents resulting of load loss.

The materials must be fastened with webbing or other accessories to avoid their displacement.

Use properly adjusted containers to transport small or loose objects.

When entering and exiting the vehicle's cabin, always do so facing the same and using all safety measures available, like grips, steps, etc.

NOTE:

During loading and unloading, establish periodical rest breaks to stretch your legs and walk.

Avoid that any remains of oil or substances remain on the steps which lead to the transport vehicle cabin.

Always obey safety distances, be aware of the center of gravity of the unit (cabin-trailer) to avoid its overturn, as well as of safe speeds and when driving down slopes, particularly when the vehicle is loaded.

Under no circumstances are the maximum admissible loads for each type of transport vehicle to be exceeded. Furthermore, the vehicle's load must be properly placed, stable and well distributed so as to achieve a correct equilibrium.

NOTE:

Never exceed the 44Tm Maximum Authorized Mass when driving the vehicle (with the exception of special vehicles).

The load must not protrude from the sides, front or rear.

In order to prevent deafness of the personnel inside the vehicle, keep the windows open as short a time as possible while driving.



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Always observe the following size limits when transporting loads:

- Maximum width: 2,55 m.
- Maximum width for vehicles with superstructures: 2,6 m.
- Maximum height: 4 m.
- Maximum length: 12m for rigid trucks, 16.5m for articulated trucks and 18.75m for rigid truck with trailer.

NOTE:

These size limits include the load and are not valid for special vehicles.

4 ACCESSING THE WIND TURBINE

Upon arriving at the wind farm, and before commencing any operations, personnel must present themselves at the substation and inform of the operation to be carried out.

Equipment which is required for any operation done on a wind turbine is as follows:

- Work clothes
- Safety helmet with chin strap

NOTE:

The safety helmet must be worn at all times, both inside and outside the wind turbine.

- Safety boots in accordance with the task to be completed (protection against electrical and mechanical risks and with non-slip soles).
- Protective gloves depending on the task to be performed (against mechanical abrasions and chemical aggressions),
- Harness
- Sliding fall arrest device
- 2 ropes with shock absorption system and wide-opening hook
- Emergency descent equipment
- Specific PPE according to the task to be performed.

In addition to the mandatory PPE for each task, the following elements should also be included for each pair of operators or work team:

- Signs delimiting the danger zone due to risk of falling objects.
- Sign prohibiting entrance into the tower
- Lock and labeling system
- Fire extinguisher
- Cellphone and intercoms

NOTE:

It is recommendable to include a front light with the climbing equipment and, depending on the work to be carried out, hearing protection as well.

4.1 MARKING, SIGNS INDICATING PERSONNEL WORKING ON THE WIND TURBINE

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).



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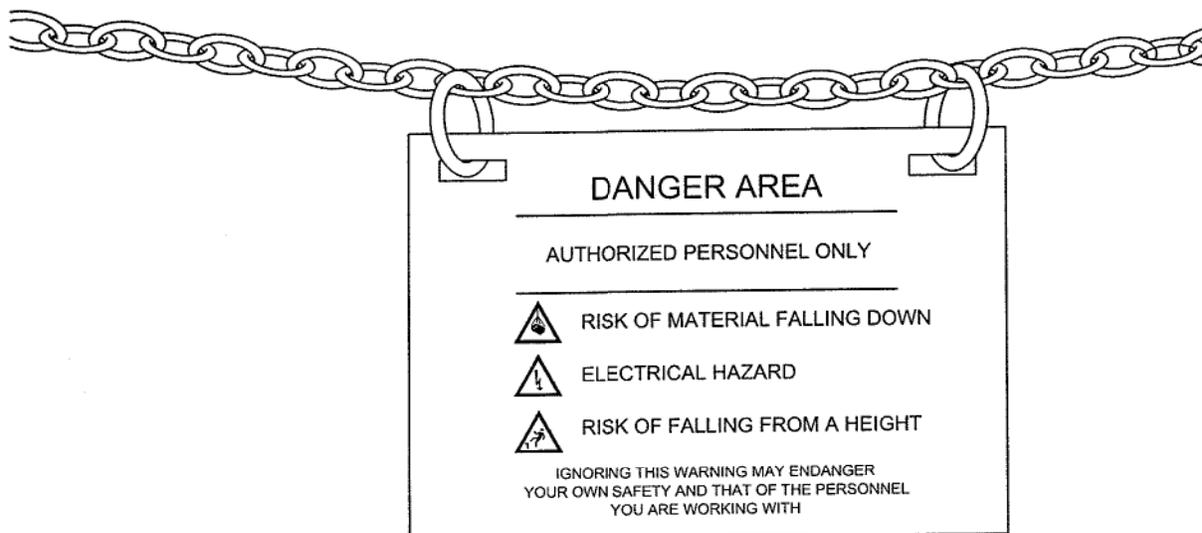
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For this reason, it is required to use the signage system to prohibit access personnel not working on the task and warn of the possible existence of these types of dangerous situations.

Each team of workers will take a signaling system to be placed at the tower's entrance each time it enters a turbine.



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Figure 16: Signs at the entrance to the Tower

NOTE:

Most farms are located in areas where there is not much transit of people but, in case there is a risk of intrusion into the wind turbine by unauthorized personnel, ask the owner to implement extraordinary measures in order to guarantee the safety of the personnel performing tasks inside the wind turbine.

In case the adopted measure is the closure of the door, bear in mind that emergency services may need to access the wind turbine.

4.2 BEACONS IN THE WORK ZONE

The activity of GCT ranges from lifting small loads using a hoist to the hoisting of large-tonnage loads at great heights using cranes, thereby generating the risk of their fall onto personnel located in the area.

Before performing any tasks involving load suspension, a safety perimeter shall be marked out around the zone.

NOTE:

This perimeter will be the result of taking a 20m radius from the load hoisting point, taking into account load displacement.

Depending on the work to be performed, 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 signaling system that must be set up every time loads that could fall on personnel located in the area are to be suspended. This signaling shall be positioned before starting the hoisting operations, using either hoist or cranes, and it will remain installed until they are finished.



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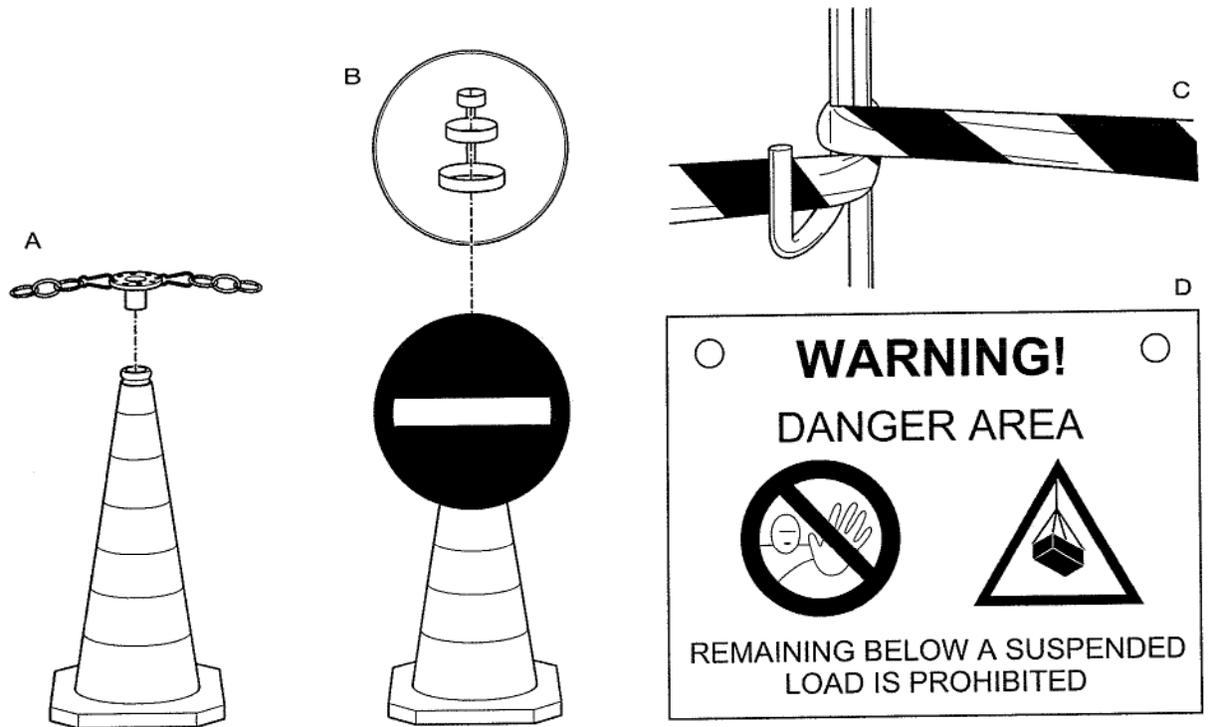
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The signaling system (biodegradable tape, bars and warning signs, or plastic chains, cones and warning signs) must warn of the risk and delimit the area, forbidding access to that area by all staff not involved in the work

The personnel involved in the operations may access the area if the work to be performed requires as such (securing the load to hooks or elevation tools, receiving the load), although respecting the prohibition of standing below suspended loads.



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Figure 17: Signs indicating personnel working

4.2.1 SIGNPOSTING ALTERNATIVE

The alternative signposting method defined below is only applicable when there exists a risk of falling objects and/or tools during the use of the hoist, the performance of operations outside the nacelle, works with open door or hatchway, and while performing start-up, preventive, predictive or small corrective maintenance operations.

NOTE:

For other tasks, follow the procedures described in the previous section.

4.2.1.1 BEACON SYSTEM INSTALLATION

- 1) Install two warning signs, each placed at 40m from the access to the yard, facing both traffic directions.
- 2) Delimit the access to the wind turbine's yard as described below.
 - Set up cones (at least 5) spaced apart 4m.

NOTE:

To ensure the stability of the cones and to prevent them from overturning due to the wind, stakes should be placed through them, hammered into the ground.



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- Place these stakes through the cones at the ends and alternating across cones.

NOTE:

The number of stakes to be placed will be defined in accordance with the existing weather conditions at the time of setting up the beacons

4.3 ACCESS TO THE INTERIOR OF THE TOWER

Access to the interior of the wind turbine shall be done when the wind turbine is stopped and as long as the characteristics of the work to be done do not require the wind turbine to be in operation.

The specific PPE required for this task are as follows.

- Work clothes
- Safety helmet with chin strap.
- Safety boots.
- Gloves against mechanical aggressions.
- Safety harness with sliding fall arrest device.
- Two ropes with shock absorption system and wide-opening hook.

NOTE:

It is recommendable to have lumbar protection and goggles.

A safety harness and sliding fall arrest device fastened to the ladder's lifeline, as well as a safety helmet with chin strap and gloves to protect against mechanical aggressions and two ropes with a shock absorption system and wide opening hook, must be worn when climbing up or down the tower ladder.

Prior to the ascent to the tower along the ladder and whenever tasks requiring physical exertion are to be carried out, a series of stretching and warming up exercises must be done to help avoid muscular-skeletal lesions during the realization of the operations. Placement of signs to indicate that there are personnel working on the turbine.

4.3.1 PRESENCE OF WATER IN THE FOUNDATION RING

If when accessing the wind turbine there is water underneath the Ground electrical cabinet platform, it is absolutely forbidden to perform tasks underneath this platform.

For tasks in the rest of wind turbine areas, the following requirements must be fulfilled to verify if their performance entails risks to the workers that are going to carry these out:

- 1) The first requirement to fulfill is to guarantee that the cables underneath the lower platform of the tower are in perfect condition and maintain their insulating capacity.

NOTE:

The tasks to perform in the wind turbine will be limited by the height reached by the water in the ring.

- If the height reached by the water is such that it makes contact with the switchgear and/or the electrical cabinets, or even not making contact if the distance between these equipments and water does not guarantee the dielectric rigidity, the tasks cannot be performed in the wind turbine.
- If the operations inside the electrical cabinets in the tower's bottom platform are not being performed, you can carry out tasks in the wind turbine with water in the ring, but taking into account that this situation must be solved as soon as possible.

4.4 ASCENT AND DESCENT ALONG THE TOWER LADDER

Safety conditions to be followed when ascending to or descending from the nacelle are as follows:



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- Only two persons at a time may be tied to the same lifeline, and at no moment may they share the same ladder section.

NOTE:

When the tasks to be carried out require the simultaneous presence of more than one person on the tower ladder, it is necessary to analyze the situation in order to put into place any necessary safety measures for that operation.

- The operator shall have the full use of both hands and will not carry any tool or load.

NOTE:

The worker carrying the load must be last during the ascent and first during the descent. When it is necessary to use tools or lift or lower materials inside the tower, the procedures for lifting loads defined in that section must be followed.

- Each trap door passed during the climb should be closed after passing through.
- Accessing the last platform from the ladder shall be done without releasing the sliding fall arrest device. Once on the nacelle, the hatchway must be closed.

NOTE:

When the installation of the lifeline does not permit access without releasing oneself from the device, one must remain anchored to the harness at all times, even when having already accessed the nacelle.

WARNING



When the lifeline installed at the wind turbine is not approved or has not been certified for use, ascent and descent along the ladder shall be done wearing a harness with a sliding fall arrest device connected to the unapproved lifeline while at the same time being anchored to a fixed and resistant point (rungs with threaded rod or ladder support) by one of the ropes with shock absorption system and wide-opening hook, so that the operator remains tied at all times to at least two points.

- The distance of a continuous ascent or descent shall be that which is permitted when loosening the tied point of the rope below or above the operator (according to whether it is an ascent or a descent) once having moved along the ladder.

WARNING



It is prohibited to let go of the rope without having tied a second rope below or above the operator (according to whether it is an ascent or a descent).

NOTE:

If during the ascent along the tower ladder the worker feels fatigue, and increase in heart rate, dizziness, muscular stiffness, etc, temporary breaks should be taken at the platforms provided at the tower sections, as well as at the rest platforms located along the vertical path of the ladder.



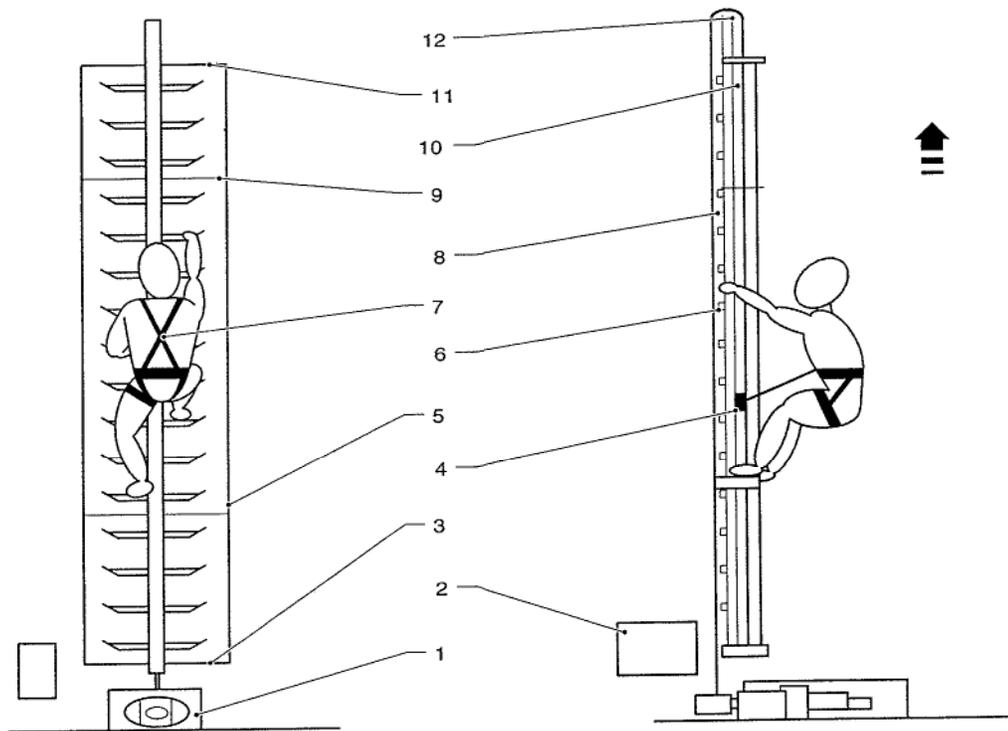
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WARNING



It is forbidden to leave the sliding fall arrest device secured to the tower lifeline once the ascent has finished.

4.4.1 USE OF THE HOIST AID DEVICE



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Figure 18: Hoist aid device components

Brand	Name
1	Spring-activated base
2	Electrical control panel
3	Ladder support
4	Harness
5	Ladder
6	Steps
7	Ascending operator
8	Cable with tensing device
9	Ladder support
10	Traction cable
11	Platform
12	Lifeline



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Table 1:

The wind speed limit for using this device is 15 m/s.

The climbing aid device may only be used by persons familiar with its installation and who weigh at least 65 Kg.

Before commencing the ascent, verify that the climbing aid device functions correctly.

It is absolutely prohibited to use the climbing aid device to transport materials.

The climbing aid device does not offer protection against the risk of falls; therefore, during the ascent along the ladder, one must remain tied to the lifeline by means of the sliding fall arrest device.

The traction cable shall be directly connected to the harness and never to the sliding fall arrest device.

If during the ascent there are hatches on the tower platforms, one must detain the climbing aid device in such a way that the worker remains underneath it, may open it, and continue with the ascent, closing the hatchway when passing through it.

The climbing aid device may not be used by more than one person at a time.

This device is only to be used to aid the ascent of persons, and may not be used for descending.

During the ascent along the ladder, pay attention to the sliding fall arrest device as it may get stuck on the lifeline support-guide, preventing the ascent while simultaneously forcing the equipment, unless its movement is detained.

While using the climbing aid device, maintain the fingers and other body parts away from the traction cables and pulleys.

4.4.1.1 HELP CLIMBER LW-50

4.4.1.1.1 LIFTING OPERATION

During the ascent, one may stop at any level without needing to stop the equipment. The timer will disconnect the equipment after 20 minutes.

To perform the hoisting operation, proceed as indicated below.

- 1) Place yourself inside the ladder.
- 2) Connect the hook on the equipment to the fastening point on the chest of the harness.
- 3) Right rope: pulling once upwards implies the start of the ascent.
- 4) Right rope: pulling upwards a second time implies detaining the ascent.

Once the equipment reaches the upper limit, detain the ascent by employing the control rope, since otherwise the equipment will reach the end of its run and will continue tractioning against the rubber stops, provoking unnecessary overexertion of the equipment and impeding the descent.

Once the equipment is detained, it is recommendable to step up a rung on foot to release tension from the system. Before proceeding with the descent, it is recommendable to send the free guide downwards.

4.4.1.1.2 DESCENT PROCEDURE

The descent of the guide is automatically detained by the limiter when reaching the lower part of the tower.

To perform the descent operation, proceed as indicated below.

- 1) Left rope: pulling once upwards implies the start of the descent.
- 2) Left rope: pulling upwards a second time implies detaining the descent.

Once the tasks are completed, press the Emergency Stop button and cut off the electric supply.

4.4.1.2 TRACTELLIFT

To use the hoist aid device, proceed as indicated below.



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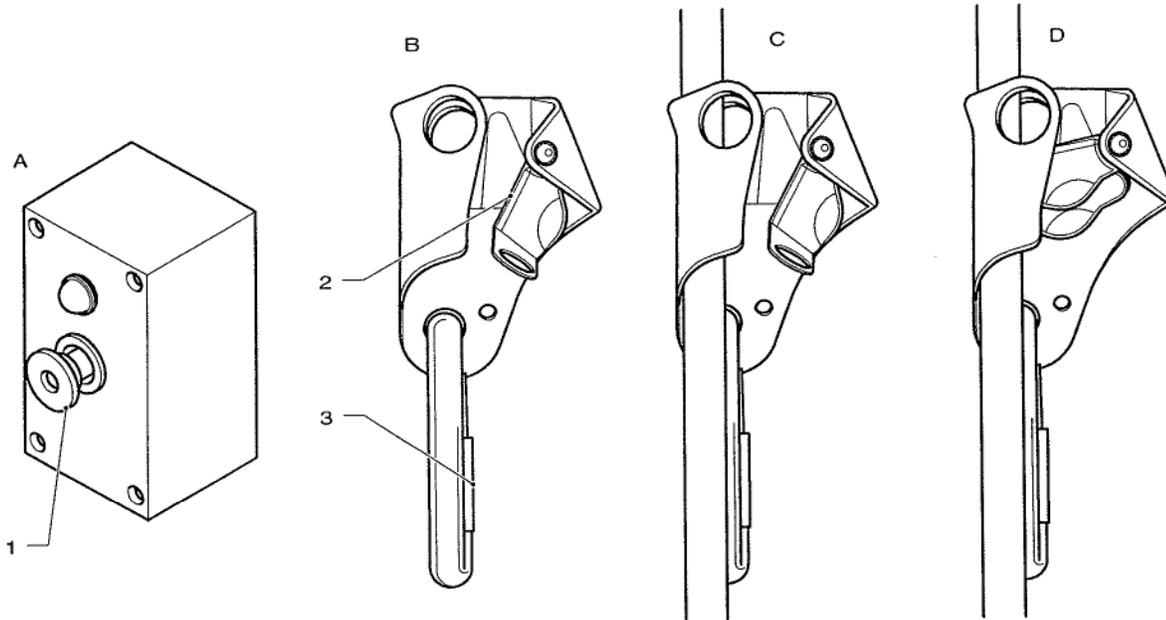
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- 1) Connect the equipment by turning the operations switch key rightward.

NOTE:

The emergency stop button trips and the control light turns on.

- 2) Connect the ascent lock to the harness using a hook.



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Figure 19: Connection of the ascent lock.

- 3) Open the lock: Pull downwards the black lever on the lock, maintain it tightened and pull outwards until it reaches the limit.

NOTE:

Set the black lever free.

The lock clamp must remain blocked in the open position.

- 4) Place the lock on the cable and push the black lever downwards.
- 5) Fasten the lock.
- 6) Stretch the lock with a short and strong downward pull so that the teeth of the lock clamp firmly hold onto the synthetic cable.

NOTE:

The ascent lock is fastened to a fastening point on the chest. This order offers the most effect aid for a comfortable ascent.

If the harness has only one fastening point at the hip, it may also be used.

- 7) Go up one or two rungs and pull the ascent lock by the synthetic cable upward. Check that the motor starts up automatically.



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- 8) Once the tasks are completed, press the emergency stop button and verify that the control light turns off.

NOTE:

The motor automatically disconnects after the preset time period elapses.

WARNING



Remove the ascent lock from the synthetic cable

- 9) Remove the key and store it in the place reserved for this.

NOTE:

Do not use the hoist aid device until an operator accesses the nacelle and removes the ascent lock from the synthetic cable.

4.4.1.3 CLIMB ASSIST AVANTI

To use the hoist aid device, proceed as indicated below.

- 1) Verify that the green light of the motor's wheel protector is turned on. Otherwise, connect the electrical power supply and/or activate the red switch on the electrical control panel.
- 2) Adjust the traction force on the control panel.

NOTE:

Depending on the length of the cable, it will be between 35 and 45 Kg approximately.

- 3) Open the lock: Pull downwards the black lever on the lock, maintain it tightened and pull outwards until it reaches the limit.

NOTE:

Set the black lever free.

The lock clamp must remain blocked in the open position.

- 4) Place the lock on the cable and push the black lever downwards.
- 5) Fasten the lock.
- 6) Stretch the lock with a strong downward pull so that the teeth of the lock clamp firmly hold onto the cable.

NOTE:

The ascent lock is fastened to a fastening point on the chest. This order offers the most effect aid for a comfortable ascent.

If the harness has only one fastening point at the hip, it may also be used.

- 7) To activate the motor, pull the cable of the climbing aid device.

NOTE:

To disconnect the motor, detain the ascent and remain stopped during 5 seconds.



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- 8) Once the task has been completed, cut off the electrical power supply and disconnect the equipment from the power source.

4.5 WIND TURBINE ANCHOR POINTS

4.5.1 ROTOR ANCHOR POINTS

Some wind turbines have hubs with some eyebolts for the required anchorage of the operators when accessing the interior of the rotor using a retractable belt.

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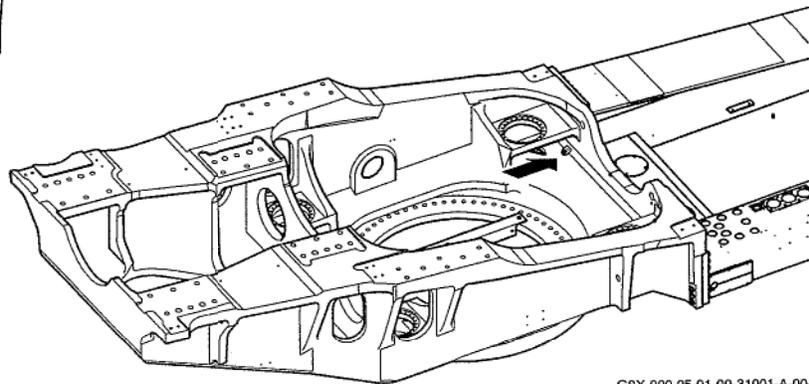
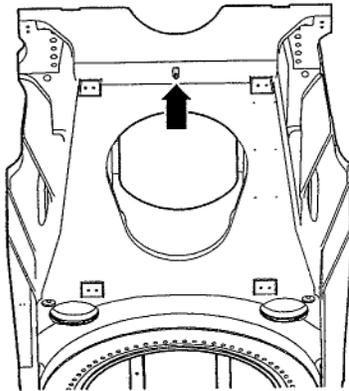
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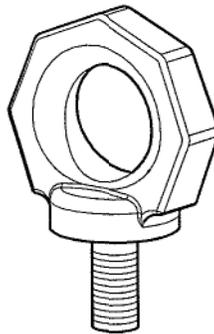
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Figure 22: Location of the anchor points



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Figure 23: Anchor eyebolt

4.5.2.2 REAR FRAME ANCHOR POINTS

For the general location and close-up of the anchor points, see the figure below.



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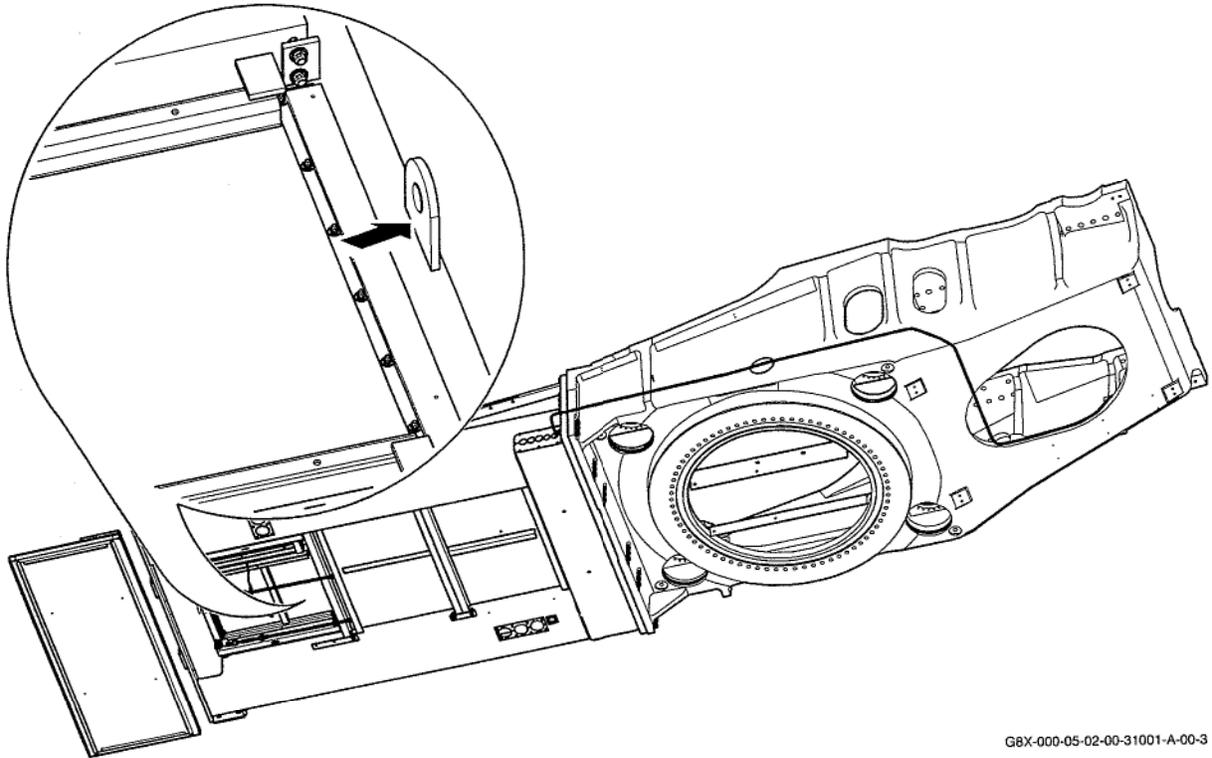
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Figure 24: Location and close-up of the anchor points

4.5.2.3 ANCHOR POINTS IN THE VERTICAL COLUMNS OF THE LOAD HOIST SYSTEM

The location of the anchor points on the vertical columns is shown in the following figures.



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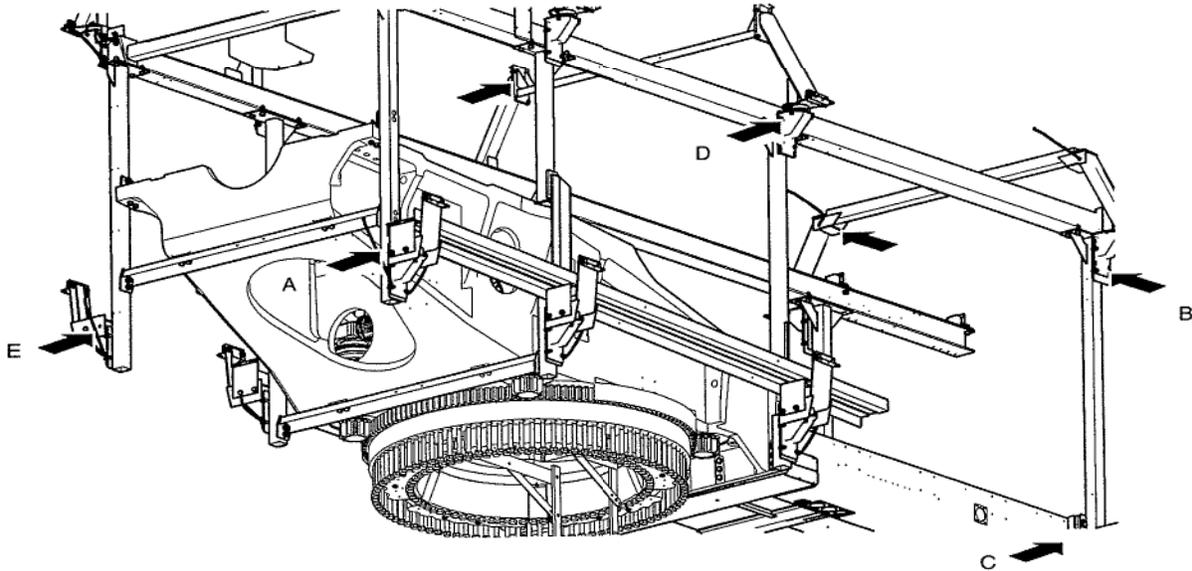
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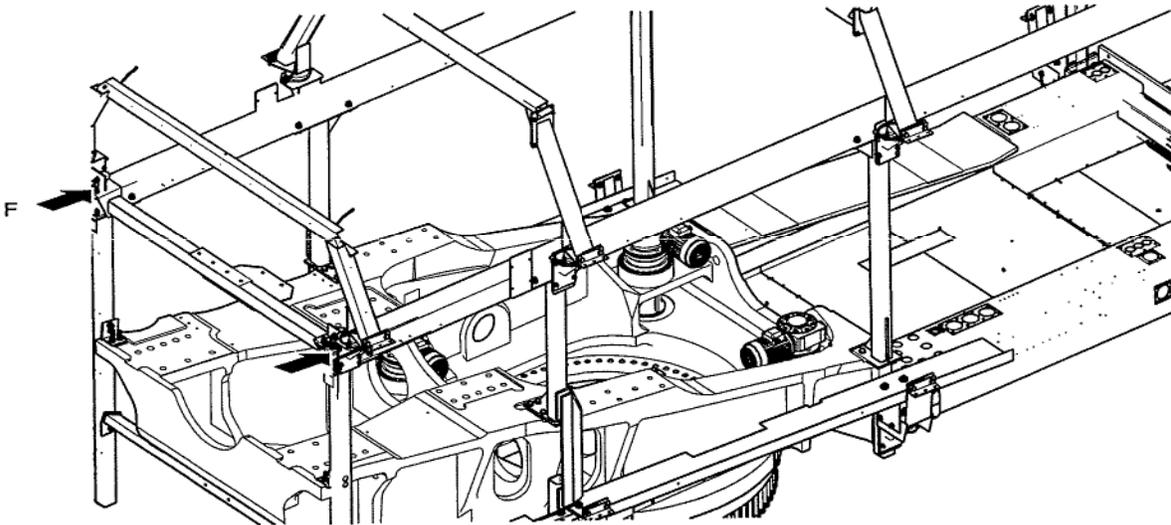
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G8X-000-14-00-00-31001-B-00-3

Figure 25: Location of the anchor points 1



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Figure 26: Location of the anchor points 2



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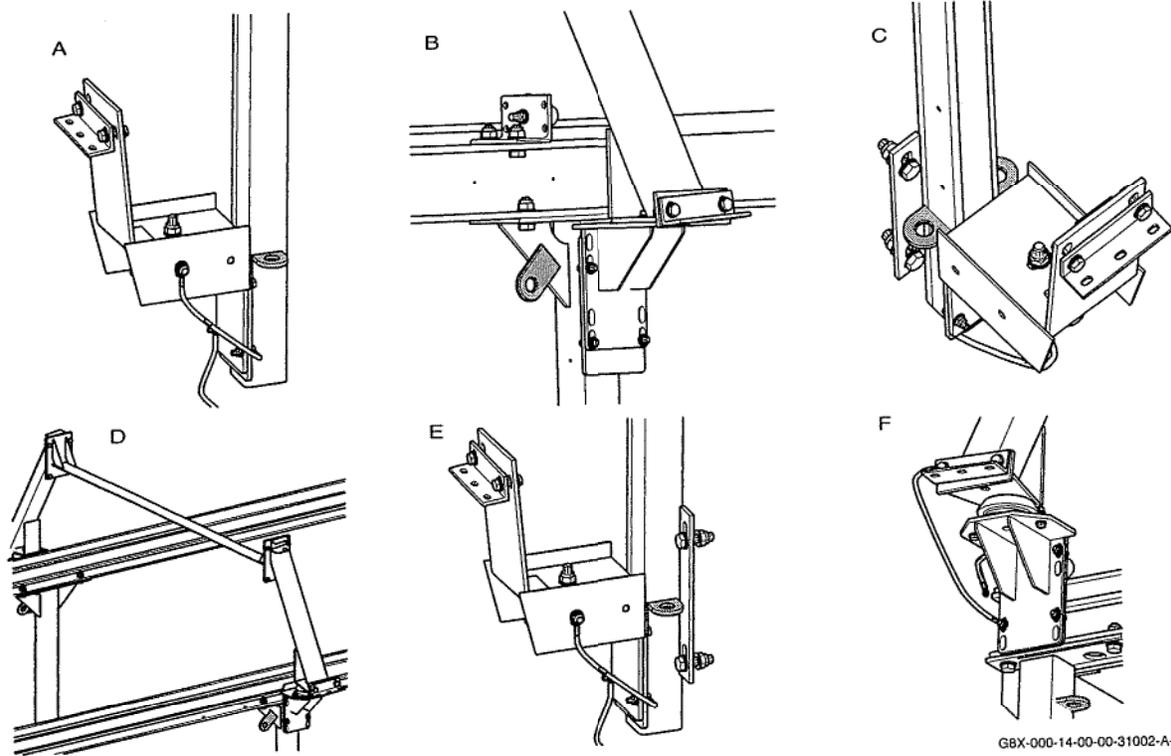


Figure 27: Close-up of the anchor points

4.5.3 ANCHOR POINTS AT THE TOWER

There are towers with certified anchor points. These are located on the middle and top platforms.

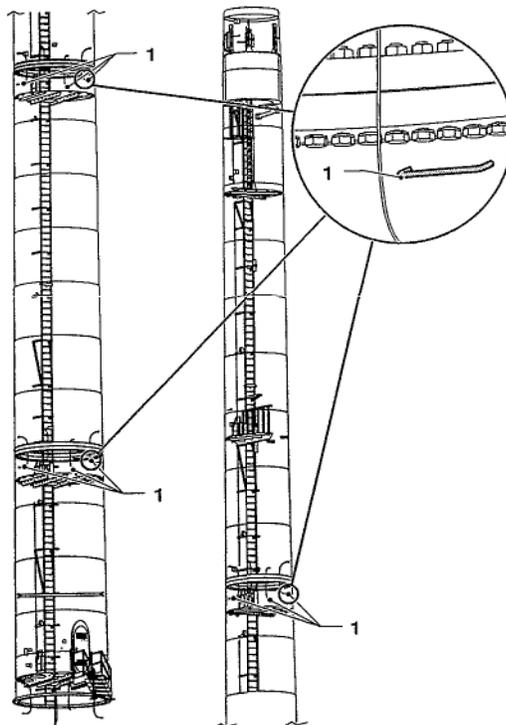


Figure 28: Anchor points at the tower



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4.6 LIGHTING

The wind turbine lighting must have a minimum luminance level of 50 lux over the work area and lighting must be available in areas where inspection and maintenance tasks are carried out.

The guide and emergency lights must have a minimum of 10 lux.

More restrictive values may be required depending on the task to be carried out and legislation in effect. In this case, the workers must be equipped with auxiliary illumination; to this end, the wind turbines are equipped with plugs in the work areas.

5 WEATHER CONDITIONS

5.1 WIND CONDITIONS

In the event a discrepancy arises between the wind speed limit as defined by GCT and that defined in the crane manufacturer's manual, the following procedure applies:

- If the crane manufacturer's manual indicates that the suspension of loads is prohibited at wind speeds which are less than those set forth by GCT, the limit established by the manufacturer will always prevail.
- If the manufacturer's manual recommends that the operations be limited to speeds inferior to those set forth by GCT, the criteria to follow as to the operation will be to act per that established by the crane manufacturer, based upon specific conditions, and always obeying the limit established by the automatic load lifting limiter with which the crane is equipped.

5.1.1 WIND SPEED LIMITS FOR GENERAL ACTIVITIES

WORKS TO BE CARRIED OUT	G8X-G9X MAX. SPEED
Access to the turbine	Nacelle 20 m/s
	Lower platform 25 m/s
Locking of the Rotor	12 m/s
Active. General Start-Up Activities	12 m/s when locked
	20 m/s when unlocked
Works outside on the Nacelle roof	12 m/s when locked
	15 m/s when unlocked
Operations inside the cone	12 m/s
Works with basket	12 m/s
Works from the hanging platform outdoors	10 m/s
Vertical Jobs	12 m/s outdoors
	20 m/s indoors
Use of the Hoist	20 m/s
Use of elevators with towrope guides	18 m/s
Use of elevators with fixed, metal guides	20 m/s
Use of HELPCLIMBER LW-50 Helper	15 m/s
Use of TRACTELIFT Helper	20 m/s
Use of CLIMB ASSIST AVANTI Helper	20 m/s
Use of POWER CLIMBER IBEX Helper	15 m/s

Table 2: Wind Speed limits for general activities



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5.1.2 WIND SPEED LIMITS FOR ASSEMBLY ACTIVITIES

WORKS TO BE CARRIED OUT	G8X-9X MAX. SPEED
Unloading of sections with one crane	15 m/s
Unloading of sections with two cranes	20 m/s
Unloading of blade cages with one crane	15 m/s
Unloading of blade cages with two cranes	20 m/s
Blade unloading from the cage	18 m/s
Unloading of the hub	20 m/s
Unloading of the Nacelle.	N/A
Assembly of lower sections	18 m/s
Assembly of intermediate sections	18 m/s
Assembly of upper sections	15 m/s
Assembly of Nacelles	15 m/s
Assembly of blades on the ground	18 m/s
Assembly of rotor unit on the Nacelle	12 m/s
Assembly of blades (blade-blade procedure)	14 m/s
Assembly of hubs (blade-blade procedure)	18 m/s

Table 3: Limit Wind Speeds for ASSEMBLY operations

5.1.3 WIND SPEED LIMITS FOR MAINTENANCE ACTIVITIES

WORKS TO BE CARRIED OUT	G8X-G9X MAX. SPEED
Inspection and Repair of Nacelle Elements	12 m/s when locked
	20 m/s when unlocked
Predictive Maintenance	12 m/s when locked
	20 m/s when unlocked
Preventive Maintenance Outdoors	12 m/s when locked
	15 m/s when unlocked
Preventive Maintenance at Hub	12 m/s
Preventive Maintenance at Nacelle	12 m/s when locked
	20 m/s when unlocked
Preventive Maintenance rest of the Tower	20 m/s
Disassembly of the Transmission Shaft	12 m/s
Pitch Control System	12 m/s
Replacement of Brake Elements	12 m/s
Replacement of the Rotor (Hoisting)	12 m/s
Replacement of the Nacelle	15 m/s



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WORKS TO BE CARRIED OUT	G8X-G9X MAX. SPEED
Replacement of the Generator	12 m/s
Replacement of the <i>TOP</i> Control	12 m/s
Replacement of the Ring	12 m/s

Table 4: Limit Wind Speeds for MAINTENANCE operations -1

WORKS TO BE CARRIED OUT	G8X-G9X MAX. SPEED
Replacement of the Blades	14 m/s when using yaw gearbox-motor
	12 m/s without using yaw gear motor
Replacement of the Gearbox	12 m/s
Replacement of the Switchgear or <i>GROUND</i>	15 m/s
Replacement of the Anemometer or Wind Vane	15 m/s

Table 5: Limit Wind Speeds for MAINTENANCE operations -2

NOTE:

In the event a discrepancy arises between the wind speed shown by the anemometers of the wind turbine and the crane, the valid reading will be that of the latter.

5.2 WEATHER CONDITIONS

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 Director of the Maneuver, Prevention Director and the Crane Driver must all agree that the operation may be effectuated, considering that the Crane Driver is the person who will evaluate the possibility of performing the task.

The wind turbine should be abandoned in the risk of electrical storm, and even the wind farm itself if the substation does not offer sufficiently safe conditions for seeking refuge therein.

In the case of strong winds, hold the tower door firmly when opening it, do not stand in the door aperture and check that no one else is there either.

5.2.1 WORKS WITH ICE AND SNOW

If the client has procedures for operations (validated and approved by GCT), the tasks will be carried out in compliance with the indications described in the document. In case no such procedure is available, the following indications must be followed:

- Access the wind farm when the access may be done with a four-wheel drive vehicle without using chains, though these must be available in the vehicle and their use is restricted to the evacuation from the farm in the event of needing to abandon it due to a worsening of weather conditions. In the event of being in the process of assembly or maintenance and a worsening of weather conditions is appreciated, operations must be suspended immediately and the wind farm evacuated.

NOTE:

While circulating within the wind farm, traffic rules and signs established by the owner must be obeyed, and when these do not exist, under adverse weather conditions (fog, snow, intense rain, ice, etc.) or the condition of the road is not optimal, circulation speed is limited to a maximum of 20 km/h



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- Access to the farm is prohibited, even if it is possible with an off-road vehicle, when the road limits are not visible due to snow accumulated on them, or even when a part of the road had been cleaned if the limits of the clean area are not visible either.
- When there is ice on the wind turbine blades, carry out the maintenance operations in the manner indicated in the procedure G8X-G9X-03-00-00-00-0-34Z-1-F

Whenever there is evidence of ice on the wind turbine's blades, whether detected through direct observation or revealed by the activation of the alarm indicating the presence of ice, access to the farm for carrying out maintenance operations on the wind turbines must be done as described below:

5.2.1.1 GENERAL WIND FARM ACCESS

During travel to the wind farm where the tasks are going to be carried out, it is possible that other farms will be passed through which sometimes are not controlled by *GCT* remote control. In the event ice is detected on the blades and no special vehicle is available, circulating on wind farm access roads is forbidden until there is visual evidence that there is no longer ice on the blades.

In the event that one is at the substation at the center of the farm branches and the remote control fails which impedes stopping the wind turbine remotely in case of ice on the blades, and no special vehicle is available, circulating on wind farm access roads is forbidden until the ice on the blades has dissipated completely or the remote control is reestablished and the wind turbine may be stopped.

5.2.1.2 ACCESSING THE FARM WITH A SPECIAL VEHICLE

Put the wind turbine to be worked on as well as the preceding and following ones in pause mode, whether from the substation or the operations center.

NOTE:

Do not start up these turbines while the task is being carried out and while operators have not yet returned to the substation or abandoned the farm. The wind turbines preceding and following the one being worked on may be started up if the operators responsible for carrying out the tasks indicate doing so. Tasks remain restricted to those which may be performed inside the wind turbine.

Should it be necessary to access the exterior of the tower, stop the wind turbine until the personnel has returned inside the tower or exited the wind farm.

The start-up of the wind turbines adjacent to the one worked on may only be done at the request of the workers who operate the wind turbine. If there is no coverage, the start-up of these wind turbines may not be done.

5.2.1.3 ACCESS TO THE FARM WITH A NORMAL VEHICLE

Set all of the wind turbines found along the route to the one to be worked on in pause mode, whether from the substation or the operations center and including the preceding and following ones.

NOTE:

In the event of different branches in the farm, in addition to the preceding and following wind turbine to the one being worked on, all of those wind turbines which are within a distance less than 200 meters from the one subject to operations must be set in pause mode.

After accessing the wind turbine, the rest of the turbines - excepting the one being worked on, and the preceding and following ones - may be started up again.

NOTE:

Do not put these turbines into operations while the task is being carried out and while operators have not returned to the substation or have abandoned the farm. The wind turbines preceding and following the one being worked on may be started up if the operators responsible for carrying out the tasks indicate doing so. Tasks remain restricted to those which may be performed inside the wind turbine.

Should it be necessary to access the exterior of the tower, stop the wind turbine until the personnel has returned inside the tower or exited the wind farm.



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The start-up of the wind turbines adjacent to the one worked on may only be done at the request of the workers who operate the wind turbine. If there is no coverage, the start-up of these wind turbines may not be done.

Once the maintenance tasks have been completed, put in pause mode all of the wind turbines found along the route to the substation or outside of the park.

6 TASKS UNDER SPECIAL CONDITIONS

6.1 WORKING WITH THERMAL STRESS:

- Prior to starting the tasks in the wind turbines, check the temperature inside the nacelle or outside (ambient temperature) depending on the area in which the tasks are being performed. This temperature check must be done from the control unit of the substation or the touch screen in *GROUND* cabinet, observing the values on the ambient PT100 and nacelle or base PT100 temperature probes.
- Once the temperature is known, the tasks may be performed, as long as the safety measures corresponding to the temperature range present at the moment are observed:
 - **$T \leq -5^{\circ}\text{C}$** : Workers may only carry out planned tasks, as long as the work clothes worn is defined to protect up to a temperature lower than that present during operations, and as long as the equipment to be used are within the margin indicated by the manufacturer in its use and maintenance manual.

NOTE:

In these weather conditions, it is recommended to make pauses for hot drinks whenever possible, after notifying the yard supervisor and getting his approval. Follow the instructions in point "Figure 6.1.1"

- **$-5^{\circ}\text{C} < T \leq 28^{\circ}\text{C}$** : Accepted temperature range to perform tasks without requiring any additional safety measures.
- **$28^{\circ}\text{C} < T \leq 40^{\circ}\text{C}$ (35°C with prolonged and direct exposure to the sun)**: When the temperature of the work area is within this range, the tasks may be performed, as long as the indications contained in point "Figure 6.1.2" of this section are taken into account.
- **$40^{\circ}\text{C} < T$ (35°C with prolonged and direct exposure to the sun)**: When the temperature in the area is above this limit, the tasks may only be carried out if the particular situation of the park has been analyzed and if the conditions under which the tasks are being performed have been clearly defined:
 - Exposure time.
 - Rest periods.
 - Physical load of the tasks to be performed.
 - Specific preventive measures for adaptation to these conditions.

6.1.1 TASKS PERFORMED AT LOW TEMPERATURES

- **HYPOTHERMIA: MEASURES TO TAKE INTO ACCOUNT TO PREVENT IT AND ACTIONS IF NECESSARY.**
 - Below are a series of instructions to recognize if a worker is suffering from hypothermia, the measures to take in order to prevent it and the way to proceed in case it is present.
 - Hypothermia is an abnormally low body temperature. It is a dangerous condition caused when the body loses more heat than the one it may produce. It requires immediate medical attention.
 - In general, hypothermia is the result of the exposure to very cold temperatures. It may also occur at less cold temperatures if there is freezing wind, if clothes are wet or if the worker is placed in a position where he cannot move.
 - Generally, the persons most likely to suffer from hypothermia are:



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- Elderly persons that do not have enough heat, food or clothes.
- Adults under the influence of alcohol or drugs.
- Persons that remain outside during long periods of time.
- In general, hypothermia symptoms happen gradually and, with time, they reduce mental and physical capacity. The main symptoms of hypothermia are: shivers, trembles, confusion, clumsiness, memory loss, slurred speech, drowsiness, irritability, hallucinations, slow breathing, cold and pale skin, muttering, tightness and disorientation.
- If the worker is shivering and stops doing it, and confusion and drowsiness increase, the situation is very dangerous, since hypothermia may be mortal.
- In order to prevent the workers from getting to this situation, below you may find a series of safety standards to take into account during the stay and the performance of tasks in the wind turbine:
 - Use the protective clothing adequate for the temperature you are going to be exposed to.
 - Protect yourself in a dry place when you are damp or shivering.
 - Do not drink alcohol.
 - Eat balanced food and remain hydrated.
 - Have hot drinks. In the case of taking bottles with hot drinks to the wind turbine, they must be taken in independent bags from those used for tools, chemical products... and must be correctly identified in order to prevent other workers from handling them or using the for a different purpose.
- If a worker is suffering from hypothermia, the first aid to apply is:
 - Take the affected person to a warm and protected area.
 - Warm his body temperature as soon as possible, beginning from the chest, neck, head and groin. If necessary, use skin-to-skin contact to share body temperature.
 - Replace his wet clothes for dry ones.
 - Help him exercise, if possible.
 - Give him warm drinks (non alcoholic) and feed him.
 - Take the accidented person to the doctor as soon as possible.

6.1.2 TASKS PERFORMED AT HIGH TEMPERATURES

- **HEAT STROKE: MEASURES TO TAKE INTO ACCOUNT TO PREVENT IT AND ACTIONS IF NECESSARY.**
 - During the summer, the temperature and humidity inside the wind turbine may be high because of: the exterior ambient temperature itself, heat generated by the wind turbine's components while operating, the use of certain necessary tools to carry out the tasks and the vicinity of coastal areas. Under these conditions, workers may suffer from an imbalance in the thermal control mechanism of the body, triggering a heat stroke.
 - In order to prevent workers from getting this condition, below are a series of safety standards to take into account while remaining inside and the performance of tasks in the wind turbine:
 - Make a natural ventilation leaving the nacelle roof hatchways open.
 - When possible, provide mechanical help to reduce the physical effort.
 - Drink fresh water frequently and in small quantities (every 15-20 minutes) during the task and after it. Do not wait until you are thirsty to drink. In the case of taking bottles with water, sodas... to the wind turbine, they must be taken in independent bags from those



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used for tools, chemical products... and must be correctly identified in order to prevent other workers from handling them or using them for a different purpose.

- Decrease the intensity of the work or make periodical breaks in areas with less heat (perform brief and frequent work-break cycles). Organize yourself so that the tasks that require more physical effort are done in the moments with less heat during the day.
- Avoid eating too much and greasy foods; eat fruit, vegetables, have salt with the meals (in case of hypertension, see the doctor). Do not take alcohol (beer, wine, etc.) or drugs. Avoid caffeine drinks (coffee, cola drinks, etc.) and very sweetened drinks.
- Use fresh fabric clothes (cotton). Protect your head from the sun.
- Avoid driving if you are not completely recovered.
- Go to work well rested. Have a shower and refresh yourself after work.
- If you experienced disorders like cramps, syncopes and discomfort, stop the physical activity and rest in fresh places
- Workers with cardiovascular and respiratory diseases, diabetes, skin diseases, sweat gland diseases, renal insufficiency, gastrointestinal diseases, epilepsy and mental disorders are more vulnerable to heat thermal stress. Taking certain medications alter the natural thermal regulation of the body (antihistamines, antidepressants, tranquilizers, etc.)
- If a worker is suffering from a heat stroke, the first aid to apply is:
 - Take him to a fresh and ventilated place.
 - Take the unnecessary clothes away and give him air.
 - Refresh his skin with cold packs in the head, soaking the rest of the body with fresh water. If the worker begins to shiver, stop.
 - Fan the victim to lower his skin temperature.
 - Turn him around unless he is vomiting or convulsing, in this case put him sideways.
 - Place a soft object (clothes, pillow, cushion...) under his head.
 - If the worker is conscious and is not nauseous, give him liquids like caffeine-free drinks, isotonic drinks or water with salt (a teaspoon of salt each half liter of water).
 - Take the victim to the hospital.

6.2 WORKS IN CONFINED SPACES

Works in confined spaces are the ones performed inside the hub, the blades, and those that require getting inside the connection boxes with adverse natural ventilation, as long as the activity performed inside can generate an accumulation of flammable or toxic pollutants, or an atmosphere with not enough oxygen. In the case of any doubts, consult with the Maintenance Procedure Area and GCT & Health and Safety Department.

To carry out these operations, make a risk evaluation specific for the tasks to perform, and the presence of preventive measures will be necessary while doing it. In addition, it is mandatory to hold a written Work permit that defines the conditions under which it must be performed.

NOTE:

The access to confined spaces will be limited to AUTHORIZED WORKERS.

6.3 WORK DURING NIGHT SHIFTS

If inclement weather or the duration of the work shift imply a loss of visibility, clothes with highly visible, reflective elements must be worn.

When the work shift must be extended, the Health and Safety Coordinator and those responsible for safety in the participating companies must be informed in order to coordinate the activity.



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Verify that there are no unmarked or unprotected horizontal openings (ditches, holes, electric cables). If this occurs, eliminate the risks generated.

Any operation different from the resetting of the wind turbine is prohibited from the lower tower platform. When it is necessary, an occupational risk assessment or Health and Safety Plan must be developed to include preventive measures and operations adopted, taking into account the following points:

- When working at night, adequate lighting must be ensured to enable work to be carried out in safe conditions.
- The illumination of work areas must allow workers to have adequate visibility conditions to enable transit throughout these areas as well as carrying out their tasks in these areas without risk to their health or safety.
- Lighting must be adequate for the type of task to be carried out, but in addition to the level of illumination, other important aspects must be considered, amongst which is the lighting control, uniformity, equilibrium of luminance within one's visual field, and integration of natural light.
- The visual demand required by the task is not the only factor to be considered when conditioning the lighting; it is also necessary to take into account if any workers have a visual capacity lesser than the norm, and the negative consequences to personal safety which may result from errors due to poor visibility. This may require an increase to the levels of lighting and an adaptation of other aspects related with illumination in accordance with criteria presented further on.
- Prior to carrying out assembly-related tasks during a night shift, effectuate a review and evaluation of the illumination levels offered by the auxiliary means used to guarantee that the minimum lighting level reached in those areas where work is to be done complies with the table 1 on Minimum illumination levels.

6.3.1 REGULATIONS APPLICABLE TO NIGHT SHIFTS

In accordance with legislation in effect in Spain, night shifts are those carried out between 10:00 pm and 6:00 am. A night-shift worker is one who dedicates, at least, three hours of the daily shift, or at least one third of the annual work time is performed during night shifts, per employment legislation. A company which regularly resorts to night shifts of its workers must communicate this to the labor authorities. For work carried out outside Spain, local legislation in effect must be complied with.

6.3.2 PREVENTIVE MEASURES

- At all times, the load to be manipulated and the crane hook must be fully visible by the crane operator and personnel who intervene in the maneuver. If this is not the case, the maneuver must be suspended.
- The illumination of each working area must be adapted to the characteristics of the task to be carried out there, bearing in mind:
 - The risks to health and safety of the workers who depend on visibility conditions.
 - The visual requirements of the tasks carried out.
- Whenever possible, the work areas must have natural lighting complemented by artificial lighting when the former, alone, does not guarantee adequate conditions for visibility. In these circumstances, preferably general artificial lighting should be used, complemented, furthermore, by localized lighting of specific areas which require higher levels of illumination.
 - The minimum levels of illumination of the work areas are set forth in the following table:

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

Table: 6: Table of minimum illumination levels

- These minimum levels must be duplicated when the following circumstances concur:



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- 1) In areas or installations for general use and on roads when due to their characteristics, condition or use present noticeable risks of falls, collisions or other accidents.
 - 2) In working areas where an error of visual judgment during the realization of tasks may entail a danger for the worker who carries them out or for third parties or when the contrast of illumination or of color between the object to be visualized and the background against which it rests is very weak. Despite the preceding paragraphs, these limits will not apply when the nature of the activities to be carried out impedes them.
- More restrictive values may be required depending on the task to be carried out and legislation in effect. In this case, the workers must be equipped with auxiliary illumination (flashlight, front light...)
 - The illumination of the area where a task is carried out shall be measured at the heights at which it is done; in the case of areas for general use at 85 cm measured as of the level at which the worker is, and in roads for the circulation of traffic the level of the same.
 - In addition, the lighting of work areas must comply with the following conditions as regards its distribution and other characteristics:
 - 1) The distribution of lighting must be as uniform as possible.
 - 2) Try to maintain adequate levels and contrasts of illumination in accordance with the visual requirements of the task, avoiding sudden changes of lighting within a working area and between these and their surroundings.
 - 3) Avoid direct glare resulting of sunlight or sources of artificial light of high luminance. In no case shall these be placed unprotected within the worker's visual field.
 - 4) Likewise, avoid indirect glare produced by reflective surfaces located in the working area or its vicinity.
 - 5) Do not use light systems or sources which hinder the perception of contrasts, depth or distance between object in the working area, or that produce the visual impression of intermittency or which may result in stroboscopic effects.
 - The working areas, or parts of these, in which a failure of the normal lighting may imply a risk to the safety of the workers, must have an emergency lighting system for evacuation and safety. To assure the perfect functioning of the auxiliary measures used (power generator set, generator, etc.), a person will be appointed as responsible for guaranteeing the supply of fuel, perfect conditions of the connections and their functioning.
 - The lighting systems used must not produce electrical risks, fire or explosion, and must fulfill, to this effect, the provisions of specific legislation in effect.
 - These auxiliary means used must be equipped with a minimum level of illumination which allows for safely evacuating the machine when there is a power drop, or all personnel participating in the operations be equipped with autonomous front lights which equally suffice this requirement of lighting for evacuating the machine.
 - Any operation which is not included in this annex must comply with the following considerations prior to approval being granted by GCT for its execution:
 - 1) Previous acknowledgment of the tasks to be carried out: The purpose of this acknowledgment is to determine the areas or jobs which have deficient illumination or cause glare, for which the opinions of the workers must be gathered and a visit done to all areas implicated in the assembly work to be done. The information to be collected and registered is as follows:
 - diagram of the distribution of areas, lights, machinery and equipment;
 - description of the work processes;
 - description of the jobs;
 - number of workers per work area.
 - 2) Evaluation: As of the records of the inspection, and evaluation of the lighting levels, work areas and jobs must be done.
 - The evaluation of lighting must be done during the workshift under normal operating conditions. It may be done by working areas, jobs, or a combination of both.



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ACTIVITIES TO BE CARRIED OUT	MINIMUM LIGHTING LEVEL	TECHNICAL RESOURCES
Assembly/disassembly of the main crane	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Elevation cable assembly	500 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Crane movement	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Works inside the wind turbine	200 Lux	Lighting of the tower
Wiring of the tower	200 Lux	Lighting of the tower
Torque values	200 Lux	Lighting of the tower
Elevator assembly	200 Lux	Lighting of the tower
Assembly of Sections	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Hoisting of sections	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Reception of sections	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Retained on the ground	100 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Assembly of the nacelle	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Hoisting of the Nacelle	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Reception of the Nacelle	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Retained on the ground	100 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Assembly of the rotor	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Assembly of the rotor on the ground	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Hoisting of the rotor	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Reception of the rotor	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Retained on the ground	100 Lux	2 lighting tower (6 lights per tower, 1500 w each light)
Assembly of the rotor blade by blade	200 Lux	2 lighting tower (6 lights per tower, 1500 w each light)

Table: 7: Minimum illumination levels

6.3.3 TIME LIMITS FOR INITIATING REPAIRS

Below you can find the approximate time required for the performance of the different operations, in order to plan them without exceeding the workday marked by the existing regulations of the place where the wind turbine is or



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will be. Also, always bear in mind that in case natural illumination is not the required to perform the operation, the artificial lighting devices defined in the previous point must be used.

MANEUVER TO BE PERFORMED	DURATION OF THE MANEUVER	OPERATION STATUS
Hoisting of the lower section	1 h	Section being lifted
Hoisting of the lower intermediate section	1 h	Section being lifted
Hoisting of the upper intermediate section	1 h	Section being lifted
Hoisting of the upper section + nacelle	3 h	Section being lifted
Hoisting of the hub	1 h	Load being lifted
Hoisting of the complete rotor (excluding tensioning)	2 h	Placement of tools
Hoisting of the first blade (blade by blade procedure)	3 h 30 min	Blades unloaded from the container

Table 8: Timetable for performing the tasks

7 PROCEDURE IN THE CASE OF ACCIDENT OR DISASTER AND FIRST AID

7.1 PROCEDURES IN THE EVENT OF ACCIDENT OR DISASTER

In the event of an accident or situation which impedes that a person descends by his/her own means, comply with the specifications of the park's emergency plan designed by the owner.

7.1.1 FIRST AID

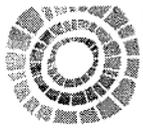
It is recommended that among the personnel to access the wind turbine, some be trained in first aid, which as the name suggests, is the primary care of an accident victim or someone suddenly taken ill, at the scene of the event, until the arrival of specialized personnel, or until the patient arrives to a hospital. The subsequent evolution of the patient may depend upon the care administered at this moment.

When administering first aid, the general guidelines for action are as follows:

- stay calm.
- act quickly but without precipitation.
- observe the situation before taking action.
- make an initial "in situ" evaluation of the patient.
- do not do anything you do not know how to do.
- keep the patient warm.
- reassure the patient if he/she is conscious.
- do not move the patient unless he/she must be evacuated.
- do not administer food or drink if the patient is unconscious.
- notify the emergency services by the fastest means possible.
- if the victim hangs from a fall arrest device, stand underneath to support his/her weight in our arms (without forgetting to remain fastened at all times), in this way avoiding that this person suffers the "harness" effect.

7.2 PROCEDURE IN THE EVENT OF FIRE

In the event there is any type of fire near the wind turbine, immediately contact the substation to disconnect the grid. The area must be cleared and cordoned off in a radius of 400 m (1,300 ft) from the turbine.



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If a small fire starts when one is inside the nacelle, the turbine must always be disconnected from the switchgear.

- From the nacelle, the switchgear is disconnected with the button next to the emergency push-button on the (*TOP*) control cabinet.
- From the base, the switchgear is disconnected by pressing the red button on the switchgear in the high voltage section.

When using fire extinguishers, do not forget there is mid-voltage in the wind turbine, and therefore the extinguishers must be suitable for use in electrically caused fires (20 KV). The fire should be extinguished with suitable powder or CO₂ extinguishers. Under no circumstances should water be used.

Remember that a carbon dioxide extinguisher should never be used in small, enclosed areas without respiratory protection.

IMPORTANT:

Remember: never use water.

Given the nature of the installation, in the event of a fire inside the wind turbine, the main risk for personnel is the lack of oxygen and inhalation of smoke from combustion, which could cause asphyxia of persons present in the installation even if they do not see the fire.

Smoke from combustion will rapidly fill the wind turbine. This circumstance is accelerated by the chimney effect produced by the tubular shape of the installation.

The use of fire extinguishers in an area of this nature without autonomous respiratory equipment will severely aggravate the effects due to a lack of oxygen in the event of a fire.

In view of the above, in the event that smoke is observed from a fire inside the wind turbine, personnel inside the wind turbine and at levels above the fire at that moment should proceed as follows:

- stay calm.
- do not stop to collect tools or personal objects.
- assemble the emergency descent equipment as described in the instructions with which the personnel should be familiar prior to accessing the generator, and that are indicated on the equipment itself.
- hang down the outside the nacelle by hooking the safety harness to the emergency descent equipment as per the instructions.
- once on the ground, release the hook from the descent device so that a second person may commence the descent.
- if the situation permits, disconnect the main circuit breaker of the wind turbine or notify the control personnel so that they may disconnect it.
- notify wind farm personnel and external fire brigade services by the fastest means possible.

When all personnel have been evacuated from the wind turbine, analyze the possibility of extinguishing the fire using the extinction methods available in the wind farm substation together with autonomous respiratory equipment if entering the wind turbine and in coordination with the public fire brigade services.

When using power generator sets, a fire extinguisher should be kept within close reach.

Special permission is required from GCT when carrying out work which may produce sparks. Before commencing this type of work, clean away any traces of oil, have a portable fire extinguisher handy and, if necessary, use a fire blanket.

Every inspection or maintenance vehicle must carry a portable extinguisher for use in minor fires on the lower platform of the wind turbine tower.



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8 PREGNANT WORKERS

- Any pregnant workers may only access the *GROUND* platform of the wind turbine, and are prohibited from accessing any other parts of the same.
- Pregnant workers may only carry out operations executed at ground level, forbidden from works at heights, for example, tasks from elevator platforms, ladders...
- Pregnant women will not be assigned tasks which require lifting, transport of loads, or any other heavy manual tasks. This measure must be respected including up to 3 months after giving birth. Do not exert pulling or pushing forces (+10 kg). When seated, do not handle loads weighing over 3 kg, nor apply force.
- Pregnant women shall not work night shifts.
- Pregnant women shall not carry out work that implies electrical risk.
- Access to and space provided on the job must assure easy and comfortable movement of pregnant women.
- Facilities must be offered so that pregnant women may carry out their tasks in a seated position.
- Tasks assigned to pregnant women, particularly during the final months of the pregnancy, must be flexible enough to allow rest stops. If necessary, work rotation may be planned in such a way as to allow the pregnant woman to regulate her own working rhythm.
- Provide pregnant workers with sufficient rest breaks over the length of the daily work shift.
- Install bathrooms and places for rest adequate for pregnant women to use them comfortably.
- Pregnant women may not handle chemical products having a Safety Data Sheet which identifies risks to the health of the pregnant women and/or fetus.

8.1 ERGONOMIC RECOMMENDATIONS: DYNAMIC POSTURES

- Do not remain standing in a fixed position for more than 1 hour without moving.
- Do not remain for over 4 hours in a fixed position or one combined with movements.
- Do not remain kneeled or squatting.
- Do not carry out continuous (> 1 minute) or repetitious (> 2 times/minute) inclinations toward the side or pronounced turns of the trunk.
- Do not bend the trunk.

8.2 ERGONOMIC RECOMMENDATIONS: STATIC POSTURES

- Do not remain seated for more than 2 continuous hours.
- While seated, intend that the legs do not hang from the seat and that the feet have support.
- Rest the trunk against a backrest.
- Move the legs comfortably underneath the work surface.

8.3 DRIVING

- Avoid continued driving during many hours. Stop every 2 hours or every 200 kilometers traveled. Exiting the road with the vehicle, stretch the legs and breathe fresh air. In any case, at the slightest sign of exhaustion, stop the vehicle on the side of the road and take a nap and/or rest.
- When worn by pregnant women, the safety belt must be placed in such a way that its sudden locking will not oppress the center of the belly, eliminating the possibility that the fetus suffers any damage. Below, there is an information description of a commercial device that may be used to achieve the indicated goal:
- To put on the seatbelt, proceed as follows:
 - 1) Place the device over the vehicle seat.
 - 2) Seat on the device and place the safety belt with the horizontal band over the fastening system. Then, fasten the belt to the device

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Case No(s). 12-0160-EL-BGN

Summary: Motion Amended Motion for Protective Order electronically filed by Mr. Michael J. Settineri on behalf of Champaign Wind LLC