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GENERAL ACTIVITIES			
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Applicability/Safe Practice Attributes			
Active crowbar	ALL	**Generator**	ALL
Blades	ALL	**Operation PLC**	ALL
Coupling	ALL	**Power converter**	ALL
Corrosion	ALL	**Service voltage**	ALL
Dust	ALL	**SW version**	ALL
Yaw system	ALL	**Temperature**	ALL
Frequency	ALL	**Tower height**	ALL
Gearbox	ALL	**Transformer**	ALL
Other:	N/A		

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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 SGRE, 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.
- 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.
- After accessing the wind turbine yard, park further than 20 m from the tower (unless there is a possibility of ice on the wind turbine in which case follow the indications of the section "Working with ice and snow" of this safe practice). If necessary to unload material from inside it, bring the vehicle to an area close to the side of the nacelle hatchway and re-position the vehicle after unloading as indicated. When using cranes, cordon off the area, taking into account the hoisting and lowering of the load being moved; vehicles must park outside of this perimeter. In all cases, the vehicles will have to be parked for the wind farm exit.

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.

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.
- 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 than 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.

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 service operations 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 that require the use of another type of eye protection (for example: tasks with electrical hazards, projection of pressurized liquids, non-ionizing radiations, 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. Also ensure that the soles of boots are free of snow, ice, mud, oil, etc. before ascending and descending the tower access ladder.
- It must be guaranteed that the distance from the yard to the first rung is less than or equal to 200 mm. 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 the wind turbine is accessed, check if these measures are present in it and if it is in good condition. If not, stop the operation until implementing actions that guarantee that fire extinguishing resources are available (if the chosen fire extinguishing means is a fire extinguisher, it must be a CO2 extinguisher with a 5 kg minimum capacity).
- Presence of personnel in the wind turbine:
  - As a general rule, any intervention to be done by personnel from Services will ALWAYS be carried out by a **minimum of two people** duly instructed and trained in the task to be executed.
  - Ensure the availability of human and material resources at all times that are required for the application of the rescue procedures established for the different wind turbine models and scenarios in which the work will be carried out.
  - The number of people that are allowed in the wind turbine at the same time (operating personnel + supervision personnel) will be limited by the maximum number of people defined in the evacuation procedures.
  - If all workers are not in the same work area, they should still be able to communicate with each other at all times via walkie-talkies, and an operations coordinator must be appointed and shall communicate every 10 minutes with all workers involved in the operation to check on their status, and must receive a reply from each worker when working from 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.

2.1 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.
  - 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.
    - 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.

- 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 merging 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.

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 SGRE) 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).
  - 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.

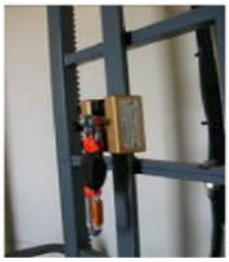
Examples of information

- Ascending/descending the tower ladder may only be done as long as the lifeline is certified for use (based on the applicable legislation depending on the country where the wind turbine is installed) and with the valid review. If these conditions are not met, do not ascend/descend the tower ladder, unless absolutely necessary to ensure the integrity of the wind turbine or to guarantee the safety of workers. In the event of either of these situations, access via the tower ladder by using the double hook technique, or by using techniques established by companies specialising in works at heights.
  - **Double hook technique:** the way to ascend and descend the ladder using this technique will be using the harness with sliding fall arrest device attached to the lifeline and being attached to an anchor device (rungs with threaded rod or support of the ladder) using one of the lanyards with energy absorber device and wide mouth hook, so that at all times you are attached to at least two points. The distance to ascend or descend in a single stretch must allow for releasing the safety line that is 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 fastened a second one above or below the worker (depending if 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 not 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




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

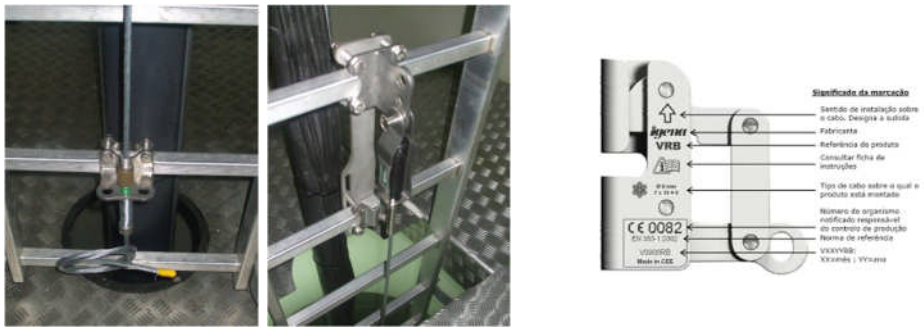

Flexible lifeline (towrope) and Söll Vi-Go de Miller (Sperian) fall arrest device

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

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

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 Igena VRB fall arrest device

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.
- Once inside the nacelle (unless it has been raised only for operations such as thermal resets, differentials, etc.) check that it has the emergency evacuation system (Emergency Descent Device or Rescue Kit) and that its review is valid. If not present in the nacelle or if its revision is expired, bring up the emergency evacuation system together with the necessary tools for using the hoist. If the wind speed is high and could make the equipment sway during the hoisting/lowering process, increase the weight of the load to be hoisted/lowered or use guide ropes. If the area to access for the work is outside the nacelle, the hub, the blade, the transformer area, or underneath the frame, the device present in the nacelle must be the Rescue Kit. For all other areas, it will suffice to have the Emergency Descent Device available in the nacelle but bearing in mind that the Rescue Kit must be available near the wind turbine (Ground platform area or inside the transport vehicle). Additionally, for works in the tower at a level higher than the ground platform, also have the Rescue Kit available near the wind turbine (ground platform area or inside the transport vehicle).

- The Emergency Descent Device equipment and the Rescue Kit that are 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 Emergency Descent Device equipment and the Rescue Kit, its instructions for use, and 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.

2.4 ELECTRICAL CABINETS INSPECTION AND REPAIR OPERATIONS

- **Required PPE:** Work clothes for electrical risk, 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 with enough insulation for the voltage in the area where they will operate and thermal protective gloves against electrical arc.
- **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 SGRE.
- 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 SGRE or the manufacturer, must be backed by a specific work instruction that SGRE 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. There 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.
- Apply the 5 Golden Rules to avoid suffer electrical shocks during tasks inside the electrical cabinets.

- It is necessary to use working clothes for electrical risk, a face shield for electrical work, thermal protective gloves against electrical arc and insulating gloves against electrical injuries appropriate for the voltage of the component to be checked.
- 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 SGRE technical and engineering services.
- 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 electrical 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.

  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

1. ***DISCONNECTING*****,** opening all possible sources of voltage. Remember that condensers and other elements may contain voltage.
2. ***PREVENT ANY POSSIBLE FEEDBACK*****,** the manoeuvring devices used to disconnect the installation must be protected against any possible feedback.
3. ***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.
4. ***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.
5. ***CORDON OFF AND MARK THE WORK ZONE*****.**

2.6 ACCESSING THE TRANSFORMER

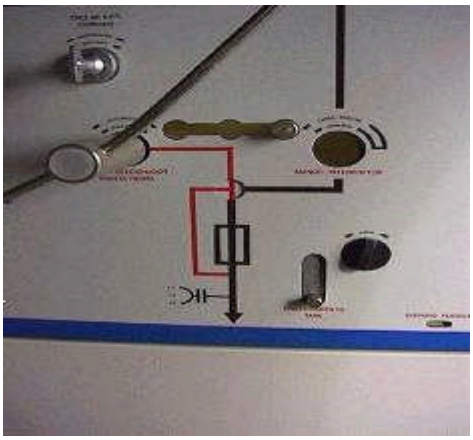
- Prior to entering the transformer compartment, it is advisable to wait at least 20 minutes after de-energising so as to allow it sufficient time to cool down. Be careful with the temperature of the flanges and windings.
- To access the transformer through the front windows, it is recommended that you 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.
- To open the switchgear it will be necessary to use working clothes for electrical risk, the face shield for electrical work, thermal protective gloves against electrical arc, insulating gloves against electrical injuries and insulating stool or mat (according to the voltage of the Transformer Station to be handled).
- Once de switchgear is open, the absence of voltage should be verified in the enabled points depending on the switchgear model (connections of the three leds 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:
  - 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.
  - 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 mm^2 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.
  - The required PPE for carrying out the operation are: working clothes for electrical risk, face shield for electrical work, thermal protective gloves against electrical arc, insulating gloves against electrical injuries, insulating mat, insulating pole and voltage detector, according to the voltage of the transformer station to be handled.
  - The steps to take for earthing are as follows:
    - To carry out the operations always use working clothes for electrical risk, thermal protective gloves against electrical arc, insulating gloves against electrical injuries, a face shield for electrical work and the insulating mat.
    - 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.
    - 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.
    - 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 mm^2 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 for carrying out the operation are: working clothes for electrical risk, face shield for electrical work, thermal protective gloves against electrical arc, insulating gloves against electrical injuries,

insulating mat, insulating pole and voltage detector, according to the voltage of the transformer station to be handled.

- The steps to take for earthing are as follows:
  - To carry out the operations always use working clothes for electrical risk, thermal protective gloves against electrical arc, insulating gloves against electrical injuries, a face shield for electrical work, and an insulating mat (for operations to be performed in the electrical cabinet supplied directly from the transformer secondary).
  - 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.).

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 SGRE.
- Create such anchor devices using a 60 cm long anchorage strap (e.g., EN-795 Class B in Europe) that can be positioned on a fixed, resistant point and attaching the corresponding fall arrest device directly to the strap.
- The anchorage strap shall be fitted as follows:

1. Pass the strap through the fixed and resistant point.

2. Join both ends together.

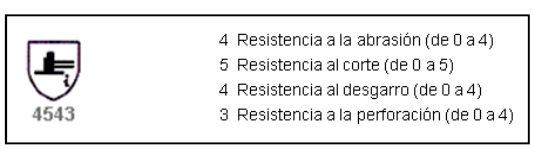
3. Connect the fall arrest device

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 and against electric risk, thermal protective gloves against electrical arc), working clothes for electrical risk (to perform tasks with electrical risk), 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, Emergency Descent Device and/or Rescue Kit, PPE depending on the task to be performed.
  - 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”.
    - Lockout and tagout system required for the task to be carried out.
    - 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.

3.1 PROCEDURE ON AN OPERATING WIND TURBINE

- 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 SGRE farm supervisor and the SGRE 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 (SGRE, 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. When working on the side of the ladder opposite to the side that has the lifeline installed, remain attached using two lanyards with energy absorber device and wide mouth hook to two defined anchor devices.
- For any work to be done from the wind turbine ladder which requires having free hands, in addition to complying with the previous point, wrap around the ladder at waist level using a positioning lanyard properly adjusted to the necessary length and tie it to the positioning points of the fall arrest harness, unless the worker is between the ladder and the tower wall and can support themselves on it so that it is possible to perform operations from this position. Remember that the positioning lanyard does not protect from falling and that it is not permitted to use it without an additional fall arrest system.
- 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.



- 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. Have portable eyewash near the work area.
- When using any solvents described in document GXX-000-31-00-00-00-0-400-0-F adopt the measures set out in RA GXX-000-31-00-00-00-0-400-0-F.
- To carry out hot works, proceed as indicated in the section "Hot works" of this safe practice.
- 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.

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 SGRE.
- When any operators, whether employed or subcontracted by SGRE, 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:

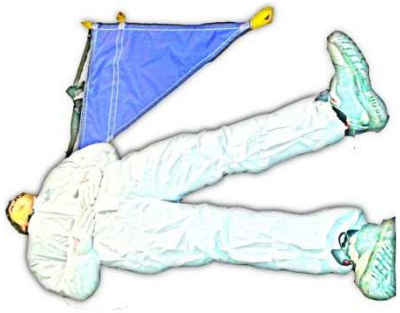
  1) Accessing the interior of the rotor: to access inside the rotor and while working inside it, operators must wear a harness secured to an anchor device on the nacelle.
  2) In cases of wind turbines with anchor devices inside the rotor, workers may wear a harness tied to one of those points using a lanyard with energy absorber 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.

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 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 coupling 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:

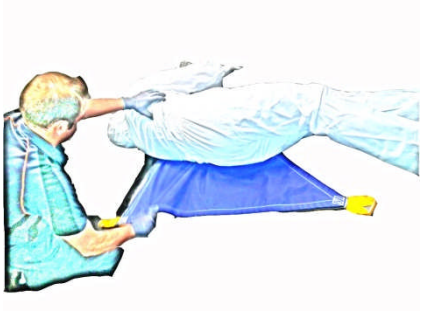
1) The workers accessing the nacelle have a rescue triangle (one per pair of workers), which will be used if it is necessary to evacuate a worker who has suffered an accident and who cannot wear the regular work harness defined by his or her company because of his or her condition.

   The general steps for using the rescue triangle are:



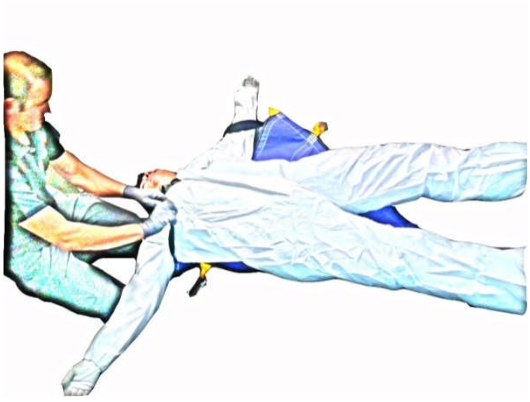
Place the triangle next to the injured person.

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



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

Place one of the triangle straps around an arm



Place the other strap around the other arm

Connect the three ends of the triangle

2) Workers are provided with quick connect harnesses (one per worker). In this case, putting this type of harness on an injured worker is also simple.

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 SGRE 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:**
  1) When you have to work on the pitch control system.
  2) 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.

- 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.

3.4.3 OTHER MECHANICAL LOCKS

- The activation, lockout and tagout of the emergency shut-down push-button (as per technology) may only be performed if it is defined in the specific Risk Assessment for each task, once analysed that it is possible to carry it out since the rest of the risks are under control.

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 SGRE 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 SGRE.
- 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.

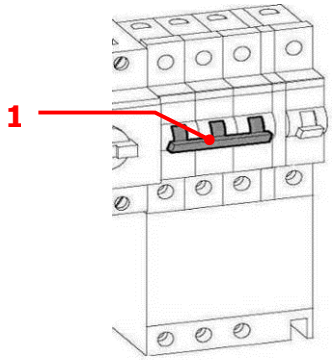
- If one needs to access the area below the tramex, bear in mind that in accordance with the farm's lay-out, it may be necessary to disconnect the previous wind turbine, from the first one of the line or from the substation itself, depending on the High Voltage circuit of the wind farm.
- The switchgear 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.

3.5.1 LOCKING EQUIPMENT: TYPOLOGY AND USE

- Lock devices must be made in such a away 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.

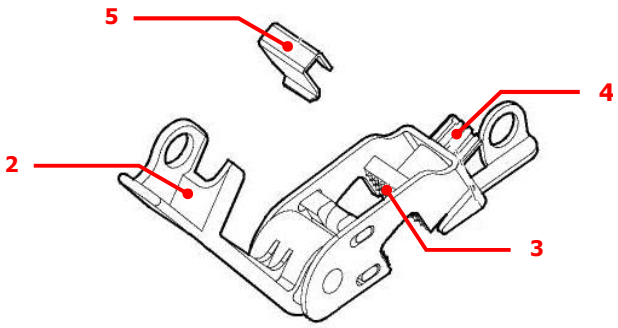
3.5.1.1 Three-pole earth leakage switches

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.

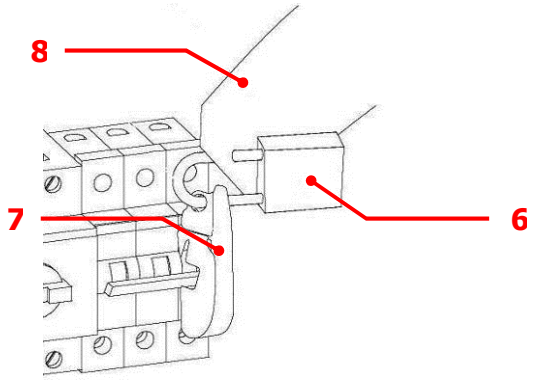
4) If the three-pole earth leakage switch has a metal connection bar on the lever: Fit the metal clips -5- onto the adjustable clamp -3- of the 493B universal locking device.

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.

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-.

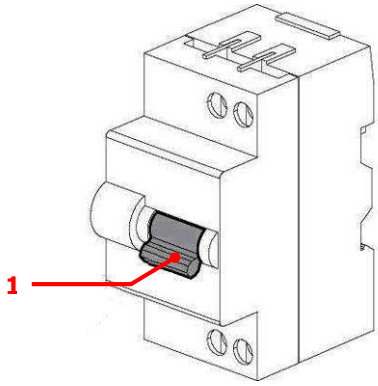


Locked three-pole differential switch

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.



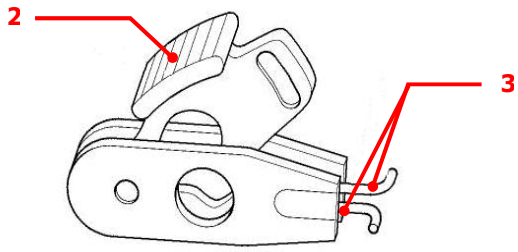
Two-pole differential switch

2) Open the red tab -1- on the 2391 universal locking device.

3) Press the metallic pins -3- of the 2391 universal locking device.

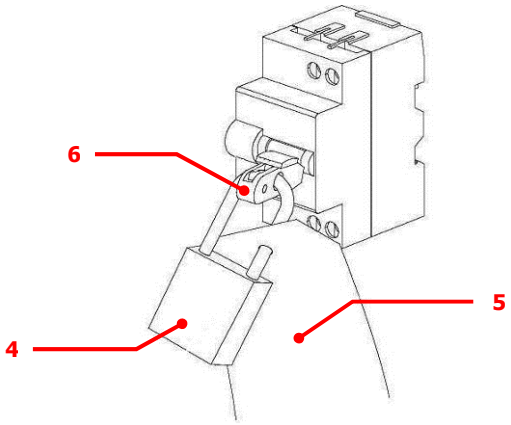
4) Place the 2391 universal locking device onto the two-pole earth leakage switch.

5) Close the red tab -2- on the 2391 universal lock device.



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-.

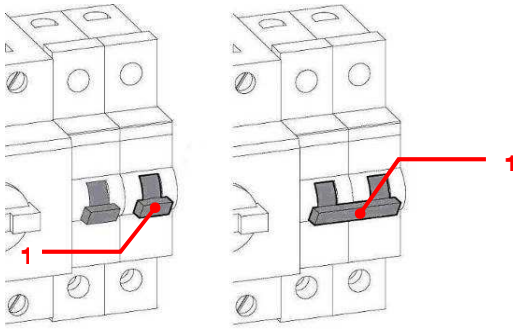


Locked two-pole differential switch

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.

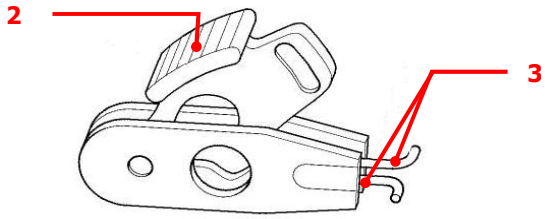
3.5.1.3 One and two-pole unregulated thermal-magnetic switches

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.



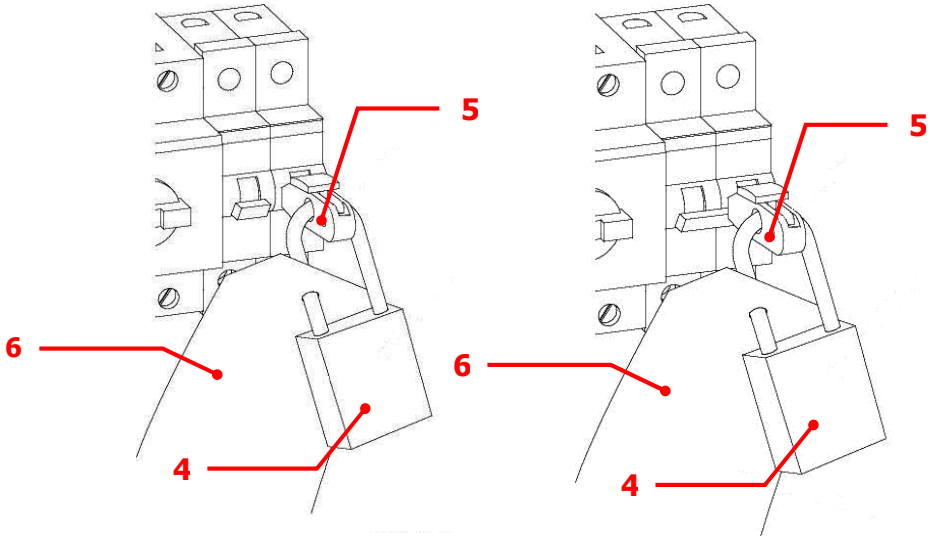
One and two-pole thermal-magnetic switch

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-.

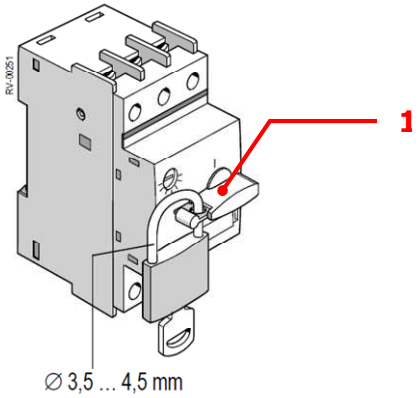


Locked one and two-pole thermal-magnetic switch

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.

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.

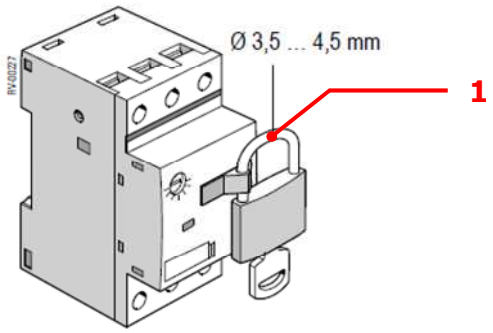


Motor guard with rotary control

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

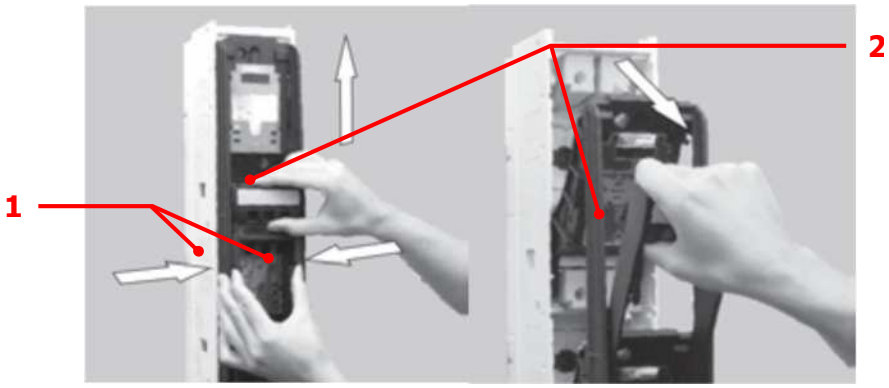
2) Insert a lockout padlock with the lockout tagout label into the hole -1-.
3) Make sure that the circuit breaker cannot move to the ON position.

3.5.1.6 Loaded fuse-holder isolators.

3.5.1.6.1 Type 1

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

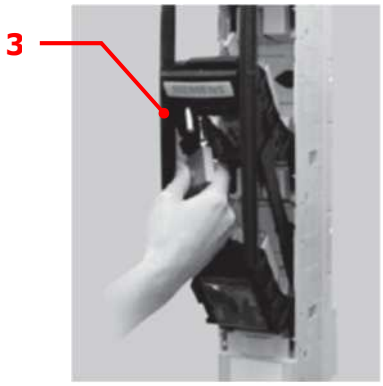
1) Press the side tabs -1- and pull down the lever -2-.



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.

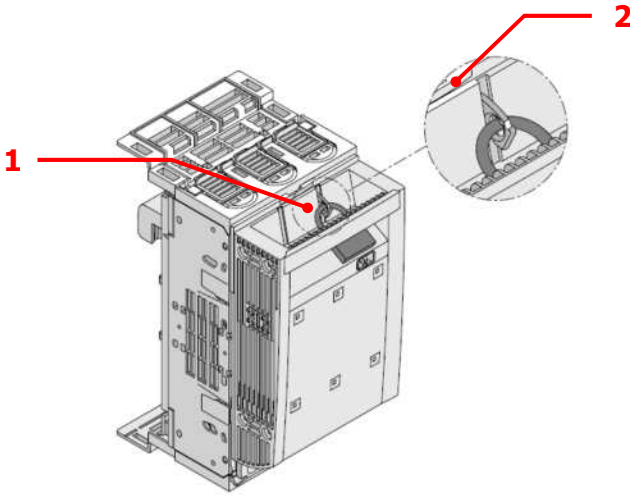
Unlocking:

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.
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)

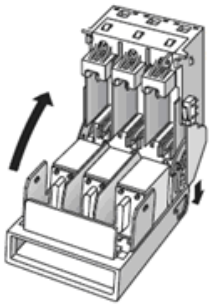
1) Open the isolator by pulling down on the front lever -1-.
2) Remove the fuses and leave them in a suitable place.
3) Re-close the isolator and fit the lockout padlock with the lockout tagout label onto the ring -2-.



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.

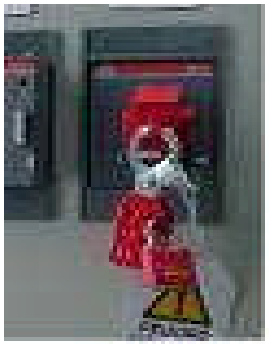


Closing the type 2 isolator

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

Socket locking device (lift, hoist, etc.)

Lockout device (electrical wiring)

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.

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, working clothes for electrical risk, thermal protective gloves against electrical arc, insulating gloves appropriate for the voltage and face shield for electrical work.
  - 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.
- **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.

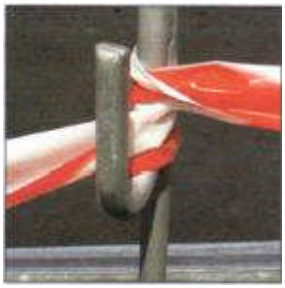
- When the worker who installed the labelling or locking device is not available to remove it, the device can only be removed at the orders of someone who has authority over that worker and is familiar with the equipment and work at hand. Before removing a padlock or label, check whether it is safe to 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 of 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

- The signposting of work areas must be done both when hoisting loads and when there is the possibility of falling objects, materials, tools, etc. from the wind turbine due to the operations carried out (e.g. working in the rotor, on the nacelle roof, etc.).

3.6.1 Standard signposting

- SGRE'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 and operations in which there is a risk of objects, materials, tools, etc. falling from the wind turbine, cordon off the area with a safety perimeter. This perimeter will be found by taking a 20 m radius from the point of the load hoisting, taking movement into account, and from directly underneath were the operations will be done.
- Depending on the work to be performed (preventive or corrective maintenance, assembly, etc.), the area of impact on which the load, objects, tools, etc. may fall will be greater and this must be taken into account when positioning the signs.
- Each team of workers shall carry a signalling system, and install it whenever they are going to suspend loads with a risk of falling on workers in the area, and when they are to carry out operations in which there is a risk of objects, materials, tools, etc. falling from the wind turbine. This signalling must 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.
- The personnel participating in the operations can access the area if carrying out the tasks so requires (securing loads to hooks or hoisting tools, receiving the load, etc.), but always observing the prohibition of standing under suspended loads and under the area where operations will be done.



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.

- 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.

ACTION TO HOIST AND LOWER LOADS WITH THE HOIST AND DURING OPERATIONS WITH RISK OF FALLING OF OBJECTS, MATERIALS, TOOLS, ETC.:

- 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.
- It is an essential requirement to hoist and lower loads with the hoist and during operations with a risk of falling objects, materials, tools, etc. when a worker is present in the wind turbine yard when carrying out these tasks.
- According to the type of wind turbine, before; opening the hatchway (opening on the ground), gate (side opening), removing the hoist arm (cowling opening), etc., and before commencing operations with a risk of falling objects, materials, tools, etc., the worker who is going to handle the hoist or who is in charge of carrying out the tasks must get permission from the worker located in the wind turbine yard, not continuing the operation until they have their confirmation.
- The worker located in the yard must be positioned outside the safety perimeter, which is found by taking a 20 m radius from the load hoisting point and from directly under where the operations will be done. This worker will ensure that there is no personnel within the safety perimeter and then will give permission, requesting from the worker in charge of handling the hoist or in charge of performing the tasks.
- If during the hoisting/lowering operations or the operations with a risk of falling of objects, materials, tools, etc., there are people, both in vehicles and on foot, moving around near 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 of suspended loads or tools, objects, etc. and 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. or that the operations with a risk of falling of objects, materials, tools, etc. has finished.

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.

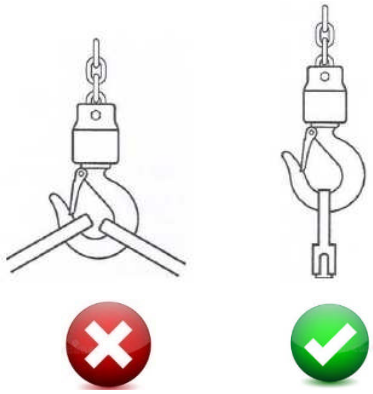
- **Before working with the hoist**
  - The area must be marked as specified in the section on “Marking work areas”. No worker must remain in this area during the load hoisting or lowering procedure. Personnel involved in the operations may access the area only when the work to be performed requires 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.
  - 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 WTG. If the wind speed approaches this limit and it can cause the swaying of the suspended load during the lifting/lowering process, increase the weight of the load or use retention and guide ropes.
- 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.

- Before each use of the hoist, carry out the checks defined in the operation and maintenance manual issued by the manufacturer. As a reference (although, they must follow the indications of each of the manufacturers), the following points must be checked:
    - Check that the chain does not have visible severe corrosion.

    - Visually check the condition of the hoist hook. Check for deformation, cracks, corrosion and wear.
    - Once the load is inserted on the hoist hook, check that the safety latch and the spring are in good condition and that they work properly.

- Lift the load a few centimetres and check that the force is on the base of the hook, not on the sides or on the safety latch.



- Lift the load a few centimetres, stop activating the hoist and check that the load does not slip.

- 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.
  - 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.

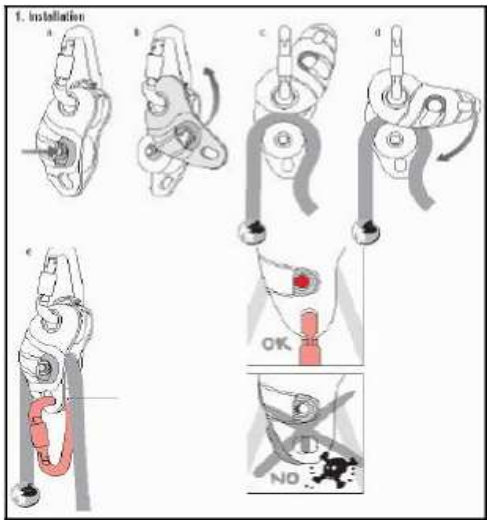
HOISTING PROCEDURE

- **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.

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

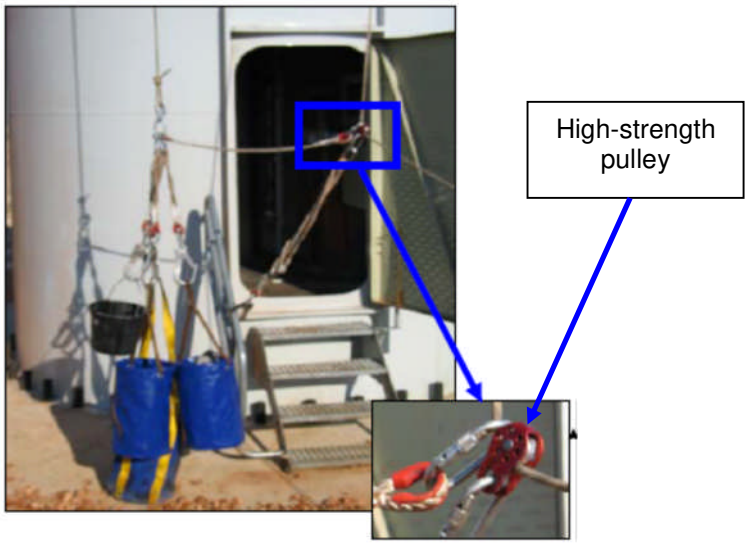
Before opening the nacelle door, hatchway or cowling (depending on the wind turbine model) and during the load suspension operations, you must always remain attached to an anchor device.

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.

- **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).

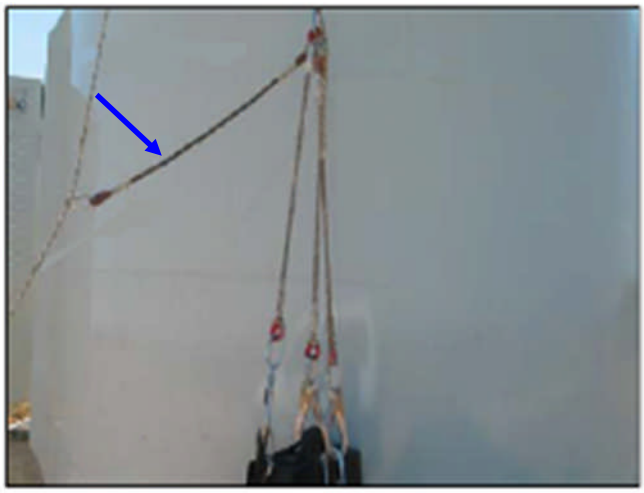


Mounting the lower anchor

- **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.

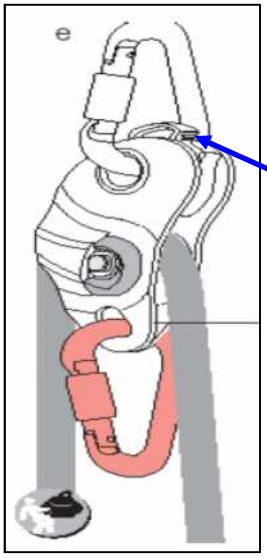


Placement of multiple ropes with hooks and guides ropes for the load

- **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).



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.

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.

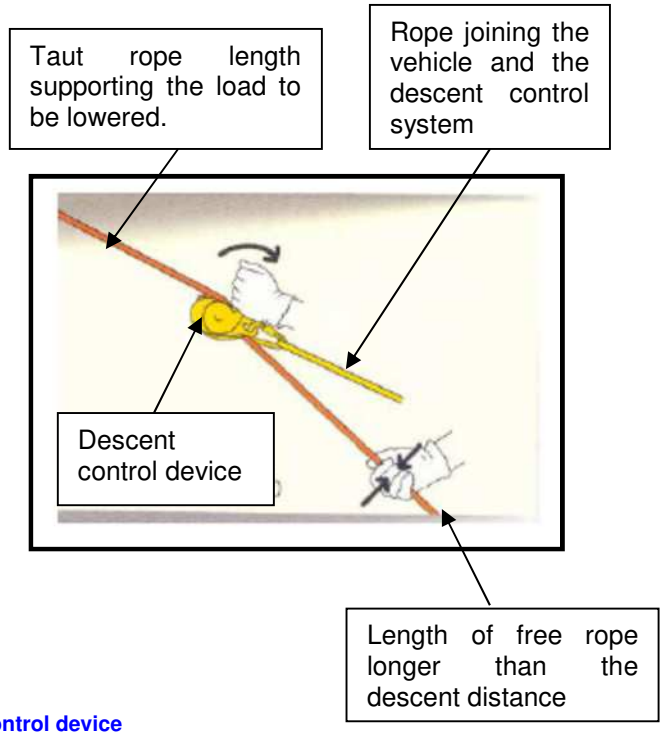


Fig.9 **Descent control device**

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.

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.

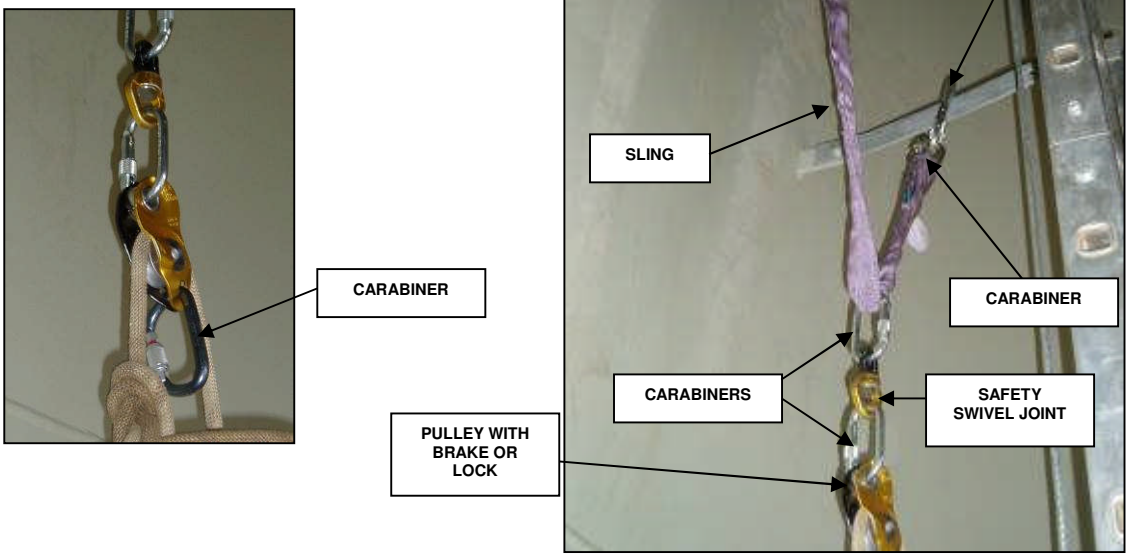
In order to perform the suspension of loads the wind speed must be equal to or less than that indicated in Safe Practice for the specific WTG model and/or in the Instruction Manual for the WTG.

HOISTING PROCEDURE

- **Hoisting system installation procedure:**

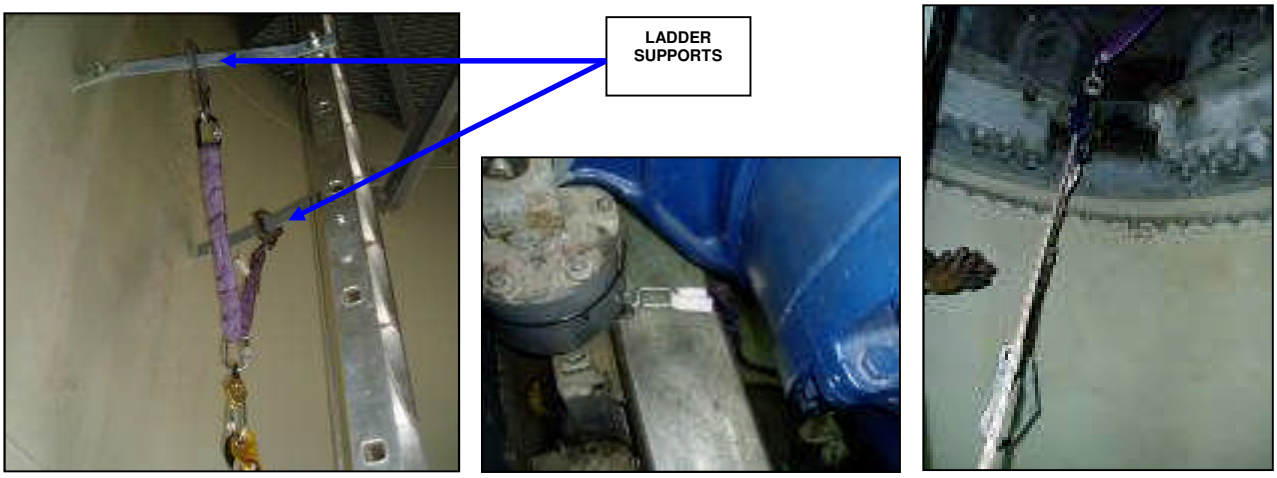
1) Climb up to the wind turbine following all the applicable safety rules, depending on the task to be performed and take up the following materials for mounting the hoisting system:

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



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. Ecotecnia), welded handholds on the platforms, etc. The pulley must always be centred over the ladder shaft.



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.

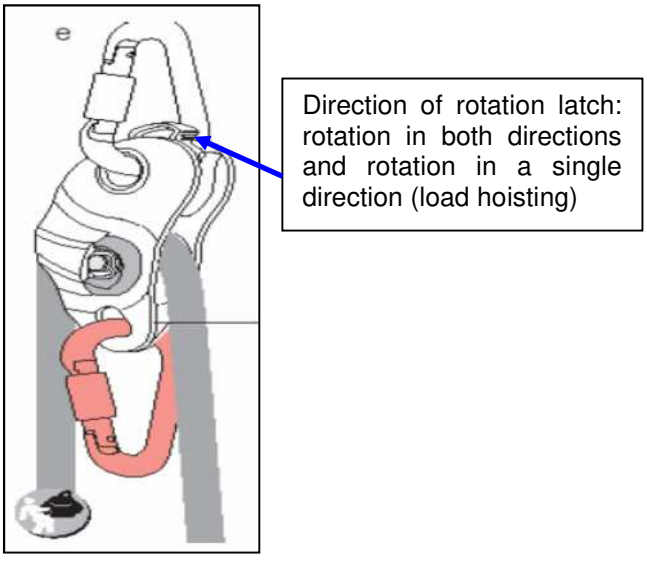
4) One end of the rope will be used to hook on the load (load line) and the other end will be the pulling line to pull or retain the load.

- **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.



Pulley latch

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

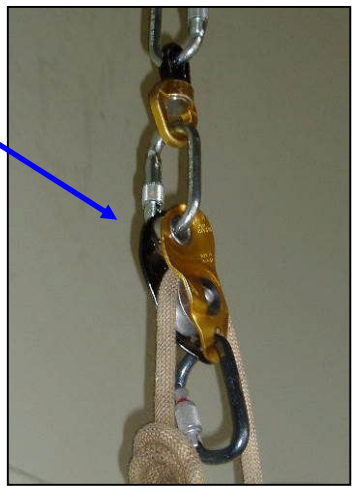
Hoist the load to the desired position.

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

- **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 in 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. It is necessary to have the necessary fire extinguishing means to fight any fires that originate therein close to the power generator set (if the chosen fire extinguishing means is a fire extinguisher, it must be a CO2 extinguisher with a 5 kg minimum capacity).
- Having concluded the work, follow this sequence in reverse to leave the wind turbine in its initial condition.
- 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.

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 SGRE 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 SGRE, 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 SGRE, 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.
- On sunny days when performing operations in which you need to remain on the outside the wind turbine exposed to the sun for a long period of time, before and during these tasks, the exposed worker must apply sun protection with a total SPF. Apply as many times as necessary depending on the duration of the task and the sun block manufacturer's recommendations.

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

Viento (m/s)	Wind km/h	Velocity mph	Ambient Temperature (∞C) 4	-1	-7	-12	-18	-23	-29	-34	-40
			Equivalent Chill Temperature (∞C)								
Calma 0 (m/s)	Calm 0	0	4	-1	-7	-12	-18	-23	-29	-34	-40
2.2 (m/s)	8	5	3	-3	-9	-14	-21	-26	-32	-38	-44
4.4 (m/s)	16	10	-2	-9	-16	-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	-16	-19	-22	-36	-44	-53	-62	-70	-78
15.6 (m/s)	56	35	-11	-20	-29	-37	-46	-55	-63	-72	-81
17.8 (m/s)	64	40	-12	-21	-29	-38	-47	-56	-65	-73	-82

Adapted from: Threshold Limit Values (TLV™) and Biological Exposure Indeces (BEI™) booklet; published by ACGIH, Cincinnati, Ohio

Little danger in less than one hour exposure of dry skin

DANGER – Exposed flesh freezes within one minute

GREAT DANGER – Flesh may freeze within 30 seconds

Maximum danger of false sense of security

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 SGRE 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.
- 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, SGRE 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.

- **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 -43ºC 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.

THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*

Air Temperature Sunny Sky		No Noticeable Wind		2.2 m/s Wind 5 mph Wind		4.5 m/s Wind 10 mph Wind		6.7 m/s Wind 15 mph Wind		8.9 m/s 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		
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5				
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5						
-40° to -42°	-40° to -44°	30 min.	5								
-43° to below	-45° & below	Non-emergency work should cease									

Non-emergency work should cease ↓ (spans 5 mph Wind)

Non-emergency work should cease ↓ (spans 10 mph Wind)

Non-emergency work should cease ↓ (spans 15 mph Wind)

Non-emergency work should cease ↓ (spans 20 mph Wind)

***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 -30ºC 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≤-5ºC: 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.

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.

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.

Phase	Body Temperature	Signs & Symptoms
Mild Hypothermia	37.2 - 36.1ºC	Normal, one may begin to shiver.
	36.1 - 35ºC	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 - 33.9ºC	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 - 32.2ºC	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 - 30ºC	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 - 27.8ºC	Muscular stiffness, semiconscious, loss of attention and presence of others, decrease of breathing rate and pulse, possibility of atrial fibrillation.
	27.8 - 25.6ºC	Unconscious, erratic heart rate and breathing, pulse may be difficult to detect.
	25.6 - 23.9ºC	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 40ºC 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.
- 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 40.5º 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).
  - 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 of 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.

- 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-RELATED ILLNESS	CAUSES:	SYMPTOMS	PREVENTIVE MEASURES/ FIRST AID	
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.

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

- 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 SGRE:

    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.

    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)

- **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 SGRE 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:

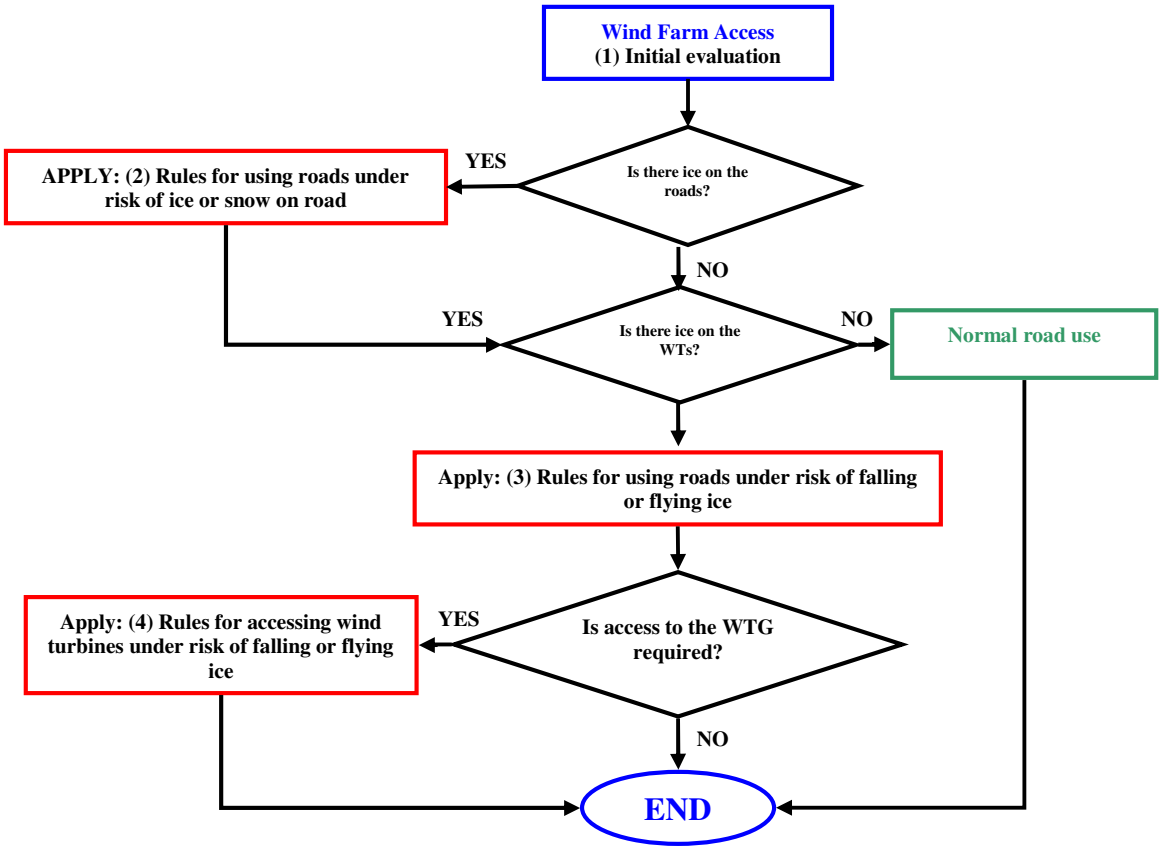
Standard access protocol with risk of impacts from ice fragments

(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.
- 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

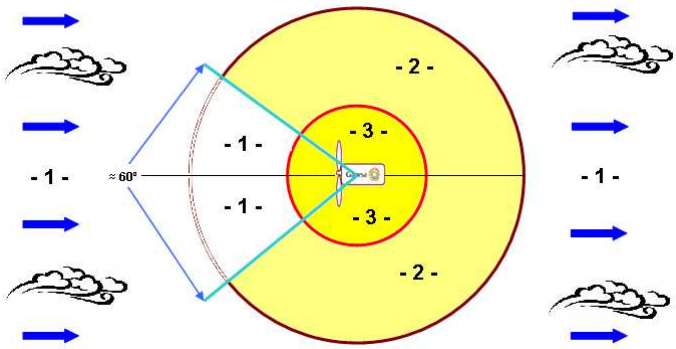
- **Snow** on the wind farm access roads: the wind farm must only be accessed with a four-wheel drive vehicle**, without using tyre chains**. They must however be carried aboard the vehicle and only used for evacuation of the wind farm if it is necessary to leave it due to worsening weather conditions (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.
- 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.



- 1 - Residual hazard area

- 2 - Hazard area with the wind turbine in motion

- 3 - Hazard area with the wind turbine stopped

Figure 1

- 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).

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										
70					170	75	160	70	150	70	140	65	130	65	120	60								
60									140	65	130	60	120	55	110	55	100	50						
50													110	50	100	45	90	45	80	40				
40															90	40	80	40	70	35	60	30		
30																	70	30	60	30	50	25	40	20
20																			50	20	40	20	30	15
	M	P	M	P	M	P	M	P	M	P	M	P	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:
  1) Communication and, therefore, control of the wind turbines, is not possible.
  2) It is necessary to pass through danger zones created by wind turbines at other wind farms not under your control.
  3) 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:
  1) 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 protection[1] 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.
  2) 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.

(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:
  1) 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.
  2) If the presence of ice on the wind turbine is conclusively ruled out: you may access the wind turbine normally.

[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

3) 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:
    1) 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.
    2) 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 4ºC) 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.

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 SGRE.
- 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.

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	- 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	- 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	- 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	- 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).

	PREVENTIVE RESOURCE
Installing people lifting equipment	- 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	- 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	- Removal and re-instating of voltage: a Preventive Resource must be present while these works are performed. - Carrying out work under voltage: ▪ 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. If the size of the work area does not allow proper supervision, this person must be assisted by other Qualified Workers.
Replacing fuses with voltage	- 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	- 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	- 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	- 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	- 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.

- **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 MAINTENANCE.	Operations in the rotor	Yes
	Generator	Yes
	Transmission Shaft	Yes
	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 MAINTENANCE.	Predictive Maintenance	Yes

			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
		Electrical Cabinets 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.

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 extinguishers are only effective in an initial stage of the fire. Once a fire has acquired considerable dimensions, they cannot be used and workers must focus on evacuating the wind turbine as per the defined evacuation procedures.
- 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.
- 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.

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 SGRE 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.
- Handling the fastening elements, washers, nuts and new DACROMET bolts (the fastening elements that are removed to release a component and is reused are not within this scope): in the elements with this coating, 2 micrograms of chrome hexavalent (Cr VI) have been found for each gram of coating in fine powder. This could cause an indefinite amount of Cr VI to be transferred to the workers when handling the elements, which is harmful to health.

  Therefore, when handling the fastening elements, washers, nuts and new DACROMET bolts:

  - Wear nitrile- or neoprene-coated gloves.
  - Classify the positions shown as unsuitable for pregnant or breast-feeding women, and for workers especially sensitive to skin contact with chemical products.
- 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. Also clean the soles of the boots if they have come in contact with the substance.
- 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 capacity of the containers to be used in the wind turbine, may not exceed 10 litres.
- 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 SGRE 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.

Hazardous goods affected:

Hazardous goods that are usually loaded in SGRE 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 handing 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.
  - Itis 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 SGRE 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"
  - 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 SGRE 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.

11. HOT WORK

- Definition: Includes all operations that generate heat, produce sparks, flames or high temperatures near flammable liquids or gases; containers that contain or have contained liquid gases; materials that could catch fire if in contact with heat sources; the nacelle fibre, cone and blades; etc. For example: welding and oxycutting, grinding, drilling, etc.
- It is completely prohibited to perform hot works inside the wind turbine, unless specifically defined and approved in a work instruction and if the risks have been assessed for performing it in its corresponding risk assessment.
- If it complies with the conditions indicated above, follow the indications below to carry out the hot works:
  - Operations may only be carried out by authorised workers.
  - Before work commences, the operations must be coordinated to ensure that the required fire extinguishing resources are available at all times. Once inside the nacelle, check if these means are inside it, and that they are in good condition. If not, stop the operation until implementing actions that guarantee the fire extinguishing resources are available (if the chosen fire extinguishing means is a fire extinguisher, it must be a CO2 extinguisher with a 5 kg minimum capacity).
  - Given the special risk of fire present during this type of work, as well as the available fire extinguishing means present in the turbine you must have a CO2 fire extinguisher with a 5 kg minimum capacity as a back-up measure. The fire extinguisher must be present in the work area and one worker must be continuously monitoring and ready to use it in the event that the fire is generated during the hot works.
  - Obtain a work permit by completing and signing a Work Permit for work entailing special risks. This work permit is subject to the application of the Safety Conditions Inspection Checklist, through which the compliance of the safety conditions defined for the works is checked.
  - Have a Work Procedure specific to the task along with its corresponding Risk Assessment.
  - Presence of a preventive resource for the supervision of compliance with the safety measures established in the risk assessment when performing tasks.
  - Personnel performing the tasks must be sufficiently trained to perform them.
  - Fire extinction training is required and all workers must be familiar with the emergency action plan.
  - Before commencing operations, clean the work area of any chemical products, flammable and/or combustible materials, rags, etc., that may cause/spread a fire and put fireproof blankets and plastic blankets to avoid ignition when working in all areas and over all elements/components and on the fibre of the wind turbine, on which sparks could fall or that could be reached by heat sources. Put fireproof blankets, including under the components (brake disc, bearings, gears etc.) to be collected once heated and during its heating before carrying out the assembly.
  - Keep any flammable and/or combustible product or liquid, rags etc. that could cause/spread a fire away from hot surfaces.

12. USE OF DRILLS

- Required PPE: Protective goggles against impacts of particles, snug-fitted protective gloves against mechanical injuries with back-of-hand protection, hearing protection.
- Do not use any work equipment that fails to meet the documentation requirements laid down by the local legislation in force in the country where the equipment will be used. In the absence of such Regulations or when less restrictive than the European Regulations, apply the latter.
- Wear snug-fitted protective gloves against mechanical injuries with back-of-hand protection and protective goggles against mechanical injuries.
- Before using any portable electric tools, such as a drill, check that they are in good operating condition. Do not use tools for purposes other than those for which they were designed.
- Read the Instruction Manuals of the work equipment before use and follow their guidelines.
- Work equipment should no longer be used if deterioration, failure or other circumstances that compromise its safe operation occur.
- Ensure the correct connection and general good condition of the elements to be used in the operations
- If during the drilling process sparks are produced or heat sources created, follow that indicated in sections "Hot works" of this Safe Practice.
- 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.
- 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.
- During drilling operations, particles from the tool or from the worked material could be projected against the worker performing the task. Wear tight protective gloves against mechanical injuries with back-of-hand protection and protective goggles against mechanical injuries.
- 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.
- When using tools, use extreme caution so as not to place body parts in areas where they could be cut, trapped or struck as a result of defects in the material being worked on, the tool slipping, etc.
- 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.
- While using the drill, if the noise emitted exceeds 85 dBA or a noise peak exceeding 137 dBA is reached, hearing may be damaged. Wear certified hearing protection if the user manual of the tool indicates noise levels above those values or if it specifies the use of personal protective equipment.
- Anyone in the work area during use of this tool must wear the same personal protective equipment due to the risk of exposure to noise.

13. ELECTRICAL PORTABLE MACHINERY

- Required PPE: Protective goggles against the impact of particles, protective gloves against mechanical injuries with back-of-hand protection.
- Recommended PPE: Hearing protection.
- If when using portable electric machinery sparks are produced or heat sources are created, follow that indicated in section "Hot works" of this Safe Practice.
- 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.
- 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.

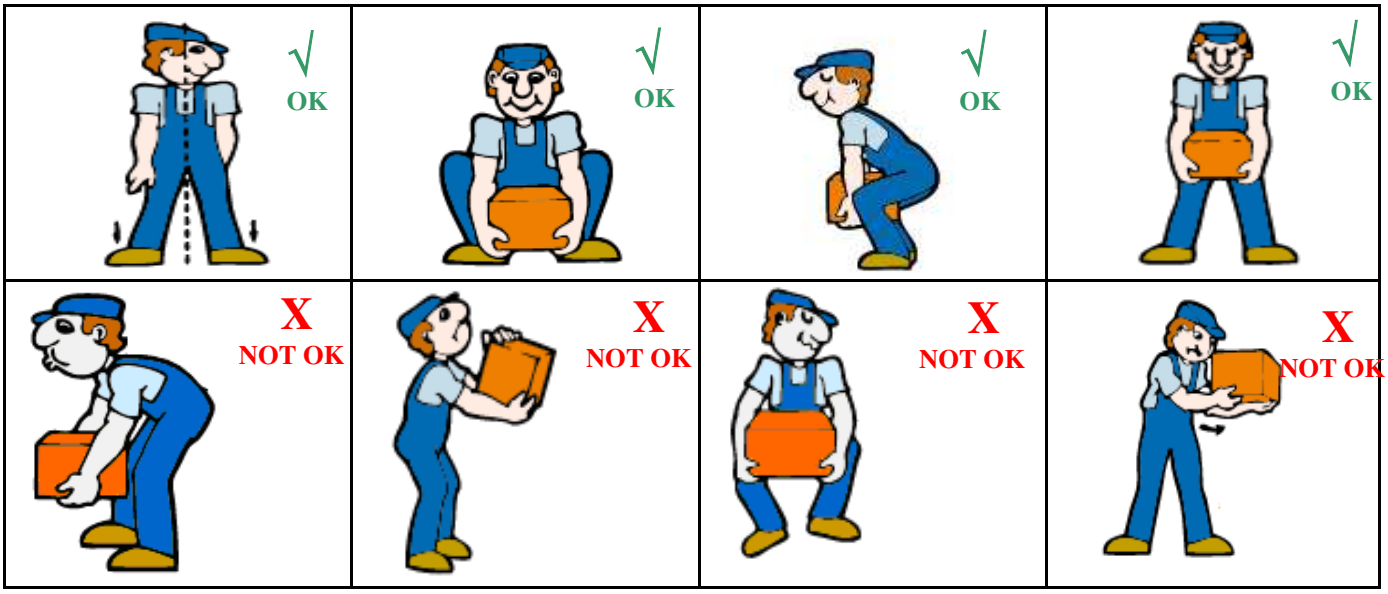
14. MANUAL HANDLING OF LOADS

- 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.
- Use the hoisting tools, handling tools, etc. defined in the work instruction.
- 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.
- The capacity of the containers to be used in the wind turbine, may not exceed 10 litres.
- 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.
- To set the load down, repeat this step in reverse order to the step for picking it up.
- 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. Take small breaks and regular rest periods during work that requires strenuous physical effort and rotate 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.

- 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:
    1. Stand behind the load and near it,
    2. Bend your knees slightly to use your leg muscles,
    3. Keep your back straight and tighten your abdominal muscles,
    4. Use both hands to move the load,
    5. 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

15. WELDING AND HEATING EQUIPMENT

- PPE Required: Welding gloves, Welding screen, Welding clothes.

GENERAL, FOR ELECTRIC AND OXYCUTTING WELDING

- When using welding and heating equipment, proceed as indicated in the section "Hot works" of this Safe Practice.
- 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.
- 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 protective welding gloves and clothing.
  - 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.
- Due to its radioactive nature, it is prohibited to use radioactive tungsten electrodes during welding operations.

SPECIFIC, FOR OXYCUTTING

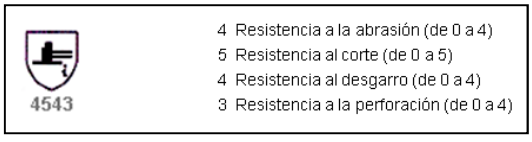
- Handle the blowtorch with extreme caution; direct it solely to the cutting area and never towards persons in close proximity.
- Place the bottles in places where contact with grease or other chemical products is unlikely.

16. WORK PLATFORMS / LADDERS

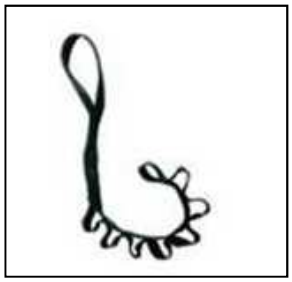
- PPE Required: Harness, safety helmet with chinstrap.
- Before using work platforms or ladders, they must be checked to ensure the good condition of the rungs, etc. In case any damage is observed on any of the components, it should not be used and instead substituted for one that is in good condition 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.).
- If the work area is not accessible from the location of the worker, use approved work platforms/ladders. It is prohibited to stand or sit on elements or components not meant for this purpose (components, cables, etc.). Have one worker hold the ladder while the other worker carries out the operations from the ladder.
- When ascending/descending along the ladder, do not carry tools, components, etc., in your hands. Once the worker is at work height, another worker will give him/her the tools, components, etc., required to perform the operation. Do this in reverse order prior to starting the descent along the ladder.

17. 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.



- 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.
  - Use protective gloves against mechanical injuries 4543 with anti-impact back-of-hand protection. Also wear protective goggles against mechanical injuries when cutting materials that can 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.
  - Use hook or automatic retractable blade cutters. The rest of cutters, fixed blade and manual retractable blade may not be used to carry out the tasks. If it is detected that it is necessary to use a fixed blade or manual retractable cutter for a specific task, it must be approved before specifically analysing the risks of the operation.

18. USING RADIAL SAWS

- Required PPE: Protective goggles against impacts of particles, snug-fitted protective gloves against mechanical injuries with back-of-hand protection, hearing protection.
- If sparks could be produced or heat sources created when using the radial saw, follow the indications of the "Hot works" section of this Safe Practice.
- 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.
- 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. Use protective, snug-fitted gloves against mechanical injuries with back-of-hand protection for handling saw discs.
- The radial saw must only be connected to power supply grids that are protected by differential switches.
- 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.
- While using the radial saw, if the noise emitted exceeds 85 dBA or a noise peek exceeding 137 dBA is reached, hearing may be damaged.
- Wear certified hearing protection if the user manual of the tool indicates noise levels above those values or if it specifies the use of personal protective equipment.
- Anyone in the work area during use of this tool must wear the same personal protective equipment due to the risk of exposure to noise.
- Do not use any work equipment that fails to meet the documentation requirements laid down by the local legislation in force in the country where the equipment will be used. In the absence of such Regulations or when less restrictive than the European Regulations, apply the latter.
- When working with the radial saw, particles may be projected from the tool and the working material and may cause impacts, cuts and entrapment. Wear snug-fitting protective gloves against mechanical injuries with back-of-hand protection and protective goggles against mechanical injuries.
- Any person in the work area while these tools are in use must wear the same personal protective equipment to protect against the risk of flying particles or fragments from the tool and the machined materials.
- Work equipment should no longer be used if deterioration, failure or other circumstances that compromise its safe operation occur.
- Work equipment shall be handled by personnel that has been trained and authorized to do so.
- Ensure the correct connection and general good condition of the elements to be used in the operations. All of the safety devices (guards) must be maintained in their position.
- Do not stop moving parts with hands.
- Before changing discs on the radial saw, the machine must be completely disconnected.
- Keep hands and other body parts away from the discs.
- Avoid overheating the discs as they could fracture.
- Before using the radial saw, check that it is in good working order. Use the tool only for the purpose for which it was designed.

- When using the tool, be careful so as not to place body parts in areas where they could be cut, trapped or struck as a result of defects in the material being worked on, the tool slipping, etc.
- Check that cables and connection pins are in proper condition. Improvised splices are forbidden.
- Never tamper with electrical tool safety systems.
- Check that there are no faults by verifying the condition of the cover, cable and connection pin.

19. 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 liquid splashes and protective nitrile gloves over protective gloves against mechanical injuries 4543 with anti-impact back-of-hand 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.
- 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.
- Before using the tools, check that they have all the required documentation in accordance with the legislation of the country where the operation will be performed. In the absence of such legislation or when less restrictive than the European legislation, apply the latter.
- Use each tool for the task for which it was designed and check that the tool is in good condition before each use.
- Verify that the Manufacturer's User Manuals for the equipment and accessories are on hand and available at all times so their users can refer to them.
- 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 undergone proper maintenance and/or inspection, notify the immediate superior so they may take the necessary corrective actions before work commences.
- Check the condition of the tool and verify that it is in perfect condition before use.
- Disconnect the tool from the grid to replace interchangeable elements of the tools (e.g. key, reaction arm, etc.) and when it is not in use. Use the correct wrench to replace interchangeable elements.
- Remember to follow the indications in safety in the Manufacturer's User Manual.
- When working on small or unstable pieces, secure the piece being worked on so that there will be no sudden movements during the operation.
- Do not use the machine in positions that require to handle it above shoulder level, since injuries can affect the face, chest or upper extremities in case of losing control.
- Do not place any body parts between the hydraulic wrench and tool reaction area.
- When handling the hydraulic wrench, do not to place hands between it and the engaged elements. An unexpected turn of the tool could cause entrapment.
- Keep the components being handled secured and stable at all times and be extremely careful not to insert any part of the body.
- Wear protective nitrile gloves over protective gloves against mechanical injuries with back-of-hand protection and protective goggles against mechanical injuries and liquid splashes when using the hydraulic tool.
- Identify the hydraulic wrench and check: All the components of the wrench are available, including the lubrication kit.
- Verify that the Manufacturer's User Manuals for the equipment and accessories are on hand and available at all times so their users can refer to them.
- Check that 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.
- If any anomalies are detected, notify your immediate superior so they may take the necessary corrective actions before work commences.
- Make sure that the wrench to be used corresponds to the one indicated for the task and that the socket is correctly fitted; fully and with no gaps.
- The worker fitting the hydraulic wrench is also the only one who may run the hydraulic pump. If, due to the position in which the spanner must be fitted, it is impossible for the same worker to run the pump, another worker will do so. However, the worker holding the spanner will control it. He/she must indicate to his/her co-worker when everything is correct for running the pump.

- The hydraulic wrench must be secured using its handles. The use of any other equipment which does not have them cannot be used. Moreover, for the tower fastening elements there must be a fastening system, as it is prohibited to use spanners.
- Also follow the indications in the section "Use of hydraulic tools for tightening by torsion".
- Properly identity all interchangeable elements to be used: Hydraulic unit, hoses, tightening spanneres.
- After finishing the work, move and store the tool and all corresponding accessories (hoses, tightening wrenches, etc.) in an appropriate spot and/or box where they cannot be struck, damaged, etc.
- All workers in the work area when this tool is being used must wear the same personal protective equipment due to the risk of projected fluids.
- For the hydraulic unit, proceed as follows:
  - 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.
  - 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.
  - Carry out all actions and/or inspections established by the equipment manufacturer before use and/or once the equipment is switched on.
  - With the pressure regulator almost all the way open (with virtually no pressure), and without load/wrench, test the pump to verify that is in working condition.
  - Whenever possible, keep a safe distance away from the pressurized tool. Only personnel essential for carrying out the operation may remain in the vicinity of the tool.
- With regard to the hoses:
  - Check that the hydraulic pump pressure is correct and corresponds to the work pressure before connecting the hose.
  - 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 the length of the hoses enables the hydraulic unit pump to be suitably arranged so as to allow access to the tightening areas.
- With regard to using the hydraulic assembly:
  - 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 any of its ends are disconnected.
  - Always put the available safety systems in place.
  - Do not dent or puncture the connectors while connecting them or in order to connect them.
  - 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.

Hydraulic tightening tools:

- Before using the tightening equipment, check that they have all the required documentation based on the legislation of the country in which the operation will be performed. In the absence of such legislation or when less restrictive than the European legislation, apply the latter.
- Only trained and experienced personnel, familiar with the safe operation of high pressure tensioning devices and associated equipment must install and operate the hydraulic tensors.
- All personnel that are not fundamental for the operation must stay away from the work area.
- Before beginning tightening procedures, ensure that all personnel are made aware that the high-pressure hydraulic equipment will be pressurised.
- Never exceed the maximum working pressure of the hydraulic tensor.
- Do not exceed the maximum movement of the piston (run) permitted by the hydraulic tensor.
- Never stand in line with the screw shaft while performing tensioning or the reverse process. If the bolt fails, it could cause a severe personal injury or death in the case that loose or broken parts turn into projectiles. All personnel must know this possible risk.
- Only allow personnel to approach pressurised hydraulic tightening equipment if absolutely necessary and solely if the pressure is stable. Continuously observe the pressure gauge of the pump.
- Before applying pressure to the hydraulic tool, move as far away as possible from the pullers. When reaching working pressure and after verifying that everything is correct, one worker may access them to apply torque to the bolt nuts. Before releasing the hydraulic tool after applying torque, move as far away as possible from the pullers again.
- Check that the threaded section of the tensor extractor is completely bolted and that the coupling is enough. Consult the bolt extension requirement chart. If used incorrectly, the pressurised hydraulic equipment could become very dangerous.
- Never attempt to repair leaks if the system is pressurized. Ensure that the pressure gauge for the system indicates zero (0) bar/psi before any repair.
- Stay away from high-pressure oil leaks. The pressure of a liquid escaping from a highly pressurised piece of equipment suffices to reach the skin, which could consequently cause sepsis. In the event of such an accident, seek medical attention IMMEDIATELY.
- Never attempt to disconnect an hydraulic coupler while it is under pressure.
- Do not move or lift the hydraulic tensors using hydraulic hoses and connections.
- Hoses must not be twisted or bent at a very closed angle.
- Before pressurising the system, carefully check all hydraulic hose assemblies.
- Immediately replace any damaged, broken or twisted hose.
- Before pressurizing the system, make sure that all the assemblies of the hydraulic hoses are connected.
- Each male coupler must be connected to a female coupler. Verify that each fitting is fully coupled and securely locked in position by physically pulling on the connection.
- Never pressurize the back of a disconnected male coupler. Male fittings cannot withstand high pressure when disconnected. Serious personal injury could occur if the fitting fails while disconnecting and under pressure.
- Check that the bolt material can withstand the initial intended load. Hydraulic tensioning equipment comprise powerful tools capable of bending or breaking bolts/rods if their load/yield point properties do not suffice to withstand the applied load.
- Be CAREFUL when pressurizing a system. The pressure could rise quicker than expected. Observe the pressure switch during pressurisation. Be prepared to stop the pump immediately at any given moment. When using a loaded pump, ensure that the release valve is adjusted properly so that the hydraulic tensioning equipment does not apply excessive application force.

- Never leave a pressurized system unattended. If leaving the area, stop the pump and completely open the pressure release valve, and ensure that the reading on the hydraulic pressure switch is zero (0) bar/psi.
- Any maintenance or repair task of the hydraulic tensors, pump or related components should be carried out with the equipment unpressurized (0 bar/psi).
- When using hydraulic tightening equipment, wear protective nitrile gloves over protective gloves against mechanical injuries with back-of-hand protection, and a face shield to protect against the impact of particles and liquid splashes.
- All workers in the work area during use of this tool must wear the same personal protective equipment due to the risk of projected particles and fluids.

20. USING HYDRAULIC TOOLS FOR TIGHTENING BY TORSION

20.1. 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 protective nitrile gloves over protective gloves against mechanical injuries 4543 with anti-impact back-of-hand protection.

20.2. OPERATIONS TO PERFORM BEFORE USING HYDRAULIC EQUIPMENT

- Properly identity 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.

20.2.1. 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.
  - 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:

20.2.2. Hoses

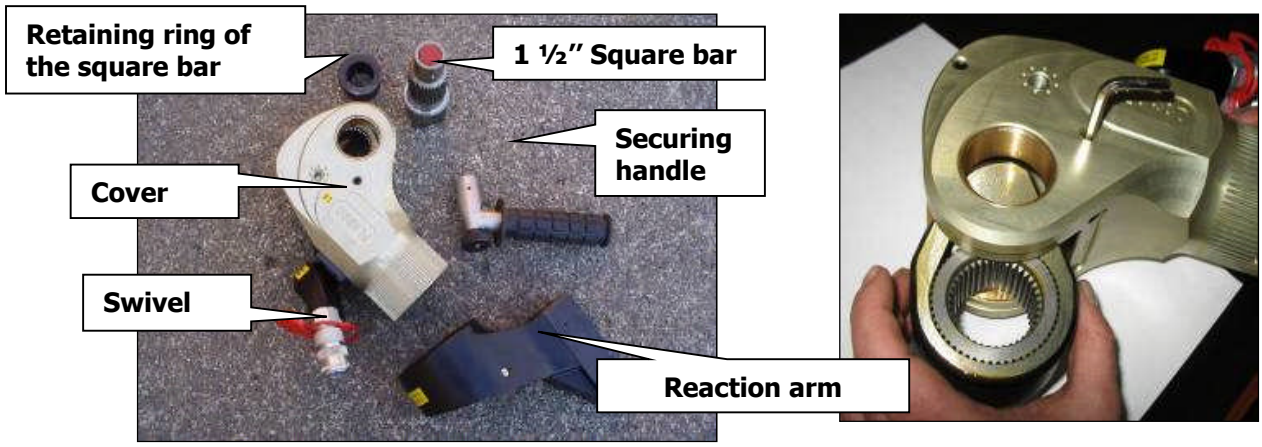
- The following actions must be performed before connecting the hoses:
  - Before connecting the hose, check that the hydraulic pump pressure is correct and corresponds to the work pressure.
  - Check the general condition of all hoses. Look for dents or rips in the protections, permanent kinks, leaks 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.

20.2.3. Torque wrenches

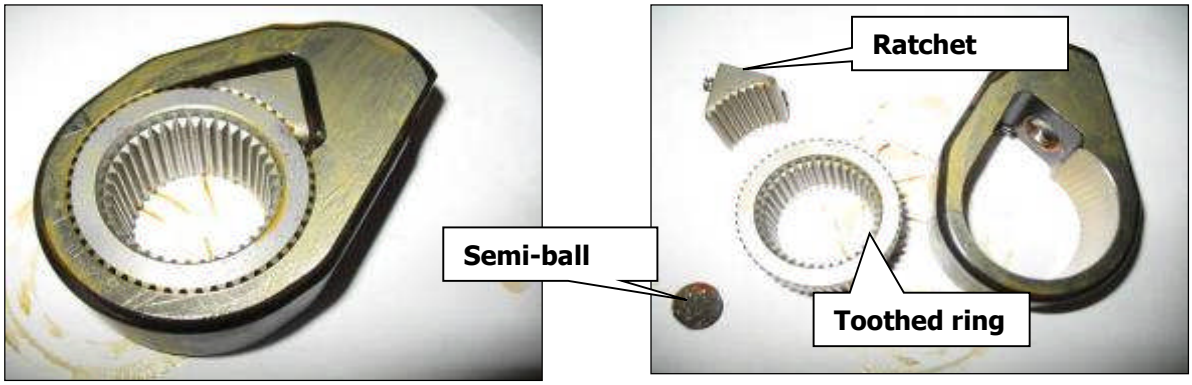
Note: The wrench model and accessories vary depending on the joint on which the hydraulic equipment is to be used.

- 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.



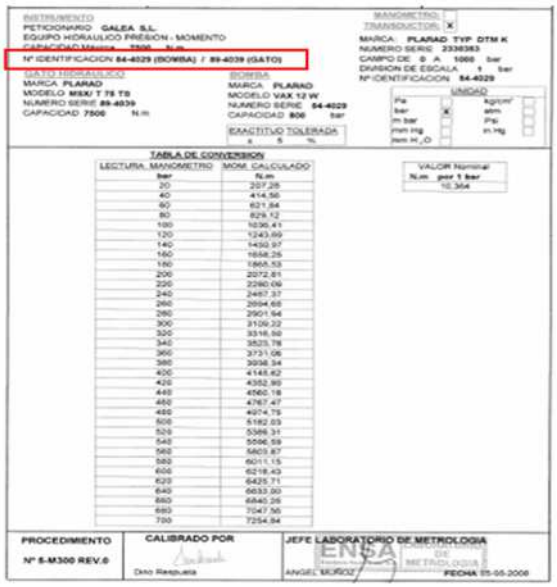
Example of torque wrench for Plarad sections and of disconnecting the drag lever



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

Example of flat torque wrench (Plarad)

Examples of grip handles (Plarad tools)



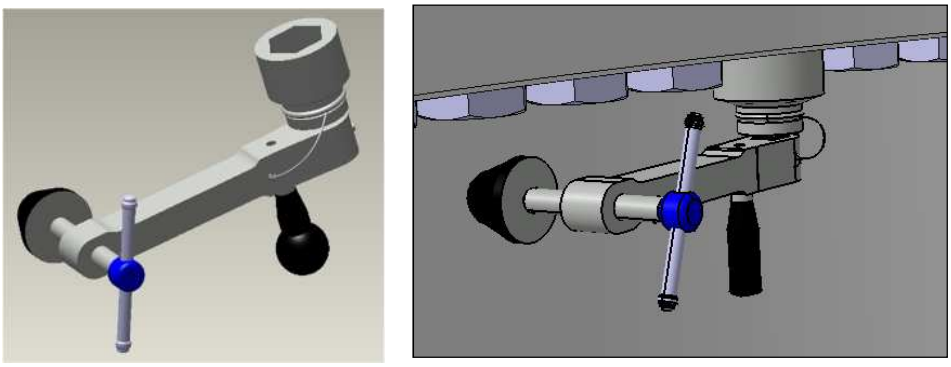
Examples of wrench case and case with lubrication kit, and calibration table

20.2.4. 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.

20.2.5. 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)

20.3. 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

- 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 use protective goggles against mechanical injuries and protective nitrile gloves over protective gloves against mechanical injuries 4543 with anti-impact back-of-hand protection while handling 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.

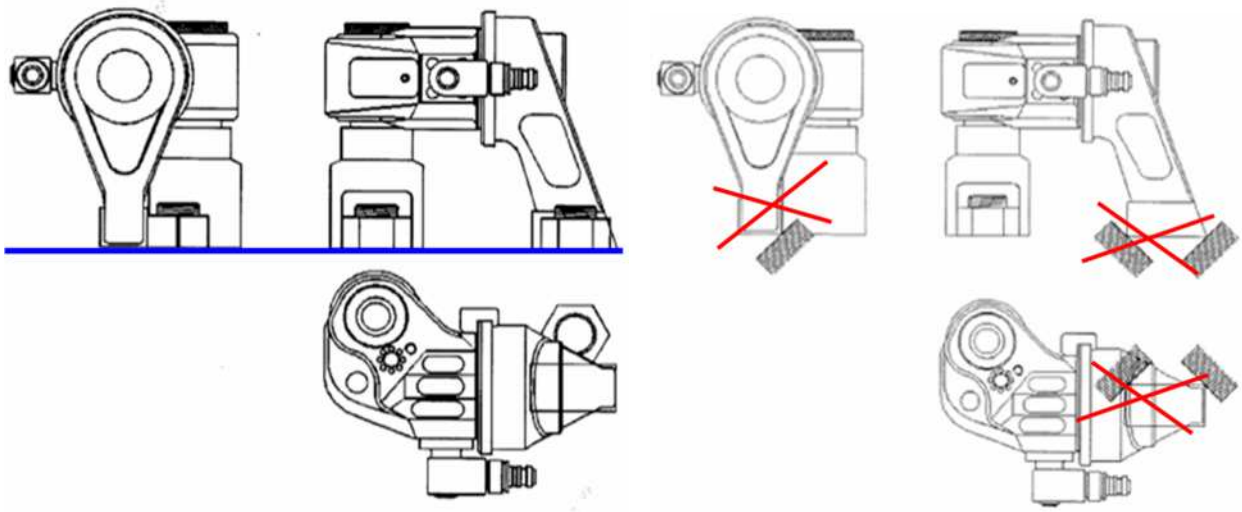
20.4. OPTIMUM SUPPORTS FOR USE OF THE TOOL

- 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.

20.4.1. 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 90º 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.

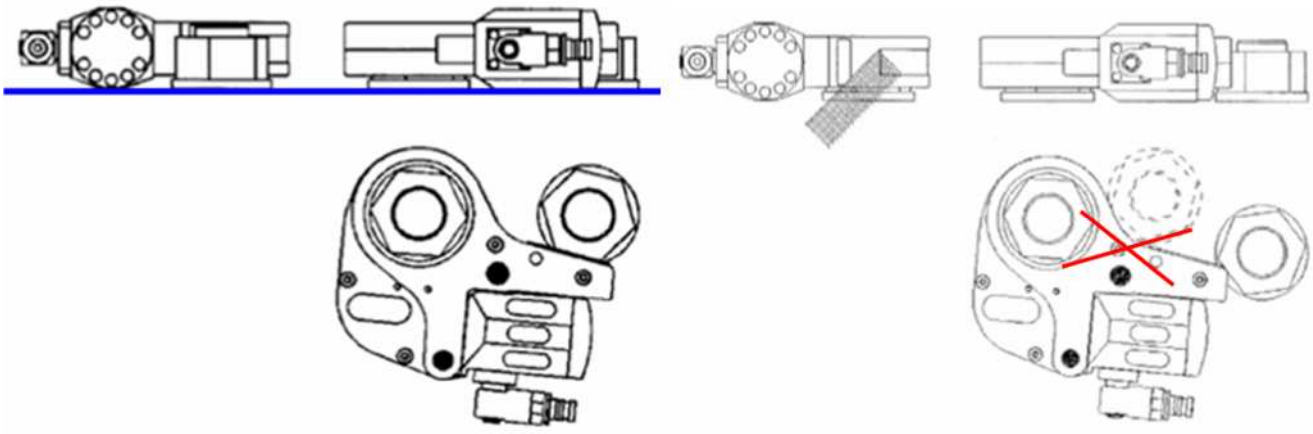
Never handle the spanner from the reaction arm. Adjust the reaction arm on the bolt or contact surface with an open palm, NEVER grasp the reaction arm with a closed hand near the support area.



Optimal position **Prohibited positions**

20.4.2. 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.

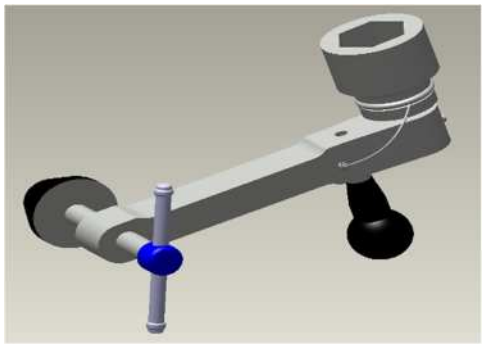


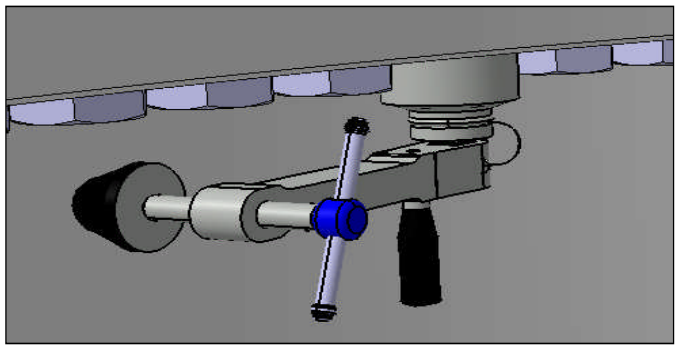
Optimal position **Prohibited positions**

20.4.3. 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)

20.5. 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.

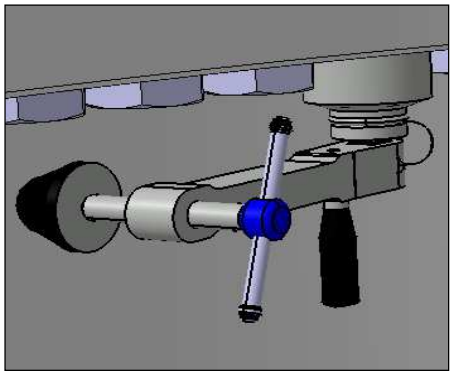
When the tool is in use, personnel in the work zones must be extremely careful to not place hands and other body parts in areas where the tools may reach them in the event of slipping, irregularities, breakage or defects in the material being worked on, etc. The person activating or giving the order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

20.5.1. PLACING THE BOLT RETENTION TOOL

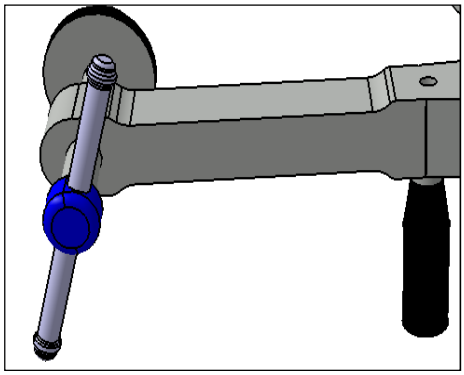
To prevent entrapments in the event of tool failure, breakage, slipping, etc, never place hands between the tool and the tower section wall.

Grip the tool by its handles.

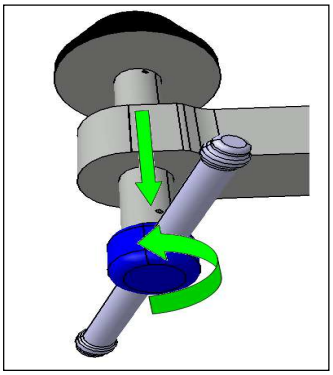
- Before beginning to tighten the structural bolt of the tower, place the tool + impact socket over the bolt head, following the indications of the tool manufacturer's use manual.
- The operator must firmly grip the tool throughout the entire tightening operation. Pay special attention to the start of 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

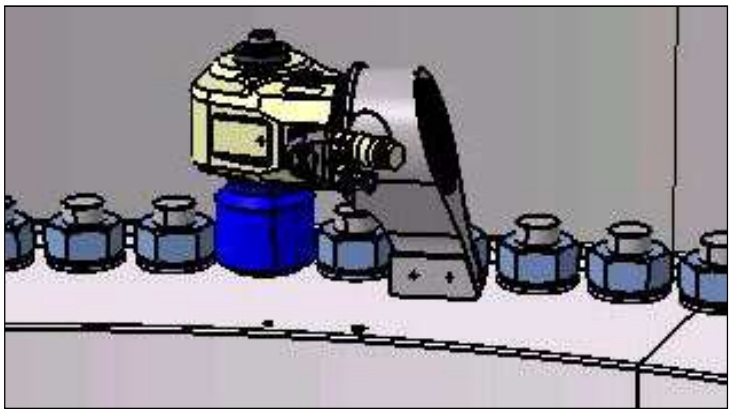
20.5.2. TIGHTENING TOWER SECTION JOINTS WITH SECTION WRENCH

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.
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.



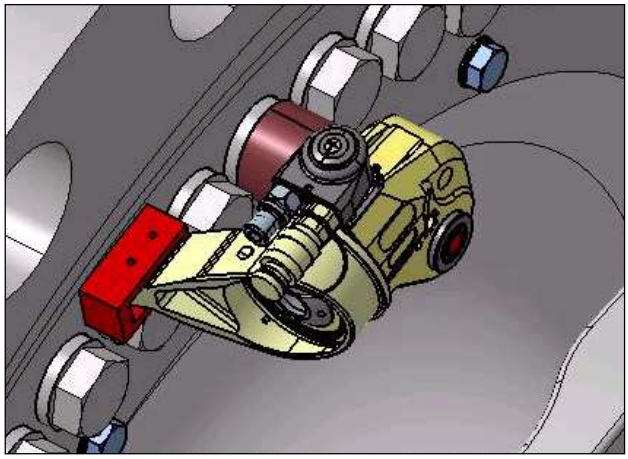
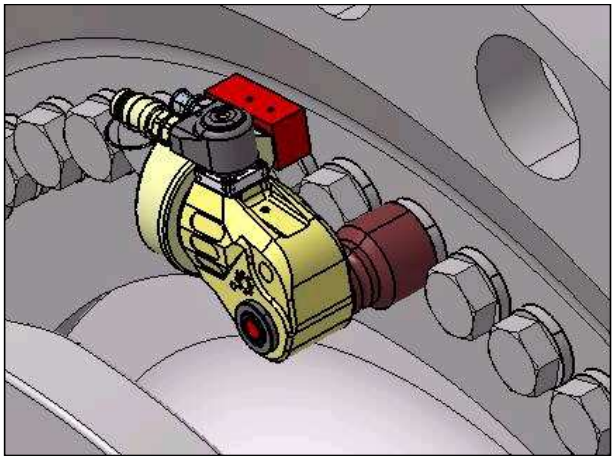
Example of the working position of the section wrench

20.5.3. 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.

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

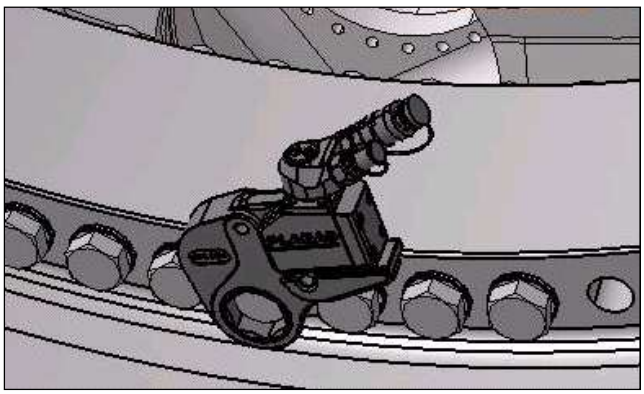
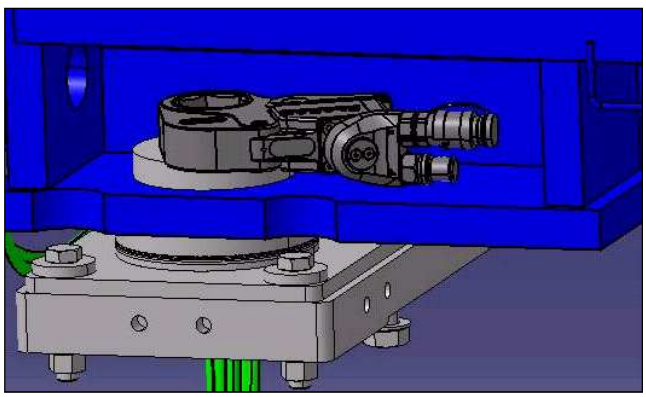
20.5.4. TIGHTENING JOINTS WITH FLAT WRENCH

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.

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 and tighten.
4. Repeat points 2 to 3 until all joints are tightened.

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

20.6. 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 SGRE.
- 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.

21. 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.

22. WARM-UP AND STRETCHING EXCERCISES

- 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. Take small breaks and regular rest periods during work that requires strenuous physical effort and rotate workers.
- 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:

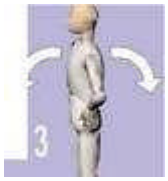
- A good exercise program should include warm-up exercises before starting work, and stretching exercises before, during and after work.
- It need not take much time: from 5 to 10 minutes per day usually suffices.
- These exercises are not a competition or a race. Movements must be slow and controlled. 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.

Arms and legs	
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.	

Head	
Move your head slowly: 1. Up and down.	
2. Right and left.	
3. To the sides.	
Arms and hands	
1. Move your arms in circles, in a swimming motion.	
2. Open out your arms to the side and then close them in a hugging motion.	
3. Stretch your arms forwards and then bend them, touching your shoulders with your hands.	
4. With your arms stretched out, move your palms upwards and downwards. 5. Open and close your hands.	

Back	
Slightly open your legs, put your hands on your waist and move your back as follows: 1. Twist to the right and left. 2. Lean your back to the right and left.	
3. Move your back forwards and backwards.	

Stretching Exercises:

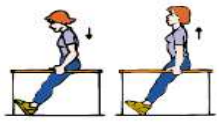
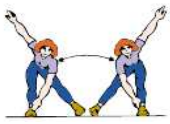
- You are advised to do stretching exercises before commencing work, although you can also do them at other times (for example, when you switch tasks) and at the end of the work day. Their purpose is to prevent strain and fatigue on specific parts of the body. They should take around 5 to 10 minutes.
- 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	
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.	
Hips	
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.	
Thighs	
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.	

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	

23. 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:
- 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.**

24. 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.