



WIND TURBINE DAMAGE PREVENTION

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These safety guidelines are prepared by Finance Finland.

Wind turbine damage prevention

1 PURPOSE

These safety guidelines can help prevent damage and interruption losses and reduce damage-related costs in wind turbines.

These guidelines concern onshore turbines.

The insurance policy holder must ensure that the design, installation and operation of the insured wind turbine or wind farm are carried out according to these guidelines. Technical properties of wind turbines vary between manufacturers, which is why this guide focuses on overall damage prevention rather than technical details.

The insurance company and the policyholder must agree on which measures in these guidelines are relevant to the wind turbine(s) in question.

2 GENERAL

2.1 Technical implementation and type approval

Wind turbine design, installation and operation must be based on the IEC 61400 set of standards by the International Electrotechnical Commission

In the design and construction of structures and instrumentation, local conditions (for example temperature and formation of ice) must be considered more thoroughly than what is specified in the standards.

Wind turbines must be suited for the local wind conditions. Wind speed, gusts and turbulence must be taken into account.

Wind turbines must be type approved by an accredited certification body. The turbines must conform to IEC 61400 standards, and the type approval must be based on IEC 61400-22 (Conformity testing and certification).

2.2 Transportation

Wind turbines must be transported in accordance with a transportation plan based on the manufacturer's transport instructions. The plan must specify requirements for the transportation route as well as the measures by which the said route will be acceptable. Transported parts must be protected from weather and mechanical stress. The parts must be fastened and supported according to the manufacturer's instructions. Once the parts have reached the installation site, they must be inspected for transportation damage. Any damage must be repaired according to the manufacturer's instructions before the part is taken into use.

2.3 Installation

The manufacturer's instructions must be adhered to when installing wind turbines. The turbines may not be installed if the weather deviates from the permitted values of either the turbine or the installing equipment. The installation work must be supervised by a person authorised by the manufacturer. An installation document must be written, and it must include information on the installation, acceptance inspections, safety system tests and starting values.

2.4 Connection to the electrical grid

Wind turbines and wind farms must be equipped with protection according to the electrical grid administrator's requirements. Protection must be tested before the connection to the electrical grid is made. During wind turbine operation the protection must be tested as instructed in the maintenance plan.

2.5 Operational safety

Wind turbines must have an up-to-date emergency plan. Safety instructions must be in plain view, and the maintenance staff must be familiarized with the emergency plan and safety instructions. The emergency plan must include detailed driving instructions or GPS coordinates to the wind turbine in case they are needed for an emergency call.

Only personnel authorised by the manufacturer, and safety-trained persons appointed by the owner, may enter the wind turbine. Persons appointed by the owner who do not have safety training may only enter under supervision of a person responsible for the wind turbine safety. Everyone in the wind turbine must use proper personal protective equipment. The wind turbine must include emergency escape devices for the personnel. All spaces the personnel work in and have access to must be kept clean and in good order to avoid accidents and ensure safe working environment.

3 PREVENTION OF MACHINERY DAMAGE

3.1 Protection system

Wind turbines must be equipped with protection systems in accordance with the IEC 61400 standards. If the turbine's key figures deviate from values allowed by the manufacturer in continuous use, the system must adjust the wind turbine into a safe mode, or stop it automatically.

3.2 Inspection documents

Acceptance inspection and the inspection before the expiration of warranty must be documented. Any damage and repairs must also be documented.

3.3 Maintenance

The manufacturer must include a maintenance plan for the wind turbines. The plan must specify inspections and maintenance for different components as well as the due dates for them. The maintenance plan must also list wearing parts that must be replaced at the end of their useful life as specified by the manufacturer, as well as any time the key figures change.

Inspections, maintenance and repair may only be performed by maintenance staff with training in the specific wind turbine. Inspections, maintenance and part replacements must be documented. The maintenance plan must be kept up to date either by the manufacturer or the company responsible for the maintenance.

3.4 Special inspection targets

Inspection intervals on the wind turbine blades may not be longer than two years. The blades must be inspected outside along their surface and length, and inside in all areas the inspector can access. Any faults that could cause the blade to break must be repaired before the wind turbine is started up again.

Inspection intervals on lightning protection may not be longer than two years. Lightning protection must be examined from the blade's receptor to the grounding electrode so that any bad connections or partially broken cables are noticed.

Electrical installations must be thermographed by a competent thermographer during testing phase, and later according to the maintenance plan, or at least once every two years. Any dangers must be eliminated and faults repaired, and the thermography must be documented.

4 PREVENTION OF FIRE DAMAGE

4.1 Fire extinguishers

The engine room of the wind turbine must be equipped with at least two frost-proof portable extinguishers with 27A 144B C rating. These shall be suitable for extinguishing targets with live electricity. The extinguishers must be located and marked so that they are easily available in case of a fire. Locations of the extinguishers must be written in the safety instructions.

4.2 Hot work

Maintenance must be carried out with methods that do not cause a risk of fire. If hot work nevertheless has to be done, safety must be ensured in accordance with the hot work guide by the insurance company or Finance Finland. Hot work safety is also discussed in the standard SFS 5900.

4.3 Fire alarm

The wind turbine must be equipped with a fire alarm based on smoke detection.

The fire alarm must operate with a double signal: the first signal must shut down the wind turbine in an automatic and controlled way, and the second signal (or a noticed fire) must be notified to the Emergency Response Centre and the wind turbine must be disconnected from the electrical grid.

Fire alarms must be designed and installed in accordance with either of the following publications (where applicable):

- CEA 4040: Planning and Installation for Automatic Fire Detection and Fire Alarm Systems; or
- CEN/TS 54-14: Fire detection and fire alarm systems – Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance

4.4 Automatic fire extinguishing system

The nacelle must be protected with an automatic fire extinguishing system when the turbine's nominal output exceeds 2 MW. The automatic fire extinguishing system can be local application or total flooding systems.

The wind farm's external electrical room must be protected with an automatic total flooding extinguishing system.

The extinguishing system must be designed and installed, where applicable, in accordance with a fire extinguishing equipment design and installation standard published by one of the following:

- European Committee for Standardization (CEN)
- Finnish Standards Association (SFS)
- Comité Européen des Assurances (CEA)
- VdS Schadenverhütung (VdS)
- National Fire Protection Association (NFPA)
- Factory Mutual (FM); or
- International Organisation for Standardization (ISO).

5 PREVENTION OF VANDALISM

5.1 Doors

The wind turbine and its electrical room must be closed with a door that makes trespassing impossible without breaking the door structures with tools.

The door frame must be supported to the wall at the lock and hinge. If the door hinge can be disassembled from outside, the hinge side must then include at least three hinge security bolts attached to the door frame or the door itself.

When the door is locked, the gap between the door's lock-side edge and the frame may not be larger than 5mm. The lock of a non-rebated door must be protected with a protection plate.

5.2 Locks

Single-leaf doors leading to the wind turbine and its external electrical room must be locked with a dead locked latch lock approved by Finance Finland.

Double-leaf doors leading to the wind turbine and its external electrical room must be locked so that the active leaf is locked to the inactive leaf in the same way a single-leaf door is locked. The inactive leaf must be fastened in place with a quick bolt installed on the inside.

5.3 Ventilation and other openings

Ventilation or other opening that is located 4 meters or less above ground or above a walkway must be protected with a fixed or locked steel grille or steel net.

5.4 Possession of keys

Only persons named by the owner of the wind turbine may have keys to the wind turbine and its electrical room. A record of key holders must be kept.

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