



Solution:

**Scope and definition:**

A wind turbine is a machine in the scope of the directive 2006/42/EC because it contains moving parts fitted with a drive system (rotating of the yaw-system and/or rotor blades). When the wind turbine is equipped with a lift, the lifting equipment, including the landings and suspension, are subject to annex IV.17. A lift in a wind turbine is not only used for accessing the landings but also for other purposes like maintenance and inspections.

**Communication system:**

As a minimum, in view of its use in remote locations, a two way communication system has to be **prescribed** during normal use as well as during emergency operations.

**Carrier:**

Due to the lack of operating space (crushing and shearing hazards may occur when there is no opening distance of minimal 0.5 m is feasible) and for the protection against falling objects, usually a full enclosure of the carrier is necessary.

The carrier must be equipped with an emergency stop.

**Opening carrier door(s) between landings:**

According to the requirements of Directive 2006/42/EG chapter 6.4.1 „...The door(s) must remain closed when the carrier stops between landings and where there is a risk of falling from the carrier...“, the opening of the carrier door(s) between the landings is not permitted and therefore a guard locking device preventing the opening of the door(s) until the carrier reaches a landing, is necessary.

The carrier door must be equipped with a device which prevents movement of the carrier in case the door is in an open position.

In practice, stopping between landings and opening of the carrier door may be required for purposes like maintenance. In that case, the following requirements exist:

- as soon as the carrier door is opened (by operating an additional separate handling device which is not used during normal operation of the lift and unlocks the carrier door lock) travelling of the carrier shall be stopped as long as the carrier door is open. This mechanism must not be easily accessible and be provided with a marking
- when the carrier door is opened, prevention of falling of persons out of the carrier is required and leaving and entering are not allowed excluding during rescue operations.

In view of the use in remote locations, the opening of the carrier door for rescue operations shall be possible from both the in- and outside of the carrier.

**Protection of persons in the travel zone:**

Crushing and shearing hazards are relevant when the distance between carrier and the rescue ladder is  $\leq 0,5\text{m}$ . When there is the possibility of hazardous contact between the moving carrier and persons on the ladder and at the landing gates, safeguarding at the floor and roof of the carrier must be present. The performance level shall be according to EN ISO 13849-1. Following the path S2-F1-P2, the result will be PL=d.

If the distance between carrier and the rescue ladder is more than 0.5 m, the safeguards can be used to protect the persons at the landings. When the full height landing gate is changed into a reduced height landing gate with minimum height of 1.1 m, the performance level shall be according to EN ISO 13849-1. Following the path S2-F1-P1 the result will be PL=c.

Solution continued:

**Landings and landing gates:**

Landings are places for entering or leaving the carrier. This can be at the top or the bottom and at intermediate stops of the travel zone.

If the distance between the carrier and the landing gate is smaller than 0.5 m, a full height landing gate is required to prevent shearing and crushing hazards. If the distance between the carrier and the landing gate is smaller than 0.5 m, a reduced height landing gate (minimum height 1.1m) is allowed if the carrier is safeguarded at the top and bottom and has a flat surface. In this case, the performance level shall be according to EN ISO 13849-1. Following the path S2–F1–P1 the result will be PL=c.

The distance from the landing gates to the landing sill must be  $\leq 0.15$  m or else a safety device which detect and protect persons/obstacles must be present.

**Interlocking of landing gates:**

The risk assessment for the landing gates must cover the intended access to the carrier as well as the intended access to a ladder (e. g. for rescue operations):

- The landing door can be opened by a primary mechanism (bar/catch) if the carrier is present. The landing door cannot be opened by primary mechanism when the carrier is absent. The position of the carrier at the landing shall be detected making sure the carrier is in the correct travel zone for the opening of the door(s).
- The landing door can be opened when, in case of a rescue operation, the operator wants to use the ladder by operating an additional mechanism – e. g. second bar – which is not used during normal operating the lift; this feature shall be considered in the risk assessment. This additional opening mechanism is only necessary for opening the landing door when the carrier is not present at the landing. This mechanism may not to be easily accessible and be provided with a marking

**Rescue conception:** The manufacturer of lifting equipment for the use by persons within wind turbines shall ensure that a contingency plan for rescue is available. The following points shall be considered:

- the person that has to be rescued is not able to assist during rescue (e.g. unconscious),
- adequate anchoring devices for the rescue teams in and on the carrier – EN 795,
- changing positions from the carrier to the ladder shall be possible in a safe way,
- ergonomic solutions shall be preferred,
- a carrier shall have a device for lowering the carrier in case of emergency.