

Note on Engineering Details

- No:** DWL-An-extern-002, Rev. 0
- Title:** Requirements additional to those in the GL Wind Guideline 2003 in order to fulfil IEC 61400-1, ed. 1999 and DIBt guideline (March 2004)
- Ref.:**
- GL Wind "Guideline for the Certification of Wind Turbines", Edition 2003 with Supplement 2004, Chapter 4
 - DIBt "Richtlinie für Windenergieanlagen", Edition March 2004
 - IEC 61400-1, "Wind turbine generator systems – Part 1: Safety requirements" Edition 2, 1999-02
- Contact:** Dr. Kai Freudenreich, email: kai.freudenreich@gl-group.com, phone: +49 40 36149 7923
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Aspects to be considered additionally to the GL Wind Guideline 2003 in order to cover the IEC 61400-1 standard (1999 edition) and DIBt guideline (March 2004):

Additional aspects to GL Wind Guideline to be considered in order to fulfil the DIBt guideline:

1. Load case DLC 1.0 is to be calculated using turbulent wind. The analysis of the load components relevant for foundation design have to be carried out with respect to identification of loads with a probability of load duration exceedance of more than $p_f = 0.01$ (1750 h in 20 years).
2. Additional load case DLC 5.2 is to be analysed assuming an emergency shut down initiated by earthquake. This load case can be regarded as being covered by load case DLC 1.12 of the GL Wind Guideline.
3. Load case DLC 6.1 is to be calculated additionally using a partial safety factor for aerodynamic loading of $\gamma_F = 1.5$; the oblique inflow may be assumed to be 0.0 degrees in that case.
4. The analysis of load cases to be considered for foundation design is given in Table 5 of the DIBt guideline. The GL Wind Guideline requires a different set of load cases, see Table 6.7.1 of the GL Wind Guideline.
5. The extreme wind speeds V_{ref} , V_{e50} , V_{m1} , V_{e1} and the annual mean wind speeds are referenced to 10 m height and are defined for wind zones and therefore differ from those in the GL Wind Guideline which are class related and defined at hub height.
6. Load case DLC 8.1. If a steady wind module is used a gust wind speed of 9 m/s is to be assumed on top if the 10-minute mean value of the wind speed, which is to be defined by the manufacturer.
7. Ice formation (DLC 1.10, DLC 6.5) may be assumed to have 50% of the mass indicated in the GL Wind Guideline. The duration of operation with ice formation is to be assumed to be 7 days at rated power.

Additional aspects to the GL Wind Guideline to be considered in order to fulfil the IEC 61400-1, edition 2 (excluding the "Common Modifications" in EN 61400-1):

1. Load case DLC 6.2 may alternatively be calculated assuming an oblique inflow due to grid loss of +/-45 degrees (steady wind speed model) or +/-30 degrees (turbulent wind model) in case the wind turbine is not equipped with an energy back-up system enabling yaw activity. The partial safety factors for loads are to be assumed according to "Normal and Extreme" (in this context see also the GL Wind "Note on Engineering Details", No. DWL-An-extern-001, Rev. 0, dated 15.07.2005).

2. For the investigation of the critical deflection analysis e.g. of the rotor blade deflection the safety factor for deflection to be applied according to IEC 61400-1 is $\gamma = 1,35 \cdot 1,1 = 1,485$.

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Christian Nath
Global Business Manager

Andreas Anders
Head of Department

Axel Andreaä
Author