



G168 VAWT v1.1

Structural Design

Methodology

Revision

Rev.	Author	Revised	Released	Date	Notes
Draft	D. Malcolm			2017-2-6	
Review	A. Ojeda			2017-2-6	
Final	K. Wolf			2017-2-6	

Scope

This document describes the methodology followed for the structural design of the G168 WHI turbine v1.1 to be installed in Texas in 2017. It includes a description of the various computer models used in the design procedure and of the Design Load Cases selected for analysis. The purpose of this document is not to address detailed design values or detailed design parameters. For this, references are given to other documents.

Contents

1	Introduction	3
1.1	Design basis	4
1.1.1	Variable Speed.....	4
1.1.2	Braking and Safety System.....	4
2	Structural analysis	5
2.1	Dynamic analysis.....	5
2.2	Resonance.....	6
2.3	Analysis of Extreme Loads	7
2.4	Fatigue strength analysis.....	8
3	Design Load Cases (DLCs).....	9
3.1	Safety factors	10
3.2	Detailed stress analysis	10
3.3	Support structure sub-assembly	11
3.4	Drive train sub-assembly.....	12
4	References.....	12
	Appendix A (List of Structural Calculations)	14

Figures

Figure 1	General design methodology (IEC61400-2).....	3
Figure 2	Power and rotor speed vs. wind speed	4
Figure 3	Dynamic analysis of wind turbine	5
Figure 4	Campbell diagram for the G168 v1.1 VAWT	6
Figure 5	Rotor discretization	7
Figure 6	Procedure for fatigue strength design.....	8
Figure 7.	Examples of 3D FEM analysis for rotor parts	11
Figure 8	FEM analysis for support structure	12

Tables

Table 1	Design Load Cases (DLCs)	9
Table 2	Most critical Design Load Cases	10
Table 3	Safety Factors Used.....	10