

# V-Forestry

in accordance with Eurocode 1, part 2-4

**Data input=**

*Tree characteristics*

Species=	<b>Pinus sylvestris</b>
Height tree=	12,00 m
diameter	15,00 cm
Bark thickness=	0,00 cm
Residual wall, t=	4,00 cm

*Wood properties*

Compression strength=	3,20 kN/cm*cm
Modulus of elasticity=	700,00 kN/cm*cm
Wood density=	0,85 gr/cm*cm*cm

*Environment*

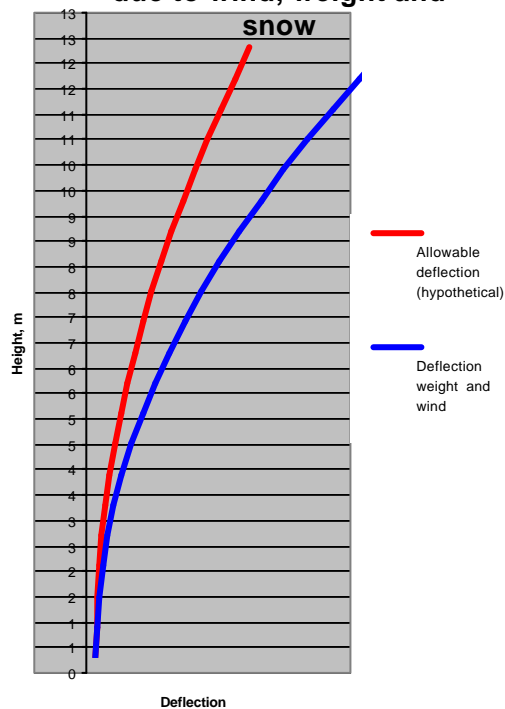
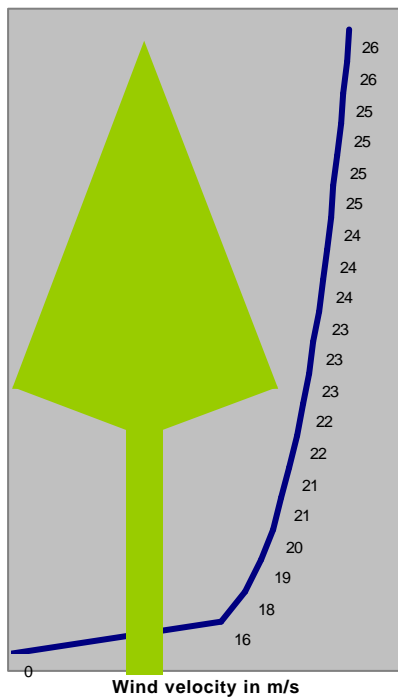
Altitude=	0,00 m
Minimum temperature=	16,00 °C
Expected wind speed for the area=	90,00 km/h

Snow thickness=	60,00 cm
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*Stand characteristics*

Marco de plantación_D=	2,5 m
Distance from forest edge_x=	0 m

**Deflection of the sound stem, due to wind, weight and snow**



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**Results=****Wind load analysis for trees**

Crown area=	10,13 m*m
Streamlining=	60,00 %
Wind speed, in the stand=	24,89 m/s
at height=	9,73 m
Wind load=	1,51 kN
	153,88 kg
Wind induced bending moment=	14,69 kNm
Total bending moment=	20,11 kNm

**Bending fracture of the sound stem=**

Mcrit=	10,60 kNm
Mcrit/ Mtotal expected=	52,72 %
Safety=	52,72 %
(tree weight and snowload incorporated)	
Required residual wall thickness=	No decay allowed!

Vcrit_bending (without snow)=	21,15 m/s
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**Torsion safety of the closed and concentric residual wall=**

Vcrit_torsion=	45,42 m/s
Safety=	332,99 %

**Bending fracture of the residual wall=**

t/R=	0,53
Vcrit_residual wall=	19,85 m/s
Safety=	47,36 %

**GREENHILL\_Elastic stability (buckling)**

Critical trunk height=	32,81 m
Safety factor trunk=	273,44 %
(elastic stability, buckling)	

**Dynamics=**

Natural frequency=	4,60 Hz
Vcrit_resonance=	3,45 m/s
Equivalent wind load=	0,03 kN

*Please consult the following publications, in order to interpret correctly wind load analysis for trees:*

Sterken P (2006) Prognosis of the development of decay and the fracture-safety of hollow trees.

Arboricultural Journal. Vol 29: 245-267

Sterken P (2005) A Guide for Tree-stability Analysis. Second and expanded edition.

University and Research-centre of Wageningen: <http://library.wur.nl/gkn/>

Sterken P (2008) Modelización de la estabilidad del arbolado y palmeras. FORESTA.

Asociación y Colegio Oficial de Ingenieros Técnicos Forestales. Nº 38: 59-67.

**Disclaimer:** While every effort has been made to validate the solutions in this worksheet, Peter Sterken is not responsible for any errors contained and is not liable for any damages resulting from the use of this material, nor for any interpretation of the calculations. These calculations are only intended for educational purposes and should only be employed by a professional trained in this method.

(\*)=According to Lavers (1983) and Wessolly and Erb (1998).