

Wind Load Analysis analogous to DIN 1055-4

Project	Site	Tree Number	1
Project Name	Nový Knín	Náměstí Nový Knín	
Project Number	1		
Test Date	31.05.2023	Nový Knín, CZ	
		Altitude a. sea level	310 m

Tree Data			Applied Material Properties		
Tree Species	lípa srdčitá		as for	Tilia cordata	
Stem circumference	223 cm		Source	Stuttgart	
Stem Diameter	 └┐	71 cm	Compressive Strength	20 MPa	
in 1m height		72 cm	Modulus of Elasticity	8300 MPa	
Bark Thickness		2 cm	Limit of Elasticity	0,24 %	
Tree Height	15 m		Green Density	0,74 g/cm³	

Crown Outline

	Load Direction	JV
	Surface Area Analysis	
	Crown Base	3,1 m
	Effective Height	10,2 m
	Total Surface Area	84 m ²
	Crown Eccentricity	0,85 m
	Applied Structural Parameters	
	Drag Factor	0,25
	Natural Frequency	0,91 Hz
	Damping Decrement	0,3
	Form Factor for Dead Weight	0,8
	Applied Site Parameters	
	Windzone	D 2
	Speed of Applied	
	Design Wind Speed	25 m/s
	Air Density	1,24 kg/m ³
	Roughness Catagory	City
	Exponent for Wind Profile	0,3
	Proximity Factor for Effects in Near Ground Wind Flow	1,3
	Factor for Crown Exposure	1,00

Results

Wind Load Analysis		Tree Static Analysis	
Mean Wind Pressure	5,6 kN	Dead Weight Tree	3,2 t
Gust Reaction Factor	3,34	Critical Degree of Hollowness	90 %
Load Centre	8,5 m	Critical Residual Wall Thickness	4 cm
Torsion Moment	16 kNm	Assuming an Uncompromised Residual Wall	
Design Wind Load	161 kNm	Basic Safety Factor	3,7

General

Comments

Calculated Tipping Stability according to Pull Test

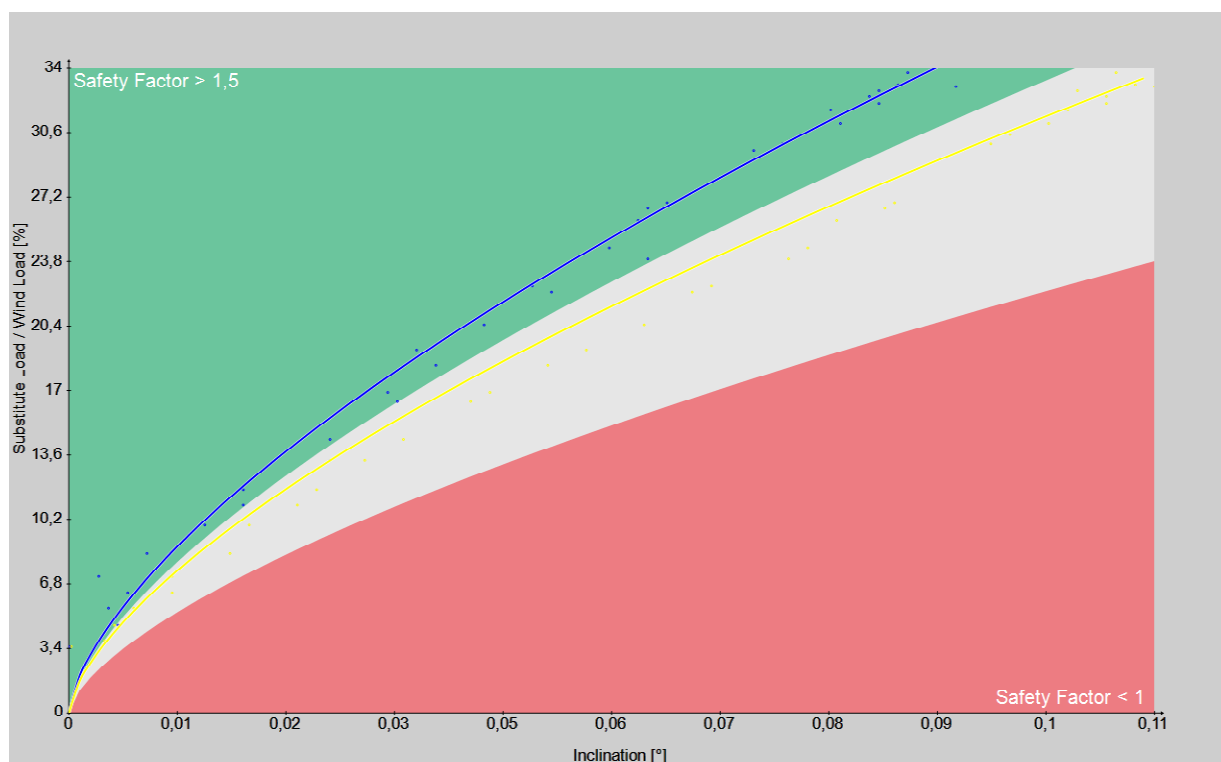
Tree Data

Project	Nový Knín	Tree Number	1
Tree Species	lípa srdčitá	Date	31.05.2023

Setup Pulling Test

Height of the Stem Anchor	4 m	Measurement No.	1
Rope Angle	9,5 °	Load Direction	JV

Graphic Display (test data and best fit to tipping curve)



Inclinometer Measurement

	80	81
Position	280°	90°

Tipping Stability (based on Generalized Tipping Curve)

Safety Factor	1,65	1,41
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Control Value

	in		
Standard Deviation	%	1,15	1,07
Substitute Load	%	33,9	33,9
Load Direction at Inclinometer	x-Axis	x-Axis	

General for Pull Test

Consultant	Bažant
Witness / Assistant	Janeček

Measurement Comments

Calculated Fracture Stability according to Pull Test

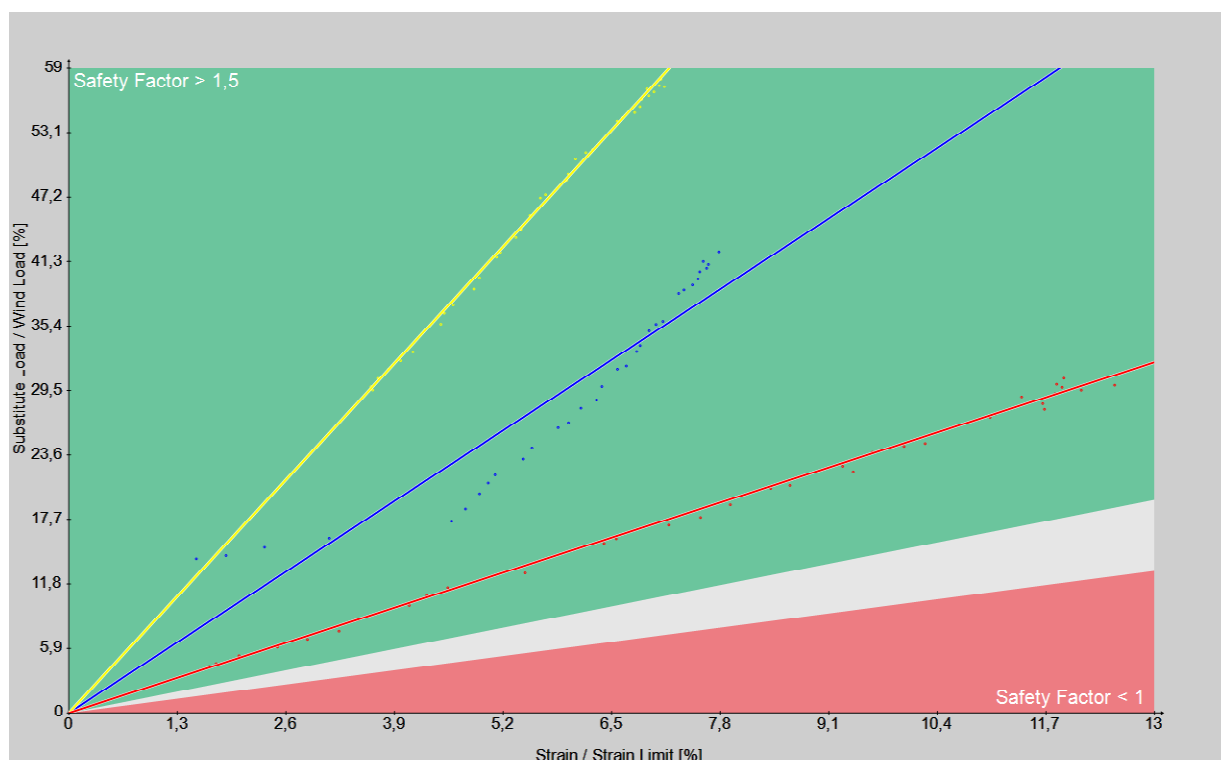
Tree Data

Project	Nový Knín	Tree Number	1
Tree Species	lípa srdčitá	Date	31.05.2023

Setup Pulling Test

Height of the Stem Anchor	4 m	Measurement No.	1
Rope Angle	9,5 °	Load Direction	JV

Graphic Display (test data and best linear fit)



Elastometer Measurement

	in	90	91	92
Measurement Height	m	0,51	0,43	0,87
Position		TLAK	TAH	TLAK
Stem Diameter 1	cm	73	76	69
Stem Diameter 2	cm	68	73	66
Bark Thickness	cm	2	2	2
Load part	%	100	100	100

Breaking Stability (derived from the gradient of the best linear fit)

Safety Factor	4,97	8,21	2,47
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Control Value

Coefficient of Determination R ²		0,8797	0,9973	0,9967
Residual Stiffness	%	>100	>100	70
Degree of Hollowness	%	0	0	66,9
Compression originating from				
Dead Weight	%	0,4	0,4	0,8
Substitute Load	%	42,4	58,2	30,8