

Summary; Strength and stability calculation

Standard configuration with one platform every four meter
Erected according assembly and use manual

Design Calculations Sheet
and Safety Checks

Declaration

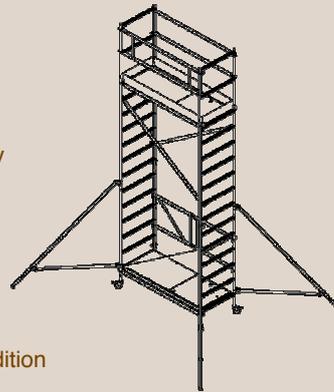
Youngman declares that the Folding Tower is established and calculated according the current valid European standard EN1004.

After purchasing a standard configuration a strength and stability calculation is available at Youngman dealer or via Youngman.

As mentioned, for mobile access towers the current standard is EN1004.

This declaration gives the certainty of a liable working tool.

Local law and legislation may encompass extra measures in addition to those stated in this document.



Quicky Tower

For more information contact your Youngman dealer

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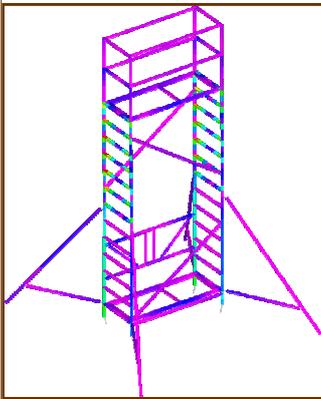
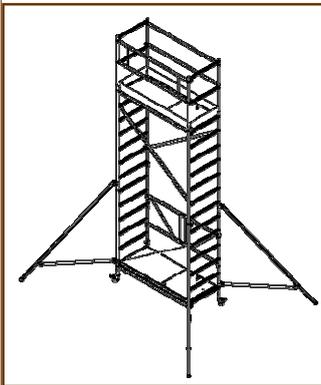
Scope of this summary

Youngman has the required speciality knowledge for making and analysing strength and stability calculation for standard and special configurations.

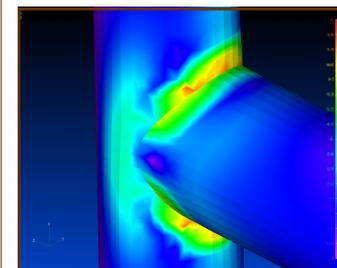
The output of such calculation is very voluminous. That's the reason for making a summary of this calculation. If applicable by a health and safety inspection the total calculation and its results can be checked at Youngman in the INDIA .

All calculation are carried out with the Fine Element Method(FEM).

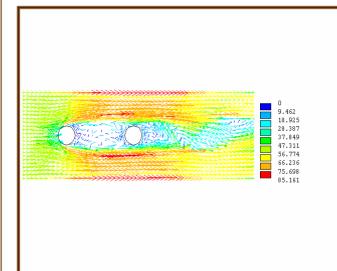
Part A



View of the tension acting under load case 3



Detail view of the tension acting under load case 4



View of the "shadow wind" which is an extra demand of the EN 1004

Strength calculation

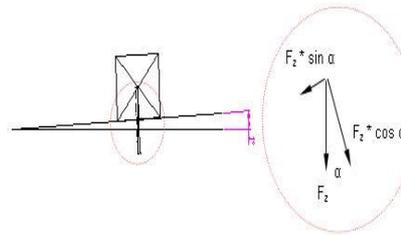
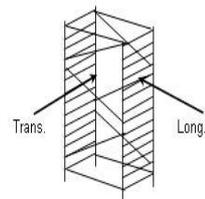
The EN 1004 describes that a folding tower must withstand a combination of load cases. These combinations of load cases are described in the diagram beneath (figure 1).

This diagram shows also the combination which is applicable for this rolling tower. The results are based on the most unfavourable load cases mentioned in the EN1004

Load cases on rolling towers according EN1004 : 2004

Load case	Self weight	5 kN/4st.			Unif. Dist. Load 2kN/m ²			Hor. Serv. Load 0,3 kN		Windload		Inclination of 1%	
		"185"	"245"	"305"	"185"	"245"	"305"	Trans.	Long.	Trans.	Long.	Trans.	Long.
5100 - 1	■	■						■		■		■	
5100 - 2	■	■							■				■
5100 - 3	■		■					■		■		■	
5100 - 4	■		■						■			■	■
5100 - 5	■			■				■		■		■	
5100 - 6	■			■					■		■	■	■

Orientatie:



$$\alpha = 1^\circ$$

$$F_z \cdot \cos \alpha = (m \cdot g) \cdot \cos 1^\circ$$

$$= (m \cdot 9.81) \cdot \cos 1^\circ$$

$$= m \cdot 9.81$$

$$F_z \cdot \sin \alpha = (m \cdot g) \cdot \sin 1^\circ$$

$$= (m \cdot 9.81) \cdot \sin 1^\circ$$

$$= m \cdot 0.17$$

Figure 1: Combination of loads

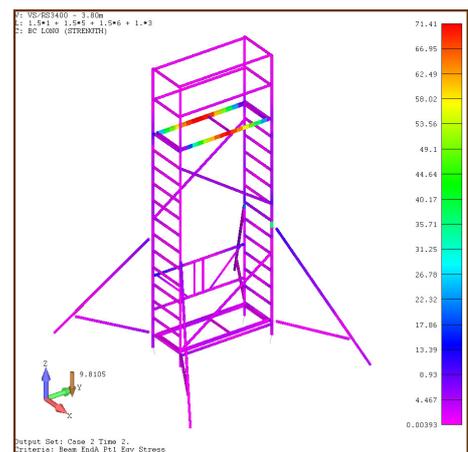
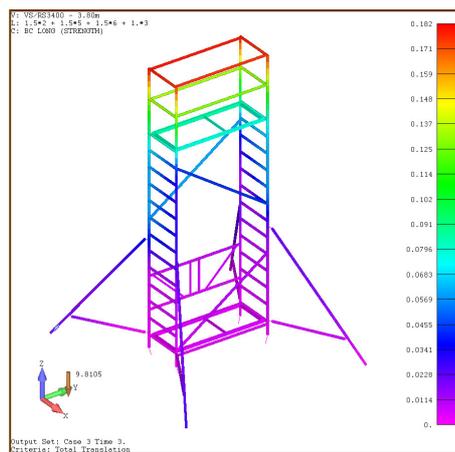


Figure 2: View deformation occurring

Conclusion Strength calculation

The folding tower configuration as described in part C fulfils the strength requirements of the EN 1004.

The FEM (Finite Element Method) model of the rolling tower doesn't show any high tensions.

The stability of the rolling tower stays within the requirements of the EN-1004

Above two graphics (figure 2) of the FEM model. Its show's which forces can occur, at and on the components of the rolling tower.

Part B

Stability calculation

The EN-1004 describes in § 11.4 how the stability of the folding tower must be calculated.

Load case 1 (§ 11.4.2.2) and load case 2 (§ 11.4.2.3) must be used.

In the EN-1004 it is taken into account the influence of an extra wind load.

This "shadow wind" load has to be carried out in the calculation of the second frame.

Also the wheel stands must be in the highest position possible.

This extra demand is stated in § 8.1 of the EN-1004

To guarantee the stability of the configuration, the effect of the wind on the configuration must be studied. Due to the wind a rotation force shall occur based on the formula:

$$M_{ind} = F_{wind} \cdot L = (C_{f,0} \cdot P_{wind} \cdot A_{proj}) \cdot L \quad [Nm]$$

Load case 1

Load case 1 reflects the situation in use, as well indoors and out doors. In the last case the wind load must be taken into account. The mentioned values beneath are valid;

Safety against rotation $S \geq 1.5$

Vertical load:

- Total weight of configuration
- Vertical load of 0.75 kN

Horizontal load

- Wind
- Horizontal load of 30 Kg.

Extra Load:

- Load due to inclination of 1%

Than the following stability calculation for load case 1 counts:

$$S_{transversaal} = M_{stabiliserend} / M_{destabiliserend} \geq 1,5$$

$$S_{longitudinaal} = M_{stabiliserend} / M_{destabiliserend} \geq 1,5$$

Load case 2

Load case 2 reflects the "not in use" situation which is applicable outdoors.

The mentioned values beneath are valid;

Safety against rotation $S \geq 1,3$

Vertical load:

- Total weight of configuration

Horizontal load:

- Wind

Extra load:

- Load due to inclination of 1%

Than the following stability calculation for load case 2 counts:

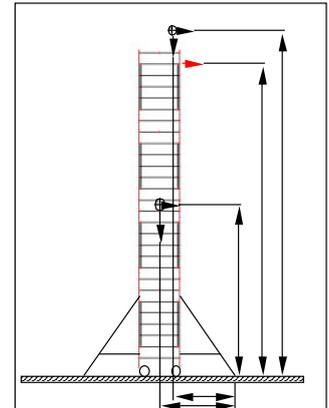
$$S_{transversaal} = M_{stabiliserend} / M_{destabiliserend} \geq 1,3$$

$$S_{longitudinaal} = M_{stabiliserend} / M_{destabiliserend} \geq 1,3$$

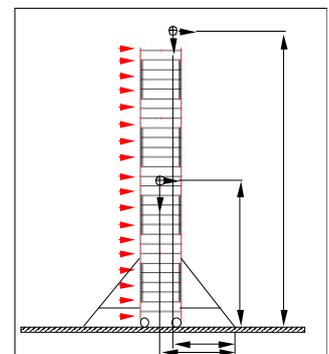
Conclusion Stability calculation

The folding tower configuration as described in part C fulfils the stability requirements of the EN 1004. For both load cases, applied in transversal and longitudinal direction at load case 1 for in and out doors situation, the stabilising force is higher than the destabilising force.

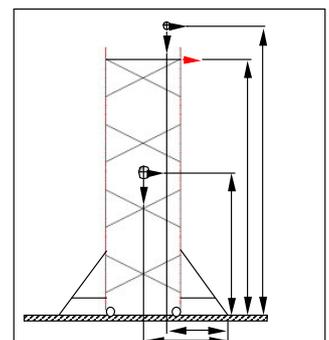
The safety requirement of both formulas (as mentioned above) are taken into account



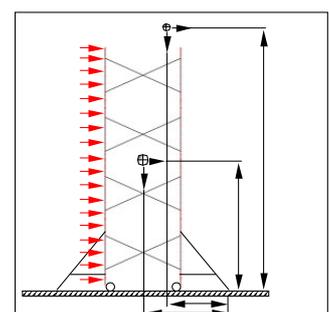
Transversal - Indoor



Transversal - Outdoor



Longitudinal - Indoor



Longitudinal - Outdoor

Part C

Configuration

This summary of the strength and stability calculations is applicable for all Quicky towers configuration as mentioned in the table below.

EN

III Folding/rolling tower 3400

III.I Configuration table 3400

GENERAL

	Platform, height (m)			1.00	1.80	3.80	5.80			
	Working height (m)			3.00	3.80	5.80	7.80			
0.75 x 1.60 m.	Description	Art.nr.	Weight (kg)	A	B	A+B	C	A+B+C	D	A+B+C+D
	Folding part	323107	11,4	1	0	1	0	1	0	1
	Set of 4 collar tubes	733658	0,6	0	1	1	1	2	1	3
	Frame	323105	4,6	0	0	0	2	2	2	4
	Guardrail frame	323104	1,9	0	2	2	0	2	0	2
	Platform with trap door	305032	11,2	1	0	1	1	2	1	3
	Diagonal brace	323102	1,4	0	0	0	3	3	3	6
	Horizontal brace	323101	1,3	0	3	3	0	3	1	4
	Double guardrail shore	503409	2,8	0	1	1	0	1	0	1
	Triangular stabilizer	323106	2,9	0	0	0	4	4	0	4
	Toe boards	323103	5,7	0	1	1	0	1	0	1
	Toe boards clamp	733654	0,1	0	4	4	0	4	0	4
	Total weight (kg)			22,6	17,2	39,8	36,8	76,6	27,8	104,4
	Set of wheels (4 items)	324531	4,4	1	0	1	0	1	0	1

Part D

Conclusion

In this summary of the strength and stability calculation Youngman declares that the Quicky Tower meets the requirements and demands as mentioned in the EN1004.

The Quicky tower meets the required strength. YES

The Quicky tower meets the required stability. YES