

Wind Turbine Foundation – Durable buildings are needed

- *Foundation Damage* -

8.2 Ingenieurgesellschaft Timo Poetschke – Münster mbH
- Germany -

Dipl.Ing.(FH) Timo Poetschke

Expert for Foundations of Wind Turbines and Static Structures
for Renewable Energies

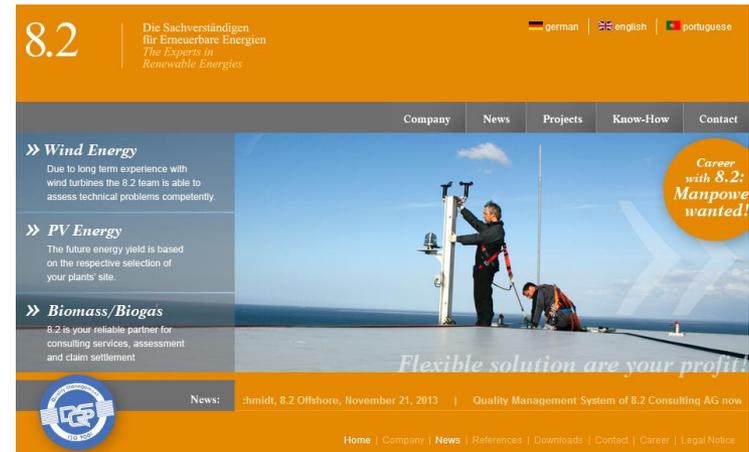
8.2 The Experts in Renewable Energies – Introduction

Was founded in 1995 with the 1st 8.2 office in Süderdeich, Germany by Manfred Lührs

Fields of work

» Wind Energy

In January 1997 Manfred Lührs was the 1st engineer, publicly appointed and authorised as expert for wind turbines in Germany.



8.2 Die Sachverständigen für Erneuerbare Energien
The Experts in Renewable Energies

german english portuguese

Company News Projects Know-How Contact

» Wind Energy
Due to long term experience with wind turbines the 8.2 team is able to assess technical problems competently.

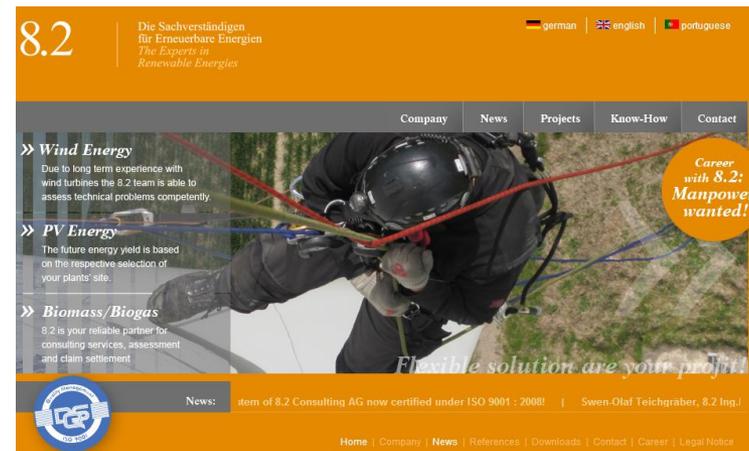
» PV Energy
The future energy yield is based on the respective selection of your plants' site.

» Biomass/Biogas
8.2 is your reliable partner for consulting services, assessment and claim settlement

Flexible solution are your profit!

News: Schmidt, 8.2 Offshore, November 21, 2013 | Quality Management System of 8.2 Consulting AG now

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News: Item of 8.2 Consulting AG now certified under ISO 9001 : 2008! | Sven-Olaf Teichgraber, 8.2 Ing.

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8.2 The Experts in Renewable Energies – Introduction

Currently 8.2 has 24 offices in Germany, Austria, France, Portugal, Taiwan.

Fields of work

- » Wind Energy
- » PV Energy
- » Biomass/ Biogas

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Career with 8.2: Manpower wanted!

News: Item of 8.2 Consulting AG now certified under ISO 9001 : 2008! | Sven-Olaf Teichgraber, 8.2 Ing.

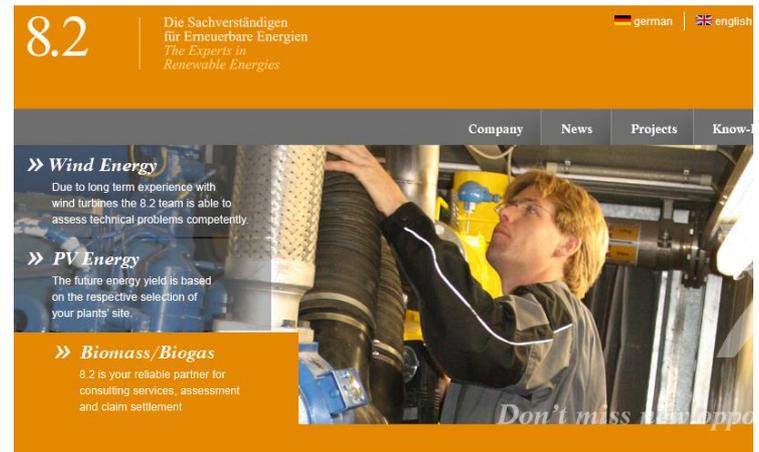
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8.2 Consulting AG – Divisions

- » 8.2 Offshore
- » 8.2 Grid integration
- » 8.2 International Projects & Institutional Investors
- » 8.2 Academy

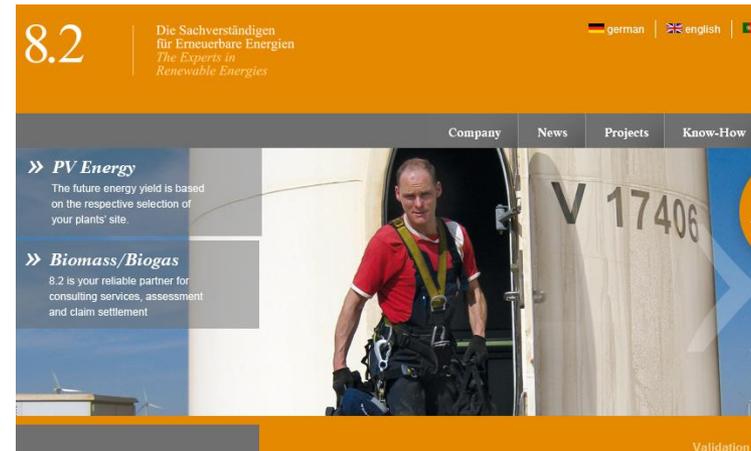
24 Independent engineering offices



8.2 The Experts in Renewable Energies – Introduction

Long Experience in:

- » Consulting
- » Technical Due Diligence (TDD)
- » Technical Inspections
- » Online Condition Monitoring
- » Video Endoscopy
- » Thermography
- » Construction supervision



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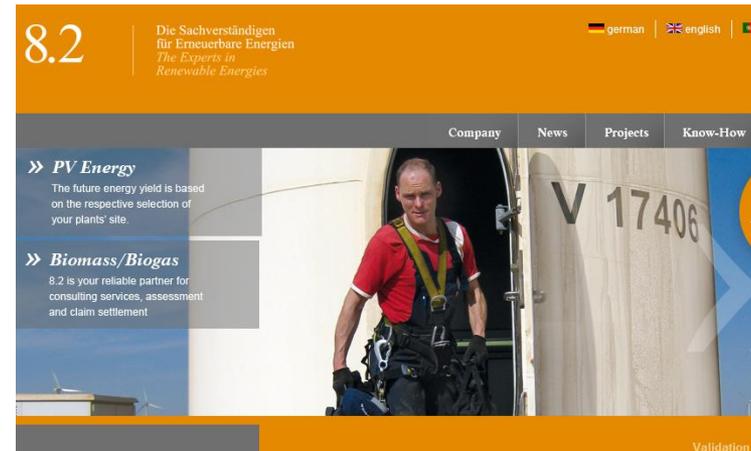
Wind turbine foundations

Timo Poetschke - Expert

- » 44 years old, Münster - Germany
- » Civil Engineer, Business Administration, Quality management supervisor (QMB)

Experience in Wind Energy

- » 6 years Manager Civil Engineering - Enron Wind/ GE Wind Energy
- » 2.5 years Technical Manager - Repair company Solido Bautenschutz
- » 4 years Manager - 8.2 Office Münster

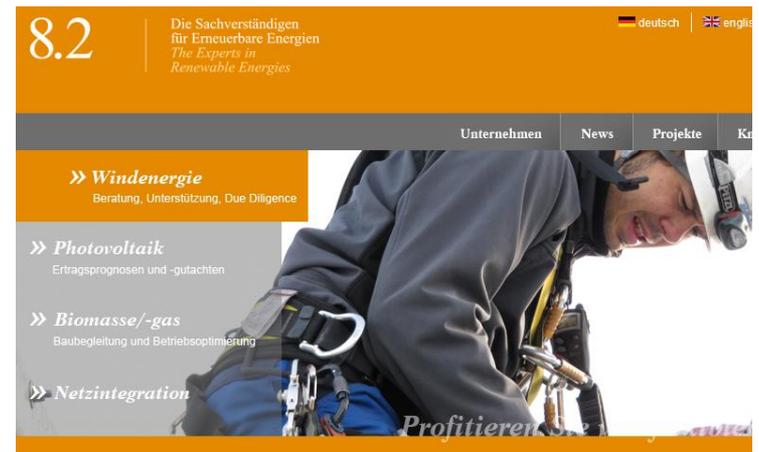
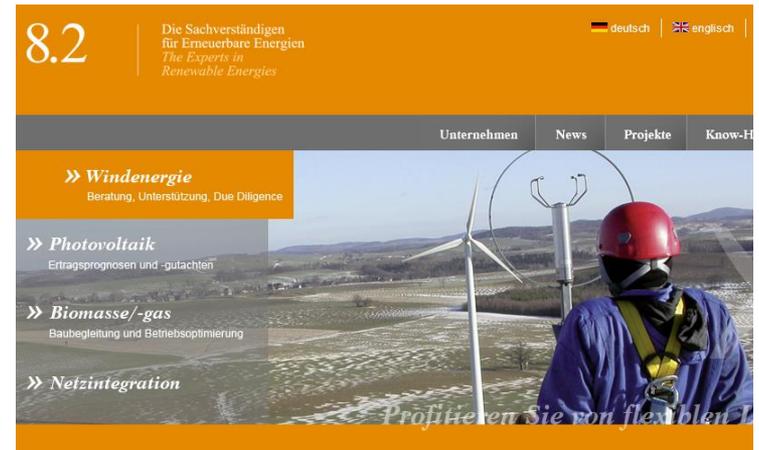


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Subjects – Wind turbine foundations

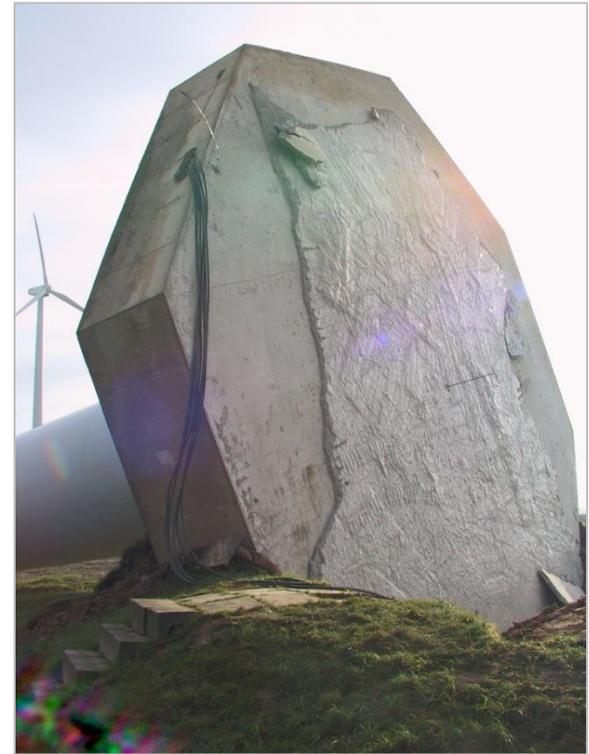
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- » Construction supervision
- » Technical Inspections
- » Appraisal of foundation damage
- » TDD - foundation part
- » Construction controlling
- » Analysis of measurements related to vertical movement of towers



Wind turbine foundations

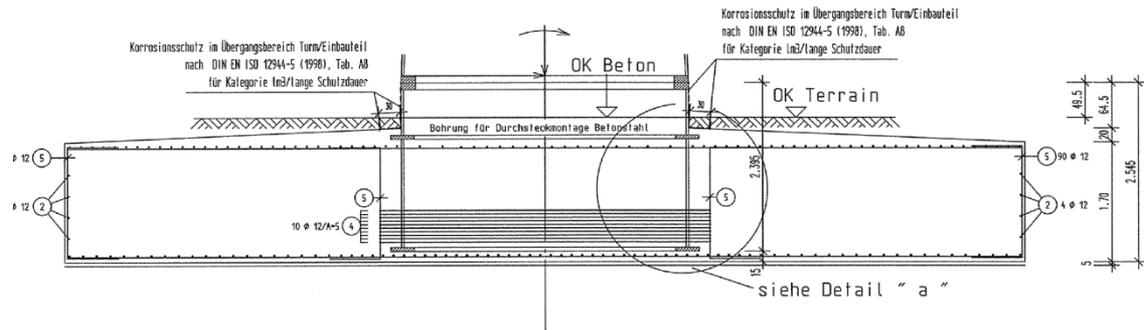
Damage has to be avoided:



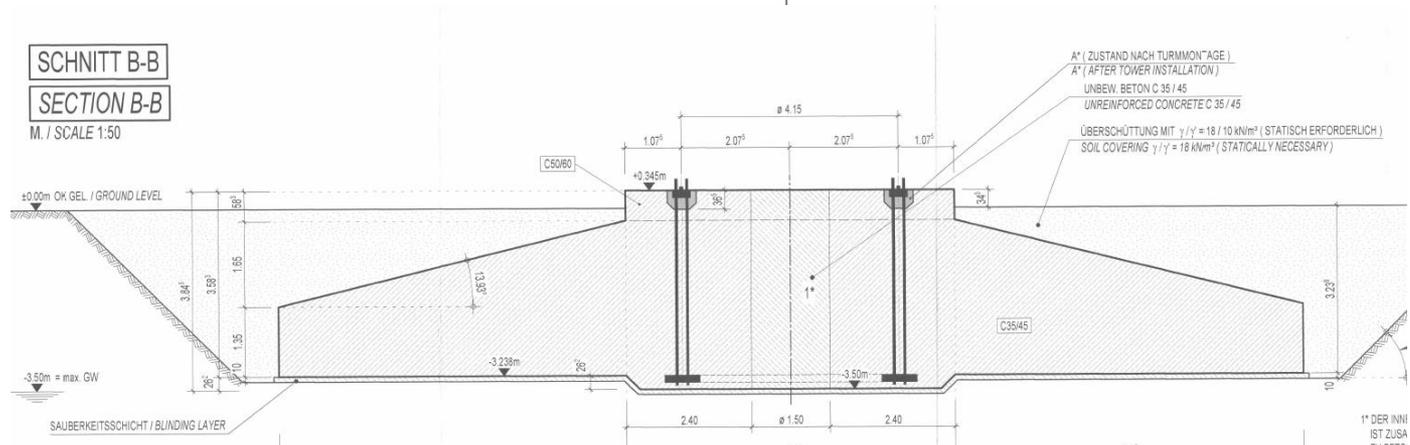
Wind turbine foundation

The most used types of tower interface...

» Foundation section Schnitt



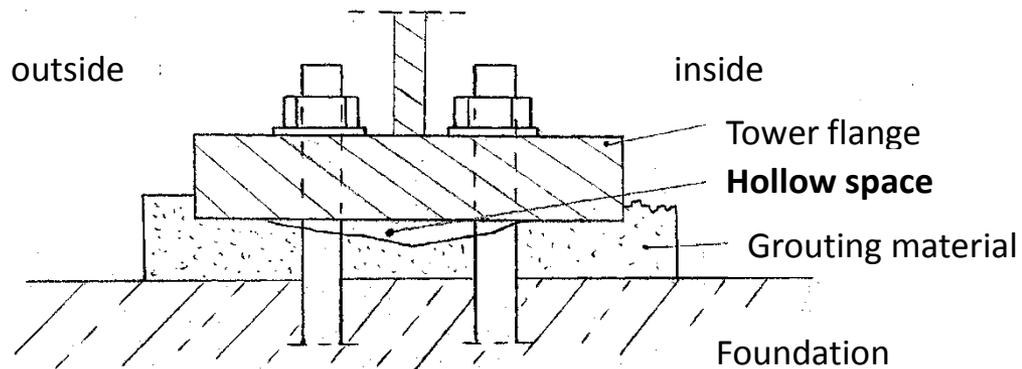
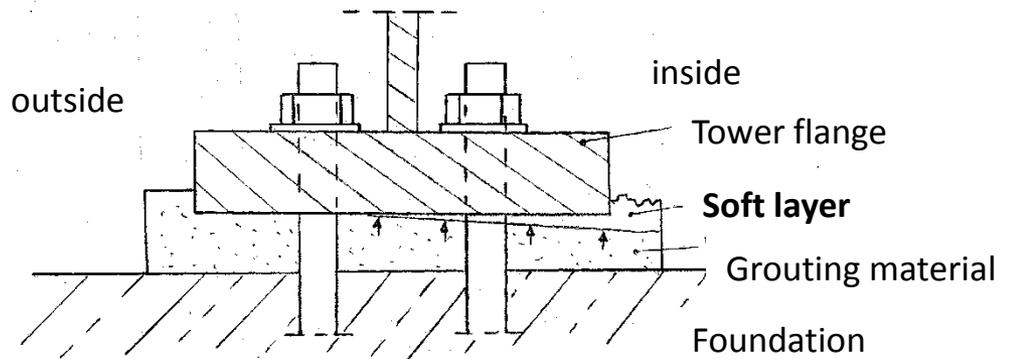
» Anchor cage



Anchor cage

Grouting joints

» Reduced load transfer surface



Anchor cage

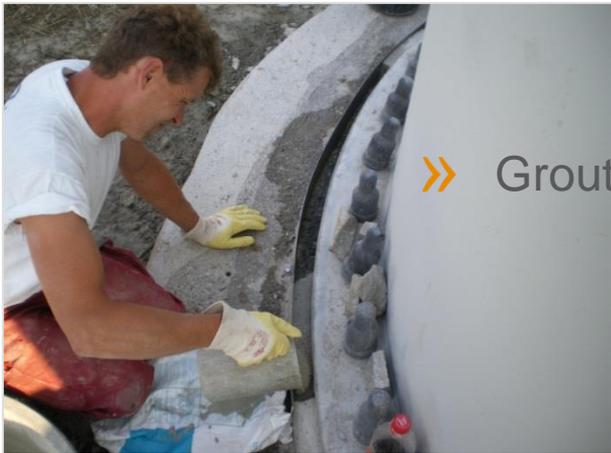
Remedial action:



» Cut out old grouting joint



» Decoupling anchor bolts



» Grouting

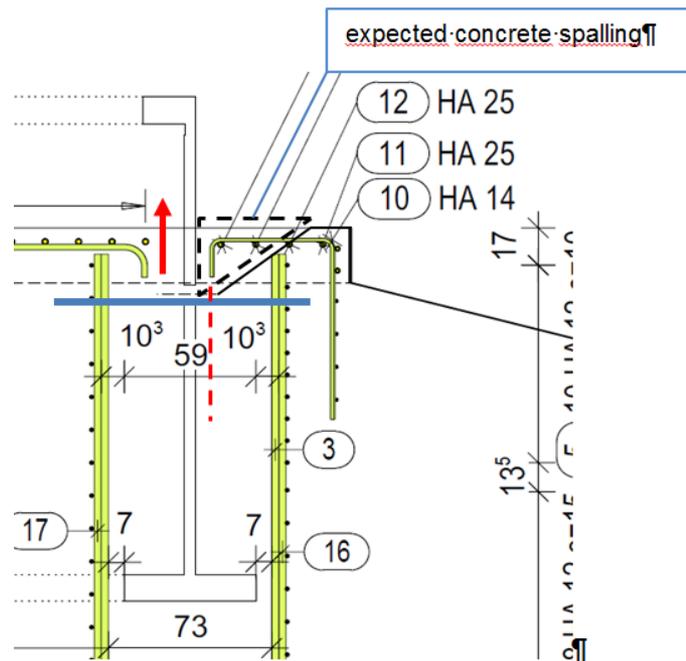


» Finished work

Foundation section - Decoupling

Decoupling needed

» Elastic elongation of steel



Foundation section - Decoupling

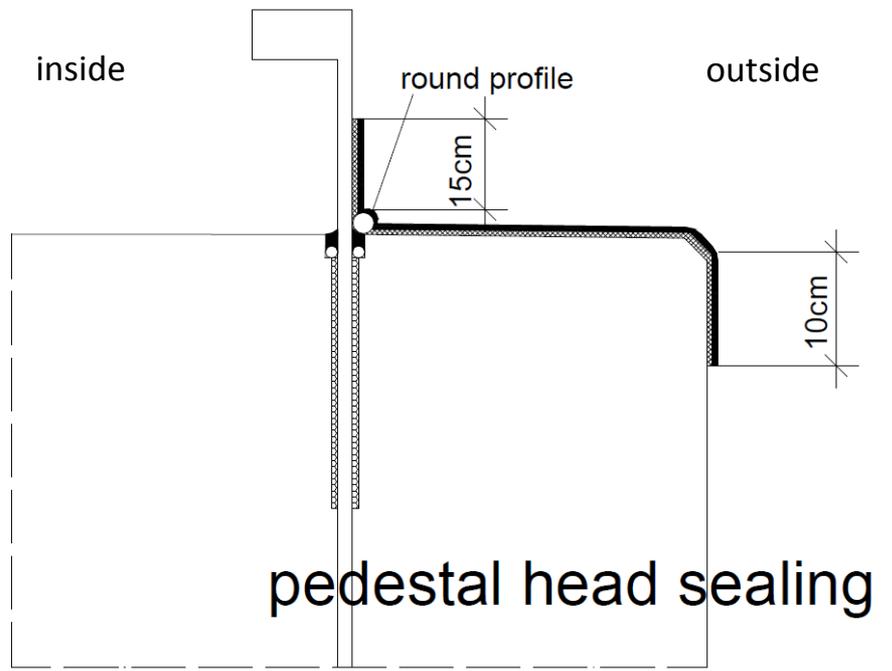
Remedial action:



Foundation section - Waterproofing

Waterproofing the gap between concrete and tower

» Use a belt as well as additional suspenders!



Foundation section - Waterproofing

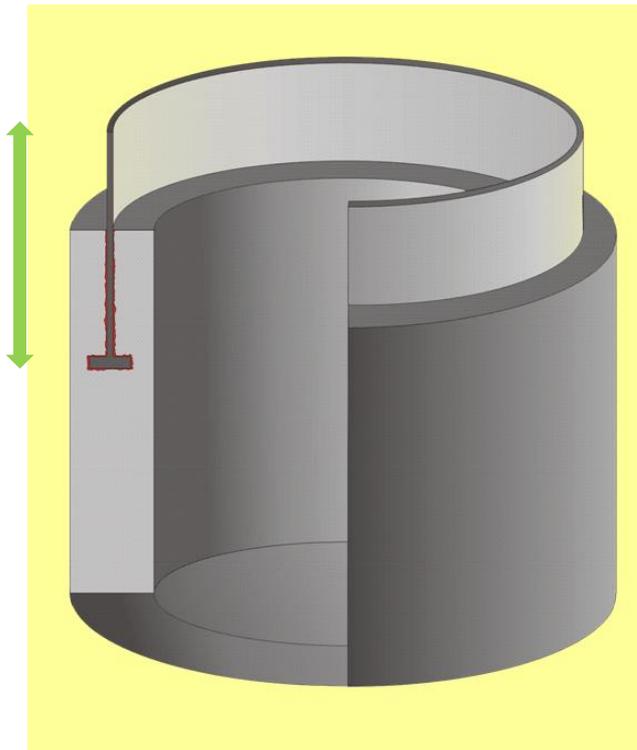
Remedial action: belt + suspenders



Foundation section - unfixed

Loose tower fixation

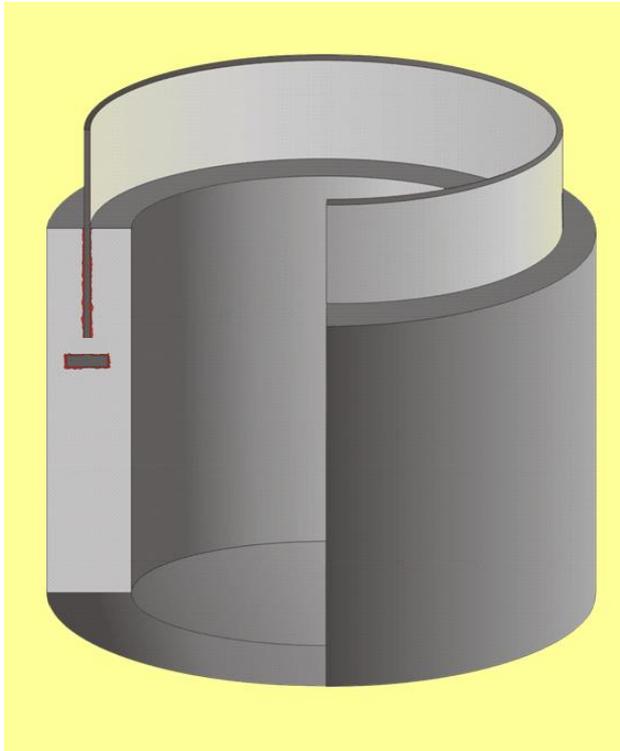
» Water destroys the tower fixation



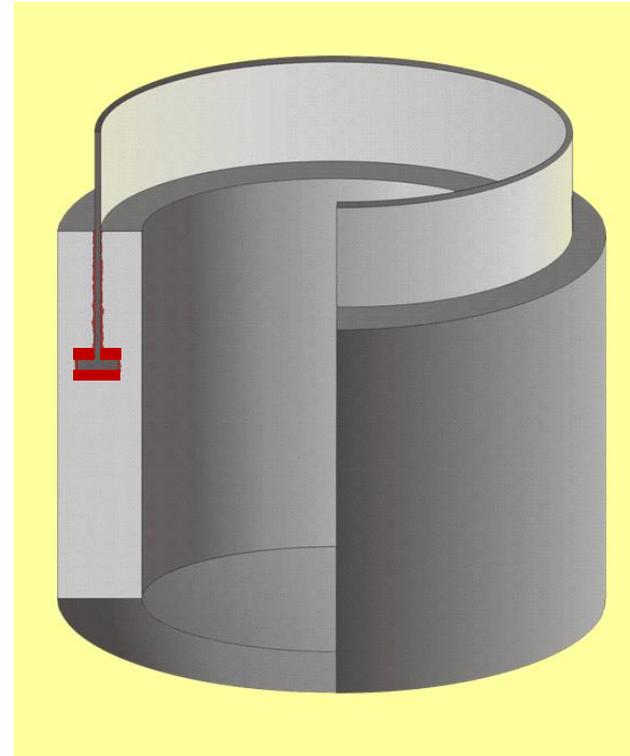
Analysis by
measurement of
vertical tower
movement.

Foundation section - unfixed

Causes for moving are:



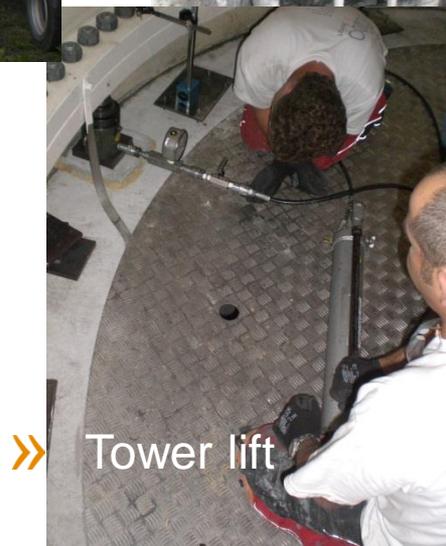
» Broken weld seam or steel plate



» Gap in form closed fixation

Foundation section - refixation

Remedial action:



Reinforced concrete

Cracks in foundation pedestal

» Work-sharing between concrete and reinforcement

Concrete = compressive force

Reinforcement = tractive force

Cracks in concrete show
activated reinforcement

Water entrance will become a problem with
durability for the building!



Reinforced concrete

Remedial action:



Repair work reduces profit

- » All Wind turbine manufacturers are affected by foundation damage. Repair work is **possible** but complicated and expensive.
- » With proper design future structural damage can be avoided.
- » Construction supervision in the building process reduces the possibility of future construction damage.
- » *For Wind turbine owners it is recommended to **invest in both.***

- » In Germany all Wind turbine manufacturers changed from foundation section to anchor cage (eno, REpower excluded). Anchor cage design is less susceptible to damage. It is recommended to have a construction supervision by an expert for grouting work.
- » In Europe the foundation-section-design is often used. Some constructive detail solutions are necessary to make this design durable. It is recommended to have a construction supervision by an expert for the construction work.
- » The least affected constructions are concrete towers and hybrid towers with external pre-stressing. They are quite expensive. It is recommended to involve experts for grouting joints, pre-stressing and repair work.

» If you need help with foundation damage, please feel free to contact me.

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