

Wind Turbine Foundation – Durable buildings are needed

- *Construction supervision* -

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

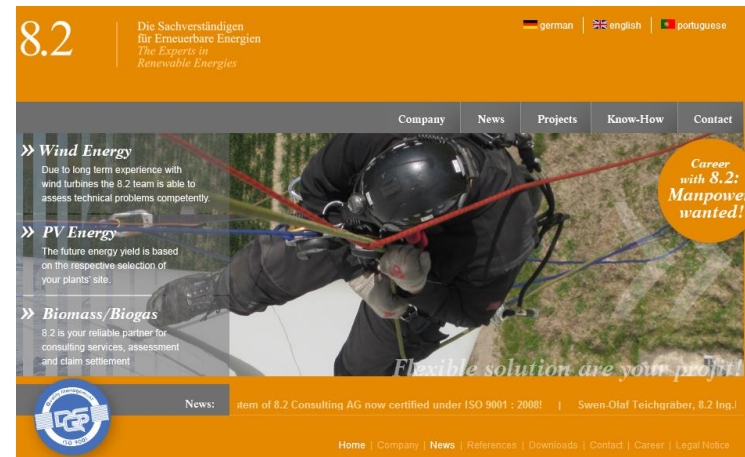
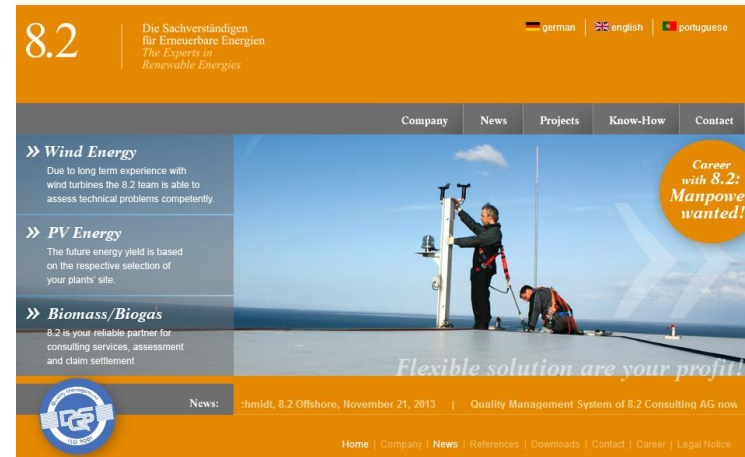
8.2 The Experts in Renewable Energies – Introduction

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.

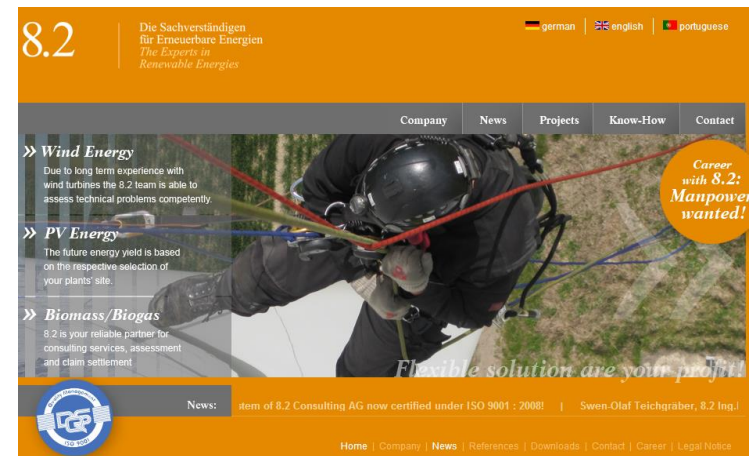
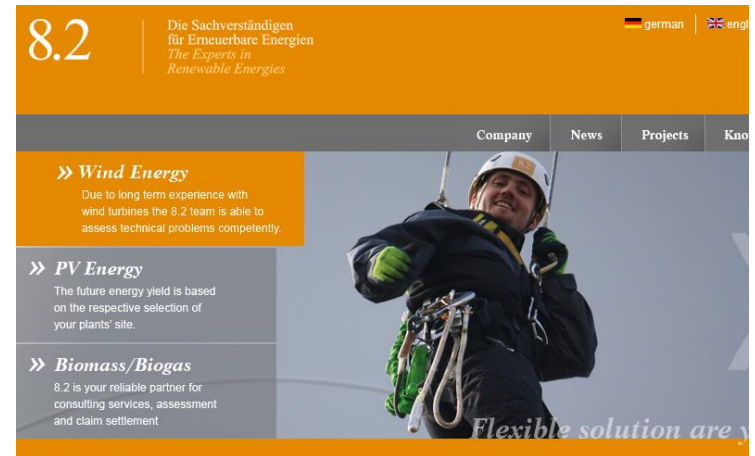


8.2 The Experts in Renewable Energies – Introduction

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

Fields of work

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

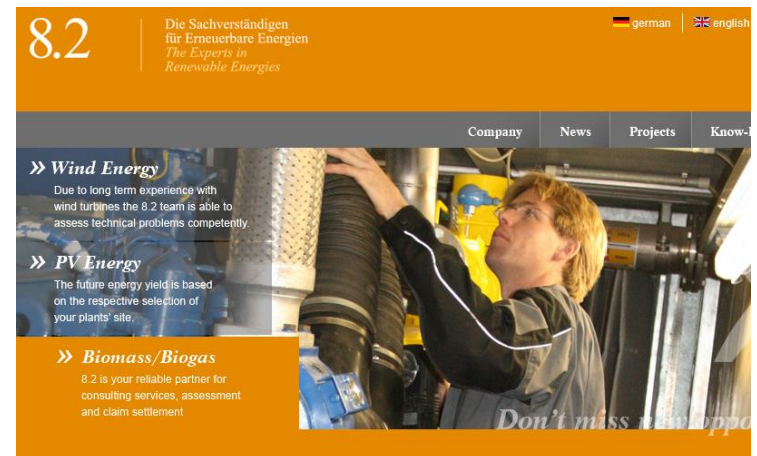
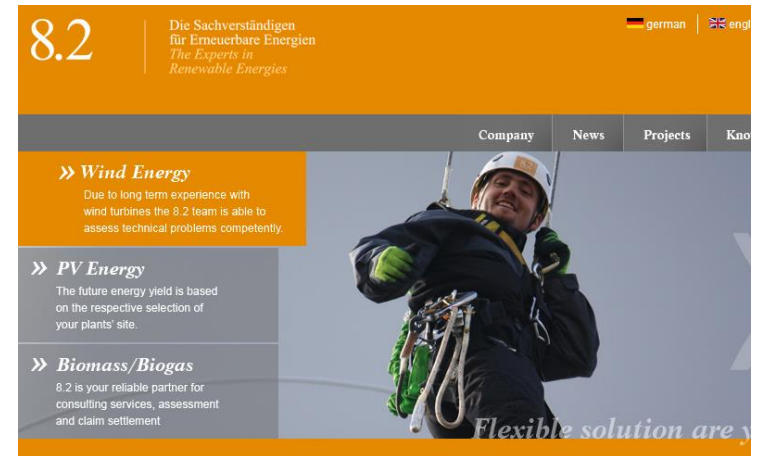


8.2 The Experts in Renewable Energies – Introduction

8.2 Consulting AG – Divisions

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

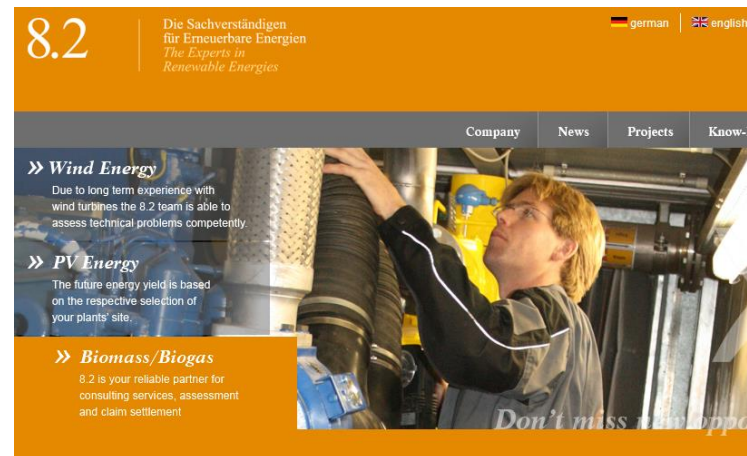
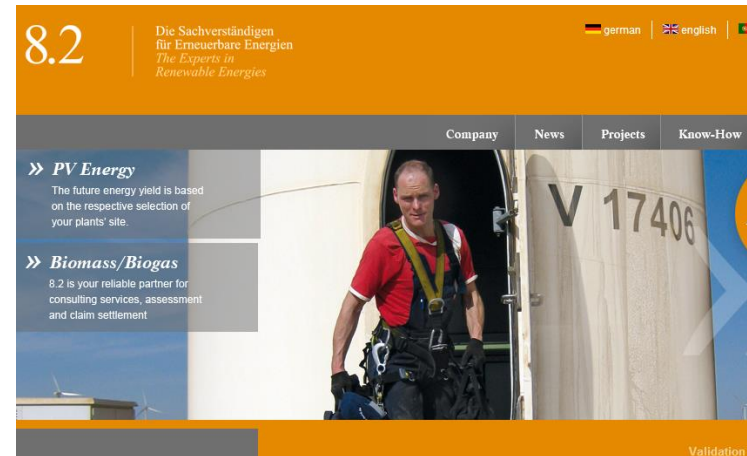
24 independent engineering offices



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



8.2 The Experts in Renewable Energies – Introduction

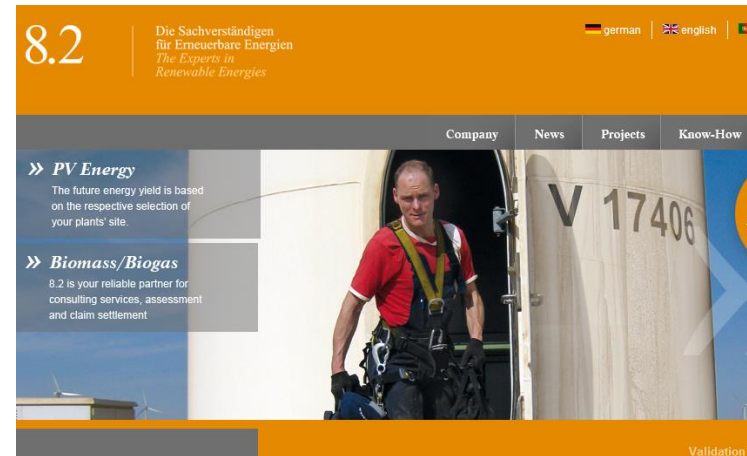
Wind turbine foundations

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

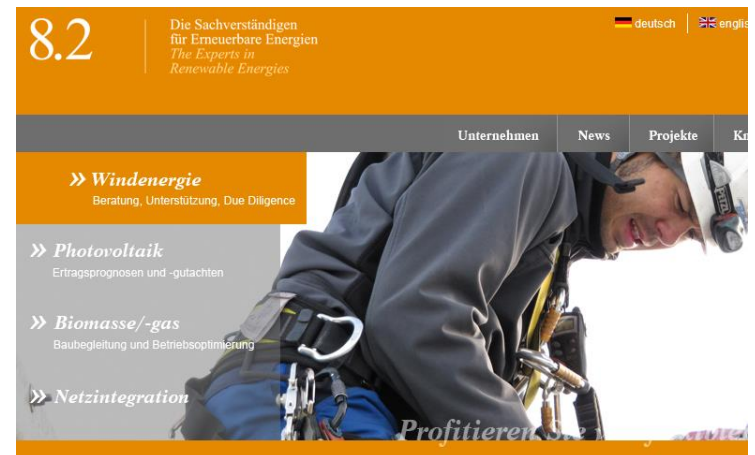
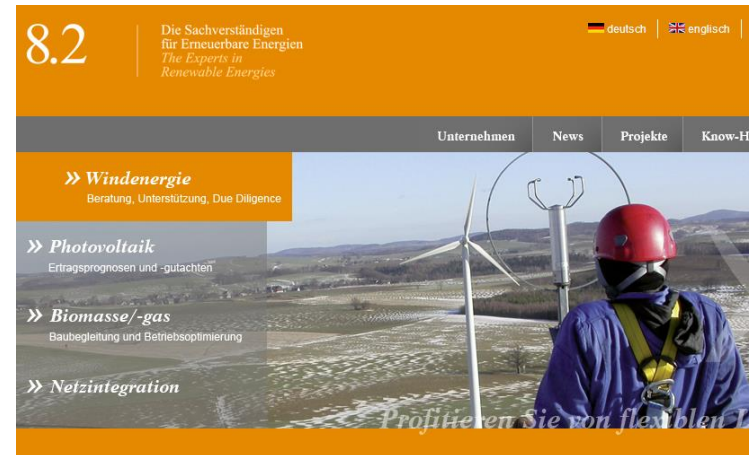


8.2 The Experts in Renewable Energies – Introduction

Subjects – Wind turbine foundations

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



Surroundings at site

Wind Turbine Sites

- » are in no-man 's land
- » are in heat, in rain, in cold, in wind



Surroundings at site

Wind Turbine Sites

- » are in no-man 's land
- » are in heat, in rain, in cold, in wind
- » work is done under time pressure
- » controls are rare
- » poor supply of food, sanitary facilities, unplanned necessary materials and tools
- » long working days, without adequate compensation

Obstacles for quality work

- » The surroundings of Wind turbine sites are not a good basis for quality work.
- » This is aggravated by financial pressure for construction companies to fulfil the task, mostly at fixed prices.
- » Installation of reinforcement and concreting work will be done by semi-skilled personnel. Communication problems are common.
- » Sometimes the personnel is frustrated or has no desire.

Consequences of missing quality work

During the construction process implemented damage in the building is normally not visible.

It could be negative for:

- » Durability
- » Serviceability

Later damage on the building is often the consequence.

Motivation for quality work

To prevent damage in the building

a construction supervision by an independent expert is recommended.

Motivation for quality work

What can be done by construction supervision on site:

- » Change the surroundings of Wind turbine sites → no
- » Reduce the financial pressure for construction companies with fixed price agreement → no but ensure the agreed performances and the generally recognised rules of technology → yes
- » Train the semi-skilled personnel → yes it happens automatically by ensuring the generally recognised rules of technology
- » Reduce personnel frustration → yes by motivation for employees of the construction company

Corrective action in construction process of buildings

What can be done by construction supervision on site:

- » Avoid damage in construction process → leads to corrective action before that damage happens

The construction supervisor is:

Expert and Representative of the owner on site

Corrective action - before damage happens

- » badly filled formwork/ soil in the foundation leads to a reduced concrete cover and reduced reinforcement compound → ***durability mainly affected***



misshap - sloppiness

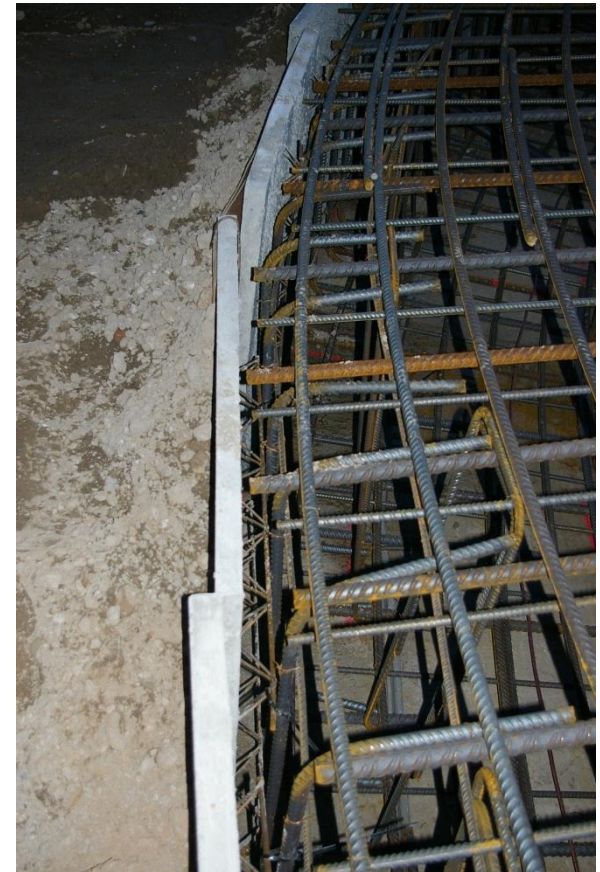


Corrective actions - before damage happens

- » badly positioned formwork leads to reduced concrete cover → *durability affected*



badly installed reinforcement cage

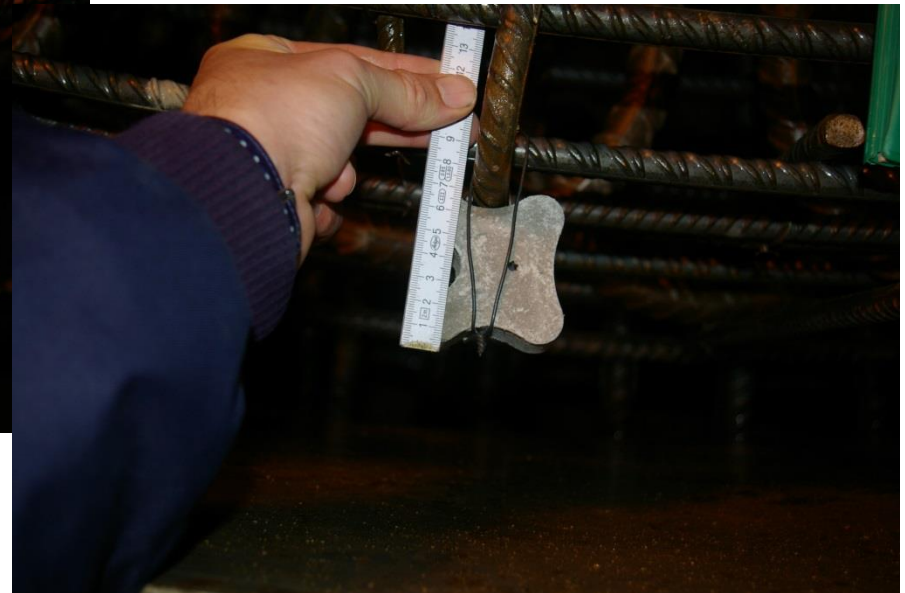


Corrective action - before damage happens

- » badly positioned concrete spacer → leads to reduced concrete cover - ***durability affected***



no foundation drawings were on site



Corrective action - before damage happens

- » missing thermal insulation leads to increasing incidence of shell cracks and the incomplete coverage of foundation to bad concrete quality in the foundation surface → ***durability affected***

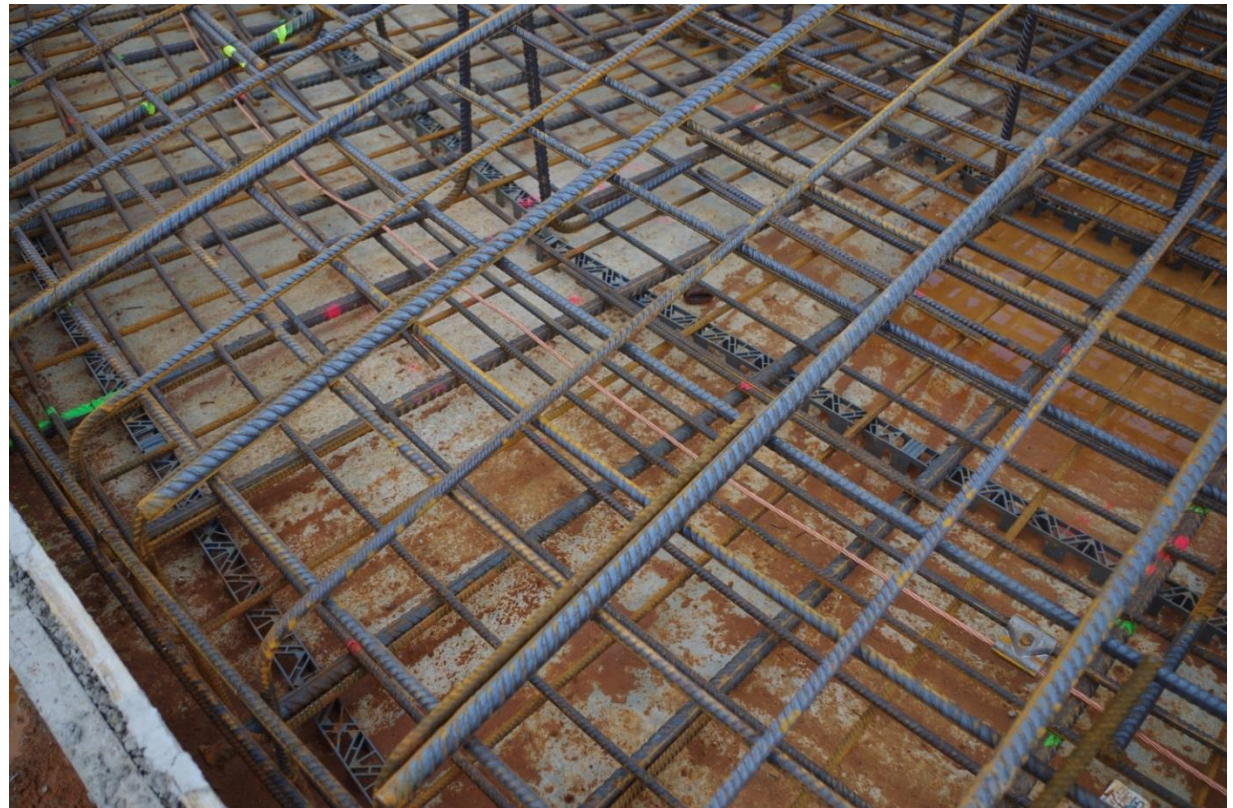
*with strong wind
employees gave up
doing this new work step*



Corrective action - before damage happens

- » Foundation earthing not assembled according to specification → ***operational safety could be affected***

*if specified work is unclear
for construction staff
it will not be done
voluntarily by the
construction company*



Corrective action - before damage happens

» missing overlap joint for radial reinforcement → ***durability could be affected***



sloppiness
(picture after final inspection of reinforcement)

Corrective action - before damage happens

- » passing through reinforcement with contact to the holes in the foundation section → ***durability affected, could increase to a structural stability problem***

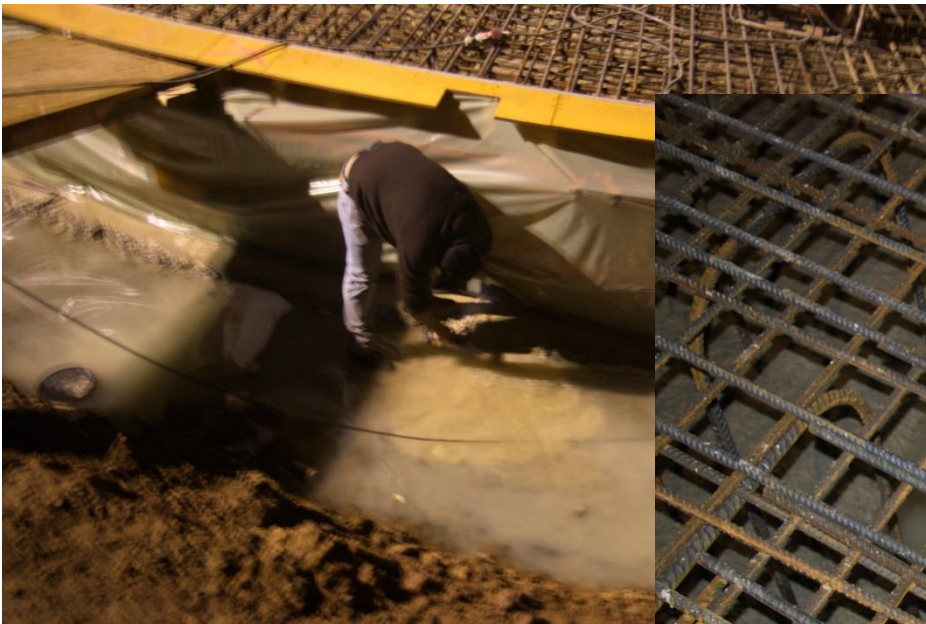


unpleasant work, missing awareness



Corrective action - before damage happens

- » rain water was drained after accumulation on cleaning layer → when mixing with the concrete ***durability could be affected***



personnel expertise



help in order to avoid defects in workmanship

» grouting → minimize the possibility of mistakes – *know how*



set starting point

help in order to avoid defects in workmanship

» grouting → minimize the possibility of mistakes – *know how*

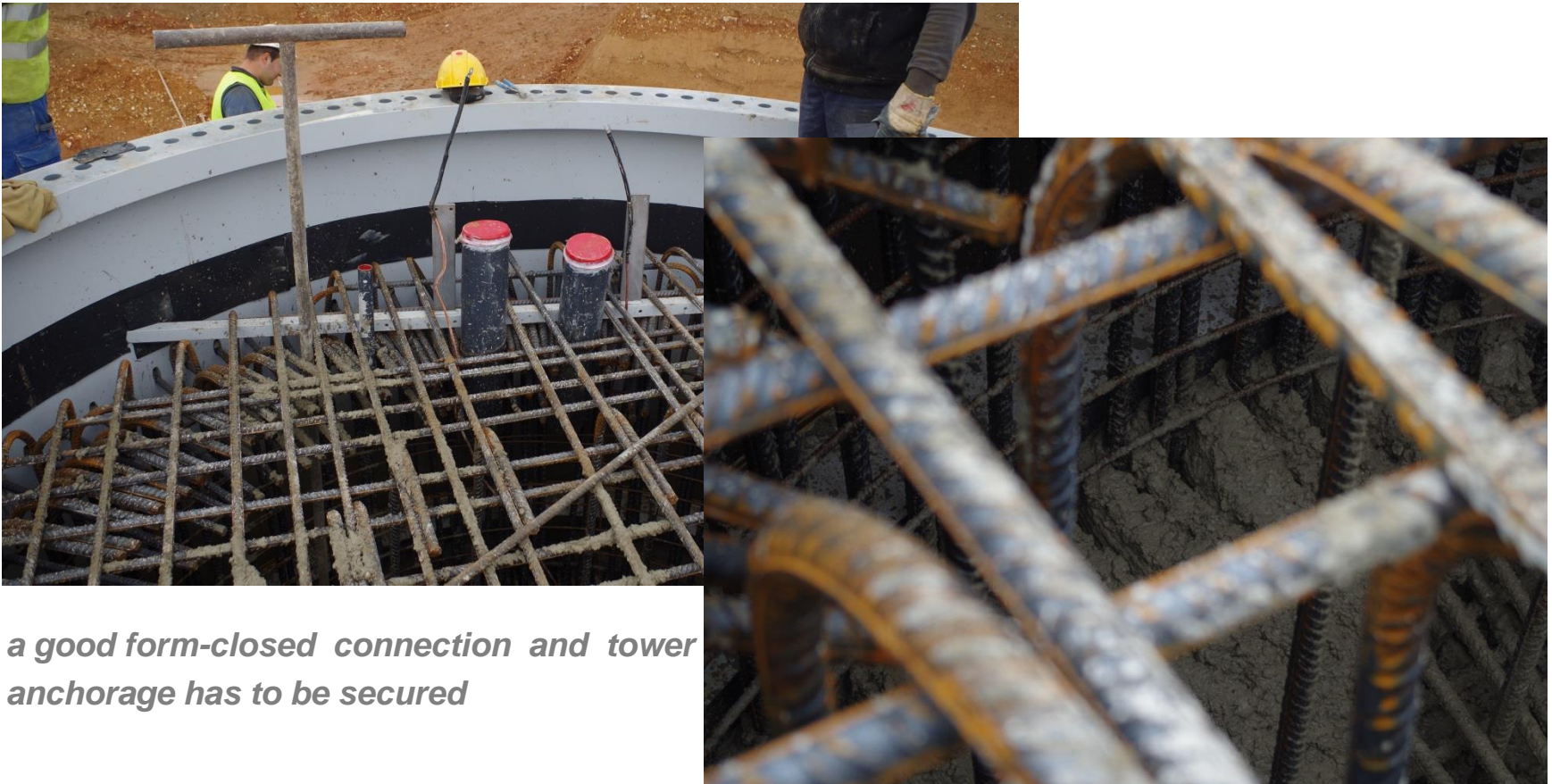


marking simplifies and prevents dosage mistakes



help in order to avoid defects in workmanship

» tower fixation → minimize the possibility of mistakes – *know how*



a good form-closed connection and tower anchorage has to be secured

help in order to avoid defects in workmanship

» dirty reinforcement → minimize the possibility of mistakes – *know how*

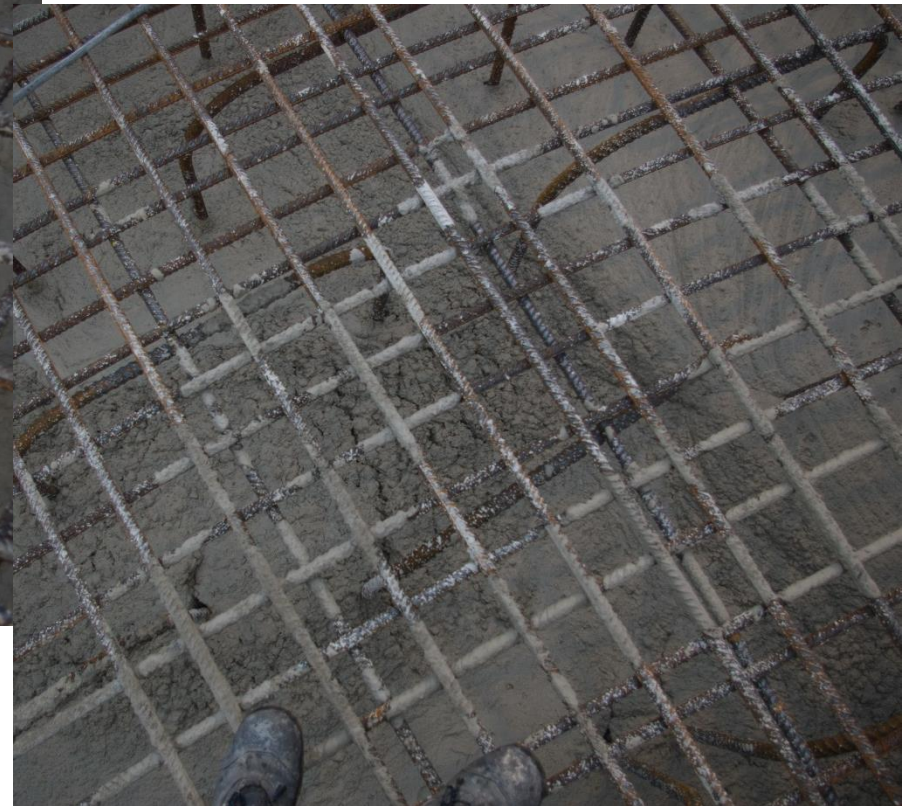
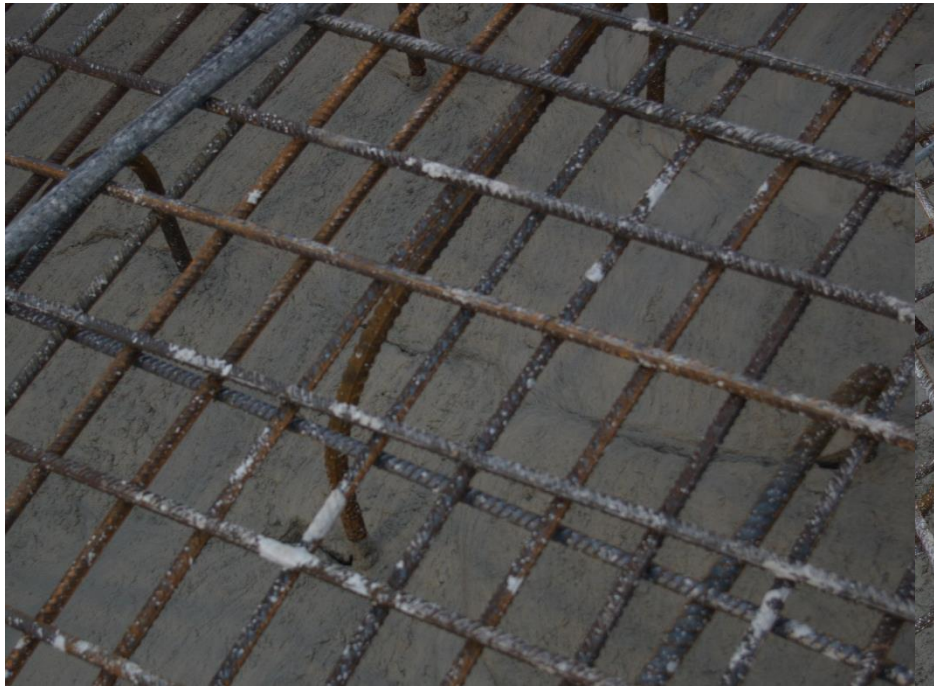


insist on clean up the reinforcement



help in order to avoid defects in workmanship

» bad compacting on concreting → minimize the possibility of mistakes – *know how*



repeatedly insist on technical rules

No cooperation from the construction company/ wind turbine
manufaktur

» Documentation of mistakes

» Clearance up to acceptance of the performances -
with financial withholding.

» If you need help with construction supervision, please feel free to contact me.

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