



UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY



# DESIGN OF ONSHORE WIND TURBINE FOUNDATIONS

A practical seminar for structural engineers on the design of wind turbine foundations for the local renewables industry according to international norms

Stellenbosch  
Engineering Faculty, S202  
15-16 October 2018

Johannesburg  
Southern Sun, OR Tambo  
18-19 October 2018

**2 CPD R 6500**

CREDITS



EARLY BIRD



## SEMINAR OBJECTIVE

South Africa's Minister of Energy, Jeff Radebe, recently signed 27 Independent Power Producer (IPP) agreements for the next round of renewable energy projects in the country with a combined capacity of 2300 MW. The National Development Plan (NDP) aims to increase the installed capacity of renewable energy to 20 000 MW by 2030. To achieve this increase in installed capacity, it will require the construction of thousands of wind turbine foundations, even after taking the contribution of solar and other forms of renewable energy into account.

Experience has shown that the design of wind turbine foundations require unconventional design approaches that are based on methods and norms not familiar to local structural engineers that typically specialize in buildings and bridges.

The seminar will provide background information and practical worked examples to equip the designer with a better understanding of the theoretical background, aspects to be considered in the conceptual and detailed design phases, interaction with other disciplines and construction documentation.

## SEMINAR FOCAL POINTS

The focus will be on:

- Components of wind turbines and their foundations
- Sequence of construction for foundations
- Typical foundation geometry
- Loading and limit states with reference to international norms
- Geotechnical aspects of design and their influence on foundation geometry
- Stability against sliding and overturning
- Design of concrete and reinforcement for Ultimate Limit State
- Checks to be performed for Serviceability and Fatigue limit states
- Construction specifications and costing
- Construction documentation

Furthermore, an **extensive design example** will be provided and the calculations explained.

# SEMINAR PROGRAM

TIME	TOPIC	SPEAKER
08:00 - 08:20	Registration & Refreshments	
08:20 - 08:30	Welcome & Introduction	Pierre van der Spuy
08:30 - 09:15	<b>Turbine and foundation components; Loading</b> Concrete; Reinforcement; Typical geometry; International norms; Load cases; Limit states; Partial factors	Pierre van der Spuy
09:15 - 10:00	<b>Foundation stability and contact pressure</b> Overturning; Sliding; Elastic soil pressure; Gapping	Pierre van der Spuy
10:00-10:15	<b>Coffee/Tea break</b>	
10:15- 11:15	<b>Geotechnical aspects</b> Foundation types, design requirements, site investigations and design parameters	Peter Day
11:15 - 12:15	<b>Geotechnical aspects</b> Assessment of bearing capacity and foundation stiffness	Peter Day
12:15- 13:00	<b>Geotechnical aspects</b> Worked example	Peter Day
13:00 - 13:45	<b>Lunch</b>	
13:45 - 14:30	<b>Ultimate limit state design</b> Plastic soil pressure; Selfweight of concrete and backfill; Load concentration factors	Pierre van der Spuy
14:30 - 15:15	<b>Ultimate limit state design</b> Top and bottom radial and concentric reinforcement design; Shear and punching shear; Anchorage of reinforcement	Pierre van der Spuy
15:15- 15:30	<b>Coffee/Tea break</b>	
15:30 - 16:15	<b>Serviceability limit state design</b> Crack width calculations	Pierre van der Spuy
16:15 - 17:00	<b>Fatigue limit state design</b> Fatigue loads; Calculation of fatigue stresses; Simple methods; Load spectrum method	Pierre van der Spuy

# SEMINAR PROGRAM

TIME	TOPIC	SPEAKER
08:30- 09:30	<b>Worked example</b> Foundation stability and contact pressures	Pierre van der Spuy
09:30- 10:30	<b>Worked example</b> Foundation stability and contact pressures	Pierre van der Spuy
10:30 - 10:45	<b>Coffee/Tea break</b>	
10:45-11:30	<b>Worked example</b> Ultimate limit state design	Pierre van der Spuy
11:30 - 12:15	<b>Worked example</b> Ultimate limit state design	Pierre van der Spuy
12:15 - 13:00	<b>Worked example</b> Ultimate limit state design	Pierre van der Spuy
13:00 - 13:45	<b>Lunch</b>	
13:00 - 13:45	<b>Worked example</b> Serviceability limit state design	Pierre van der Spuy
13:45 - 14:30	<b>Worked example</b> Fatigue limit state design	Pierre van der Spuy
14:30 - 15:15	<b>Worked example</b> Fatigue limit state design	Pierre van der Spuy
15:15- 15:30	<b>Coffee/Tea break</b>	
15:30 - 16:15	<b>Documentation</b> Drawings and reporting	Pierre van der Spuy
16:15 - 17:00	<b>Construction challenges</b>	Pierre van der Spuy

# PRESENTERS

---



## **Mr Pierre van der Spuy**

A senior structural engineer at Aurecon and an adjunct senior lecturer at Stellenbosch University. He specialises in bridges and renewable energy structures and was involved in many of the wind farms in South Africa in various roles including detail designer and owner's engineer for foundations. He also acted as technical advisor to Vestas, the world's largest supplier of wind turbines, on their projects in South Africa.

He is currently studying full time towards a PhD in structural engineering working on a new bridge live load model for South Africa. Pierre has designed structures accross Africa, the Middle East and Australia.

## **Prof Peter Day**

A geotechnical engineer by profession, Peter spent most of his industry career with Jones & Wagener consulting engineers where, after 34 years with the company, he served as chairman of the board until his retirement in 2013. Peter is a highly accomplished engineer, winning the SA Geotechnical medal, the JE Jennings award and a SAICE best paper award. He is a honorary fellow of SAICE.

Peter holds a DEng from Stellenbosch University where he currently holds an appointment as Adjunct Professor of geotechnical engineering.

# CPD CREDITS



The seminar is accredited for 2 Continued Professional Development credits with the ECSA.

# REGISTRATION



To register, please provide your details on the registration link provided below:

STELLENBOSCH, S202: <https://shortcourses.sun.ac.za/application-form.html?offeringid=047a3d49-63b2-e811-9d66-0050568000ff>

JOHANNESBURG, SOUTHERN SUN, OR TAMBO: <https://shortcourses.sun.ac.za/application-form.html?offeringid=2d5d59ef-c2b4-e811-80dd-0050568033a6>

Our system will generate an invoice for your records.

# PAYMENT



**Early Bird: R 6500.00**

Payment must be received by 1 October 2018

**Normal Bird: R 7000.00**

Payment must be received 5 working days prior to the course date



UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY

**WE LOOK FORWARD TO  
WELCOMING YOU AT THIS COURSE**



INSTITUTE OF  
STRUCTURAL  
ENGINEERING