



**Fault-Rupture and Strong Shaking Effects on the
Safety of Composite Foundations and Pipeline
Systems:
Quantification and Reduction of Seismic Risk
Through the Application of Advanced Geotechnical
Engineering Techniques**

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Project Coordinator**

Scope of Presentation



- Project objectives
- Reason for the project
- Field data
- Background for three presentations on aspects of the project

The QUAKE Consortium



- University of Dundee
- Géodynamique et Structure
- National Technical University of Athens
- Studio Geotecnico Italiano
- L.C.P.C. Centre de Nantes

Major Objective



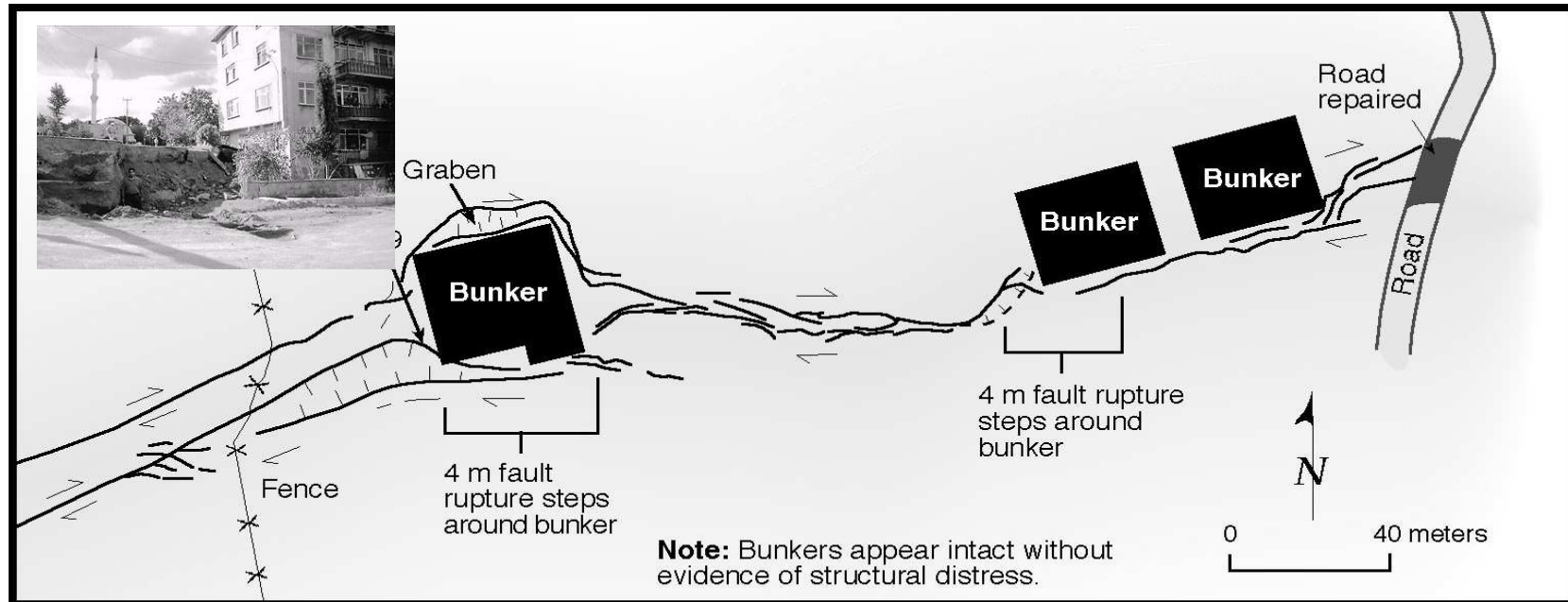
To gain a greater understanding of the effects of earthquake loading on soil and structure/lifeline systems by the application of advanced geotechnical engineering techniques

Project Aims



- improve understanding of the behaviour of soil and structural systems in strong earthquakes
- produce high quality experimental and field data
- examine existing design methods in light of new data
- develop appropriate methods of analysis
- provide and disseminate practical engineering design recommendations
- inform the development of design codes

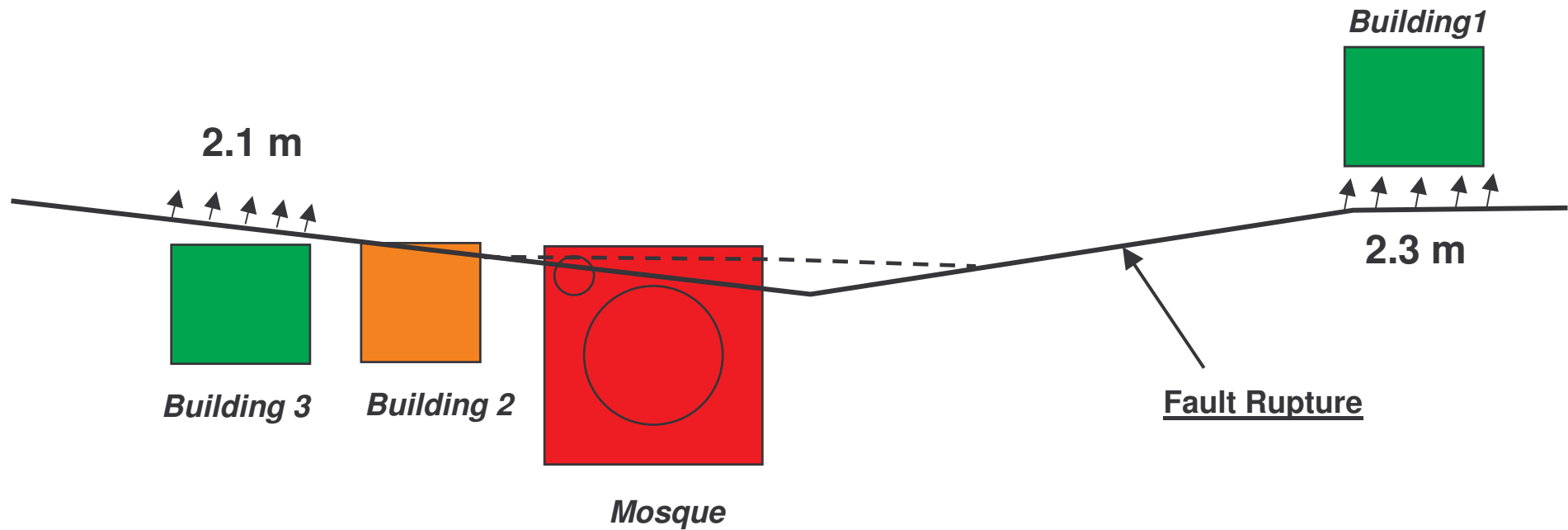
Field Evidence

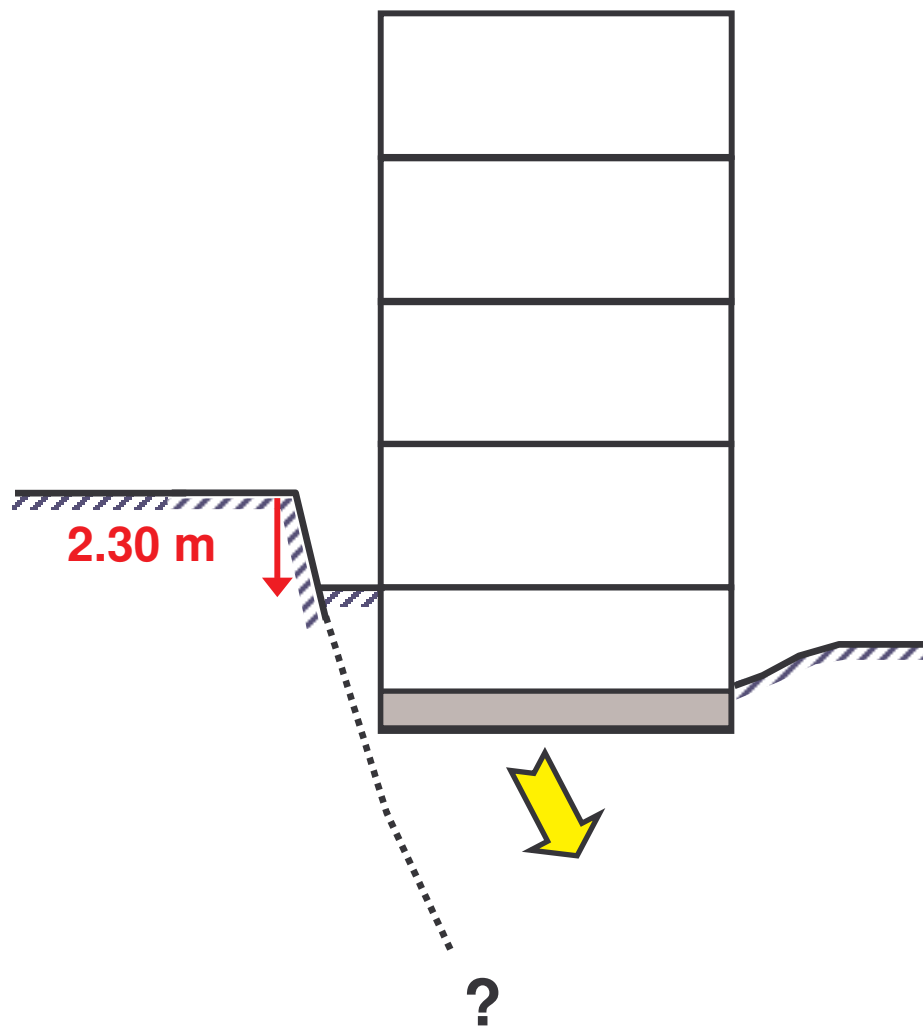


Mapped by : J. Bachhuber and W. Lettis

Diversion of fault-rupture by buildings (Golcuk)

Fault Rupture at the area east of Golcuck, Turkey (1999)

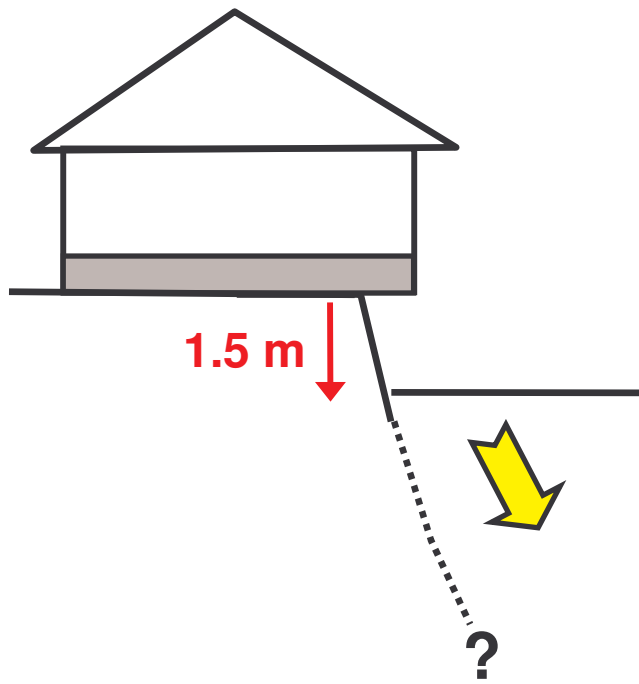




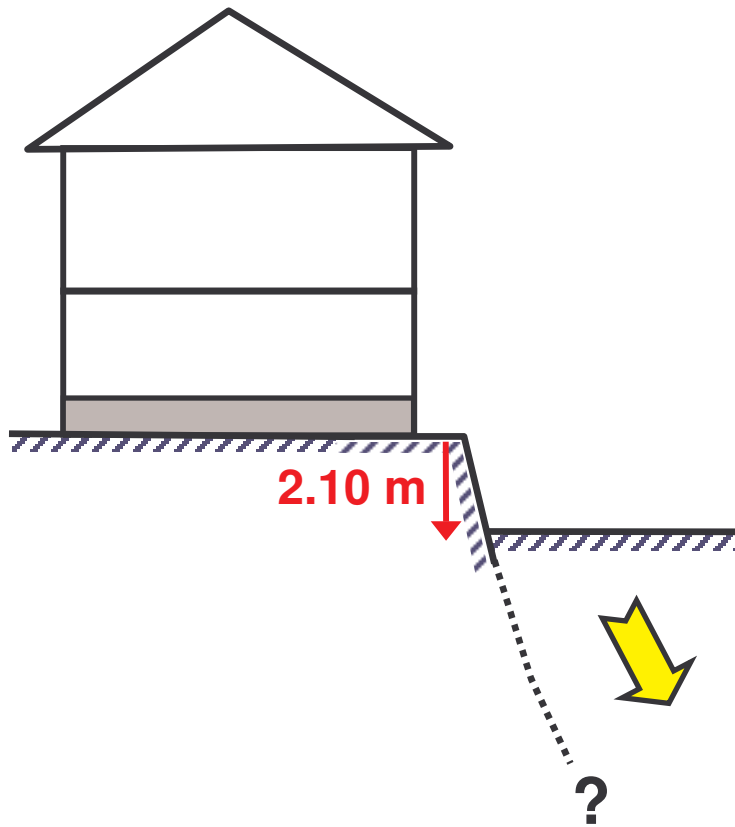
Building 1 : 4-storeys + Basement – No Damage





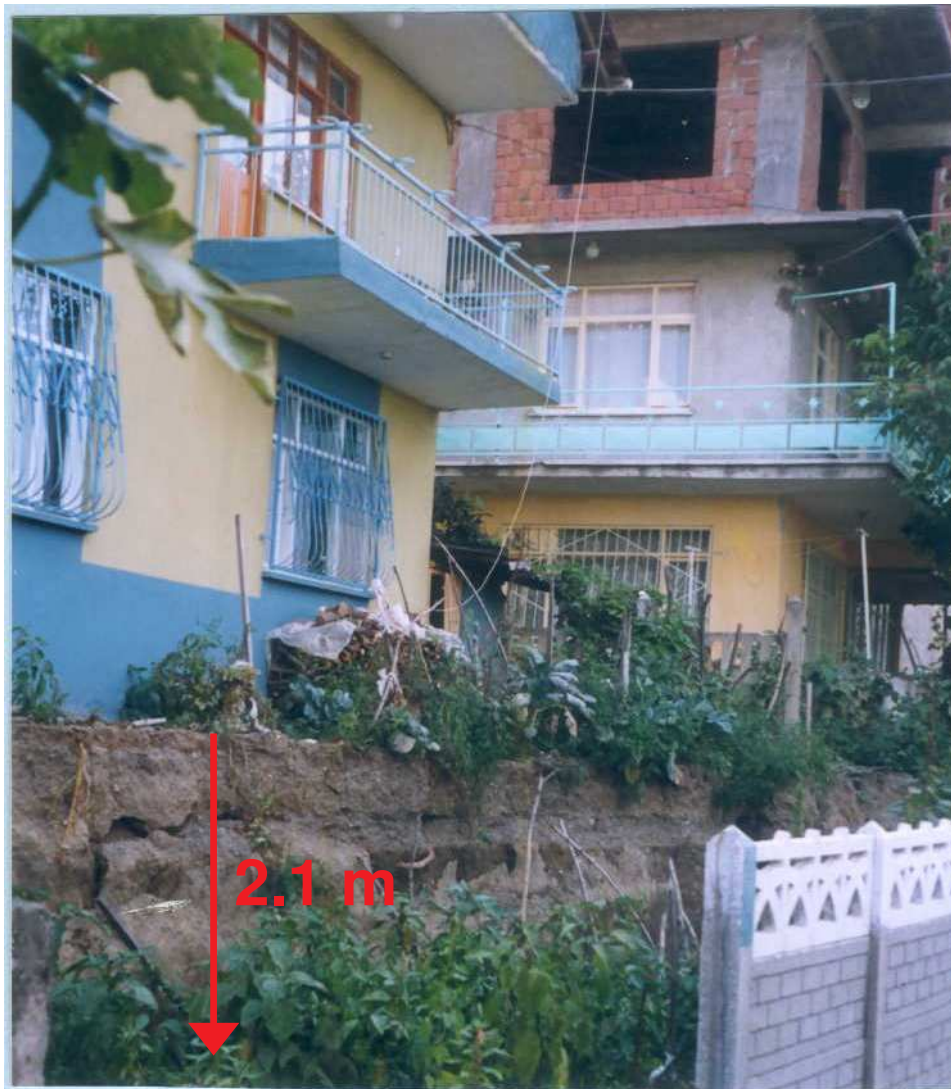


Building 2 : 1-storey – partial collapse

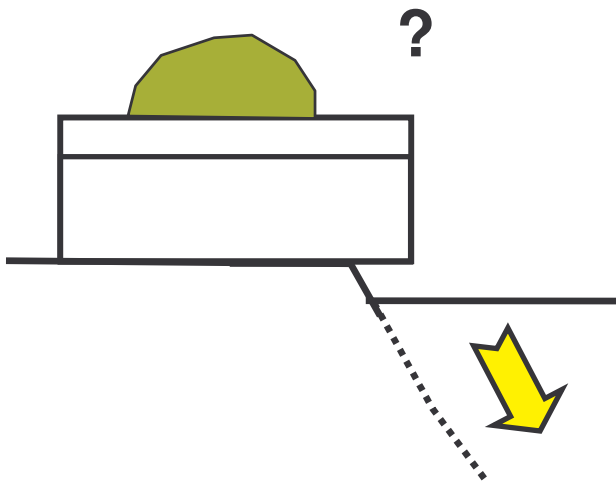


Building 3 : 2-storeys – No Damage





Building 3 : 2-stories + attic – No Damage



Mosque : Collapse



Field Evidence

QUAKER



Thrust-faulting adjacent to an intact pylon (Golcuk)

Field Evidence



Surface ruptures during the 1999 Chi-Chi earthquake

Field Evidence

QUAKER



Pile-supported structure subjected to liquefaction induced lateral-spreading ground movement (Port Island harbour, Kobe)

Field Evidence



Port and waterfront facilities in Kobe, Japan, suffered extensive damage due to liquefaction during the 1995 Kobe earthquake

Research Topics



Topic A - Fault-Rupture Soil Structure Interaction

- Develop and validate simplified methods to analyse the behaviour of foundation systems and pipelines crossing active earthquake faults.

Topic B - Strong Seismic Response of Composite Foundation Systems

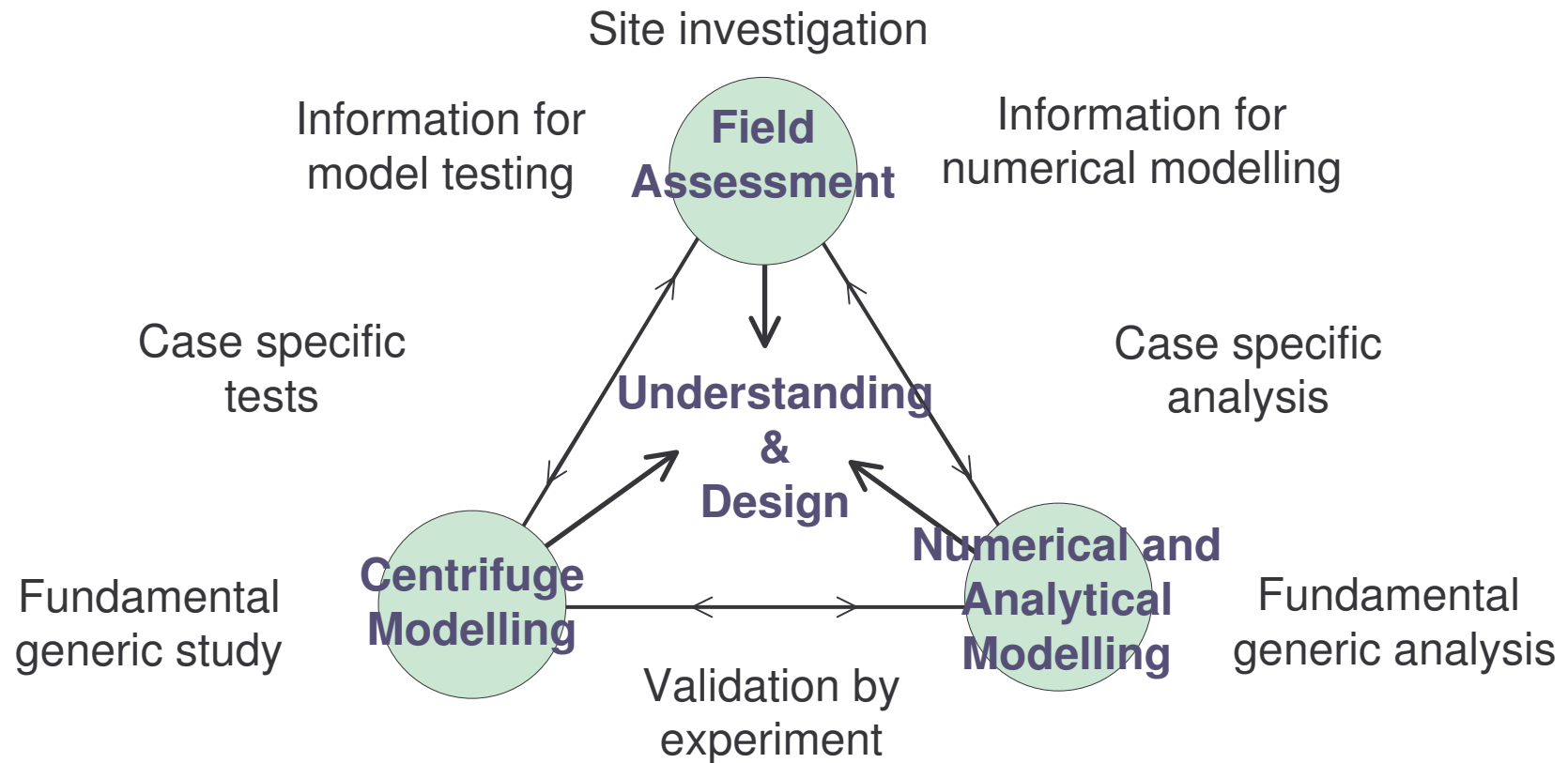
- B1: Effect of pile inclination on foundation behaviour under seismic loads
- B2: Non-linear soil-structure interaction effects on the seismic response of shallow foundations

Research Techniques



- assess real earthquake events with relevant case histories
- conduct series of reduced scale geotechnical centrifuge models
- conduct sophisticated numerical and analytical modelling; calibrated by comparison with the case history and centrifuge test results

Integrated Approach



Presentations



Topic A - Fault-Rupture Soil Structure Interaction

Dr Fraser Bransby, University of Dundee

Topic B - Strong Seismic Response of Composite Foundation Systems

Topic B1: Inclined piles

Dr Sandra Escoffier, LCPC

Topic B2: Shallow foundations

Dr Luc Thorel, LCPC

