



# Continuous Surface Wave testing

## A new solution to measuring ground stiffness

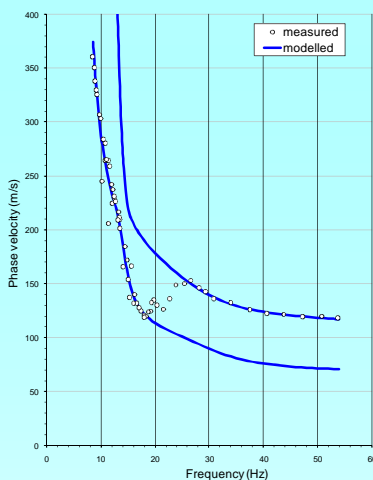
RJM Ground Solutions is offering a new service to measure ground stiffness and enable accurate analysis of the response to loading, seismic forces and vibration



### What is CSW?

Continuous Surface Wave (CSW) testing is a geophysical technique which measures the speed of propagation of surface waves generated by a vibratory source or 'shaker'.

The velocity of these waves are measured by a geophone array at a range of frequencies allowing a velocity versus frequency plot (or dispersion curve) to be determined. As surface wave velocity is primarily a function of soil stiffness the dispersion curve can be readily converted to a stiffness against depth profile.



### Why do I need CSW data ?

CSW is relevant anywhere where accurate stiffness data is required, for example:

- Foundation settlement predictions
- Retaining wall analysis
- Finite Element Analysis of soil structure interaction
- Ground improvement design and validation
- Performance of earthworks
- Seismic analysis
- Design of foundations subject to vibration

### Why use CSW over other techniques ?

- It can be undertaken quickly from the surface without the need for boreholes
- It can provide a stiffness profile to typical depths of 6-10m
- It is a proven technique providing high quality repeatable small strain stiffness values
- Data acquisition is rapid with typically around 6 stiffness profiles obtained per day
- Being non-intrusive means the technique is very cost effective

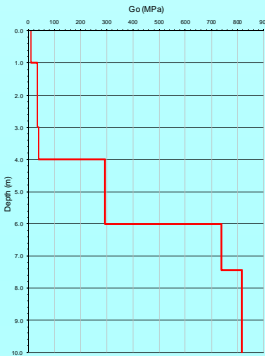




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## What are the limitations of the CSW technique ?

- 👉 Provided there is drive on access close to the test area test equipment can be moved by hand to the actual test location
- 👉 Each test needs a reasonably level area some 2x5m free of hard finishes such as concrete or tarmac
- 👉 The presence of near surface buried structures can affect the interpretation of results, ideally surveys will be located >2m from such obstructions
- 👉 Constant nearby heavy traffic or other ground vibration sources can reduce the quality of data obtained, however acquisition times at each test frequency are short and periodic noise can normally be accommodated
- 👉 depth of penetration can be reduced by the presence of shallow rock or very stiff near surface layers



## Who are RJM?

RJM is a small, client-focussed, specialist geotechnical consultancy used to providing a high quality service at a competitive price. RJM is working in conjunction with Professor Gerhard Heymann of the University of Pretoria to offer CSW profiling as a stand alone service to its clients and to complement its in house design work.

## Why use RJM?

- 👍 Field acquisition is undertaken by experienced geotechnical engineers who optimise the survey configuration and undertake basic field analysis of data to ensure data quality
- 👍 We use a high energy mechanical shaker optimised to obtain data at low frequencies thereby maximising the depth of investigation
- 👍 A full multi-modal inversion of data ,which can analyse the most complex ground conditions, is undertaken by Professor Gerhard Heymann, an internationally recognised expert in the acquisition and analysis of CSW data
- 👍 If required, we can offer a comprehensive analysis and design service using the finite element programme PLAXIS to provide accurate predictions of settlements, stresses or displacements in response to proposed loadings

## Contact us

If you need more information about CSW, RJM's capability, or would like to talk informally about how we could help you, please call either John or Chris on 0870 1642309, or email us at [info@rjm-ground.co.uk](mailto:info@rjm-ground.co.uk).



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